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Satoyama Initiative Thematic Review vol. 2



Mainstreaming concepts and approaches of socio-ecological production landscapes and seascapes into policy and decision-making

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Satoyama Initiative Thematic Review vol. 2

**Mainstreaming concepts and approaches of
socio-ecological production landscapes and seascapes
into policy and decision-making**

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Satoyama Initiative

The Satoyama Initiative is a global effort, first proposed jointly by the United Nations University and the Ministry of the Environment of Japan (MOEJ), to realise “societies in harmony with nature” and contribute to biodiversity conservation through the revitalisation and sustainable management of “socio-ecological production landscapes and seascapes” (SEPLS). The United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) serves as the Secretariat of the International Partnership for the Satoyama Initiative (IPSI). The activities of the IPSI Secretariat are made possible through the financial contribution of the Ministry of the Environment, Japan.

UNU-IAS

The United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS) is a leading research and teaching institute based in Tokyo, Japan. Its mission is to advance efforts towards a more sustainable future, through policy-relevant research and capacity development focused on sustainability and its social, economic and environmental dimensions. UNU-IAS serves the international community, making valuable and innovative contributions to high-level policymaking and debates within the UN system. The activities of the institute are in three thematic areas: sustainable societies, natural capital and biodiversity, and global change and resilience.

IGES

The Institute for Global Environmental Strategies (IGES) was established in March 1998 under an initiative of the Japanese government and with the support of Kanagawa Prefecture. The aim of the Institute is to achieve a new paradigm for civilisation and conduct innovative policy development and strategic research for environmental measures, reflecting the results of research into political decisions for realising sustainable development both in the Asia-Pacific region and globally. The Institute will tackle fundamental challenges to human society, and to redefine the values and value systems of our present societies that have resulted in the global environmental crisis, in order to create new ways of conducting activities and a new paradigm for civilization.

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Foreword

In recent years, there has been growing recognition of the indispensable role of biodiversity and ecosystems in supporting human livelihoods and well-being, and the necessity of their conservation in order to achieve sustainable development. Efforts are being made to develop innovative ideas for creating synergies between conservation and livelihoods, and to achieve an even wider range of social, cultural, economic and environmental goals. The rapid urbanisation, globalisation and ever-increasing demand for natural resources that threaten ecosystems, however, require us to take further action to promote the mainstreaming of such good practices through replication and upscaling.

Since its launch at the Tenth Meeting of the Conference of the Parties to the Convention on Biological Diversity (CBD COP 10) in Aichi-Nagoya, Japan in 2010, the International Partnership for the Satoyama Initiative (IPSI) has been promoting conservation and sustainable management of “socio-ecological production landscapes and seascapes” (SEPLS) to ensure the provision of diverse ecosystem services while supporting biodiversity. Good management of SEPLS contributes to the achievement of the CBD’s Aichi Biodiversity Targets, the UN’s Sustainable Development Goals (SDGs) and others. As the membership of IPSI has grown to 190 organisations, it has accumulated a wide range of knowledge and experience, which members take advantage of in various ways through their collaborative work toward the better management of production landscapes and seascapes.

In this context, it is my pleasure to present the second volume of the Satoyama Initiative Thematic Review, focusing on the theme of “mainstreaming concepts and approaches of socio-ecological production landscapes and seascapes into policy and decision-making”. The Satoyama Initiative Thematic Review publication series was launched in 2015, providing an annual compilation of IPSI case studies on a specific theme with the purpose of gaining a deeper and more focused understanding of SEPLS and approaches to their management. Mainstreaming has recently been increasingly emphasized in the global conversation on biodiversity and development as a critical process to move the world forward towards sustainable development, and it will be one of the themes of CBD COP 13 in December 2016. I hope the papers in this volume will provide inspiration and useful knowledge for practitioners, policymakers and scientists working for the sustainable management of production landscapes and seascapes, and that the activities described here will make broader contributions towards mainstreaming.

Dr. Kazuhiko Takemoto

Director, United Nations University Institute for the Advanced Study of Sustainability

Preface

The Satoyama Initiative is “a global effort to realise societies in harmony with nature”, started through a joint collaboration between the United Nations University (UNU) and the Ministry of the Environment of Japan. The initiative focuses on the revitalisation and sustainable management of “socio-ecological production landscapes and seascapes” (SEPLS), areas where production activities help to maintain biodiversity and ecosystem services in various forms while sustainably supporting the livelihoods and well-being of local communities. In 2010, the International Partnership for the Satoyama Initiative (IPSI) was established to implement the concept of the Satoyama Initiative and promote various activities by enhancing awareness and creating synergies among those working with SEPLS. IPSI provides a unique platform for organisations to exchange views and experiences and to find partners for collaboration. At the time of writing, 190 members have joined the partnership, including governmental, intergovernmental, nongovernmental, private-sector, academic and indigenous-peoples’ organisations.

As one of its core functions, IPSI serves as a knowledge-sharing platform through the collection and sharing of information and experiences on SEPLS, providing a place for discussion among members and beyond. More than 80 case studies have been collected and are shared on the IPSI website, providing a wide range of knowledge covering diverse issues related to SEPLS. Discussions have also been held to further strengthen IPSI’s knowledge-facilitation functions, with members suggesting that efforts should be made to produce knowledge on specific issues in SEPLS in order to make more targeted contributions to decision-makers and on-the-ground practitioners.

It is in this context that a project to create a publication series titled the “Satoyama Initiative Thematic Review” was initiated in 2015 as a joint collaboration between UNU’s Institute for the Advanced Study of Sustainability (UNU-IAS), which hosts the IPSI Secretariat, and the Institute for Global Environmental Strategies (IGES), an IPSI partner and research institute based in Japan. The Thematic Review was developed as a compilation of case studies providing useful knowledge and lessons focusing on a specific theme that is important for “socio-ecological production landscapes and seascapes (SEPLS)”. The overall aim of the Thematic Review is to collect experiences and relevant knowledge, especially from practitioners working on the ground, considering their usefulness in providing concrete and practical knowledge and information as well as their potential to contribute to policy recommendations. Each volume is also accompanied by a synthesis chapter which extracts lessons learned through the case studies, presenting them for policy-relevant academic discussions.

The first volume of the Satoyama Initiative Thematic Review was published in 2015 with the theme “enhancing knowledge for better management of SEPLS”. This second volume’s theme is “mainstreaming concepts and approaches of SEPLS into policy and decision-making”, covering topics including advocacy, multi-stakeholder engagement, facilitation and coordination of institutions, concrete tools and information useful for policymakers and stakeholders. The volume compiles seven selected case studies provided by authors belonging to IPSI member organisations. Authors were asked to describe their findings on necessary capacities, processes, success factors and obstacles to mainstreaming SEPLS concepts and approaches, and were invited to take part in a three-day workshop held at UNU-IAS in Tokyo in May 2016 for further discussion of these topics.

The seven case studies present a wide range of experiences of mainstreaming initiatives in seven different parts of the world, covering activities including: conservation of agricultural biodiversity of rice and other crops in India, revitalisation of ancient wheat varieties in Italy, domestication of forest medicinal herbs in Nepal, governance and management of forests used by indigenous communities in China, conservation of wine production landscapes in Austria, protected area management through potential use of tourism in Uganda and participatory management in Taiwan.

This publication was developed through a multi-stage process including both peer review and discussion among the authors. Authors had several opportunities to get feedback, which helped them to make their manuscripts more useful and easy to understand for readers. First, each manuscript received comments from the editorial team relating primarily to their contributions to the theme of the volume. Peer review was then conducted by the authors of other chapters, with each author receiving feedback from two other authors who were requested to comment on whether the manuscript was easy to understand and informative, provided useful lessons, and so on. The aforementioned workshop was then held to enable the exchange of feedback between authors. Here, the authors presented their case studies and received comments both from the two designated reviewers and from the other workshop participants. The workshop also served as a place for discussion

to further deepen understanding on the theme and to extract findings across all the case studies. The basic ideas contained in the synthesis chapter were developed from the presentations and discussions during the workshop, and the chapter was made available for review by authors and selected experts before finalisation.

We believe that the above process used for developing this publication offers an opportunity for authors from both academic and non-academic organisations to contribute to knowledge-building in an accessible and interactive way, as well as to provide high-quality papers written in simple language for academics and a broader audience alike. It is our hope that this publication will be useful in providing information and insights on sustainable management of SEPLS for practitioners, researchers and policymakers.

We would like to thank all of the authors who contributed their case studies and the other participants in the case study workshop. We also greatly appreciate the efforts of IGES for their continued collaboration in the publication process of this volume. Our grateful thanks are also due to the Ministry of the Environment, Japan for supporting the activities of IPSI and its secretariat hosted by UNU-IAS.

Kaoru Ichikawa, Suneetha M. Subramanian, Shamik Chakraborty

United Nations University Institute for the Advanced Study of Sustainability (UNU-IAS)

Toward mainstreaming concepts and approaches of socio-ecological production landscapes and seascapes (SEPLS): lessons from the field

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1. Introduction

The term “socio-ecological production landscapes and seascapes” (SEPLS) has been used to refer to areas with “dynamic mosaics of habitats and land and sea uses where the harmonious interaction between people and nature maintains biodiversity while providing humans with the goods and services needed for their livelihoods, survival and well-being in a sustainable manner” (IPSI Secretariat 2015). SEPLS can be found in many parts of the world—with many different socio-economic contexts—where humans are directly linked with nature through various forms of resource use including primary industries, subsistence activities, tourism and others. In SEPLS, biodiversity and ecosystems

support humans with food, fuels, shelter, cultural values and other tangible and intangible services while humans support biodiversity and ecosystems through sustainable management of natural resources. Many systems have evolved through such mutual human-nature relationships over a long time, accumulating traditional knowledge useful for sustainable management that can be built on for further development.

Given its multifaceted nature, SEPLS management calls for a holistic approach, as promoted through the Satoyama Initiative (Figure 1). This often means multi-sectoral participation at the landscape scale. Furthermore, activities for SEPLS conservation often cover multiple dimensions,

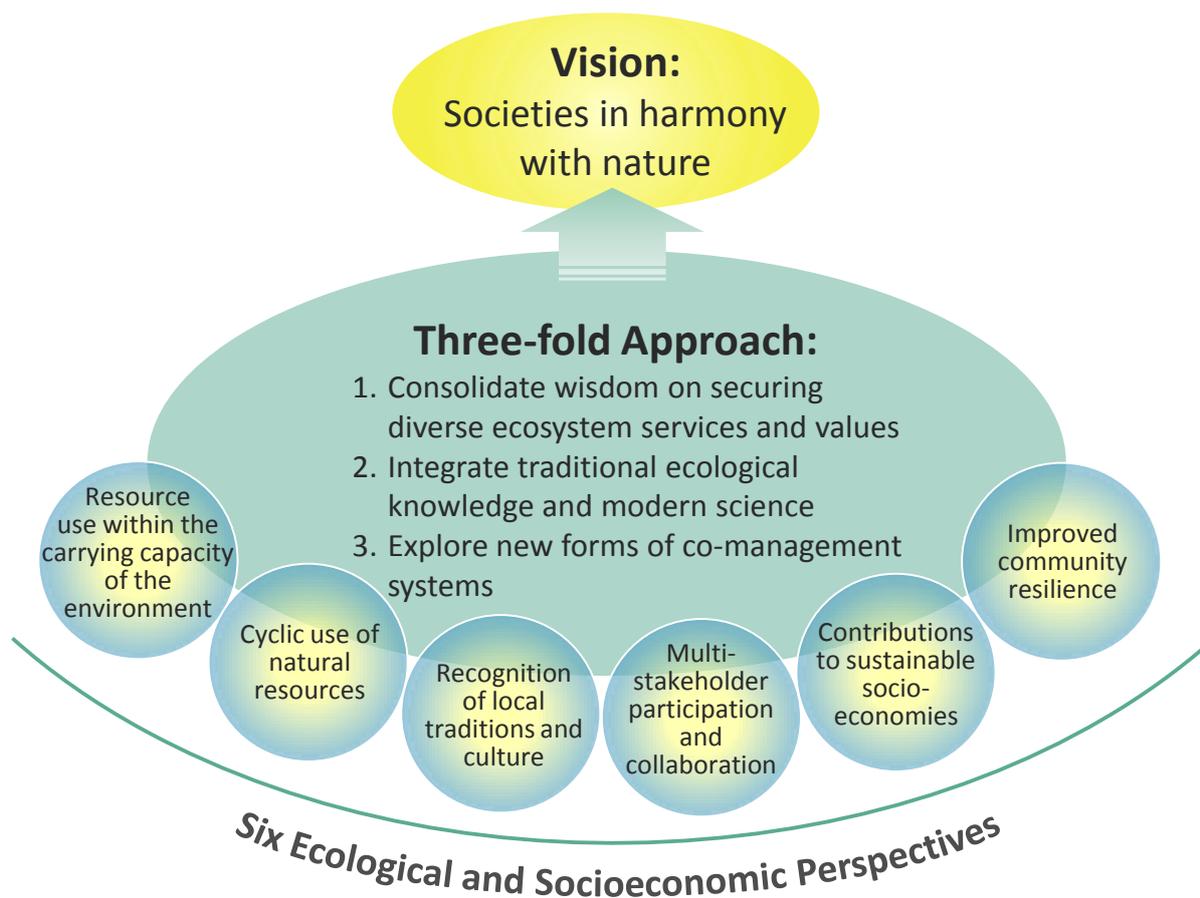


Figure 1: Conceptual Framework of the Satoyama Initiative (Source: IPSI Secretariat 2015)

such as gender, poverty and deforestation, and incorporate traditional knowledge for sustainable management practices (UNU-IAS & IGES 2015). However, despite the increasing number and variety of innovative activities for sustainable SEPLS management, it is still far from being sufficiently integrated into mainstream landscape-management practices. Unless effective innovative activities become regular, ubiquitous and operated continuously at larger scales, it will be difficult to achieve sustainable development with harmonious human-nature relationships that safeguard ecosystems and biodiversity while increasing human well-being.

In this chapter, we summarise findings from a selection of case studies on mainstreaming concepts and approaches of SEPLS in decision-making processes. “Mainstreaming” here refers to larger-scale adoption of activities for SEPLS conservation. The mainstreaming process can happen at various levels. For example, at the relatively small social level of local community groups, efforts that have worked well in one place can be replicated in other areas, or mechanisms can be established at larger scales as part of policy-planning and implementation processes. Either way, it means an incorporation of activities and

associated principles of resource and ecosystem-service use into wider areas. Successful mainstreaming would ensure better visibility and attention for issues related to conservation of resources and their sustainable use, preservation and promotion of related knowledge, and cultural and livelihood values associated with SEPLS. This is especially important given the increasing global emphasis on locally-relevant solutions that meet the principles of sustainable development (Gu & Subramanian 2012).

This publication aims to highlight lessons on mainstreaming SEPLS activities from seven case studies contributed by members of the International Partnership for the Satoyama Initiative (IPSI). The case studies are from various parts of the world and cover a wide range of activities related to management of natural resources, as shown in Table 1. They were selected from submissions to a call for papers sent out on this theme. This chapter builds on discussions undertaken by the authors at a workshop held at the United Nations University Headquarters Building in Tokyo in May 2016. In this chapter we first summarise characteristic features of the mainstreaming efforts described in the seven case studies by identifying the focus of the activities and their socio-economic and environmental contexts. Then,

Table 1. Overview of the case studies

Chapter number	Authors	Sites	Major actors	Activities
2	Liu and Liu	H Village, Yunnan Province, China	University, research institutes, government, NGOs, donor agencies, local communities	Use of policies and development interventions that affect forest use from the perspective of activating traditional forest-related knowledge (TFRK) through community participation
3	Gualandi and Gualandi	Montespertoli, Tuscany, Italy	NPO, university, local council, government, farmers, processors, local stakeholders	Revitalizing ancient wheat varieties through coordinated links among producers, processors, consumers and other stakeholders
4	Kieninger et al.	Wachau, Austria	EU, government and state authorities (Federal state, province), local authority, market parties, civil society actors/NPOs	Use of policy tools and market mechanisms for conservation of cultural landscapes including subsidies for environmentally friendly farming, community development programmes and Geographical Indication for branding products
5	Lee et al.	Ciharaay Cultural Landscape, Hualien County, Taiwan	University, local management committee, farmers	Tailoring the concept of SEPLS to the national planning process on protected areas through designation and planning of the Ciharaay Cultural Landscape
6	Olupot and Isabirye-Basuta	Mabira Central Forest Reserve, Uganda	University, National Forestry Authority, NGO, local forestry organization	Documentation and evaluation of landscape values (attractions) and biodiversity characteristics for ecotourism in a Reserve Forest area
7	Kumar et al.	Wayanad, Kerala, India	Research institute, NGOs, farmers (indigenous people)	Four programs for conservation of agrobiodiversity and cultural diversity; livelihood improvement; and capacity building
8	Pandit et al.	Syafu (Rasuwa District), Kushadevi (Kavre District) and Shaktikhor (Chitwan District), Nepal	University, local government (e.g. VDC/DDC), district line agencies, local groups (including forest or buffer zone user groups), farmers	Development of local biodiversity strategies and action plans (LBSAPs) Domestication of endangered wild herb species

based on the success factors and challenges provided in the case studies, we highlight broad principles that enable successful implementation of mainstreaming activities.

2. Characteristic features of mainstreaming activities

Although diverse, the activities discussed and analysed in the seven case studies exhibit certain characteristics relevant to mainstreaming processes, some of which are extracted here to provide clues to success factors.

2.1 Focus of activities

The case studies describe activities that are diverse and often multiple in focus, showing that SEPLS conservation benefits from holistic resource-management approaches. Mainstreaming of SEPLS concepts in different contexts can

involve focus on different key needs as listed below. More detailed examples can be found in Table 2.

- Biodiversity conservation (including agricultural biodiversity) and resource management: Biodiversity conservation and resource management are a main focus in these case studies, indicating that the availability of a diverse range of resources is important for successful SEPLS activities. Also, particular species and varieties can be especially important as they are directly linked to local communities' livelihoods and well-being.
- Sectoral activities: A wide range of sectors (e.g., agriculture, forestry, fishery, tourism, conservation, small-scale industry, education) are involved in the management of SEPLS. Wise management interventions are often defined by the choice of sectors and the regulatory and incentive mechanisms within which resources are used. New values related to the landscape can be revealed through such management activities.

Table 2. Examples of focus of activities

Focus	Some examples from the case studies
Biodiversity conservation and resource management	<ul style="list-style-type: none"> - Conservation of near-extinct wild herb species <i>S. chiraita</i>, <i>V. jatamansi</i> and <i>R. austral</i> in Syafru, Nepal. - Conservation of plant genetic resources of crops including rice and tubers and of wild crop (landraces) in Wayanad, India
Sectoral activities	<ul style="list-style-type: none"> - Agriculture: Conservation of agrobiodiversity, a primary focus of activities in Wayanad, India. - Tourism and forestry: Enhancing forest use for ecotourism in Mabira, Uganda. - Small-scale industries: Millers, bakers and pasta makers as critical parts of a project to revitalise an ancient wheat variety in Tuscany, Italy.
Poverty alleviation and livelihood improvement	<ul style="list-style-type: none"> - Provision of economic benefits to the local communities through cultivation of endangered herbs in an LBSAP in Syafru, Nepal.
Cultural heritage, practices and preferences	<ul style="list-style-type: none"> - Indigenous landscape management as a main focus in the Ciharaay Cultural Landscape in Taiwan. - Traditional forest-related knowledge (TFRK) including culture, religion and ways of living with nature in H Village, China. - Vineyard landscapes in a World Heritage Cultural Site with rich biocultural diversity and long history in Wachau, Austria.
Social equity	<ul style="list-style-type: none"> - Women's traditional knowledge and ability to manage their surrounding environment in the village domain in Wayanad, India.

- **Poverty alleviation and livelihood improvement:** Addressing core security needs of the population such as food security and employment can ensure that stakeholders have a strong sense of ownership over natural resource management processes that can address biodiversity decline and diminishing ecosystem services. Promoting alternative livelihoods or adding value to products to ensure sustainable management can be viable ways for improvement of livelihoods in SEPLS that are facing degradation.
- **Cultural heritage, practices and preferences:** Social and cultural dimensions of landscape management form the basis for stakeholders' connection to the landscape, its resources, and land-use practices. They play an important role in strengthening people's motivation for sustainable management and can increase economic opportunities through value-added products.
- **Social equity:** Minority peoples often play an important role in managing and safeguarding biodiversity in SEPLS where they have lived for generations. Also, in many cases men and women have different knowledge associated with resource management, although women's knowledge is not as highly recognised or respected (Buechler & Hanson 2015; Turner and Turner 2008). Imbalances in the empowerment of minority groups and women can negatively affect SEPLS if these important actors are not sufficiently involved in their governance.

2.2 Influential factors

Mainstreaming activities and their implementation are broadly influenced by a range of socio-economic and natural factors, some of which are listed here. For examples from the specific case studies, please see Table 3.

2.2.1 Socio-economic factors

Different socio-economic factors have different effects on SEPLS management, influencing the success or failure of mainstreaming activities positively or negatively as described briefly below.

- **Demographic characteristics:** These can include social status, gender balance, age distribution, minority groups, migration patterns and others. For example, traditional practices by indigenous peoples and local communities or abandonment of farmland due to out-migration can have major effects on SEPLS.
- **Literacy:** Literacy is a key determining factor for mainstreaming. A low literacy rate may cause the adaptive capacity of a community to decline, as literacy can influence governance, institutions and management interventions in response to changes in the environment (Engle 2006).

- Knowledge on resource use and management (both traditional and modern): Traditional knowledge and related practices serve as important contributing factors for resilience in social-ecological systems (Ruiz-Mallén & Corbera 2013). Appropriately integrating or reconciling these knowledge systems with modern approaches to meet the challenges of sustainability allows more contextually-relevant management solutions to be developed.
- People’s values: The people in a community have distinct individual or collective values regarding their surrounding environment, which may be reflected in their use and management of natural resources.
- Adaptive capacity of stakeholders: The capacity of communities to adapt to changes in their environment is related to their values, knowledge and attitudes toward change and innovation, and tends to maintain or increase their resilience (Folke et al. 2002).
- Institutions: Institutions at different levels from local to global, and their horizontal and vertical linkages, are influential factors for SEPLS management. These can

Table 3. Examples of influential factors

Factors	Some examples from the case studies
Socio-economic factors	
Demographic characteristics	<ul style="list-style-type: none"> - Indigenous people’s needs, natural resource management skills, and cultural practices performed in their ancestral domains for development in H village, China. - Role of women related to their village homesteads, which, when well managed, can provide considerable ecosystem services in Wayanad, India. - Large out-migrating population requiring new opportunities for income generation through less-extractive use of natural resources in rural villages in Nepal.
Literacy	<ul style="list-style-type: none"> - Low literacy potentially leading to higher dependence on forests through extractive resource use practices, such as hunting and logging in Mabira Central Reserve Forest, Uganda.
Knowledge on resource use and management	<ul style="list-style-type: none"> - Integration of traditional knowledge and practices with modern knowledge and institutions to make the landscape culturally and ecologically resilient in the Ciharaay Cultural Landscape, Taiwan and Wayanad, India. - Knowledge and techniques to grow ancient wheat varieties with different properties from conventional ones in Tuscany, Italy.
People’s values	<ul style="list-style-type: none"> - Cultural landscapes deeply rooted in the collective values of the society in Wachau, Austria.
Adaptive capacity	<ul style="list-style-type: none"> - Setting up a Biodiversity Management Committee and Peoples Biodiversity Register to increase the adaptive capacity of the Local Self Governments toward biodiversity-integrated development plans in Wayanad, India. - Specific classification and rules for forest management used by the Lisu People to adapt to today’s commodity exchange and economic production in China.
Institutions	<ul style="list-style-type: none"> - Weak institutional arrangements may build weak links that can make implementation of sustainable land use strategies complicated and difficult in Wachau, Austria.
Economic activities	<ul style="list-style-type: none"> - Sustainable economic activities within the carrying and regenerating capacity of ecosystems as shown by ecotourism in Mabira, Uganda. - Improvement of livelihood opportunities through conservation and cultivation of rare and endangered herbs in village-based studies in Nepal.
Power structures	<ul style="list-style-type: none"> - Power structures within the family and in village-level governing bodies as major determining factors for mainstreaming SEPLS concepts in Wayanad, India.
Policies and planning	<ul style="list-style-type: none"> - A forest management plan that addresses overexploitation of resources through clarifying land use zoning and local communities’ access to resources in Mabira Central Reserve Forest, Uganda. - Local Biodiversity Strategies and Action Plans (LBSAPs) under the Convention on Biological Diversity (CBD) framework for conservation and livelihoods in three rural areas in Nepal.
Natural factors	
Climate change	<ul style="list-style-type: none"> - Careful project design to address adaptation by conserving different indigenous crops in Wayanad, India.
Natural disasters	<ul style="list-style-type: none"> - Natural disasters such as landslides and flooding as barriers to long-term residence in villages, creating uncertainties that lead to unsustainable livelihood practices in rural villages in Nepal.

also include informal institutions such as norms within communities. Weak institutional arrangements may hinder sustainable land-use.

