Crossing Boundaries: celebrating 20 years of environmental research in Cagayan Valley and Sierra Madre.

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CROSSING BOUNDARIES

CELEBRATING 20 YEARS OF ENVIRONMENTAL RESEARCH
IN CAGAYAN VALLEY AND SIERRA MADRE

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EDITED BY: GERARD PERSOON, ANDRES MASIPIQUEÑA, JAN VAN DER PLOEG, MERCEDES MASIPIQUEÑA AND MERLIJN VAN WEERD

Colophon

Crossing boundaries: celebrating 20 years of environmental research in Cagayan Valley and Sierra Madre

The Cagayan Valley Programme on Environment and Development is a joint undertaking of the Institute of Environmental Sciences, Leiden University (the Netherlands), and the College of Forestry and Environmental Management, Isabela State University (the Philippines).

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Cover photo: Landscape in the upper part of Cagayan River (Persoon 1991)

Previous page: Sunset in Cagayan Valley (van Weerd 2009)

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PREFACE

Gerard Persoon

Even a long lasting relationship starts with a first encounter. When Leiden University decided to establish a Programme for Environment and Development at the Institute of Environmental Sciences in 1986, it was envisioned that the programme would establish two research stations: one in Southeast Asia and one in sub-Sahara Africa. Because of its interdisciplinary research and education aims, the establishment of these research stations had to fulfill certain criteria. There had to be a close fit between the potential partners. Also the area had to meet the formulated criteria in terms of potential research topics. After a short comparative reconnaissance trip in Southeast Asia, two staff members of Leiden University arrived at the Cabagan Campus of Isabela State University in August 1987 during a typhoon. Few people were to be found on the campus as the typhoon warnings had urged people to stay at home. During the first meetings with the staff, of what was then still called the College of Forestry, it became very clear that the meeting took place at the right time, at the right place and with the right people.

The representatives of both institutions appeared to be on an equal level with respect to research and education. The Cagayan Valley with its vast natural resources, especially its mountain ranges with high biodiversity, its ethnic composition but more importantly its emerging environmental problems, seemed to fulfill the requirements and the ideas formulated from behind office desks at the Institute of Environmental Sciences at Leiden University. Both partners decided to get to know each other better. Between 1987 and 1989 several cross visits were made and the first Dutch students went to the Philippines to conduct fieldwork in 1988 together with two Filipino students. At the same time the construction of the house for the Dutch coordinator on the Cabagan campus was started.

Left page: Rice planting is usually a collective activity in Cagayan Valley (Persoon 1991)

In June 1989 the presidents of Isabela State University, Dr. R. Nayga, and Leiden University, Mr. C. Oomen, signed an official agreement for cooperation in the field of environmental studies. This event in Leiden underscored the wish of both universities to work towards a contribution to the safeguarding of biodiversity and the sustainable management of natural resources through research and education. The universities appointed two coordinating units to implement this cooperation. On behalf of Isabela State University the College of Forestry and Environmental Management (CFEM) was assigned to be the coordinating unit and Leiden University entrusted the task upon the Institute of Environmental Sciences (CML).

In the agreement it was stipulated that the aim of the cooperation was to contribute to the growth of environmental science as an interdisciplinary field of research and education at both universities. It also aimed to stimulate the design and implementation of projects in an effort to safeguard the region's rich natural heritage (for the full text of the agreement, see Appendix I).

Joost Maus and Eric Schieferli, the first Dutch students (Persoon 1988)

The agreement was open-ended. It did not stipulate its exact duration. Both institutions agreed to embark on a long lasting cooperation with mutual benefits in terms of research and education. The universities agreed to establish a joint programme which was labeled the Cagayan Valley Programme on Environment and Development (CVPED). A partnership structure was developed with equal ownership over the activities. The programme would be run by a Filipino and a Dutch coordinator. A steering committee, consisting of senior staff members of both universities would supervise the annual activities, determine budgets and help to solve administrative problems if they would occur. Through the programme research and education activities would be channeled as well as any additional project initiated or acquired in line with the main mission of the cooperation.

Over the years more than 250 students from both institutions have done research at their bachelors' or masters' level on a wide variety of subjects. Many more have participated in a wide range of courses or practical field trainings. They have come from various disciplines, including forestry, biology, anthropology, physical geography, ecology, economics and many others. Also PhD. projects have been initiated or channeled through CVPED: in total five have successfully been defended and nine are ongoing at the moment of writing.

A number of large scale projects have been implemented in the field of training in resource management. Other projects were aimed at reforestation, biodiversity conservation and at building a network in Southeast Asia. The rediscovery of the Philippine crocodile in 1999 initiated a range of activities in terms of research and practical nature conservation activities for this highly endangered animal.

Right from the beginning international conferences were organized to present and discuss the outcome of the research activities by Filipino and Dutch students and researchers. Whenever possible these results were compared with ongoing research activities in other areas of the world. Researchers with an international reputation participated in these meetings.

Themes of conferences of the Cagayan Valley Programme on Environment and Development:

1. *Forestry for people and nature (1991)*
2. *Research for the Sierra Madre forest (1994)*
3. *Co-managing the environment: the natural resources of the Sierra Madre Mountain Range (1998)*
4. *The Sierra Madre Mountain Range: global relevance, local realities (2002)*
5. *The future of the Sierra Madre: responding to social and ecological changes (2005)*
6. *Changing landscapes (2009).*

The longstanding and productive relation between both institutions and its output in terms of education and research has generated respect. It contributed to CFEM's status as a centre of excellence in forestry education in the Philippines awarded through the Commission on Higher Education in the year 2000. It was an opportunity for the programme to assist CFEM in sustaining this recognition in rendering excellent services in instruction, research and extension. CVPED also received high commendations from regional agencies for sharing its expertise, providing technical inputs and active participation in various endeavors in the field of environment and development. Further, in 2006 the research station was classified as a treasure for Leiden University by an international commission reviewing the research of CML.

The construction of the house of the Dutch coordinator (Persoon 1989)

Within this general context it is unfortunate that the Executive Board of Leiden University has decided to discontinue its financial support for CVPED at the end of 2009. This was one of the consequences of the decision by the Board to restructure the Institute of Environmental Sciences. In this process the Department of Environment and Development was abolished by the end of 2008. Because of this decision the future of a successful joint interuniversity programme has become uncertain, even though efforts are undertaken to find alternative sources for funding or to structure the cooperation on another footing. The prospects however are not yet clear at this moment.

This book has been given the title *Crossing boundaries*. In various ways this research and education programme has been different from other projects and programmes. In the first place it differed from many other types of projects in the field of international university-to-university cooperation because of its open-ended character. No fixed duration was stipulated in the original agreement. It also did not have a pre-determined and strictly defined research and education programme. Both universities allowed the cooperation to develop its plan of operations in a more or less organic way, gradually gaining more knowledge on the basis of which next steps could be taken. The spirit of partnership has always been the basis of the cooperation. This is reflected among others in the equal representation in management structures and decision making but also in the benefits that both universities needed to get out of this joint programme in terms of publications and numbers of students trained. Both universities have contributed substantially to the programme in terms of manpower, infrastructure and finances. Compared to other international university cooperation projects the amounts of funding involved have always been modest but the length and the long term commitment have been exceptional.

Cooperation and teamwork among students and staff have been key values in CVPED's operations. Developing a truly interdisciplinary research and education programme required serious efforts to overcome the limitations of traditional disciplinary education and scientific paradigms. In combination with cultural differences, this implied that numerous scientific and educational boundaries had to be crossed both by staff and students involved in the programme. The willingness to do so was based on the idea that, in order to understand environmental problems, knowledge from a single discipline rarely suffices. Also in terms of the contribution that individual research projects can make to larger or overarching questions, students and staff had to overcome their disciplinary limitations.

It is hoped that this book does not only document 20 years of CVPED operations, but that it also marks a new beginning of this type of work with new partners, and new challenging horizons.

We want to express our gratitude to the Royal Netherlands Embassy in Manila for the generous support to make this publication possible in its present form.

The way to the CVPED office at the Cabagan Campus of Isabela State University (van der Ploeg 2004)

Republic of the Philippines
Isabela State University
Echague, Isabela
Tel. No.: (078) 672-2013
Office of the President

MESSAGE

I take great pleasure in congratulating the CVPED and the many individuals behind the task of producing this book that celebrates the 20th anniversary of the programme.

Years past witnessed the fruitful collaboration in environmental education and interdisciplinary research between the Isabela State University (ISU) through its College of Forestry and Environmental Management (CFEM) and the Institute of Environmental Science (CML) of Leiden University. Together, we have truly promoted a partnership that breaks boundaries in knowledge production and integration.

The CVPED has been the working arena of these two universities in helping create a global human resources network of boundary-crossing figures. This includes hundreds of student researchers, faculty members, experts, practitioners, consultants and other key players in as many fields of inquiry, trainings, seminars, conferences attended, and publications produced. This helped bring about an international system of knowledge in Southeast Asia that advances the frontline of inter-university cooperation.

We at the Isabela State University take pride in hosting the CVPED for 20 long years, a fete unmatched by other similar cooperation in the entire country. It had lasted this long because we understood the different dimensions in fostering ethical responsibilities to continually serve the purpose of the academic cooperation. For ISU, the programme has become one of our finest innovations and good practices recognized by the National Economic Authority (NEDA) and the Commission on Higher Education (CHED).

On behalf of the entire university system, we thank the sponsors most especially the Netherlands Embassy in Manila for making this book a reality. Lastly we thank the many people, organizations, government agencies and others that made this cooperation a very successful endeavor. We look beyond for its future in the region.

ROMEO R. QUILANG, Ph.D.
University President

Universiteit Leiden

MESSAGE

This book celebrates the twentieth anniversary of the Cagayan Valley Programme on Environment and Development, the academic partnership of Isabela State University in the Philippines and Leiden University in the Netherlands. The book documents the research and education activities of the joint programme in the Cagayan Valley and the northern Sierra Madre, and commemorates the long lasting and productive relationship between two universities that are far apart, a rare phenomenon in the present day world.

Looking back at the past two decades, we appreciate the spirit of true partnership in which the cooperation has taken place and which has been fruitful for both universities. This could only have been achieved by the hard work and commitment of all the people involved in this programme on a day-to-day basis. Through the programme more than two hundred fifty Filipino and Dutch students have gained valuable experience working in an interdisciplinary and intercultural research framework. As this book shows, we have gained important insights on environmental changes in the Cagayan Valley. These research outputs have led to substantial gains in natural resource management, biodiversity conservation and sustainable development. This has not only been important for the Cagayan Valley and the protected area of the Northern Sierra Madre Mountain Natural Park, but the knowledge gained here has also proven to be useful elsewhere.

Leiden University has a long tradition of international cooperation, with extensive exchange of scholars and students. However from time to time we are forced to reconsider our commitments. As a result of the renewed position of the Institute of Environmental Sciences within the Faculty of Science, the cooperation with Isabela State University can no longer be maintained in the same manner. We do hope however that new forms of joint activities or projects will be possible in the future and that the productive work in the field of environmental sciences can be continued. The Philippines as part of Southeast Asia remains one of the areas in the world that is of key interest for Leiden University.

On this occasion I would particularly like to thank Isabela State University very much for the support and hospitality offered to the Dutch researchers and students over the past years.

prof. Paul F. van der Heijden
rector magnificus & president Leiden University.

Pasuguan ng Pilipinas Embassy of the Philippines

The Hague

MESSAGE

Crossing Boundaries

Like music and art, love of nature is a common language that can transcend political or social boundaries

JIMMY CARTER

Twenty years ago, a momentous occasion happened in Isabela Province, a poignant event in the History of the Cagayan Valley. On June 5, 1989, the signing of a cooperation agreement between the Isabela State University in Isabela, Philippines and the Leiden University in Leiden, The Netherlands, heralded the dawning of a fruitful cooperation between these two institutions of higher learning.

The Cagayan Valley Program on Environment and Development (CVPED) was born out of the cooperation agreement between the two universities. This development program that started in 1989 was able to accomplish many milestones in the field of environmental management.

Long before the United Nations Millennium Declaration in 2000, CVPED was well on its way in working towards the fulfillment of one of the Millennium Development Goals on Environmental Sustainability.

CVPED has left its hallmark on studies in biodiversity conservation, land use change, co-management of natural resources, and eco-tourism.

Students and researchers have benefitted from CVPED funding in their studies on agroforestry, fish stocks, and forestry. Projects on sustainable development of the Cagayan River basin and other surrounding areas were made possible through the CVPED program.

Through CVPED funding, an ecological study of the Philippine Crocodile was developed. The crocodile sanctuary in Disulap River, San Mariano, which was developed as the natural habitat of the Philippine crocodile, has helped various experts in observing the territorial and mating behavior of the Philippine crocodile, considered as the most threatened crocodile species in the world.

In terms of crossing boundaries, to cite the title of this book, a very signficant boundary was metaphorically crossed through the efforts of CVPED. This boundary is that of the Sierra Madre Mountain Range, which has been a consistent theme in CVPED conferences since 1991.

The Sierra Madre is the longest mountain range in the Philippines because its area spans the eastern length of the island of Luzon.

Through CVPED studies, problems on environmental protection of the Sierra Madre were addressed.

These and other projects on environmental protection have helped the Philippines, especially the Cagayan Valley Region, to meet the target set forth in the UN Millennium Development Goal on environmental sustainability.

I would like to congratulate the Isabela State University and Leiden University for the 20th anniversary commemoration of the signing of the CVPED agreement.

The cooperation benefitted both the Isabela State University and Leiden University in terms of research and education, and has contributed to sustainable management and biodiversity conservation.

Although it is regrettable that the Leiden University Boardhas ceased its financial support for CVPED at the end of 2009, I am hopeful and confident that this boundary can be crossed as well so that projects that rely on CVPED support will reach their successful conclusion.

Love for nature knows no boundaries. By championing the cause of protecting philippine nature despite the geographical divide, CVPED's love for nature has itself transcended the boundary between the Philippines and the Netherlands.

May its success in the pursuit of future projects be limitless and without boundaries.

MABUHAY!

ROMEO A. ARGUELLES
Ambassador Extraordinary and plenipotentiary
of the Republic of the Philippines
to the Kingdom of the Netherlands

Koninkrijk der Nederlanden

MESSAGE

The Embassy of the Kingdom of the Netherlands takes great pleasure in commemorating 20 years of interdisciplinary environmental research by the Cagayan Valley Program on Environment and Development (CVPED) through this publication. As the academic partnership between Isabela State University and Leiden University since 1989, CVPED has become the leading interdisciplinary research and education center on environmental issues in the Cagayan Valley and the Northern Sierra Madre Mountains in northeast Luzon. CVPED has contributed to a better scientific understanding of environmental changes in Northeast Luzon and has played a pivotal role in the establishment of the Northern Sierra Madre Natural Park, the largest and biologically the most diverse protected area of the country. More importantly, this book illustrates the Philippine-Netherlands cooperation of the past 20 years, which was started by Dutch development funding.

As a book that celebrates the unique landscapes and biodiversity of Cagayan Valley and the Sierra Madre Mountains, this is a landmark publication which reflects the range of environmental issues in the region in a span of 20 years of research. It has envigorated the research and education capacities of both Isabela State University and Leiden University as shown by its more than 200 Philippine and Dutch graduate (MSc and MA) and undergraduate (BSc and BA) students, and fourteen Philippine and Dutch PhD students having graduated or are working on a thesis based on fieldwork conducted under the umbrella of CVPED. Many of these former students now work in international organizations carrying with them valuable experiences from the program. It is my fervent hope that more will follow in their footsteps.

May this endeavor by CVPED and the Embassy serve as a fitting legacy of genuine scientific partnership and academic cooperation, and contribute to promoting environmental governance in the Cagayan Valley region.

ROBERT G. BRINKS
Ambassador

Republic of the Philippines
Province of Isabela
Office of the Governor

MESSAGE

On behalf of the provincial government of Isabela, let me congratulate and thank the Cagayan Valley Program on Environment and Development for the 20 years of enriching partnership between the Isabela State University and the Leiden University on elevating the consciousness of stakeholders on the importance of protecting and conserving our environment most especially the Northern Sierra Madre Natural Park (NSMNP), the last bastion of biodiversity in the country. Thank you because without these efforts the fate of the Sierra Madres would have been unfortunately sealed just like the many destroyed forests around the region and Southeast Asia. The knowledge and experience gained by all who passed through the CVPED these past 20 years is our collective contribution and legacy to the next generation especially in this province and region.

The provincial government of Isabela's serious campaign to save the NSMNP was greatly inspired by my knowledge and appreciation of the great concern and commitment of our friends from the Leiden University and all our other CVPED partners, from the time I was a broadcast journalist chronicling the unfolding of events in Isabela until the time I, by an amazing twist of events, became its Governor. What we started as a small but relentless effort to stop illegal poaching and logging has started to draw attention not only in this country but also around the world. I am glad that various churches, multi-sectoral groups and environmental organizations have joined me in this campaign.

The theme "Changing Landscapes" of the CVPED 20 year anniversary conference in June 2009 aptly describes the humble but significant accomplishments we already made as well as tough challenges we still have to face. As agents of transformation we need to change the landscapes all in the interest of the common good. No amount of resources, laws, policies and research can work if we remain to be bystanders taking on the scenery around us or simply feeling helpless in the face of the greed and selfishness of those who use the power they have not to create but to destroy.

With my two polio-stricken feet, I have shown that we can and indeed we must walk our talk. *Dank u wel* CVPED for the 20 years of laying and strengthening the ground on which all of us can stand to save, protect and enrich our land.

Mabuhay!

GRACE M. PADACA
Governor

"Bagong Kultura para sa Kaunlaran ng Bawat Isa"

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REPUBLIC OF THE PHILIPPINES
House of Representatives
QUEZON CITY

MESSAGE

It is my pleasure to laud the organizers and sponsors of this book - **Crossing Boundaries** in celebration of the 20th anniversary of the Cagayan Valley Programme on Environmental and Development (CVPED) and in making us proud of its achievements within the 1st District of Isabela which I represent.

Our eyes and minds have been opened to the state of degradation of our natural resources and the clamor to arrest this degradation if only to meet the challenges posed by the real climate change. We are pressed forward to act on the issues facing the Northern Sierra Madre Natural Park to the international agenda. We realized that the government by itself cannot solely be responsible in working out solutions to many environmental problems around us especially those that impinged in our agriculture, forestry, fishing, and mining which are the lifeline of rural people. We believe that the platform is always open in promoting effective public participation in aid of legislative agenda and indecision-making.

CVPED had introduced to us the basic framework for elucidating processes and how relationships work in the case of environmental performance. We are happy to see how CVPED developed in this province and carved a niche in the region in addressing issues that demand a truly global response.

We thank the CVPED, Isabela State University, Leiden University and the Netherlands Embassy in Manila in creating a vivid impression to our economic, social and political life.

RODOLFO T. ALBANO III
Congressman, 1st District of Isabela

Republic of the Philippines
Province of Isabela
MUNICIPALITY OF CABAGAN

OFFICE OF THE MUNICIPAL MAYOR

MESSAGE

With my heartfelt greetings, I congratulate the Cagayan Valley Programme on Environment and Development (CVPED) for coming up with this book – **Crossing Boundaries** in celebration of its 20th Anniversary. Indeed, we are fortunate that CVPED is hosted by Isabela State University here in the Municipality of Cabagan for many years.

Cabagan and adjacent areas with its different *barangays* and *sitios* together with its households and communities are close to nature and other resources. Hence, we have been eyewitnesses in the crossing of our boundaries by Dutch and other foreign nationals, students, researchers, experts and many others in as many activities that we have been part and parcel of the programme. Truly, Cabagan had been home to different nationalities.

The presence of the programme had tremendous impact in the training of our own students, and mentors as well as having forged a synergy between educational modernization and environmental preservation. The Local Government Unit of Cabagan had benefited in working closely with the programme in doing our modest but assiduous efforts in addressing environmental concerns and issues. We at the LGU together with the people in the area of jurisdiction have been motivated to work closely with environmental programs and projects implemented to attain a sustainable development of our environment.

As the Chief Executive of Cabagan, I must congratulate the CVPED, the Isabela State University, Leiden University, and the Netherlands Embassy in Manila for jointly sponsoring this important book as a showcase of inspiration for everyone who cares for our natural resources.

Mabuhay!

ATTY. CHRISTOPHER A. MANGSAG
Municipal Mayor

1

RESEARCH THEMES, PROJECTS AND EDUCATION

Gerard Persoon, Andres Masipiqueña, Jan van der Ploeg, Mercedes Masipiqueña and Merlijn van Weerd

Travelling by car from Manila to the Cagayan Valley makes a lasting impression upon every visitor. The landscapes are impressive: the steep slopes of Dalton Pass, the lush rice fields of the valley, the extensive grasslands and the blue mountains of Sierra Madre. In 1989, when the joint research and education programme started, another aspect of the Maharlika Highway was probably even more memorable: during the 10 to 12 hours' drive one could see hundreds of heavily loaded logging trucks passing by on their way from the Sierra Madre to Manila. Logging seemed the most important economic activity in the Cagayan Valley. Along the road the effects of logging were clearly visible: denuded hills as far as one could see. Studying the dynamics and effects of logging was a logical topic for an interdisciplinary programme trying to understand the environmental changes in the region. Over the years the focus of the research programme has expanded into new directions.

This chapter consists of three parts. In the first part we describe the various research topics that have been studied by students and researchers of the Cagayan Valley Programme on Environment and Development. Some of these topics will be described in greater detail in the chapters that follow and at the end of each chapter the most relevant student reports and publications of the joint programme are mentioned in a text box. In the second part of this chapter we provide an overview of the main research and extension projects that were implemented within the framework of the Cagayan Valley Programme on Environment and Development. In the third part we will describe the training and education activities of the joint programme.

Heavily loaded trucks on their way to Manila (van den Top 1989)

Left page: Harvesting rice in the Cagayan Valley (Persoon 1994)

Research themes

Over the past twenty years more than two hundred Dutch and Filipino undergraduate and graduate students have conducted fieldwork and written a thesis within the framework of the Cagayan Valley Programme on Environment and Development (see Appendix II for a complete list of student reports). Fifteen PhD. students have worked on research topics ranging from indigenous peoples' rights to contract reforestation, and from biodiversity conservation to the adoption of transgenic corn. Here we will briefly outline these themes.

Deforestation

Behind the heavily-loaded logging trucks heading for Manila there is a complex world of timber harvesting, trade channels, governmental policies, law enforcement, consumers preferences and so on. The Cagayan Valley Programme on Environment and Development tried to understand the social dynamics of deforestation. Students and researchers studied the environmental effects of logging, both in the forest as well as in downstream areas, the people involved in illegal logging networks and the timber trade. Study was also made of the policy responses such as the logging moratorium and their projected and real impacts. Over the past twenty years the scale of logging has dramatically changed in the Sierra Madre: from corporative logging in the 1980s to community-based forestry in the 1990s. But logging remains a driving force of deforestation in the Sierra Madre.

Upland agriculture

Agricultural encroachment is another cause of the rapid decline of forest cover in the Philippines. Since the start of the joint programme there has been a strong interest in shifting cultivation and upland agriculture from an ecological as well as a sociocultural perspective. In the forests of the Sierra Madre there are peoples, such as the Bugkalot, who depended on traditional shifting cultivation. The slash-and-burn techniques of recent immigrants, who settled in the Sierra Madre in the wake of the logging companies in the 1960s and 1970s, are more destructive. Students and researchers of the Cagayan Valley Programme on Environment and Development studied the livelihood strategies of upland farmers, described the push- and pull-factors of immigration, assessed the ecological impact of shifting agriculture, quantified the impact of roads and market forces upon crop selection and prices, and formulated policy recommendations to halt deforestation and alleviate poverty in the uplands.

Fire is an important instrument in upland agriculture (Persoon 1999)

Reforestation

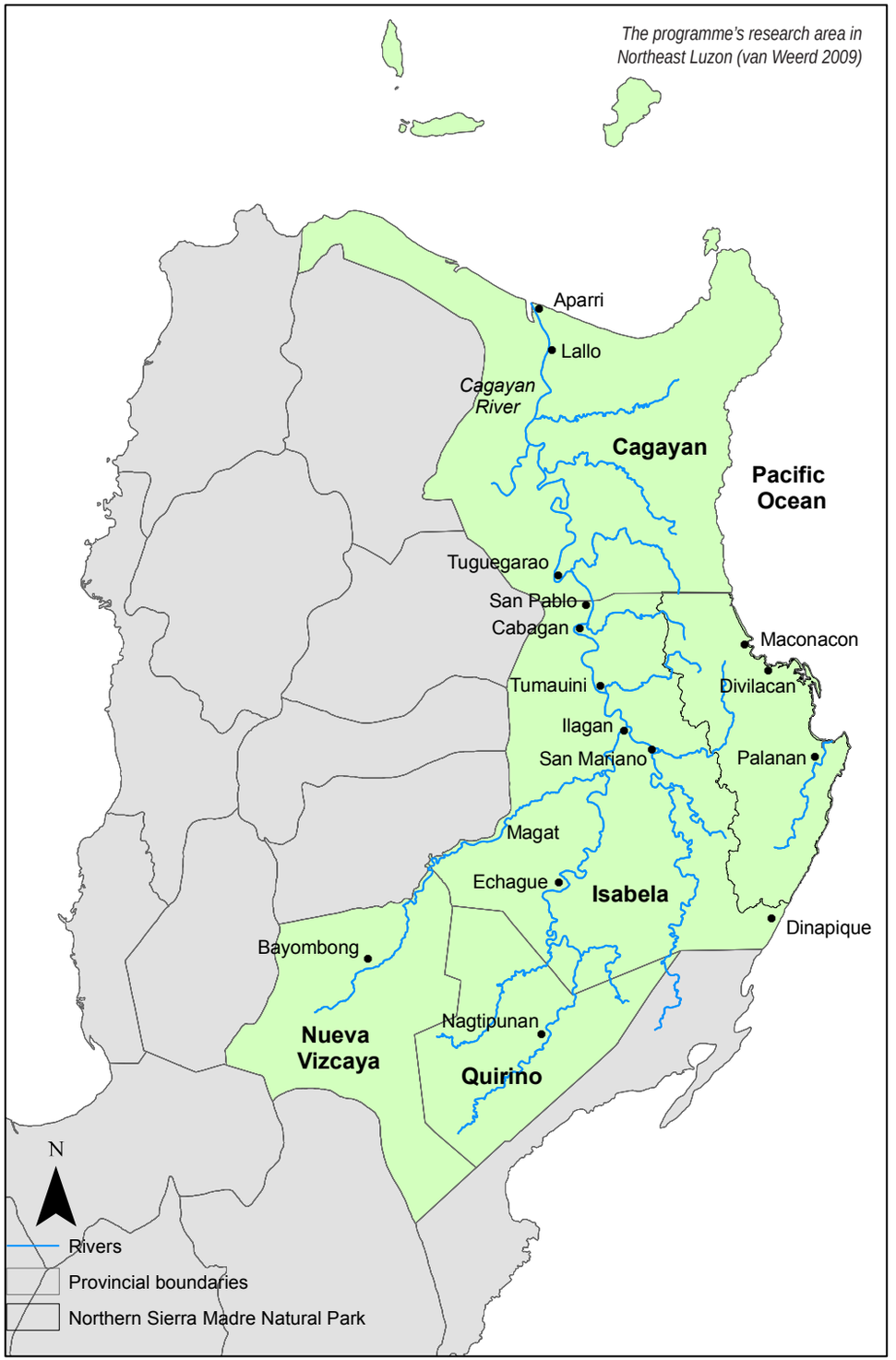
In the early 1990s reforestation gained relevance. The Philippine government and international donors were willing to invest in reforestation. Numerous reforestation projects were implemented in the Cagayan Valley. The design and the implementation of these reforestation projects became an interesting topic for research. There was an urgent societal need to determine the factors determining the success or failure of these reforestation projects. Land ownership, selection of suitable tree species, conflicting claims over pasture areas, performance of project staff and fire control were among the factors identified by students of the Cagayan Valley Programme on Environment and Development.

Non-timber forest products

The need to identify alternative forest-based livelihood options has prompted research into non-timber forest products. Forests can yield much more than just timber. The income derived from products such as rattan, bamboo, resins, bushmeat, fish, fuel wood, birds' nests and medicinal plants is crucial for forest dwelling communities, and can be promoted as an alternative to logging. Identification of products, modes of exploitation and management, and the sustainability of harvesting techniques are themes that have been investigated over the past years.

Grassland rehabilitation

Logging and the encroachment of migrant farmers created large tracts of unproductive grasslands, which were mainly used for extensive cattle ranching and fuel wood gathering. The transformation of these so-called 'idle grasslands' into productive agricultural field became a major challenge for farmers, policy makers, agricultural extension services and researchers in the Cagayan Valley in the 1990s. The Cagayan Valley Programme on Environment and Development conducted several studies to determine the potential of the extensive grassland between the floodplains and the forest.



The programme's research area in Northeast Luzon (van Weerd 2009)

Biodiversity conservation

The enactment of the National Integrated Protected Areas System Act in 1992 placed the conservation of biodiversity high on the research agenda. Over the years, the Cagayan Valley Programme on Environment and Development has studied the effects of forest degradation on biodiversity. These efforts have contributed to the proclamation of the Northern Sierra Madre Natural Park in 1997. The Northern Sierra Madre Natural Park is the largest protected area in the Philippines. The park includes a great variety of ecosystems ranging from coral reefs to montane forests, and harbors numerous endemic plant and animal species. The discovery of a remnant Philippine crocodile population in 1999 has spurred research into the ecology of this critically endangered species and the conditions in which it survives. The scientific information generated by students and researchers of the Cagayan Valley Programme on Environment and Development has been used to design an in-situ conservation strategy for the species in the Sierra Madre.

Luzon Tarictic Hornbill (Penelopides manillae) (van Weerd 2000)

Converting grassland to corn fields (Persoon 2000)

Indigenous peoples

The role of indigenous peoples in forest management, particularly the Agta in the northern Sierra Madre, has been an important part of the research programme. When the Department of Environment and Natural Resources issued a department administrative order in 1993 that allowed indigenous peoples to claim and manage their ancestral domains, it became important to document traditional resource practices and assist indigenous communities in the management of natural resources within their domains. The issuance of the Indigenous Peoples' Rights Act in 1997 made the relevance of this research topic even stronger. In the Philippines indigenous peoples also play an official role in the co-management of protected areas. Several studies have been undertaken in the framework of the Cagayan Valley Programme on Environment and Development on the management of ancestral domains, resource utilization, and the relation between indigenous peoples and their neighbors.

Land use transitions

Understanding the forces and influences by which people change their land use practices is a major scientific challenge. In particular the transition from unsustainable land use practices to more sustainable ones is of key interest among researchers working in this field. Physical conditions, market forces, access to roads, capital to invest, technical skills and prevailing policies are among the determining factors in this transition. The complex interaction between those factors has been a topic of research within the programme. This kind of study requires both qualitative and quantitative field data as well as comparative data from other areas in order to construct models that can help to predict changes in land use patterns as a result of changing market prices, the impact of new roads or the potential risk of natural hazards.

Alvin de la Peña wearing his anti-para in Divilacan (Persoon 2001)

Projects

The Cagayan Valley Program on Environment and Development has been involved in a number of projects that allowed for expansion of the scope of work in terms of research, education or extension activities.

Project: Environmental Information Centre (1994)

Donor: Plan International & Australian Government (AIDAB)

Project leaders: Gerhard van den Top & Roberto Araño

Staff: Andres Masipiqueña, Domingo Paguirigan & Eileen Bernardo

Goal and objectives: provide a resource-base for environmental management in the Cagayan Valley

Outputs: In 1989, when the joint programme started its operations, office facilities and means of communication were very limited. There was an urgent need for a facility that could serve as resource base for environmental problems in the Cagayan Valley. The Environmental Information Centre (EIC) at the Cabagan campus of Isabela State University has grown into a centre of expertise on environmental management in the Cagayan Valley. The centre is used for trainings and has an extensive library on environmental issues. The herbarium of Isabela State University is housed at the centre. The Environmental Information Center also hosted various environmental projects: the Community-Based Forest Regeneration and Research Project (COMFREP), the Northern Sierra Madre Natural Park Conservation Project (NSMNP-CP) and the Mabuwaya Foundation. Since 2002 the Cagayan Valley Programme on Environment and Development holds office in the Environmental Information Centre.

References: CVPED 1992

The construction of the Environmental Information Centre (van den Top 1994)

Arnold Macadangdang and Processo Tarun in front of the EIC building (van der Ploeg 2002)

Project: Community-Based Forest Regeneration and Research Project (COMFREP)

Donors: USAID

Project leaders: Paulo Pasicolan, Roger Guzman & Gilbert Braganza

Timeframe: 1997-2001

Goal and objectives: develop a community-based forest regeneration system and evolve a sustainable forest resource management system

Partners: Plan International Philippines, Department of Environment and Natural Resources

Outputs: The Community-Based Forest Regeneration and Research Project used a community-based approach to reforest extensive grasslands in Cagayan, Isabela, Quirino and Nueva Vizcaya. The project developed innovative rural development strategies, and assisted in the reformulation of the Community-Based Forest Management policy. A soil and plant-tissue laboratory was established at the College of Forestry and Environmental Management.

References: Snelder 2001; Snelder & Lasco 2008

Counting surviving seedlings in a reforestation site (Persoon 1997)

COMFREP conceptual diagram

Project: Land Use Transition Modeling (LUTM)

Donor: Dutch Organization for Scientific Research in the Tropics (WOTRO)

Project leaders: Wouter de Groot & Peter Verburg

Staff: Cecilia Mangabat, Marco Huigen & Koen Overmars

Timeframe: 2001-2004

Goal and objectives: identification of driving factors that determine land use at the watershed level

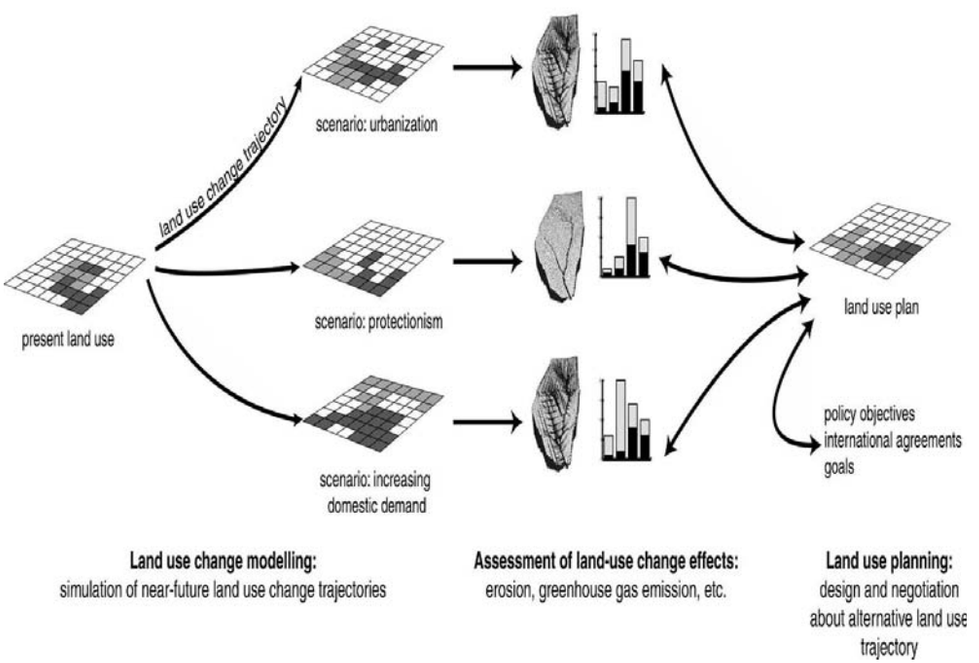
Partners: Wageningen University (the Netherlands)

Outputs: The Land Use Transition Modeling (LUTM) project aimed to identify the driving factors that determine land use at the watershed level. Both biogeophysical as well as socioeconomic factors were taken into account. The project focused on three levels: (1) multi-agent modeling of land use change at the community level, (2) linking processes and patterns of land use change at the watershed level, and (3) spatially explicit analysis and modeling of land use change in the Sierra Madre for different scenarios of future macro-economic and demographic developments. Three PhD. researchers worked on this interdisciplinary research project. They aimed to simulate future developments of land use change and develop different scenarios.

References: de Groot et al. 2005; Overmars 2006; Verburg et al. 2006; Huigen & Jens 2006; Mangabat et al. in press

Koen Overmars plots his findings on a map (van Weerd 2008)

Land use model (LUTM 2007)



Project: Southeast Asia in transition (SEAtrans)

Project leaders: Wouter de Groot & Rene Kleijn

Staff: Marieke Hobbes & Orlando Balderama

Timeframe: 2001-2003

Goal and objectives: identify and recommend effective policies to promote sustainable development in Southeast Asian economies

Partners: the project is a joint effort of 10 academic institutions located in Southeast Asia and in Europe

Outputs: Southeast Asia in transition is an interdisciplinary research project that aimed studying the dynamics and processes of transitions in society-nature interactions currently visible in Southeast Asia. Studies in Thailand, Laos, Vietnam, and the Philippines provided an in-depth picture of social, economic, and ecological processes in the region. The researchers studied changes in material and energy flows over time in three villages, selected along a transition gradient on the basis of their incorporation in the market economy. Three different methodologies were combined: the Material and Energy Flow Analysis (MFA/EFA), the Action in Context (AiC) and the Multi-Criteria Analysis (MCA).

References: Hobbes 2005; Hobbes & Kleijn 2007

Drying corn on the highway (Persoon 2001)

A local 'model' about achieving greater stability (Persoon 1987)

Project: Junior Expert Programme

Donor: Dutch Ministry of Foreign Affairs (DGIS)

Project leaders: Hans de Iongh & Gerard Persoon

Staff: Tessa Minter, Susan Schuren & Padmapani Perez

Timeframe: 2002-2004

Goal and objectives: strengthening research capabilities in Northeast Luzon

Partners: Cordillera Study Center - University of the Philippines Baguio, WWF-Indonesia, Department of Environment and Natural Resources

Outputs: The Junior Expert Program provided extensive training opportunities for junior experts in the field of development cooperation. Three junior experts were recruited for extensive training in the Philippines and the Netherlands. Tessa Minter worked on the role of the Agta in the management of the Northern Sierra Madre Natural Park. Susan Schuren studied smallholder agroforestry practices in Cagayan Valley. And Padmapani Perez worked on comparative issues related to natural resource management and indigenous peoples in the Philippines and Indonesia.