- **Economic activities:** SEPLS by definition are supported by economic activities with sustainable use of natural resources within the carrying capacity and regenerating capacity of the ecosystem. Factors for mainstreaming may include land-use strategies, alternative and new means of livelihoods, discovery of new values in the landscapes and its products, and exploration of new forms of marketing and distribution.
- **Power structures:** Power structures ranging from those within the family to governing bodies have a direct impact on sustainable land and natural-resource use. Decisions regarding rights and access to land, natural resources and benefit-sharing can be affected by power structures within the local community or at larger scales and should be informed by good knowledge.
- **Policies and planning:** To realise better SEPLS management and governance, policies related to land and resource use need to be context-sensitive and flexible in addressing common problems such as overexploitation and underutilisation.

It should be noted that some of these factors overlap to some degree—for example institutions, policies and planning and power structures. We have chosen to list them separately, however, to highlight subtle nuances that need to be captured under each of these topics.

2.2.2 Natural factors

Among the many natural factors that characterise and influence SEPLS, climate change and natural disasters were identified as having important effects on mainstreaming.

- **Climate change:** The impacts of climate change require planning and good management for improved resilience. They can have effects on many things, from production activities (e.g., decisions regarding type and yield of crops) to ecosystem conditions (e.g., vegetation, water availability and soil fertility).
- **Natural disasters:** Natural disasters such as landslides, earthquakes, volcanic eruptions, droughts and flooding, some of which may be related to climate change, demand good knowledge and adaptive capacity, and can even affect whether people will stay in an area to carry out their land-use practices or migrate to other areas in search of other livelihood options.

3. Overarching principles for mainstreaming

3.1 Challenges and success factors

A wide range of challenges and success factors for mainstreaming efforts were identified based on the experiences of the case study authors and their partners.

Major challenges include:

- Institutional mismatches and inadequate coordination between institutions and organizations at different levels (e.g., between local and regional) or within the same level of operation (e.g., between upstream and downstream actors in a watershed).
- Vertical and horizontal power dynamics leading to hierarchies, elite capture of benefits, unequal access to resources and related asymmetries.
- Perverse incentives such as subsidies that promote unsustainable practices (e.g., excessive use of chemicals in farming).
- Financial and economic pressures including lack of availability and access to funding for desirable activities.

Success factors include:

- Multi-stakeholder involvement and a participatory and inclusive approach.
- Open learning and dialogue between different knowledge systems to ensure that appropriate technological innovations are integrated into conventional and traditional SEPLS-management practices.
- Leveraging existing knowledge on resource use and management in order to foster endogenous development and minimise external-expert-driven management.
- Diverse production activities based on the needs of local community that mitigate risks from market perturbations.
- Shared vision, commitment and cooperation of stakeholders, with composite goals reflecting multiple functions of SEPLS and stakeholders' interests.
- Communication to consumers and other external users, and education about SEPLS values.
- Institutional flexibility, stability, networking and clear definition of roles.

- Funding with strategic planning and free, prior and informed consent to ensure that management activities are implemented with the active involvement of all stakeholders beyond the funding period.
- Joint implementation and monitoring of management interventions.

3.2 Principles for mainstreaming SEPLS concepts and approaches

Based on these challenges and success factors and lessons learned from the process, some broad principles have been identified for mainstreaming SEPLS concepts and approaches as described in the following sections.

3.2.1 Mobilise knowledge toward action

- **Integrate traditional and modern scientific knowledge of SEPLS in order to find appropriate solutions for the social, political and economic context**

Human-nature relationships in many SEPLS have revolved around traditional knowledge, practices and beliefs, and many effective approaches promote their complementary use together with scientific knowledge and technology (Moller et al. 2004). Knowledge may be about certain crop varieties and cultivation methods, about the landscape itself or about resource management and governance among many others. While new knowledge should be constantly created and accumulated as seen in the case of Mabira Central Forest Reserve in Uganda, where researchers assessed its potential for ecotourism, traditional knowledge that is not documented must also be captured as it can be lost within a single generation despite being useful for management. Scientific knowledge can support public policy-making work in a way that helps to maintain or restore resilience by capturing traditional knowledge and making it relevant for land-use policies. Leveraging these two types of knowledge can be an effective means for successful management of SEPLS.

In the case from Wayanad, India, where the researchers worked closely with local farmers, traditional practices were studied and their value and scientific validity investigated further. Results showed that they supported maintenance of agrobiodiversity, which is vulnerable to decline along with associated ecosystem services due to a range of politico-economic and demographic factors. In Tuscany, Italy, where the traditional wheat variety was successfully revived, modern knowledge held by experts such as agronomists, microbiologists and wheat experts was vital for the project. These experts linked with wheat

growers, processors and customers through dialogue to find the best ways to bring back know-how while also creating jobs and economic benefits for the farmers, a process that led to the comeback of heritage wheat in Tuscany, with associated environmental benefits. The study from the Ciharaay Cultural Landscape in Taiwan takes a unique approach in the designation of a “Cultural Landscape”, a new category included in the Cultural Heritage Preservation Law based on IUCN’s protected-area frameworks, through consolidation of traditional knowledge. This approach to knowledge helped to ground the three-fold approach of the Satoyama Initiative (Figure 1) in the study area.

- **Translate, transcribe and transform knowledge through inter- and trans-disciplinary approaches**

The SEPLS covered in this volume have either already seen rapid degradation in the past few decades, or are vulnerable to changes that threaten their future sustainability. Thus, one vital step for successful mainstreaming processes is to capture the existing knowledge base for sustainable resource use, and to translate, transcribe and transform the knowledge into a form appropriate to the socio-economic and ecological context.

For instance, the case study from Wayanad, India stresses transformation of practices in the field to more formal knowledge through a multilateral approach to action research and policy advocacy towards a sustainable and gender-equitable use of agrobiodiversity. The study demonstrates four case examples of application of multidisciplinary research involving ecology, economics and social sciences to capture the different dimensions of this knowledge for sustainable landscape use.

The case of cultivating ancient varieties of wheat in Tuscany, Italy utilised different kinds of knowledge and expertise as a result of a multi-stakeholder approach through several levels of planning and management. The project started from academic research, and was then supported by cooperation between the university, the local council, the Ancient Grain Association, agriculturalists, millers and bakers. Their participation made it possible to create a whole chain of actors needed to create sustainable agricultural environments for a heavily commodified product such as wheat. The project was also able to address several biodiversity-related issues associated with the wheat agricultural system, such as loss of flora and fauna from pollution of aquifers, use of herbicides and pesticides and decrease in pollinators, in addition to conservation of native varieties of wheat.

3.2.2 Foster and leverage inclusive participation

- **Foster a participatory approach to create a shared vision and identify composite or inter-linked goals that address multiple objectives**

Multi-stakeholder involvement and participatory approaches have been key to grounding the concept of SEPLS in many case studies. This is because SEPLS entail diverse land uses, and local communities are supported by a bundle of ecosystem services from these mosaic landscapes through their engagement in diverse production activities. Without including a wide range of stakeholders it is not possible to capture the vital cultural and institutional linkages to SEPLS that ensure their long-term management for human well-being.

Multi-stakeholder engagement first requires a good understanding of diverse stakeholders (e.g., academia, local government, farmers and processors in the case from Tuscany, Italy), institutions (e.g., capacity-building for designation of cultural landscapes in the case from the Ciharaay Cultural Landscape, Taiwan) and traditional norms (e.g., forest management with traditional knowledge-based norms and rules of the Lisu indigenous people in the case from H Village, China) associated with natural resources and ecosystem services in the respective SEPLS. Next, there need to be measures to build trust and cooperative mechanisms between these stakeholders. Power dynamics and communication can be important factors here. Power dynamics can cause difficulties in identification of cooperative mechanisms, while good communication, on the other hand, is always important for full engagement of stakeholders.

In the case from the Ciharaay Cultural Landscape in Taiwan, where the landscape is made up of a mosaic of different land uses including rice terraces and irrigation channels, orchards, secondary forests, natural forests and streams, the authors conducted action research with a community-based participatory approach. This approach enhanced partnership with a village inhabited by the indigenous Amis people. In the case study, the authors try to capture cultural aspects of indigenous and traditional landscape management on the one hand, while explaining the concepts and purpose of “Cultural Landscape” protection on the other. Setting composite goals that explore the scope of the three-fold approach of the Satoyama Initiative, and following up with processes such as collaborative planning with the participation of other stakeholders including the government, has provided an opportunity to fully understand and conserve this type of diverse landscape.

A focus on needs-based activities, demonstrated in all the cases, encourages a higher sense of purpose in the community. For example, a need for locally self-sufficient, environmentally-friendly and healthy food has made the cultivation of ancient wheat varieties possible in Tuscany, Italy. On the other hand, economy-based activities for more income generation through domestication of endangered wild herb species in Nepal are contributing to reduce forest overexploitation. This relates to the concept of endogenous development, which is important for wise and successful management of SEPLS as particularly shown in examples where there is a close relationship with a forested landscape supported by a strong traditional knowledge base, such as in the case study of the Lisu people in H Village in China.

Creating a shared vision supported by sound leadership and commitment must be at the core of any management intervention for SEPLS, because activities in SEPLS can cover a broad spectrum of resource management including food production, conservation, cultural inheritance and others. Such a vision can be realised through goals with different time frames. Some land use practices may involve short-term interventions based on local conditions (e.g., cultivation of endangered wild herbs in the case from Nepal, employing environmentally-friendly practices for viticulture in the case from Austria, or for wheat production in the case from Italy), while also trying to address long-term and higher-level goals (e.g., conservation of biodiversity in agro-ecological systems, or establishment of a long-term harmonious relationship between people and nature through new management interventions).

- **Foster “collective efficacy”**

“Collective efficacy” is a term derived from the sociological literature, denoting the ability of members of a community to exhibit a high degree of social cohesion and intervene in the behaviour of other members in the interest of the community’s well-being or for the common good (Sampson et al. 1997). Bandura (1998) explains it as people’s shared belief in their collective power to produce a desired outcome. A landscape is formed reflecting the values and societal meanings that people attach to it, and so to make the landscape sustainable, it is critical that there is consensus and that this is reflected in the management of the landscape. The case from Wachau, Austria shows that community-based action can result in successful approaches that further motivate community members for collaboration. A need to foster collective efficacy among stakeholders is a primary need seen in the case from the Mabira

Central Forest Reserve in Uganda, which introduces a new type of non-extractive forest management through ecotourism for preserving the biodiversity of the forest.

Collective efficacy requires robust engagement among different stakeholders and should involve at least the following key points:

- **Build trust among stakeholders**

Trust is vital to involve a wider spectrum of stakeholders (including women, minorities, consumers) and ensure equitable use of resources and sharing of benefits for livelihood development. For instance, the case from Wachau, Austria concerns sustainable regional development supporting SEPLS conservation, which requires building trust among different stakeholders within and across sectors. In these approaches—based on multi-sectoral networking and cooperation—trust within and between sectors is a vital attribute that binds the whole process together to strengthen the rural economy and quality of life, while also internalizing rural biodiversity connected to viticulture.

The case studies from China, India and Nepal deal with landscapes where the spectrum of stakeholders is itself an important factor in landscape management. Some people are economically or socially marginalised, while resource use varies widely by gender and age. The Nepal case includes a variety of stakeholders who are affected or are going to be affected biodiversity loss, while the India case tries to include people through their connection to rice-paddy landscapes. The study on the Lisu forest-dwelling people in China, on the other hand, stresses a human-ecological perspective, involving religion, behaviour, etiquette and habits that ensure forest protection through cultural interaction with intrinsic values.

The case from Italy takes a different approach, with strategic involvement of stakeholders—the local government and university, farmers, millers, bakers and the local community—to create new values, such as health benefits or genetic diversity in wheat, for growing ancient wheat varieties. The NPO that facilitates cooperation among stakeholders also ensures that higher prices paid by consumers are transferred to the farmers, thus ensuring protection of the heritage wheat landscape while making the whole process economically viable and ecologically sustainable.

- **Identify relevant institutions and define roles**

Institutions, including organizations, laws, policies, financial mechanisms, customary rules and norms,

and others, play important roles in SEPLS and work at different levels from local to national to global. Institutions relevant to those involved in projects should be identified, with defined roles considering potential synergies and complementarities. This is important to avoid unnecessary overlaps or gaps that can occur between and within levels of stakeholder operation. For example, the case study from the Ciharaay Cultural Landscape in Taiwan concentrates on institutional arrangements for tailoring the concept of SEPLS to national planning processes, including exploring a feasible framework under which institutional arrangements should work. The case shows that an institutional approach is especially important and feasible where the rural population, key to bottom-up management, faces depopulation, aging and economic decline.

In some cases, sustainable governance of SEPLS may not be possible if laws and other policies do not work well for local and indigenous communities. These communities may have their own rules for survival and well-being shaped by traditional knowledge, as exemplified in the case from H Village in China. State power may create hierarchies, asymmetries and changes in power dynamics in the traditional forest-related knowledge (TRFK) system, and thus may not ensure long-term and sustainable forest resource management. Under such circumstances, sharing rights and responsibilities under the laws of the local authority may be a viable solution. Integration of traditional and modern knowledge, as discussed above, can help to guide the development of mutually-beneficial power dynamics.

Institutions are also important to ensure economic viability in SEPLS. Financial and economic pressures including lack of availability and access to funding for desirable activities often constrains communities pursuing them. In Tuscany, Italy, falling prices for products such as cereals, olives and wine have caused farmers in marginal areas to have less access to resources for environmentally-friendly farming including water and wood. As a result, the area has lost sustainability and local self-sufficiency in food production, eventually importing more than it produces, especially grains.

- **Engage higher political systems and get feedback**

Continuous support from both local and higher-level government can help make projects effective in the long term. For example, the support of politicians and national and European Union agricultural systems is considered an important factor to ensure the mainstreaming process of SEPLS in ancient wheat-based agriculture in the case study from Tuscany, Italy. Although the study's project

started from academic research in a university and is now supported by cooperation between the Ancient Grain Association and the local council, who sponsor the project, without engaging the higher political system it would not be possible to get continuous support for this type of innovative project.

The case study from Nepal argues for the upscaling of policies to address the whole politico-administrative chain of wards, village development committee districts, zones or regions, finally linking them to national-level policies. This should be coupled with regular feedback to share knowledge learned at the grassroots level at higher political levels.

- **Encourage cross-learning among communities and other stakeholders for development of capacities and to raise awareness**

Transformation toward environmentally, economically and socially sustainable landscapes requires changes in people's values and behaviour. The case study from Wachau, Austria shows that financial compensation for the delivery of ecosystem services and improved environmental quality not only automatically results in behavioural changes in participating farmers, but can also result in a so-called "crowding-out effect", where farmers act in line with subsidy schemes' priorities because it is in their financial interest.

Peer-to-peer learning among communities and other stakeholders is one of the most effective ways for raising awareness and changing behaviour, which can lead to true transformation. For example, one of the main challenges to mainstreaming the concept of SEPLS in the Ciharaay Cultural Landscape in Taiwan is a lack of comprehensive ground-level work with data and learning shared among government, practitioners and researchers. This case study therefore stresses how collaborative planning through institutional capacity building involving social capital (relationships), intellectual capital (knowledge) and political capital (mobilisation), a framework described by Healey (1998), can be a viable means towards grounding the concept of SEPLS. Learning is promoted throughout the process. For the case study from Italy, where revitalisation of ancient wheat varieties was successful, similar revitalisation activities are being started in other areas, and the NPO involved is sharing experiences and also helping to create groups of farmers to work with local councils in these areas.

It is also necessary to increase awareness among consumers and external users about the values of SEPLS,

both environmental and economic, because they can support SEPLS through their purchase of products and services. For example, wild herbs from the villages of Shypru and Ramche in Nepal are bought and consumed in other towns and cities.

An open approach to learning is important for dynamic and adaptive landscape management. Lessons learned through international efforts such as the Satoyama Initiative and IUCN's protected area framework are well demonstrated in the Ciharaay Cultural Landscape case from Taiwan. The case has also been informed from its own backyard—the indigenous village landscape. Such openness to learning from all the different angles has made it possible to designate and protect the cultural landscape in Ciharaay.

3.2.3 Adaptive planning and management of activities

- **Establish long-term monitoring and periodic review**

SEPLS are dynamic in nature, and are maintained through adaptive co-management regimes, with interlinkages between natural processes such as geomorphological processes that work over a very long time scale, cultural processes that are influenced by people's values and can change within relatively shorter time scales, and political and economic factors, which change even faster. Mainstreaming requires envisioning changes over different time scales, involving changes both to the natural environment and to societies. For a management regime to be successful, it is necessary to constantly monitor the on-the-ground situation.

In the case study from Austria, for instance, the long-term effects of combining agricultural and nature-based policies with market-based instruments (such as regional branding) and civil society has been considered a major factor in the sustenance of cultural landscapes. Market-based instruments alone may not result in sustainable use of a dynamic cultural landscape and protection of its natural and cultural resources, so long-term monitoring of the effects of the combination is necessary.

Long-term monitoring is also stressed in the case from Taiwan as a vital mainstreaming process. It is argued that evaluation of the current situation needs to be adaptive based on the whole picture of the situation on the ground, with regular revision of the management plan based on local feedback. This means that a process involving long-term goals and medium-term planning based on short-term monitoring feedback can ensure grounding of SEPLS concepts.

- **Make sure replication efforts are flexible**

Mainstreaming involves replicating efforts and activities in other locations. Sensitivity to both ecological and social conditions is required during such efforts, meaning they must be:

- adaptable to the local context
- within the capacities of communities without degrading landscapes and cultures

While all of the seven case studies exemplify these characteristics in some way, they accomplish it differently. For example, the case from Taiwan tries to capture good practices by internalizing already-present indigenous landscape principles, while the case from Uganda tries to implement new alternative-livelihood practices, promoting ecotourism in a reserve forest area.

The case of the Lisu People in China illustrates that local context is one of the most important features to consider for replication, as development for the people must come from themselves—i.e., must be endogenous—rather than from external organizations and epistemic communities. This also ensures that replication efforts are within the capacity of the communities and do not degrade their cultures and associated landscapes. This case exemplifies the importance of local context where traditional forest-related knowledge (TRFK) is intricately related to local livelihoods through religion, beliefs, customs, daily life and land use. Without context-specific interventions, TRFK has a tendency to be marginalised, and without TRFK the forest ecosystem and well-being of the indigenous people face peril. On-the-ground assessments for understanding the local context are also a major feature in the case from Uganda, which tries to create new recreational values through ecotourism, a new approach in the region to address the problems of a degrading forest landscape.

Similarly, local context is emphasised in the Nepal case in terms of the Local Biodiversity Strategy and Action Plan (LBSAP) and the National Biodiversity Strategy and Action Plan (NBSAP). Efforts are made to remain within the capacity of the local communities, in order to avoid degradation of landscapes and culture. Local village residents in Nepal are heavily dependent on subsistence-level agriculture for their livelihoods, which are very closely linked to the biodiversity of their surrounding environments, so planning based on the local context has been considered as a main pillar for national biodiversity conservation.

4. Conclusions

Efforts to incorporate good practices and management strategies into policies and other institutional mechanisms while promoting sustainable local production practices and associated knowledge in line with the priorities of local communities require good knowledge and planning, as such efforts are often small in scale and seen as statistically insignificant within the larger scale of society. Increasingly, however, resource-management systems like SEPLS are being held up as examples that have managed to conserve a wide variety of actively-used natural resources while remaining economically profitable. Furthermore, such landscapes and seascapes have proven to help ecosystem functioning and provide sustenance and well-being to populations within policy parameters. This translates into sustainability in terms of various needs including food, health, water, energy, income and livelihoods. Increasingly, global policies have started re-emphasizing support and promotion of local practices and innovations, as demonstrated by concepts such as Green Economy (UNEP 2011; TEEB 2010), and in international biodiversity and development targets such as Aichi Biodiversity Targets and Sustainable Development Goals (SDGs).

In line with these policy developments, there has been a resurgence of enthusiasm for local and traditional production, processing and consumption practices. There is also interest in ensuring that lessons are shared between practitioners and various other stakeholders. Consequently, this is leading to greater awareness of products and services from SEPLS and greater adoption of these practices in policymaking and among society more broadly. This is well illustrated in the case studies presented here, as they convey challenges, frustrations and success factors that enable this mainstreaming process, and which are summarised by the principles found in this chapter. What is shown here is that while the creation and use of formal institutions such as government policy and economic mechanisms (e.g., certification programmes) are necessary and influential for mainstreaming concepts and approaches of SEPLS, making mainstreaming efficient and effective requires a lot of effort to build and increase awareness, capacity, trust and cooperation among all stakeholders. This effort ensures that activities are implemented in a way that fits their social and ecological settings and thus provide maximum benefits to people and the environment. It is also important to leverage existing resources, including both traditional and scientific knowledge, and to have a long-term vision and adaptiveness.

The diversity of activities and their socio-ecological contexts seen in just the seven case studies presented in this volume sufficiently indicates that it is not possible to produce

rigid prescriptions or “how-to” guidance to fit all types of mainstreaming activities. However, with the concrete examples shown in these case studies, we hope that readers will find this volume useful for learning lessons to use and share, and that it will encourage similar activities and their documentation in other contexts.

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Transforming nomadic traditions to biodiversity-friendly livelihoods from the perspective of traditional forest-related knowledge: the successful story of H Village of Yunnan Province in China

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Abstract

Can we achieve the dual goals of biodiversity conservation and improved lives for indigenous communities? H Village of Yunnan province is one of the successful cases. This paper took this case as an example and examined it to understand how its success happened from the perspective of traditional forest-related knowledge. The study documented periodic land and forest tenure reform from 1950 to present and major development interventions by the Chinese government and foreign donors. The culture and religion of the Lisu people, and the ways Lisu people have lived with natural resources and village regulations, were invented through long-term practical experience living with nature and inherited generation by generation. With modern technologies and culture, the traditional forest-related knowledge and culture have faced great challenges. In their livelihoods recently, the Lisu People have reduced dependence on forest products. “Slash-and-burn” farming and nomadic lifestyles have been transformed to agroforestry practices for commercial crops and off-farm jobs. The case of H Village proves that, with proper interventions, humans can achieve dual goals to improve the livelihoods of local residents and preserve biodiversity in the era of modernisation, globalisation and marketisation. The story of H Village tells us that the relationship between humans and nature should be interactive and interdependent, and thus biodiversity conservation should be based on the socio-ecological system as a whole, not separating humans from natural ecosystems. We should fully consider traditional forest-related knowledge (TFRK) as an asset of local minorities and activate it in this era of globalisation, marketisation and privatisation towards sustainable development.

Keywords: Traditional forest culture; Lisu; Cultural change; Forest polices

1. Introduction

Poor people in many cases live in good quality forests with rich biodiversity, and this is particularly the case in hinterlands where indigenous people live (Liu 2007). In the past indigenous peoples in developing countries, unlikely to escape from poverty, have fallen into a so called vicious cycle of poverty, overuse of natural resources and resource degradation, with development interventions over the last few decades (Liu & Innes 2015). This phenomenon has been backed up with academic explanations. The environmental Kuznets curve is among these explanations, and purports that environment deteriorates with GDP increase until GDP reaches a certain level, when environmental impacts reduce with GDP increase (Li et al. 2015). This article tells the successful story of how a traditional nomadic community was transformed into a biodiversity friendly community with quite profitable livelihoods, which is contrary to the above-mentioned common vicious cycle tendency. The story occurred at H Village, a Lisu minority hamlet, which originated when nomadic ancestors in the West China mountainous regions immigrated to Southwest China where they lived on shifting cultivation and collective hunting. Nowadays, this hamlet has become a settlement where people rely on their livelihoods of commercial farming and off-farm work, enjoying their traditional lifestyles and rich biodiversity as well. This article took traditional forest-related knowledge (TFRK) as an analytical perspective from which to understand why H Village could be successful in achieving a win-win situation in livelihood improvement and biodiversity protection.

TFRK is the experience in and cognition of forest and society that is developed and created from the production and living practices of local residents (Parrotta et al. 2012). It includes many techniques and customary rules for forest management in a sustainable manner. Over many thousands of years, TFRK has been key to maintaining the continuation of natural resource management and local livelihoods and an important aspect of the diversity of ethnicities, languages, wisdom and cultures in many regions of the world including China (Liu 2007). About 60 million residents live in forests around the world (Berkes et al. 2000) and TFRK plays an important role in their daily lives, especially in minority areas where people mainly live off the forests. TFRK has contributed to the establishment and development of many scientific disciplines including botany, forest sciences and medicinal and healthcare sciences (Liu 2007). TFRK is embedded in local communities' understanding of traditional religions, customs, daily life and land use, and is subject to changes in social and economic conditions and policies at macro and micro levels (Liu 2007; Yi & Liu 2012). With rapid socio-economic transformation, TFRK has become endangered and marginalised (Parrotta & Agnoletti

2007; Luo et al. 2009) and has been widely considered to be ignorant and outdated (Liu et al. 2012; Yuan & Liu 2009). Since the 1990s, forest experts have mobilised for documentation of TFRK globally, directly promoting debate on its protection and inheritance, based on a recognition of the importance of TFRK in sustainable forest management and state and rural development issues in general, including a variety of goods and spiritual services (Yuan et al. 2012). This paper examines a case of the Lisu minority at H Village, Tengchong County in Yunnan Province, particularly the relationships among folk culture, customs, taboo, local rules, primitive religion and forestry management, in order to understand the factors that drive changes in TFRK. Further, this paper puts forward some recommendations on the protection and enlivenment of TFRK.

2. Targets and methods

2.1. Lisu minority

The Lisu people are descendants of the Qiang minority who lived in mountainous areas in the western part of Sichuan Province, in the west of China. They used to live along the Jinsha river valley, which is located at the border of Yunnan and Sichuan provinces. Later, they gradually moved further south and west, ending up in the Nujiang river valley area, which is located in the west of Yunnan province. To date the population of Lisu comes to 0.73 million and is recognised as one of the minority communities in China. Today most Lisu live near the Nujiang river region, and the rest live in Lijiang, Dali, Baoshan, Lincang and Yingjiang in Yunnan Province, as well as Liangshan in Sichuan Province. Like other minorities in Yunnan province, the Lisu have a long history of collective hunting and shifting cultivation, or so-called "slash-and-burn cultivation". Because of inaccessible natural conditions, communication was not convenient, and most Lisu lived a pastoral lifestyle and were considered to have a sort of primary livelihood and primary society. Meanwhile, inconvenience brought adverse effects to the local economy and made it develop slowly. The founding of the People's Republic of China brought about policy interventions such as land reform in the early 1950s and collectivisation of lands in the late 1950s, the Household Responsibility System in the early 1980s and the Reform of Collective Forest Tenure. Along with social and economic development in China, these policy interventions dramatically changed the livelihoods and society of the Lisu minority people in terms of economy, culture, management of natural resources and livelihoods.

2.2. H Village

H Village represents the history of such changes. H Village

is located in the southeast of Tengchong and lies at the southwest part of the Gailigongshan National Nature Reserve. H Village is surrounded by mountains with little flat ground, so villagers are scattered into hamlets, including Shangzhai, Xiazhai, Laozhai and Doudiping. The lowest altitude is 1,280 metres, and the highest altitude is 2,500 metres, with an average of 1,950 metres. As of 2011, there were 61 families with 304 villagers in total. Among them, ten families were of Han ethnicity, with 40 people, and the rest were Lisu people. The total amount of land is 3,777 mu¹, among which permanent farmland (paddy fields and home gardens for vegetables and fruits) occupy 338 mu, forests cover 3,315 mu, and others land uses account for 124 mu. The local communities in the area categorise forest land into two types, forest land for self-sufficiency purposes taking up two-thirds of total forest land, and forest land for household responsibility², which occupied only one-third, following the logic of implementing the “Household Responsibility System” policy. Although this categorisation legitimated local authorities to collect governmental revenue, forests in the category of land for self-sufficiency was covered in secondary evergreen broad-leaved forest that was used for fuelwood collection for household consumption, and land in the category of household responsibility was reserved for plantations for commercial purposes that villagers can manage, harvest and trade according to their own wishes. During periods when forests were severely cleared or degraded, in particular in the early 1960s and 1980s, frequent landslides led to serious damage to crops and farmers’ properties, so the community has learnt from these experiences to recognise the forest’s role in water and soil erosion control. A country road was built in 1948, which linked the H Village to the outside world. However, the country road was built around the mountains, has many steep slopes and curves, and it takes three hours to get to Tengchong County, around a 60 kilometre distance.

H Village was founded in 1893 when the Lisu people went there for slash and burn land activities in the early stages,

and a few Han people arrived to avoid wars later on. On this basis, Lisu and Han have lived together having different family names. There were 2,000 mu of cash tree forest, which is used for slash-and-burn land, dominated by 35,000 walnut trees. Farmers intercrop corn and tsaoko (*Amomum tsaoko*) under the walnut tree canopy. Tsaoko and walnut are the main source of cash income for the villagers and in 2010, per capita income was 8,000 RMB, which is relatively better off in China. Forest cover reaches 97%, with great biodiversity in species and ecosystems. Most of the young people in H Village tend to work outside the village, ignoring the traditional livelihoods and gradually becoming modernised. H Village can be considered a special case that achieves the double goals of poverty alleviation and biodiversity conservation. As shown in Figure 1, compared to 1950, per capita income has increased by 20 times, and population increased by about four times, while the forest cover remains the same in 2010.

2.3. Data collection methods

This study began in 2010 with a group of researchers from different disciplines, including sociology, ecology and community development, organised to carry out this study. They first consulted local specialists, including experts from the Forestry Department of Yunnan Province, the Forestry Planning and Design Institute of Yunnan Province and the Yunnan Academy of Social Sciences. H Village of Tengchong County was jointly recommended to be a field survey site. We visited the Tengchong County Forestry Bureau, the Gaoligongshan National Nature Reserve and the County Official Archives Agency to collect and compile materials about TFRK, the folklore, religious beliefs, traditional cultural activities, policy changes, livelihood activities and so on. The team carried out research activities for a week using qualitative research methods in H Village in order to understand the relationships among resource status, policy changes and livelihood activities in the Lisu community. We used the following methods to collect qualitative data.

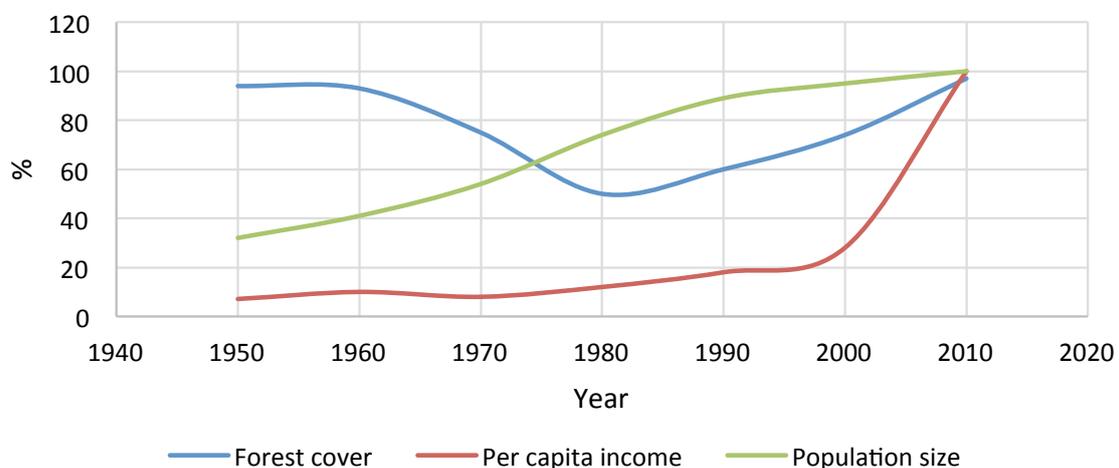


Figure 1. Change in per capita income and forest cover in H Village 1950-2010

Observation: The researchers lived in the villagers' houses to be involved in their daily lives. Through observing the community, natural resource utilisation and farmers' behavior, we formulated issues or hypotheses on the cultural activities of local traditional land use and the relationships among humans, forest, land use, policy intervention and livelihood changes, providing clues and ideas for in-depth interviews.

In-depth interviews: For this study, we interviewed 10 villagers, covering all age ranges of the population born between the 1940s and the 1980s, including the current village leader, the team leader, "Headman" of Lisu Village rural residents, migrant workers born in 1980s, and undergraduates. We adopted an "oral history" method to learn about historical events, natural phenomena, sacred trees or timber forest, village rules and forest management.

In 2015, we paid a return visit to the relevant departments in Tengchong County, sharing the research findings with them in order to further confirm or clarify the results of the study.

2.4. Analytical methods

Grounded theory guided our analysis of the collected data. Before the field work, we read materials about local chronicles and image recordings of Tengchong County, such as documents on the "Sino-Dutch biodiversity conservation community development project" and the "Hong Kong community partnership project" implemented in H Village, raising questions about traditional forestry knowledge of the Lisu minority, livelihoods and culture. With the help of experts and workers in the local management department, we discovered research issues and conducted field work based on these hypotheses. We used interactive modes to collect data, translating specific and fragmentary information into effective materials related to community livelihoods, economy and policy, and traditional forestry knowledge. Through comparison, analogy, extrapolation, deduction, analysis and synthesis, we showed certain relationships among each of these in order to obtain hypotheses and answers (Miles & Huberman 1993). We shared the hypotheses and answers with the local people and encouraged them to ask questions and finally, explained our findings. Through discussions, we could confirm or modify the previous hypotheses and answers, to finally form the conclusion of this paper.

3. TFRK, livelihoods and culture

As a minority people historically living in a mountainous region, the Lisu people possess a wealth of TFRK, which is reflected in their traditional livelihoods, beliefs, culture and forest management systems.

3.1. Traditional livelihoods

The practices of the Lisu people over the long term developed into a technical system for shifting cultivation, or slash-and-burn cultivation. Key techniques for slash-and-burn cultivation include land selection and preparation, fire control and crop management.

Firstly, selection of land depends on the size of the trees and the coverage of vegetation. Big trees must be kept, especially those of nitrogen fixation tree species, for instance, nepalensis (*Alnus nepalensis*). In order to prevent water and soil erosion, the trees growing within a distance of 100 meters from a water body or low-lying areas should not be cut, and the land would not be suitable for shifting cultivation. Trees with a DBH of around 20 cm in the area for slash-and-burning should be kept. The trees can be cut from the roots if the land is to be developed for corn, or the roots should be kept if the land is to be developed for buckwheat. Buckwheat land is cut every August and corn land is cut every October.

Secondly, when to start fires and how to control fires are essential to the success of slash-and-burn cultivation. It is considered better to have continuous sunny days in the winter and spring seasons, then the cut-down trees are dried and burn completely. In January of the following year, the buckwheat land is fired and the corn land is fired in February. Before firing, the weeds around should be cleared and a 30 to 40 metre fire break should be built. A sunny and windless day is perfect for burning for safety reasons. The fire starts from the head of the land, and when it reaches the heart of the plot, another fire can be started from the foot, which ensures that the land is fired all over. The Lisu people believe that hope for good life is brought about when trees can be burned completely. The ash left behind is used as fertiliser to increase the land fertility. For land not sufficiently fertilised, firing leaves is used to supplement.

Thirdly, with enough rain, the seeds that were sowed in April or May grow smoothly, otherwise they dry up and die. As a village located in the western part of Yunnan, H Village has exactly such a climate. As a result, slash-and-burn cultivation is not only a traditional livelihood for the Lisu people, but also a chance they took to adapt to the local climate and natural resources. Buckwheat land needs ploughing and corn land needs dibble seeding with a stick. The corn can be sowed in February and harvested in October, at which time it may or may not need to be pulled out. After harvesting the corn, it is dried in the sunshine or by fire.

With this kind of cultivation, the land can be planted for two to three years and abandoned with the decline in soil fertility. Five to seven years are required for vegetation

to recover and then the land is ready for the next cycle of shifting cultivation.

3.2. Traditional lifestyles

Residences and housing: In old times, the Lisu people tended to choose places near the river basin and forest. They believed plenty of water and forests bring good luck and wealth, so people who lived in houses without rivers or forests were treated as poor. Most traditional architecture is built with wood for raw material. But in the past ten years, people prefer to choose places that are near the road. This implies that the convenience of the transport system has become the most important consideration. With socio-economic development, people are using bricks as raw material instead of wood.

Life utensils: Compared to the traditional life utensils like tableware and cups made of wood, presently glass and metal are widely used by the people.

Keeping warm in winter: Because of the very cold winter, here every family has a fireplace inside the house. When the cold winter evening comes, the entire family sits around the fireplace to keep warm. The fire can also be used as light. Traditional clothes are made out of the raw materials of *Gerbera delavayi* Franch, and *Mucuna sempervirens* Hemsl. Only a few elders have such traditional clothes.

3.3. Basic cognition of natural ecology – animism

The Lisu people are animist traditionally. They believe that gods dominate mountains, snow, and lightning. Disease is caused by ghost hauntings, which require a sacrifice of animals. Forest and stone also become the objects of their worship. Amidst their hard lives, the Lisu people pray to supernatural gods for blessings, forming the traditional religious belief system, sacrificial rites and songs. This traditional religious belief system includes the worship of holy mountains, holy trees, wizards and totems.

Worship of holy mountains and holy trees: Traditionally, the Lisu people believe in animism, which asserts that everything, such as a mountain, tree and water, has its own eudemon. People believe that the souls of their dead ancestors are reincarnated into the whole forest or a single tree. They believe that they came from the forest, so they worship the forest, holy mountains and holy trees. An old man said that people here hold yearly unified worship ceremonies, offering sacrifice activities to the holy trees or holy mountain, to pray for blessing. People also pray to the holy trees if their children get sick or if cattle have any problems. Therefore, people protect the forest and headwaters intentionally. In H Village, those ceremonies

have evolved into worship of the “Big Temple” and “Small Temple”.

The traditional religious wizard: In the Lisu language, the traditional wizard is called a “Ni Pa”, and is mainly responsible for praying and chanting in the ritual activities to express the people’s respect and pray to the gods, exorcising ghosts. The “Ni Pa” is a heritage of Lisu folk culture, but has already disappeared from H Village.

The worship of totems: Each clan and tribe of Lisu ethnicity has its own totem, which is the idol of the Lisu people and the emblem of a clan or a tribe. These kinds of totems number up to more than 40 kinds, including buckwheat, tiger, snake, hemp, bamboo, vegetable, birds, fish, frost, fire, etc. These totems are mainly marked on their clothing. Some clans also use totems as their surname, for example, “Ma” meaning of “house” is still available in H Village.

Lisu ecological ethics tell us to treat nature morally, as one of them said:

Since everything has a spirit, human is not the only creature in the world. Thus, we need to obey some principles to live together. Human and nature, human and animals can't hurt each other by no cause.

They think everything in this world is interlinked. The way we treat nature, the same way it treats us back. The Lisu people believe in animism, reflected in the relationship between humans and gods, people and people. A normal human ecological system would be a harmonious and holistic system. People and the environment there have a karmic relationship. A disordered consciousness of ecology will eventually lead to the deterioration of the natural ecology, causing a crisis of human existence. Sun, moon, trees and so on are the objects of primitive religious worship that people do not want to offend. These objects directly or indirectly create things, intervening in human life. So, in Lisu people’s consciousness, it is wrong to go against nature and the ecological environment. Humans should not destroy the harmonious ecological balance. In celebrations and ceremonies, they treat flowers and trees, birds, fish and insects as symbols of the life cycle. A simple consciousness of natural and ecological environmental protection is contained in folk activities, delivered from generation to generation, and is condensed into the Lisu green ecological and cultural complex.

3.4. Forest management and utilisation

Forest property: Traditionally, the original forest resources surrounding Lisu communities can nowadays be

categorised as common pool resources scientifically. Due to the low population and multiple migrations of the Lisu people, forest resources were open to everyone. Villagers needed to make boundaries on a piece of land with stones as marks and cut the trees inside in order to show that that land has an owner. Other people could not move the marks, otherwise they would be punished. The land for gathering and hunting was open to everyone. The holy trees near the village were seen as guardians, which cannot be cut.

Forest classification: Forest resources are traditionally divided into slash-and-burn farming land, hunting land and holy forests and trees in H Village.

Forest management: Forest management is mainly reflected in the management of “slash-and-burn” land and holy hills and trees. It was forbidden to cut the holy trees near the village, punishable by village regulations. The means of punishment include economic compensation for the loss and public shows of apology in the community.

Forest management decisions: Traditionally, the headman was in charge of the village or the clan’s daily routine. Like other villages of the Lisu minority, village H headman was selected naturally by the common sense of community people, not inherited or elected. The headman had absolute authority in forest resource management and other social affairs. Nowadays, the forest agency is in charge of forest management, but the headman still plays an important role in social affairs and forest related activities. For example, the headman is always first to lead the villagers in the implementation process of an important policy, and the residents are willing to ask the headman for help when they have disputes.

3.5. Traditional forest worship

Worship of the “Big Temple”: On the eighth day of the second lunar month, the villagers led by the headman hold a ceremony for the “Big Temple”. The Big Temple is surrounded by “temple trees” that are treated like safeguards, and is also the place enshrining the ancestors of the villagers. The headman prepares a sheep, two chickens, incense and paper money, three litres of rice, firecrackers, and glutinous rice for sacrifice. The process of sacrifice is clearly defined: consecrate the livestock and sheep first, and then again cooked, with six incense sticks, six cups of wine, six cups of tea, six bowls of rice, six “baba” (a kind of pastry), and six bowls of “sansheng” (meaning three kinds of livestock). The headman and venerable elder pray towards the idol and holy trees. Women cannot enter the temple when the “Big Temple” worship is going on.

Worship of the “Small Temple”: Every settlement of the H Village has their own holy trees, called a “Small temple”. A family can consecrate a single holy tree, too. There is no specific time to have ceremonies, while villagers consecrate every first and fifteenth day of the lunar month normally. If livestock gets sick, villagers can hold rites immediately. The props include: three sticks of incense, three cups of wine, three cups of tea, three bowls of rice, a bowl of “sansheng”, and an egg. Incense will be put out first, and then tea and wine and the egg, with “sansheng” coming last.

Worship of the hunting god: Before the 1950s, the livelihoods of the villagers were mainly dependent on hunting and gathering, and they consecrated to the hunting god before hunting each time, with the belief that the god would bless their safety and good harvest. Due to nature preservation activities, the villagers turned over shotguns and gave up hunting. The worship stopped with time while some stones marked for the practice are left.

4. Review of external policy and project interventions

We divided the land tenure reform into four stages to analyse the loss of TFRK caused by policy intervention and social changes. The four stages are: 1) public land period, from the late Qing Dynasty to 1949; 2) land reform period, from 1950 to 1962; 3) commune period, from 1963 to 1984; and 4) decollectivisation period since 1985.

4.1. Public land period

The H Village was established in the late Qing Dynasty (about 1893). It had only 15 families, with 74 residents until 1949, mainly living on slash-and-burn farming and nomadic hunting. The village had five surnames: Yu, Ma, Dou, Cai and Hu, with the Yu and Ma surnames being big families. They immigrated there at the same time from various villages nearby. Then, the Zhu, Lu, Feng and Guo surnames appeared between 1919-1949 for various reasons, including avoidance of army duty (see case 1). During this period, the H Village maintained relationships among humans, livelihoods and the forest in a traditional way.

Case 1: Between 1947 and 1949, in order to avoid being vault dwellers of the Kuomintang, we fled here with knives, pots and bedding, staying in the roadside shelters. My father was respected by people here for his good medical skill, and we could always get some corn, poultry, firewood and such household stuffs from neighborhood. My mother and sister worked for others to achieve some corn and firewood for a living. At that time, the trees were

all over the mountain, with animals living there. We cut the trees, dug the ground and planted the corn together with the local people.

-- Yongzhong Zhu, resident of H Village, Han nationality, born in 1941

4.2. Land reform period

During this period, the H Village transformed from a nomadic form with no formal organisation directly into the socialist economy form. In 1952, land reforms were carried out leading to extensive changes in land ownership. The residents got 91.5 mu of paddy field from the neighboring Han landlord. There were about 15 families and 80 residents at that time. Due to few people and more land, every family could own land that was cleared off for slash-and-burn cultivation. Land with forests, if close to settlement points, was equally divided among every household. Land far from settlement points and relatively steep was clarified as collectively owned, and the farthest, a relatively large area, to be state owned.

In 1956, the cooperative movement began. Excluding fruit trees nearby residential areas and the temple trees, holy trees and trees at tombs which were still managed by the local customs, other forests and cash trees were confiscated by cooperatives with part compensation. After 1958, the commune movement began, and household forest land and cropland turned into collective assets. In 1960, because of the Great Leap Forward, including jacked up iron and steel production, collective forest was nearly destroyed for energy.

Case 2: In the early 1950s, landlords, who typically have more family members, were afraid of opening up forests for expanding farming areas, and the poor and lower-middle class families easily had access to land nearby for "slash-and-burn" corn production. The government issued land titles to individual households, communities and the state based on the land reform policy. As there were few residents in the village, we all got a large area of land. I got 4 pieces of land, more than 100 mu. But very little was permanent cultivated land, and almost all was slash-and-burn land for corn. After the Great Leap Forward, the trees were almost destroyed for smelting iron.

-- Yongzhong Zhu, the team leader of H production team from 1967 to 1974

This period had a profound impact on H Village. The nomadic lifestyle of the Lisu people in H Village came to an end, and they were organised into groups to live in a village with the name of H with a clear boundary for their settlement. They had to engage in farming, collecting and hunting in defined geographical areas.

4.3. Commune period

In the period of collectivisation between 1963 and 1984, the villagers acclimatised to settled life and formed permanent villages and communities. Formal organisations such as production brigades and production teams, planted in traditional community informal institutions, gradually became more and more important to production, organisation, consumption and culture. Modes of production and livelihoods, newly introduced technologies and culture had become an important part of community life and production. The demarcated paddy fields became an important constituent of livelihoods for villagers. As a consequence, growing Chinese chestnuts and planting corn under the forest canopy and shifting cultivation was gradually transformed into permanent agriculture. By 1984, the population of the village had increased to 200 people, and walnut planting areas had expanded to 100 mu. During the same time, Christianity infiltrated the community. Some villagers came to believe in Christianity.