References: Minter et al. 2005; Perez 2007; Schuren & Snelder 2008

Susan Schuren and Edwin Ending in an agroforestry farm (Persoon 2007)

Tessa Minter taking fieldnotes (Persoon 2004)

Project: Regional Network for Indigenous Peoples in Southeast Asia (RNIP)

Donor: Dutch Ministry of Foreign Affairs (DGIS)

Project leaders: Hans de Iongh & Gerard Persoon

Staff: Rolando Modina, Dante Aquino & Myrna Eindhoven

Timeframe: 2005-2008

Goal and objectives: build a network of indigenous peoples' organizations in Southeast Asia to improve poverty alleviation and natural resource management

Partners: In the Philippines: Philippine Association for Intercultural Development (PAFID), Piksalabukan Ngak Subanen Gataw'g Ginsalugan (PINSUGG), Indigenous Peoples' International Centre for Policy Research and Education Foundation (Tebtebba), Cagayan Valley Partners in People Development (CAVAPPED), Christian Mission for the Unreached (CMU), Tribal Cooperation for Rural Development (TRICORD), PREDA Foundation, Lower Muta Valley Farmers Cooperative, and the Centre for Development Programmes in the Cordillera (CDPC). In Indonesia: Padepokan Casntrik Nusantara (PCN), Yayasan Madanika, Yayasan Harapan Sumba, Yayasan Anak Dusun Papua (Yadupa), Yayasan Nazaret Papua (YNP), SETARA Foundation (NTFP Indonesia program), AMAN Sul-Sel (Indigenous people's Alliance of South Sulawesi), Persatuan Masyarakat Adat Paser (PeMA Paser), and the Jasa Menenum Mandiri Cooperative. In Vietnam: PCRF-Vietnam, and the Center for Sustainable Development in Mountain Areas (CSDM). In Malaysia: Tompoq Topoh-Mah Meri Women's First Weave Group, Partners of Community Organisations (PACOS Trust), and the Institute Pribumi Malaysia Sarawak (IPIMAS). In Thailand: Karen Environmental and Social Action Network (KESAN), Lisu Network of Thailand (LNT), and the Inter Mountain Peoples Education and Culture in Thailand Association (IMPECT)

Outputs: The Regional Network on Indigenous Peoples organized trainings and workshops for more than 35 indigenous peoples' organizations in Southeast Asia. The network also provided financial support to these organizations to implement livelihood development and biodiversity conservation projects in the Philippines, Indonesia, Malaysia, Thailand and Vietnam.

References: Persoon, Eindhoven, Modina & Aquino 2007; Modina, Aquino, Persoon & Eindhoven 2009

Fieldtrip during a RNIP workshop in northern Thailand (Persoon 2008)

Project: Northern Sierra Madre Natural Park-Conservation Project (NSMNP-CP)

Donor: Dutch Ministry of Foreign Affairs (DGIS) & Plan International

Project leader: Roberto R. Araño

Timeframe: 1996-2002

Goal and objectives: strengthening the management of the Northern Sierra Madre Natural Park

Partners: Plan International Philippines, Department of Environment and Natural Resources

Outputs: The Northern Sierra Madre Natural Park-Conservation Project provided technical support to the Protected Area Superintendent and the Protected Area Management Board of the Northern Sierra Madre Natural Park. The project conducted ecological, physical and anthropological research that was used in the formulation of a management plan for the protected area. Local governments and rural communities were supported in the formulation and implementation of sustainable land use plans. To counter illegal resource extraction and agricultural encroachment in the protected area the project aimed to establish a social fence: alternative livelihood projects were initiated in and around the park, such as the promotion of agroforestry plantations in the buffer zone.

References: Araño & Persoon 1998; Hilterman 1998; Spijkerman 1998; van Lavieren 1999; van Weerd 2002; Snelder & Bernardo 2005

Gwen van Boven, Lilian Spijkerman and Roberto Araño leaving for the east coast (Persoon 2001)

Municipal councillor Jerome Miranda and NSMNP-CP staff release a Philippine Eagle (Buduan 2003)

Project: Crocodile Rehabilitation, Observance and Conservation (CROC)

Donors: Conservation Leadership Program, Haribon Foundation, Critical Ecosystem Partnership Fund, Van Tienhoven Foundation, WWF-Philippines, WWF-Netherlands, Netherlands Committee for IUCN, Rufford Maurice Laing Foundation, Hong Kong Ocean Park Conservation Foundation, Provincial Government of Isabela, Chicago Zoological Society, Idea Wild, IUCN Crocodile Specialist Group, Melbourne Zoo, Gladys Porter Zoo, St Augustine Alligator Farm, Oregon Zoo Foundation, Pittsburgh Zoo & Aquarium, Henry Doorly Zoo, the Terry Cullen Vivarium, Köln Zoo, Zurich Zoo, Chester Zoo, London Zoo, Bergen Aquarium & Danish Crocodile Exhibition.

Project leaders: Merlijn van Weerd, Jan van der Ploeg, Andres Masipiqueña & Myrna Cauilan-Cureg

Staff: Dominic Rodriguez, Jessie Guerrero, Samuel Telan, Marites Balbas, Bernard Tarun, Racquel Gatan, Edmund Jose & Willem van de Ven

Timeframe: 1999 - ongoing

Goal and objectives: conserve the critically endangered Philippine crocodile in its natural habitat

Partners: Local Government Unit of San Mariano, Department of Environment and Natural Resources, Mabuwaya Foundation

Outputs: The Northern Sierra Madre Natural Park-Conservation Project initiated Philippine crocodile conservation in San Mariano in 1999. After the phase-out of the project, conservation action was continued in the framework of the Cagayan Valley Programme on Environment and Development. In 2003 a new organization was created to spearhead conservation action for the Philippine crocodile in the Sierra Madre: the Mabuwaya Foundation Inc. Mabuwaya is a contraction of the Pilipino words *mabuhay* (long live) and *buwaya* (crocodile). The community-based Philippine crocodile conservation strategy has four main components: (1) action research; (2) communication, education and public awareness campaigns; (3) protection; and (4) capacity building. The Cagayan Valley Programme on Environment and Development continues to provide institutional support to the Mabuwaya Foundation.

References: van Weerd 2000; van der Ploeg et al. 2008

Bernard Tarun holding a juvenile crocodile (van Weerd 2006)

Project: Facilitating the effective participation of the Agta in the protected area management board of the Northern Sierra Madre Natural Park

Donor: Netherlands Committee for Indigenous Peoples (NCIV)

Project leaders: Tessa Minter & Andres Masipiqueña

Staff: Maria Ranay-Pedrablanca

Timeframe: 2005-2009

Partners: Tanggol Kalikasan, Department of Environment and Natural Resources

Goal and objectives: facilitate the effective participation of the Agta in the protected area management board of the Northern Sierra Madre Natural Park

Outputs: The Agta officially have eleven representatives in the protected area management board of the Northern Sierra Madre Natural Park. So far however their participation in the management board has been minimal: during the majority of the past meetings none or only few Agta members attended. The project organized several training workshops for the Agta representatives, facilitated community dialogues, raised awareness on indigenous peoples' rights and protected area management among government agencies in Isabela, and assisted the Agta during the PAMB meetings.

References: Minter et al. 2005; Minter, Ranay-Pedrablanca & Masipiqueña 2009

Participants of the Agta workshop at the Environmental Information Centre (van der Ploeg 2007)

Fidela Impiel explaining resource use during a workshop (van der Ploeg 2005)

Project: Louwes Fund

Universities of Leiden and Oxford
LOUWES FUND
research on water and food

Donor: Hendrik Jan Louwes & Evelyn Blanche Louwes

Project leader: Gerard Persoon

Staff: Miladis Afidchao, Willie Saliling & Karl Villegas

Timeframe: 2007 - ongoing

Goal and objectives: stimulating PhD. research by young scholars from developing countries on water management and food availability for poor communities

Partners: Oxford University (United Kingdom)

Outputs: Three PhD. researchers are currently conducting fieldwork in the Cagayan Valley. Karl Villegas is studying developmental needs and perceptions of nature of local communities. Miladis Afidchao studies invertebrate abundance, richness and diversity in transgenic corn fields. And Willie Saliling is developing a methodology to assess water and nutrient resources dynamics in upland agricultural systems. Yearly the Louwes lecture on water management and food availability is held, alternating in Leiden and Oxford. The first Louwes lecture was held by the Governor of Isabela, Grace Padaca, and the Vice-Minister of Transport and Water Management of the Netherlands, Tineke Huizinga.

References: Persoon & Eindhoven 2007

Water plays a key role in the production of food (Persoon 2007)

Guests of honour at the 1st Louwes Lecture on 13 December 2007 in Naturalis in Leiden: (from left to right) Paul van der Heijden (Rector of Leiden University), Tineke Huizinga (Vice-Minister of Transport and Water Management of the Netherlands), Romeo Arguelles (Ambassador of the Philippines to the Netherlands) and Grace Padaca (Governor of Isabela Province) (van der Ploeg 2007).

Dante Aquino and Gert Polet comparing field notes (van den Top 1991)

Victor de Brabander and Pilinan and Eric Sangbi in Dinapigue (Macadangdang 2008)

Education

International cooperation in higher education has been one of the core activities of the Cagayan Valley Programme on Environment and Development. Over the past twenty years undergraduate and graduate students from the Philippines and the Netherlands were trained in doing environmental research in an interdisciplinary context. Students from various disciplinary backgrounds, both social sciences as well as natural sciences have conducted field research in the Cagayan Valley through a variety of educational forms.

Counterpart students

The Cagayan Valley Programme on Environment and Development facilitated the fieldwork of undergraduate and graduate students in the Cagayan Valley. Lecturers from the Institute of Environmental Sciences and the College of Forestry and Environmental Management supervise the students in the preparation of a proposal, the gathering of data in the field and the presentation of results. Bringing students together from different academic disciplines has been a key feature in the educational philosophy of the Cagayan Valley Programme on Environment and Development. In principle Dutch and Filipino students worked together on a specific topic. The idea behind this set up was that students would not only learn about a specific topic but at the same time would get insights in different academic disciplines and know more about Dutch and Filipino ways of thinking; the cooperation was not only interdisciplinary but also intercultural. Dutch students came from a variety of disciplines such as biology, forestry, physical geography, public administration, anthropology and political science. Initially most of the Filipino students had a background in forestry. But recently, students from other colleges of Isabela State University were also involved in the joint programme (agriculture, biology, sociology and development communication).

Right page: Research assistent Arnold Macadangdang shows the way (Persoon 2007)

Courses

The Cagayan Valley Programme on Environment and Development has worked closely with the College of Forestry and Environmental Management to restructure the forestry curriculum by incorporating concepts of environmental sciences. New research paradigms and methodologies were integrated into the teaching activities of the college. Experiences from the Philippines were also used to enrich courses at the Institute of Environmental Sciences in Leiden.

Study groups

In the 1990s the joint programme experimented with a new educational form: interdisciplinary study groups. Ten to fifteen Dutch and Filipino students worked for a period of two years on a large research project. Four of these study groups have worked on land use planning in the Sierra Madre Mountain Range. The supervision of these groups was challenging because of the sheer size of the groups and internal group dynamics. Finding one's position within an interdisciplinary and intercultural team was a valuable and thorough learning-by-doing experience. The immersion of students in rural communities gave them a taste of life at the forest edge.

Project-related research

In the course of the cooperation students were also involved in ongoing research projects. Dutch and Filipino students were recruited to provide specific expertise. For students it was an opportunity to get involved in 'real life' projects. Students gained experience in the framework of the Community-Based Forest Regeneration and Research Project, the Northern Sierra Madre Natural Park-Conservation Project, the Junior Expert Programme, the Land Use Transition Modeling Project and the Crocodile Rehabilitation, Observance and Conservation project.

Medy Caasi and Bern Persoon, two students of the 2006 summer course, during a social gathering (van de Ven 2006)

Summer courses

Since 2003 the Cagayan Valley Programme on Environment and Development organized an intensive summer course for undergraduate students. In 2003, 2004 and 2005 students from the College of Forestry and Environmental Management conducted an environmental impact assessment. In 2006 and 2007 the summer course programme was expanded. Thirty students (15 Filipino and 15 international students) worked together for 6 weeks on a problem-oriented research assignment, and practiced research methods in the field.

A jeepney collects the students of the 2007 summer course after their first field trip (Persoon 2007)

Early morning gathering for hosts, students, supervisors during the 2007 summer course in sitio San Isidro (Persoon 2007)

'Have a seat' was a new experience for student Sanne van der Hout in the giant butaka in Ilagan (Persoon 2007)

Dutch and Filipino students

Over the years Dutch students from nearly all major universities and other higher education institutes in the Netherlands have participated in the programme. In particular many students from Wageningen University have come to work in the Philippines. As we have seen above, students have also come from a wide range of academic disciplines, including Chinese language, psychology, history and communication science. In fact, many students from the Netherlands were not Dutch: students from Germany, Sweden, Argentina, Trinidad & Tobago, Latvia, Denmark, the United States, Taiwan, Italy and Spain have participated in the Cagayan Valley Programme on Environment and Development. These students were enrolled in the Netherlands through international exchange programmes, such as the Erasmus Programme. This has certainly added an interesting international dimension to the Filipino-Dutch programme. Many of the Dutch students of the Cagayan Valley Programme on Environment and Development have found employment in international biodiversity conservation agencies, environmental consultancy agencies, research institutions or developmental programmes.

Most Filipino students were enrolled in Isabela State University, but the Cagayan Valley Programme on Environment and Development has also facilitated the fieldwork of students from other academic institutions in the Philippines, such the Cagayan State University and the University of the Philippines at Los Baños. Many of the Filipino students involved in the joint programme are at present connected with government line agencies such as the Department of Environment and Natural Resources and the National Commission on Indigenous Peoples, or work in non-governmental organizations in the region such as CAVAPPED and Conservation International.















Fifteen Filipino-Dutch student couples went out to the villages to do joint research during the 2007 summer course. From left to right: Katherine Vad & Sheryl Balubar, Elisa Trepp & Samuel Cammagay, Angelica Mendoza & Edwin Diciano, Marco van Beest & Allan Panao, Christopher Telan & Jasper Wester, Marjon Gibcus & Jayma Bicera, Mark Anthony Tuliao & Christiaan Oostdijk, Jesse Bruins & Lemuel Dao-ayan, Victor de Brabander & Enrico Cabaccan, Noortje van Geenen-Schrauwen & Jenifer Gatan, Novie Buguina & Bess Doornbos, Cynthia Malayao & Linde Linthorst, Anna Piestrzynska & Glory Cañete, Sarai Alons & Jocelyn Pagalilauan, Sanne van der Hout & Celestino Reyes (Persoon 2007)

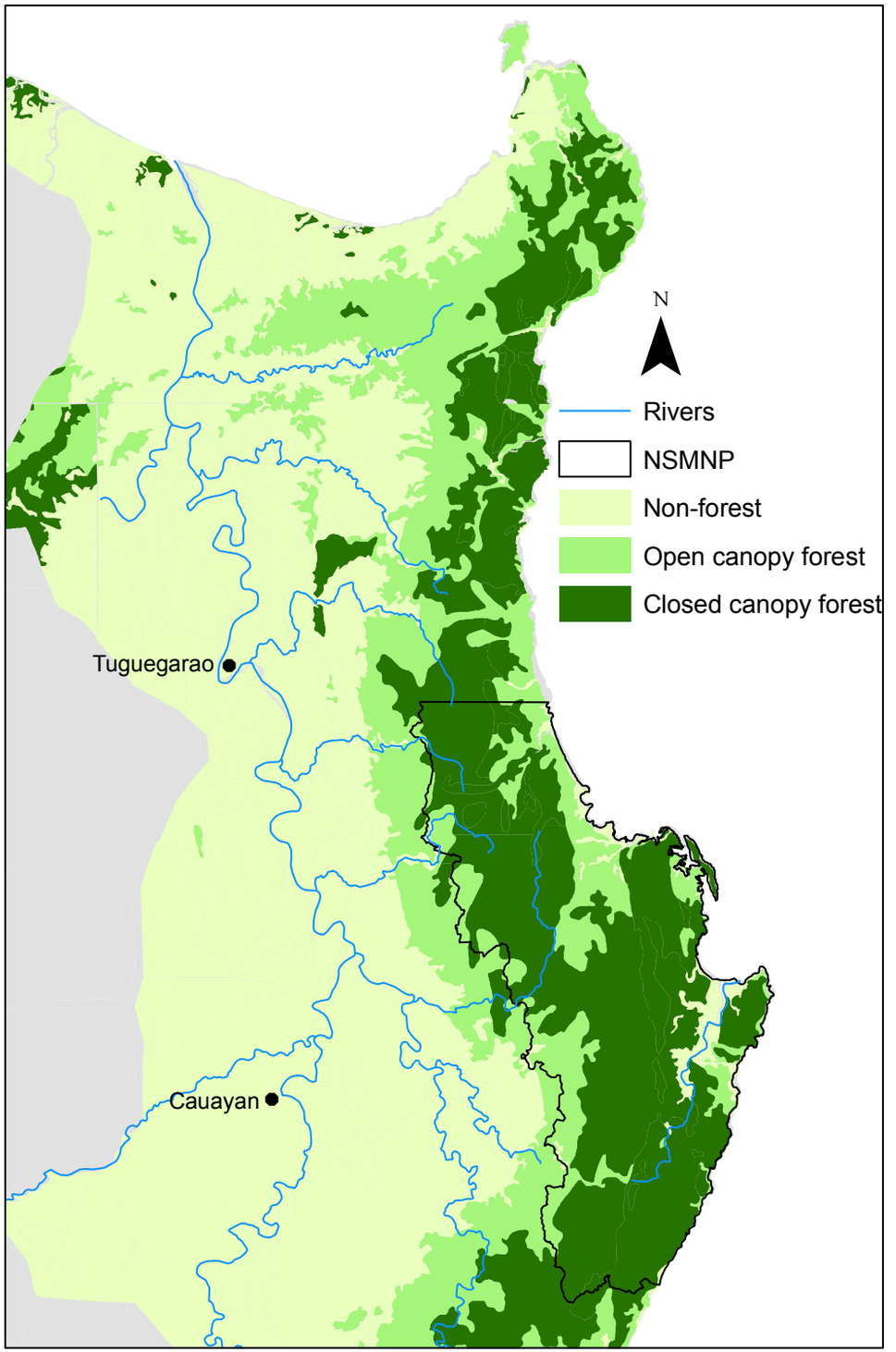
2

A BIRD'S EYE VIEW OF NORTHEAST LUZON

Merlijn van Weerd, Denyse Snelder, Lilian Spijkerman and Andres Masipiqueña

Cagayan Valley and the Sierra Madre

The main focus of the Cagayan Valley Programme on Environment and Development's research activities has been on Northeast Luzon, particularly the Cagayan Valley and the Sierra Madre, a region exceptional in its variety of natural habitat types including mangrove forest, beach forest, lowland dipterocarp rain forest, limestone forest, forest over ultrabasic rocks, montane forest and grassland. All of these habitats are encountered over a distance of just 50 to 70 kilometer when traversing the region in east-west direction. The Cagayan River, the longest river of the Philippines, flows from south to north, emptying in the Babuyan Channel. The river's floodplain, along which the region's major towns are located, is bounded by the Sierra Madre Mountains in the east, the Caraballo Mountains in the south and the Cordillera Mountains in the west. The Sierra Madre itself is a mountain range, with gently sloping foothills in the west and steep slopes bordering a narrow flat coastal zone in the east, running parallel to the Cagayan floodplain through the provinces of Nueva Vizcaya, Quirino, Isabela and Cagayan in Northeast Luzon. The highest peak of the northern Sierra Madre is 1844 meter above sea level. The diversity of habitats and associated biodiversity and natural resources in Northeast Luzon should be seen against the background of the region's climate and complex geological history.



The forest cover of Northeast Luzon (van Weerd 2009)

Left page: The Sierra Madre Mountain Range (van Weerd 2008)

Climate

The climate of the region is tropical and is dominated by the northeast (November to April) and southwest (May to October) monsoons with a dry period between February to May and a strong influence on rainfall from frequent typhoons. Typhoons have an impact on the area regularly, from May to January with the peak during July to October. Out of the 20 tropical storms and typhoons impacting the Philippines on average each year, a third traverses Northeast Luzon with maximum wind speeds of up to 290 kilometer per hour and maximum 24 hour rainfall of about 800 mm. Super typhoons, with wind speeds over 240 kilometer per hour and potentially large scale destruction hit Northeast Luzon on average once every three years. There is a dramatic difference in rainfall between Cagayan Valley and the coastal zone along the eastern seaboard. Tuguegarao in the Cagayan Valley lowlands has an average annual rainfall of 1,650 mm. Casiguran, along the Pacific coast has an average annual rainfall of more than twice that at 3,500 mm. Although long term climate data are lacking for the very narrow coastal zone north of Casiguran, the town of Palanan recorded almost 9,000 mm in 1999 and Maconacon recorded nearly 8,000 mm in 2003. This coastal zone is among the wettest sea level locations on the planet. Rainfall is also high at higher elevations in the Sierra Madre but any meteorological data are lacking.

Mean annual maximum temperature in Tuguegarao, the region's capital, is 32.3 °C, the mean annual minimum temperature is 21.7 °C. The coldest month is January with a mean minimum temperature of 19 °C and the warmest month is May with a mean maximum temperature of 35.9 °C. Tuguegarao has the highest recorded temperature of the entire Pacific: on 29 April 1912 the temperature reached 42.2 °C. Temperatures are slightly lower along the coast and decrease with elevation in the mountains though the peaks are not high enough to witness frost or freezing.

Flooding in Cagayan Valley (van der Ploeg 2005)

The effect of super-typhoon Harurot (van der Ploeg 2003)

Geological history in a nutshell

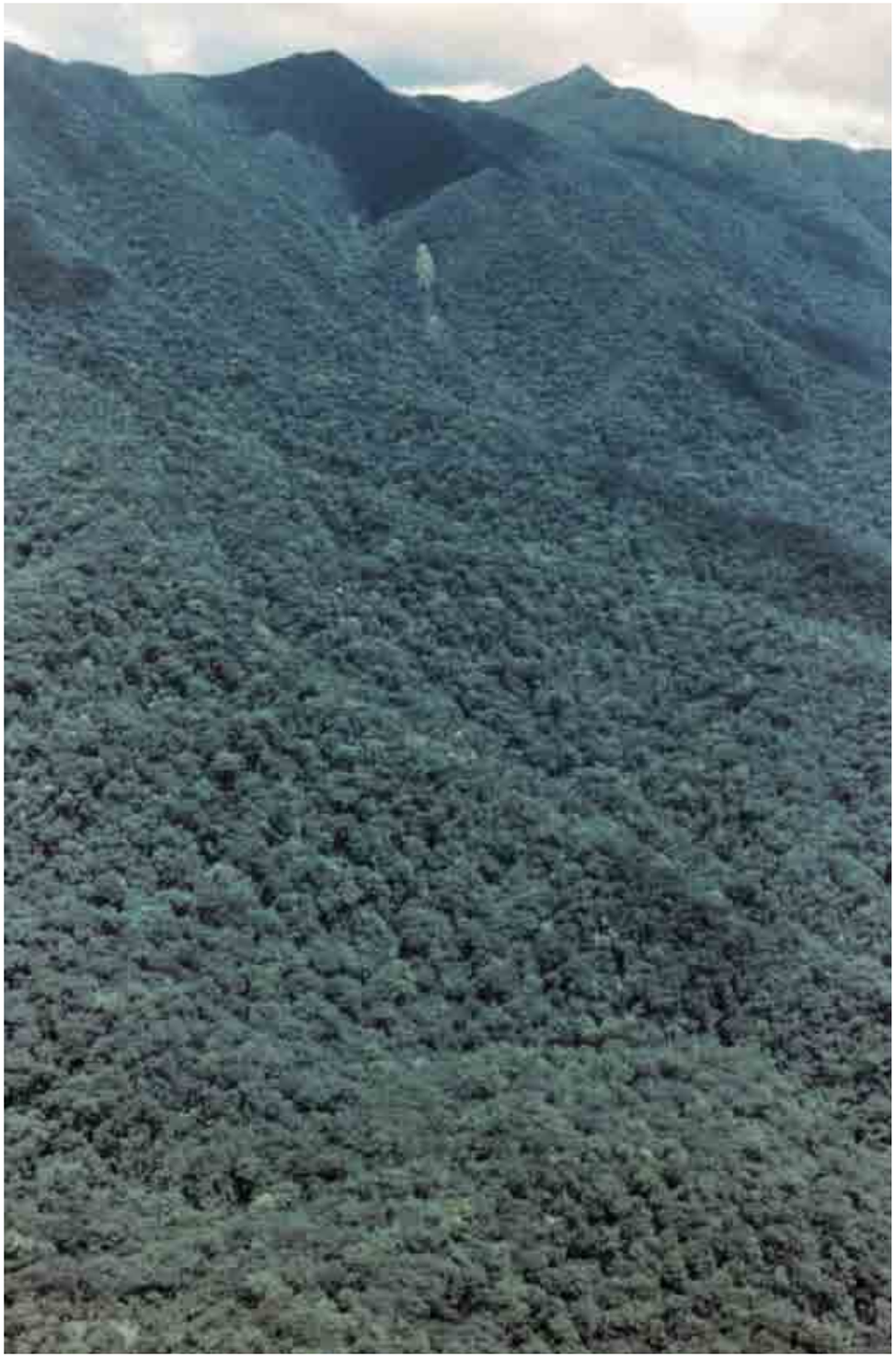
The complex geological history of Northeast Luzon and the Philippines in general, largely explains the diversity of habitats in the region. The tectonic evolution of the Philippine Islands is difficult to retrace as the country is situated on the margin of several tectonic plates that move in various directions. Where tectonic plates converge, one plate will move under another (subduction) usually resulting in volcanic activity, earthquakes and mountain building through uplifting. The Philippines is situated in the Pacific Ring of Fire, a horseshoe shaped nearly continuous stretch of oceanic trenches, volcanic arcs and moving tectonic plates that runs from New Zealand via eastern Asia to Alaska and down along the western coast of the Americas.

Throughout the Cenozoic (65 million years ago to present), the underlying crust fragments that now form the Philippines were spread over the Eurasia boundary zone. It was only from the Late Miocene onwards, around 20 million years ago, that the Philippine archipelago formed a single broad region at the margin of the Philippine Sea, as we know it today. But even since then, changes in sea level, volcanic activity and uplifting have continued to shape the Philippine Islands.

Northeast Luzon started to develop as an island arc system more than 65 million years ago and migrated to its present position during the Cenozoic. The Sierra Madre mountain range was uplifted during the Late Eocene, 45 to 37 million years ago, as a result of the westward subduction of the Philippine basin crust beneath the Asian continental plate. The basement complex is older than 200 million years (pre-Jurassic) and is composed of amphibolites, quartzo-feldspatic micaschists, marbles and quartzites. The Cordillera mountain range, located at the western side of the Cagayan Valley, has a basement complex similar to that of the Sierra Madre. The Cagayan Valley basin began to develop 26 million years ago as an interarc basin in north-south direction parallel to, and in between, the active Cordillera Central and the tectonically passive Sierra Madre mountain range. Subsidence of the Cagayan Valley basin started in the early Miocene 23 million years ago creating an inland sea and resulted in the deposition of marine sediments. Later, in the Plio-Pleistocene (2 million years ago), regional uplift brought the valley above sea level and deltaic, fluvial and pyroclastic sediments were deposited in the central part of the Cagayan Basin. The sedimentary history of the Cagayan Valley was dominated by the volcanic complexes of the Cordillera Central, which at various times affected the western side of the Sierra Madre mountain region with deposition of volcanic and fluvial sediments.

Left: Floodplains, foothills and the mountain range (van der Ploeg 2004)

Cross-section of the Sierra Madre from the Pacific Ocean in the east to Cagayan River in the west with main vegetation and habitat types

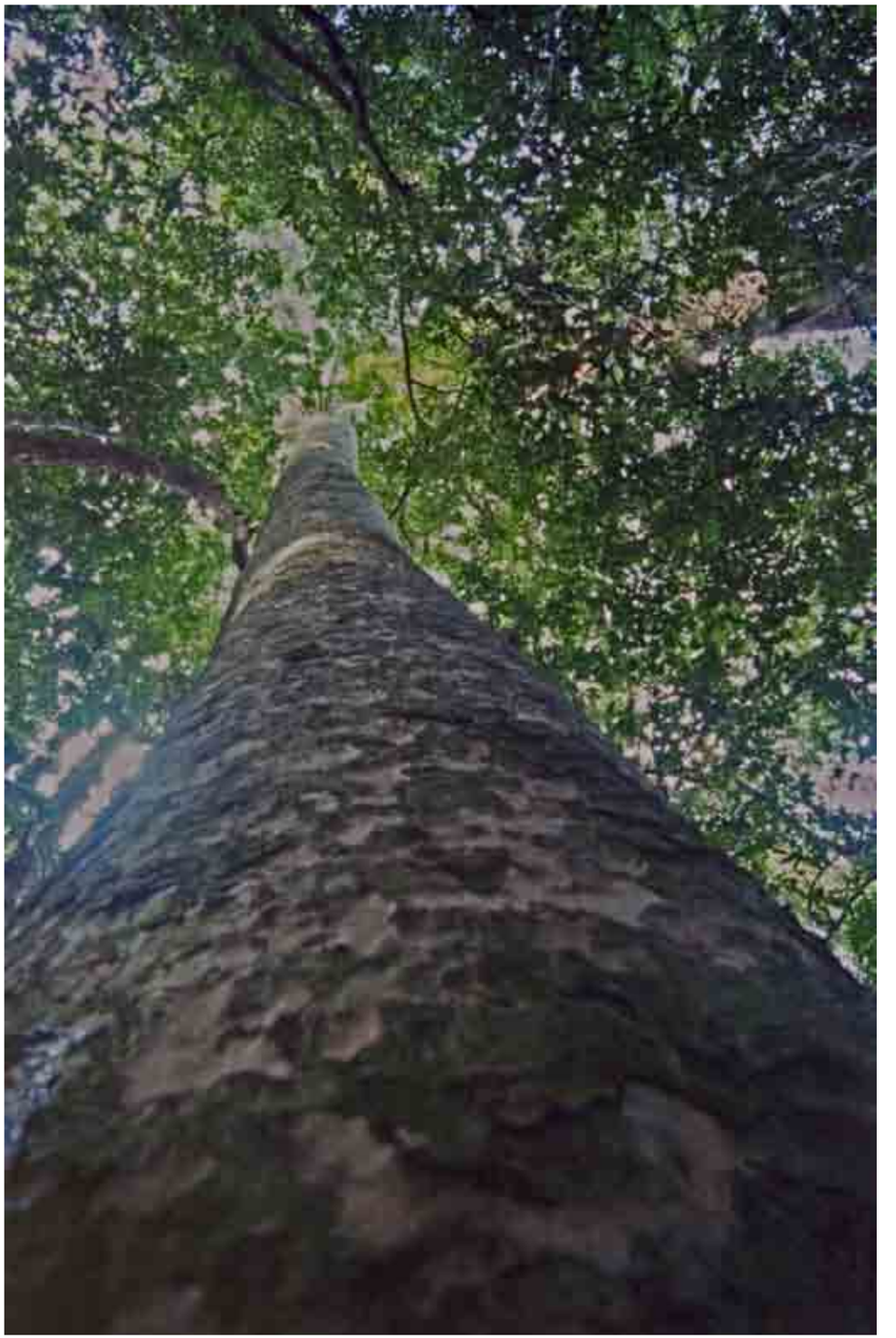


Habitat diversity and endemic species

Habitat diversity in the Sierra Madre mountain region is directly associated with the wide range of rock formations, with varying age, composition and altitudinal exposure, on which distinct species have established themselves over time. Moreover, flora and fauna have evolved isolated from source populations over a long period of time. Luzon has most likely never been connected to mainland Asia through land bridges. During the last ice-age, which ended about 10,000 years ago, the sea level was 120 meter lower than it is today because so much water of the planet was trapped in glaciers. Even then, judging from present day bathymetry, Luzon would not have been connected to China, mainland Southeast Asia or any Indonesian islands, and probably not even to other large islands of the Philippines. Smaller islands near Luzon, such as Polillo, were part of a Pleistocene island (Greater Luzon) during that time. The connections and isolation of Philippine Pleistocene islands are reflected in their biogeography. Polillo for example is much more similar to mainland Luzon in terms of fauna and flora than is Mindoro, an island at the same distance from Luzon that was not connected to it during the last ice age. Isolation explains the extremely high endemism levels that characterize the fauna and flora of the various Pleistocene island complexes of the Philippines, ranging from 35 percent of Philippine birds and vascular plants to 85 percent of Philippine amphibians. Over evolutionary time, species have colonized the Philippine Islands by chance over water or though air and evolved into separate species restricted to the colonized island. Flying birds and plants (seeds are easily carried by wind, over water and by animals) disperse more easily than frogs explaining the differential levels of endemism in the country.

Forest cover (Persoon 1991)

During the Pleistocene, the lower sea- and ground-water levels and the different climate created semi-arid conditions in lowland areas such as the Cagayan Valley basin and affected flora and fauna. While forests retreated to higher elevations, dry seasonal savannah type vegetation probably spread in lowland areas, as suggested by various studies conducted elsewhere in Southeast Asia. Fossil Pleistocene elephant molars have been found in Cagayan Valley (on display in the regional museum in Tuguegarao). Elephants could have crossed sea gaps between Greater Luzon, other Pleistocene islands and Sundaland (present day western Indonesia and mainland Southeast Asia) swimming; a theory supported by observations of elephants swimming to islands off the coast of India. The first people colonized Cagayan Valley around 35,000 years ago. Probably they arrived in a savannah woodland landscape although hardly anything is known of vegetation, climate and people in Philippine prehistory. One is tempted to visualize the ancestors of the current Agta hunting elephants on the grasslands of Cagayan Valley but it is entirely unknown when the Philippine elephants lived and when they went extinct.



Almaciga tree (Agathis philippinensis) (van Weerd 2004)

Vegetation and habitat types: a virtual flight from the Pacific to Cagayan Valley

Flying west in a small plane from the Pacific Ocean towards Divilacan on Luzon Island we would see the Sierra Madre mountains, although usually shrouded in clouds, rising up steeply from a narrow coastal plain. During summer we could see Humpback Whales with their young far out in the ocean and dolphins and sea turtles nearer to the coast. Small bancas, outrigger boats with fishermen using line and hook and fishing nets, would dot the coastal waters beneath the plane.

Shortly before reaching the shore, coral reefs would be visible through the clear waters fringing extensive reef flats made up of old and dead coral beds. At high tide these reef flats are inundated, at low tide they provide a fertile habitat for reef organisms with numerous tidal pools. During low tide we would see many Agta, the indigenous people of this area, collecting shells, fish, octopus and sea cucumbers from these pools. During September-March, thousands of migratory waders and egrets forage on the tidal flats. We fly over Honeymoon Island with its two humpy hills and flat Dipudo Island covered with coconut groves. White beaches line these islands, with narrow strips of beach forest along them. In shallow coves and on sandy substrate, sea grass beds would be visible just beneath the water surface or just exposed, depending on the tide. Here, the Dugong used to graze but this large sea mammal is now extinct along the northern coast of Luzon.

The Pacific Coast of Isabela (Van Weerd 2001)

Intertidal reef flat (van Weerd 2001)

Lining the coves and bays, and tidal creeks we would fly over extensive mangrove forest interspersed with nipa palm stands. These mangrove forests are among the least disturbed and largest in area in the Philippines. The mangroves are important as a breeding ground of marine fish. The leaves of the nipa palm are used as a roofing material by communities along the coast. If we would be really lucky we would see an Estuarine Crocodile floating in the cove. To the north we would see the new municipal town hall of Divilacan on a hill towering over this former logging town. Further north we see the beaches, repeated half-circles ending in a pointed reef flat and Maconacon town with its air strip, decaying pier and overgrown ruins of the large logging compound that was burned down in an attack by communist rebels in 1992.

To the south, a sloping hill that separates Divilacan from Palanan rises steadily consisting of very old metal-holding rock uplifted from the ocean floor millions of years ago. The ultrabasic rocks contain high concentrations of heavy metals such as magnesium, chromium, cobalt and nickel and are deficient in soil phosphorus, potassium and calcium. The rocks are covered with a dense forest of stunted trees with many endemic species and the highest tree species diversity per hectare of any forest type in the Sierra Madre. In this forest we find the largest roost site of giant fruit bats in the Philippines. Perhaps they choose this area because it is not disturbed by logging as the timber is commercially worthless. Other threats loom though as mining companies have claimed the ultrabasic rock formations for exploitation.

Mangrove forest (van Weerd 2001)

Ultrabasic forest (van Weerd 2006)

Now our plane quickly ascends to cross the Sierra Madre mountain range. Lowland dipterocarp forest with cauliflower shaped canopies topping trees of up to 45 meter high creates a dense dark green carpet below us. This is the most extensive forest type within the Sierra Madre mountain region and the largest block of remaining lowland evergreen rain forest in the Philippines. This forest type is numerically dominated by the Dipterocarpaceae family of trees which is extremely diverse in genera and species and includes tall trees with commercially valuable timber. This explains why the forest is under high pressure and has been seriously threatened particularly by large-scale timber corporations who were allowed to extract an estimated 26 million cubic meters of premium hardwood from natural forest stands between 1965 and 1990 in the Sierra Madre.The forest is parched up at times by slash-and-burn farmers who cultivate corn and cassava. A larger opening shows bright green irrigated rice fields surrounding the village of Sapinit. The old logging road from Maconacon ends here, though a trail continues up the mountain through the middle gap to the other side. The coastal municipalities would like to see a road developed here that links their now isolated communities with the outside world.

Lowland forest (van der Ploeg 2005)

The dipterocarp forest changes over a very short distance into montane forest at about 800 meter above sea level. Huge almaciga trees are visible, the resin used to be a valuable ingredient of varnishes, now replaced by chemicals. Still, hunters use the resin to light their campsite fires, even when the wood is wet, and routinely make a cut in the stem with their bolo when passing by an almaciga tree to make the resin flow. The Philippine Eagle lives in montane forest, hunting in the forest canopy.

Montane forest (van Weerd 2001)

Even higher, and along ridges and mountain tops, the trees are rarely taller than 5 meter, and less than 1 meter on the very top of the highest peaks. Here, the trees are dwarfed by the harsh climatic conditions and strong winds. The rain that unremittingly soaks the Sierra Madre enables the growth of a thick layer of moss on the forest floor. The trees are covered in moss as well, and this peculiar mountain top forest type is aptly named mossy forest. The ridge of the Sierra Madre comes much earlier than expected and we leap, to the discomfort of air travelers here all too often quite literally, into Cagayan Valley and leave the Pacific coast behind.

On the western side the mountain face is not as steep but deep ravines have been cut by roaring rivers through the higher portions. These make way for rolling hills as we move further west. Here we see the evidence of active logging on the Cagayan Valley side of the Sierra Madre. We see the blue tarpaulin covers of logging camps, logging trails and the gaps where trees have been cut. Still lower, the first openings in the disturbed forest cover show the extent of agricultural advances by slash-and-burn farmers. Cragged hilly outcrops and deep gorges lined by cliffs are covered with limestone forest, another rare and typical forest type in which molave used to be a dominant tree species. The priced molave trees are all cut nowadays but the limestone areas remain an important habitat for many specialized flora and fauna species. Bats use the caves as roosting places and farmers collect the guano as fertilizer. A very special inhabitant of the limestone gorges of San Mariano is the Philippine Crocodile that uses the caves and crevices cut by the river as hiding place.

On top of the Sierra Madre (van Weerd 2001)

Degraded lowland forest on the western side of the Sierra Madre (van der Ploeg 2004)

Gradually, the forest gives way to a patchy mosaic landscape of cornfields, banana plantations, forest patches, extensive areas of cogon (*Imperata cylindrica*) grassland and villages in the foothills of the Sierra Madre. We might see the first fields of planted sugarcane on former grasslands, a totally new crop in this area recently introduced by biofuel feedstock investors. The grasslands cover an extensive area, amounting to about 500,000 hectare in the whole Cagayan Valley region. Cattle ranching is the main land use and in addition cogon grass is gathered, in most cases on a part-time basis, and sold as cheap material for the roofing of houses and other buildings or sheds. It is assumed that the grasslands in Northeast Luzon mainly occur on former forested land. In the Cagayan Valley, small-scale forest clearance by means of slash-and-burn farming was already practiced before the Spaniards arrived in the sixteenth century. Slash-and-burn farming promoted the spread of grasses where fields were left fallow.