Case 3: During 1963-1984, H Village was officially organised as one production team, which was a unit for farming and livestock raising. Work was assigned to a person according to his/her capacity. Farmers on the team who were good at farming were assigned to manage corn fields, and those who were good at husbandry were assigned to manage livestock. Grain foods and walnuts which are major products of the H Village, were distributed to each household with fixed roles. Deducting the amounts which had to be contributed to the state, 70% of the rest of grain foods and walnut production was equally distributed to each household according to the population size of the household. The remaining 30% was allocated to labour time and contributed to the commune to each household in a year. I have 1.2 mu of family plot for self-sufficiency, planting walnut trees and corn or beans. Families can collect fuelwood, herbal medicines and wild vegetables for family subsistence. --Hu Zhuanfa, villager of H Village, Lisu people, born in 1955

4.4. De-collectivisation period

From the early 1980s, China implemented reforms for opening up and market-orientated development approaches, which have greatly shaped forest management. The three-fixes policy reform of the 1980s, greening barren mountains in the 1990s and collective forest tenure reform in 2000s are among the most important interventions in the policy reform agenda that directly relate to forest management. H Village was recognised and identified by the state and local authorities as a sort of village located

in a hinterland, minority and high-poverty region, closed to boundaries with other states, and has been favoured with access to many development projects, including those funded by international donors. In regards to forest management, the Sino-Dutch Forest Conservation and Community Development Project and the Hong Kong Community Partner Project were selected for this research.

Three-fixes policy: This policy is similar to the household responsibility system that began in 1980 and was implemented in the H Village for farmland, where the village carried out land and farm output quotas on a household basis, bringing about great production enthusiasm. In 1983, the village implemented the three-fixes policy, which means to fix (similar to the meaning of clarify) the ownership of forests and forest lands, fix the management rights of forests, and fix household responsibility. Accordingly, collective forests were divided to small parcels which were contracted to individual households for management. Compared to the setting of boundaries of each parcel of forest around 1952 when land reform policy was implemented, this time boundaries were more accurate and followed the process of dividing forests into small parcels for each household management required by the forest authority.

*Case 4: H Village has 4 sub-villages, named Shang-zhai, Xia-zhai, Lao-Zhai and Dou-Diping. One to two representatives from each sub-village were selected to be responsible for land allocation. As for variation in terrain, landforms and distance, all lands owned by H Village were divided into 4 parts equally in light of the population size of each sub-village. Each part would be divided equally among the households in each sub-village. As for the high economic value of walnut, its distribution plan had to be discussed separately. For every sub-villager, their owned walnut trees and those trees' outputs would be estimated in RMB. The normal value of one walnut tree's output was 7-8 yuan. The lowest value was only 1 yuan and the two highest values were 30 yuan and 50 yuan respectively. They summarised the whole value of trees and allocated those trees to every family in the small village group equally. After the allocation, villagers planted Chinese catalpa wood, lacquer tree, cedar, birch, walnut tree, etc., and cultivated timber and firewood forest on their own hills. Villagers were willing to keep the trees and expected to sell those trees after maturity rather than cultivating the land.
-- Hu Zhuanfa, the main member of the allocation in 1983*

Mountain closure campaign for greening hills and mountains: The local forest authority and the Gaoligongshan National Nature Reserve Administration Office had enacted a local act, called the "Act of Mountain Closure at the Gaoligongshan NNR region", which was implemented from 1986. Grazing of cattle, sheep, horses and other animals on the hillsides was prohibited, but it was difficult to enforce and utterly failed.

Sino-Dutch Forest Conservation and Community Development Project: This project was implemented in H Village from 1999 to 2001. The main activities of the project were as follows: 1) training of community elites in "biodiversity resources and their value", "ecological balance", and "sustainable use of biodiversity resources and forest conservation", to increase consciousness for the protection of forest resources; 2) enhancing participation of community people in community development planning through different ways such as publicising, participatory assessment, community interviews, villagers meetings and so on; and 3) small-grant community development projects, such as energy-saving stoves, drinking water project for humans and livestock, etc. The consciousness of villagers on protection of the forest was awakened by this project and they also realised the importance of forest resources to their livelihoods.

Conversion of farmland into forest programme: This programme was implemented from 2004. It offered farmers an annual payment of 260 yuan/ha subsidy for afforestation of farmland plus free seedlings for afforestation. Considering that the average annual income of farmers was about 800 yuan per capita at that time, farmers were very enthusiastic to participate. Villagers in H Village planted trees that amounted to up to 1,000 mu of area a year for 2004-2005. But after planting, the community people were told that only land officially registered as permanent farmland with acreage of at least 50 mu a piece could qualify to get subsidies from this project. Eventually, only 334 mu were officially accepted to qualify for this programme. As an important outcome of this programme, mountains and hills were closed up and grazing was prohibited in the hills and mountains, as otherwise the newly planted trees would not have survived.

Case 5: The goats can destroy the trees and grass badly. In order to enable success in implementing the project of conversion of farmland into forests, no grazing was allowed in the mountains and hills. In 2004, all goats in the amount of 500 raised by households in H Village were sold. Due to oversupply, the people had to sell them cheaply. Normally at around 2004, one matured goat could value 300 yuan, but we sold for only 120 yuan. All the

villagers jointly made the rules to close hillsides and no grazing in forests. Because of this we could not feed livestock, and many younger residents left the village for labour work afterwards.

-- Guanghong Ma

Hong Kong Community Partner Project: This project entered the H Village from 2007. From 2007 to 2009, it established a mechanism to promote biodiversity conservation together with the H community, by recovering the connections between traditional culture and nature and collecting and organising the traditional cultural knowledge of the community. In addition to recovering the Lisu language, writing, dance, clothing and other activities, the project helped to formulate more formal and complete village rules. Some of the rules were about forests, such as - 1) the owner would be fined if their livestock entered into farmland or closed hillsides. They would be imposed a fine of 20 yuan for each horse or cow, or 5-10 yuan for each pig or sheep; 2) They should pay 5-10 times the value of whole crop losses on the ground or 200-500 yuan for compensation; 3) They would be fined 200-500 yuan and would be embarrassed in public for their sabotage. These punishments were very serious relative to the same clause in the Forest Law of the People's Republic of China. The headman of Lisu had the right to implement these punishments.

5. Changes in forest use and management and their causes

5.1. Changes in forest governance

Table 1 describes the changes in the forest management grassroots system over the past century in H Village. Traditionally, state power had no place in practices in the community. The Lisu people were self-governed by their own logic, values, religion and spirits. By establishing a land titling system, a forest tenure system with Chinese characteristics,

through unintended steps and evolving approaches, going from privatising to land reform to collectivization, then to privatising, centralisation, decentralisation, state power and local authority gradually gained legitimacy to share the rights and responsibilities of forests with community people. Scientific knowledge assisted this process. Nowadays, forests in the H Village are managed by the community and people, however under the law and administration of local authorities with practices guided by a mixture of traditional and modern knowledge.

For forest management, the H Village adopted a newly developed technology to cultivate the forest and carry out agroforestry practices in the forest, which eventually facilitated completely stepping away from slash-and-burn, collective hunting and local livelihoods highly dependent on natural resources (Table 2). However some elements of land use practices were inherited from traditional slash-and-burning, for instance intercropping of corn under tree canopies and using timber for building and firewood. Nowadays, trees naturally generated are replaced by walnut trees which have a high economic value. Villagers learnt walnut tree grafting techniques to improve walnut varieties, increase production and income. These practices help to achieve the goal of forest conservation and the villagers' enthusiasm for afforestation has increased.

Case 6: My family began to grow Chinese fir (Cunninghamia lanceolata (Lamb.) Hook), watermelon, southwest birch (Betula alnoides Buch.-Ham. ex D. Don) and some other fast growing species from 2004. I believe that the trees grown in the mountains are our fortunes. They can be auctioned or transferred when our family faces financial problems and is in urgent need of money in the future. Even if there is no urgent need, my child can also inherit the family property.

-- Ma Guanghong

Table 1. Changes in forest governance at H Village

Subject	Traditional	Nowadays
Land ownership	Common-pool resources	Village collectives owned
Forest ownership	Common-pool resources	Privately or community owned
Forest classification	Slash and burn forest, hunting-gathering forest, holy forests and trees	Economic forest, timber forest, fuelwood forest, and holy forest and trees
Legal arrangements	Custom regulation	Legal and rural regulations
Law enforcement	Headman	Local forestry department and headman
Management decisions	Holy forest by headman, the others by individuals household	Holy forest by headman the others by household based on relevant law

Table 2. Changes in forest management at H Village

Subject	Traditional	Nowadays
Forest cultivation	Depend on natural force	The holy tree depends on natural force the others depend on technical measures such as genetic improved varieties, tending and using fertiliser and pesticide.
Management form	Hunting and slash-and-burning at open forests, collecting non-wood forest products.	Household management
Profit-making way	Self-sufficiency	Sale walnut, tsaoko, wood; government subsidies; self-sufficient of grain and vegetable products

There has been a profound change in the forest's spiritual and cultural value in H Village. In the modern H Village, only the sacrificial ceremony of the holy trees and temple trees has been continued. The hunting stone has become a historical site to be shown. The other nature worship and production technologies that came along with slash-and-burn and hunting have disappeared. The Lisu's traditional view of nature has faded away and been gradually replaced by a human-centered view based on remaking nature and creating economic value from nature. Along with the young labour force going out to study and work and the changing ideas of people, the traditional knowledge and culture of H Village began to decline. In 2000, the village built a simple Christian church. In 2002, there were only ten villagers who believed in Christianity, however, the number of such believers is increasing constantly.

5.2. Changes in the population and land use

In the seventy years after the establishment of the PRC, the population of the H Village increased fourfold. The growth of population during the late 1950s became rapid. As people in H settled down and could not move away for more land for slash-and burning, they shortened the slash period and soil quality and vegetation had not yet recovered, resulting in the decline of farming production. Additionally, the Great Leap Forward policy also wielded effects. All of these conditions resulted in severe forest destruction. The natural forest within the village suffered a lot. So far, it has not recovered to its original state. Subject to the constraints of land resources, farmers were forced to convert their low-productivity slash-and-burn cultivation system into an intercropping system that realises a higher productivity. After 1990, the prices of rosewood and other rare hard

timber increased considerably which promoted local illegal logging of precious wood. Subsequently, smuggling across the Myanmar border increased rapidly, creating a serious threat for the Gaoligongshan Nature Reserve. Farmers also knew the value of rare wood from the market. Many actors actively intervened in H community including the local governmental authority, the nature reserve and non-governmental organisations to improve the local people's livelihoods and awareness of the importance of forest biodiversity and other ecological services. The growth in population is an internal driving force that transforms local traditional knowledge and cultural changes.

After 2000, the number of out-migrant workers has increased year by year. By 2014, around two-thirds of the work force worked outside the village for more than half a year, and 15% of families, including children, lived in towns except for a few days for the spring festival and traditional gathering activities including weddings. Fuelwood used to be the dominant source for cooking and heating, but by 2014, fuelwood was largely reduced. Considering restrictions on grazing that were implemented, pressures on native forest cover were removed, vegetation was recovered, and forest cover was increased in the village.

5.3. Change in livelihoods

Over 100 years, the agricultural production system was transformed from slash-and-burn practices, to self-sufficient permanent farming and a mixture of self-sufficient and small-scale commercial farming. Units of farming were transformed from households to commune and back to households. After 2004, agricultural production quickly

Table 3. The population and land use change in H Village

Year	1900	1949	1962	1984	2010
Population	15	74	90-100	200	304
Land (mu)	Non fixation	Non fixation	3777	3777	3777
Paddy field (mu)	0	0	91.5	91.5	91.5
Forest (mu)			2500	3200	3200
Number of walnut trees	0	0	0	10000	30000

Table 4. Changes in the livelihood of H Village, production tools, source of income

Time	Means of livelihood	Tool of production	Source of cash income
Before 1949	Slash-and-burn cultivation	Knife, ax	NTFPs, and animal products by hunting
1950-1962	Slash-and-burn, paddy field	Cattle, rake, hoe, sickle, etc.	Rice, corn, NTFPs, and animal products
1963-1984	Intercropping crops under trees, and paddy field	Cattle, rake, hoe, ax etc.	Rice, corn, NTFPs
1985-2010	Intercropping under trees	Cattle, iron plow, hoe, knife axe, agricultural vehicles etc.	Sheep, cattle, walnut, tsaoko, migrant labors

shifted to the commodity type of agricultural production (Table 4). Compared to 1949, agricultural production types and technologies have changed greatly, the main crops and varieties are completely updated, and the family has become a labour, capital and technology-based service provider and commodity producer.

5.4. Policy interventions

The ownership of land and forests experienced a series of policy interventions, such as land reform in early 1950s, the commune movement around 1960, the household responsibility system in 1980, the forest three-fixes policy in 1983, the mountain closure policy of 1986-1996, conversion of farming land into forest in 2004, and collective Forest Tenure Reform in 2008. The property rights of forests were transformed from common-pool resources, to privatised, to combined collectively owned and privately owned, and finally privately owned, while holy forests and trees were maintained as community owned. Management units of forests were transformed from vast scale (little management), to small scale by household, to community, and finally to small scale by household. Every adjustment pushed changes in forest management and utilisation.

In the commune movement period, the collective replaced the individual household as a management unit, thus slash-and-burn was greatly altered to an act undertaken by each household. Burning sites were enlarged, which actually increased soil erosion. After implementing the Forest three-fixes policy, the residents got ownership of the forest again. They mastered grafting techniques for walnut trees, improving the survival rate from 50% to 80%, and yield was greatly increased as well.

The Gaoligongshan NNR protects forest resources and preserves biodiversity while utilising forest resources. The reserve has assisted farmers in planting cash crops, including tsaoko, tea, and medicinal herbs to improve farmer cash incomes. The Sino-Dutch project and the HK community partner project reviewed traditional knowledge and culture here, discovering a value of its own by directly intervening in local livelihoods. At the same time, they trained the

residents in protection awareness and provided techniques and facilities to save bio-energy for home consumption, which influenced local livelihoods indirectly. For example, using energy saving stoves, the residents found an easier way to cook compared to traditional firewood.

As early as 1996, villagers went out to work in the nearby county, and later, more and more community people went out for migrant jobs at greater and greater distances. As of 2010, they worked in Kunming, Shanghai, and so on. The outsiders' ideas and behaviors changed, and they have become the link between H Village and the outside world, which has had a significant influence on the younger generation.

6. Discussion and conclusion

The cultures and religion of the Lisu people, including the ways that Lisu people have lived with natural resources and village regulations, derive from their practical experiences of living with nature, as well as the knowledge that they have inherited from ancestors for generations. On this basis, they unintentionally affected positive influences on nature, such as protecting natural resources and keeping the ecological balance, which is still important in modern life. Out of animism, the Lisu people express their respect for forests, plants, animals and the environments they live in through tangible and intangible way of life etiquette, religion, habits, etc. Through all these activities they built a long-term harmonious relationship between mankind and nature, which can be seen in every aspect of local ethics, culture, politics and economy. Thus, the forest coverage has been kept at a high level, although has plunged in the short term due to unfavourable policy interventions. The forest ecosystem has been well-functioned, and biodiversity has been well protected. On the other hand, rich forests and biodiversity are a precondition to maintain traditional cultures and lifestyles to some extent, which are supported by biodiversity and forest protection (Shen 2015).

Today, China is in a rapid socio-economic transition. Under modern technology and modern culture, traditional forest-

related knowledge and culture have faced great challenges. In their livelihoods recently, the Lisu People have reduced dependence on forest products. Slash-and-burn farming and nomadic lifestyles have been transformed into agroforestry practices for commercial crops and off-farm jobs. If we classify the forest here into two categories—forest related to religious beliefs and forest for livelihoods, we can see that the influence of livelihood change on traditional forestry knowledge is more prominent. People now use more Chinese and specific classification and rules to manage forest use, adapting to the commodity exchange and economic production at a higher frequency. Contrary to this, TFRK and related culture, such as sacred trees and holy mountains, have been preserved in the Lisu religion, split from their lives and production.

It has been a prevailing concept that poor communities with rich biodiversity are vulnerable to outside interventions, and quite commonly both parties are losers during the process of modernisation, globalisation and marketisation. We should admit that modernisation, globalisation and marketisation are deeply changing the relationship pattern of humans and nature and luring people with the desire for a better life and modern technology. They are destroying the one and only thing that human beings can rely on, which is the ability to sustain the life of the earth's ecological system (Luo et al. 2015). Hopefully, the case of H Village can prove that with proper interventions, humans can achieve dual goals to improve the livelihoods of local residents and to preserve biodiversity in the era of modernisation, globalisation and marketisation. The story of H Village tells us that the relationship between humans and nature should be interactive and interdependent, and accordingly biodiversity conservation should be based on socio-ecological systems as a whole, not separating humans from the biosphere. The Lisu people's simple epistemology, traditional forest knowledge and culture enlightened us that forests will be managed in a better way if we carefully consider the role of this wisdom and knowledge in modern society. Thus, we need to explore how to bridge the gaps between modern knowledge and traditional knowledge, modern culture and traditional culture. To explore and seek the harmonious development of humans and nature, we had better positively address the challenges of globalisation. Instead of holding onto traditions passively, we need to find ways to protect national culture and regeneration of traditional knowledge with an open mind.

We should fully consider TFRK as an asset of rural minorities and activate it in the era of globalisation, marketisation and privatisation towards sustainable development, with multi-dimensional objectives, including improving the material and cultural livelihoods of local ethnic peoples and maintaining the integrity of species diversity and

ecosystems, to achieve the harmonious development of humans and nature.

In the Law of Forestry of the People's Republic of China, enacted in 1998, there is no clause on traditional forest-related knowledge (Liu & Innes 2015). Traditional forest-related knowledge has not yet entered the forest policy debate in China. From 2013, big and ancient trees in the countryside have been recognised as important assets that require protection, and the State Forestry Administration (SFA) conducted a national inventory on big trees and protection actions have been taken. However, traditional culture, as a reason why these trees can be maintained, was not recognised. These cultures are considered to be outdated ideas which should be eliminated in order to develop modern society. In recent years, ecological civilisation has been highlighted as a national development strategy, which might initiate a new era for the revitalisation of traditional culture related to environmental protection. However there is a long way to go in China to recognise TFRK as an asset.

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1 1 hectare = 15 mu.

2 Between 1994 and 2003, when agriculture tax was collected, local people paid agricultural tax or other charges levied by the local authority that were collected based on the acreage of land in the category of household responsibility land. No tax was levied on the land in the self-sufficiency category.

Heritage wheat renaissance in Montespertoli, Tuscany

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Abstract

Ancient grain renaissance. A system called *mezzadria*, set in place in most Tuscan agricultural areas for many centuries, is a socio-ecological production landscape (SEPL) consisting of a share-cropping system whereby the farmer pays a share (usually half, as the etymology of the word *mezzadria* suggests) of the products to the landowner as rent. A *podere*, a piece of land surrounding a house assigned to a *mezzadro* of a size manageable by a family, is almost entirely self-sufficient. The beauty and uniqueness of the Tuscan landscape may be attributed mainly to the system of the *mezzadria*.

This paper discusses the birth of a project that is a unique cooperation involving the University of Florence, a miller, bakers, farmers and local government to promote ancient varieties of wheat grown, milled and transformed locally. Initiatives, such as the non-profit Ancient Grains Association that sponsors local cultivation, milling, baking and pasta production, reap substantial benefits for the local population. The ancient grains project brings back know-how and jobs to the SEPL. It promotes social aggregation around the agricultural calendar and traditions. It sponsors sustainable agriculture, and increases biodiversity in wheat and local flora and fauna. Finally, it brings to the consumer better quality products with several health benefits.

Keywords: Ancient grains; *Mezzadria*; Montespertoli; Pasta; Tuscan bread; Wheat

1. Introduction

Tuscany, a region in central Italy with an area of about 23,000 square kilometres and a population of almost four million inhabitants, has been cultivated with different types of grains (e.g. common wheat, spelt, durum wheat), olive trees and grapevines since Roman and Etruscan colonisation going back to the sixth century B.C.E. In addition to being major consumers and exporters of wine and olive oil, the Romans, like the Greek and the Etruscans, considered themselves largely a bread-eating population in comparison to other populations. These agricultural features have remained largely unaltered in Tuscany for the past two millennia.

Gradually, in addition to the cultivation of these three types of crops, the raising of pigs, goats, chicken and cows was introduced. The resulting agro-silvopastoral system has been in place for centuries in most of Tuscany and constitutes the base of the socioeconomic fabric of Tuscan towns. Most areas have developed their own varieties of wheat as well as their own types of grapes and their own olive trees. Some areas even distinguish themselves from others in the way they cure their meat. The combination of agricultural products and systems, traditions, festivals and cultural events all contribute to the complex socioeconomic system.

1.1. *Mezzadria* system, SEPLs in Tuscany

Tuscany's land distribution has gone through a series of changes in the course of history. In ancient Roman times (from the first century C.E.), a system of *villae* was established in some areas of Tuscany.¹ In the Middle Ages (12th century), land, owned by the church and the aristocracy, was organised into fortified towns. This latter land distribution was then slowly replaced by a system called *mezzadria*², a socio-ecological system that shaped most of the Tuscan landscape from the Middle Ages to the 14th century. The *mezzadria* system is a share cropping system whereby the farmer pays a share (usually half, as the etymology of the word *mezzadria* suggests) of the products to the landowner as rent. Due to its nature, the *mezzadria* system allowed landowners to sit back and relax without having to make any significant investments. They provided land and houses (that they already owned by inheritance) to the *mezzadri*, the families who worked the land. In return, the *mezzadri* had to work the land all year long and provide half of every harvest (once a year for wheat, grapes and olives) to the owner. The conditions in which the *mezzadri* worked depended on the type of soil they were given and the fairness of the owner. As large areas of land were difficult for a single family to farm, the land was divided into small plots, which were then divided into smaller parts and rows assigned to olives, wheat and grape cultivation, thus transforming the hills into a huge patchwork.

Every family of the *mezzadri* had to provide their own food and cultivate the traditional crops of grains, grapes and olive trees, as well as raise as many animals as they could. Other plants such as chestnuts, walnuts and apple trees were cultivated in different areas of Tuscany. The most common animals raised were pigs, chickens, goats and cows. They used oxen (castrated bulls) to work the soil, and chicken and pigs for animal protein or to produce the typical salami and prosciutto salted meats. Goats and cows were usually used for their milk and occasionally for their meat. Woods were a fundamental resource for firewood, for acorns to feed the goats and pigs, as well as for foraging different berries, wild asparagus, mushrooms, truffles, etc.

The system was efficient due to the cycle of each harvest, being naturally timed so that the different harvests alternated with each other and did not inundate the *mezzadro* with harvests at the same time. Thus, olive tree and vine pruning was carried out in the spring, canopy management occurred in the summer, and the harvesting, threshing and ploughing the fields for wheat were undertaken in August. In the fall, the grape harvest was carried out during the months of September to October. In November, the olive harvest

occurred and the year would conclude with pig slaughtering in December. The system created almost no waste—the remaining hay and straw from the wheat harvest was used to feed the cows. The discarded branches of olive trees and stems of the vines could be eaten by the goats, and the grape skins provided food for the chickens. This system could be reproduced at a farm with very little external input required.

A *podere*, a piece of land surrounding a house assigned to a *mezzadro* of a size manageable by a family, is almost entirely self-sufficient. The beauty and uniqueness of the Tuscan landscape may be mainly attributed to the system of the *mezzadria*. Due to the *mezzadria* system, large monoculture was avoided as every *podere* was organised in a way that integrated the various different types of crops within its land. The *podere* usually consisted of a farmhouse on top of a hill surrounded its crops: the grapevines and olive trees would be arranged in rows and separated by an area allocated for wheat cultivation (Figure 1). Some areas would then be reserved for woods, a well, a threshing area, a cellar and a barn. Activities were held by extended families in front of the barn, as shown in this picture from the early 1900s (Figure 2). The *mezzadri* divided the Tuscan territory into various *poderi*, with borders shown by pointy cypress trees, shaping the landscape that, years after the end of the *mezzadria*, may still be enjoyed today (Figure 3).