The persistence of grasslands during the last century is mainly attributed to the combination of frequent grazing and regular burning. The latter is conducted for a number of reasons, such as to promote the re-growth of young shoots after fire and the production of optimal cogon grass for roofing purposes, or is purely due to accidents. Landless farmers who migrate from densely populated lowland and upland areas elsewhere in search of land to cultivate resort to squatting of grassland areas, most of which are leased on a long-term basis to absentee cattle owners and ranchers. More efficient management of grassland has become increasingly important in local government programs and forms a challenge for future land use planners. The government plans to reduce the total area under grassland from 500,000 hectare to about 180,000 hectare to meet the region's anticipated agro-industrial land requirements by the year 2020

Mosaic landscape (van Weerd 2004)

Grasslands (van Weerd 2008)

Ever moving further west agriculture becomes more intensive, with irrigated rice fields in shallow depressions and in the valleys beneath the hills and larger areas of monoculture corn. We see square blocks of geometrically planted dark green mango and light green fine-leaved Gmelina arborea plantations. The world seems doubtlessly dustier now compared to the fresh greenness of the forest. The grey-brown Cagayan River meanders through the flattest part of the valley. The floodplain is cultivated with corn and ever rarer with tobacco. This used to be one of the World's finest tobacco growing areas but changes in micro-climate as a result of deforestation have made conditions too dry and hot to cultivate prime tobacco leaves now. Another winding line marks the national highway that connects the many towns and cities along the river with each other and with Manila. Finally we descend for our landing on Cauayan City airport. We see thousands of tricyles clogging up the busy streets of Cauayan that are lined with every imaginable shop.

From the vast Pacific Ocean and the rugged coast of Isabela, over the green forest and the moss-covered ridge and the patchwork foothills of the Sierra Madre into the intensively cultivated fields of the Cagayan River floodplain and the cityscape of Cauayan we have soared over a multitude of different worlds within a distance of 50 kilometer, a 40 minutes' flight.

Tobacco and corn in the floodplain of Cagayan River (van Weerd 2001)

Airstrip in Cauayan (van der Ploeg 2008)

3

THE PEOPLES OF THE VALLEY AND THE MOUNTAINS

Jan van der Ploeg, Dante Aquino and Gerard Persoon

The Irraya

In earlier times the Cagayan Valley was known as the Irraya, meaning upriver in Ibanag. This culturally diverse area has long fascinated anthropologists. In this chapter we will look at the major ethnic groups that live in the valley.

The Cagayan Valley has been inhabited for at least thirty-five thousand years. The first colonizers, Australoid people, were hunter-gatherers who settled along the coast and in the river valley. Four thousand years ago Austronesian farmers settled in the Philippine archipelago using the Cagayan Valley as their first stepping stone. Little is known about the pre-colonial history of the peoples of Cagayan Valley. For long Chinese and Japanese merchants had traded with coastal communities at the mouth of the Cagayan River, present day Aparri. The first written accounts of the Cagayan Valley date back to 1572 when the Spanish conquistador Juan de Salcedo explored the northern coast of Luzon. In 1581 the Spanish colonizers founded Nueva Segovia, what is now the town of Lallo, which served as the administrative and religious capital of the valley. Dominican, Franciscan and Augustinian friars set up mission posts along the Cagayan River. What followed was a long and often violent process of conversion of the lowland communities. For more than three hundred years the Cagayan Valley was the scene of numerous rebellions of the *indios* against colonial rule, followed by violent Spanish retribution. Groups that resisted Spanish rule retreated in the mountains, thereby reinforcing ethnic boundaries (or creating new ones) between the Christian lowlanders 'living under the bell' and the 'infidel mountaineers.'

Left page: Sambali dances during the fiesta in Cabagan (Minter 2007)

The parish church of San Matias in Tumauini (van Weerd 2008)

Agta

The Agta are descendants of the Australoid people that arrived in the Philippines sixty to thirty-five thousand years ago: the aboriginals of the archipelago. The Agta still form a distinct cultural group, mainly because of their characteristic physical features (dark skin, short stature, black curly hair) and their hunter-gatherer lifestyle. As a result they are often discriminated against by other groups. The Agta live along the Pacific Coast, where they are also referred to as Dumagat or Agay, and along the Sierra Madre forest frontier. The Agta depend heavily on forest, riverine and marine resources. Bushmeat, fish and other forest products are bartered for rice. Environmental degradation and the encroachment of farmers threaten the Agta's way of life. The Agta are the poorest people in the Cagayan Valley. It is estimated that there are around 5,000 Agta living in the region.

Paranan

The Paranan have lived in the Sierra Madre for more than 250 years. Most probably the Paranan are a Tagalog group who migrated north along the Pacific coast and intermarried with Agta. The Paranan speak their own language. Approximately 15,000 Paranan inhabit the Palanan River valley and the rugged coast of Isabela between Palanan and Dinapigue. Upland rice and white corn are the staple crops. Coconut groves are a source of cash-income. Little is know about the history of the Paranan and the distinctive features of their culture.

Ibanag and Itawis

The upper Cagayan River was called 'Banag' and the people living on its banks were known as the Ibanag. They cultivated rice in the floodplain of the Cagayan Valley. In his book *The ethnohistory of Northern Luzon* the anthropologist Felix Keesing (1962) describes how in the 18th century the Ibanag became the dominant ethnic group in the Cagayan Valley. The Spanish colonizer discouraged contact and prohibited trade between the converted lowland groups and the enemy mountaineers. Ibanag became the lingua franca in the Cagayan Valley, used in trade, governance and religion. Upon conversion several other ethnic groups in the Cagayan Valley adopted Ibanag identity and culture.

Ibanag is still the main language in the major town centers in the northern part of Isabela Province, particularly in Ilagan, Tumauini and Cabagan. But in other parts of the Cagayan Valley the Ibanag form a minority: around 225,000 people identify themselves as Ibanag, about 8 percent of the total population of the valley. Relatively few Ibanag have settled in the uplands of Sierra Madre. They cultivate rice, corn, sugarcane and tobacco in the floodplains.

The Itawis have strong cultural and linguistic ties with the Ibanag. The Itawis, or Itawit, inhabit the area southern part of Cagayan province. The 2000 national population census recorded 150,000 Itawis.

Left page: Bawi and Liling Donato in Palanan (van der Ploeg 2008)

Planting rice in San Mariano (Persoon 2007)

Kalinga, Gaddang and Yogad

The Kalinga inhabit the uplands of the Sierra Madre, particularly along the Catalangan River and Ilaguen River in the municipality of San Mariano. It is important to make a distinction between this group and the Kalinga of the Cordillera mountain range (see below). The word ‘kalinga’ means ‘enemy’ in Ibanag and was used by the Christian communities in Cagayan Valley to refer to the infidels in the Sierra Madre and the Cordillera. There are no linguistic or cultural connections between these two Kalinga groups. The Kalinga of the Sierra Madre, also known as Irraya, Kalibugan or Catalangan, were first described by a German explorer, Carl Semper, in 1861. Since then there has been much debate about the origins of this ethnic group. Most likely the Kalinga are Ibanag who rebelled against Spanish rule and retreated to the foothills of the Sierra Madre. Here they intermarried with Agta and other refugee groups. The local government of San Mariano estimates that there are approximately 2,500 Kalinga living in the municipality, but many Kalinga nowadays identify themselves as Ilocano.

The Gaddang also have a long history of rebellion against Spanish rule. Numerous punitive expeditions were sent to ‘pacify’ these fierce warriors. The lower Siffu and Magat rivers form the heartland of Gaddang territory. Little is known about the Yogad, an ethnic group living on the banks of the Cagayan River in and around Echague. According to the National Commission on Indigenous Peoples there are around 65,000 Yogad and 126,000 Gaddang, but these numbers should be treated with care.

The Kalinga, Gaddang and Yogad are increasingly assimilated in mainstream Filipino society. For outsiders it has become almost impossible to distinguish these cultural groups. Most cultural artifacts, such as the brass gongs for the healing rituals and the statues of the ancestors, have been destroyed in the course of history. In remote areas, however, some cultural features have remained. Most Kalinga, for example, live in bamboo huts and refrain from using corrugated iron roofs or hollow blocks for the construction of their houses out of fear of displeasing the spirits and ancestors. But these traditional beliefs and practices are rapidly disappearing nowadays.

The Kalinga, Yogad and Gaddang were swidden cultivators, sometimes living in tree houses. The Gaddang and Yogad now predominantly cultivate rice and yellow corn. The Kalinga in the uplands of San Mariano remain largely subsistence farmers, but the production of hybrid yellow corn is becoming increasingly important. The Kalinga are among the most marginal communities in the Sierra Madre. They have lost control over most of their ancestral lands: in many cases the land has been titled to absentee land owners.

Left page: Mrs. Garatiyu, a Kalinga faith healer in San Mariano (Hulshoff-Pol 2005)
A Kalinga farmer, Tony Francisco, in San Mariano (van der Ploeg 2004)

Beauty contest in Cabagan (van Weerd 2008)

Bugkalot

Where the Caraballo and Sierra Madre mountain ranges merge, the headwaters of the Cagayan River, is the ancestral domain of the Bugkalot. The Spanish and American colonizers never controlled this steep and remote area and its people. Until fairly recently, the Bugkalot, also known as Ilongot or Italon, were feared as head-hunters. Allegedly the practice was only officially abandoned in the 1970s under pressure of missionaries and the military. They were the last tribe to do so in the Philippines. The Bugkalot cultivated upland rice and sweet potatoes on steep swiddens. Nowadays irrigated rice, banana and yellow corn are important crops. As with the Kalinga, Gaddang and Yogad, the Bugkalot go through a rapid assimilation process. As a result the Bugkalot language and culture is under threat: most people prefer to speak Ilocano and Tagalog and are reluctant to talk about their traditional beliefs and customs. In his PhD. dissertation *The resource management in ancestral lands: the Bugkalots in northeastern Luzon* Dante Aquino estimated the current Bugkalot population at 60,000.

Symbols of modernity in the uplands of Cabagan: church and basketball court (van der Ploeg 2006)

Ilocano

The Ilocano are lowlanders from Central and Northwest Luzon. Over the past two hundred fifty years there has been a massive influx of Ilocano immigrants to the Cagayan Valley. In the 18th century the Spanish colonizers, dissatisfied with the work ethic of the Ibanag and Itawis, encouraged Ilocano farmers to settle in the sparsely populated Cagayan Valley to boost the tobacco production. In the 1950s Ilocano farmers were granted land rights in the uplands of the Sierra Madre under the homestead programme of the Magsaysay administration, for example in Masipi East in Cabagan. In *The social dynamics of deforestation in the Sierra Madre, Philippines* Gerhard van den Top (1998) described how these pioneers claimed and cleared the best lands along the forest frontier. In the 1970s the corporate logging industry further attracted laborers and settlers to the forests of the Sierra Madre. Nowadays the Ilocano are the largest ethnic group in the Cagayan Valley and the Sierra Madre. Almost two million Ilocano now live in the Cagayan Valley. Ilocano is the lingua franca of the region. The Ilocanos dominate trade and politics.

Wedding in San Mariano (van der Ploeg 2007)

Ilocano boys in San Mariano (van der Ploeg 2005)

Ifugao, Kalinga and Tinguian

The Cordillera Mountain Range harbors a remarkable diversity of peoples and cultures. The eastern Cordillera is inhabited by Isneg (in Apayao province), Kalinga (in Kalinga), Ifugao (in Ifugao) and Ikalahan (in Nueva Vizcaya). Together with the other tribes of the Cordillera these upland peoples are collectively called ‘Igorot’, a condescending term meaning ‘mountaineer’ in Tagalog.

There have always been close contacts between these groups and the peoples in the Cagayan Valley. But the massive immigration of Ifugao, and to a lesser extent Kalinga, to the Cagayan Valley is a relatively recent development fuelled by rapid population growth and land scarcity in the Cordillera. Ifugao farmers create small settlements along the Sierra Madre forest frontier, cultivating bananas and yellow corn, and constructing rice terraces. The influx of Ifugao farmers and the expansion of their fields have led to land conflicts with other upland farmers, and negative sentiments towards this ethnic group in the valley. In the Sierra Madre the Ifugao succeed in maintaining their cultural identity. Immigrants keep close contacts with their relatives in Ifugao: most children, for example, still go to school in the Cordillera. In some parts of Quirino and Nueva Vizcaya the Ifugao nowadays form a majority and dominate social life and politics.

Other people from the Cordillera also migrated to the Cagayan Valley in search for land but on a much smaller scale. There are several Kalinga villages in the Sierra Madre, such as Dicaruyan in Divilacan. The Tinguian from Abra province also settled in the uplands of Sierra Madre, for example in Puerta in Cabagan. There is no reliable information of the exact number of Cordillera immigrants in the Cagayan Valley.

Towards 4 million people

The ethnographic map of the Cagayan Valley is rapidly changing. Ethnic groups no longer live predominantly in a single home area, or the territory of their ancestors. Especially the uplands of the Sierra Madre form a heterogeneous mix of different peoples, cultures and languages from all over the Philippines: there are, for example, around 185,000 Tagalog people residing in the Cagayan Valley. Bicolano and Cebuano have also settled in Sierra Madre.

Conversely, people from the Cagayan Valley have migrated to other parts of the Philippines, or work abroad as Overseas Filipino Workers. Intermarriage between people from different ethnic backgrounds is quite common. Education forms another important leveling force, reinforcing Tagalog as common language. Cultural differences in land use, clothing, architecture, and so on are becoming less marked. The history of the Cagayan Valley can be read as the ongoing assimilation of a variety of ethnic groups into a single Filipino identity.

At the same time people continue to identify themselves with a particular ethnic group. On special occasions people wear their traditional clothing, for example during the annual town fiesta. Ethnicity is also becoming a political factor: under the Indigenous Peoples Rights Act indigenous peoples can claim land rights to their ancestral domains. Throughout the Cagayan Valley, people are rediscovering their past and strengthening their ethnic identity. Distinctive cultural features like traditional dress, architectural styles, language, art, music and dance become important identity markers.

Left page: Ifugao houses in Dipugpug in San Mariano (Persoon 1992)
Ifugao dancers during a cultural celebration in the Northern Sierra Madre (Persoon 1996)

In 1903 there were around 200,000 people living in the Cagayan Valley. One hundred years later there are more than 3 million people residing in the region. The National Statistics Office projects that with current population growth (more than 2 percent per year) there will be more than 4 million people in the Cagayan Valley in 2020. This rapid population growth poses the largest societal and environmental challenge for the coming decades.

Student reports: *Maus & Schieferli 1989; Doedens 1992; te Velde 1994; de Groot 1996; Fritsma 1998; Inberg 1999; Mingelers 1999; ten Berge 2000; van der Ploeg et al. 2008.*

Publications: *Doedens, Persoon & Wedda 1995; Moonen 1998; van den Top 1998; Aquino 2004; Knibbe & Angnged 2005; Minter et al. 2005; Persoon 2006; Perez 2007.*

Children on their way to school (Persoon 2007)

4

THE AGTA OF THE SIERRA MADRE

Tessa Minter, Maria Pedrablanca, Gerard Persoon and Reimar Schefold

Introduction

The very first modern humans that settled in what we today call the Philippines, have arrived there between 60,000 and 35,000 years ago. These people were part of a major population dispersal that reached all the way to Australia and the Bismarck Islands. They entered the archipelago in a south-north direction, settling along coasts and in broad river valleys. Living in small, mobile groups, they subsisted on hunting, fishing, gathering, and possibly extensive forms of agriculture. This situation remained for a long time, but about 4,000 years ago farming peoples entered the northern part of the archipelago from Taiwan. Contacts between the hunter-gatherer and farming peoples differed. In some locations the former were assimilated by the latter, in others they may have been exterminated by them. In yet other situations the two populations developed symbiotic relationships. These relations must have been fairly intense, for in the process the hunter-gatherers abandoned their original languages for those spoken by the farmers. Such was the case in North Luzon. In the rough, coastal strip, which was unattractive for agriculture, the hunter-fishers stayed put. But the farmers' occupation of productive hunting-gathering grounds in the lowland interior made the hunters move to higher, forested areas. They exchanged meat, fish and other wild commodities for agricultural products with farming populations. This system still survives among their descendants: the Agta.

Moning Molina in Palanan (van der Ploeg 2004)

Left page: Cecille and Ose Wagi in San Mariano (Minter 2004)

When Spanish colonizers first arrived in the Philippines in the sixteenth century, they were simultaneously fascinated, frightened and appalled by the hunter-gatherers who roamed the coasts and mountains. They described them as wild, savage, uncivilized, and barbaric. They called them Negritos (little blacks), in contrast to the rest of the Filipinos, to whom they referred as Indios. The Spanish also foresaw that within due time the Negritos would belong to an extinct race, as they would be either assimilated or exterminated by the Indios. Such predictions have since been repeated by American colonizers, and after that by foreign and Filipino missionaries, adventurers and anthropologists. It is certainly true that Negrito populations have been greatly reduced since the time of Spanish colonization, both in absolute numbers and relative to the rest of the Philippine population. This is the combined result of colonization, political turmoil, loss of forest land, and high mortality rates, especially among children.

It is estimated that a total of about 31,000 Negrito individuals remain in the Philippines. This is only 0.03 percent of the Philippine national population, which is projected to reach over 92 million in 2009. Despite their low population numbers and their marginal position in Philippine society, however, Negrito populations are more resilient than they have received credit for, as is demonstrated by the Agta's surviving hunting-gathering mode of existence. Researchers and students of the Cagayan Programme on Environment and Development have looked into the ways this lifestyle is adjusted in response to social and environmental change. Their studies focused on the relation between the Agta and sedentary farming communities, natural resource use, the effects of new policy instruments on the Agta's cultural and economic system and the Agta's role in the management of the Northern Sierra Madre Natural Park. Here, we will reflect on the most important conclusions.

Anday Cariño collecting roofing material in Maconacon (Minter 2005)

Right page (from left to right):
Agta camp in Palanan (van der Ploeg 2006)
Dikkad Domingo transferring a pinanahang in San Mariano (Persoon 2005)
Ponica and Wasing Mariano watch their new grandson Christopher in the hands of his father Kekek Impiel (Minter 2004)

Social organization and mobility

The Agta, numbering about 10,000 individuals, form one of the largest remaining Negrito populations. They live along the coasts, in the forested uplands and in the denuded foothills of the northern Sierra Madre. Their settlement patterns range from sedentary to highly mobile. Especially in the lower lying areas, which were logged-over by timber companies in the second half of the twentieth century, Agta have often adopted a sedentary life in or near to non-Agta villages. They combine paid land labour with tilling their own small plots of land, in alternation with occasional hunting and fishing activities. This is the case on the San Ildefonso Peninsula in Aurora Province, and in parts of Cagayan and Isabela Province.

A large share of the Agta population, however, retains an economy, social organization and settlement pattern that is typical for hunter-gatherers. This is especially so in and around the Northern Sierra Madre Natural Park. Here, about 2,000 Agta live dispersed along beaches and rivers in groups of up to 60 individuals. These groups, to which the Agta refer as *mapisan*, are made up of one or several extended families, which in turn consist of closely related households. Agta must marry outside their own extended family, and preferably outside the mapisan. Each household usually consists of a nuclear family, but widowed parents or siblings, or orphaned cousins often take up (temporary) residence with the family too. Households have their own dwelling and hearth. Dwellings usually are open wooden and bamboo structures with palm leaf roofs, although Agta occasionally build closed sawn-timber huts. In the hot, dry season Agta live under lean-to's, which are constructed of a few wooden poles and a woven palm leaf shield. These shields are called *pinanahang*, literally: a place to be abandoned.

Indeed, mobility is high, especially during the dry season when travelling is not impeded by lengthy rains, typhoons and swollen rivers as it is in the monsoon months. Freedom of movement is an important value among Agta, and it explains why government and church initiated efforts at turning them into sedentary farmers have mostly failed. Agta travel for several reasons. A very important motivation to shift camp is related to the Agta's cosmology. They see the spiritual world to be composed of several classes of spirits, the most important of which are nature spirits on the one hand, which inhabit springs, rock formations and coral reefs; and the spirits of the deceased on the other hand. The Agta have a deep fear of the latter in particular, as these jealous and wandering souls are believed to cause sickness and even death among the living. For this reason every death is followed by the destruction of the dwelling and abandonment of the settlement where it occurred by the closest relatives. Other reasons to shift camp are conflicts within the mapisan, a desire to visit relatives in other mapisan, a need to look for a marriage partner, and, as we will see below, economic opportunities.

While Agta thus are highly mobile, they do not randomly wander throughout the northern Sierra Madre. Kinship relations are a major factor influencing Agta settlement patterns. And as not all Agta are related to each other, their social and physical world is limited to where their kinship relations expand. In general, coast-dwelling Agta move in north and southward direction along the Pacific coast; while there are several kinship networks of river-dwelling Agta expanding in east-west direction across the mountain range. These river-dwelling kinship networks are roughly bounded by major waterways such as the Blos, Abuan, Catalangan and Ilaguen Rivers. Each kinship network consists of several mapisan, who all consider a specific stretch of coast, or a particular river valley as their home. In addition, every Agta individual has the right to settle, marry and make a living among neighbouring mapisan belonging to the same kinship network. Beyond kinship boundaries, however, intra-Agta interactions are limited, and sometimes wrought with suspicion and tension.

Bening Donato in Divilacan (Minter 2004)

Livelihood

Agta subsist on a mixed economy, the composition of which varies over time and between residential groups. The most notable difference is between coast- and river-dwelling Agta. In all cases, however, Agta procure wild products through fishing, hunting and gathering. They exchange part of these products with non-Agta residents and traders for rice, salt, coffee, sugar and other commodities.

For coast-dwelling Agta, marine fishing forms the main income generating activity. In the dry season, when the sea is calm, men and women intensively engage in spear fishing. Women do this in pools on top of reef flats, while men usually concentrate on the deeper waters behind the reefs. Several types of self-produced spears, in combination with home-made goggles (*anti-para*), are used to catch a wide variety of fish species. In addition, women daily gather octopi, crabs, shellfish, sea cucumbers and other reef species during gleaning sessions on top of the reef. In addition to spear-fishing, some coast-dwelling Agta occasionally use nets, and hook and line, which they either own themselves or borrow from non-Agta. Coast-dwelling Agta sell about half of their fishing produce to local buyers, while they consume the remainder.

Since about fifteen years, commercial lobster fishing has been a major income activity for coast-dwelling Agta. A hand-full of buyers is operative along the northern Sierra Madre coast where they purchase several lobster species from fishermen in order to sell them in local town centres, Manila or even outside the country. The Agta, being renowned divers, are popular labourers for these traders. During the dry season, the buyers supply Agta fishermen with fykes which are set-up on the reef. Live lobsters are collected from Agta settlements once or twice a week and paid with rice, coffee, sugar and other products. In the wet season, when fykes get easily damaged by the strong waves, Agta manually collect lobsters from the reef at night time. For almost all coast-dwelling Agta lobster fishing generates indispensible income. They are worried however that lobster-stocks will be depleted and have repeatedly urged the management board of the Northern Sierra Madre Natural Park to act against over-fishing.

Lobster fishing in Divilacan (Minter 2005)

Emoy Wagi and Wagi Impiel showing their catch in San Mariano: a Gray's Monitor Lizard, a Long-tailed Macaque and a Philippine Warty Pig (Minter 2004)

In the wet season coast-dwelling Agta have to turn to other sources of income than fishing alone, as the sea is often inaccessible. In these lean months, hunting becomes more important. The forest is also sought for several species of rattan, which is sold to local buyers. In recent years, another important non-timber forest product concerns the nests of two species of swiftlet. Breeding in caves, these birds produce nests from saliva which are a highly priced commodity at local, national and international markets. Agta who dare to enter these caves earn a relatively good income from collecting the nests, although this resource too is over-exploited. Small swiddens, which are planted with root crops and vegetables, provide supplemental sources of food, as do the coconut plantations of non-Agta neighbours from which Agta are usually allowed to harvest. Although irregularly, coast-dwelling Agta work as land labourers on nearby farms when there is demand for planting or harvesting labour. Their work is paid on a daily basis in kind or cash, and payment usually involves a meal and snacks as well.

River-dwelling Agta depend on the forest year-through. They live along the forest fringe, and in some cases in the forest interior, usually below elevations of 500 m. Like their coast-dwelling counterparts, they engage in fishing, but the rivers give much lower fishing returns than the sea. Moreover, the use of nets and fykes is impractical in the rocky streams, and so spear-fishing and manual collection are the most important fishing methods. Hunting is of much greater importance than along the coast. It is done throughout the year, although it gets more emphasis in the wet season. This is partly because fishing is least attractive then, and partly because hunting is more successful in the rainy months: game is fat, it less easily smells hunters in a damp and cool environment, and its tracks are better visible on wet forest floors.

Inserts: Motong Salazar gathering swiftlet nests in Palanan (Minter 2005)

Bianca Almonte spearfishing in San Mariano (van der Ploeg 2007)

For river-dwelling Agta the collection of several other forest products for consumption, medicinal use and trade is of great importance. These include honey, fruits, yams, rattan, and earlier mentioned swiftlet nests. Another commercially important forest product is timber. With illegal logging continuing on a wide scale in the northern Sierra Madre, Agta settlements often serve as gateway to the forest for logging teams. Although Agta disapprove of logging as it destroys their hunting, fishing and gathering grounds, they lack the power to provide effective resistance against logging. Feeling unable to turn the tide, many river-dwelling Agta therefore opt to get their share of the pie before it is too late, and act as tree-pointers, chainsaw operators and log-transporters in this clandestine industry. In southern Isabela, where one of the last remaining timber concessions operates, Agta are also employed as concession guards, and occasionally as chainsaw or bulldozer operators.

River-dwelling Agta in higher elevation areas all maintain small swidden fields, which they plant with upland rice, root crops, corn and vegetables. These fields are situated on marginal land, and the yields are generally low, although they do provide so-called famine food. As these remote Agta groups generally live at considerable distance from non-Agta farmers, they rarely engage in paid land labour. The situation is different for river-dwelling Agta living in lower elevation areas, especially on the eastern side of the mountain range. They live in close vicinity to rice farmers to whom they regularly provide labour. Moreover, in recent years, in these areas Agta have often developed their own irrigated rice fields, from which they may harvest up to twice yearly. The yields do however nowhere sustain Agta families throughout the year and farming remains just one component of the Agta's mixed and flexible livelihood package.

Jordan Baliwa with a Philippine Deer in San Mariano (Minter 2002)

Right page: Carmen and Jessica Matias weeding their camote field (Minter 2004)

Cultural resilience in times of social and environmental change

The Agta's hunting-gathering economy and social organization have clearly been more resilient than Spanish and American colonizers, and many other observers since, expected them to be. Their socioeconomic system has persisted despite great changes it has had to reckon with. It has survived the arrival of early farming peoples, the imposition of colonial and post-colonial states, civil war, deforestation and immigration. The Agta owe their cultural survival to their great flexibility. They are always ready to shift to new opportunities as they arise, and thereby show an admirable ability to make the best of situations that are beyond their control.

But this is not to suggest that the Agta are in a bright situation. On the contrary, they face enormous problems. Levels of malnutrition and mortality, among children in particular, are very high. Of all children born alive in the Northern Sierra Madre Natural Park, about one third die before reaching puberty. An Agta child's chance to die before its fifth birthday is seven times higher than that of an average Filipino child. Moreover, the Agta are a discriminated group, who are often taken advantage of by more powerful entities and who largely fall outside Philippine society. This shows from their low participation in formal education, their complete absence from local and supra-local politics, and their poor access to medical services.

Especially worrisome is the ongoing degradation of the resource base from which the Agta make a living. Not only does the forest continue to shrink in quality and quantity; what remains is to be shared with increasing numbers of people. More than ever, the Agta have to compete with other rural poor, who may be busy farming most of their time, but engage in hunting, (lobster) fishing, logging and the commercial collection of rattan, bird nests, and other commodities too. While legal instruments such as the Indigenous Peoples' Rights Act of 1997, and the Northern Sierra Madre Natural Park Act of 2001, could have served to protect the Agta's ancestral domains from further resource depletion, in a context of weak law enforcement the Agta have not yet benefited from these interventions.

Even within the Northern Sierra Madre Natural Park, unsustainable and illegal resource exploitation continues. The Agta's repeated outcries for sound environmental management have so far fallen to deaf ears. And it is the Agta who suffer disproportionately from this situation.

Student reports: *Baldi 1997; Agatep 1998; Goverse 1998; Piano 1999; Serdiene 1999; van Alphen 1999; van der Schaaf 2000; de Jong 2003; van Velthoven 2004; Giebels 2005; van der Ploeg 2005; Doornbos 2008; de Brabander 2009; Bogaert in prep.; Goslinga in prep.*

Publications: *Minter et al. 2005; Minter, Goslinga & Persoon 2007.*

Alvin de la Peña looking ahead (Minter 2004)

Left page: Donato family in Dikente, Palanan (Pedrablanca 2008)

5

ILONGOT THEN, BUGKALOT NOW

Dante Aquino and Gerard Persoon

Introduction

Until the mid-1970s the Bugkalot were known as the Ilongot. The Ilongot were notorious because of their headhunting activities. The abandonment of headhunting is the interrelated and cumulative effect of a period of evangelization, the declaration of Martial Law under President Marcos, the opening up of the ancestral domain for corporate logging, the influx of people from the Cordilleras, and other social factors. During a religious and government-sponsored peace pact meeting, the Ilongot decided that they preferred to be called Bugkalot. They collectively decided to disown the term Ilongot; a term they considered derogatory and connoted with headhunting.

Since then, the Bugkalot have changed. From being reclusive and outcasts in the past, they adapted through time and are now a part of mainstream society. Although they still project themselves as an unique and distinct people, most of them have adopted a lifestyle not very different from non-Bugkalot. Many of them are elected local government officials at the village, municipal, and provincial levels, and some of them now occupy positions in government line agencies. However, these are generally individual accomplishments. Their supposed transformation into a capacitated and empowered people, the envisioned result of the issuance of a Certificate of Ancestral Domain Claim and later a Certificate of Ancestral Domain Title, has still a long way to go.

Left page: Mr. Dobillo Sr. telling the story of his life in sitio Buayo, Dupax del Norte (Persoon 1996)

The following account, based on a PhD. research project within the framework of the Cagayan Valley Programme on Environment and Development, gives a brief description on the dynamics of the biophysical and social, economic and political environment over the years and how these led to the present status of the Bugkalot ancestral domain.

Entrance to the land of the Bugkalot: 'the place where a payment was made' (Persoon 2000)

Changing landscapes

Before the 1950s, the Bugkalot domain used to cover a wide expanse of land that include the whole of Quirino (based on current province names), the eastern side of Nueva Vizcaya, the southern edge of Isabela, the northern part of Nueva Ecija, and the north-western tip of Aurora. This large area is inaccessible and can only be reached through the rivers that spring in these mountains. The headhunting forays of the Bugkalot, sensationalized and widely disseminated through the radio, were the major reason that deterred people in threading into this land.

Then the Bugkalot country was mostly covered by thick and lush primary forests endowed with diverse non-timber forest products and wild animals. The numerous streams that traverse this vast land were teeming with fish. Fish, game, fruits, and plants were abundant and readily available. Those were the days when a day's labour could last them for at least a week.

The Bugkalot land was not given that much attention by the government. Development programmes were concentrated on the accessible lowlands. The Bugkalot land only came in the picture when a lowlander was beheaded within the fringes of their domain. To eradicate 'their barbaric headhunting ways' the government decided that there was a need to convert the Bugkalot to Christianity, educate their children, and disseminate farming techniques (in short to 'tame' or 'pacify' them). To achieve this, the government started to build roads, opened elementary schools, provided scholarship grants to children, and induced migration from the Cordilleras. The Bugkalot territory slowly gave way: forests were cleared and cultivation around the domain expanded.

When commercial logging started in the 1970s, the entrance of people was greatly facilitated with the construction of logging roads. The concessionaires of Timber License Agreements issued by government made sure that they could bring out as much timber as possible. Roads branched-out in areas with very steep slopes. Mechanized logging (using winches and cables) reached the most inaccessible mountains. Day and night, as long as the weather permitted, logging continued without any restrictions. Indiscriminate logging and slash-and-burn farming resulted in the wanton destruction of the forest. Non-timber forest products were destroyed in the process. Then biodiversity was not yet a vogue term; it was still to be coined.

Right page: A traditional Bugkalot house surrounded by secondary vegetation, rice paddies and banana fields near Buayo (Persoon 1996)

Fighting the current near Landingan (Persoon 1996)

The Bugkalot land was gradually opened up. Upland farms and small-scale irrigated farms were established. Farm houses were build, villages were established, and municipalities were created. The land that used to be the territory of the dreaded headhunting Bugkalot became a melting pot of people coming from different ethnic backgrounds. The land where they used to be the only recognized group became dominated by migrants. Over the years, the Bugkalot were driven to the more inaccessible and steeper parts of their land. The Bugkalot land is now limited to the mountainous areas at the boundary of the provinces of Quirino, Nueva Vizcaya and Aurora: the south-western part of the municipality of Nagtipunan in Quirino; parts of Kasibu, Dupax del Norte, Dupax del Sur, and Alfonso Castañeda in Nueva Vizcaya; and a portion of Maria Aurora in Aurora.

The headwaters of several important river systems in the Philippines are within the Bugkalot domain. The national Luzon power grid is supplied by electric power coming from two big dams dependent on water from these areas. The largest rice production areas in Cagayan Valley and Central Luzon are likewise dependent on these two dams: the Magat Dam in Isabela and the Pantabangan Dam in Nueva Ecija. The Casecnan River supplies water through the 27 kilometer trans-basin (from Cagayan Valley to Central Luzon) tunnel to the Pantabangan Dam. The Addalam River Dam provides irrigation to the province of Quirino. In addition, there are community-based irrigation systems within the province of Quirino and Nueva Vizcaya and many stream-diversion irrigation systems that also depend on these waters. The sustainability of this infrastructure and the benefits derived from them ultimately depends on the land of the Bugkalot.

It is therefore evident that the current Bugkalot domain plays a important role in the Philippine and regional economy. However at present not much importance is given to the sustainable management of this important watershed. Significant parts of the domain are under pressure from forest exploitation and mining. These activities, in combination with unsustainable farming, exert increasingly insurmountable ecological pressures on the Bugkalot domain.

Dobillo Enrique plays the flute in Buayo, Dupax del Norte (Persoon 1996)

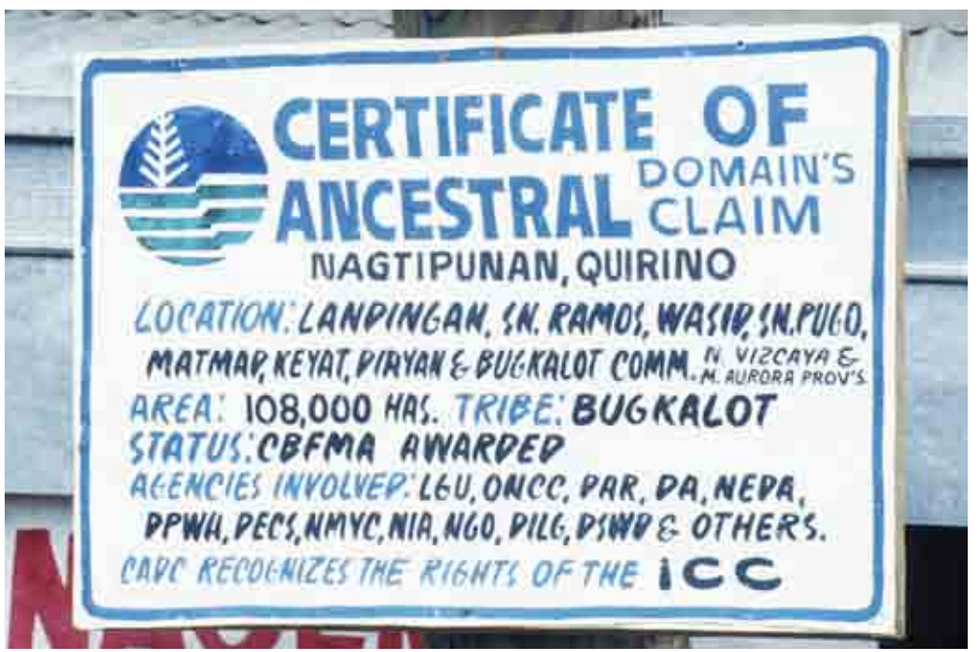
Adaptation to change

The Bugkalot used to live in small groups composed of close-knit relatives. For security reasons their houses were elevated on high posts or built in trees, well-hidden and camouflaged. The stairs were brought in at night so that no one could go in without permission.

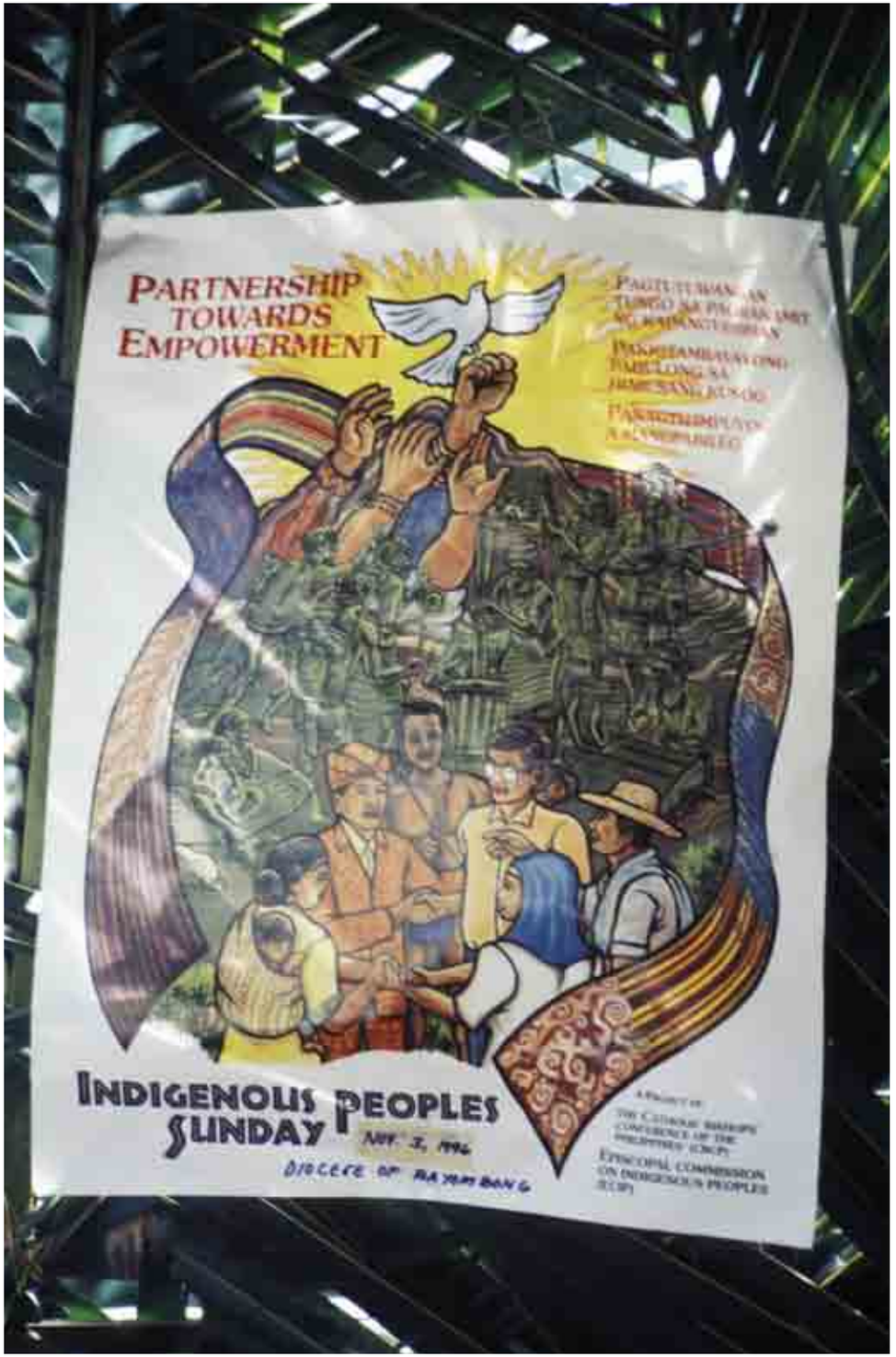
The Bugkalot way of life may be viewed as closely linked to their headhunting practice. Contradictory headhunting myths were perpetuated and published. The most popular is that headhunting was a prerequisite for marriage: it was done by a man who wanted to take a wife. However Renato and Michelle Rosaldo (authorities on the Bugkalot) documented that there were men who took wives but were not able to behead anyone and there were men who did not take wives who did successful headhunting. Michelle Rosaldo maintained that headhunting was done to throw away the burdens of life (such as grudge, insult or grief) or as a reaction to a provocation (theft of crops for example).Headhunting was a major contributory factor to the preservation of the forested areas within the Bugkalot domain. Because of fear, migrants did not dare to settle in the area. However, when the New Tribes Mission and the Summer Institute of Linguistics slowly made progress in the evangelization of the Bugkalot, significant changes (social and biophysical) started to happen. When many of the Bugkalot were converted, even talking about headhunting became evil. Headhunting was eventually discontinued (even by unconverted Bugkalot) when Martial Law was declared in 1972 because of the fear created by the summary execution of criminals and the imprisonment of law-breakers and curfew violators.

The way of life of the Bugkalot was affected by the conversion of most of them to Christianity. The Sunday service gatherings and the midweek bible studies provided opportunities for socialization and building up camaraderie and confidence. Religious, sports and cultural programmes were regularly organized. These meetings and the interactions with non-Bugkalot gradually exposed them to the outside world. Gradually they became a part of mainstream society.

When resource conservation became a national concern because of natural calamities brought about or aggravated by logging and mining, the government implemented various programmes to address this issue. The Bugkalot became the recipients of a sequence of government programmes on forest conservation. They became participants or contractors in the community and family approaches to reforestation initiated by the Department of Environment and Natural Resources. When the Department of Environment and Natural Resources issued Certificates of Ancestral Domain Claim to the Bugkalot, they became collective owners of six tribal domain properties. However only a few people participated in the implementation of these certificates. Because of widespread malpractices (the certificates were used to legitimize illegal logging), the programme was suspended. The suspension hardly affected the Bugkalot because many of them were not actually involved. The certificate did not make significant changes (such as the sustainable use of forest resources, forest protection, reforestation, and the empowerment of members of the People's Organizations who were the collective owners of the claim).



The billboard of the first Bugkalot ancestral domain in Nagtipunan (Persoon 2000)



The passage of the Indigenous Peoples' Rights Act in 1997 provided the legal basis for the issuance of a Certificate of Ancestral Domain Title to indigenous peoples. In the Bugkalot domain, four of the six Certificates of Ancestral Domain Claim (two were left out because of insufficient documents) were lumped into one Certificate of Ancestral Domain Title. It was awarded in 2004. Since the Certificate of Ancestral Domain Title covers three provinces (more than 100,000 hectare), the recipient People's Organization was the federation of the three provincial Bugkalot associations. Interestingly, most of the officers of the provincial associations were elected local government officials (three of them were municipal mayors and at least ten of them are members of municipal councils). The elected president of the federation was one of the mayors. The federation officers did not initiate the preparation of the required management plan. After four years of inactivity a foreign-funded non-governmental organization facilitated the participatory preparation of the ancestral domain sustainable development and protection plan, which was finished in 2008. However the plan needs external funding.

While the Certificate of Ancestral Domain Claim and Certificate of Ancestral Domain Title programmes were implemented in their ancestral domain, most of the Bugkalot lived their own lives. They have continued to widened their swiddens, which is nowadays facilitated by chainsaws. In the olden days, the Bugkalot used to leave the large trees standing and cut only their branches, just to let sunlight through for the plants they raise. This traditional practice is now abandoned. Areas with steep slopes are cleared. The period of fallowing is either shortened or totally disregarded. What used to be small swiddens planted with various crops are now large farms mostly planted with commercial yellow corn. The Bugkalot followed the example of the lowlanders of diverting some streams to irrigate rice paddies. Mechanized farming (cultivation, threshing and transport) is now common. The Bugkalot have adopted sedentary agriculture, primarily raising crops for the market.

Poster of the Catholic Church announcing Indigenous Peoples' Sunday in Dibibi (Persoon 1996)

Right page: Simbe Mallo taking energy food for his next dance performance during Indigenous Peoples' Sunday in Dibibi (Persoon 1996)


ARBANZOS

Bugkalot villages are now concentrated groups of houses. Roofs made of galvanized iron sheets can be seen from afar. Concrete hollow blocks, steel and sawn wood are now the commonly used construction materials. The Bugkalot have adopted the house designs of the lowlands (the bungalow-type), although a few people still put a traditional bird-like design at the two ends of the roof. The furniture of the Bugkalot is bought from the stores and shops in the nearby cities. The Bugkalot use clothing and textiles that are trendy and in the vogue. Their customary attires are only used during sociocultural programmes when they are requested to perform the traditional headhunting and courtship dances.

The Bugkalot are no longer an isolated tribe. It is not uncommon to hear Bugkalot speak the dominant languages (Ilocano or Tagalog) among themselves. Bugkalot is usually spoken within the household but words from other languages are adopted and used. Bugkalot who graduate from colleges and universities find a job in government or in private enterprises. Some have become politicians and have established some spheres of influence with non-Bugkalot. The Bugkalot have indeed changed; they have adapted themselves well. They are no longer distinctly different to the mainstream Filipino.

Rice harvesting using a hired huller near Buayo (Persoon 1996)

Billboard for a log pond in an almost treeless landscape near Landingan (Persoon 1996)

Conclusion

So what is in store for the Bugkalot in the future? The Bugkalot adapt to changes that come their way. They have lived and survived within their ancestral domain. Government programmes come and go but the majority of the Bugkalot lived their own way; many of them not even aware of the programmes implemented within their midst.

Over the years, many Bugkalot have had high hopes and expectations on the many programmes they participated in. These often ended in frustrations because of unfulfilled expectations resulting from improper operation and plan implementation. When they were issued a Certificate of Ancestral Domain Claim, the Bugkalot became part of a bold policy shift of the government to award indigenous peoples the rights to their ancestral domains. Despite shortcomings from both the capability-lacking indigenous people recipient organization and the implementing agency, the Bugkalot experienced having a say and expressing what activities they want to be done in their domain. These same representatives participated in the negotiations for the issuance of their Certificate of Ancestral Domain Title. After some years of inactivity, the ancestral domain sustainable development and protection plan was eventually prepared and approved. The challenge now is to tap the resources needed to implement the plan.

The Bugkalot were willing to participate in the programmes that came their way; but it is revealing that they were always more reactive than proactive. Unless the Bugkalot will be self-motivated and start programmes for their ancestral domain at their own volition and initiative (without depending on outside help) then the intents of programmes will not be attained.

Student reports*: Huijbregts 1996; de Boer 1996; Bermosa 1998; Houkes 2000.*

Publications*: Aquino 1999; Moonen 2000; Aquino 2001; Aquino 2002; Aquino 2003a; Aquino 2003b; Aquino 2003c; Aquino 2004; Aquino 2005.*

Dante Aquino exploring a cave in Bugkalot territory (Persoon 1996)

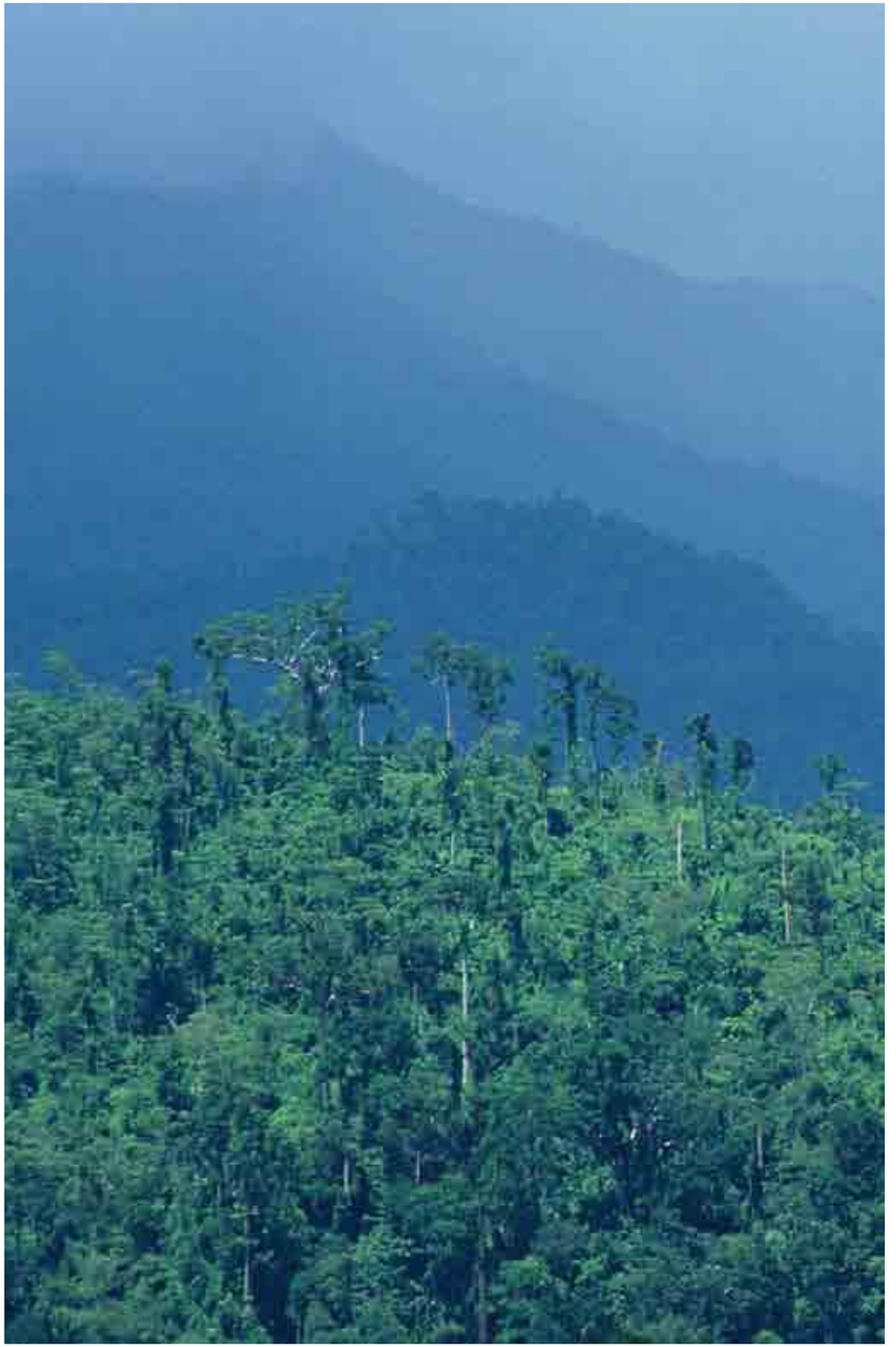
6

LOGGING THE LAST FOREST

Jan van der Ploeg, Roberto Araño, Gerhard van den Top, Andres Masipiqueña, Merlijn van Weerd and Arnold Macadangdang

Deforestation in the Philippines

In less than one hundred years the Philippines has lost about 75 percent of its forest cover. The remaining forests are severely degraded. Logging is an important driver of deforestation in the Philippines. Unregulated and irresponsible logging forms a major threat to biodiversity and contributes significantly to global warming. The socioeconomic costs of logging are large, and disproportionally affect the rural poor. Over the past two decades a fundamental shift has taken place in the Cagayan Valley. In 1980s corporate logging was the most important industry in the Sierra Madre. Twenty years later most logging companies have ceded operations and there is growing public awareness of the detrimental social and environmental effects of illegal logging. But illegal timber harvesting remains a serious problem which prevents the sustainable management of forest resources.



The northern Sierra Madre: Luzon's last forest frontier (van der Ploeg 2004)

Left page:Log landing site in Ilagan (Persoon 1990)

Corporate logging

Logging corporations started operating in the forests of the northern Sierra Madre in the 1960s. Companies were granted a Timber Licensing Agreement, a twenty-five year contract for the sustainable harvest of timber. In the early 1980s, at the height of the 'logging boom', there were 44 concessions active in the northern Sierra Madre, legally extracting 2 million cubic meter wood per year. Cronyism, corruption and anarchy characterized the corporate logging industry during the administration of President Ferdinand Marcos. In most cases the concession holders, well-connected businessmen, army officers and politicians in Manila, sub-contracted the logging operations to local entrepreneurs in Nueva Vizcaya, Quirino, Isabela and Cagayan. The so-called 'Bataan-system' (derived from Bataan Province where the old U.S. Army trucks were refitted to be used in the corporate logging industry) became the dominant mode of logging operation: a bulldozer, two or three chainsaws and several logging trucks extracted timber from the forest. The laborers, often hired from upland communities, were paid by the volume of timber that was produced. Forestry regulations were violated to maximize profits: timber stands were overcut, logging roads were improperly constructed, annual allowable cuts were exceeded, protected species were cut, logging took place outside concessions, and reforestation efforts were minimal. These illegal and unsustainable practices were ignored by government foresters in exchange for personal favors and payments. Fortunes were made during the logging boom. But the largest profits were made in Manila by businessmen connected to the Marcos administration: little money was re-invested in the development of the Cagayan Valley.

Heavily loaded truck at check point (Persoon 1991)

Charcoal making in San Mariano (Persoon 1990)

The democratization and decentralization processes that followed the People Power revolution of 1986 had profound effects on the corporate logging industry. Reports of pervasive illegal logging led to the issuance of a logging moratorium in the municipality of San Mariano in 1989. In 1991 there remained ten active forestry concessions in the northern Sierra Madre with an annual allowable cut of 241,600 cubic meter. In 1992, in the wake of the Ormoc tragedy in which more than one thousand people died in mudslides on the island of Leyte, the Aquino administration issued a ban on commercial logging in all primary forests in Ilagan and San Mariano. San Mariano became a ghost town: it took ten years to transform the economy from timber extraction to the production of corn, bananas and rice. The Southern Plywood Corporation, one of the largest logging concessions in the northern Sierra Madre, ceased operation after its sawmill and staff quarters in Maconacon were attacked and burned to the ground by the New People's Army in 1992; allegedly because the company had refused to pay the so-called 'revolutionary taxes.' During Martial Law (1972-1981) most logging companies were blackmailed by the insurgents and had to provide food, fuel and cash.

In 2009, only two logging companies continue to operate in the northern Sierra Madre: the Luzon Mahogany Timber Company and the Pacific Timber Export Corporation. Another important legal source of wood nowadays are the community-based forest management agreements that are issued to peoples' organizations. But illegal logging continues in the forests of the Sierra Madre.

Next page: Bataan logging truck in the Sierra Madre (Persoon 1989)

The site of a sawmill in San Mariano before (left) and after (right) the logging moratorium (Persoon 1990; Persoon 1993)

Illegal logging

Illegal logging, the harvesting of timber in violation of national law, is a major problem in the management of the Philippine forests. It is estimated that as much as 46 percent of wood supply is illegally harvested from public lands. Timber is harvested without permits in all lowland dipterocarp forests of the Cagayan Valley, also in the Northern Sierra Madre Natural Park. Every year more than 20,000 cubic meter of timber is illegally extracted from the protected area per year, representing a market value of two hundred million peso. Timber extraction is concentrated along all major river systems of the Northern Sierra Madre Natural Park, most notably Abuan River and Bintacan River in Ilagan and Catalangan River, Disabungan River and Ilaguen River in San Mariano. The scale, intensity and level of organization of illegal logging activities in these five watersheds is comparable to a corporate logging concession.

Illegal timber extraction, locally called *salabadiok*, is financed by a few businessmen in Cagayan Valley. In most cases these financers, who often made their fortunes during the corporate logging boom, are registered lumber dealers or timber plantations owners, which enable them to legalize illegal timber. The financers operate through middlemen in the barangays. The middlemen, often barangay officials, organize specialized logging teams to harvest timber in the forest and collude with government officials to secure permits. Without connections to a middleman and financer, it is impossible to transport or sell timber. The logging teams consist of surveyors, a chainsaw operator, helpers and transporters. The surveyors identify suitable trees for harvesting. The chainsaw operators, locally called *atcheros*, are often former skilled employees of the logging companies. The helpers carry the equipment, fuel and supplies, maintain the chainsaw and prepare the food. The transporters, *bugadores*, are responsible to transport the timber to the hauling points. In most cases these young men, between 16 and 30 years old, are recruited from the barangays along the forest frontier. In some of these remote villages, 50 to 60 percent of the men are involved in illegal logging operations.

Chainsaw operator along Abuan River in Ilagan (van Geenen 2007)

Logging teams claim exclusive extraction rights in the forest: the so-called area-area system. Sometimes these concessions in the forest are even marked with signboards. Financers place an order for a certain amount of timber and provide a cash-advance for fuel and supplies, which is deducted from the payment upon delivery of the timber. The logging teams make regular trips to the forest, usually five to ten days long. The bugadores transport the timber through the rivers to the collection points and travel back with supplies: a complex logistical operation. Bugadores often make two trips per month to haul timber. It takes one to five days to transport the timber to the hauling points. Most often logging is a full-time operation: the teams work throughout the year.

The logging teams make temporal camps along the rivers. Sometimes women assist in the camp, but logging is a men's world. The working conditions in illegal logging operations are harsh: felling, sawing and transporting timber through the river are hazardous activities. The chainsaw operator fells the tree and saws the stem into square flitches at the felling site. All trees that exceed a diameter of 1 foot are harvested. Carabaos are used for skidding the logs to the camps, which function as log landings. Here the square flitches are sawn into thick boards: *dos lapad*. Large rafts, sometimes more than 25 meter long, are constructed to facilitate the transport of these boards through the river. The boards are kept afloat with interior tire tubes. The bugadores transport the rafts to a hauling point in the lowlands where the lumber is loaded into six-wheel-drive logging trucks, and transported to a saw mill. The saw mills, locally called *simpin*, process the lumber. From here the wood is distributed to lumber dealers or furniture makers in the region, or directly transported to the urban centers in central Luzon. In the coastal area, wood is transported by motorized boats to saw mills in Aurora and Quezon.

Logging is one of the most profitable income generating activities in the forest frontier. Young men can earn twice as much with illegal logging as with agricultural labor. All payments are done on consignment, which places the bugadores at risk: if illegal timber is confiscated by the authorities the financers do not pay the transporters. There is a strong patronage bond (a code of honor) between the middlemen and the bugadores that extends beyond logging: often credit for agricultural inputs is paid back with logging revenues. Timber revenues form an important source of cash income for many households along the forest frontier. The money derived from illegal logging is used to invest in agriculture and to pay health care and school fees. But a considerable part is also spent on alcohol, tobacco and prostitutes. Young unmarried men are attracted to the easy money. Sometimes they spent more money in the forest on gin and cigarettes than they earn with transporting timber.

From left to right:
Hauling timber with carabaos in Cabagan (Persoon2007)
Log landing in San Mariano (van Weerd 2007)
Bugadores transporting timber (Nagtegaal 2007)

Standard operating procedures

Loggers collude with government officials to evade forest charges and maximize profits. Illegal timber is authenticated through a variety of legal loopholes. A popular method is the issuance of permits for residual timber left in the forest by logging companies in the 1980s (so-called tops-and-branches). The Department of Environment and Natural Resources also grants permits to collect and sell supposedly damaged or dead wood that has washed ashore after typhoons (salvaged logs). Another way to legalize illegal wood is the old-stock method: over the past fifteen years on several occasions the furniture industry was granted an amnesty which enabled the shops to legally sell their clandestine wood on the condition that they would make a transition to yemane or mahogany wood from plantations in the region. Stocks were over-declared with tacit approval of government officials and are continuously replenished. Permits are also often recycled: several wood transports are covered by the same permit. In other cases wood is simply sold without any permits or receipts.

To secure passage for the logging trucks at the checkpoints middlemen bribe forest guards. In many areas these payments are institutionalized: 1 peso per board foot. It is estimated that between 8 million to 14 million peso per year is paid in bribes to forestry officials in Isabela. Army and police officials are sometimes also involved in illegal logging operations. The New People's Army claims revolutionary taxes, food and gasoil from the loggers. Several barangays on the forest frontier have set up their own checkpoints and demand 50 peso per logging truck. To transport wood from Isabela to Central Luzon, trucks have to pass at least 11 checkpoints along the national highway, allegedly paying 2,000 peso at every checkpoint to avoid confiscation.

The failure to enforce environmental legislation and the persistent allegations of corruption has undermined the credibility and legitimacy of the Department of Environment and Natural Resources. Forest guards rarely visit the upland areas. It is estimated that less than 3 percent of illegal timber is actually confiscated by the forestry service, despite numerous checkpoints throughout Cagayan Valley.

From left to right:
Logging trucks destroy farm-to-market roads (Budde 2005)
A chainsaw repair shop next to a DENR checkpoint (van der Ploeg 2007)
Furniture shop in Ilagan (van Weerd 2006)

Need or greed?

In recent years public awareness of the detrimental effects of illegal logging has grown, especially in relation to flashfloods. In the aftermath of the landslides that killed 1,800 people in Quezon Province in 2004, President Gloria Macapagal-Arroyo identified illegal logging as one the 'most serious crimes against our people.' However illegal logging continues unabated in the Sierra Madre. Government officials in the Cagayan Valley in effect sanction illegal logging activities by the rural poor, a strategy that is locally called 'humanizing the law.' They claim that logging is an important livelihood strategy for poor upland communities along the forest frontier and it is therefore unfair to enforce the law. In fact this pro-poor rhetoric is a pretext for collusive corruption and organized crime. The illegal timber trade in the northern Sierra Madre is controlled by criminal syndicates that co-opt and intimidate upland communities. The lion-share of the profits of the timber trade is captured by a few: primarily the financers in Cagayan Valley. It is estimated that the seven financers in Isabela jointly have a minimal profit of 42 million peso per year. The bugadores and atcheros have remained poor. Obviously timber poaching provides cash benefits to upland households. However, after decades of illegal logging activities, it can be concluded that this is clearly not an effective poverty alleviation strategy for the Sierra Madre, or for other areas in the Philippines. Rather illegal logging undermines sustainable rural development by destroying ecosystems, distorting markets and subverting the rule of law. Across the country, illegal and unsustainable logging has caused land slides and floods that destroy lives, crops and property. It resulted in declining fish catches and hunting success rates. It created conflicts between and within communities about the deterioration of roads, the sharing of benefits, the neglect of local institutions such as traditional ownership rights or communal labor, and about damage to agricultural fields. Illegal logging erodes trust in government thereby leading to feelings of disempowerment. And it renders sustainable alternatives impossible: yemane and mahogany tree plantations are not profitable as long as illegal timber depresses wood prices. The ecological and societal costs of uncontrolled timber harvesting are passed on to upland communities. Many people living along the forest frontier want illegal logging operations to halt.

Left page: Robert Aglugub assesses the damage of a flash flood in San Mariano (van der Ploeg 2003)

Wood carver in Ilagan (van Weerd 2006)

Alternative livelihood projects cannot by themselves counter illegal logging activities. Further investments to enhance the capacity of the Department of Environment and Natural Resources are also unlikely to curb illegal logging activities. The only way to halt illegal logging operations is by confiscating chainsaws and timber, by prosecuting loggers, traders and corrupt government officials, and by forcing the furniture industry to shift to timber from tree plantations. These measures are often portrayed as 'anti-poor.' But in fact they are a precondition to alleviate poverty in the northern Sierra Madre.

The past two decades offer gloom as well as a ground for optimism for sustainable forest management in the North Luzon. Corporate logging and its associated malpractices devastated the forests of the Sierra Madre. Civil society activism and democratic reforms led to the cancellation of most concessions. But the logging entrepreneurs in Cagayan Valley continued their operations underground. Without genuine political change illegal logging will continue to cause irreplaceable environmental damage, and take away resources that are fundamental to the health and well-being of the rural poor. More and more people in the Cagayan Valley are realizing that their well-being depends on the forest of the Sierra Madre. The creation of the Isabela anti-illegal logging task force by the provincial government of Isabela, the police, army and civil society groups in July 2008 is a promising development. Within 8 months the task-force confiscated, despite resistance of local government officials and forestry staff and death threats from the logging syndicates, 850,000 board feet of lumber along Abuan River. It proves that illegal logging can be effectively halted by committed people on key positions in government. After twenty years the struggle to save Luzon's last forest frontier is far from over.

Student reports*: de Frel et al. 1990; Kusters 1991; Veth 1992; Simons 1992; Buizer 1994; Mastenbroek et al. 1994; van der Werf 1994; Perez 1995; Bakker 1995; Balde 1995; Chrispijn 1995; Huijbregts 1996; van Zorge 1996; Geelkerken 1997; Huigen 1997; Jongman 1997; Labuguen 1998; Prins 1999; Gilsing 2001; Leemoon 2002; Siriban 2006; Aggabao 2006; Nagtegaal 2007; Stoel 2007; van der Ploeg, Persoon & Masipiqueña 2007; van der Zanden 2008.*

Publications*: de Groot & Kamminga 1995; van den Top 1996; van den Top 1998; van den Top & Persoon 2000; Wiersum & Persoon 2000; Persoon & van der Ploeg 2003; van den Top 2003; Masipiqueña et al. 2008.*

Children playing with a self-made logging truck (van der Ploeg 2007)

Left page: The steep slopes of Sierra Madre are vulnerable to land slides (Persoon 1991)

7

REFORESTATION FOR A BETTER FUTURE

Andres Masipiqueña, Jan van der Ploeg and Gerard Persoon

Introduction

The Philippines lost most of its tropical forest cover in the 20th century. It is estimated that around 7 million hectares of the country remains forested. The largest contiguous natural forest lies along the Sierra Madre Mountain Range covering several provinces in Luzon.

Among the main causes of the country's deforestation are population growth, forest land conversion, logging and forest fires. To mitigate the rapid loss of forest and increase forest cover the government initiated several measures, among which a massive reforestation program in the entire archipelago.

The Philippine government has been reforesting the open and denuded forest lands, often covered with cogon grass (*Imperata cylindrica*) for more than ninety years. The earliest reforestation efforts were made in the province of Cebu. However Cebu remains one of the most degraded provinces in the country. Despite massive reforestation efforts of different stakeholders, the reforestation rate (64,000 hectare per year over the last three decades) does not match the average deforestation rate (more than 260,000 hectare per year). Moreover, of all these trees planted, only 10 percent will reach timber size in due time.

Mahogany (Swietenia macrophylla) (van der Ploeg 2005)

Left page: Reforestation in Nueva Vizcaya (Persoon 1998)

Reforesting our future

Motivations behind reforestation efforts have varied widely. They range from restoration of natural habitats relevant for forest-based biodiversity and watershed protection to control erosion near hydropower reservoirs, to straight forward production of timber for the construction of houses or the furniture industry. Projects can also be motivated as an additional source of livelihood for poor communities. Very often reforestation projects make an appeal to the environmental services that forests can provide in creating a better future for 'our children.' This appeal is also meant to increase a sense of responsibility for the projects among communities living nearby. The intention behind reforestation project has of course big impacts on the choice of the location of the project, the size of the area to be replanted, the selection of preferred tree species, and the projected duration of the project. The aim of the project also determines whether or not trees can be harvested in due time.

Reforestation initiatives

The Philippine government has been spearheading reforestation activities through the Department of Environment and Natural Resources. Forest rehabilitation efforts in the Philippines can be traced back to the reforestation project done by students of the University of the Philippines at the Los Baños campus in 1910 in Mount Makiling. As early as in 1916, a reforestation project was established in Cebu and later expanded to other parts of the country (Pampanga, Ilocos, Zambales, Benguet and Bukidnon).

In 1960, the Reforestation Administration Office was created with a mandate to balance deforestation with reforestation. Using regular funds from the Forestry Department reforestation activities were implemented in which local people were hired as contract laborers. The 1970s saw the birth of various socialized forestry programs. Several programs were implemented nation-wide; for example the Forestry Occupancy Management in 1971, the Family Approach to Reforestation in 1971, the Communal Tree Farm in 1974, and the Integrated Social Forestry Program in 1982.

To expand societal participation in reforestation activities, the government implemented the Program for Forest Ecosystem and Management in 1976. Every Filipino citizen (older than ten), was required to plant one tree a month for five consecutive years. Later on the government tried several other reforestation strategies involving families, communities, people's organizations, non-government organizations and corporations. Funds and other technical services were provided by the government.

Those who exploited the vast timber lands in the country were also obliged to participate in the restoration of open public land areas. Timber Licensee Agreement holders were obliged to reforest one hectare of open and denuded areas for every hectare of natural forest logged. To guarantee compliance, the logging corporations had to deposit 10 peso per hectare of their concession.

Large scale reforestation projects were started in the late 1980s. Many projects suffered from insecurities: Who owns the trees? Whose land is reforested? Who will harvest the timber? Whose future is at stake? (Persoon 1989 - 2006)


DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
R-02
CONTRACT REFO. PROJECT
LOCATION ..... FALLAS, BAMBANG, NVA. VIZCAYA
AREA ..... 20.0 HAS.
DATE ESTABLISHED .....
PROJECT COST ..... P 100,000.00
SOURCE OF FUND ..... O.E.C.F.
NO. OF FAMILIES/COMMUNITY ..... 1 COMMUNITY
TYPE OF CONTRACT ..... COMMUNITY BASED
NAME OF CONTRACTOR ..... BRGY. CAPT. LUIS BAGUIWAN
1.5 KMS.


SPIRIT WOOD CORP.
Growing Tomorrow's Future...TODAY!
1914
FLORENCIO MARZAN
PRESIDENT


FS ACOSTA
PAPER TREE PLANTATION
UNDER SUPERVISION OF DENR
RESTRICTED AREA
NO TRESPASSING


ONE TREE CAN MAKE 3,000,000 MATCHES
ONE MATCH CAN BURN 3,000,000 TREES
LET US PROTECT OUR ENVIRONMENT;
PREVENT FOREST & GRASSLAND FIRES.
A message from:
TUMAUINI LODGE Nº 251
TUM. LOCAL GOVT. UNIT, DENR
TUMAUINI PNP


COMMUNITY FORESTRY PROGRAM


TREES
PROTECT
THE
ENVIRONMENT
KATUDON


REPUBLIC OF THE PHILIPPINES
NATURAL RESOURCES
FOREST MANAGEMENT BUREAU
SALINAS REFORESTATION PROJECT
SALINAS
90 M. AHEAD


Department of Environment and Natural Resources
CENRO Ilagan, Isabela
CARBON-SINK PLANTATION
Location: SAN MANUEL, NAGUILIAN ISABELA

The National Forestation Program

The largest reforestation program of the Philippines (in terms of coverage and public participation) was launched during the Aquino administration, with funding from the government, the private sector and foreign donors. Under this program, contract reforestation replaced the traditional methods. The program aimed to establish 600,000 hectare of forest plantation by 1992 and to reforest 1.4 million hectare of degraded forest areas by the year 2000. In order words 100,000 hectare of open lands had to be reforested every single year.

In 1988, the government was granted a loan of 240 million US$ from the Asian Development Bank and 120 million US$ from Japan's Overseas Economic Cooperation Fund under the Forestry Sector Program. This was the first phase of the government's efforts to restore the country's forest cover to ensure the adequate supply of industrial timber and fuel wood.

Hundreds of non-government organizations were formed to officially participate in the contract reforestation projects. Different contracting schemes were applied: individual, family, corporate, and community reforestation contracts were awarded across the country in the late 1980s and the early 1990s. The usual duration of a contract was three years, after which the project had to be turned over to the Department of Environment and Natural Resources. At present, most of these non-government organizations have ceased to operate as the Department of Environment and Natural Resources stopped awarding reforestation contracts.

Government agencies also participated in the program. The National Irrigation Administration, for example, acted as a reforestation contractor of degraded watersheds under their care. Since the agency is not capable of doing large-scale reforestation activities, most of the reforestation activities were subcontracted to families and communities living near or inside these watersheds.

In 1993 the Asian Development Bank and the Overseas Economic Cooperation Fund granted 175 million US$ for the second phase of the project. The Philippine government provided counterpart funding of 50 million US$. This package was intended mainly for the implementation of the community-based forestry projects targeting 120,000 hectare.

Contract reforestation

Contract reforestation is a strategy to rehabilitate open forest lands by tapping the services of families, communities, non-government organizations, local government units and private corporations in establishing, developing, maintaining and protecting forest plantations. This scheme was revitalized through the National Forestation Program. The Department of Environment and Natural Resources devoted much attention to the program.

The contract reforestation programme was expected to: (1) promote forest conservation, (2) increase public awareness of the values of forest resources, and (3) foster the growth of dynamic private sector participation in the reforestation industry.

Contract reforestation is based on the capacity of the contractors. There are three distinct approaches: (1) the family-approach involves families residing near or within the reforestation project areas; (2) the community-approach taps associations, cooperatives, foundations or religious organizations acting for or in behalf of residents of a community located in or adjacent to reforestation sites; and (3) the corporate approach involves non-government organizations, government-owned and controlled corporations, local government units and other legally constituted entities.

Left page: Free roaming cows are a threat to seedlings (Persoon 2004)

Distributing seedlings from a nursery (Persoon 1989)

Reforesting the grasslands in Nueva Vizcaya (Persoon 1998)

Reforestation in the Cagayan Valley

Some of the oldest and largest reforestation projects in the Philippines are found in the Cagayan Valley, and have been the focus of field research of students of the Cagayan Valley Programme on Environment and Development. As early as in 1940s at least five big reforestation projects were established in the provinces of Cagayan (2), Isabela (2), and Nueva Vizcaya (1). Each project measured more than 3,000 hectare. These projects have been successful, except the Liwanag reforestation project in Isabela.

The Liwanag reforestation site in Tumauini has recently been converted into an agricultural area. This grassland was successfully turned into a forested area with pine, teak, ipil-ipil and yemane trees in the 1970s and 1980s. In the late 1990s, however, the area was clear cut when the Department of Environment and Natural Resources failed to control the influx of migrants. Conflicts erupted between the government and the people residing in the project area: affected families claimed not to have been consulted prior to the project's implementation and to have lost their lands without just compensation. Another problem was that the salaries of contract laborers were in many cases not paid. Fire destroyed the Liwanag plantation. It remains unclear whether the fire was intentionally lit or whether it was an accident. In some reforestation projects in the Philippines unsatisfied laborers ignited fires. In other case the project management burned the area as a way to sustain the budget allocation from the central office. In other cases accidental fires were caused by cattle herders who burning range lands to have fresh re-growth of grass during the dry season in adjacent areas. Or fires are accidentally caused by people who cook food and forget to put the fire off after eating.

Reforestation projects after the 1980s resulted mainly in failures in Region 02. Millions of peso were spent but only a handful of trees can be seen. Yet donors continue to finance reforestation activities. In the late 1990s, USAID funded a community driven research and development project to save the existing natural forest and rehabilitate degraded forest lands. However, after the first phase of its implementation, the project failed to secure funds for its continuation.

Fire destroying a tree plantation in Antagan (Persoon 1990)

In 2008, Japan's Toyota Motors Corporation donated 3 million US$ for the reforestation of 3,500 hectare of denuded areas in Peñablanca in Cagayan Province. The Japan International Cooperation Agency financed a 1.5 billion peso reforestation project in the province of Nueva Vizcaya. These initiatives are acknowledgements that the region's watershed areas are in a critical stage and need immediate protection. These watershed areas provide water requirements to generate hydropower and to irrigation systems to sustain crop production, in particular rice fields.

Problems with reforestation

Despite the efforts from the various stakeholders in forest land rehabilitation and lavish funding from national and international institutions, the result can not be called a success. This is, among others, indicated by the dismal survival rate of seedlings in plantations. Sites where forest cover was actually restored are difficult to find. A number of specific reasons can be identified for this limited amount of success.

Unavoidable factors: there are plantation failures that could not have been avoided. In some case plantations burned because of abnormal weather patterns, for example a lack of rainfall. Water needs of any plant are critical during the initial growing periods. There are however certain species that can adapt well to extreme conditions.

Use of suitable species: the performance of reforestation projects may be unsatisfactory because the tree species that were planted were not suitable to the climatic and soil conditions of the plantation site. Such failure can be avoided by establishing trials on small plots before large-scale plantations are established. In Luzon the most common tree species in reforestation projects are narra (*Pterocarpus indicus*), mahogany (*Swietenia macrophylla*) and yemane (*Gmelina arborea*). Other species also often used are: *Acacia mangium*, *Acacia auriculiformis*, Eucalyptus species, *Albizia falcataria* and *Tectona grandis*.

Narra (Pterocarpus indicus) plantation in San Mariano (van Weerd 2005)

Use of appropriate techniques: the survival rate of seedlings is also affected by how the planting stock is produced and handled. Solid knowledge of planting stock type and use of fertilizers is basic for all replanting activities. Nursery and plantation operations should be on time and carried out efficiently, especially because rainfall is seasonal. It is necessary to have a realistic management plan of all activities for the whole project cycle.

Injuries to the plantation after planting: fire and grazing by free roaming cattle are the most common hazards for forest plantations. Firebreaks should be constructed to protect the plantation from outside fires, coupled with fire patrols during dry season. Fires are usually caused by people living near the site either through carelessness or deliberate ignition. Grazing animals such as goats can cause great damage to plantation. Cows and buffalos can also cause damage by trampling on the young seedlings. The only way to completely avoid damage from grazing animals is to fence the entire area but this requires huge budgets and regular checking of the fence. The government is usually not prepared to pay for such kind of expenses.

Key issues of plantation establishment

During the implementation of the national forestation program in the late 1980s and 1990s scientific knowledge on techniques for plantation establishment, species-area compatibility and other necessary ingredients for a successful plantation were very limited. Species trials in the different physical and climatic conditions of the area (which cost money and take time to undertake) could have avoided costly mistakes.

At the onset of the massive reforestation period of the country, there were only few non-government organizations, associations and corporations with a good track record in reforestation activities. Since more groups were needed at that time to handle projects, non-government organizations mushroomed, which lacked experience. Activities were rushed to beat deadlines for submission shortcutting the normal time to produce well designed and thought-out plans.

Ideally, well-trained foresters should keep a close eye on all plantation operations that start with the care for seedlings at the nursery and protection of the young trees against fire and other hazards at the plantation sites, to the thinning and final harvesting of the mature trees. In reality however this supervision task was often delegated to foremen who often did not have the required supervisory qualities and authority. In some cases this was done by contractors to minimize operational cost. There was no provision in the contract to employ qualified and experienced foresters to directly manage the plantation.