As grape cultivation has been the most economically rewarding, vineyards are now of larger sizes than in the past. However, in most areas it is still possible to see mixed landscapes with woods, olive trees, wheat fields and vineyards. Next to the vineyards and along rivers one can



Figure 1. Author's farm on the hill (Photo by Guido Gualandi)



Figure 2. Agricultural life in the “Novecento” or early 1900s (Photo by Comune Montespertoli)



Figure 3. Vineyards, olive orchards, laboured land in author’s farm, Montespertoli. Borders are shown with cypress trees (Photo by Guido Gualandi)

still find several types of willows. For example, *Salix viminalis* and *Salix alba* are still used to tie the vine’s canopy. The kinds of trees found in woods vary according to altitude and the presence of water. In most Tuscan areas poplars, oaks, elms and field maples may be found. Truffles and mushrooms are also found in the woods and harvested by locals. Likewise, farmers have a tradition of picking many wild plants to eat according to the season. For example, several kinds of wild asparagus, borage and rocket salads of the *Brassicaceae* family are picked, as well as plant species of the genus *Silene* of the pink family (*Caryophyllaceae*) and *Cicerbita* of the aster family, *Asteraceae*. This is not true of several areas where viticulture has invaded all possible areas and the use of herbicides has reduced biodiversity. House distribution may be also traced back to the *mezzadria* as each farm is situated near or in the middle of its own land.

1.2. Transition of Tuscan landscape

With the transition to modern agriculture in the middle of the 14th century, some of the *mezzadri* were able to buy their houses and land. In other cases, large landowners have continued their agricultural activities with hired workers. Tourism has also shaped the Tuscan landscape. Agro-tourism (hotel farmhouses) has emerged in many places, houses are rented out through the Internet and it has become trendy for the wealthy and famous to acquire properties here.

Several issues have affected the socioeconomic system. The necessity to lower the price of wheat arose following the transition to modern crops and the pressure of globalisation. In order to do so land was abandoned or it was exploited without the necessary maintenance.

Water management must be carried out and canals and ditches kept in order all year long; however, in order to lower prices, modern farms have cut their maintenance work. This has resulted in larger vineyards and bigger arable fields that cause increased soil erosion and landslides (Landi 2004). In addition, it is now known from numerous studies that the use of chemical fertilisers, insecticides and herbicides has polluted some of the aquifers, reduced biodiversity and damaging pollinators such as bees (Marshall 2001). Wheat cultivation has been the most impacted due to the fact that wheat has become a global commodity that is cheaper to import than to produce, therefore distorting the relationship between price and the cost of production. Similarly, the decreasing cost of olive oil worldwide favours importing oil from other areas in the Mediterranean rather than producing it in Tuscany. Grape cultivation is the only one of the trio that is still predominantly produced in Tuscany. This is impacting producers who have abandoned or are considering abandoning wheat cultivation and olive production. According to Casini Benvenuti (2013), import statistics show that all sorts of agricultural products, such as oil, wheat and raw meat, are imported to produce several products, including cured hams and salami. This has a negative effect on agricultural practices that must adapt to global competition with lower prices for wheat, meat and so on. All of these phenomena thus wield a negative impact on socio-ecological production landscapes (SEPLs).

Over the past 20 years, local farmers have again started to produce local agricultural products thanks to increased demand for local products. An increased awareness among consumers and producers, and actions by local governments and associations have begun to change the production method from international imports to local production

and transformation. Many different areas of the SEPLs have been involved. Grape production has started to change with a boom in organic producers and the re-discovery of indigenous varieties and natural wine-making techniques. Local vegetable production has started again thanks to local purchasing groups who are willing to pay slightly more. Supermarkets have commenced promoting local products. Producers associations with the ability to lobby local government have arisen and some have managed to even reach Brussels and the European Union with the results of obtaining some funds and recognition. Local government is now aware of the need to manage the land in a new way after an increase in landslides mainly due to modern monoculture techniques. Because of the complexity of recent events, it is difficult to analyse all these issues at once. This paper will focus on one case of a very local Ancient Grains project that started in Montespertoli ten years ago. Montespertoli is a Tuscan town with 13,000 inhabitants and an area of 125 square kilometres in the Florence area. Its economy is mostly based on agriculture and tourism with some inhabitants commuting to Florence for work.

2. Effects of globalisation on grain cultivation

2.1. Ancient grain selection and preservation by the University of Florence

All Tuscan indigenous varieties of wheat, called here ancient varieties, may be traced back to the work of a group of geneticists in the early 1900s (Becherini 2013). The first cereal genetic research centre was established in 1919 by Nazareno Strambelli. Different research stations were created in various parts of Italy in the following years. Professors would then move around the stations and teach where help was required. In the beginning of the 19th century, also due to fascist government policies, Italy was self-sufficient in terms of wheat and was even exporting. By 1940, new varieties were selected and synthetic fertilisers were introduced. Strambelli and subsequently Marco Michaelles selected many varieties that were used until the 1970s (see Benedettelli et al. 2013). A fundamental role was played by the research centre located on the farm of the Count of Frassineto in Arezzo, a province of Tuscany. One of the main features of these research projects was that the selection criterion for wheat was based on how adaptable the grain was to Tuscan soil and not how efficient the grain would be for industrial purposes. The selection of new varieties and research in all fields of agriculture were essential to the success of Tuscan food in Italy and worldwide. The model, based both on tradition and quality, gained Tuscany the

international reputation that it still maintains. The Ancients Grains project has focused on those ancient varieties selected as best adapted to the Tuscan soil and climate, the most replanted of which are now Verna, Frassineto, Gentil Rosso and Inalletabile. They are tall varieties, with lower yields than modern varieties. They have similar amounts of protein content and they do not require fertilisation.

2.2. Modern developments

Recent modern techniques and globalisation have begun to obstruct the traditional Tuscan model and a balance needs to be found. Following industry's demand for higher performance gluten and reduced costs, techniques have changed and modern dwarf varieties with different types of gluten have been planted everywhere causing most old varieties to disappear from the fields.

As previously mentioned, over the past 40 years, farms have felt the pressure to cut costs. Local consumers also have increasingly chosen cheaper agricultural products as their purchasing power was reduced by continuous economic crises, the latest in 2008. In some areas, especially cereal cultivation, competitive imports have discouraged cultivation. Similar conditions apply to olive tree cultivation, and to a certain extent the drop in prices has also affected viticulture. The result of having to reduce costs is that farmers have less resources to invest in water management, wood management, sustainable farming and other key field techniques. Today, Tuscany imports more food than it produces. In 2012 Tuscany exported food worth 7.711 billion EUR and imported food worth 9.898 billion EUR (Rossi-Benvenuti 2014).

2.3. Agro-tourism, regional landscape plan and replanting ancient varieties

From the year 2000, a few positive factors have slowed the deterioration of farming and wood management. On one hand, the boom of agro-tourism (Tuscany accounted for 33% of total market share in Italy in 2012 (Rossi-Benvenuti 2014)) has provided resources for agro-tourist farms to maintain their fields and landscapes. Many farms were restored, roads were repaired, and farms invested the revenues from tourism in their agricultural projects as laws require that more than 50% of revenues need to come from agriculture to maintain an agro-tourist farm status with tax benefits and incentives. On the other hand, incentives given to convert to organic agriculture and modernise agricultural practices in all fields have assisted in both the development of sustainable agriculture and the heightened quality of products.

2.4. Ancient grains and landscape preservation

The highly acclaimed technological innovations in agricultural methods were introduced mainly for the benefit of large industrial companies that were able to influence government decisions. Modern wheat cultivation reduces biodiversity and damages the environment. Modern wheat processed to become white flour has lower nutritional value than previous varieties (Adom 2007) and contains high performing gluten that is good for the baking industry but difficult to digest for humans. Industrial methods in the food industry remove jobs from places of production, also putting an end to local traditions.

Research by the University of Florence has played a key role in bringing back ancient varieties. The first institute to initiate biodiversity actions was the Scuola Superiore di Agraria in Florence. Ancient grain cultivation was initiated in the 2000s decade with pioneers such as the Floriddia Farm in the Pisa area and some other farmers in Siena. Ancient varieties have a lower yield than modern ones, but they are similar when organic agriculture is carried out. Ancient varieties also have the advantage of reducing costs for buying seeds, chemical fertilisers and herbicides/pesticides and therefore are not favoured by the agro-industry. In fact, ancient grains were not selected to perform better with modern chemical fertilisers or other agro-chemical products. Some of their features are counterproductive to large-scale industrial purposes. For example, their higher stalks make them more vulnerable to being snapped by the wind. The cultivation of ancient varieties supports more sustainable practices—their roots are able to extract more nutrients from the soil, so they demand less fertilisers. Likewise, they tend to grow taller than weeds and therefore help preserve biodiversity by reducing the use of herbicides that hinder weed reproduction as demonstrated in the Marshall study (Marshall et al. 2001). Ancient grains also do not require anti-fungal products as their height keeps the grains away from the soil's humidity, however making them, as previously mentioned, more subject to fall with strong winds and storms.

Regarding the cultivation of wheat specifically, the Tuscan Region has taken some actions to ensure ancient varieties of wheat (and some ancient varieties of grapes as well) do not disappear. With the regional law, L.R. n. 64/2004, the Regional Register of Vegetal Varieties with Risk of Extinction was created. University farms and external farmers were involved in replanting these varieties. Since abandonment of the ancient varieties, some have been lost; however, many were also saved. The Tuscan Region has also worked to maintain the Tuscan landscape with its own peculiar features. The Landscape Plan (D.lgs 42/2004)

has the scope of preserving and enhancing the value of the Tuscan territory. The plan distinguishes itself from older ones because it involves the whole territory instead of being mainly addressed to “save” beautiful areas. This paper will not be able to analyse this plan, as it is a complex regional plan that deals with the placement of land-use activities, infrastructure, and settlement. Tourism has played a fundamental role in pushing the Tuscan Region to introduce a law favourable to agro-tourism (incentives and tax breaks for companies engaged in both tourism and agriculture). Subsidies given for the refurbishing and restoration of old farms have improved the level of accommodations offered so that Tuscany has increased its share in numbers of tourists. The same farms have used profits from tourism to improve their landscapes and agricultural practices. Socially, agro-tourism has created plenty of jobs, stimulated local artisans and increased the demand for artisanal food production. Focusing on the Montespertoli area, nearly one-third of farmers in the Montespertoli Ancient Grains Association have been able to sustain initial costs as they invested profits from agro-tourism.

2.5. Health benefits of ancient grains

Several studies have shown that ancient varieties are more beneficial to human consumption. One of these studies shows that ancient grain varieties have higher nutritional value. Benedettelli (2010) focuses on the effect on a set of individuals of short-term dietary intake of bread made with a selected variety of ancient grain grown in Tuscany. Twenty healthy subjects (median age, 39.5 years) were made to follow a 10-week diet containing bread (150 g/day) made from the test grain (test period) and, for the same period, a diet containing commercially available bread in the same quantity (control period).³ Results highlighted the high content and unique composition in lignans of old cultivars, suggesting they should be used to produce a wide range of regular and specialty food products naturally enriched with health-promoting compounds. Several other studies by Benedettelli (2013) seem to demonstrate that ancient grains contain more easily digestible gluten (Benedettelli 2013, p.41) and a more diverse variety of nutrients, and thus have a positive impact on reducing IBS (irritable bowel syndrome) and gluten intolerance. Their genetic variety, their adaptability to local features and their performance in low environmental impact agriculture make them suitable for a more sustainable agriculture. To preserve their nutritional value, ancient grains need to be stone ground and not decorticated in roller mills that only leave the starch of the endosperm of the seed. In addition, sourdough is preferred when making bread, while traditional methods that do not heat the dough are favoured for making pasta. The University of Florence developed optimal practices to

be passed on to all workers in the supply chain from the farmer to the baker so that the best conditions could be established.⁴

3. Ancient Grains Project birth

3.1. Work in the field, revitalising collaboration among the ancient grains

In addition to cultivating grapes and olives, Montespertoli has for centuries been a strong wheat producer, selling its wheat locally and to nearby towns such as Florence. In the Virginio valley in Montespertoli, more than ten mills were operating up to the past century. Today, only one mill remains, no longer situated on the Virginio river, but in the centre of town as water has been substituted with electricity. It is at Molino Paciscopi that the Grani Antichi Association (Ancient Grains Association) was created. Initially, Montespertoli had been trying to sell its bread locally as part of the Tuscan initiative, "Filiere Corta." Within this project, the Tuscan Region has been sponsoring local producers and small reselling businesses to work together to sell food made within a 70 kilometre range. Councils, cooperatives and other businesses were also able to obtain financial help from the region to organise markets to sell local products. (This operation still continues today.) The locally grown wheat from modern varieties was milled at Molino Paciscopi and sold to local bakeries. Bread was

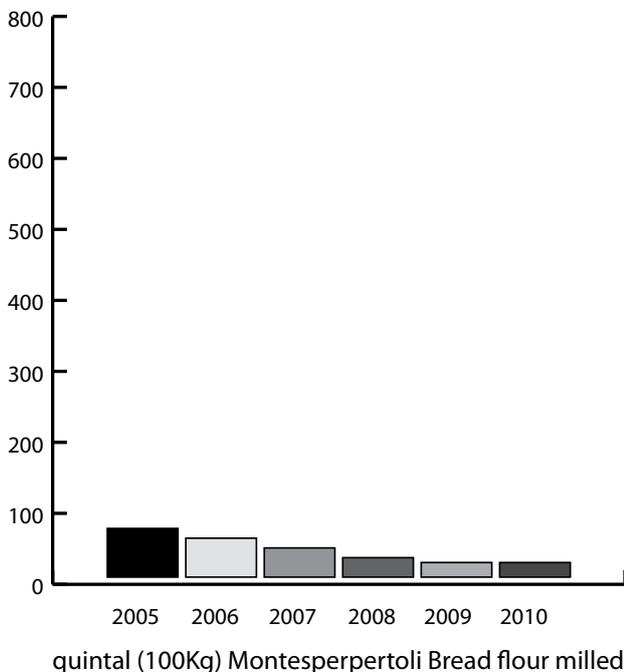


Figure 4. Amount of bread flour milled in the first short chain project in Montespertoli: The first short chain project in Montespertoli concerned regular modern wheat, milled and baked in town. Despite advertisements and the creation of a brand, it was not very successful and the wheat milled slowly decreased every year (Source: Montespertoli Ancient Grains Association)

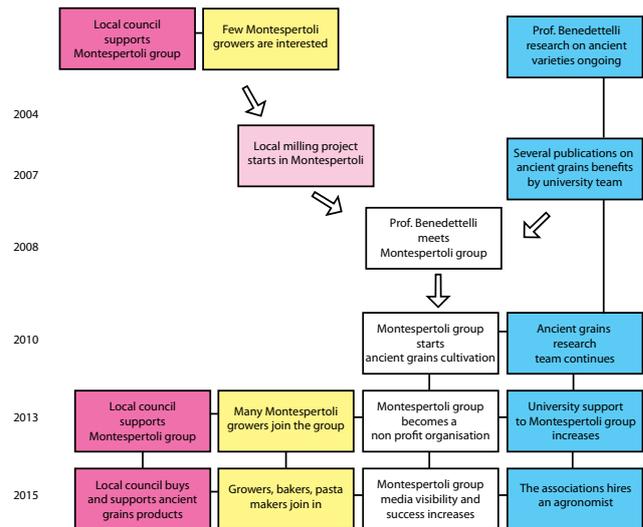


Figure 5. Connections between university work and the short chain project: the diagram shows how the university work and the short chain project connected and how success was determined by the role of different stakeholders interacting.

made and sold in the Florence area. The project was started in 2004 and worked initially, albeit at a small scale because this bread does not have sufficient unique features to be able to go beyond a couple bakeries and few selling points (Figure 4).

3.2. Upscaling the initiative

In 2008, the situation changes. Prof. Stefano Benedettelli from the University of Florence meets the miller Gianni Paciscopi from Montespertoli, who is quickly convinced to start working with the ancient varieties the university was testing, instead of using the modern varieties (Figure 5). A friend and client of Gianni Paciscopi, the baker Marco Panchetti, starts collaborating with the miller and then a few producers are convinced to try the new "old" grains they had never worked with before. Industrial processes had previously killed the links between producer, miller, pasta maker, baker and consumers. Ironically, this link has been a difficult one to recreate, also due to the fact that traditional techniques have been lost. The stone-grinding mill had nearly been abandoned and was used only once in a while to grind low quality grains for animal feed. Sourdough bread was no longer made in Montespertoli, and ancient grain varieties had been forgotten. This forced all the participants of the project to acquire new (old) professional skills. The work in progress is really a combination of different heritage skills. The university team, led by Prof. Benedettelli, helped select the wheat varieties and develop the processes for milling and bread and pasta making, as well as made progress on research on health benefits. Francesca Castioni, an agronomist, follows the producers in the field. The miller, bakers and pasta makers prepare the products and sell

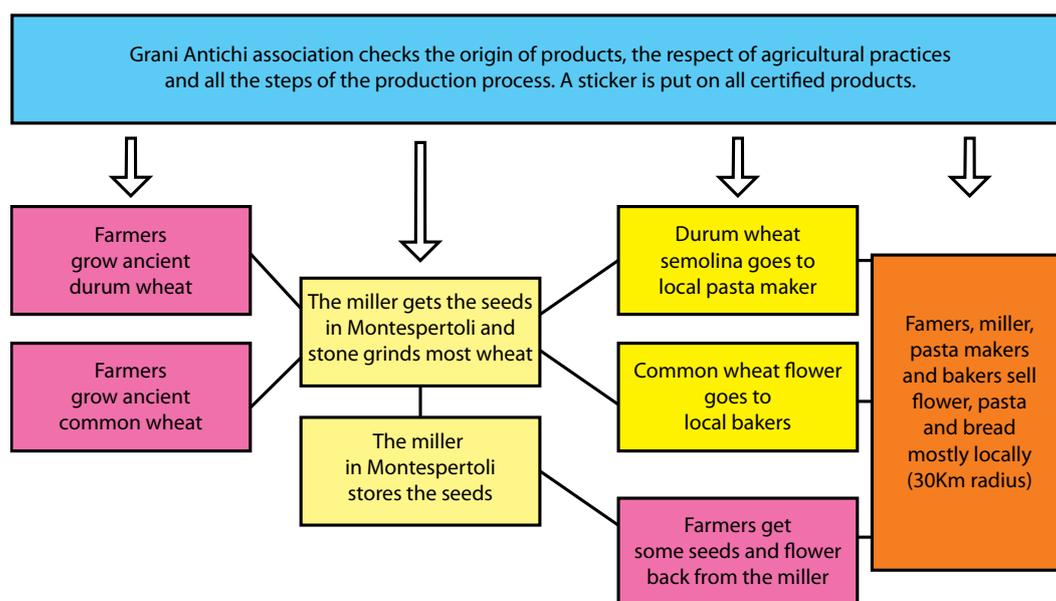


Figure 6. Short chain system in Montespertoli

them, helped by other members of the association. Thus, the environment benefits as the association ensures that all wheat is grown sustainably and best practices are respected in the agricultural fields. Consumers benefit as they can buy a better product that is quality controlled by the university and the Grani Antichi Association (Figure 6).

3.3. Results of the project

Guidelines that involve all the steps from growing the wheat to milling, baking and making pasta were created based on university research to guarantee a healthy and high quality product. For example, guidelines in the field prohibit the use of herbicides and chemical fertilisers. For grinding wheat, stone is preferred as roller mills tend to take away more nutrients. For making bread, sourdough is to be preferred, and for pasta making, there is a maximum temperature for the drying process as high temperatures tend to decrease quality and nutritional value.

Discussions on this project started in 2008. As early as 2010, wheat production began and the non-profit Ancient Grains Association was registered in 2013. The aim of the organisation is to protect and help producers respect the guidelines and promote ancient grain products. The association also acts as a facilitator of cooperation among stakeholders. It confers with the university team and spreads good practices learned to the growers, and it talks to local politicians to help them determine the right policies. Likewise, it talks with consumers and producers so that information passes from the beginning to the end of the chain. It also makes sure that the higher prices paid by consumers are transferred to the farmers. Thanks to promotion by the association, help from the university and

the higher price paid by the miller for the ancient wheat, 20 producers have joined since the project was initiated, and 450 hectares are dedicated to ancient grain production, though due to crop rotation only about 150 are constantly planted. The biggest growth in term of hectares and grain produced was attained in 2015. The miller and the baker agreed that producers should have a premium price for their effort. In 2015 they were paid 60 euro cents per kilogram for their wheat, as opposed to 20 cents for modern non-organic wheat. As of March 2016, industrial bread can cost as little as one euro per kilogram. Montespertoli bread made with regular stone ground flour costs two euros per kilogram, and ancient grain bread between 3.5 and four euro per kilogram. Flour costs are 35 euro cents for industrial, 45 cents for local flour, 80 cents for stone ground flour and one euro and 40 cents for ancient grain stone ground flour. A higher payment is required for many reasons. First, ancient grain cultivation is not recognised by the subsidies system as seeds are not available in the mainstream market and yields are usually smaller than modern seeds. Also, wild animals seem to prefer ancient grains to modern ones thus fields of ancient grains sustain more damage than conventional ones. Rewarding the farmers for their work is clearly one of the main reasons farmers are willing to grow ancient varieties. The reward is guaranteed by the miller who buys the wheat and the association that owns the trademark. 2015 has seen a record production of 80,000 kilograms of wheat, with three pasta makers and three or four bakers and flour shops selling the products in all areas of Florence (Figure 6).

Many articles have been published and television programmes dedicated to ancient grains. This is not an isolated project. Similar initiatives were started in Tuscany and in other Italian regions from Liguria to Sicily. Although the models are similar,

the Montespertoli project is one of the few that makes sure the farmers are paid more and that intentionally creates social aggregation around the project. One of the main purposes of the Ancient Grains Association is to help create other associations in Italy. Many groups of farmers, together with local councils, are currently gaining assistance to start up similar projects. Many of the requests for help received by the association are from groups of farmers associated with a local council that acts as catalyst.

Despite higher prices, ancient grain products are very successful. They are sold both in specialty stores and at local supermarkets, as well as used in local schools. Clients are happy as they feel they are doing something for their health, the local economy and the environment. Demand is rising from all economic and cultural groups of people. Local promotion and education has been a key factor in fuelling demand. The local council includes ancient grain products in all events and even the Florence city council has provided assistance in promoting the association.

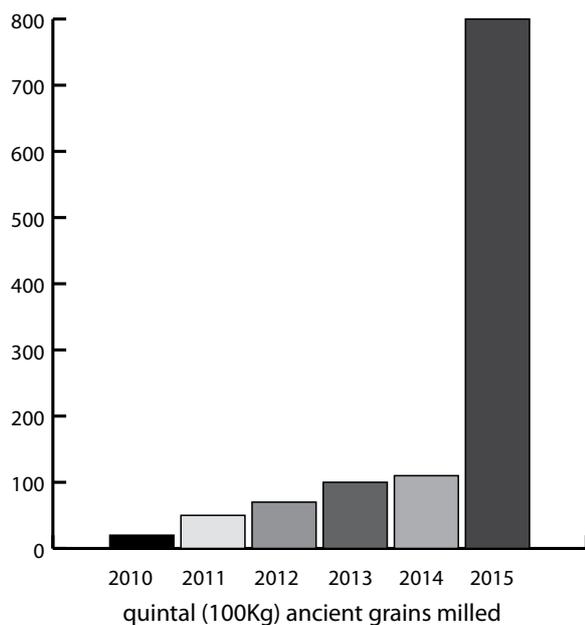


Figure 7. Amount of ancient grain wheat milled in Montespertoli: the sharp increase shows the success of the project. (Source: Montespertoli Ancient Grains Association)

The members of the Ancient Grains Association are the wheat growers, the bakers and pasta makers, the miller and the consumers that feel they want to take part in it. Several hundred people have joined and every week there are new members. Each person donates a small fee, and the money is used mainly to promote ancient grains. Members meet to make important decisions on how to control the process, create events, and partner with other associations and local councils. While the association guarantees the



Figure 8. Wheat party (Photo by Comune Montespertoli)

origin and production of products, the entire process is under the supervision of an agronomist and receives help from the university. It could also be viewed as the first step in a process that could subsequently be recognised at the European level for protected agricultural products such as PDOs/DOP or PGI/IGP certifications.⁵ This particular association also promotes a certain type of lifestyle and healthier agricultural methods. Grain cultivation needs to be organic, which is for example not required by IGP or DOP. In addition, the way the fields are worked increases biodiversity both in wheat and in local flora and fauna. The association also sponsors local cultural activities, including threshing with ancient methods in local costumes (Figures 8 and 9) and cultural activities involving bread and pasta with the revival of ancient recipes and festivities.