Delays in releasing the funds often affected smooth field operations. Finance officers usually gave more attention to bureaucratic procedures than to the timing of the plantation operations. Furthermore, the overall budget for plantations did not provide sufficient funds for efficient protection of the project against all kinds of hazards. Allocated budgets for projects were also based on average costs: there were no provisions for projects at more distant locations or on more difficult sites. These circumstances resulted in poor implementation of reforestation projects.

Contracted reforestation activities were target-based arrangements. Staff of the Department of Environment and Natural Resources had to meet their targets. Criticism could only be avoided if the area planted did not fall short of these targets. But targets were often limited to short-term goals: survival rates often declined soon after the projects had been turned over at the end of the contract to the Department of Environment and Natural Resources.

In recent years there has been a major shift in reforestation efforts. Private timber plantations have become more popular and do relatively well. The planted areas are better protected and survival rates are higher. Fast growing species may yield cash income after a relatively short number of years. Aims like restoration of forest cover and recreation of suitable habitats for all kinds of species of plants and animals do not play a dominant role in these private reforestation efforts anymore.

Student reports*: Hoekstra 1992; de Frel 1993; Chrispijn 1996; Noordhuizen 1996; Gumpal 2003; Strijk 2003; Betay 2008.*

Publications*: Masipiqueña 1995; Pasicolan 1996; Masipiqueña, Persoon & Snelder 2000; Aquino 2005; Snelder, Klein & Schuren 2007; Villamor et al. 2008; Snelder & Lasco 2008; Masipiqueña, Masipiqueña & de Groot 2008; Schuren & Snelder 2008; Mangabat, Snelder & de Groot in press.*

Left page: Transporting gmelina timber (Persoon 2007)

Community-based reforestation site in San Mariano (van der Ploeg 2007)

8

VALUE FROM THE FOREST

Gerard Persoon, Merlijn van Weerd, Dante Aquino and Tessa Minter

Introduction

Since the late 1980s, in the heat of debates on forest policies and deforestation, a renewed interest was generated in non-timber forest products, sometimes also labeled as minor forest products. Even though before World War II, foresters and economists had already realized that forests produce much more than just timber, more sophisticated research on the diversity of products and their potential contribution to local economies raised great interest. Harvesting of non-timber forest products was also proposed as an alternative to large scale commercial logging. The sustained production of non-timber forest products over longer periods of time would generate more income than clear-cut logging could yield. And on top of that the forest cover would be maintained thereby reducing erosion and also regulating hydrological cycles throughout the year.

Non-timber forest products are usually defined as 'all biological materials other than timber which are extracted from natural forests for human use.' They include a wide variety of products ranging from food products, medicinal plants, resins, ornamental plants, wildlife products as well as live animals, fuel wood and raw materials like rattan and bamboo. The general idea is that the harvesting is done from wild sources but in a couple of cases some kind of domestication is also taking place to stimulate the production of such products.

Left page: Selling baskets and other objects made out of rattan and bamboo (Persoon 2001)

The harvesting of the products is both done for subsistence purposes as well as for the generation of cash income by selling it to outside traders. In the Sierra Madre numerous products have been used by forest dwelling communities such as the Agta, the Bugkalot, and the Kalinga for long periods, but also migrants quickly understood the potential value of these non-timber forest products. They too started to collect, gather and hunt the plants and animals from the forest, both for their own use as well as to generate cash income. Competition with the original forest dwellers was a logical consequence of this development.

Estaniel Prado with rattan fruits (van der Ploeg 2008)

The original forest dwelling communities and the migrants use forest fruits, rattan, various kinds of bushmeat, and medicinal plants for subsistence purposes. The most important commercial non-timber forest products are rattan, bamboo, nipa leaves, resins, honey and bushmeat. They find their way to external markets through intermediate traders and points of collection. Numerous household utensils and agricultural instruments are also made of forest products.

In the Philippines there has been a substantial interest in these products from various research institutes in the field of forestry as well as from the Department of Environment and Natural Resources. Harvesting these products has also been made subject to a system of permits as soon as they are of more than just subsistence value.

Over the past twenty years numerous students have studied in the framework of the Cagayan Valley Programme on Environment and Development the modes of exploitation of particular products, their methods of harvesting, the trade networks and the potential contribution of non-timber forest products to sustainable forest management. Here we would like to give a few examples of this research. This short overview will pay attention to rattan, nipa, bamboo, bushmeat, bats, and bird nets.

Rattan

Rattan, the common name of various climbing palm species, has been recognized as an important product in the Philippines since the 1980s. Worldwide the rattan trade is worth about 225 billion peso (4.5 billion US$) annually. Its use has given rise to a flourishing furniture industry that developed so rapidly that at some stage the demand could not be met anymore by the domestic supply. To prosper, rattan needs shade provided by a canopy cover and tall trees to grow onto. The rapid deforestation in general and the overexploitation of the rattan in particular, forced the furniture industry to start importing rattan canes from abroad and in particular from Indonesia.

Pulling rattan canes in Blos River (van Weerd 2007)

Rattan collection site (Persoon 1996)

The Department of Environment and Natural Resources has claimed authority over the harvesting of rattan by dividing the forests into production blocks. People could apply for licenses for these blocks. In the past these blocks could be located inside logging concessions. Because of the reduction in the overall forest cover and the overharvesting of rattan in particular, the value of the trade in Luzon has dramatically been diminished over the years. Unfortunately the cultivation of rattan has never been taken up by the government nor the private sector or the forest dwelling communities in the way this has happened in Indonesia. As a result rattan poles now have to be imported from elsewhere as the domestic supply is not sufficient to meet the demand of the furniture makers. Rattan continues to be used by local communities for making simple furniture, hunting and fishing instruments and also in the construction of houses. Within the Northern Sierra Madre Natural Park in the province of Isabela, the Protected Area Management Board allowed the operation of two rattan concession areas (in the municipalities of Maconacon and Palanan) both by Agta groups as an alternative source of income for this indigenous people. However, the technical and financial requirements of the concession are beyond the capability of the concessionaires so they rely on outsiders for the preparation and the operation of their management plans.

Nipa

Nipa (*Nypa fruticans*) is a mangrove species that grows in soft mud along tidal creeks. Mangrove forests along the Pacific coast of the Sierra Madre have extensive nipa stands. The long, feathery leaves of the nipa palm are used by as roof material for thatched houses. The leaves are also used in many types of basketry. A sweet sap can be tapped from the flower cluster to produce vinegar and a popular alcoholic beverage called tuba. Within the Northern Sierra Madre Natural Park the harvesting of nipa leaves by local communities is regulated under a co-management agreement with park authorities.

Cleaning and splitting of canes in San Mariano (Persoon 1996)

Weaving a rattan hammock (Persoon 1996)

Bamboo

Bamboo grows extensively in the forests of the Sierra Madre. Various species of bamboo can also be found in the forest patches in the grasslands and close to settlements where its cultivation is being promoted. It is often planted along the banks of rivers and creeks. Bamboo is a widely used product. It is used for the construction of houses and field huts. In pioneer settlements along the forest fringe house frames are usually made of bamboo. Walls and floors can also be made of bamboo. It is only at a later stage, when settlements become more permanent or when people avail of more money or chainsaws that wooden frames are constructed. In households bamboo is often used as containers. Musical instruments can also be made of this product. Young bamboo shoots can be eaten as a vegetable.

With the decreased availability of high quality wood for furniture making, efforts have recently been undertaken to make higher quality furniture from bamboo. Tools used in agricultural activities often contain parts made of bamboo. It is highly valued for its durability, strength and relative limited weight compared to solid wood for instance. It is also used for the construction of rafts to float down agricultural crops like bananas to down stream markets or to landing sites where the products can be put on vehicles.

Extensive bamboo rafts are also taken to urban areas where they are sold for house construction and scaffolding. Other uses of bamboo poles are for irrigation systems: taking water from wells and creeks to the agricultural fields.

There now exists a flourishing bamboo trade within Cagayan Valley selling pre-fabricated huts (*bahay kubo*) made completely of bamboo, either *bayog* (Dendrocalamus spp) or *kawayan* (Bambusa spp) with cogon (*Imperata cylindrica*) roofings. With some prominent shops along the national highway, a finished product may be delivered to the buyer's place. The more widely-used and much-cheaper *buho* (Schizostachium spp) is likewise readily available in seven meter culms sizes in various outlets in many towns. Costing 20 to 25 peso, this much cheaper bamboo is commonly used for temporary or farm houses either singly or in combination with other construction materials. Aside from these uses, the different species and varieties of bamboo are used as live ornamental plants for outdoor landscaping and indoor decoration materials as well as dry architectural decorative artifacts.

One of the interesting aspects of bamboo compared to other non-timber forest products is that is grows rather quickly. Compared to other products the risk of overharvesting is limited in the case of bamboo.

Bushmeat

Hunting of wild animals has been a dominant activity for many of the original forest dwelling communities like the Agta, the Kalinga and the Bugkalot. Animals most often caught are the Philippine Warty Pig (*Sus philippensis*) and Philippine Deer (*Rusa marianna*). Long-tailed Macaque (*Macaca fascicularis*), Gray's Monitor Lizard (*Varanus olivaceus*), Water Monitor Lizard (*Varanus salvator*) and Python (*Python reticulatus*) are also valued but less often obtained. Several species of birds, such as the Red Junglefowl (*Gallus gallus*), rails and various pigeon and dove species are regularly caught but generate less meat. Rufous Hornbill (*Buceros hydrocorax*) is caught for its casque, which is dried and used mainly by Ifugao to decorate head ornaments. Popular wetland game birds are ducks and egrets. During the Palearctic winter many migratory ducks and egrets are sold along the highway and on the local markets. The Sarus Crane (*Grus antigone*) which used to be an abundant species in the Cagayan Valley at the turn of the 19th century was hunted to extinction in the Philippines as was the Spot-billed Pelican (*Pelecanus philippensis*). Parrots are caught alive and locally kept and sold as pets. The small parrots Guaiabero (*Bolbopsitaccus lunulatus*) and Colasisi (*Loriculus philippensis*) are the most popular pets and can be found in small cages in any village of the Sierra Madre. South Asian Box Turtle (*Cuora amboinensis*) and Cantor's Giant Softshell Turtle (*Pelochelys cantorii*) are also popular pet species. Hunting, catching and trading of any wild animal is officially illegal since 2004 when the Wildlife Act came into force. The interregional trade of live animals with Manila seems to have largely stopped after several transports of pet animals were confiscated but locally the law is not being enforced.

Monkey skulls hanging from a roof in sitio Coop, Ilagan (van Weerd 2007)

Left page (from left to right):
Children playing on bamboo rafts near Tuguegarao (Persoon 2001)
Bamboo hut for sale along the highway in Santiago (Aquino 2008)

The weapons that are used in hunting are bows and arrows, locally made shotguns and snares to trap the animals. Usually people hunt by themselves or in small groups. The use of dogs is quite common on hunting expeditions. Another weapon that has gained in popularity is the so-called pig-bomb even though some refuse to use this destructive method. The bombs are made of powder from matches and iron scrap. The bomb is usually hidden in some kind of bait and placed along agricultural fields where wild pigs come to forage. When the pig takes the bait the bomb explodes. Many migrants and increasingly Agta as well use snare traps to catch wild pigs and deer. Some hunters place more than three hundred traps and can only check each trap once a week. This hunting method is not very sustainable as a large proportion of the catch is rotten before it is found by the hunter.

Bushmeat is not only an important source of protein, but is also sold to outsiders. In recent years the selling of bushmeat to outsiders has become more important as a result of the increased interaction between the forest dwellers and outsiders. The hunting intensity diminishes the damage done by animals, wild pigs in particular, to agricultural fields. Pigs can cause serious damage to crops like sweet potatoes and corn by uprooting the plants.

In the literature it has been stated that ‘wildlife can live with logging’ in the sense that particular large terrestrial mammals such as pigs and deer can survive rather well in logged-over forest. The dense vegetation that starts to grow once gaps in the canopy have been created by the cutting of big trees, provides ample food for these mammals. However the continuous disturbance by illegal logging in combination with the high intensity of hunting activities, and the use of less sustainable methods such as snare traps, has led to reduced wildlife densities in the Sierra Madre forests. The forest cover has dramatically declined and animals have also become more scared and as a result become harder to hunt. As a consequence forest dwellers and migrant hunters increasingly use shotguns and other high-powered firearms and snare traps in a spiral of increasing hunting pressure.

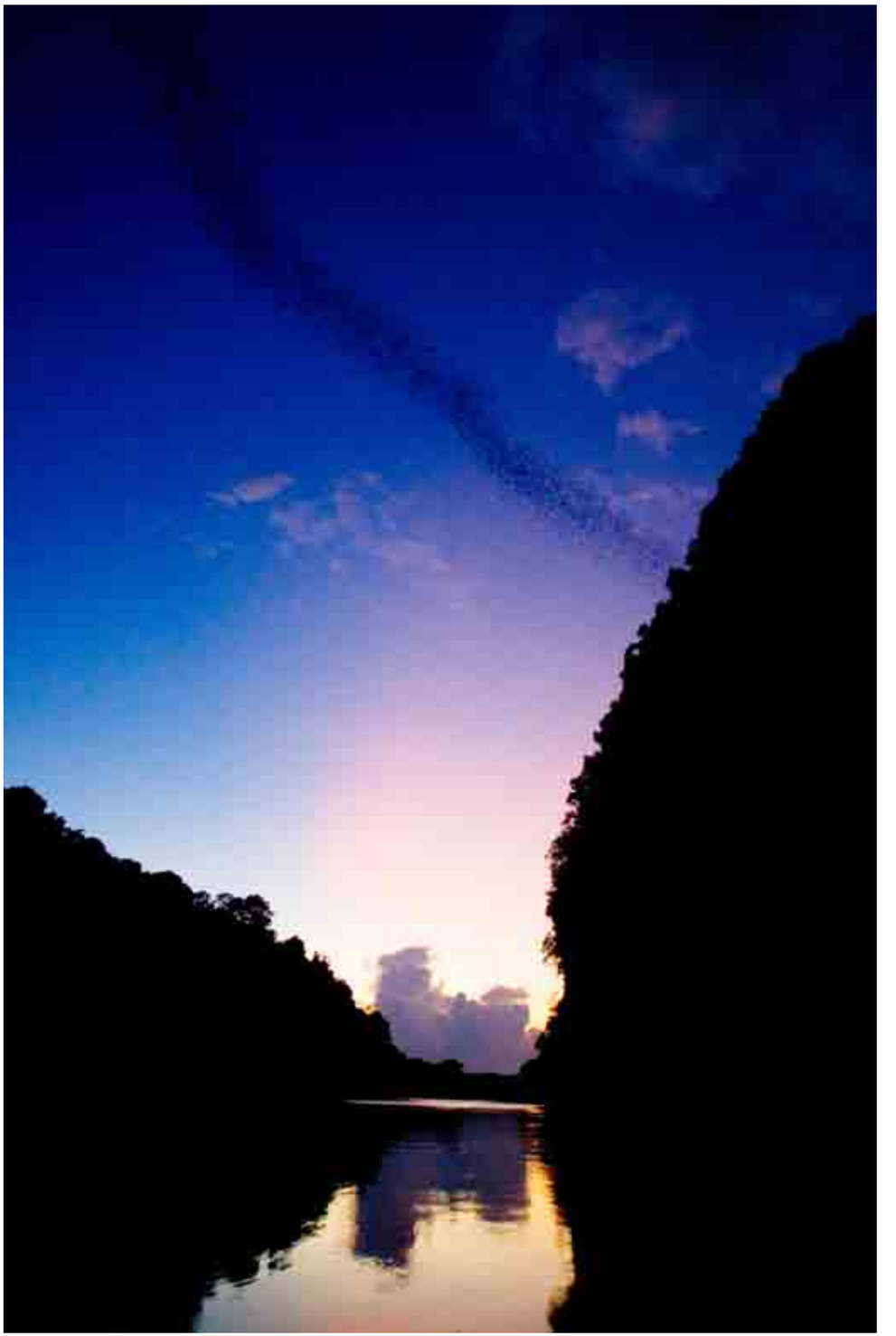
Showing forest fruits in Divilacan (van der Ploeg 2005)

Bats

A relatively small but interesting non-timber forest product is the manure of bats, also called guano. The droppings of bats are a very good fertilizer which can be used in agriculture. It is often mixed with other types of manure such as cow dung and compost made of sawdust or banana leaves. Guano is considered to be a good fertilizer because of its specific characteristics. It does not only fertilize the soil, but it also works as a soil cleaner and as a fungicide when sprayed on leaves. Some bats, in particular the large flying foxes, are also hunted for their meat. Being a valuable product with commercial value it comes as no surprise that the collecting of guano is subject to claims of ownership. Guano is collected from the numerous caves in the Sierra Madre Mountains.

Local communities often claim ownership over such caves in an effort to avoid outside people from collecting this valuable material. Its collection from the lime stone caves such as those in Callao has been controversial because of the disturbance to the bats within the protected landscape.

Various bat species have suffered from deforestation. In combination with hunting and disturbance of the caves for guano collection, this forms a serious threat for bats in the Sierra Madre. Bats fulfill an important function in the ecosystem and are also important for agriculture because of the large amounts of harmful insects on which they forage (insect bats) and their role as pollinators (fruit bats).



Millions of bats flying out of the Callao Caves at sunset (van Weerd 2008)

Bird nests

Swiftlets build their nests in the extensive limestone caves of the Sierra Madre Mountains. Collecting these nests has within the past decade become a rewarding activity as they yield high prices. The nests are taken from the caves, carefully cleaned and then sold to specialized traders. Swiftlet nests are in demand for the Chinese markets in Taiwan, China, Hongkong, Singapore and by ethnic Chinese in the Philippines who greatly value the bird's nest soup made from the saliva that the swiftlets use to build their nests. In particular the nests of the Pygmy Swiftlet (*Collocalia troglodytes*) and the Island Swiftlet (*Collocalia vanikorensis*) are considered valuable. Neither of the two species is among the various edible-nest species of which the nests that are commonly collected in Southeast Asia but that do not occur on Luzon. The swiftlet nests collected in the Sierra Madre need to be thoroughly cleaned from vegetation to yield the high value saliva used for the soup.

Because of the nests' high value, collectors are prepared to walk several days in order to reach caves with harvestable nests, sometimes spending up to a week in nest collection. Harvesting of these nests is a risky, specialized job, as it requires entering humid and slippery caves. There is fierce competition over this precious resource. Caves are often claimed by particular groups of collectors. There are no regulations as to the number of nests that may be harvested per person, per cave or per period. A cave is stripped off nests completely before collectors move to the next. Nests of any size are collected year-through. In the absence of a management system, the sustainability of this form of non-timber forest product extraction is in question.

Honey

Wild honey is another valuable product gathered in the forest of the Sierra Madre. Collectors locate nests in trees and use smoke to keep the bees at bay when collecting the nest. Wild honey is sold at local markets throughout the Sierra Madre.

The Cariño family collecting honey in Maconacon:
Chasing away the bees with smoke;
Climbing up the tree;
Taking the honey from the bee nest (Minter 2006)

Conclusion

Non-timber forest products are important for forest communities. Even though the discussion about the sustainable use of non-timber forest products as an alternative for commercial logging has yielded an impressive amount of ecological and socioeconomic knowledge about these products, the use of this knowledge within policy circles has remained relatively limited. This has not only been the case in the Philippines but also elsewhere. This can be explained by the fact that the income generated from non-timber forest products is highly dispersed among local communities and a whole range of traders. Income generation also takes place over longer periods of time. In contrast most of the income generated from logging ends up in the hands of relatively few people and it is generated much faster than that from the non-timber forest products. There is a sense of disappointment regarding the limited realization of the potential of sustainable harvesting of non-timber forest products as an alternative for commercial logging.

Student reports*: Polet 1991; Wakker 1991; Zeegers 1992; Aquino 1993; Martin 1994; Mangabat 1995; Goverse 1998; Kusters 1999; van Alphen 1999; Mangabat, Taggueg, Ong & Guingab 1999; Pol 2002; Slieker 2002; Bautista 2004; Bolier 2004; Giebels 2005; van der Lans 2005; Cabaccan 2008; Cabauatan-Guzman 2008; Taguinod 2008.*

Publications*: Persoon 1999; van Weerd & van der Ploeg 2004; Persoon & de longh 2004; Defo, Persoon & Aquino 2007.*

Pigeon hunter with White-eared Brown-Dove (van Weerd 2007)

9

UPLAND FARMING IN PERSPECTIVE

Wouter de Groot, Marino Romero, Cecilia Mangabat, Marieke Hobbes, Denyse Snelder, Willie Saliling and Karl Villegas

Introduction

In this contribution we will explore land use change in the uplands of the Sierra Madre, based on research of the Cagayan Valley Programme on Environment and Development in recent years. It will focus especially on investments of farmers in more sustainable land use.

Research ends up in international journals or books. An example is the new volume *Sustainable land management in the tropics; explaining the miracle* edited by Kees Burger and Fred Zaal published in 2009 that contains material from Kenya, Cameroon, Benin and the Philippines. The miracle from the subtitle is the history of Machakos district in Kenya, which is an upland area relatively close to Nairobi, the capital of Kenya. Some 60 years ago, Machakos district was generally regarded as a disaster area in the making. Very poor farmers were eking out a living from denuded hills, and soil erosion was washing away ever more land. In the 1990s however, three times more people were living in Machakos, with incomes three times higher than before on average, while terraces and trees were covering every hill, and soil erosion had virtually been stopped. How has this miracle of sustainability come about? That is what the book tries to explain, and that is why researchers, also in the Philippines, went out to find why (sometimes) upland farmers invest in terraces and trees, instead of doing nothing, logging the forest, or migrating to town when it all has been lost in the end.

Left page: Clearing a field in steep terrain (Persoon 1996)

Many factors turned out to have played a role in Machakos. One was culture. People feel attached to Machakos as their homeland, and much money earned outside the district flowed back to the hills in the form of remittances and of pensioners who went back to their villages and started a farm there. Moreover, money sent home by men in the cities was received by their wives in the district, and Machakos women have a strong tradition of knowing exactly what to do: for instance building terraces or hiring men to do it for them.

Slash-and-burn farming along the forest frontier (Persoon 1996)

Another factor was knowledge. Government and non-governmental organizations programs had made the upland farmers quite aware of the erosion problem and had helped much to develop the best terracing technology, which, by the way, was different from what the experts from the government first thought. The farmers had forced the experts to rethink their terrace design and after a while, the farmers' way became the official way.

The factor that mattered most, however, was straightforward economics. The 1960s witnessed the biggest boom in terrace making, and it was also the period of biggest boom in the world coffee price. Everybody in Machakos wanted to grow coffee, and it so happened that rainfall in Machakos is such that coffee only does well on a terrace. Moreover in dry years, the people's staple (maize) does much better on terraces than on steep slopes. In other words, people made terraces for the money, not for some broad value such as sustainability. As the book concludes, sustainability was the by-product.

This finding will form the heart of the perspective on upland farming that we aim to develop in this essay. This implies that if we see, for instance, that Ifugao farmers protect the forest on the steep slopes above their terraces, we will not assume that they do this for sustainability or biodiversity protection. Rather, our first route of explanation will be that they do it for the money, that is, that they do it because in their perception the forest is essential for the water inflow on their terraces and for preventing landslides that would destroy the terraces.

Note that this does not imply that we assume that people are without long-term motivations or without broad values such as a desire to protect sustainability and biodiversity. Of course they do have these motivations and desires. The question rather is: how can these long-term motivations and broad values be acted out in real behavior? Our perspective will not be complete without answering this question.

Applying chemical fertilizer near Balete, Cabagan (Persoon 2007)

Right page: Contour farming (Persoon 2007)

Capacity, poverty, motivation

In order to act, people need not only the motivation to do so but also the capacity. Poverty is the reverse of capacity. One effect of poverty is that people can become too poor to act, meaning that they do not have the capacity to act anymore even if they would be willing (motivated). This is the well-known poverty trap.

If we are caught refraining from doing something good, we may expect some sort of frowning or even punishment if we say that we are not willing to do that good. If we can convince the other that we are in fact quite willing to do the good thing but lack the capacity, however ('we are too poor!'), we may expect some sort of reward (for example credit or capacity building). In other words, there is always a strong incentive to invoke the poverty trap. Governments do it when meeting the World Bank. Farmers do it when meeting the government or well-intending non-governmental organizations.

Would people in the Philippines uplands be that poor? Could it be that they spend all their available time to satisfy their basic needs and have to time left to invest in anything? There has been no systematic research into this issue, but circumstantial evidence suggests that many upland dwellers do have capacities to invest. In the drylands areas in Africa, for instance, farmers tend to be much poorer than in the Philippine uplands, and many of them nevertheless invest in the land if motivated. In the Philippine uplands, research of the Cagayan Valley Programme on Environment and Development into the cost and benefits of (slash-and-burn) land use of recent immigrants at the forest fringe has shown that this farming system runs at a systematic loss. Then, why would these farmers in fact do this land use at all? The answer is that they are investing. Their tree cutting and upland rice growing is only a first step on the way to establish a permanent, remunerative farm; a farm for which the forest has to be removed first. If these very poor immigrants have the capacity to invest, so will the other uplanders with a longer-established farm.

We cannot conclude now that each household in the uplands is sufficiently well-off to invest at all times. Some households may be burdened by sickness. Others may be locked in debt. Yet others may be hit hard by a natural disaster. And some time of the year, virtually all households will need all their energies to plant or harvest the crops. We do venture one general conclusion however: overall, upland households have the capacity to invest in sustainable land use if they would be motivated. Arguably, upland households are poor enough to need strong motivations. They cannot simply take a month to go to town and follow an agricultural course, or employ a contractor to construct terraces or plant trees for them. Yet, invest they can, and motivations rather than capacities are key. Below we will focus on the structure of these motivations.

Pioneer farmer in front of his bamboo house in the uplands in San Mariano (Persoon 2007)

‘We do it for the money and other short-term costs and benefits’

Explaining people’s behavior as if people do it only for the money (rational choice theory) is generally abhorred, and often for good reasons. We do not contend here that people do everything for the money only, however (see below), and more importantly, we focus here on aggregate choices concerning land use, which is something very different from individual choices concerning other things in life. Recent research of the responses of upland farmers to rising fertilizer prices has shown that famers make quite conscious calculations of costs in terms of cash, labor and yields in the face of changing market conditions. These calculations are then decisive for the choice between chemical and organic fertilizer, resulting in that rising cost of chemical fertilizer results in more use or organic fertilizer. Farmers say that chemical fertilizer is ‘good for the plants’ while organic fertilizer is ‘good for the soil’, but this superiority of organic fertilizer in terms of sustainability is not a motivational factor for that chemical fertilizer. In fact besides the price differential, the only other reason to apply more organic fertilizer is that it now comes in manageable bags and is more available at the traders’ shops, hence requiring less labor than before. There is hardly a better example of sustainability as a byproduct of short-term considerations.

Farmers calculate the benefits of various land uses (corn, vegetables, cattle raising, illegal logging) on the basis of expected prices and risks when the product is sold, if it is ever sold. Many institutional factors come into play here, especially market security with respect to tree crops. One example discussed in a recent study of the Cagayan Valley Programme on Environment and Development concerns the effect of the logging ban regulation on the attractiveness of tree planting. If such a policy does not differentiate between illegal species from the forest and legal species from plantations, implying that any plantation tree may be confiscated, why plant trees?

New high-yielding corn variety (Persoon 2007)

‘We do it for the money or for the children’

The prevalence of short-term considerations does not exclude investments. In Machakos, the benefits of coffee were so strong that farmers, in spite of their short time horizon, invested in planting the coffee bushes and making the terraces. But other stories are heard too in Machakos. Elderly but proud farmers may take the researcher round the farm and talk about its beauties and the big plans, but besides that mainly about their children who will inherit this really good and resilient place. Research of the Cagayan Valley Programme on Environment and Development has traced many investments of upland farmers in their land, for example in trees, terraces and irrigation systems. And here too, arguments are sometimes heard that refer to children as a vehicle that sometimes appears to lift farmers out of their normal short-term reasoning. People refer to this when discussing terraces, for instance. It is also heard when farmers explain their reasons to plant timber or firewood trees on the farm. They say that even though these trees do not bring in anything now and probably not much in the foreseeable future either, the trees may play an important role for their children in the more distant future, when the Sierra Madre forest, which is now available to be logged anytime when quick cash is needed, is no more there (sic).

Economists would tend to subsume this type of famers’ reasoning under their all-pervading rational choice model, for example proposing a lower discount rate for certain types of investments. Other theorists however propose a theory of different moral domains in human decision-making. One domain then is rational choice reasoning with its high discount rate (short-term focus), and another would be something like the for-the-children mode of reasoning, where no discount rate applies. The latter idea, we think, is closer to the truth.

What would be the relative strength of a for-the-children reasoning versus the short-term economics? Sometimes, it is very strong. Women make no cost-benefit analysis when feeding their child. It is something that you just do. Land-use decisions, however, are decisions of a much stronger economic character. Our research has shown, for instance, that direct profitability of crops dominates all other considerations for crop choice, except when the profitability comes close enough for other considerations to set in. In other words, though a for-the-children reasoning does appear in land use decisions, its force is relatively weak.

Right page: Shredding corn (van der Ploeg 2005)

Corn (van der Ploeg 2005)

‘We do it for the money, for the children and sometimes for the values too!’

Farmers hold values. Some of them we may call deep values because they refer to what it is to be a good person or a good farmer. Others we may call wide values because they refer to the wider world around the person.

Deep values exert a systematic influence on farming. One of the first internationally published papers of the Cagayan Valley Programme on Environment and Development was about Ifugao and Ilocano farmers in the uplands, who differ much in land use as well as self-images of what a good farmer and a good farm are.

When looking at their land, upland farmers do not only see an economic production unit. It is also their home and the basis for their community. There are clouds above it and animals in it. There is the great forest at the horizon, and many farmers know that their land functions as watershed for downstream communities. Farmers do have a positively loaded vision of nature. As a part of the Philippine crocodile conservation project of the Cagayan Valley Programme on Environment and Development, for instance, upland farmers were asked if crocodiles have their own ‘right to live.’ More than ninety percent of the people said they did. Moreover farmers in the municipality of San Mariano have come to see the crocodiles as fascinating animals, ugly and yet beautiful, even ‘something to be proud of.’ Obviously something totally different from what it would have been if crocodiles would be valued only from an economic point of view. The Philippine crocodile project is a remarkable exception in that it has succeeded to put people’s wider values into concrete action. Usually, the relationship between these values and actual behavior is only very weak. Hence the question that the next section starts out with.

‘We do it for the children’ (Persoon 2007)

Sustainability and biodiversity, the role of institutions

Sustainability and biodiversity are wide, general values that, as it turns out, are difficult to put into concrete action. They are just too general, it seems, too close to the common good, to compete with the short-term and nearby worries of daily life. This is not anything specific for upland farmers but a universal human phenomenon.

As the universal answer to this problem, we have institutions, especially governments. Let's take one example from the climate problem. In the Netherlands, people can subscribe to a programme called Trees for Travel. The programme assures that a tree is planted for every so many miles of air travel that you make, in order to compensate the CO_2 emissions of the flight. Most researchers at the Institute of Environmental Sciences have no subscription for their private travel, in spite of their dedication to sustainability. The institute as a whole used to have one for the researchers' business travel, illustrating that institutions are often more responsive to wide values than individuals are. The director scratched the institutional subscription during the recent budget cuts, however, illustrating the weakness of the response. Notably, however, probably all researchers would happily agree if the Dutch government would raise some tax on each air ticket and would do the planting for each traveler. We accept that governments put wide values into action, and even if we don't, governments still have the right to protect the common good and other wide values.

Back to upland farmers: we may conclude that there is no reason to worry about that they only very partially, on average, translate their own and society's sustainability and biodiversity values into action. It is universally human, it can be compensated by the universal government solution, and it is not likely to change much anyway. We should rather worry about the unwillingness (sometimes incapacity) of governments and bureaucracies to effectively take up their responsibilities. For the Philippine uplands, many studies of the Cagayan Valley Programme on Environment and Development have pointed at options to rectify this situation.

Student reports*: Doedens 1992; Numan 1992; Plugge 1992; Wedda 1992; Adsuara 1993; Graber 1994; Henkemans 1994; van Eldik 1994; Potma 1994; Bakker 1995; Balde 1995; Dirkx 1995; Peters 1995; van Veldhuizen 1995; Dros 1996; Terbijhe 1998; Zondag 1998; Polderman & de Pundert 1999; ten Berge 2000.*

Publications*: Doedens, Persoon & Wedda 1995; Henkemans, Persoon & Wiersum 2000; Hobbes & de Groot 2004; Hobbes 2005; Romero 2006; Hobbes & Kleijn 2007; Masipiquena, Masipiquena & de Groot 2008; Romero & de Groot 2008; de Groot & Romero 2009.*

A settlement at the forest edge: sitio Lumalug in San Mariano (van der Ploeg 2007)

10

TRANSITIONS TOWARDS SUSTAINABLE LAND USE

Denyse Snelder, Marino Romero, Susan Schuren, Cecilia Mangabat and Mercedes Masipiqueña

Introduction

Land-use intensification takes place in many parts of the Philippines where a large part of the steadily expanding population still depends on land and agriculture for their livelihood. The process of intensification tends to have a negative effect on the environment and hence sustainable alternatives are being sought. It is generally accepted that the integration of trees in agricultural systems (in the form of various agroforestry systems) on humid sloping land is a road to follow in order to enhance sustainability in the cultivation of marginal lands. Agroforestry is proposed as a sustainable upland farming alternative for sloping land in the Philippines. However, there exists a gap between the theoretical world of opportunities associated with agroforestry, and its actual status in practice. One explanation is the generalization in terms of the applicability of a given agroforestry practice; for example densely planted gmelina (*Gmelina arborea*) plantations in fire-prone grassland areas, with the introduction of similar practices in various parts of the country as the sole answer to most land-use constraints. Over the years more diverse and efficient systems well adapted to local conditions, for example naturally vegetated strips, have been promoted with the other previously widely applied systems being disqualified because of unsuitability at household or field level.

Left page: Carlito Preligana plants a jackfruit in the bufferzone of the Northern Sierra Madre Natural Park (van der Ploeg 2004)

There are multiple motivations of smallholders to integrate trees in their household economy, including household and market demands, market accessibility, secure marketing channels, technical knowledge about tree crop production and familiarity with a specific species. To better understand smallholders' reasoning for growing trees, it is crucial to question what contribution trees have to rural households and how trees are valued by smallholders in terms of income, conservation value, and other factors. Households differ in their perception of the role of trees in their farms and accord different values to different tree species.

Grasslands in Cabagan (van Weerd 2008)

Under conditions of declining natural tree resources, private tree management and integration pass through different stages. Where land use is extensive and tree cover still vast due to low population pressure, private tree management tends to be passive. Where land and natural tree resources become scarcer and land use intensifies, tree management takes on a more active role. Continuing along this line of land-use intensification and associated tree loss, local farmers devise new strategies to increase their tree resource base. Land use intensification is coupled with increasing sophistication of tree management strategies, with trees gaining in market value and starting to play a role as cash crop. For example, extensive grasslands considered infertile and unsuitable for cultivation in the past are increasingly being used for the production of annual and perennial crops through specifically designed tree-based strategies in Indonesia.

Various studies on land use transition and tree plantation have been conducted within the framework of the Cagayan Valley Programme on Environment and Development, and we will present an overview of some interesting findings of these studies below.

Organic farming at a demonstration farm in Gamu (Snelder 1998)

Homegarden in Cabagan (Snelder 2001)

Land use changes

The Cagayan Valley has been transformed from an area rich in dipterocarp forest in the distant past to an area primarily composed of grassland and agricultural fields today. The lowland areas adjacent to the Cagayan River are mainly used for the cultivation of seasonal cash crops, with yellow corn, tobacco and rice forming the major sources of livelihood. At the somewhat higher and hilly locations, a vast area of grassland stretches out in north-south direction. However with the gradual integration of high-yielding crop varieties over past three decades (hybrid rice in the 1970s, hybrid corn in the mid-1980s and transgenic corn from 2002 onwards), land use at these locations has been subject to change once again. Large tracks of grassland have been converted into fields with monocultures of rice along flat intersections, corn on sloping fields, and banana along creeks, field boundaries or other steep slopes.

Forests are only left in the higher upland areas. Deforestation and land degradation, both in the valley and adjacent mountain area, have become very serious issues. In response to this, government and non-governmental organizations put much effort towards protection of remaining forests and rehabilitation of degraded forest and grassland areas. Local and regional measurements include tree growing activities directed at watershed rehabilitation and economic development through community-based reforestation, as well as upgrading nutrition and income diversification through farm-level fruit and timber production. These efforts are mainly concentrated in the buffer zone area surrounding the Northern Sierra Madre Natural Park.

From top to bottom:
Tobacco fields along the Cagayan River (van der Ploeg 2005)
Rice fields dominate the landscape in Cagayan Valley (van Weerd 2006)
The production of hybrid and transgenic corn is booming (van Weerd 2004)

Transition towards tree-based farming

Tree growing on farm fields is particularly common in the Cagayan Valley's upland areas and is, though modestly, on the increase. Farmers are interested in growing trees mostly out of economic and partly out of environmental considerations, whereas there is much evidence that both push and pull factors are at work. On the one hand, decreasing natural supplies of trees coupled with augmenting market demand for farm-grown timber (such as gmelina, teak, narra, acacia) have resulted in favorable prices for tree products (pull). And on the other hand, disappointing productivity and profitability of seasonal crops (mainly yellow corn) have encouraged farmers to orient themselves more on trees (push). Trees are increasingly part of rural livelihood strategies; they are planted or retained as a means of savings, income diversification and pension provision. Farmers' perception of trees as income-generating crop may well be associated with extension efforts promoting trees like mango, citrus and to a minor extent guava as cash crops. Moreover, according to farmers, tree cultivation has some comparative advantages over seasonal crops, such as, low labor and capital requirements (specifically timber trees). Yet, most on-farm tree growing activities take place out of subsistence considerations. In other words: trees are grown to meet household needs.

From top to bottom:
Gmelina plantation (van Weerd 2005)
Banana plantation (Snelder 2005)
Coconut grove (Schuren 2005)

Spatial differences in tree growing across the Cagayan Valley

There are clear differences in tree growing activities throughout the Cagayan Valley. Firstly, in the intensively cultivated lowland zone, both the level of tree adoption and planned tree growing are lowest. Similarly, natural tree stocks have almost disappeared while in the upland zone still a reasonable amount of naturally growing trees occur. However, tree growing in the lowlands is more often related to the need for a tree product that cannot be satisfied with naturally growing trees at a reasonable labor and financial investment, whereas tree growing in the uplands is more market-oriented. In addition, trees are increasingly grown to counter soil degradation in sloping areas; a role that is valued highly. This indicates that after two decades of progressively more intensive cultivation of seasonal crops, degradation processes are becoming a familiar phenomenon to farm households in sloping or hilly areas. Related to this, the awareness of reduced yields through soil degradation and the recent increases in prices for fuel and chemical fertilizers lead in various cases to greater interest in trees (including biofuel crops like *Jatropha curcas*) rather than seasonal cash crops. These developments coincide with a rising market demand for tree products among both rural and urban communities. Markets that cater the growing urban populations can absorb higher quantities of fruits and fruit products from the agricultural hinterland communities, while also the demand for timber and construction materials increase with the standards of living of parts of the rural and urban populations. Because it is becoming gradually more time-consuming and expensive to harvest trees from the forest, a market for farm-grown trees has come to exist. Timber is increasingly produced from farm fields rather than gathered from surrounding woody patches and nearby forests, as was common in the past. Thus, land use intensification produces two opposing trends in tree integration that at the same time contributes to regional specialization: the uplands with lower land-use intensity where trees are preferably grown at increasing densities for both home and market purposes and the lowlands with high land-use intensity where tree integration is limited and usually subsistence oriented.

Citrus plantation in Nueva Vizcaya (Persoon 2005)

Factors influencing tree growing

The age of a farmer proves to be positively related with tree growing: the older the farmer, the more trees are generally grown. Old-aged farmers grow trees as a pension provision and value trees for their limited labor requirements (compared to seasonal crops). Moreover, the trees or fruits are often harvested by buyers, implying the elderly are still able to make independent transactions even if their physical condition may not allow them to engage in too straining activities. Older farmers are also less cash-oriented since their lifestyle does not require large amounts of cash, for example, to pay their children's education. Instead 'leaving something behind for one's children' is rather an important motive for establishing a timber plantation, assisting offspring in meeting their future wood needs.

Extension activities also have a positive effect on tree growing in farm fields. Although most tree projects in the Cagayan Valley have not been utterly successful (very low survival rates of seedlings dispersed), both free distribution of seedlings and information and technology dissemination campaigns have lead to increased tree adoption rates. Similarly, households with greater land endowments more often grow trees. Greater endowments imply more willingness by households to engage in new, and therefore insecure, farming activities. Moreover, households are only willing to devote land to long-term crops after having set aside sufficient land for growing short-term commercial crops to fulfill immediate cash needs. Large farms allow households to produce both seasonal and tree crops for diversification, subsistence use and market sale. Surprisingly tree growing is positively related with households having no or limited capital available, given the establishment of a tree plantation usually requires high investment. The latter is particularly true for fruit trees. However, farmers regularly refer to freely distributed fruit-tree seedlings within the framework of various promotional programs as source of planting material. Moreover, they mention low investment needs for timber plantations.

Calamansi (van der Ploeg 2007)

Guava (van der Ploeg 2007)

The time spent on non-farm labor is also positively related to tree growing. Tree production is generally perceived as less labor intensive, and thus combining better with non-farming activities, compared to seasonal crop production. At the farm field level, tenure is negatively related to tree growing. Fields with secure tenure are mainly prime agricultural land preferably used for seasonal cropping. The fields with relatively insecure tenure are preferably used for tree growing and located on sloping land close to the forest boundary. Although officially households have no tenure over these lands, they can use the land with little chance of being evicted. The Philippine government generally tolerates the informal land occupancy and, at local level, the informal claims are well recognized. Some farmers use tree growing as a means to claim the land, hoping that tree ownership will eventually lead to secure land rights.

Finally, trees are preferably grown close to the house where farmers can more easily inspect them and prevent damage or losses by fire, astray-animals and theft (in the case of fruits). The size of a field also matters: the larger the field, the more likely a farmer will decide to grow trees on it.

A major challenge is to translate these observations into adaptations of extension programs. What is necessary is to adapt proposed technologies to specific situations of the recipient communities and offer multiple, rather than single, technologies allowing each household to choose whatever fits best within their livelihood strategy. This is the so called ‘basket of technology’ as extension strategy. That this has not yet been achieved illustrates that the gap between the research community and actual development practice has not yet been bridged.

Homegardens harbor a great diversity of fruit trees: papaya, banana, mango and cacao (van Weerd 2006)




The adoption of fruit trees

Despite extensive promotion, the adoption of fruit trees in farming systems across the Valley has occurred at relatively low pace. This is in strong contrast with the cultivation of seasonal cash crops that have spread rapidly during the 1970s and 1980s as monocultures with high inputs of fertilizers and pesticides. Farmers consider fruit trees as a subordinate crop, by far less profitable compared to seasonal cash crops. The latter is in striking contrast with the results of economic analyses based on a ten-year production cycle. The net present value for citrus (*Citrus reticulate*) cultivation is at least two times the value for irrigated rice and as much as four times the value for corn, even at discount rates up to 20 percent. Farmers' knowledge of tree management and species selection proved often to be inadequate, contributing indirectly to poor growth and fruit production. Marketing opportunities are not fully utilized as evident from unstable network channels for fruit-tree sales, lack of expertise in fruit-tree marketing and insufficient knowledge on market demands, quality production and market location.

The role of home gardens

The relatively low pace of tree integration on farms outside the villages is in strong contrast with the spontaneous planting of abundant fruit and timber trees in back yards and on compounds near houses. These home gardens, ranging in size from 0.07 to 0.13 ha, may include up to 155 plant species in total (and more than 312 if including ornamental plants), of which 71 are tree species. Home garden plant species composition varies however with topographic location and population density. When moving from forested uplands to densely populated lowlands, home gardens become more diverse, better structured and higher in plant density. Likewise, they show increasing differentiation towards tree crop mixtures with mango (*Mangifera indica*) and horseradish (*Moringa oleifera*), non-tree crop mixtures with egg plant (*Solanum melongena*) and cocoyam (*Colocasia olotorius*) or sweet potato (*Ipomoea batatas*), and livestock for selling purposes. Farmers' most important reasons for having home gardens refer not so much to sustainable land use but rather to household consumption. The selling of excess crops and livestock products is also of increasing importance as income from farms decreases (due to smaller sizes and lower soil fertility) being eventually inadequate to meet households' cash needs. Garden products generate on average 14,000 peso (US$ 281) per ha per year or 3,650 peso per home garden at minimal or no input costs, although this may vary considerably. The annual gross income from gardens with livestock is much higher: US$ 5,750 peso per household. Yet, this is still relatively low compared to corn: where corn is grown as major cash crop on farm fields, it yields a gross income of 33,800 peso per ha per year with inputs varying from 6,870 peso (without fertilizer) to 12,500 peso per ha (with fertilizer) per cropping cycle.

Cultivation of onions in a homegarden in Tumauini (Persoon 1991)

Towards smallholder tree-based systems

The discussion above demonstrated that tree-based land use systems do play a significant role in the livelihoods of local communities in the Cagayan Valley, yielding food, wood and non-wood products for subsistence and commercial markets and at the same time contributing to various environmental services. We expect that the importance of smallholder tree-based systems will continue to increase as the national forest resource will further shrink and human populations expand throughout the region and elsewhere in the Philippines. In conclusion there is a clear need for a paradigm shift in the forestry, development, and extension sector to (1) recognize the contribution and importance of smallholder agroforestry systems as part of the solution to achieve sustainable forest management and production objectives, and adopt more holistic and sustainable strategies to support and strengthen the market orientation of smallholder agroforestry systems; (2) provide technical support to smallholder farmers that enable them to improve their success, productivity, and profitability of their agroforestry systems, and develop supportive institutions (rules and organizations) together with a fundamental policy rectification which would lay a basis for sustainable and equitable regional tree product markets; and (3) implement enabling conditions that support the success of smallholder agroforestry systems and their potential to provide environmental services.

Students reports*: Graber 1994; van Rijt 1998; Brandsma 2000; van Rees 2000; Brekelmans 2000; op de Laak 2000; Opperdijk, van Veen & Wanders 2000; Boerwinkel 2001; Reemer 2002; Dulay 2003 Klein 2003; Bhagwandin 2004; Mabbiazan 2004; Malana 2004; Barcelano 2005; Aman 2008.*

Publications*: Snelder 1997; Snelder 2001; Snelder, Klein & Schuren 2007; Snelder 2008; Snelder & Lasco 2008; Snelder & Persoon 2008; Schuren & Snelder 2008; Romero & de Groot 2008; Romero & de Groot 2008; Roshetko et al. 2008; Udo de Haes, Snelder & de Snoo 2008; Masipiqueña, Masipiqueña & de Groot 2008; van Weerd & Snelder 2008; Mangabat et al. 2009.*

Boundary planting in Ilagan (Snelder 2005)

Biofuel feedstock production is becoming increasingly important (van Weerd 2009)

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A BIODIVERSITY HOTSPOT

Merlijn van Weerd and Roberto Araño

Whitehead's discoveries

When the English naturalist John Whitehead visited the foothills of the Sierra Madre in Isabela Province in 1894 he was in a bad mood. He boated up the Rio Grande (Cagayan River) from Aparri to Isabela Province. Whitehead wrote in his field diary:

> 'The country was mostly flat and covered with coarse grass; when the hills were reached they were found to be almost impossible collecting grounds, being covered with thick bamboo-growth intermingled with very high trees. In a few hours I discovered that my two new collectors were useless. After some days I myself was knocked up with dysentery…'

In a Spanish hacienda named Molino, most likely the village of San Antonio near San Mariano where the Molino family has been ruling since time long lost, John Whitehead found the peace and tranquility he needed to recover from his illness. He was weak and could not stroll far from the hacienda, but he did make daily excursions in the surroundings. He shot a yellow-green oriole that looked different from the orioles then known from the Philippines. One afternoon, 'in one of my wanderings through the parched-up forests of Isabela' he shot a mouse running on the other side of a creek where he was taking a rest, and was lucky not to destroy it because it was hit by only a few pellets.

Left page: Rhacophorus pardalis (van der Ploeg 2006)

Type specimen of Knema ridsdaleana de Wilde, collected in the Sierra Madre (NHN 1992)

The yellow-green bird was described by Mr. Ogilvie Grant, an ornithologist of the Natural History Museum in London to which Whitehead sent his collections, and named the Isabela Oriole (*Oriolus isabellae*), in honor of the province where it was shot. It has since 1894 been recorded at only six other localities on Luzon, the last time with certainty in 1961 when 11 Isabela Orioles were shot by bird collectors in San Mariano. In 2003 a pair was found in sitio Ambabok in San Mariano and at present this is the only known site in the world where the Isabela Oriole is regularly seen. The mouse that Whitehead so skillfully shot was named Northern Luzon Shrew-mouse (*Crunomys fallax*). The single type specimen is till this day the only individual of this species known to science.

After a few miserable weeks, Whitehead returned to Manila and never came back to Isabela. He went on to shoot the type specimen of the Philippine Eagle (*Pithecophaga jefferyi*) on the island of Samar. Upon his request, the eagle was named after his father Jeffery Whitehead who funded his collection trips. It is not unlikely that he would have shot the type specimen of this majestic eagle in Isabela had he not fallen ill. But Whitehead did collect several new species in a matter of days in Isabela, species that now are among the rarest and least known in the World.

The Isabela Oriole is genuinely rare, and threatened with imminent extinction. The northern Sierra Madre is the last wilderness where this species survives, together with many other species that have elsewhere disappeared. Of the Northern Luzon Shrew-mouse on the other hand we simply know too little to say anything about its true status, this species is data deficient in IUCN Red List terms. There are many other species in the northern Sierra Madre that are data deficient, or that have never even been seen by a taxonomist. Apart from being a globally important conservation area, the northern Sierra Madre is also one the least explored wilderness areas of the World.

Isabela Oriole (Oriolus isabellae) (Van Weerd 2004)

Sierra Madre revisited

After Whitehead's visit many years passed before naturalists visited the northern Sierra Madre again. Dioscoro Rabor and Godofredo Alcasid collected birds in the area in the early 1960s. K.M. Muddar and M.S. Allen collected bats along the coast of the Sierra Madre in 1981. But really in-depth inventories of various taxa in different habitat types were only conducted in the early 1990s by a group of scientists working for the Department of Environment and Natural Resources, Birdlife International and the Danish Ornithological Society and later by the Nordic Agency for Development and Ecology. The results of these surveys identified the northern Sierra Madre as a top priority conservation area in the Philippines and led to the declaration of the Northern Sierra Madre Natural Park in 1997. Biologists of the Northern Sierra Madre Natural Park-Conservation Project, an integrated conservation and development project implemented by Plan International from 1996 to 2002 funded by the Dutch government, added further information on the marine, flora and fauna diversity of the Sierra Madre. Scientists of Conservation International have also conducted surveys in the Sierra Madre and have maintained a 16 ha forest dynamic plot since 1994 to monitor changes in vegetation structure and composition in the Sierra Madre. The Cagayan Valley Programme on Environment and Development participated in these biodiversity survey projects since 1989 with technical and financial support and several students have contributed to a better knowledge of the fauna and flora of this little known area.

Cream-bellied Fruit Dove (Ptilinopus merrilli) (Van Weerd 2001)

Conservation hotspots

The enhanced knowledge on the biodiversity of the Sierra Madre in the 1990s coincided with the realization by leading conservation biologists that (1) species with restricted ranges are most vulnerable to extinction and (2) limited resources for conservation need to be spent as cost-effective as possible, for example in areas where threats are largest for restricted species. A key article in Nature by Myers and colleagues in 2000 identified biodiversity hotspots for conservation priorities. The Philippines was identified as one of the hottest hotpots because of its unparalleled forest loss (only 3 percent of original forest cover remained in a pristine state) and the large numbers and proportions of species endemic to one or several of the Philippine Islands. Endemic species are restricted to a distinct area, for example an island, or to a political unit, for example a country. Endemic species are more vulnerable to extinction than wide-ranging species because they occur in smaller areas, with smaller populations, and usually are highly adapted to local circumstances. For species that occur in the Sierra Madre we distinguish three levels of endemism: species that are endemic to the Sierra Madre itself, species that are restricted to Luzon or Greater Luzon (Luzon and satellite islands) and species that are endemic to the Philippines as a country.

Female Luzon Racquet-tail (Prioniturus montanus) (van Weerd 2001)

Golden-crowned Babbler (Stachyris dennistouni) (van Weerd 2001)

Furtive Flycatcher (Ficedula disposita) (van Weerd 2001)

The biodiversity of the Northern Sierra Madre Natural Park

Being far from complete, except for birds, the list of species known to occur in the Northern Sierra Madre Natural Park now includes 1,079 tree species, 294 bird species, 61 mammals, 42 reptiles, 20 amphibians, 36 freshwater fish, 117 marine fish, 112 shellfish, 118 butterflies and 35 dragonflies (table 1). Of these, 73 species are listed as globally threatened on the IUCN Red List 2008 (15 critically endangered, 9 endangered and 49 vulnerable). In addition, 33 species are listed as near-threatened. To put these figure in perspective: the Netherlands hosts 6 globally threatened species, Western Europe 53 and the Galapagos Islands 49.

Table 1: The number of observed species per species group in the Northern Sierra Madre Natural Park, including the number of endemic species and globally threatened species.

Species group	Number of species	Endemism			IUCN red list status[1]			
		Philippines	Greater Luzon	Sierra Madre	CR	EN	VU	NT
Trees	1079	204	47	3	10	2	24	4
Birds	294 (218 residents)	68	21		3	2	15	19
Mammals	60							
Marine	5						1	
Terrestrial	17	4	4	2			2	
Bats	38	12	1			1		7
Reptiles	42							
Marine	3				1	2		
Terrestrial/freshwater	39	14	4		1	1	2	
Amphibians	20	4	6	3		1	4	3
Freshwater fish[2]	36							
Marine fish	117							
Shellfish[2]	112							
Butterflies[2]	118	44	1				1	
Dragonflies[2]	35							

[1] CR = Critically Endangered, EN = Endangered, VU = Vulnerable, NT = Near-threatened. IUCN Red List 2008.

[2] These species groups are insufficiently known to determine endemism and/or threat status

Pitcher plant (van Weerd 2006)

Trees

Of the flora, only the diversity of tree species of the Northern Sierra Madre Natural Park has been studied relatively well by Hubert Garcia and colleagues of the Northern Sierra Madre Natural Park-Conservation Project, although the inventory is far from complete. They found 1,079 tree species in the various forest types of the park. Lowland forest is numerically dominated by the dipterocarps, valuable timber species of which several are now threatened with extinction such as the priced narra (*Pterocarpus indicus*). A large number of collected plant species of the Sierra Madre is kept in the herbarium of Isabela State University. Some specimens were brought to the National Herbarium of the Netherlands and were described there. The Sierra Madre remains a treasury of undescribed plant species that await discovery.

Birds

The largest bird in the park is the Philippine Eagle (*Pithecophaga jefferyi*). Three or four pairs of this majestic raptor have territories in the park. They are extremely difficult to see though, as they are restricted to montane forest far away from human disturbance. Other rare bird species for which the Northern Sierra Madre Natural Park provides refuge are the earlier mentioned Isabela Oriole, the Green Racquet-tail (*Prioniturus luconensis*) and the Luzon Racquet-tail (*Prioniturus montanus*), the Philippine Dwarf Kingfisher (*Ceyx melanurus*), the Whiskered Pitta (*Pitta Kochi*), the Philippine Eagle-Owl (*Bubo philippensis*) and the Grand Rhabdornis (*Rhabdornis grandis*). Apart from 218 resident bird species, the park also hosts migrant birds from northern Eurasia during the northern winter period. Thousands of waders and egrets forage on the reef flats along the Pacific coast of the park. Four globally threatened migratory bird species have been recorded during the past years: the Chinese Egret (*Egretta eulophotes*), the Oriental White Stork (*Ciconia boyciana*), Baer's Pochard (*Aythya baeri*) and the Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*). These species are among the rarest in the world underscoring the importance of the Northern Sierra Madre Natural Park for migratory water birds, in addition to the well-recognized importance of the forest habitats of the park for endemic birds.

Jade Vine (Strongylodon macrobotrys) (van der Ploeg 2006)

Philippine Dwarf-Kingfisher (Ceyx melanurus) (van Weerd 2008)

Mammals

The largest mammals in the park are the Philippine Deer (*Rusa Marianna*), the Philippine Warty Pig (*Sus philippensis*) and the Long-tailed Macaque (*Macaca fascicularis*). Large mammalian predators do not occur on Luzon but the park has two civet species, the Common Palm Civet (*Paradoxurus hermaphroditus*) and the Malay Civet (*Viverra tangalunga*). Twelve rodent species have been recorded of which the Northern Sierra Madre Shrew-mouse (*Archboldomys musseri*) and the Northern Luzon Shrew-mouse (*Crunomys fallax*) are endemic to the Sierra Madre. The majority of mammals in the park are bats. Three giant fruit-eating bats, flying foxes, occur in the park. The Golden-crowned Flying Fox (*Acerodon jubatus*) is endemic and threatened. Roost sites of this species can still be found in Divilacan. A second large roost site was destroyed by mining operations just south of the park. Another rare species is the Mottle-winged Flying Fox (*Pteropus leucopterus*). This species, of which very little is known, lives solitarily. The 13 fruit and nectar eating bat species of the park play an important role as pollinators. The other 25 bats are insect eaters. Many of these bats roost in caves. They fly out when evening falls in huge flocks although most caves have nowadays been disturbed by guano collectors and bat hunters.

From top to bottom:
Large-eared Horseshoe Bat (Rhinolophus philippinensis) (van Weerd 2006)
Luzon Pygmy Fruit Bat (Otopteropus cartilagonodus) (van Weerd 2008)

Large Flying Foxes (Pteropus vampyrus) (van der Ploeg 2004)

Reptiles and amphibians

The reptiles and amphibians of the Northern Sierra Madre Natural Park are not yet very well known, with the exception of the two crocodile species in the park, the Estuarine Crocodile (*Crocodylus porosus*) that lives along the coast and the Philippine Crocodile (*Crocodylus mindorensis*) that lives in freshwater. The conservation of the Philippine Crocodile has been the target of the Cagayan Valley Programme on Environment and Development for many years now. Sixteen snake species are currently known from the park, a number that will rise sharply when more survey work will be done on this species group. The same is true for the skinks, lizards and geckos of which 17 species are now known from the park. A new gecko species, *Luperosaurus kubli*, was only described in 2007. Apart from three sea turtle species, the park also has the rare and threatened freshwater Cantor's Giant Softshell Turtle (*Pelochelys cantorii*). In 2005, researchers of the Cagayan Valley Programme on Environment and Development documented the presence of the very rare fruit-eating Gray's Monitor Lizard (*Varanus olivaceus*). This species was hitherto only known from southern Luzon. Thirteen of the 20 known amphibian species in the park are endemic, 3 of these for the Sierra Madre. The introduced Cane Toad (*Bufo marinus*) however now dominates all non-forest habitats.

Striped Bronzeback (Dendrelaphis caudolineatus) eating a frog (Van Weerd 2008)

From left to right: Platymantis sierramadrensis (van der Ploeg 2006), Luperosaurus kubli (van Weerd 2006), Ahaetulla prasina (van der Ploeg 2006), Right page from left to right: Cantor's Giant Softshell Turtle (Pelochelys cantorii) (van Weerd 2007), Philippine Eagle (Pithecophaga jefferyi) (Persoon 1989), Philippine Crocodile (Crocodylus mindorensis) (van Weerd 2008)

Freshwater fish

Only limited information on the freshwater fish diversity of the Sierra Madre is available, most of it through student research. All known native freshwater fish species of Cagayan Valley are secondary; they evolved from marine fish that adapted to freshwater conditions. The absence of primary freshwater fish, species that belong to families that are strictly living in freshwater, is a strong argument for the isolation of Luzon Island in biogeographical history. Primary freshwater fish never colonized Luzon, probably because Luzon was never connected to a large landmass that had freshwater fish. Nowadays, the rivers and creeks of the Sierra Madre and Cagayan Valley do have many true freshwater fish species but all of these have been introduced by man (exotic species). Recent research of the Cagayan Valley Programme on Environment and Development shows that about 50 percent of freshwater fish, in numbers, species and weight, in Cagayan Valley is exotic. Fishermen usually prefer to catch exotic species because these are bigger than most native fish. Fishermen are supported by government programmes in actively introducing exotic fish species in the river systems of Cagayan Valley. Native fish species seem to decline as a result of the introduction of exotics, and as a result of fishing pressure. An example of a native species disappearing is the ludong (*Cestreus plicatilis*), a migratory mullet species that was fished to near extinction. Stories about the marvelous taste of ludong have reached mythical proportions, as has the price of what has been dubbed 'the president's fish'. Ludong is now sold at 3,000 peso (60 US$) or more a kilo.

Table 2: Globally critically endangered and endangered species that occur in the Northern Sierra Madre Natural Park

Common Name	Scientific Name	Conservation status[1]	Status / Endemism
	Trees		
	Dipterocarpus validus Blume	CR	
Apitong	*Dipterocarpus grandiflorus* Blanco	CR	
	Dipterocarpus hasseltii Blume	CR	
Dalingdingan	*Hopea acuminata* Merr.	CR	Philippines
Yakal-kaliot	*Hopea malibato* Foxw.	CR	Philippines
White lauan	*Shorea contorta* Vidal	CR	Philippines
Guijo	*Shorea guiso*(Blanco) *Blume*	CR	
Red lauan	*Shorea negrosensis* Foxw.	CR	Philippines
Mayapis, White Lauan	*Shorea palosapis* (Blanco) Merr.	CR	Philippines
Tanguile	*Shorea polysperma* (Blanco) Merr.	CR	Philippines
Narig	*Vatica mangachapoi* Blanco	EN	
	Gloeocarpus patentivalvis Radlk.	EN	Philippines
	Mammals		
Golden-crowned Flying Fox	*Acerodon jubatus*	EN	Philippines
	Birds		
Philippine Eagle	*Pithecophaga jefferyi*	CR	Philippines
Spoon-billed Sandpiper	*Eurynorhynchus pygmeus*	CR	Migrant
Isabela Oriole	*Oriolus isabellae*	CR	Luzon
Oriental White Stork	*Ciconia boyciana*	EN	Migrant
Baer's Pochard	*Aythya baeri*	EN	Migrant
	Amphibians		
	Platymantis taylori	EN	Sierra Madre
	Reptiles		
Hawksbill Turtle	*Eretmochelys imbricata*	CR	
Philippine Crocodile	*Crocodylus mindorensis*	CR	Philippines
Cantor's Giant Softshell Turtle	*Pelochelys cantorii*	EN	
Green Sea Turtle	*Chelonia mydas*	EN	
Loggerhead Turtle	*Caretta caretta*	EN	

[1] *CR = Critically Endangered, EN = Endangered. IUCN Red List 2008.*

A last refuge?

For several endemic species that used to occur more widely in the country or on Luzon and for a large number of globally critically endangered and endangered species, the Northern Sierra Madre Natural Park is one of the last areas where viable populations can be found (table 2). Ten critically endangered dipterocarp tree species, six of these endemic to the Philippines, do still occur in the park although they continue to be threatened by illegal logging of the lowland forest in the park. The Philippine Crocodile and the Isabela Oriole are among the rarest species in the world but survive in the park. The northern Sierra Madre also has the last pairs of Philippine Eagle on Luzon. The municipality of Divilacan hosts possibly the largest roost site of the Golden-crowned Flying Fox of the country with several tens of thousands of these and another species of giant fruit bat, *Pteropus vampyrus*, flying out every evening. Several smaller species are endemic to the forest of the northern Sierra Madre itself and thus depend entirely on conservation of their habitat here. The frog *Platymantis taylori* has so far only been found in the Northern Sierra Madre Natural Park and the frogs *Platymantis sierramadrensis* and *Rana tipanan* have recently been described and are endemic to the Sierra Madre. The critically endangered Hawksbill Turtle (*Eretmochelys imbricate*) nests on the beaches of the protected area. The majority of bird species found on Luzon Island is represented in the Northern Sierra Madre Natural Park; of all birds known to occur on Luzon (402 species), 294 (73 percent) are found in the park. For other species groups representation of Luzon species in the park is difficult to determine as species presence data is incomplete. For dragonflies for example, the first surveys in a limited number of habitats in the park were only conducted in 2008. But it is likely that the majority of species of Luzon are represented in the park. Efforts are ongoing to enlarge the area protected in the northern Sierra Madre to ensure the survival of all these species in the future. But of course, effective conservation of the unique biodiversity of the Sierra Madre will depend on more than just protected status on paper. The future of the Isabela Oriole and the Northern Luzon Shrew-mouse, the species collected by John Whitehead in May 1894, will entirely depend on effective protection of the forests of the Sierra Madre.

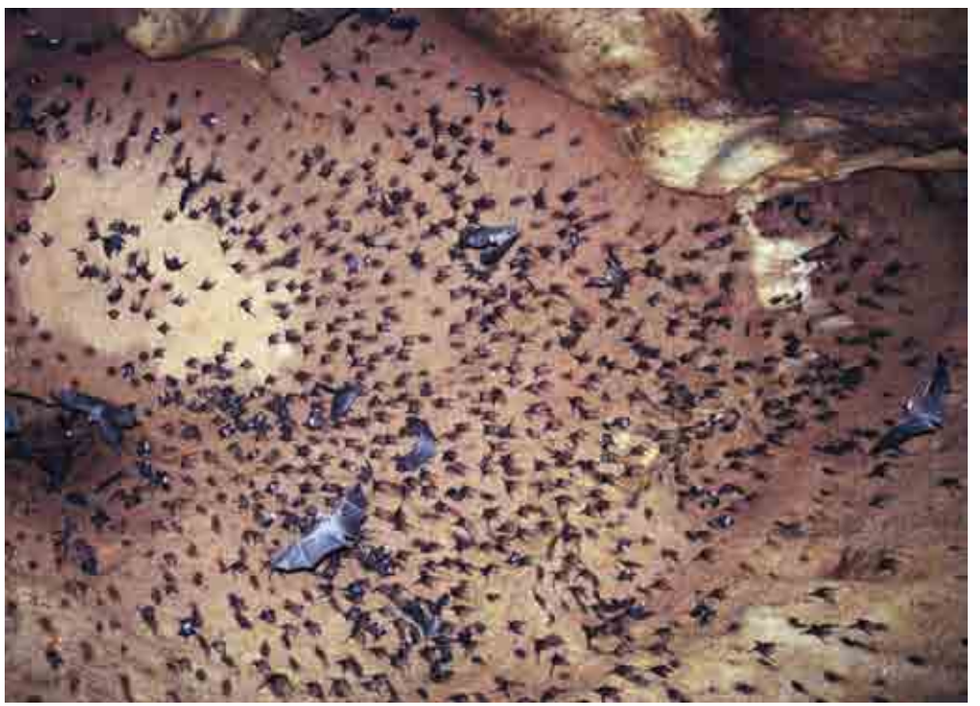
Student reports*: de Rooy & Wout 1998; Blok & Troost 2000; de Groot 2001; Linnebank 2001; Guzman 2002; Slieker 2002; Strijk 2003; Bautista 2004; Salazar 2005; Thijs 2005; van der Ploeg 2005; van de Ven 2006; Aggabao, Cammayo & Sia 2006; Bagunu 2006; Banwa 2007; Baquiren, Mactuggal & Tanguilan 2006; Frogoso & Pasicolan 2007; Pangilinan 2007; Paguigan 2007; Cabauatan-Guzman 2008; Bok in prep.; Pascua in prep.*

Publications*: van der Linde 1996a; van der Linde 1996b; de Iongh & van Weerd 2004; Strijk 2004; van Weerd & Hutchinson 2004; van Weerd & van der Ploeg 2004a; van Weerd & van der Ploeg 2004b; van Weerd et al. 2004; de Iongh & van Weerd 2005; de Iongh & van Weerd 2006; Persoon & van Weerd 2006; van Weerd & Snelder 2008.*

Reports*: Hilterman 1998; Spijkerman 1998; van Lavieren 1999; van Weerd 2002.*

Right page: Philippine Eagle-Owl (Bubo philippensis) (van Weerd 2006)

Inside a bat cave in San Mariano (van Weerd 2001)



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THE NORTHERN SIERRA MADRE NATURAL PARK

Roberto Araño, Merlijn van Weerd and Jan van der Ploeg

The Palanan Wilderness area

The creation of protected areas in the Philippines has a long and turbulent history. Under the American colonial administration several protected areas were proclaimed that still exist today. The Callao Caves in Peñablanca for example were officially declared a national park in 1935. And the Fuyot Springs National Park, or the Santa Victoria Caves as it is called nowadays, in Ilagan was established in 1938. Even during the years of environmental plunder by the Marcos administration new protected areas were proclaimed. In fact the history of the Northern Sierra Madre Natural Park started in 1979 with a decree by President Ferdinand Marcos (Letter of Instruction 917) declaring all mossy forests, protected forests and critical watersheds in the country as wilderness areas. This was followed by Letter of Instruction 917-A on 7 September 1979, which specifically declared all forest lands within a radius of 45 kilometer from Palanan point as the Palanan Wilderness Area.

Thirty years later the signs of large-scale corporate logging are still visible in Palanan, Divilacan and Maconacon, which are located within the 45 kilometer radius. The protection of the Palanan Wilderness Area existed only on paper: the logging companies continued to operate along the entire coast of Isabela. Corporate logging in the Palanan Wilderness Area stopped when the huge logging compounds in Didadungan in the municipality of Palanan and Maconacon were attacked and burned down by the New People's Army in the early 1990s, allegedly because the companies did not pay their revolutionary taxes. The burned logging trucks, bulldozers and sawmills are testimony of the scale of the logging operations. Maconacon, then a town of more than 10,000 inhabitants, used to have the largest drying kiln, a wood-fueled oven used to dry logs, of the northern Philippines. Soon after the closure of the logging company, more than half of the population left: nowadays there are approximately 3,500 people living in Maconacon.

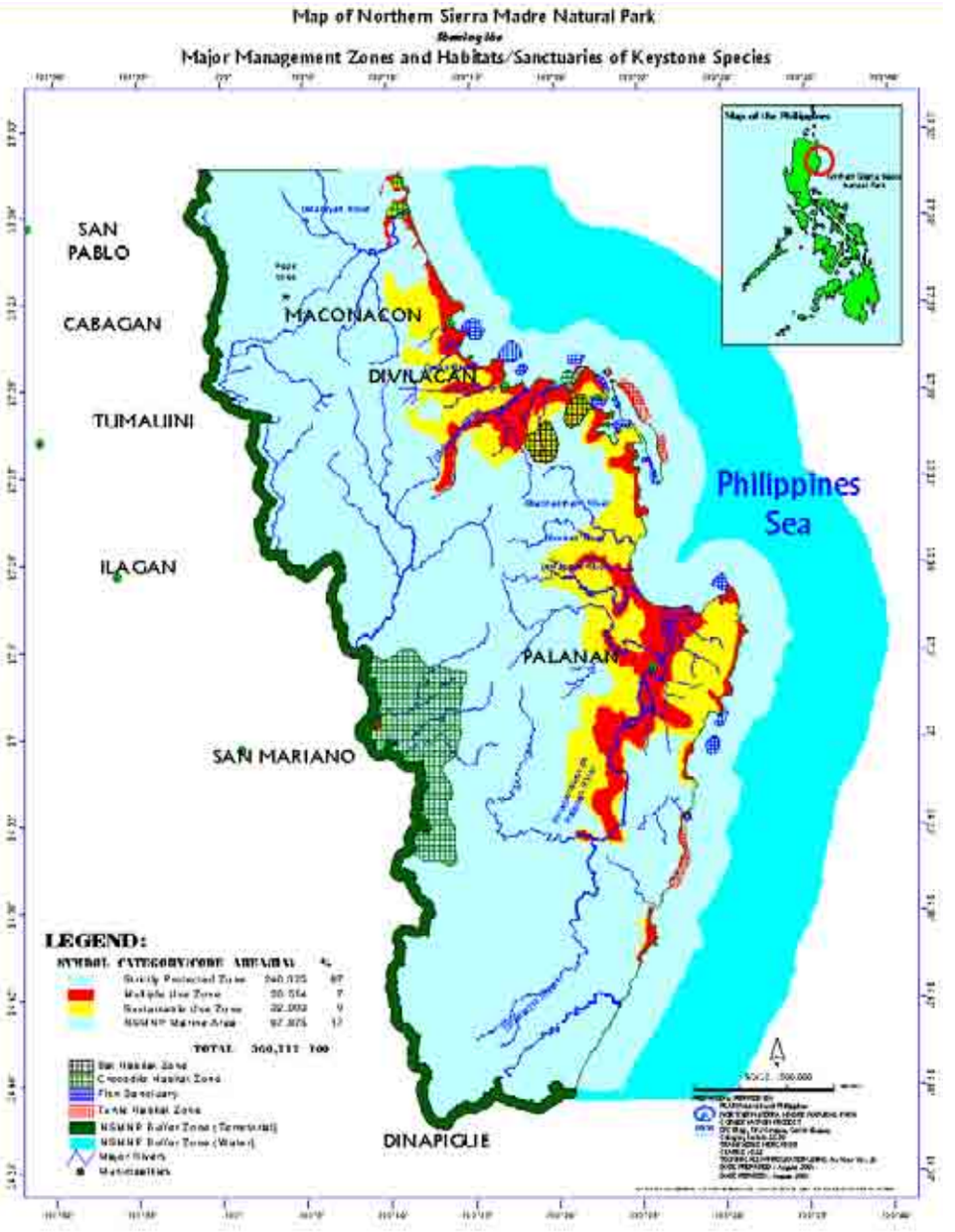
Old logging equipment in Didadungan, Palanan (van der Ploeg 2004)

Left page: Participatory land use planning: making a three-dimensional model of the Catalangan watershed in San Mariano (van Weerd 2009)

The National Integrated Protected Areas System

After the fall of the Marcos dictatorship, a strong social and environmental movement pushed for drastic reforms in policies regarding natural resource extraction, indigenous peoples' rights and biodiversity conservation. In 1992 the National Integrated Protected Areas System Act, usually called the 'NIPAS Act', was adopted. This law provides the framework for a decentralized, community-based reserve management strategy. For an area to be declared as a protected area it has to go through a 13-step procedure. The first steps include resource profiling and mapping. This is followed by an elaborate public consultation program among the inhabitants of the protected area, at that time a progressive conservation strategy. Forced relocations were avoided: people who lived for at least 5 years in the proposed park were allowed to stay. A co-management structure was set up: the Protected Area Management Board, most often simply called the 'PAMB', in which local governments and rural communities are strongly represented. When 11 steps are completed, a presidential proclamation officially establishes the park. The 13th and last step is the confirmation by Congress through the adoption of a specific act for the protected area.

Biodiversity surveys in the early 1990s, in which researchers of the Cagayan Valley Programme on Environment and Development participated, identified the northern Sierra Madre as an important biogeographic zone. During the first international conference organized by the joint programme at the Cabagan campus of Isabela State University in 1991 a resolution was adopted requesting the inclusion of the Palanan Wilderness Area into the National Integrated Protected Areas System.



Management zones in the Northern Sierra Madre Natural Park (NSMNP-CP & DENR 2001)

The management of the Northern Sierra Madre Natural Park

From 1996 to 2002 two integrated conservation and development projects supported the establishment of the park, and the set-up of its management: the Dutch-funded Northern Sierra Madre Natural Park-Conservation Project and the Conservation of Priority Protected Areas of the Philippines with funding of the World Bank. Students and researchers of the Cagayan Valley Programme on Environment and Development have been closely involved in the Northern Sierra Madre Natural Park-Conservation Project.

A complicated process of negotiations started with the municipalities in the wilderness area. The consultation process came at a time when preparations were underway to establish a community-based forest management agreement in Maconacon to enable the community to exploit the forest for timber. Eventually, Maconacon, Divilacan and Palanan accepted inclusion of their total land area in a new protected area. Dinapigue in the south, and San Pablo, Cabagan, Tumauini, Ilagan and San Mariano in the west accepted inclusion of uninhabited parts of their municipalities. On 10 March 1997, Letter of Instruction 917-A was amended by President Fidel Ramos through Presidential Proclamation 978 declaring 359,486 hectare (287,861 hectare of land and 71,625 hectare marine areas) in Isabela Province as the Northern Sierra Madre Natural Park, the largest protected area of the Philippines. Congress endorsed the establishment of the park by adopting Republic Act 9125 on 22 April 2001. This act specifically lays out the management system of the park, and specifies the prohibited acts and corresponding penalties. Only ten other protected areas in the Philippines have so far gone though all the 13 steps of the NIPAS Act.

From top to bottom:
Community consultation in Palanan (Pedrablanca 2008)
Raising environmental awareness in San Mariano: the Dalaw Turo programme of the Department of Environment and Natural Resources (van der Ploeg 2004)
The Protected Area Management Board of the Northern Sierra Madre Natural Park (Minter 2007)


ng Northern Sierra Madre Natural
ark ay mayaman sa samut-saring
uhay at yamang tubig.
Alagaan natin at protektahan
ura sa kinabukasan.

A protected area management board was established consisting of 37 members: the mayors of the nine municipalities in the park, the provincial government, several barangay captains, twelve representatives of the indigenous peoples of the area, a youth representative, a women's group representative and three civil societal organizations. The board is chaired by the regional director of the Department of Environment and Natural Resources, the government institution charged with the implementation of the decisions taken by the board. For this, a protected area superintendant unit was established that consists of a head, administrative staff and forest rangers that are tasked to patrol the protected area and enforce the rules and regulations. A protected area management plan was adopted by the board in 2001, dividing the park into different zones. The multiple-use zone is designated for sustainable development. All villages and agricultural areas are located in the multiple use zone. The strict protection zone is basically off-limits for people with the exception of the Agta. Logging and the use of destructive fishing and hunting methods (for example fishing with electricity, dynamite or pesticides, and hunting with snare traps or pig-bombs) are prohibited in the strict protection zones of the park.