The association's biggest achievement is the promotion of social aggregation around the theme of agriculture following customs that have been practiced for centuries in the area. In short, these practices bring back tradition to this SEPL instead of outsourcing all food production to industrial sites that have no relation with the area whatsoever.

3.4. Local government actions

The association has asked the mayor of Montespertoli, Giulio Mangani, what actions he has taken and intends to take given the presence of this association in his territory. Before Mangani, the local council had sponsored, promoted and helped create Montespertoli's brand bread and the Montespertoli Chianti wine subzone. Both initiatives were not very extensive and did not create many jobs. Thus, it seems that sponsoring a product when the producers and consumers are not interested results in failure. In the future, Mangani's policy will be to not impose any agricultural

regulations or laws, but to let initiatives spring up directly from the citizens, and then to support them. If initiatives arise from a need deep in the social structure of the SEPL, there are greater chances of them being successful. For example, projects that were begun with regulations on wheat and wine did not succeed. The Ancient Grains Project, on the other hand, initiated based on an idea of the university and supported by the people and producers, has been successful even without subsidies. Similarly local grape varieties that have not been supported by any government initiative have seen some success. These examples reveal the appropriate path of regulators. On the one hand, there needs to be demand—people are interested in healthier products and local varieties. On the other hand, there needs to be an endorsement by the producers, in this case a miller and a passionate baker, backed by the necessary knowledge of the university team. Support from the local council is also required, and in fact, the first president of the association was the former agricultural attaché of the local government, Patrizia Ducci. Projects also need to be open to everyone and not restricted by regulations. Mayor Mangani believes that it is best for the administration to listen and help when a good idea comes along. Incentives are in most cases useless unless the needs and the passion of local people are involved. In this particular case, the passion started the projects and also stimulated the initial group to find a way to make the project economically viable for all the actors involved in the production process.

Finally, the Ancient Grains Association will bring numerous positive consequences for the future. A considerable amount of land, previously abandoned, has been recuperated, and crop rotation has been introduced. Farmers have started to plant legumes and forage for animals again. If the land is managed properly, the danger of landslides will be reduced. All of this will bring the previously disappearing farming community together again, at least partially. The council is extremely happy that local traditions such as wheat threshing have started again, even if symbolically. Now children will know where wheat comes from. The council has also asked local schools to buy local products including ancient grain ones.

Going forward, the city council will be engaged in revealing best practices, financing local events, and sponsoring local products that are healthy and organic. They also have created an agricultural reservation with common rules so that each farmer will be responsible for a part of the project and will receive some funds. Some large farms are already converting to this new (old) system hugely benefiting the environment and the health of people. The university team will continue to cooperate with the Ancient Grains Association to develop hybrids of old varieties that can best adapt to local needs.

4. Conclusion

Initiatives such as the non-profit Ancient Grains Association that sponsors local cultivation, milling, baking and pasta production reap substantial benefits for the local population. Not in order of importance, the Ancient Grains Project brings back to the SEPL know-how and jobs. It promotes social aggregation around the agricultural calendar and traditions. This new social aggregation is welcomed by local governments as it reduces social exclusion, increases tourism and creates jobs. Best practices from the SEPL have been incorporated by the council in the selection policies for food providers that serve the local schools, with the association's stamp of approval required to be on the bread or pasta. Other policies have been created so that local food producers selling at council events are required to use products from SEPLs (e.g. bread, wine, vegetables). The university has played a key role by selecting the best varieties and sponsoring them with the growers.



Figure 9. Wheat threshing by the Ancient Grains Association (Photo by Comune Montespertoli)

Both the Ancient Grains Association and the local council sponsor sustainable agriculture that increases biodiversity in wheat and local flora and fauna. Cooperation between the three stakeholders is a key factor for success. An analysis of the birth of this project shows that it was surely initiated by academic research on biodiversity, then gained attention and spread to SEPLs in the Tuscan Region, resulting in the start of the Filiera Corta project. University help was again fundamental in finding the right plants and the right methods. At a later stage, the local council provided marketing support and sponsored initiatives to spread the idea, as well as support for traditional gatherings. The passion of the operators involved is the bulk of the work, but they need continuous support from local politicians and

the university team. Eventually these innovations will need to be supported by the national and European agricultural system, such as including ancient varieties in the subsidies and rewards system. In order to move in this direction, an association that is capable of talking and mediating among all stakeholders and that also has some political weight in town decisions, as well as the ability to lobby higher political institution, is required. At the moment, no ancient wheat association in Italy has enough weight to lobby the Italian or European Government.

Acknowledgements

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- 1 The Romans colonised large parts of Italy, creating a system of farms with both an urban and a rural part. Those Roman urban unities later became villages and shaped some of the Italian landscape. For in depth analysis of the process, see Dyson (2003) and Francovich (2003).
- 2 For a detailed history of *mezzadria* see Nanni (2012).
- 3 As shown by Sofi (2010): Short-term dietary intake of whole grain bread obtained from an old grain variety seems to impose a favourable status with regard to lower circulating levels of markers of atherosclerosis.
- 4 Several publications in Italian were passed on to all people in the chain. Agronomists have followed the work in the field, and microbiologists and wheat experts have helped to find the best ways to mill the wheat, usually stone, and then make bread and pasta. A book has been published, *Pane Nuovo da Grani Antichi*, (Benedettelli et al. 2013).
- 5 DOP or Denominazione di Origine Protetta is Italian Protected Designation of Origin (PDO) in English and guarantees the origin of a certain product. IGP or Indicazione Geografica Protetta is Protected Geographical Indication (PGI) in English and was created to protect and guarantee the quality of a product made in a geographical area and by a specific know-how or tradition.

Governance-mix for resilient socio-ecological production landscapes in Austria – an example of the terraced riverine landscape Wachau

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Abstract

Highly valued socio-ecological production landscapes (SEPLs) have to adapt to changing conditions along with globalisation processes in the food and energy sector, demographic and climate change and shifting expectations of food consumers and landscape users. How can different governance approaches contribute to the resilience of a SEPL? This question will be answered for the Austrian case study Wachau, a famous bio-culturally rich terraced wine-growing region along the Danube. This paper illustrates different governance approaches on multiple scales and discusses if and how they contribute to SEPL resilience. The data are outcomes of several studies on land use change, landscape rurality, amenities and governance. The results show that a resilient SEPL needs market-driven land use, civil society and state-based governance. In contrast to alpine agriculture where farmers do not have strong bargaining power in marketing, and in milk or beef commodity markets, the Wachau benefits from place-based (i.e. locally branded) food and tourism associated with well-recognised quality and origin labels (e.g. the “Wachau Wine” and the UNESCO World Heritage Site as high quality and identity goods and destinations with a clear geographical link to the landscape). These landscape-based market approaches, supported by a mix of policy and civil society instruments, can ensure the long-term resilience of an authentic SEPL.

Keywords: Cultural landscape; Landscape governance; Terraced viticulture; UNESCO World Heritage Site Wachau (Austria), Resilience; Protected designation of origin;

1. Introduction

Like elsewhere in Central Europe, most of the Austrian landscapes are social-ecological production landscapes, shaped by intense human-nature interactions over centuries.

The diversity of Austria’s natural environment has resulted in a broad range of SEPLs linked to local culture, customs and management systems. They are hotspots of biodiversity, providing food and energy, as well as places of spiritual, physical and aesthetic well-being that are important

for local identity and pride. Difficult climatic conditions, steep slopes, low soil productivity, outmigration and/or low population density constitute major challenges. Due to these handicaps, SEPLs in less favoured areas are more likely to be affected by land abandonment than elsewhere. Land abandonment, which might be conceptualised as an attractive option for secondary wilderness elsewhere, in Austria and other parts of Europe generates landscape and biodiversity-related concerns in the scientific community and among the public (Navarro & Pereira 2012). Literature reviews identified the following negative consequences of land abandonment: biodiversity loss, increased frequency of fire, soil erosion, desertification, loss of cultural and/or aesthetic values, reduction of landscape diversity, reduction of water provision (Benayas et al. 2007) and an overall undesirable effect on the environment (MacDonald et al. 2000, Estel et al. 2015). Land abandonment is an indicator that some SEPLs are not able to adapt to changing conditions, such as globalised food markets, demand for renewable energy, climate and demographic change or changing expectations of food consumers and landscape users. How can different governance approaches contribute to the resilience of SEPLs? This question will be answered for the Austrian case study of the wine region Wachau, a famous terraced vine-growing area along the Danube. SEPL resilience is understood to be the capacity of a socio-ecological production landscape to absorb or withstand perturbations and other stressors without losing its essential structures and functions (Walker et al. 2004).

2. Wachau case study

Austria is a very mountainous country: 80% of the federal territory is considered to be agriculturally disadvantaged “less favoured area” (LFA) that is particularly threatened by land abandonment (Hovorka 2006, BMLFUW 2015a). Despite supportive action, extensive land abandonment (particularly loss of grasslands, but also terraced vineyards) has been an issue in the last decades and is expected to continue to be so for the next decades (Hiess et al. 2009).

Vineyard landscapes, like the UNESCO World Heritage Site Wachau, are located in the hilly eastern part of Austria with more favourable soil and climatic conditions. The Wachau is characterised by very high bio-cultural diversity, which results from different habitat and land use types (e.g. alluvial and semi-natural forests, dry grasslands, orchards, vineyards, stone terraces) as well as rich variety in local conditions (e.g. geological and edaphic underground, geographic direction, inclination, relief, climate). While the western part of the Wachau is characterised by a Central European climate with most species of the Central European geobotanical region, in the eastern part, due to the Pannonian climatic influence,



Figure 1. While bird feathers are used for most of traditional Austrian local costume hats, in the Wachau it is the feathergrass that looks very similar to a feather. The photo shows a proud feathergrass hat owner from Spitz (22.07.2012, Spitz) (Photo by G.E.)

xerothermic species can be found (Bundesdenkmalamt 1999). Amongst several IUCN red-listed species, some also play an important cultural role, such as feathergrass that is used as a headdress of the local male costumes (Figure 1).

The Wachau is a historic riverine cultural landscape. While the vast landscape transformation to a terraced landscape originates in the High Middle Ages, wine growing in the Northern parts of the Roman Empire was already prevalent in the first to fifth centuries A.D. Wine-related management practises became rooted in the High Middle Ages, and it is this historical richness that was the basis for the inscription as a UNESCO World Heritage Site in 2000. The Wachau is also part of the EU Natura 2000 network of nature protection areas and since 1994 has been designated within the European Diploma for Protected Areas (AK n.d.-a).

The Danube valley and its tributaries consist of steep slopes with primary rock terraces (inclination up to 50%), explaining its classification as LFA and thus its eligibility with regards to associated EU co-funded compensatory allowances. The landscape is characterised by small-scale vineyards and orchards of mainly apricots. Grasslands occur in the tributary valleys and on softer slopes with less solar radiation. Meadows and pastures are increasingly abandoned since most farmers have given up animal husbandry, and grasslands are overgrown or are replaced by other land uses such as afforestation or Christmas tree plantations.

Abandoned vineyards exist, but are hard to identify in the landscape. Even though they are almost entirely overgrown, the rock terraces and stone walls still exist (Figure 2). New

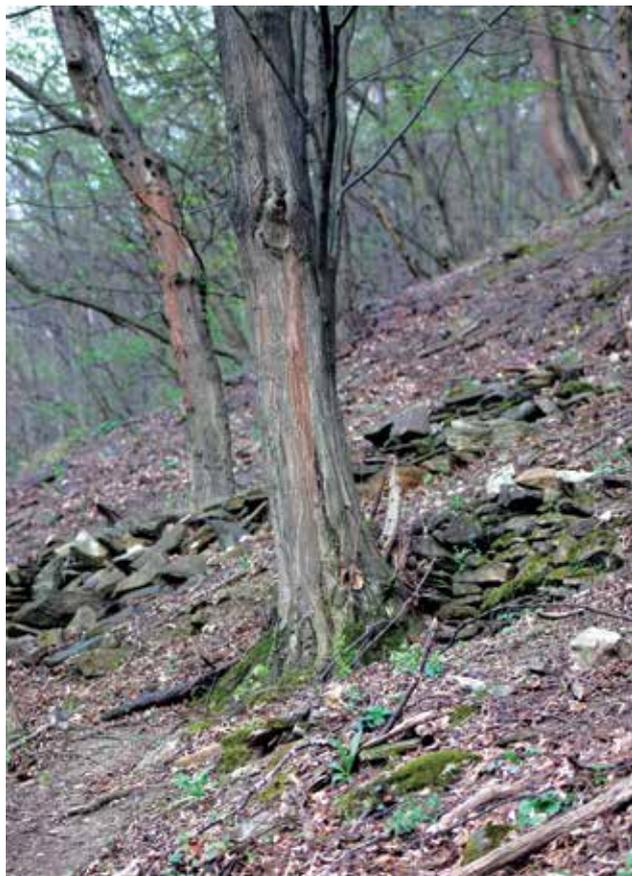


Figure 2. Old terraces in the forest hills of Arndsorf (04.04.2016) (Photo by Kieninger)



Figure 3. Reconstruction of terraces in Arndsorf (04.04.2016) (Photo by Kieninger)

abandonments are rather rare because vineyards are nowadays highly valued, and likewise abandoned vineyards are recultivated when the necessary efforts are reasonable (Figure 3). Altogether, terraced vineyards cover 360 hectares with a total length of 722 kilometres of stone walls (AK 2007).



Figure 4. Wine taverns are important meeting points for locals and tourists (29.05.2013, Oberloiben) (Photo by Kieninger)

The main income source of the Wachau is tourism and agriculture (Leader-Verein Wachau-Dunkelsteinerwald 2015). More than 90% of the winegrowers belong to the wine cooperative “Domäne Wachau” and deliver at least a part of their grapes or sell them to bigger vintners (Feigl & Peyerl 2011). A small share of vintners solely procure and sell wine. A major portion of the vintners gain additional income from, amongst others, agri-tourism or running seasonal wine taverns called “Heurige” (Figure 4), orchards (Wachau apricots, which are registered with an EU-protected designation of origin), Christmas tree plantations or provision of some other on- or off-farm labour.

Since the early 1980s wine cultivation area (Figure 5) has remained rather constant, representing 3% of the Austrian vineyard area (BMLFUW 2015b). A total of 600 vintners are cultivating around 1,450 hectares with an average farm size of less than one hectare, which is significantly lower than the average Austrian wine farm size of 4.8 hectares (AK 2007, Feigl & Peyerl 2011, BMLFUW 2015b). Farms are scattered into many small fields (Figure 6 and 7). One third of all Wachau’s vineyards (and therefore all terraced vineyards) have an inclination greater than 25% and accordingly are classified as LFA (AK 2007, BMLFUW 2015a).

The main challenges for the Wachau SEPL are:

- Removal of landscape elements (e.g. fruit trees like peaches between the vine rows, piles of stone, vineyard shelters) negatively impacting the bio-cultural diversity;
- Intensive use of insecticides and herbicides with negative effects on biodiversity and environmental quality; Labour and cost intensive production and maintenance of the landscape.

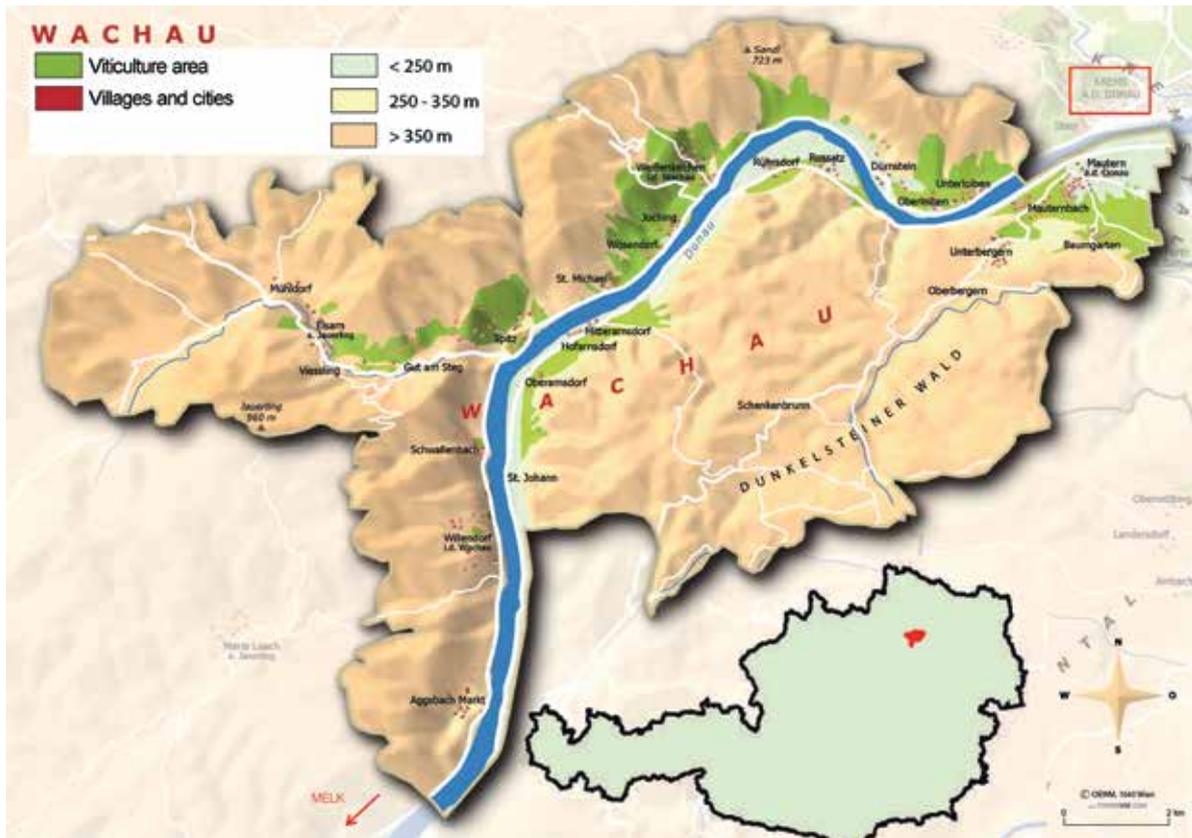


Figure 5. The Wachau (44,684 inhabitants) is a less than 36 kilometre stretch between the cities Melk and Krems (Statistik Austria 2015). The vineyard region (strong green) is smaller than the geographical unit and restricts the usage of the geographical designation “Wachau” wine. (Source: ÖWM, modified by the authors)

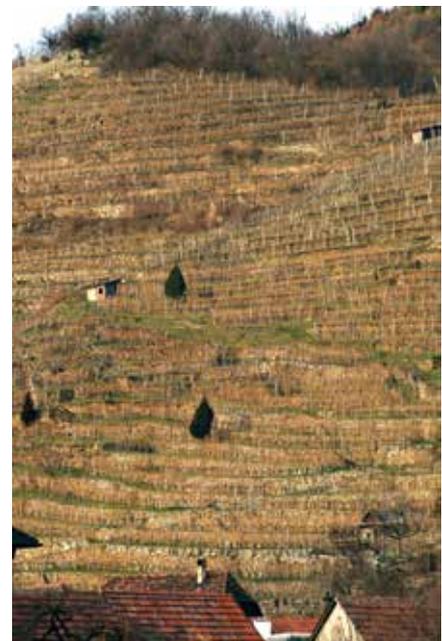


Figure 6 and 7. Vineyards in Loiben (20.05.2010) and Spitz (09.02.2016) (Photo by Kieninger)

3. Methods

This article is based on the results of three different research studies, conducted between 2006 and 2014 on the landscape governance and landscape change of the

Wachau SEPL (Gugerell & Petrovics 2006, Gugerell 2012, Kieninger & Winter 2014). The interdisciplinary mixed-method approaches of these studies involved analyses of historical maps of the years 1823 and aerial photos of 1950 and 1980, land use mapping between 2010 and 2011,

vegetation surveys of 124 vineyards and documentation of landscape structure elements (e.g. birdhouses, raptor poles, vineyard huts) in spring and summer 2013, as well as 22 semi-structured interviews with farmers and stakeholders and document analysis of current and past policy programmes.

4. Results

4.1. Past and current multi-level, multi-actor governance of the Wachau SEPL

Landscape governance is a hybrid, linking government, the market and civil society (Figure 8). The multi-level and multi-actor Wachau governance involves different spatial scales that are vertically and horizontally connected via many actors (Figure 9). The decentralisation of governance systems and institutional arrangements has provided a framework for bottom-up, landscape-based and co-designed policies, instruments and implementation actions. However, landscapes themselves have been rarely recognised as administrative units or scales, resulting in an overlap of different administrative units and legal frameworks. In contrast to legally binding acts and strategies, recommendations and guidelines are often based on optional implementation. Lacking direct enforcement power or financial incentives, their implementation is often less attractive at the local level. One interesting example is the management plan for the UNESCO site (currently under elaboration), which has weak immediate legal effect and cannot supersede other policies or implementation measures, thus making its implementation more difficult

(Deutsche UNESCO Kommission 2009). Formal protection of cultural heritage is limited to buildings and architectural ensembles, safeguarded by the Monument Protection Act. Apart from agricultural policies and their compensatory payments, landscape and nature preservation policies and spatial planning have prevented a loss of ecologically valuable habitats as well as the conversion of agricultural lands into settlements, factories, roads and other infrastructure. These can cause unintended socio-economic effects, like limited job opportunities for younger generations. Whereas farm succession compared to other areas in Austria is not a big issue, jobs outside of agriculture are mostly limited to tourism. Ten of the 13 municipalities are confronted with population shrinkage (Leader-Verein Wachau-Dunkelsteinerwald 2015). The number of elderly people and empty houses is increasing, particularly in the side valleys, alongside the viticulture area. In general the whole Wachau suffers from an ageing population, exacerbated by high real estate and land prices (Weisbier & Zahrl 2013).

4.2. Government-state authorities

4.2.1. The Austrian agri-environmental programme for extensive and environmentally friendly agriculture (ÖPUL)

ÖPUL (since 1995) is an agri-environmental scheme co-funded by the EU that provides financial incentives for pro-environmental and sustainable agricultural production and management techniques (BMLFUW 2015c). The fifth

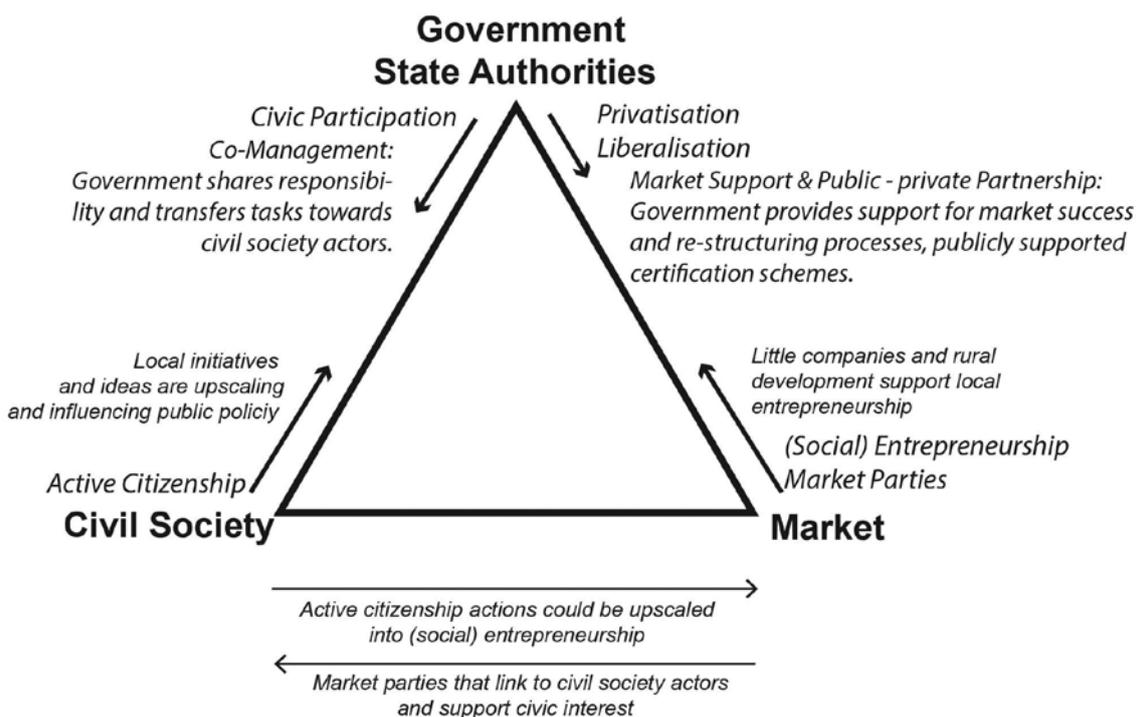


Figure 8. Conceptual model of hybrid governance network (Source: Gugerell, based on Steen et al. 2013)

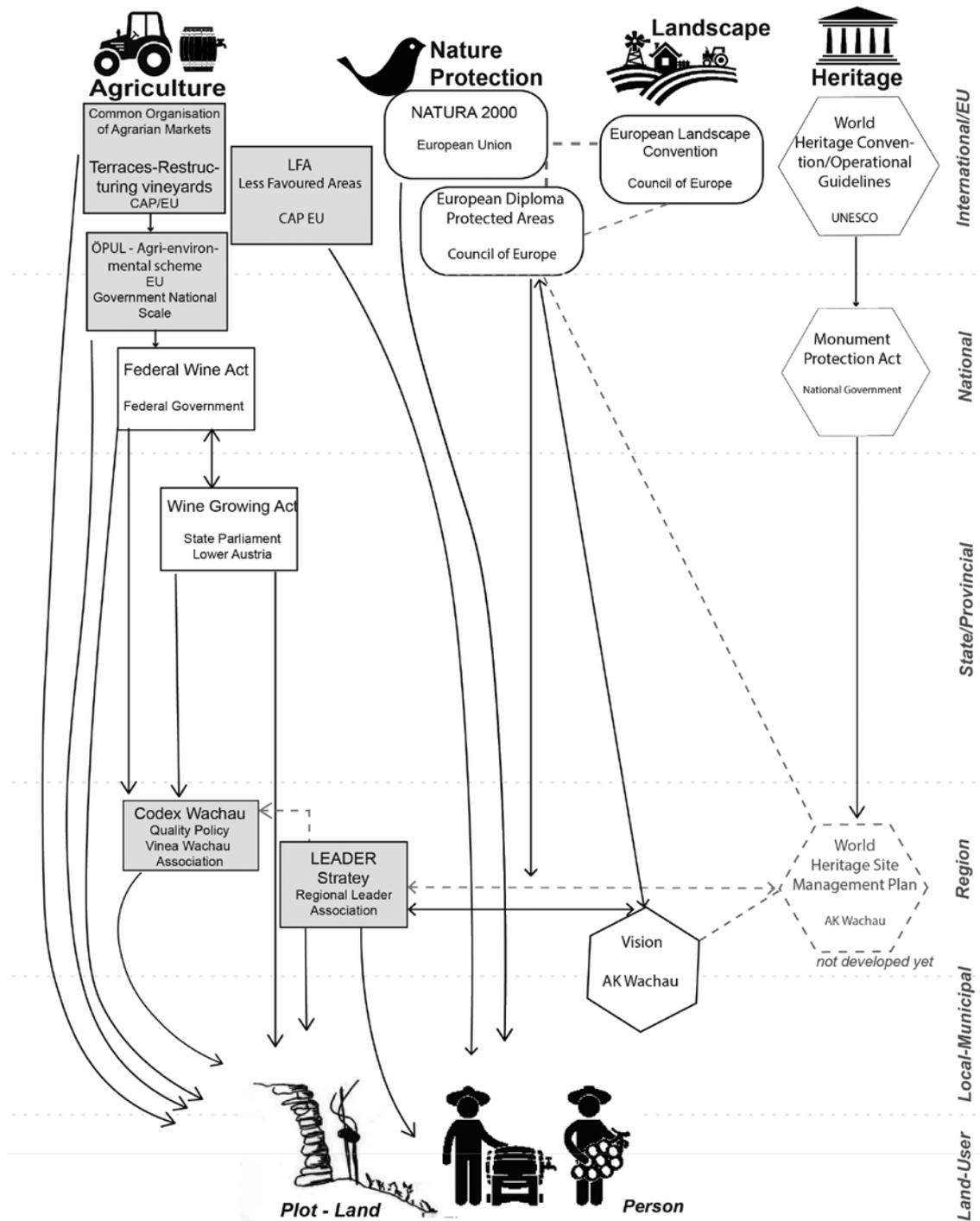


Figure 9. Multi-level network of different landscape-related policies, strategies and instruments in the Wachau (Source: Gugerell)

ÖPUL programme (2014-2020) is one measure of the fourth priority of the EU common agricultural policy's (CAP) second pillar, "Rural Development" (Figure 10). Requirement for compensation payment for viticulture is the participation with an area of at least 0.5 (if the farm size is ≥ 2 ha) or 1ha (if the farm size is < 2 ha) (AMA 2015). ÖPUL offers four main actions in viticulture: a) organic farming, b) erosion control, c) herbicide abstinence, and d) insecticide abstinence. In the last funding period (2007-2013), around 57% of the interviewed Wachau vintners participated in the action

"erosion control" (Kieninger & Winter 2014). While steep areas of greater than 25% inclination need permanent vegetation cover in the vine rows (only the area beneath the vine can remain open; subsidy: 300-800 EUR/ha), a temporary vegetation cover from November-April and open soils in the rest of the months is allowed on areas with less than 25% inclination (subsidy: 100-200 EUR/ha) (AMA 2015). However terraced vineyards are considered to be erosion control itself (even without vegetation cover), which might explain the measure's popularity. To avoid water stress in very dry

EU-cofinanced agricultural policy measures: Public funding

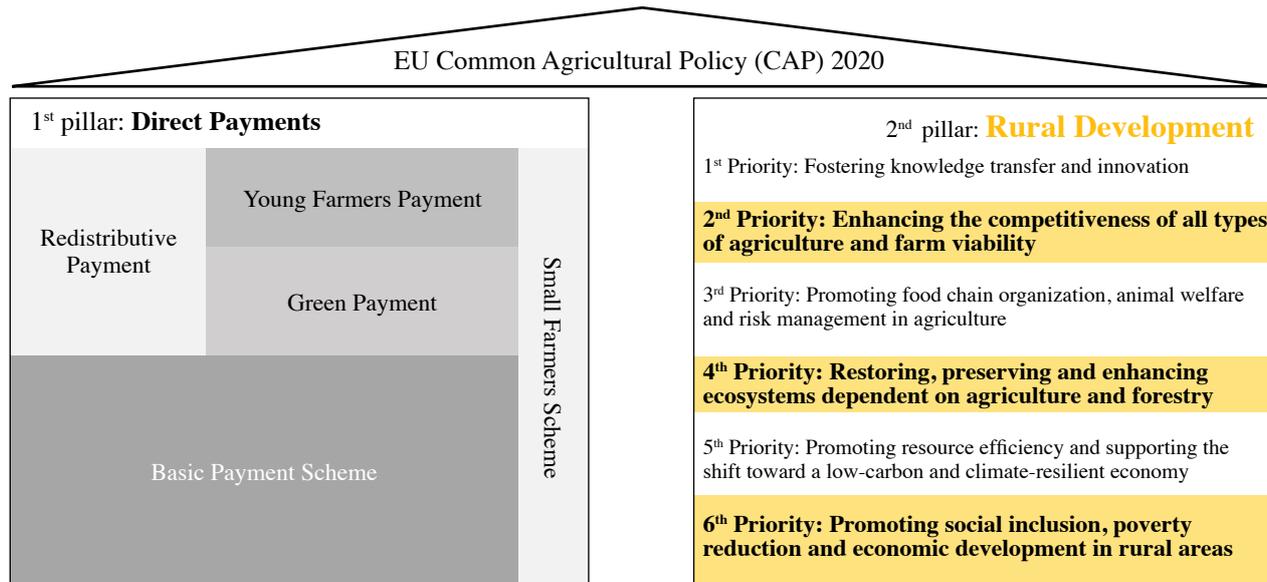


Figure 10. Simplified scheme of the new CAP period

summers, a local management practice is ploughing the vine rows during this period.

Ploughing in general can have a positive effect on biodiversity (open soil supports germination); however, too frequent and deep ploughing harms typical vineyard plants like *Muscari* or *Ornithogalum*. The admittance of spontaneous vegetation (in ÖPUL 2007, “natural greening” was accepted as erosion control management) increased the general floristic diversity (Kieninger & Winter 2014).

The funding is coupled with vocational training, which is considered as useful and valuable for the vintners, but should be better tailored to the needs of viticulturists with a special focus on environmental friendly management (ibid.).

4.1.2. Compensatory allowance for less favoured areas (LFA)

The compensatory allowance for less favoured areas (LFA) is a long-lasting measure of the Common Agricultural Policy (since 1975), in order to aid farmers to maintain the countryside even in areas, where agricultural activity and production is difficult (Agriculture & Rural Development 2009).

To avoid land abandonment of valuable landscapes particularly in mountainous areas, compensatory allowances (4th priority, 2nd pillar) were given only to livestock farmers for their extra efforts due to steep slopes and harsh climate. In the new CAP programme, these compensatory payments, however, are given to all agricultural use areas in LFA, thus also to terraced vineyards. The funding scheme is linked to

farm size and disadvantage and is capped to a max of 70 hectares (LKÖ n.d.).

4.1.3. Maintenance and recultivation of abandoned vineyards and terraces

The rock terraces are the main landscape elements of the Wachau. As long as they are not treated with pesticides, they are also an important habitat for several plant species that can be found normally on rocky terrain, e.g. *Sedum album*, *Veronica prostrata* or for reptiles, *Lacerta viridis* (Kieninger & Winter 2014). Although aesthetically pleasing, production on terraces is more labour and cost intensive and requires additional work for regular maintenance of the stone walls. Abandoned terraced vineyards are quickly overgrown, and recultivation and rebuilding of stone walls require a large effort. CAP provides a set of subsidies for the recultivation of abandoned vineyards and the maintenance and rebuilding of stone walls. Restructuring of vineyards encompasses all necessary activities to re-plant vineyards and adapt them to demand, i.e. changing the vine variety to one that has a higher demand in the global wine market. The amount of the subsidy differs from 9,000 to 13,000 EUR/ha, depending on the location and steepness of the vineyard (more than one-third of terraced vineyards in the Wachau have an inclination of greater than 25%) (AK 2007). Repairing damaged stone walls or (re)building entirely new stone walls in existing or newly structured vineyards are supported with 91 EUR/m² (BMLFUW 2015d). Commonly addressed as “dry stone masonry” (historic construction technique), many stone walls are nowadays (re)built or repaired using mortar or faced brickwork, which imitates traditional design techniques to stage a historic landscape visual, but has a

much lower biodiversity value.

Since 1997 in the Wachau the restoration and reparation of 20,000 m³ of stone walls have been subsidised (NÖ Landesregierung 1997-2000, Katzmayer & Rennert 2003). These subsidies have mainly targeted demand-oriented production and better integration of production into the global market, but also serve landscape preservation purposes as explained earlier and in Figure 11. Biodiversity is significantly influenced by the type of wall and is much higher with the traditional dry stone masonry compared to the faced concrete brickwork walls. With the traditional dry stone walls, as gaps are filled with soil and humidity enters from the backside, plants can root inside and reptiles and insects can hide inside the holes. Around 150 rare animals and 500 plant species have their habitats there (Kraus 2015).

4.1.4. LEADER strategy

LEADER (6th priority, 2nd pillar) is a hybrid programme linking government, the market and civil society. The overall goal of LEADER is to support endogenous rural development and promote cooperation and measures to strengthen and develop the rural economy and quality of life (Land Oberösterreich 2013). LEADER is based on seven different methodological approaches: a) area-based, b) bottom-up, c) Local Action Groups (LAGs) (consisting of representatives of the local council, diverse interest groups, organisations and engaged citizens from different society sectors), d) innovation, e) integrated and multi-sectoral approach, f) networking and g) cooperation. Fifty-six percent of Austria's population lives in 77 LEADER regions (budget 246 Mio. EUR), and is organised into Local Action Groups (Weinviertel Ost n.d.). The Wachau (13 municipalities), together with the adjacent Dunkelsteinerwald (4 municipalities), forms one LEADER region with 51,250 inhabitants in an area of 502.92 km² (LEADER-Region Wachau-Dunkelsteinerwald n.d.). LEADER funding calls for proposals from inhabitants and stakeholders that develop creative and adequate solutions for local challenges and serve the enhancement of common welfare. A project selection committee is organised to select convincing proposals, and recommends them to the funding agency for final approval (Land Oberösterreich 2013). Each LEADER region has its own management office for project development and financial administration.

Until recently, LEADER had been strongly focusing on tourism and agriculture: in the last period, 15 to 20% of Wachau vintners received financial support for technical infrastructure or diversification measures, e.g. wine taverns (AK 2007). Different touristic products were developed to create local income and improve the tourism destination (e.g. hiking trails, info-points, the "MyWachau" app providing information on local tavern operating hours, or the "rent-a-

wine-maker", where one can book his/her own vintner for a tour). Courses, including on historic building techniques for stone walls, were also financed via LEADER. Since LEADER generally covers 80% of project costs, the Arbeitskreis (see below) often funds the missing 20% (ibid.). In the new period, the focus has shifted to cross-sectoral and cooperative projects, so that individual farm projects are no longer eligible (Ecoplus n.d.).

4.2. Civil society: Working Group Wachau (AK – "Arbeitskreis Wachau")

The local association AK was initiated by two winegrowers in 1972, aiming to conserve and sustainably develop the Wachau, as well as to oppose the construction of a planned hydropower plant that threatened the unique Wachau-Danube and vibrant viticulture landscape along a free-flowing river (AK n.d.-b). The activities of the AK contributed to the recognition of the Wachau area as a World Heritage Site in the 1990s. The association has 250 members representing different economic, societal and cultural groups in all 13 municipalities, as well as citizens and friends of the Wachau (AK 2015). The AK has three goals: a) conservation of the Wachau in its traditional form, b) maintenance of the scenery and c) strengthening awareness of the values, tradition and history in the local population and among guests (AK n.d.-b). The AK is also active in the implementation of nature conservation projects. It organises volunteers to mow steep grasslands that would otherwise disappear due to the suspension of animal husbandry and with them rare plant species, e.g. feathergrass. Other nature conservation actions include the suppression of alien species (e.g. *Robinia pseudoacacia*), planting of native species (e.g. *Populus nigra*) and the promotion of endangered species by various measures (river renaturation projects).

The AK is closely linked to the LEADER programme: on one hand it co-funds LEADER projects, and on the other hand initiates and implements projects. Among Wachau's inhabitants, apart from civil society organisations and official bodies, it appears that the AK and its work could be better communicated and mainstreamed. In 2016 another NGO "AK Welterbe Wachau" appeared, which is also active in the field of heritage, but is currently focusing on maintaining and protecting historic architectural ensembles (Arbeitskreis Welterbe Wachau 2016).

4.3. Market: geographical indication (DOC, PDO) and quality management

Products with geographical indications are traditional products with place-based specific qualities, produced by local farmers. The recognition and protection of the geographical name aims to protect the name from



Figure 11. The lizard (*Lacerta viridis*) and the feathergrass Steinfeder (*Stipa sp.*) have their habitat in the terraces or rather in the grasslands around. Vinea Wachau uses them as a seal of quality: the “Steinfeder” marks the lightest category of wine, and the “Smaragd” the wines with the highest share of alcohol. (Photos by Kieninger (Federgras Setzberg, Spitzergraben, 05.06.2016; lizard, Wagram, 18.04.2012); Labels ©Vinea Wachau)

misuse. Consumers are willing to pay more for Wachau wine and apricots, with their quality reputations, than for the same products from elsewhere. The protection of the geographical product name ensures that only local farmers are allowed to use it and that the higher reputation based revenues remain in the region and help to sustain the labour and cost intensive production, and with it the characteristic vine terraces and typical "vineyard species".

The DOC label guarantees high quality white wines from the Wachau, exceeding the quality standards and requirements of the strict Austrian wine legislation for high quality wine and meeting the regional terroir characteristics that are written down in the quality policy “Codex Wachau” of the regional association “Vinea Wachau”. In addition, a local brand (Figure 11) is also managed by the Vinea Wachau and can only be used by vintners growing vine in the Wachau, meeting the quality standards of the Vinea Wachau and being a member of this association.

The spatial and quality restriction of the label unifies the DOC, based at the French Appellation d’Origine Contrôlée (AOC), with the German ripeness-based classification scale. Vintners have to apply for the label for every harvest and variety and a jury evaluates and certifies if the wine meets the required quality standards. More than 200 winegrowers are members of the association—most of them anticipating that the geographical indication supports promotion and marketing (Vinea Wachau n.d.). Higher prices compensate for the higher production costs in the steep rock terraces. The label targets high-end markets for a luxury product like

vintage wine.

Similar to the DOC label, the Wachau apricot has been protected as an EU protected designation of origin (PDO) and only farmers whose fields are located in the Wachau can sell apricots as “Wachau apricots”.

5. Discussion

This case study suggests that a hybrid governance approach linking government, the market and civil society can be successful in preserving and developing a SEPL (Figure 9). Co-management approaches where the government shares tasks with civil society actors and farmers fosters shared responsibility between governmental and local scales. The case study shows that active citizen participation can not only influence public policy, e.g. against building a hydropower plant, but also supports local entrepreneurship and new product labels and seals. Market, civil society and governmental approaches converge in instruments that support landscape-based markets (i.e. AOC/DOC, PDO). Collective action, deliberation and trust among the different public and private organisations and groups are important characteristics for local landscape-focused associations such as AK or Vinea Wachau, to foster bottom-up processes and active citizenship.

A diverse mix of multi-level interactions including EU, national, regional and local approaches, as well as a diversity of professional backgrounds, interests and ideas, support

local livelihoods and landscape-based development strategies. These landscape-based development strategies contribute to the resilience and long-term viability of authentic, evolving and thriving socio-economic production landscapes in contrast to state controlled, static “museum landscapes”.

Other examples have demonstrated that public subsidies and legislation alone cannot guarantee a SEPL’s resilience, for instance the ongoing abandonment and thereby loss of biocultural diversity of mountain grasslands and dairy farming in the Alpine region (e.g. Holzner (ed.) 2007, Hiess et al. 2009, Kieninger et al. 2011, Kieninger et al. 2015). In the Wachau, subsidies for the stone terraces would not be effective without a well-established wine market. Likewise, even if ÖPUL supports the mowing of ecologically valuable grasslands, they disappear due to the unattractiveness of animal husbandry to the Wachau vintners. For sustainable long-term protection, the combination of different instruments is necessary, as are personal and emotional reasons, e.g. local identity and pride for the landscape. Losing pride or the “degradation of pride” is considered to be the root of depopulation and abandonment (Odagiri n.d., Holzner et al. 2007, Xie et al. 2014).

5.1. State intervention and public incentives as strengthening for ecological quality

Vineyards can harm the ecological system and the environment, e.g. via negative side effects on biodiversity from insecticides, herbicides or fungicides, or the eutrophication of ground water due to mineral fertiliser. The CAP tries to govern these undesirable consequences by cross compliance (EU and national environmental regulations have to be fulfilled for eligibility of EU co-financed agricultural payments) and voluntary agri-environmental schemes (ÖPUL). Whereas the legal regulations for water and soil protection or nature conservation ensure long-term effects on ecological and environmental resilience by constraining market driven land use, ÖPUL has resulted in short-term effects on biodiversity (e.g. herbicide reduction and temporary vegetation cover) and mid-term effects (e.g. higher amounts of plant species in the organically managed vineyards, see Kieninger & Winter 2014). Long-term ÖPUL effects cannot yet be evaluated because the current programme period has not lasted long enough, data from prior funding periods are too fuzzy due to strong variance in the implemented actions and measures or rather due to missing former evaluation studies. This case study also shows that the participation in the ÖPUL measures, such as “erosion control” or “integrated production”, does not necessarily reflect a certain ecological attitude of the vintners, but rather a rational cost-benefit trade off. This “subsidy behaviour” means that ecological services are often

delivered as long as the payment is available and will stop the moment the funding dries up (Frey & Jegen 2001, Rode et al. 2015). To illustrate: the success of decreased herbicide use in the 3rd funding period was put into perspective when in the 4th period (2007), due to the termination of the subsidy, herbicide use increased so much that it equalled the level prior to the start of the programme in 2000 (Kieninger & Winter 2014). Some interviewed vintners affirm that they expect a similar trend for stone masonry if subsidies for maintenance and rebuilding are lowered or dropped. This “subsidy behavior” suggests two interpretations: (1) agri-environmental schemes encourage utilitarian approaches in governing the delivery of environmental services (and might even crowd out intrinsic motivation for environmental and biodiversity protection (Vatn 2010)), and (2) the programme might have increased ecological literacy among vintners, but apparently as yet has failed in mainstreaming or at least triggering substantial behavioural change towards more sustainable and environmentally friendly management practices.

5.2. Market mechanisms as prerequisite for dynamic and authentic socio-ecological production landscapes

A dynamic thriving Wachau SEPL depends on wine and food production that provides livelihoods for local farmers. This case study showed that market mechanisms are successfully deployed in the Wachau: geographical indications and regional branding support stronger collaboration among farmers, tourism and other stakeholders and are therefore adaptive responses in the resource regime in case of disturbances or unexpected impacts (Knüppe & Pahl-Wostl 2011). They have a long-term effect (whereas subsidies’ effects are short-term). As wine is a luxury commodity with a high global demand (Anderson & Wittwer 2013), it is doubtful that the same level of success could be expected in SEPLs that focus on staple food products like milk, corn or rice, and the transferability of the Wachau case study to other areas might therefore not be so easy.

The strong branding through the Vinea Wachau can be regarded as a positive effect for the vintners, and also even for non-members who benefit from higher price levels. Also, the demand for vineyards is increasing, causing less abandonment and recultivation. The risk is that the strong brand and its related success can lead towards a lock-in and hamper experimentation and innovation (Hartmann et al. 2015), which is crucial for the region’s resilience (i.e. the development of new sources of income outside of agriculture, the experimentation with new management practices like organic wine growing, new and/or fungus-resistant wine varieties). The strong specialisation and success in the (white) wine and tourism sector, but also strict interpretation of historic monument protection and

building culture (UNESCO, Arbeitskreis Welterbe Wachau), can aggravate regional development and job creation outside the tourism and wine sector. Facing the challenges of an ageing population, demographic challenges are also addressed in the development of the UNESCO management plan.

5.3. Civil society as the heart and soul of SEPLs

The AK and the underlying civil society activities played an important role in preventing a hydro-power plant investment that would have tremendously changed the hydrobiological and morphological situation of the Danube region, including both the scenery as well as the identity of the historical landscape. Local civil society is the forum where emotions and moral arguments, such as on the next generation or the intrinsic value of bio-cultural diversity, are shaped, contested and transformed into actual actions, such as protection as a UNESCO World Heritage Site. The group had and still has an important role regarding awareness building on the unique SEPL Wachau and is a powerful local stakeholder.

Recently the “old” AK and the “new” AK Welterbe Wachau launched a broader discussion on the future development of the UNESCO World Heritage Site, peaking in a controversial debate on spatial development and historical architectural design (Arbeitskreis Welterbe Wachau 2016). These discourses are conflicting albeit necessary for a shared vision that can be broadly implemented by land users, tourism firms, local governments and the population. Collective action, communication, social capital, social learning and connections to place, activated by self-organisation, seem to support the resilience of socio-ecological systems (Adger 2003, Berkes & Ross 2013).