Sustainable use of natural resources is possible under an agreement with the board, and for a user fee. Seventy-five percent of this user fee is intended to pay for the management of the park; the other 25 percent is for the national integrated protected area fund that was set up to finance all parks in the country. In theory the park could financially sustain its own management and protection through this user fee system. In reality however the income gained through user fees in the Northern Sierra Madre Natural Park is by far not enough to pay for an effective protection system. There remains a structural shortage of funding for the protection of the park, particularly at the western side. Overfishing, unsustainable hunting practices, logging and agricultural encroachment continue to pose a threat to the biodiversity and undermine the sustainable development of the communities living in and around the protected area. The Department of Environment and Natural Resources lacks the resources, capacity and political support to effectively enforce the Northern Sierra Madre Natural Park Act. The park is still protected on paper only.

Hunters showing a Rufous Hornbill (Buceros hydrocorax) in San Mariano (van der Ploeg 2007)

Left page: Billboards mark the boundary of the Northern Sierra Madre Natural Park (van Weerd 2006)

Developmental plans

Paradoxically, a severe threat to the park is paper: several ambitious developmental plans for the region could have devastating impacts on the protected area. This is best illustrated by the plans to develop a Coastal Isabela Industrial & Tourism Estate. A few years ago the Provincial Government proposed a plan to transform 18,000 ha of contagious forest into an international airport, a seaport, residential areas and a golf course. The envisioned infrastructure facilities would consist of a port bigger than the Keelung Harbor of Taiwan (in 1996 ranked 12th in the world in containership cargo), an airport with a 4 kilometer concrete runway and a terminal, and a coastal road. The infrastructure would support a tourism estate with waterfront hotels and villas, a world-class golf course, water sports facilities and high quality housing. This proposal raised alarm and strong opposition from conservation organizations for a number of reasons. The port structure and the waterfront developments would have an adverse impact on the rich marine life. The proposed international airport would destroy rare beach forest and ultrabasic forest and is planned near the largest roosting site of the endemic threatened Golden-crowned Flying Fox (*Acerodon jubatus*). The proposed golf course would require the clear cutting of one of the last remaining pristine lowland dipterocarp and ultrabasic forest areas in the country. The construction of the proposed 24 kilometer coastal road would destroy a significant portion of one of the last remaining pristine mangrove forests in the Philippines. The protected area management board eventually voted against the plan as its impact on biodiversity and local communities was considered to be too destructive.

But government agencies continue to develop plans for the Northern Sierra Madre Natural Park that are in conflict with the protected area management plan. During a protected area management board meeting early 2009, for example, plans to construct a coastal road, to build a road crossing the Sierra Madre, and to develop mining in the coastal ultrabasic forest areas were presented. These are complex societal issues which require a trade-off between conservation and development. This is perhaps best illustrated by the on-going discussions on the construction of a road from Ilagan to Palanan.

Mining exploration in Ilagan (Persoon 2007)

Open pit mine in ultrabasic forest in Dinapigue (de Brabander 2008)

The road debate

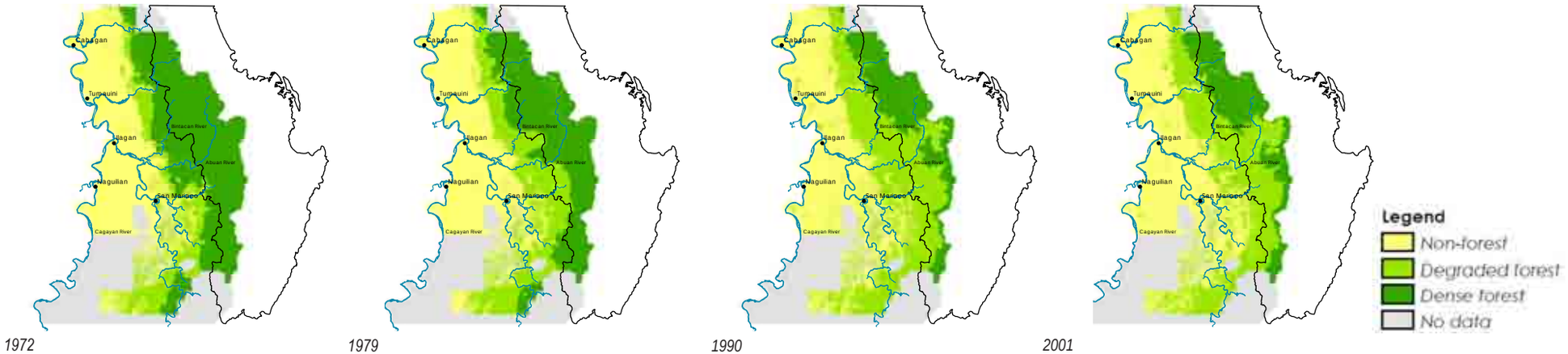
The construction of a road through the protected area to connect the coastal communities (Palanan, Divilacan and Maconacon) to the Cagayan Valley has long been a priority project of the local governments. Some maps already indicate the road and for some time a rather optimistic road sign along the national highway in Cagayan Valley showed drivers the way to Palanan.

A road will surely benefit the coastal municipalities. During the rainy season from June to February the ocean is very rough and several passenger boats plying the route from the northern tip of Luzon along the coast have sunk. The other option to reach the Cagayan Valley is by small plane, but this is dangerous too: three planes crossing the Sierra Madre have crashed over the past 10 years. Besides, the plane fare is prohibitively expensive for most coastal people. The current inaccessibility is most dramatic when people have to reach a hospital in emergency: health services are very basic in the coastal area. However the development of a road will have drawbacks as well. The costs to build the road would certainly top the costs of constructing a good hospital in one of the coastal municipalities. Road maintenance would be costly and most likely higher than maintaining the medical services in the coastal municipalities that are now lacking. Conservation organizations therefore oppose the construction of a road in the Northern Sierra Madre Natural Park: the scientific evidence that accessibility is the major driver of forest degradation and biodiversity change is overwhelming. Numerous scientific case studies in other countries have shown that a road will stimulate migration. Settlers will cultivate the forest areas along the road. And not unimportantly it will make it much easier to transport illegally cut hardwood and bushmeat from the forested eastern side of the park to the valley.

The clamor for an access road to the coastal area may disappear if an 'island strategy' is deliberately formulated and implemented for the municipalities of Palanan, Divilacan and Maconacon. Among others, this could provide the coastal area with high quality healthcare, social welfare, education services, communication systems, a competitive and affordable sea and air transportation system, and support to upgrade and enhance the development, processing and marketing of its agricultural-fishery-

The environmental impact of a road through the protected area will be large (Persoon 2003)

Deforestation in the western side of the Northern Sierra Madre Natural Park (Nagtegaal 2006)



1972 *1979* *1990* *2001*

The future

The adoption of the Northern Sierra Madre Natural Park Act in 2001 has been an important milestone for the protection of this unique protected area. But the hope and positivism that characterized the 1990s has disappeared. The absence of law enforcement in the protected area fuels cynicism and discontent: rural communities feel powerless as illegal logging continues, often in broad daylight. International and national support for the Northern Sierra Madre Natural Park has dwindled. The two foreign-funded projects terminated in 2002, which had detrimental consequences for the management of the park. This globally significant protected area risks being forgotten.

A promising sign is that there is growing recognition at the local level that the protection of the Northern Sierra Madre Natural Park will benefit the 25,000 people that live within the park boundaries and the 32,000 people that reside in 24 barangays along its western boundary. These communities heavily depend on the natural resources of the protected area; forest degradation forms a threat to their livelihoods. The protection of this critical watershed is again high on the political agenda in Isabela, as more and more people realize that 1.5 million people in Cagayan Valley rely on the hydrological services the Northern Sierra Madre Natural Park provides. Over the past twenty years there has been impressive progress in the sustainable management of forest resources in the northern Sierra Madre: from corporate logging to the largest and one of the most important protected area of the Philippines. The challenge is now to translate the lofty words on paper into sustained conservation action on the ground.

Left page: New field in the forest (Persoon 1990)

Student reports*: Daliuag 1993; Aggabao 1994; Buizer 1994; Rommelse 1996; Ticheler 1996; van Zorge 1996; Labuguen 1998; Prins 1999; Serdiene 1999; van der Schaaf 2000; Gilsing 2001; Elixhauser 2002; Cranen 2003; Tulfer 2003; Giebels 2005; Stoel 2007; van Velthoven 2004; Abiqui 2005; van der Ploeg et al. 2007; Nagtegaal 2008; de Brabander 2009.*

Publications*: Arano & Persoon 1998; Wiersum & Persoon 2000; Persoon 2000; Snelder & Persoon 2001; Spijkerman, Masipiqueña & Snelder 2002; Persoon & van Est 2003; Persoon, van Est & Sajise 2003; Perez & Minter 2004; Persoon & van Weerd 2004; van Weerd, van Boven & van der Ploeg 2004; Persoon, Minter & Visorro 2005; Snelder & Bernardo 2005; van Lavieren, de Iongh & Belen 2005.*

Road sign along the Maharlika Highway (van Weerd 2004)

13

MANAGING COASTAL RESOURCES

Hanneke van Lavieren, Hans de Iongh, Ali Belen and Merlijn van Weerd

Introduction

The Northern Sierra Madre Natural Park contains 71,000 hectare of marine habitat, including coral reefs, seagrass beds, beach forests and mangroves. Fringing reefs are patchily distributed along the coastline. 64 percent of the reefs remain in fair condition. The average percentage of live coral cover and dead coral cover on the reefs are 46 percent and 20 percent, respectively. The park hosts a diverse assemblage of reef-fishes and marine invertebrates; 177 reef fishes have been observed during marine surveys in 1999 to 2001 and 112 marine shellfish were found to be used as food or ornamentals by local communities. The beaches of the park are a nesting area for the Green Turtle (*Chelonia mydas*) and Hawksbill Turtle (*Eretmochelys imbricata*). In addition the Loggerhead Turtle (*Caretta caretta*) occurs in the coastal waters of the Northern Sierra Madre Natural Park. The Green and Loggerhead Turtle are classified as globally endangered on the IUCN Red List (2008). The Hawksbill Turtle is critically endangered. Five cetaceans are known to occur in the coastal waters of the park: the Long-snouted Spinner Dolphin (*Stenella longirostris*), the Bottelnose Dolphin (*Tursiops truncatus*), the Short-finned Pilot Whale (*Globicephala macrorhynchus*), the Humpback Whale (*Megaptera novaeangliae*) and the Sperm Whale (*Physeter macrocephalus*). The Sperm Whale is listed as Vulnerable. The Dugong (*Dugong dugong*) is now extinct from the coastal waters of the park, with the last individual killed in 1997. Other special species known from the coastal waters of the Northern Sierra Madre Natural Park are the Estuarine Crocodile (*Crocodylus porosus*), the Tiger Shark (*Galeocerdo cuvier*) and the Great Hammerhead Shark (*Sphyrna mokarran*). The latter is classified as endangered.

Left page: Danny Cauilan catching an octopus on the Kanaipang reef flat, Palanan (van der Ploeg 2005)

Dorado (Coryphaena hippurus) (van der Ploeg 2006)

Blue-spotted Stingray (Neotrygon kuhlii) (Persoon 2001)

Coastal resource exploitation

Over the past decades the coastal resources of the Northern Sierra Madre Natural Park have been heavily exploited. Dynamite and cyanide fishing have severely damaged some reefs and impacted fish community structures. Reef flats are exploited by local communities who gather shellfish, sea cucumber, octopus and other products of all sizes. Sea turtles and their eggs are collected and have declined in numbers. Sharks are caught offshore using hook and line for the shark fin trade with China and Taiwan. Lobsters are collected and sold to traders who bring these to restaurants and markets in Manila. Other management issues in the park include the open access nature of fisheries, the lack of law enforcement, and conflicts between resource users. An integrated management zoning scheme for the coastal area of the Northern Sierra Madre Natural Park was developed in 2001 based on several criteria such as traditional fishing methods, resource use patterns, feasibility to patrol, social acceptance and conflict minimization between the different resource users.

Right page: Tidal reef flat in Palanan (Persoon 1991)

Nonie de la Peña releasing a Green Turtle (Chelonia mydas) (van der Ploeg 2002)

This integrated coastal management plan proposed several small village-level reserves to be managed by communities under the technical and legal supervision of the Protected Area Superintendent and the Protected Area Management Board.

Octopus from the tidal flat (Persoon 1991)

Stakeholders in coastal resources

There are approximately 25,000 people living in the Northern Sierra Madre Natural Park. Two distinct groups can be identified in the park: migrants and Agta. Most inhabitants of the protected area are migrants or descendants of migrants from Ilocos, Cagayan, Pangasinan, Abra and Nueva Vizcaya. These people can be sub-divided according to profession or occupation into full-time fishermen, full-time farmers, seasonal fishermen and farmers, traders of marine products (mainly lobster, shellfish and fish), workers in the private sector, and government officials. The Agta are the indigenous inhabitants of the Northern Sierra Madre Natural Park. The Agta that live along the seashore are often called Dumagat. Most Dumagat depend directly on their daily catches from the inter-tidal reef flats and trade marine products with migrants. They often move their campsites, which represents a mechanism to control over-exploitation of resources by constantly shifting fishing pressure. There is competition for marine resources between migrants and the Dumagat.

The Department of Environment and Natural Resources is responsible for the conservation of biodiversity and habitats in the protected area. The Protected Area Superintendent is the operating officer of the protected area, and reports directly to the Protected Area Management Board. Also the local government units have considerable influence over resource extraction and environmental protection. The democratically-elected municipal council (*Sanguniang Bayan*) can issue municipal ordinances to regulate resource extraction and environmental protection. Therefore, the support and close cooperation of the municipal council and other key political figures, such as the mayor and the barangay captains, are necessary to successfully manage the protected area. These stakeholders are also represented in the Protected Area Management Board.

Fishermen on the pier of Maconacon (van Weerd 2008)

Management constraints

Other issues to be taken into account for formulating appropriate management actions for the Northern Sierra Madre Natural Park are the long coastline, the patchy nature of the coral reefs, a general lack of enforcement of the existing laws, conflicts among different user groups, and ineffective linkages and coordination among groups involved in the park management. Coastal waters are often perceived as open-access commons involving a large number of stakeholders.

The park's marine area is large (around 71,000 ha) and the coastline has a length of more than 100 km. Instead of being part of one compact reef system the coral reefs of the protected area are scattered along the coastline. These different reefs are located within the waters of different municipalities and barangays. This has implications for management. It takes about ten to twelve hours from the north to the south boundary of the Northern Sierra Madre Natural Park using an outrigger boat, which makes regular patrolling of the area a difficult and time-consuming activity. Furthermore, weather conditions determine the feasibility of patrols. These factors make it difficult to propose one overall management strategy for the whole area, but require a more local management approach.

The coast line between Palanan and Dinapigue (van der Ploeg 2004)

Lack of law enforcement

Probably the main problem in the coastal area is the lack of law enforcement. Problems with staff, logistics, organization, coordination and political will are the underlying causes. The Department on Environment and Natural Resources is ultimately responsible for the conservation of biodiversity, the protection of threatened species and the protection and rehabilitation of critical marine habitat. Dynamite and cyanide fishing (and other illegal practices such as the collection of giant clams) still take place in the coastal waters. It is difficult to stop these lucrative but destructive methods. One possible solution is to deputize local residents. Often local community members indicate that they would like to have authority to act against illegal activities in their area.

Conflicts between resource users are also apparent between migrant and Dumagat communities. Both groups blame each other for the over-exploitation of marine resources. The migrants, for example, blame the Dumagat for collecting turtle eggs. In turn the Dumagat blame the migrants for using dynamite to catch fish. In fact both groups are involved in these illegal activities (although the Dumagat use destructive fishing methods at a far smaller scale). Another conflict is the collection of reef flat animals. Many Dumagat are directly dependent on the daily collection of reef flat organisms for food. Migrants often disregard the traditional users' rights of the Dumagat, which leads to conflicts. Migrants use more efficient fishing methods, for example motorized boats, gill nets, and long lines, whereas the Dumagat often only use hook-and-line and spear guns. In order to effectively manage the coastal area of the Northern Sierra Madre Natural Park collaboration is needed between these two groups.

The pier in Dimasalansan, Divilacan (van Weerd 2004)

Right page: Collecting shells on the beach of the Dimasalansan peninsula, Divilacan (Persoon 2001)

Discussion

Integrated coastal resource management can be achieved either by establishing a series of small marine reserves, or by establishing a single large marine protected area encompassing a complete marine ecosystem. In the Northern Sierra Madre Natural Park it was opted to create a number of small reserves (between 2 to 10 ha) because of the patchy layout of reefs, better social acceptability, and the feasibility to patrol these small reserves. This cluster of small coral reef reserves is divided by deep channels and sandy patches. These reserves will have positive effects on biodiversity and will help restore fish stocks.

Trade-offs are necessary when creating a marine reserve. The absence of clear scientific criteria for placement does not matter much: the social acceptability of the reserve is more important. It seems better to have an imperfect reserve that is enforced than to focus too much on creating a perfect reserve that is not respected. The benefits from marine reserves are critically related to the efficacy of protection. Effective protection was therefore an important selection criterion for the establishment of marine reserves in the Northern Sierra Madre Natural Park. Establishment of a marine reserve requires the strong support of people living in and adjacent to the area concerned.

A target for the future should be to improve the management competence of local governments in the Northern Sierra Madre Natural Park. Reducing conflicts among the different coastal resource users is also a priority. The recognition of the ancestral domains of the Agta is one solution to reduce these conflicts. Finally, as marine protected areas are located downstream of rivers, the links between logging, mining, erosion and declining fisheries should be better recognized.

Left page: Agta fisherman on the Honeymoon Island reef flat (van Weerd 2001)

The management issues in the coastal area of the Northern Sierra Madre Natural Park are complex and need a dynamic and integrated approach. The coastal zoning scheme reflects the needs of species and ecosystems and of the people that depend on them. The open access nature of the coastal area and consequent resource user conflicts in the park should be addressed through the establishment of a common property management system, the improvement of a license and permit system for non-local fishermen, and through securing users rights. Community-based marine sanctuaries have proved successful in other areas in the Philippines.

Student reports*: Blok & Troost 2000; Tulfer 2003; Passion 2005; Goslinga in prep.*

Publications*: Persoon et al. 2003; van Lavieren et al. 2005; Minter et al. 2007; Masipiqueña 2008.*

Nipa palms in the estuary of Palanan River (van der Ploeg 2001)

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HOPE FOR THE PHILIPPINE CROCODILE

Jan van der Ploeg, Dominic Rodriguez, Andres Masipiqueña, Willem van de Ven, Jessie Guerrero, Hans de Iongh, Samuel Telan, Marites Gatan-Balbas, Gwen van Boven, Bernard Tarun, Myrna Cauilan-Cureg and Merlijn van Weerd

The beginning

In the early morning of March 17, 1999, Samuel Francisco returned home from a night fishing in the Disulap River. Samuel lived in San Isidro, a small village along the forest frontier in the municipality of San Mariano. That night the catch had been good: three kilos of shrimps and a small crocodile. Crocodiles were rare these days and Samuel hoped to get a good price for it in town. Soon the word spread that Samuel had caught a crocodile and the people of the village came to have a look. But Vicente Anog, the chairman of the farmer's cooperative of San Isidro, had more important matters on his mind. At three o'clock Vicente was in barangay San Jose for a meeting with Alex General, the area manager of the Northern Sierra Madre Natural Park Conservation project. They would discuss a proposal to establish tree plantations in San Isidro. Alex politely informed whether he had a good trip from San Isidro. Vicente jokingly replied that these days it was safe to cross the river as all crocodiles were hiding in the house of Samuel. He then started to explain what fruit tree species the members of the cooperative wanted to plant. But Alex no longer had an interest in jackfruit or mango. At six o'clock they were back in San Isidro, where Alex persuaded Samuel to give him the crocodile. And so the little crocodile ended up on the desk of Robert Araño, the overall director of the project. Robert and Alex called some of us to assist with the identification. The small crocodile hissed and snapped at our fingers. We confirmed what Alex suspected. Samuel had caught a Philippine crocodile, one of the rarest and most severely threatened species of the Philippines.

Left page: Adult Philippine crocodile in Disulap River (van Weerd 2007)
Mr Rochelio Corpus with a Philippine crocodile skull (van Weerd 2003)

Two crocodiles

There are two crocodile species in the Philippines: the Estuarine crocodile (*Crocodylus porosus*) and the Philippine crocodile (*Crocodylus mindorensis*). Throughout the Philippines the Estuarine crocodile is called *buwaya*. The Estuarine crocodile ranges from northern Australia to India. In the Philippines the species is restricted to southern Palawan, the Agusan and Liguasan marshes on Mindanao, and the Pacific coast of Northeast Luzon. But globally the Estuarine crocodile is not threatened. As its name implies the Estuarine crocodile occurs in river estuaries and mangroves. Large individuals can grow up to 6 meter and may form a potential threat to people. The Philippine crocodile is endemic to the Philippine archipelago. The species is known by a variety of local names: the Ilocano call it *bukarot*, the Ibanag *lamag*. The species is classified as critically endangered. It occurs in a variety of freshwater habitats: rivers, creeks, marshes and ponds. Philippine crocodiles can grow up to 3 meter. There are no reported unprovoked attacks of Philippine crocodiles on people. It's difficult to distinguish the two crocodile species from each other, especially in the wild: the most prominent taxonomic difference is the presence of six enlarged scales in the neck of the Philippine crocodile where the neck of the Estuarine crocodile is smooth.

The past

In pre-colonial Philippines crocodiles were venerated. People saw crocodiles as the re-incarnation of the ancestors. Crocodiles were benign symbols of fertility and power. Attacks on humans were seen as a divine punishment and there were strict taboos on killing crocodiles. The Jesuit friar Francisco Colin recorded these primordial sentiments towards crocodiles in 1663:

> 'They held the crocodile in the greatest veneration; and when they made any statement about it, when they saw it in the water they cried out, in all subjection, Nono, meaning Grandfather. They asked it pleasantly and tenderly not to harm them, and for that purpose offered it a portion what they carried in their boats, by throwing it into the water.'

For the Spanish friars crocodiles were the personification of the devil. The idolatry of crocodile statues throughout the archipelago reinforced this idea. The American colonizers on their turn regarded crocodiles as vermin. Over the years traditional Filipino views of crocodiles were fundamentally transformed. Nowadays crocodiles are seen as bloodthirsty man-eaters, a threat to children and livestock. In popular Filipino culture crocodiles are associated with egoism and greed: corrupt officials, selfish athletes, and stingy landlords are called buwaya. These negative sentiments towards crocodiles have contributed to the rapid decline of crocodile populations in the archipelago and impede conservation action.

Left page (from left to right):
Estuarine crocodile in Maconacon (van Weerd 2004)
Sub-adult Philippine crocodile in San Mariano (van Weerd 2003)

Painting in the parish church of San Mariano: a Filipino saint saves his congregation from the evil crocodile (van Weerd 2004)

Commercial crocodile hunting in the Philippines started in the 1920s. Within forty years the demand for crocodile leather depleted the crocodile populations in the Philippine Islands. Vicente Anog remembered how hunters from Mindanao systematically searched the rivers at night and killed crocodiles. In 1975 the international trade in Philippine crocodile skins was banned through the Convention on International Trade of Endangered Species. Ten years later it also became illegal to export Estuarine crocodile leather from the Philippines. But habitat loss, driven by a rapidly growing human population, continued to pose a heavy toll on the crocodile populations. Throughout the archipelago mangroves and marshes were converted into fishponds and rice paddies. Wetlands became the most severely threatened ecosystems of the Philippines.

In 1983 two scientists, Andy Ross and Angel Alcala, warned that the Philippine crocodile was on the brink of extinction. The Philippine government responded to this alarming situation by setting up a captive breeding program (the Crocodile Farming Institute on Palawan), designating several critical wetlands as protected area and prohibiting the killing of crocodiles (by virtue of the Wildlife Act). But crocodiles were still killed for food, for fun or out of fear. Most people simply didn't know that the species was protected by law. Rural communities and local politicians objected to plans to re-introduce captive-bred Philippine crocodiles to the wild. The reclamation of critical wetland habitat and the use of destructive fishing methods such as the use of dynamite and electricity (electro-fishing) continued unabated, also in protected areas. The Department of Environment and Natural Resources, the mandated government agency to enforce environmental legislation, lacked funds, manpower and capability to effectively protect the species in the wild. In 1998 conservationists estimated that there were less than one hundred adult Philippine crocodiles surviving in a few isolated areas on Mindanao and Luzon. There seemed to be no future for this species in the wild.

Right page: Adult Philippine crocodile in Catalangan River (van Weerd 2004)

Electro-fishing (van der Ploeg 2007)

The present

The accidental by-catch of Samuel Francisco offered new hope for the survival of the Philippine crocodile in the wild. At that time it was thought that the species had been exterminated on the island of Luzon. But surveys proved that a small Philippine crocodile population survived in the wetlands of the municipality of San Mariano. Three breeding areas were identified in the ancestral domains of the Agta and the Kalinga, the indigenous people of the northern Sierra Madre. The Disulap River, where Samuel had caught his hatchling, is a fast flowing river surrounded by limestone cliffs. Most inhabitants are Ilocano. Ifugao immigrants have recently settled in the area. An Agta community lives upstream. They often fish in the river and sometimes encounter crocodiles underwater. Dunoy Lake is a shallow pond in secondary forest near the Catalangan River. It is the only site that is located within the Northern Sierra Madre Natural Park. Three Agta families camped on the river bank, but have recently sold their land claim to Ilocano immigrants and moved upstream. Dinang Creek is an almost stagnant stream surrounded by grasslands and corn fields. Most people in this area are Kalinga. The creek is intensively used by the community to fetch water and bath livestock. The Kalinga believe that crocodiles have supernatural powers and therefore will not risk killing a crocodile: 'if you don't harm a crocodile the crocodile will not harm you.' Before crossing a river the Kalinga often place a small offer on the bank to appease the crocodiles. The Agta respectfully call large crocodiles *Apo* (grandfather) or *Lakay* (old man); a vivid relict of the times of Padre Colin. As a result of these traditional beliefs Philippine crocodiles have survived in San Mariano. But, as in other parts of the Philippines, this fragmented crocodile population was under severe threat. Crocodile hatchlings were occasionally captured and sold as pets. Crocodiles got entangled in fishing nets, or were killed when people fished with dynamite, electricity and pesticides. Riverine forests, critical nesting habitat, were cleared for corn production. People opened crocodile nests, large mounds of vegetation, and ate the eggs. There was an urgent need to address these threats.

Bernard Tarun and Mario Soto Jr. radio-tagging an adult crocodile (van der Ploeg 2005)

Releasing a captive-raised juvenile crocodile in Diwagden (van der Ploeg 2007)

In cooperation with the local government unit of San Mariano and the Department of Environment and Natural Resources we designed an in-situ conservation program for the Philippine crocodile. Defying cultural prejudice the *Sanguniang Bayan* adopted the Philippine crocodile as the flagship species of the municipality and drafted several municipal ordinances to protect the species in the wild. In 2001 the administration of Mayor Jesus Miranda declared a municipal Philippine crocodile sanctuary in Disulap River. Farmers agreed to maintain a ten meter buffer zone on the banks of the river. In 2004 the new Mayor Edgar Go deputized twelve people to guard the breeding areas: the *Bantay Sanktuwaryo*. Samuel Francisco became a sanctuary guard in the Disulap River. His task is to inform people about the specific rules of the sanctuary and to guard the crocodile nests in the breeding season (from May to July).

To raise awareness on the protected status of the Philippine crocodile and address irrational fears towards the species we distributed posters, gave lectures in schools, placed billboards, made newsletters, and organized community consultations. Students of Isabela State University performed a cultural show featuring crocodiles in all villages of San Mariano during the annual fiesta. We brought students to Dunoy Lake to see crocodiles in the wild. And we talked with farmers, fishermen and village leaders to discuss crocodile conservation action and solicit their consent. We aimed to engage rural communities in the conservation of the Philippine crocodile and foster interest in the species. The slogan of the public awareness campaign 'the Philippine crocodile: something to be proud of!' characterizes this positive community-based approach. Most people in San Mariano now know that the Philippine crocodile is protected by law. Eighty percent of the people living in crocodile areas say they support the conservation of the species in the wild.

Community consultation on crocodile conservation in barangay Disulap (van Weerd 2008)

Effective communication campaigns for crocodile conservation (van der Ploeg 2007)

The Philippine crocodile population in San Mariano is monitored on a quarterly basis. Students of Isabela State University and Leiden University collect scientific information to design effective conservation measures. Radio telemetry and behavioral observations have provided new insights in the ecology of this poorly known species. Interviews and focus group discussions have led to a better understanding of peoples' attitudes towards crocodiles and the socioeconomic impact of conservation action. Through field research we found that the few hatchlings that were born in the wild nearly all died within days because they were swept away by strong currents in the rivers and creeks. The only area where hatchlings survived was Dunoy Lake, with its warm water and abundant hatchling food in the form of insects, small fish and snails. Using this knowledge a nest protection and head-start program was set up to re-enforce the Philippine crocodile population in San Mariano. Nest surveys are conducted starting April and nests are protected by the Bantay Sanktuwaryo. Crocodile hatchlings are collected and kept in captivity. After eighteen months these animals are released back to the wild thereby greatly reducing mortality rates. So far thirty-four captive-raised crocodiles have been released in specially constructed shallow ponds near crocodile habitat. Also Samuel's crocodile was freed. She was named Isabela, in honor of the province. After eight years in captivity she adapted well to her new environment and now lives in Dunoy Lake where she was observed with an adult male in January 2009.

Governor Grace Padaca releasing a head-started Philippine crocodile (van Weerd 2008)

Left page: Showing the catch of the day. Rural communities benefit from wetland conservation (van der Ploeg 2008)

Hatching eggs at Dunoy Lake (van Weerd 2008)

The future

Philippine crocodiles are no longer purposively killed in San Mariano. The Philippine crocodile population is slowly recovering: from twelve non-hatchling crocodiles in 2000 to fifty-one in 2008. People are proud that such a rare and iconic species still occurs in their village. Rural communities have become actively engaged in the protection of wetlands and the rehabilitation of watersheds. The widespread use of destructive fishing methods not only threatens the Philippine crocodile but also the fish stocks on which people rely. Barangay officials are trained to enforce environmental legislation. Fourteen villages in San Mariano have declared a fish sanctuary to preserve fish stocks. Rural communities made land use plans to reforest idle grasslands and maintain natural riparian buffer zones. Farmers are planting fruit trees to minimize erosion and secure cash benefits. Ten years after Vicente's meeting with Alex farmers in San Isidro are harvesting fruits. The experiences in San Mariano are widely regarded as a model for community-based crocodile conservation. There is new hope for the Philippine crocodile!

Student reports*: Oppenheimer 2001; Oudejans 2002; van Alphen & Telan 2002; van Gils, Tarun & Telan 2002; DESAM 2003; Gatan 2003; Laggui 2003; Guingab 2003; Ranay 2003; Acorda 2004; Garduque 2004; Guingab 2004; DESAM 2004; Tarun 2004; Dabo 2005; Dalupang 2005; Allam, Tagao, Tagarao & Tumaliuan 2006; Arandia 2006; De Jonge 2006; Hoevenaars 2006; Janse 2006; Schreuder 2006; Tumaliuan 2006; Budde 2007; Cauan 2007; Tubbs 2007; van der Aa 2007; Alejandro 2008; Merin 2008; Subia 2008; Telan 2008; van de Ven 2008; Wijtten 2008; Izquierdo-Acebes & Jose 2009; Lindeyer 2009; Alfons in prep.; Engelhart in prep.*

Publications*: van Weerd 2000; van Weerd, General & van Boven 2000; van Weerd 2002; van der Ploeg & van Weerd 2003; van Weerd & van Boven 2003; van Weerd & van der Ploeg 2003; van Weerd et al. 2003; Miranda, van Weerd & van der Ploeg 2004; Tarun et al. 2004; van der Ploeg & van Weerd 2004; van Weerd 2004; van Weerd, van Boven & van der Ploeg 2004; van Weerd & van der Ploeg 2004; Cauilan-Cureg et al. 2005; van Weerd 2005; van Weerd & van der Ploeg 2005a; van Weerd & van der Ploeg 2005b; van der Ploeg & van Weerd 2006; van Weerd & van der Ploeg 2006; van Weerd et al. 2006a; van Weerd et al. 2006b; Cauilan-Cureg & van der Ploeg 2007; van der Ploeg 2007; van der Ploeg, van Weerd & Telan 2007; van der Ploeg 2008; van der Ploeg & van Weerd 2008a; van der Ploeg & van Weerd 2008b; van Weerd & van der Ploeg 2008.*

Adult crocodile in Dunoy Lake (van Weerd 2007)

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HIGH SCIENCE IN RUSTIC HILLS

Wouter de Groot, Koen Overmars, Cecilia Mangabat, Marco Huigen, Marieke Hobbes and Peter Verburg

Introduction

All over the world, farmers have methods for learning. One well-known method applies to what farmers may do when they receive a small amount of seeds of some new crop variety about which it is claimed that it could give very good yields. Would that be true? And where on the farm (soil, slope, shading) should this crop be planted? The strategy that farmers may follow in this case is to: (1) first plant a small amount of seeds in many places on the farm, (2) observe where they grow best and the yield at that best place, (3) remember that best place for this crop. Then, if the yield at the best place has been good enough, (4) next season, plant all now available seeds next to the house and give them a lot of care and fertilizer so that they produce a lot of new seeds, (5) in the next season sow the new seeds at the best place on the farm.

Left page: Carabao in San Mariano (van der Ploeg 2005)

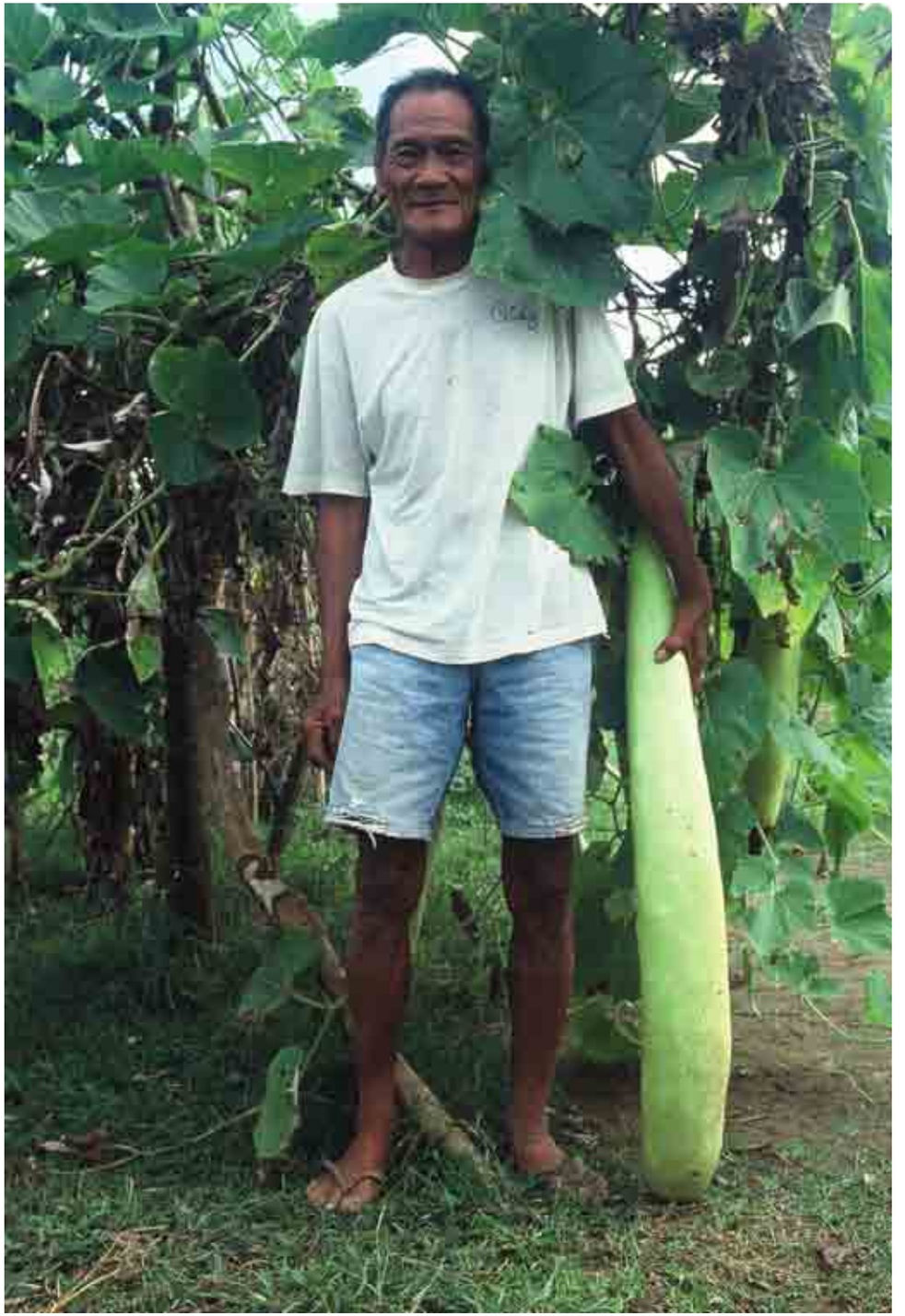
This farmer's method had two key characteristics. First, the farmers did not act upon any pre-set idea about where the crop would grow best. They did not say something like: 'these seeds are round and red, and therefore they will grow best on sandy soil.' Scientists would say that the farmers had no hypothesis, no model, no theory. Therefore, the farmers planted the first small amounts of seeds blindly, everywhere on the farm. Doing so, they created information, a dataset, which in this case contained the pattern of how well the new variety had been growing on the various places. Second, the farmers generalized this pattern from the few seeds and the one season to the many seeds and many seasons. They reasoned that 'if a few seeds did best at this place this time, many seeds will do best here any time.' Together, these two steps of pattern finding and generalization form exactly the methodology that is called induction in the philosophy of science.

As a popular song puts it: 'Planting rice is never fun' (van der Ploeg 2005)

We may well imagine that having good methods for learning can be a matter of life and death for farmers. A farmer, who sowed the new seeds at the wrong place just because he thought they would do well there, may completely fail (or be saved only by the knowledge from the neighbors who did apply the right method). We may therefore expand our story a bit and imagine that farmers would have a discussion on methods, trying to establish, for instance, if it would be best to sow very few seeds at very many places, or sow some more seeds at fewer places. Or: should we have one data set per farm or add up all data and have one big data set for the whole village? And, if a whole-village data set would be better, we may have so many data that we may not be able anymore to discover the pattern just by walking around. Maybe, we should make some classification of soil types and then tally the results on paper? What the farmers are doing here is their own village-level methodology development.

Much can be learned from this story. The first is that the difference between common sense and scientific methods is only gradual. The second is that methods are very important; they can make the difference between a failing and a successful farm; they can help create a successfully adaptive, resilient village. And thirdly, the farmers' methodological discussion was very far removed from the farmers' day-to-day work. It was not about what to do on the farm tomorrow. It was about improving methods for improving learning for improving farming. If the farmers would insist only on direct applicability, that is, on applied science directly relevant for tomorrow, they would never be able to learn about learning and be successful in the longer run. In other words, their high science, even though removed from daily decisions, is very relevant.

Many studies conducted in the framework of the Cagayan Valley Programme on Environment and Development have contained an element of high science, feeding into the world of theories and methods rather than being directly applicable in the region. The history of the joint research programme contains a project that has been focused fully on methodological development: the Land Use Transition Modeling project. This project developed and tested methods in the hills of the municipality of San Mariano. Here, we will give a brief sketch of what the project has been doing.



Mr. Macapia showing his bottle gourd (van der Ploeg 2004)

Induction and deduction

Induction is the methodology that we encountered in the farmers example. Induction proceeds by first gathering the data that are related to some sort of question, then trying to find some pattern in these data, and then declaring this pattern to be a general one. Most often, the data are of the quantitative kind (as was the case also with the farmers; they measured yields as the key variable). In that case, pattern finding usually entails inductive statistics, for example in a correlation or cluster analysis. The farmers used only informal statistics when they tried to establish the correlation between soil type and yield. Scientists usually apply formal methods with the help of computers to 'crunch the numbers.' Sometimes, data are more qualitative, more like stories, and researchers may then compare a number of those stories to find the pattern in them. This is what Elinor Ostrom, for instance, did in her famous book titled *Governing the Commons* published in 1990.

The reverse of induction is called deduction. Deduction is what all students learn as the standard way doing science (even though inductive approaches are in fact much more common). The steps of deduction are the following. First there is a theory or model, for example some general proclamation about how the world is or how it works. From that theory, we derive a hypothesis, which is a specific statement about how things are in a specific case. Then we go into that specific case and test if the hypothesis is true indeed. If it is, we are happy because we can add this test to the truth claim of the theory. If the hypothesis turns out to be untrue, we are (or should be) even happier, because we have falsified the theory, which is (or should be) even more interesting to everyone who believes in the theory.

In practice, deductive and inductive methods are often used inside each other. The farmers of our example used an inductive methodology overall (without a hypothesis on soils/yield correlation) but inside that, they did have theory, for example on what are in fact the appropriate soils types to distinguish and to do the induction with. Moreover, intermediate positions exist between the extremes of pure induction and pure deduction. Often in land use studies, for instance, theories are used to somehow help define what variables to measure and do the induction with. In the present discussion, we use induction and deduction as a straightforward pair of alternatives, however, without bothering about the mixtures.

Upland farm with corn, banana and rice in San Mariano (van der Ploeg 2003)

Ifugao farmer in San Mariano (van der Ploeg 2004)

The Land Use Transition Modeling project and methodological tests

The Land Use Transition Modeling project, a joint research project of Leiden University, Wageningen University and Isabela State University through the Cagayan Valley Programme on Environment and Development, addressed methodological questions. One question was to investigate whether inductive and deductive methods could be compared or integrated in land use studies.

Inductive methods are well-established in land use studies. Usually, the question is to explain land use in some way, that is, to find a correlation between, say, the expansion of corn and a number of explanatory factors such as the slope of the land or the wealth of the land owners (farmers). This is normally done in a spatially explicit way, with many data entered into a geographic information system, and using advanced statistics to find the patterns, for example the correlations between land use change and the explanatory variables. The Land Use Transition Modeling project used this approach in one part of its work.

For the deductive approach, there was no well-established platform yet to start with. The Land Use Transition Modeling project therefore paid much attention to developing a spatially explicit software platform that could be used to build models predicting what farmers in San Mariano would be doing with the land. This platform was of the multi-agent kind, meaning that it simulated the land use choices of many agents (roughly, farmers), depending on input and output (crop) prices, slopes, ethnic group and so on.

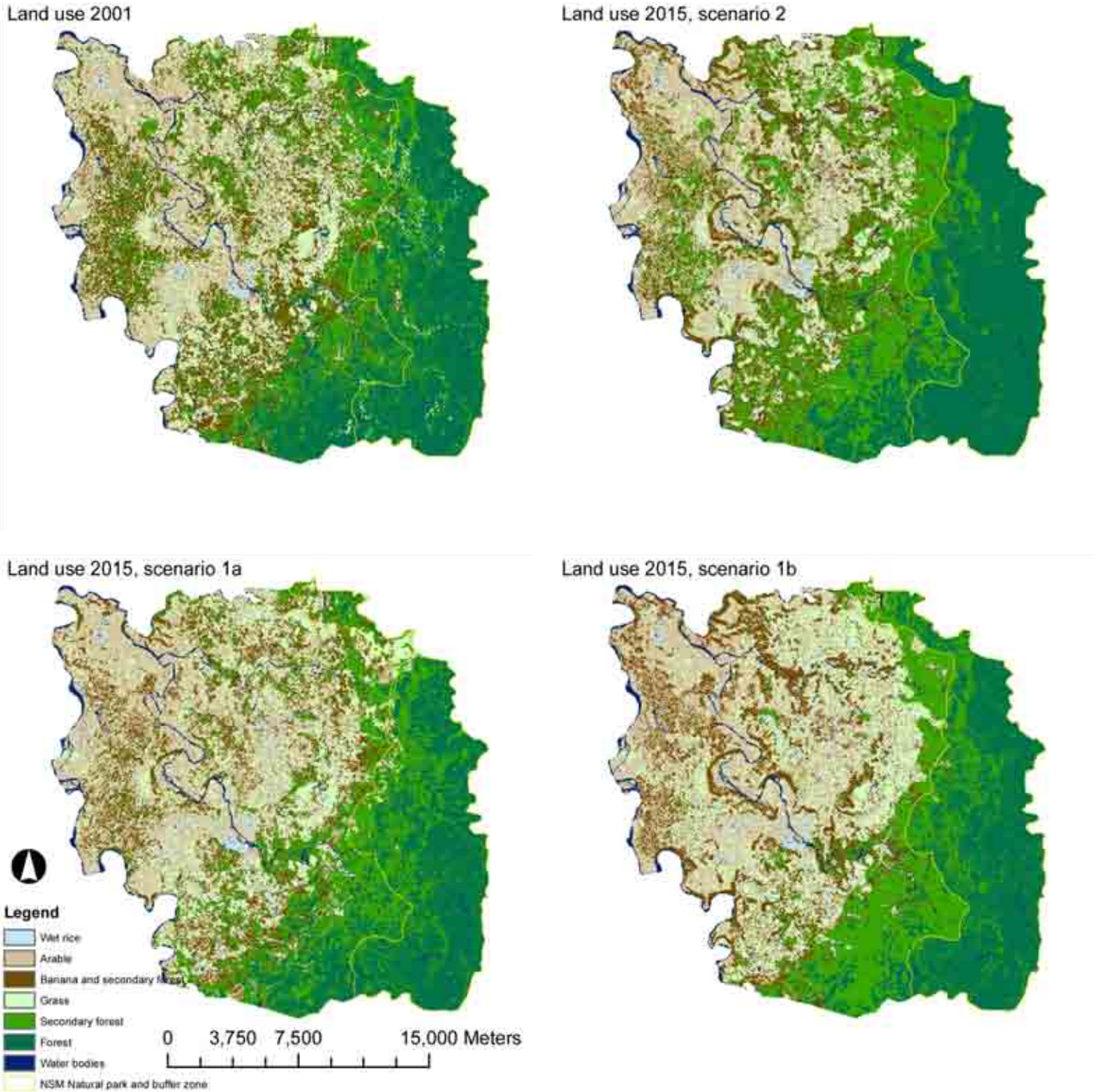
Both approaches, in their own way, could predict what would be the land use in San Mariano, in simple terms such as rice, corn or banana. But which of the methodologies would be the best? The explanatory variables for the inductive methodology were chosen. They were regressed against the actual land use, and all significant correlations were used to build the multiple regression formula that predicted what the actual land use according to that formula should be.

Parallel to that, the deductive model was constructed. It used a broad type of rational choice theory, predicting the land use choices of the farmers on the basis of their (modeled) capacities and their (modeled) motivations, in which the crops' profitability ranked first but also some cultural factors (crop preferences) played a role. The model was then filled with field data on prices, slopes, ethnic group and so on. Notably, the structure and parameters of the model were not calibrated, meaning that the model was not reconstructed on the basis of outcomes in order to arrive at a better fit with reality. That was chosen to keep the work purely deductive, a pure prediction from theory.

The outcome was that the inductive formula generated a true prediction of land use for about 70 percent of the non-forest area of San Mariano. The deductive model also generated a true prediction of land use for about 70 percent of the non-forest area of San Mariano. In a predictive sense, therefore, the approaches scored equally well.

Transporting bananas in San Mariano (van der Ploeg 2003)

The Land Use Transition Modeling project developed land use scenarios for San Mariano (Overmars 2006)



Scenario 1a: “business as usual”, high agricultural expansion without forest protection.

Scenario 1b: high agricultural expansion with forest protection.

Scenario 2: low agricultural expansion, tree-based agriculture, reforestation and forest protection.

The significance of the inductive/deductive test

In a deeper scientific sense, however, everybody is much better off with a deductive model that predicts right in 70 percent of the cases than with an inductive formula that does the same thing. Two reasons apply. The first reason is that the deductive model gives true causal insight. The second reason is that the deductive model can predict the effect of new events. The next two sections elaborate on this.

Let us, by way of example, look at the explanation of the pattern of banana cultivation over the landscape. The inductive model for San Mariano could have found, for instance, that the occurrence of bananas correlates with the occurrence of steep slopes. This is true, of course, but do steep slopes cause bananas? No, they do not. Bananas can grow almost anywhere and if the price of corn would plummet and if the rice would be eaten by snails, we would find bananas almost everywhere, down to the flat valley floors. The formula can never predict this. The deductive model, on the other hand, puts it that bananas are found on every place where they are more profitable than rice and corn, which so happens to be on steep slopes nowadays, because rice there would require terracing and corn there is too risky. If relative prices would change, however, the model predicts that the boundaries between the three crops would wax and wane with them. That is the power of causal knowledge.

The relative prices of corn, rice and banana are of course very important to explain their occurrence in the region. A strange thing with the inductive method is that prices can not enter into the inductive formula, because they are invariable over the region. In other words, the key thing that drives land use cannot be captured. This problem may to some extent be circumvented by making the method a bit less purely inductive. After all, the prices do exist in the region. A next problem represents an even deeper limitation of the inductive method. The effects of new phenomena can never be predicted. They do not exist yet, and therefore can not enter into the data set, and therefore not into the inductive formula. What will happen if cassava or sugarcane is introduced in the region? What will happen if the climate becomes drier? The inductive formula is silent. It can only predict the occurrence of present crops under basically the present circumstances. The deductive model has no problem handling this, however, provided some data are available to calculate the basic profitability of the new crops (depending on prices, soils, slopes) or the effect of drought (on for example corn yields). Of course, the deductive predictions may be proven wrong, for example because the entered data were not good enough or the model structure does not reflect the land users' decision-making any more. Nevertheless, having the model is much better than having nothing at all.

From left to right:
Sweet potato used to be an important food crop (van der Ploeg 2004)

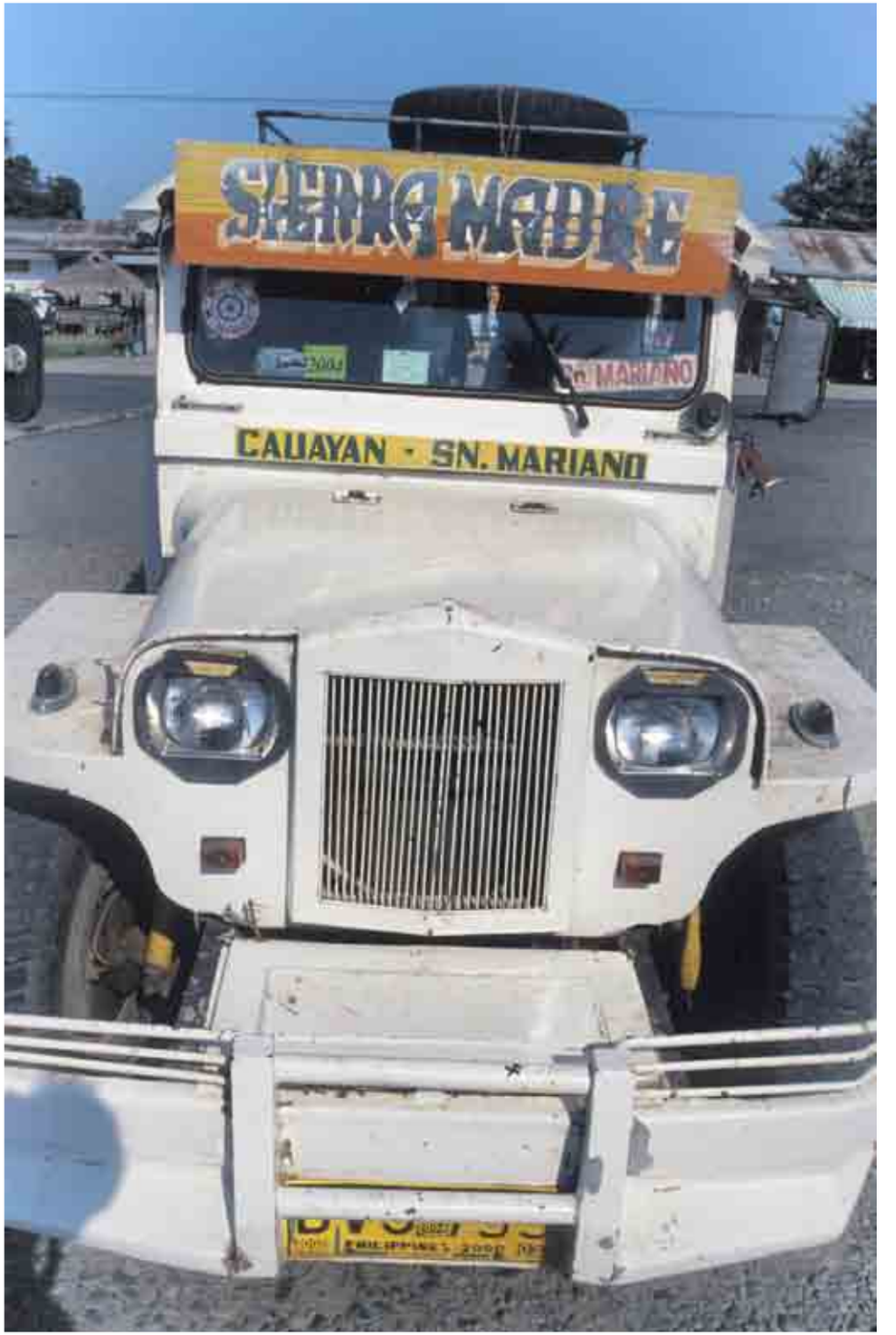
Traditional varieties are replaced by transgenic seeds: white corn (left) and yellow corn (right) (van der Ploeg 2006)

All this does not imply that inductive work should simply be abandoned. To begin with, we may find ourselves in a situation where theories to deduce anything from are simply not available. That was the case, for instance, with the farmers in our seeds example. In the case of Elinor Ostrom, she found that the theories that claimed to be relevant for common property management (rational choice theory, tragedy of the commons model, game theory) were inadequate to capture the essence of the empirical situation. So, she dropped them all and decided, quite rightly, to first listen to the full richness of real-world cases, try to find a pattern in these stories and re-invoke the theories only after that.

In quantitative land use studies, however, inductive methodology is not chosen after careful consideration. Backed up by the impressive machineries of econometrics and geographical information systems, the choice has become an unquestioned paradigm, a matter of routine that is hardly reflected upon. But we do have theories to make models and hypotheses with. All the benefits of deductive methods are waiting to be reaped. Land use science would be better off if inductive and deductive methods would be much more consciously chosen, mixed, sequenced and made to inform each other.

Student reports*: Witte 2003; van Egmond 2003; Sterken 2004; Verhagen 2004; van der Ploeg 2005; Nagtegaal 2008.*

Publications*: de Groot et al. 1998; Huigen 2002; Huigen 2003; Verburg, de Groot & Veldkamp 2003; Overmars, de Koning & Verburg 2003; Verburg, Overmars & Witte 2004; Verburg et al. 2004; Huigen 2004; Overmars & Verburg 2005; Overmars & Verburg 2006; Verburg et al. 2006; Huigen & Jens 2006; Huigen, Overmars & de Groot 2006; Overmars 2006; Overmars, de Groot & Huigen 2007; Overmars, Verburg & Veldkamp 2007; Mangabat et al in press; Huigen & de Groot in press.*



Jeepney to San Mariano (van der Ploeg 2005)

16

SLOW RAFT TO APARRI

Gerard Persoon, Jan van der Ploeg and Andres Masipiqueña

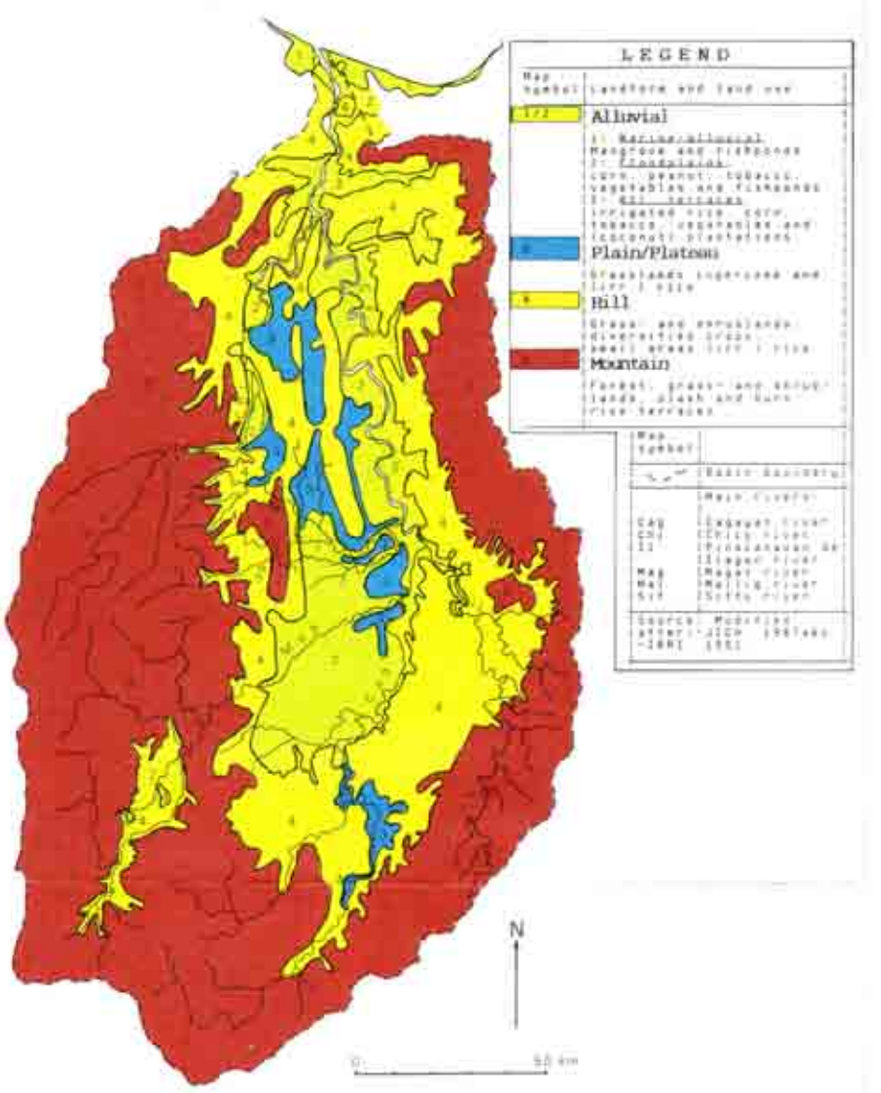
Navigating the river

A long raft of bamboo poles with a single man on it, floating gently towards a downstream destination. It seems the ultimate way to discover the Cagayan Valley and to get to know its people, wildlife, landscapes and problems. In this final chapter we will virtually navigate the Cagayan River, embarking in the mountains and drifting towards Aparri, and present in pictures some fragments of life along its banks.

The Cagayan River, the longest and largest river of the Philippines, draws its waters from the Sierra Madre in the east, the Cordillera in the west and the Caraballo mountains in the south. From the headwaters in the provinces of Quirino and Nueva Vizcaya, the river flows north to its mouth at the Babuyan Channel. Its major tributaries include the Chico River in Kalinga and Mountain Province, the Siffu, Mallig, Abuan and Ilaguen rivers in Isabela, and the Magat River in Nueva Vizcaya and Ifugao, draining an area of approximately 27,000 square kilometer. The Spanish friar Domingo de Salazar was one of the first foreigners who wrote about the Cagayan River in 1588:

> 'This river [….] is very broad and deep, and large vessels can ascend it even to the city [Nueva Segovia, present-day Lallo]. It has an excellent bay. It rises fifty leagues inland, and is inhabited along its entire course by […] people. Its water is excellent, and the whole land is quite fertile and healthful, and abounds in rice, swine, fowls, and palm-wine; and there is much hunting of buffaloes, deer, wild hogs, and birds. A great amount of wax, cotton, and gold is collected in this district, in which articles the natives pay their tribute.'

More than four centuries later the river is still the source of life of the Cagayan Valley. Measuring 227 kilometer from its source to its mouth, the Cagayan River used to be the main mode of transportation. This determined to a large extent the historical settlement pattern in the Cagayan Valley. Almost all towns in the valley are located on the convergence of the Cagayan River and one of its tributaries.



The watershed of the Cagayan River (Maus & Schieferli 1989)

Left page: A man on a bamboo raft approaches the suspension bridge near Lallo (Persoon 1996)

Transporting lumber in Del Pilar, San Mariano (Persoon 2004)

Corporate logging and slash-and-burn farming have severely degraded the watersheds of the valley. Illegal timber extraction continues in the uplands. The rivers are used to transport lumber downstream where it can be loaded onto trucks.

Fishermen chasing fish into their nets in Pinacanauan de Tuguegarao River (Persoon 1987)

Thirty-six freshwater fish species are recorded in the Cagayan River basin. Fish is an important source of food for many people in the valley. People use a variety of fishing methods to maximize their catch: gill nets, hook-and-line fishing, spear fishing, fykes, baited traps, cast nets and small seine nets.

Landslide in Nueva Vizcaya (van der Ploeg 2003)

The flashfloods in Ormoc in 1991 and in Infanta in 2004 claimed thousands of lives, and destroyed crops and properties. Both disasters mobilized broad societal support to enforce environmental legislation protecting critical watersheds, and place reforestation high on the political agenda. But in both these catalytic events, this attention proved to be short-lived: new disasters are in the making as illegal logging, slash-and-burn farming and uncontrolled house-building continue.

Drift wood near a bridge in Nueva Vizcaya (Persoon 1992)

Heavy rainfall and typhoons can cause flashfloods. Driftwood, soil and stones are deposited in the bends of the river and under bridges causing much damage to infrastructure, houses and crops. This situation is aggravated by the unabated deforestation activities in critical watersheds. The drift wood also provides an economic opportunity: some people use the driftwood to produce charcoal. People in the Cagayan Valley cope with environmental change, and try to make the best of it.

The Magat Dam (Persoon 1993)

As with so many other rivers in the world, the natural flow and rhythm of the Cagayan River has been thoroughly modified. The Magat Dam has fundamentally transformed life in the Cagayan Valley. Constructed in 1983, the dam provides electricity, limits flooding and supplies irrigation water for approximately 85,000 hectare, making Isabela one of the major rice producing areas in the Philippines.

Fish cages in the reservoir of the Magat Dam (Persoon 1996)

Ifugao communities along the Magat River were obliged to resettle during the construction of the dam. But the reservoir also offered new economic opportunities. Nowadays, fish cages provide a source of income for people. Due to the sedimentation of the reservoir, the dam's expected life span has been reduced from 50 to 35 years.

Transporting bananas over the Ilaguen River in San Mariano (Persoon 1998)

Since the construction of the Maharlika Highway in the late 1960s the Cagayan River has lost its transport function. But in the uplands farmers still transport their agricultural products by boat or raft over the river to the market. Note the remnant wooden pillars of an old bridge.

Bathing cows in Cagayan River in Cabagan (Persoon 2005)

Cows, buffalos and horses are taken to the river to cool down from the heat during the hottest hours of the day. Cars, buses, jeepneys and motorbikes are also cleaned in the river.

Chico River dam (van der Ploeg 2007)

Irrigation contributes significantly to the increase in the production of rice. This dam in the Chico River raises the water level to supply the inlet of an irrigation system.

Quarrying gravel in Tumauini (Persoon 2001)

Sands and stones are taken from the river beds to provide construction material for houses, roads and bridges.

Bridge waiting to be finished in Isabela (Teeuwisse 2005)

There are only few bridges across the Cagayan River. The biggest bridge is at Lallo. Other bridges are located in Tuguegarao, Gamu and Naguilian. In many areas the only way to cross the river is by boat. In some areas a number of bancas are tied together to allow for heavier loads. Jeepneys and small trucks can be taken on board to reach the other side of the river.

Collapsed bridge in Cagayan (van der Ploeg 2007)

Typhoons can cause substantial damage to bridges. In some cases weakened bridges collapse under heavy trucks. This causes serious transport problems in the Cagayan Valley.

Reaching Aparri

One would expect that the mouth of the largest river in the Philippines is a big and busy place. Port towns are usually full of movements of ships, products and people. But in the Cagayan Valley this is not the case. Aparri is a sleeping fishing village: small fishing boats are pulled ashore, fishing nets are being repaired, and shrimps and fish are put on the concrete roads to dry in the heat of the sun.

Sedimentation due to upstream erosion has made the Cagayan River impossible to navigate for seafaring vessels. Reaching Lallo by ship as was described by Domino de Salazar in the 16th century is no longer possible. Cagayan's harbor is located in Santa Ana, on the northeastern tip of the province. Most economic activity is located here, particularly after the creation of the Cagayan Economic Zone and Freeport.

One day when walking along the beach, we were suddenly surrounded by men, women and children who energetically collected the rubbish deposited by the Cagayan River. They piled it into heaps and set it on fire. Under a little shed a lady proudly explained that this was an action taken by the community. People were fed up with the enormous amounts of waste materials in their environment. In the future they hope that politicians will take steps to reduce the amount of waste from upstream.

In some areas, the river banks have been enforced to avoid erosion and prevent damage to houses and infrastructure. But despite these large infrastructural projects, the Cagayan River remains an untamed river, freely meandering through the valley. In Tuguegarao, for example, the government has tried to redirect the flow of the water by constructing a dam in the river and by enforcing the river bank.

River control in Tuguegarao City (Persoon 1991)

Right page: Boats on the beach in Aparri. In the background: piles of waste material deposited on the river banks are collected and burned by the inhabitants of Aparri. (Persoon 2005)


JENELYN
CRIS VERGEL

THE SIGNING OF THE AGREEMENT BETWEEN ISABELA STATE UNIVERSITY AND LEIDEN UNIVERSITY ON 5 JUNE 1989

From left to right: Prof. H. Udo de Haes (Director Institute of Environmental Sciences), Mr. G. Braks (Minister of Agriculture, the Netherlands), Dr. R. Nayga (President Isabela State University), Mr. C. Oomen (President Leiden University), Prof. P. Nkwi (Minister of Higher Education, Cameroon), G. Persoon (Programme Environment and Development) (CML archive 1989)

APPENDIX I - AGREEMENT FOR COOPERATION

Agreement for cooperation in the field of Environment and Development between:
THE ISABELA STATE UNIVERSITY (ISU), THE PHILIPPINES and THE LEIDEN UNIVERSITY (RUL), THE NETHERLANDS

Article 1: Aims

The aims of this agreement are:

- to contribute to the growth of environmental science as an interdisciplinary field of research and education for developing countries;
- to strengthen the research, education and extension capacity of ISU, especially of its College of Forestry;
- to strengthen the research and education capacity of RUL, especially of the Programme Environment and Development of the Centre for Environmental Studies;
- to contribute to the institutional build-up of ISU, especially of its College of Forestry;
- to stimulate and to work for the implementation of projects with a directly practical relevance for the sustainable development of the Cagayan River Basin and the adjacent areas within Region 2, and for the safeguarding of the region's natural heritage.

Article 2: Means

The aims of this Agreement will be pursued by means of the design, execution and periodic evaluation of a Joint Programme, in which the general research themes of the Programme Environment and Development (RUL) will be linked to environmental problems and potentials of the region specified above, by mutual consent of the Programme Environment and Development (RUL) and the College of Forestry (ISU). In physical terms, the Joint Programme will consist of:

- a field station of the Programme Environment and Development (RUL), connected to the College of Forestry (ISU), of which the basic personnel and budget will be provided by RUL, as specified in the Joint Programme;
- faculty member time commitments, basic office space and limited other facilities of ISU, as specified in the Joint Programme; this especially concerns the College of Forestry, but other ISU components may be involved as the need arises;
- additional means, provided from other sources, collaboratively applied for or accepted by the two participants of the Joint Programme.

Article 3: Structure

3a. The cooperation of ISU and RUL will be shaped by documents on four levels. This Agreement constitutes the highest level of this structure.

3b. A Joint Programme will be signed on behalf of the College of Forestry (ISU) and the Centre for Environmental Studies (RUL), specifying, in general terms and for a period of 5 years, the research and education efforts to be undertaken and the contributions of both parties.

3c. The execution of the Joint Programme will be supervised by an Environment and Development Management Team from ISU consisting of qualified faculty involved in environmental science, and the Management Team of the Programme Environment and Development of the Centre for Environmental Studies at RUL. Separately, they bear the final responsibility for the allocation of the contributions of ISU and RUL, respectively. By mutual consent, they bear the final responsibility of the execution of the Joint Programme as a whole.

3d. The daily management of the respective contributions and execution of the Joint Programme shall be entrusted to a field station coordinator from RUL and a counterpart coordinator from ISU. They shall draft a Yearly Plan of Operations, stating in sufficient detail the activities to be carried out and the allocated budgets and time commitments for that year, set in a three-year perspective. The Yearly Plan of Operations requires the endorsement of both the Management Teams.

3e. Projects and studies carried out within the Joint Programme framework shall in principle be carried out by counterpart students and faculty from RUL and ISU, working together, student by student, faculty by faculty or in a mixed arrangement, on a basis of project and study descriptions mutually adhered to.

3f. Both parties will account for their finances separately, following regulations of their respective universities. As for additional funds acquired by the collaborative action of the Joint Programme, it will be decided on a case to case basis which of the two parties will keep the account.

Article 4: Time Frame

4a. The Joint Programme's activities shall be designed and executed in a long term perspective. The Joint Programme will start in 1989 and its first phase of the operation will be evaluated in 1991.Thereafter, evaluation will take place every 5 years, and a renewed Joint Programme may be formulated on that basis.

4b. Alterations on the Agreement or the Joint Programme may at any time be agreed upon mutual consent.

4c. This Agreement terminates by mutual consent or by cancellation by any one of the parties, on a 6-month notice. In the case of termination mutually agreed upon, the material goods of the Joint Programme will be transferred to the host university. In the event of termination not mutually agreed upon, RUL has the right to withdraw the movable goods brought in by that university.

Signed in Leiden, June 5th 1989

President of the Isabela State University, Rodolfo C. Nayga, Ph.D.	President of the Leiden University, Dr. C.P.C.M. Oomen.

APPENDIX II - CVPED PUBLICATIONS

Over the past twenty years the Cagayan Valley Programme on Environment and Development has produced a range of publications. We have arranged these outputs in the following categories:
a. PhD. dissertations
b. Conference proceedings
c. Student reports
d. Scientific publications
e. Project reports

All publications are available at the library of the Cagayan Valley Programme on Environment and Development at the Environmental Information Centre at the Cabagan campus of Isabela State University and at the library of the Institute of Environmental Sciences at Leiden University.

a. PhD. dissertations

Finalized

Aquino, D.M. 2004. *The resource management in ancestral lands: the Bugkalots in northeastern Luzon.* PhD. dissertation. Leiden University, Leiden

Overmars, K. 2006. *Linking process and pattern of land use change: illustrated with a case study in San Mariano, Isabela, Philippines.* PhD. dissertation. Leiden University. Leiden.

Pasicolan, P.N. 1996. *Tree growing on different grounds: an analysis of local participation in contract reforestation in the Philippines.* PhD. dissertation. Leiden University. Leiden

Romero, M.R. 2006. *Investing in the land: agricultural transition towards sustainable land use in the Philippines forest fringe.* PhD. dissertation Leiden. University. Leiden.

van den Top, G.M. 1998. *The social dynamics of deforestation in the Sierra Madre, Philippines.* PhD. dissertation. Leiden University. Leiden.

On-going

Afidchao, M. in prep. *Invertebrate abundance, richness and diversity in transgenic (Bt, Bt/RR) and non-transgenic corn fields in the Philippines.*

Huigen, M. in prep. *Multi-agent modeling of land use change at the watershed level, Philippines.*

Mangabat C. in prep. *Tree planting and sustainable forestry in the Northeast Philippines uplands.*

Minter, T. in prep. *The Agta of the Northern Sierra Madre Natural Park. Livelihood strategies and resilience among Philippine hunter-gatherers.*

Perez, P. in prep. *Indigenous peoples and natural resources use in the Philippines and Indonesia.*

Saliling W. in prep. *Development of Joint Analyses and Design (JADE) methodology for assessing and improving water and nutrient resources dynamics in upland agricultural systems*

van der Ploeg, J. in prep. *Philippine crocodile conservation.*

van Weerd, M. in prep. *Biodiversity of the Northern Sierra Madre.*

Villegas, K. in prep. *Biodiversity conservation: integration of communities' perceptions and needs with global visions on nature conservation in Northeast Luzon.*

Left page: Opening of the 5th Conference of the Cagayan Valley Programme on Environment and Development on April 10, 2005 in Callao Caves (Persoon 2005)

Regional stakeholder meeting (van der Ploeg 2005)

b. Conference proceedings (in chronological order)

CVPED. 1992. *Forestry for people and nature. Field research and theory on environment and development in the Cagayan Valley, Philippines.* Proceedings of the 1st CVPED work conference. CVPED. Cabagan: 469 pages, 4 parts:

1. Overview (5 papers)
2. Environment and development in the Cagayan Valley, first impressions (13 papers)
3. Theoretical reflections (12 papers)
4. Institutional cooperation: forestry and environmental science for people and nature (7 papers)

Guzman, R.S. & W.T. de Groot (eds.). 1997. *Research for the Sierra Madre forest.* Proceedings of the 2nd CVPED conference. CVPED. Cabagan: 134 pages, 4 parts.

1. Science (4 papers)
2. Biodiversity (4 papers)
3. Forest use (5 papers)
4. Action (4 papers)

Bernardo, E.C. & D.J. Snelder (eds.). 1999. *Co-managing the Environment; the natural resources of the Sierra Madre Mountain Range.* Proceedings of the international work conference, CVPED & Plan International. Cabagan: 330 pages, 6 parts:

1. Defining co-management (2 papers)
2. Socioeconomic causes and consequences of environmental degradation (3 papers)
3. Indigenous forest dwellers (3 papers)
4. Resource exploitation and management (5 papers)
5. Community-based projects (8 papers)
6. Policies and institutional arrangements for community-based resource management (7 papers)

van der Ploeg, J., E.C. Bernardo & A.B. Masipiqueña (eds.). 2003. *The Sierra Madre Mountain Range: global relevance, local realities.* Papers presented at the 4th regional conference on environment and development. CVPED. Golden Press. Tuguegarao: 464 pages, 5 parts:

1. Ecosystems, endemism and extinction: improving protected area management (8 papers)
2. Land, logging and livelihoods: a transition to sustainable land use (7 papers)
3. Guardians, greed and governance: an evaluation of co-management approaches (6 papers)
4. People, parks and poverty: integrating conservation and development (6 papers)
5. Forest, frontiers and the future: building an ecological conscience (4 papers)

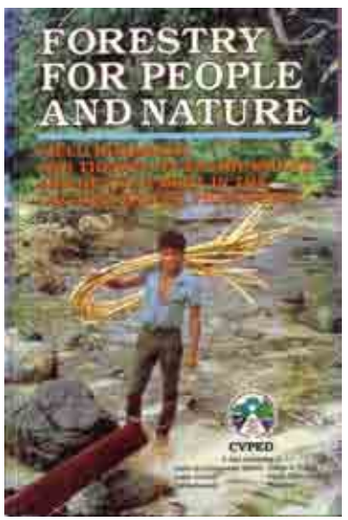
Available at: https://www.openaccess.leidenuniv.nl

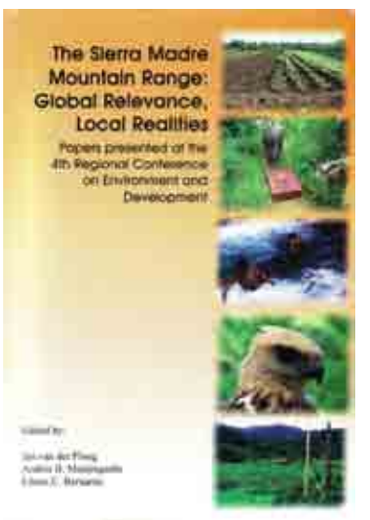
van der Ploeg, J. & A.B. Masipiqueña (eds.). 2005. *The future of the Sierra Madre: responding to social and ecological changes.* Proceedings of the 5th international conference on environment and development. CVPED. Golden Press. Tuguegarao: 528 pages, 4 parts:

1. Tree growing in agricultural landscapes: smallholder tree growing for sustainable rural development and environmental conservation and rehabilitation (16 papers)
2. Environmental change through social change? Towards understanding the role of indigenous peoples in the Philippines (15 papers)
3. The future of Philippine forestry education: issues and challenges (3 papers)
4. Modeling land use transitions in the Cagayan valley (2 papers)

Available at: https://www.openaccess.leidenuniv.nl

Next page:
Forestry students working in a reforestation site in San Mariano (van der Ploeg 2006)
Nicolas Tubbs explores a cave in San Mariano (van der Ploeg 2006)
Students go to the field by boat during the summer course in Divilacan (van der Ploeg 2005)
Sanne Wagenaar films a Philippine crocodile nest in San Mariano (van Weerd 2008)
Michela Baldi, Way Agatep and Mina Labuguen with their key informants in Gattaran (Persoon 1997)
Hans Goslinga playing guitar in Palanan (van der Ploeg 2006)





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APPENDIX III - THE PEOPLE OF CVPED

CVPED coordinators

Filipino coordinators

Roberto Araño (1989 – 1994)
Andres Masipiqueña (1995 – to present)

Dutch coordinators

Gerhard van den Top (1989 – 1994)
Denyse Snelder (1995 – 1998)
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Leonardo Paat
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Steering committee (the Netherlands)

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Roger Guzman
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Leon Gonzales
Edmundo Gumpal
Tomas Reyes
Cecilia Mangabat
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Severina Baldonado
Herminia Allam
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Marino Romero
Domingo Paguirigan
Jovy Servitillo
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In 1989 Isabela State University and Leiden University signed an agreement for cooperation in the field of environmental research and education: the Cagayan Valley Programme on Environment and Development (CVPED). In the course of two decades the joint programme has facilitated the research activities of Filipino and Dutch scholars in the Cagayan Valley and the Sierra Madre Mountain Range. Over the past twenty years the programme has contributed to a better understanding of the social and environmental changes in the region, and strengthened research capabilities of the two partner universities.

This book celebrates twenty years of interdisciplinary and intercultural research and education in Northeast Luzon. It offers a description of all the activities conducted in the framework of the academic partnership, and it provides an overview of all scientific publications. The main research topics of the joint programme are described ranging from deforestation to grassland rehabilitation and from protected area management to sustainable land use. This book has 16 chapters that celebrate the people, the wildlife and the landscapes of the Cagayan Valley and the Sierra Madre, illustrated with photographs by researchers and students of the programme.