The success of Wachau’s wines resulted often (where possible) in a conversion of orchards, arable land and forests into vineyards. Grassland management depends on volunteers (organised by the AK and other nature conservation associations, e.g. Lanius). Whether or not this maintenance approach can be considered a long-term sustainable solution is doubtful, because the organisation of volunteers depends on the engagement of a very few active persons.

6. Conclusion

In the Wachau, different public policies, market instruments and civil society have created a multi-level, multi-actor hybrid governance structure. There is a complementarity between the three domains. Particularly as market-based mechanisms such as geographical labelling and regional

branding work very well, policy and civil society need to ensure ecological and social resilience. The market mechanisms support the livelihoods of local vintners and thus the maintenance of the landscape. Active citizenship highlights ecological and socio-cultural priorities, pushes policy and fosters entrepreneurship (i.e. Vinea Wachau). Even though successful—or maybe even because of their success—market-based tools must be accompanied by regulations and governmental policies that mediate societal values, norms and customs. The case study shows that the mix of different push (i.e. market forces, public incentives and civil society engagement) and pull (i.e. regulations and civic control) mechanisms open up an action space to navigate between multiple important goals of SEPLs.

Even if there are some weaknesses in the governance of the Wachau SEPL, such as the abandonment of ecologically valuable grassland, limited job opportunities outside agriculture and an aging population, it can be regarded as an example of a dynamic thriving socio-ecological system with high adaptability and resilience, in contrast to static museum landscapes (Gugerell & Penker 2012) or other rural SEPLs in Austria affected by land abandonment. The multi-level and multi-actor governance network ensures adaptive learning and innovation processes based on multiple sources of ideas and capacities, which hopefully will also ensure the Wachau’s adaptation to future changes and challenges.

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Tailoring the Satoyama Initiative concepts to the national and local context: a case study of the collaborative planning process of a rice paddy cultural landscape in an indigenous community, Taiwan

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Abstract

The idea of landscape/seascape conservation was introduced into the amended Cultural Heritage Preservation Act in 2005 as a new legal subject entitled a "Cultural Landscape" in Taiwan. Unlike traditional strictly protected areas, namely the IUCN protected area categories I-IV, the Cultural Landscape is a new concept to Taiwan that emphasises the interaction of local people and the land. In order to help stakeholders of governmental authorities and local communities to apply this new instrument, the research team employed a community-based participatory approach to enhancing partnership among them. The research has especially learnt from the "three-fold approach" of the Satoyama Initiative, as well as the operational guidelines of IUCN protected area category V (protected landscapes/seascapes). A study area of rice paddy production landscape in the indigenous Fengnan village, Hualien County, was selected as a potential Cultural Landscape site. Two-year participatory action research from May 2011 to June 2013 was conducted by the researchers drawing on collaborative planning theory and qualitative methods to analyse interactions and enhance partnerships among the villagers, the local authority officers and experts. Various formal and informal forums and workshops were conducted in the local area to achieve stakeholder consensus on the designation of the Cultural Landscape and the formulation of its management plan. This case study shows that a landscape approach can be welcomed by local people and create a new style of a "living" protected landscape in Taiwan's national protected area system.

Keywords: Socio-ecological production landscape; Satoyama Initiative; Multi-stakeholder forum; Collaborative planning; Cultural landscape;

1. Introduction

Ever since the Satoyama Initiative (UNU-IAS 2010a, 2010b, Morimoto 2011) was introduced to Taiwan in late 2010, it has

been received with great popularity by the government and the general public. Practices that engage in conservation and revitalisation of socio-ecological production landscapes (SEPLs) in compliance with the goals of Satoyama Initiative

are on the rise. For example, the Forestry Bureau of the Council of Agriculture has been working with universities, NPOs and local communities on ecological restoration of rice terraces and wetlands in the name of the Satoyama Initiative since 2011. However, there are many challenges ahead concerning the promotion of the Satoyama Initiative in Taiwan. One of the challenges is that many local good practices in conservation and revitalisation of SEPLs are insufficiently academic in that they lack comprehensive studies, analyses and exchanges of knowledge and experiences among practitioners, government officers, researchers and others working on-the-ground. Most practices in Taiwan lack analytical reports on detailed planning processes, management frameworks and implementation outcomes, and as a result most practices are not very helpful as examples that can be learned from or referred to by international or domestic practitioners.

In 2005, the idea of landscape/seascape conservation was introduced into the amended Cultural Heritage Preservation Act (CHPA) as a new legal subject entitled a “cultural landscape” in Taiwan. Unlike traditional strictly protected areas, namely the IUCN protected area category I-IV, the cultural landscape is a new concept to Taiwan that emphasises the interaction of local people and the land (IUCN 1994, 2010; Phillips 1995, 2002). Therefore, the concept of IUCN’s protected landscape/seascape is

most similar to the Satoyama Initiative’s socio-ecological production landscape.

From 2005 until early 2012, 34 sites were legally designated as cultural landscapes. However, most of the designated sites concerned historical architecture preservation. None of the sites employed any integrated landscape or community-based approach to benefit both local people and their living landscapes. In order to help the stakeholders of governmental authorities and local communities to apply this new instrument, the National Dong-Hwa University worked with the Hualien County Cultural Affairs Bureau (HCCAB) and conducted a two-year action research project from May 2011 to June 2013. The research particularly drew upon the idea of IUCN protected area category V (protected landscapes) as well as the “three-fold approach” of the Satoyama Initiative (Figure 1, UNU-IAS 2010a). A pilot study area, a rice paddy production landscape in the indigenous Fengnan village, Hualien County, Taiwan, was selected as a potential cultural landscape site. The goals of the empirical study were twofold. The first was to explore to what extent the Satoyama Initiative framework could fit into the management plan of a rural cultural landscape, and second to determine what contribution a collaborative planning approach could make to reaching consensus among different stakeholders.

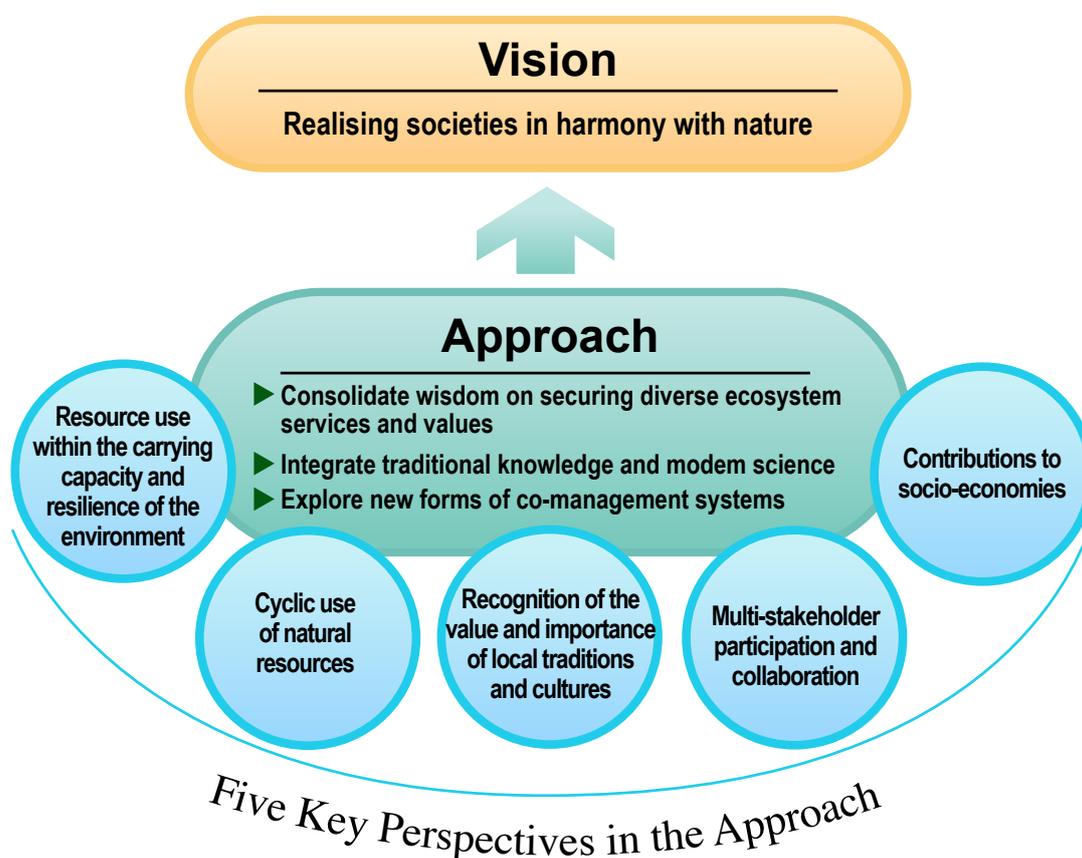


Figure 1. The “three-fold approach” to the Satoyama Initiative (Source: UNU-IAS 2010a, p. 2)

2. Methodology

2.1. Research questions

In Taiwan the concepts of both the Satoyama Initiative and the socio-ecological production landscape are new and welcomed, as mentioned above. However, a feasible framework of institutional arrangements for tailoring these concepts to the national planning system is lacking. In addition, for SEPLs in ageing and declining rural areas, collaborative governance needs to be fostered and the new values of the SEPLs need to be created while involving all stakeholders in the planning processes. However, there is a lack of case studies that exhibit ways of designing and exercising collaborative planning processes for socio-ecological production landscape conservation in Taiwan. Therefore, there are three interrelated research questions to be explored, including: How to tailor Satoyama Initiative concepts to a national planning system? How to put Satoyama Initiative concepts into practice? What are the new values of the SEPL identified by key stakeholders through collaborative planning processes?

2.2. Research strategies and the theory of collaborative planning

In order to answer the above research questions, the study employed two strategies as follows (Figure 2). First, the study employed a landscape and institutional approach to incorporate both the Satoyama Initiative's three-fold approach and the IUCN protected area category V "protected landscape/seascape" into a rural cultural landscape planning process under the new legal opportunity offered by the amended CHPA of Taiwan in 2005. Second, the study employed a participatory approach to enhancing interaction and consensus among stakeholders on the designation and management plan of the cultural landscape site.



Figure 2. Research strategies and flow chart (Source: Lee et al. 2016, p. 77)

The study also emphasises the role of protected areas in planning and management of socio-ecological production landscapes rather than focusing on areas "beyond" protected areas. Planning and management of protected areas is an important institutional approach in which the governmental institutions have a role to play. In most cases, it is not realistic to depend on rural communities' own efforts to revitalise the socio-ecological production landscapes without help and resources from governments since most communities are faced with issues of ageing and economic decline.

Traditionally, in Taiwan there were five different types of protected areas designated by different laws: national parks and smaller scale national nature parks, nature reserves, wildlife refuges and major wildlife habitats, and natural forest reserves. These protected areas could be considered equivalent to the IUCN category I to IV. The dominant governance type was "government managed" and "top-down", and therefore was not welcomed by local

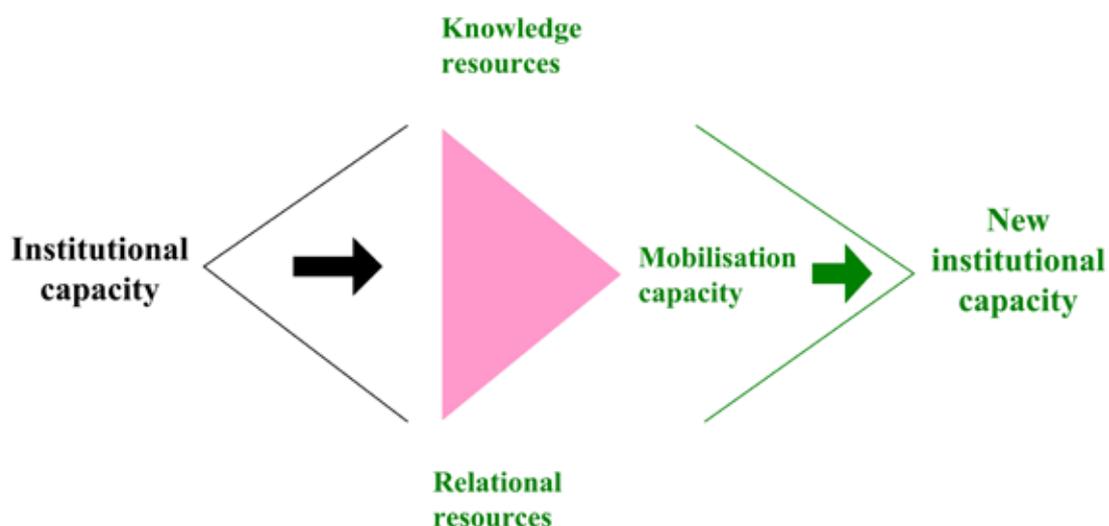


Figure 3. Theory of collaborative planning (Source: Healey 1998, p. 1542)

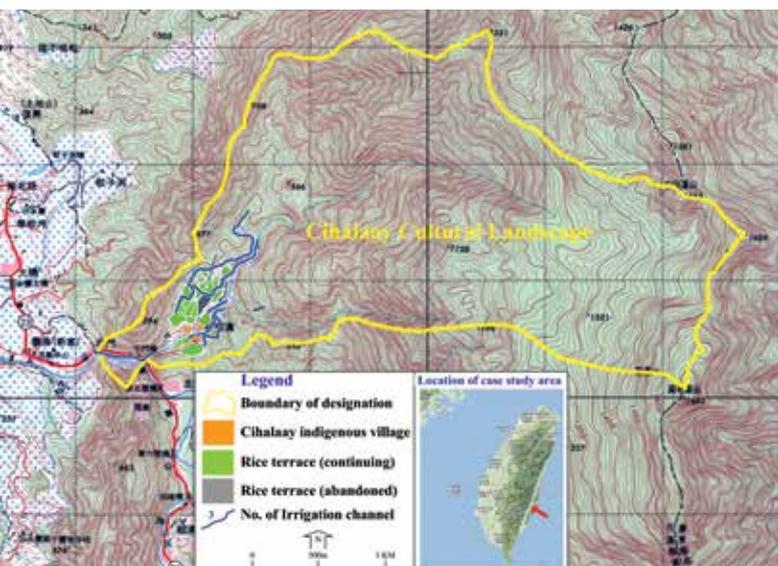


Figure 4. Location and boundary of the Cihalaay Cultural Landscape



Figure 5. The Cihalaay Cultural Landscape covers about 1000 hectares and comprises mosaic landscapes of an indigenous village, rice terraces and irrigation channels, orchards, secondary forest, natural forests and streams. (Photo by Kuang-Chung Lee)

communities. There have been calls for a more collaborative and landscape approach to protected area planning and management. The research was also expected to create a new “living landscape” type of protected area in Taiwan, equivalent to IUCN category V, through a collaborative planning process in light of the Satoyama Initiative’s framework.

Concerning the theoretical basis, the study employs Healey’s theory of collaborative planning (Healey 1997, 1998) that seeks to develop a new approach to spatial and environmental planning to cope with concerns about the quality of places and dilemmas on how to “make sense together while living differently” (Forester 1989, p. 118). On the one hand, people celebrate diversity and individual liberation; on the other, they are often confused by the conflicts among different interest groups and threatened by the environmental degradation. Healey argues that these dilemmas require a new approach to planning which offers both a force to change the quality of places and a force to change normative ideas about the forms and processes of collective governance. Social capital (relational resources), intellectual capital (knowledge resources), and political capital (mobilisation capacity) are terms used by Healey (1998) to describe “institutional capacity-building”, which is a key concept in collaborative planning (Figure 3).

2.3. Data collection and analysis methods

This study employs a qualitative research methodology based on the belief that qualitative methods can provide a more in-depth understanding of “inner experiences”, “language”, “cultural meanings” or “forms of social

interaction” than purely quantitative data can do (Silverman 2000). The study employs a multiple-method approach and a range of different source material to help maximise understanding of the questions (Flowerdew and Martin 1997). Methods include document analysis, participant observation, individual interviews and group discussions. Each method provides a particular perspective that illuminates certain aspects of reality (Morse 1994). The multiple-method approach also allows findings to be validated or questioned by comparing the data collected by different methods through a process of triangulation (Denscombe 1998).

The method of transcript analysis of taped group meetings and interviews is based on Huberman and Miles’ (1994) interactive model that comprises three sub-processes: data reduction, data display, and conclusion drawing/verification. First, with data reduction, the transcript is reduced in light of Healey’s conceptual framework of the “institutional capacity” that consists of three dimensions, i.e. knowledge resources, relational resources, and mobilisation capacity (Figure 3). The process of reduction includes data summaries, coding, emergent themes and clustering of key issues. Second, the reduced set of data helps to construct an analytical diagram of the discussions. Third, conclusion drawing and verification involves interpretation and drawing meanings from the displayed data. Methods used include comparison/contrast, noting of themes, and triangulation.

2.4. Characters of the SEPL in the case study area

The Cihalaay Cultural Landscape, the case study area, covers a land area of 1,040 hectares and is located in the Fengnan



Figure 6. Five steps of the participatory planning processes (Source: Lee et al. 2016, p. 81)

village, Fuli township, Hualien County of Taiwan. The boundary of the Cihalaay Cultural Landscape is a complete watershed of the Stonehouse Ravine Stream that is situated in the northernmost area of the Turtle Stream watershed. Right next to the landscape is the 1682-meter high peak, Ma-lao-lou, of the Coastal Range. The area is covered with rice terraces and irrigation channels and is home to the aboriginal tribe Cihalaay. Downstream of the Stonehouse Ravine Stream is the core area of the entire cultural landscape, with 20 hectares of rice terraces and six irrigation channels totaling 4,100 meters in length (Figures 4 and 5).

Based on Lee et al. (2016), the cultural landscape has 26 households with a registered population of 150, of which 99% are indigenous Amis. Due to the lack of job opportunities, only 70 people are living in the local area (with 28% from 0-14, 57% 15-64, and 15% above 65 years of age). Most of the residents under the age of 30 have attained a high school education, whereas those above 50 for the most part have a primary school education.

Fengnan village has clean water and a natural environment to grow organic crops; however, transportation is quite inconvenient, thus sales can only be made through food dealers. Organic rice, for example, has a better market price, but its relatively higher cost and manpower problems stop farmers from growing it. Therefore, not all farming households are involved.

In terms of other agricultural products, the cost of plum planting is low and plums do not require the application of pesticides, thus plums are still being grown in most of the area. Wild and planted bamboo shoots are harvested in

March and April each year. When it comes to harvest time, farmers travel far up to the mountains to pick bamboo shoots and carry them to markets for sale or home for self-consumption. Other products, including sweet peaches, persimmons, oranges, pears and betel nuts, are produced through a non-organic method of farming as herbicides are applied.

3. Results and discussion

3.1. How to tailor Satoyama Initiative concepts to a national protected area planning system? How to put Satoyama Initiative concepts into practice?

In this project the research team employed Healey's theory of collaborative planning to design and evaluate multi-stakeholder participation processes. The five steps of participatory planning processes (including preparation, discussion, consensus-building, action planning, implementation and monitoring; Elcome and Baines 1999) were facilitated by the research team of National Dong-Hwa University from May 2011 to June 2013 to enhance partnership among stakeholders (Figure 6).

Through intense field investigations (Figure 7, Figure 8) and communication in local workshops and forums facilitated by the research team, local people voluntarily set up a Local Management Committee in July 2011 (Figure 9) and drew up a local Code of Conduct in November 2011 for the future management of the Cultural Landscape under discussion. The local Code of Conduct included 29 paragraphs in terms of goals, organisation and land use, as well as



Figure 7. PPGIS workshops held for mapping production landscapes (Photo by Kuang-Chung Lee)



Figure 8. Interviewing a local elder about local land use history (Photo by Kuang-Chung Lee)

management of rice paddies, irrigation channels, natural streams and forests. The research team worked with the Local Management Committee and relevant governmental authorities on building up a community-based Multi-stakeholder Partnership Platform (Figure 10) in January 2012 for planning and management of the proposed Cihalaay Cultural Landscape.

Based on an analysis of existing legal instruments and administrative arrangements, the research team proposed a framework for incorporating the local people's Code of Conduct into the official Management Principles & Plan in light of the three-fold approach of the Satoyama Initiative (Figure 11). First, the Code of Conduct for the Cihalaay Cultural Landscape proposed by the Local Management Committee was deliberately infused into official Management Principles. The research team worked with local people and local governmental authorities to convert

the 29 paragraphs of the local Code of Conduct for the Cihalaay Cultural Landscape, with only minor revisions, into the formal texts of the Management Principles. Second, the Satoyama Initiative's three-fold approach to the Cihalaay Cultural Landscape (the right diagram of Figure 11) based on the local Code of Conducts was proposed by the research team and later agreed upon by all stakeholders to be the framework of the Management Plan. As a result of the above consensus built through a series of stakeholder meetings, the local authority (HCCAB) officially designated the site as a legal Cultural Landscape in May 2012, approved the Management Principles in November 2012 and completed the mid-term Management Plan for Cihalaay Cultural Landscape in June 2013. The Management Plan comprises 23 tasks closely related to the five perspectives of the three-fold approach of the Satoyama Initiative.

3.2. What are the new values of the SEPL identified by key stakeholders in the collaborative planning processes?

Through the participatory investigation and mapping processes, key stakeholders including the local community, experts and officials collaboratively identified the following new values for the socio-ecological production landscape of the case study area (Lee et al. 2016).

3.2.1. Ecological, economic and cultural value

Production landscapes including farmlands of rice terraces, houses and irrigation channels in Cihalaay are situated on sloping hills downstream of the Stonehouse Ravine Stream. Sloping hills at midstream are orchards and secondary forests, mostly planted with fruit trees and bamboo, while



Figure 9. Local Management Committee meeting concerning the proposed Cihalaay Culture Landscape in July 2011 (Photo by Lameru Kacaw)

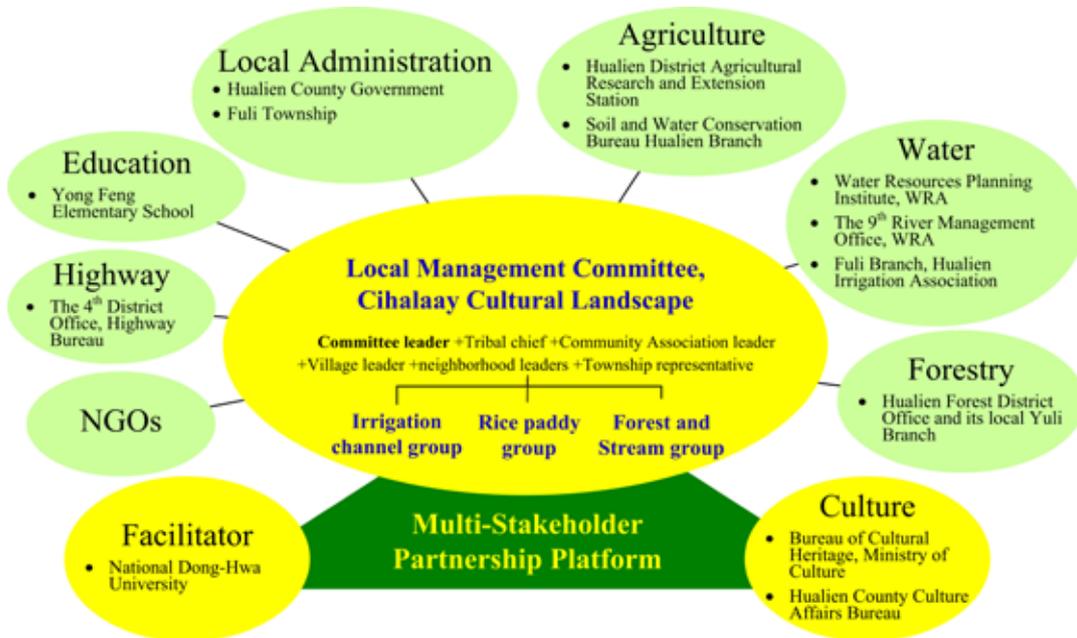


Figure 10. Composition of the Multi-stakeholder Partnership Platform (Source: Lee et al. 2016, p. 88)

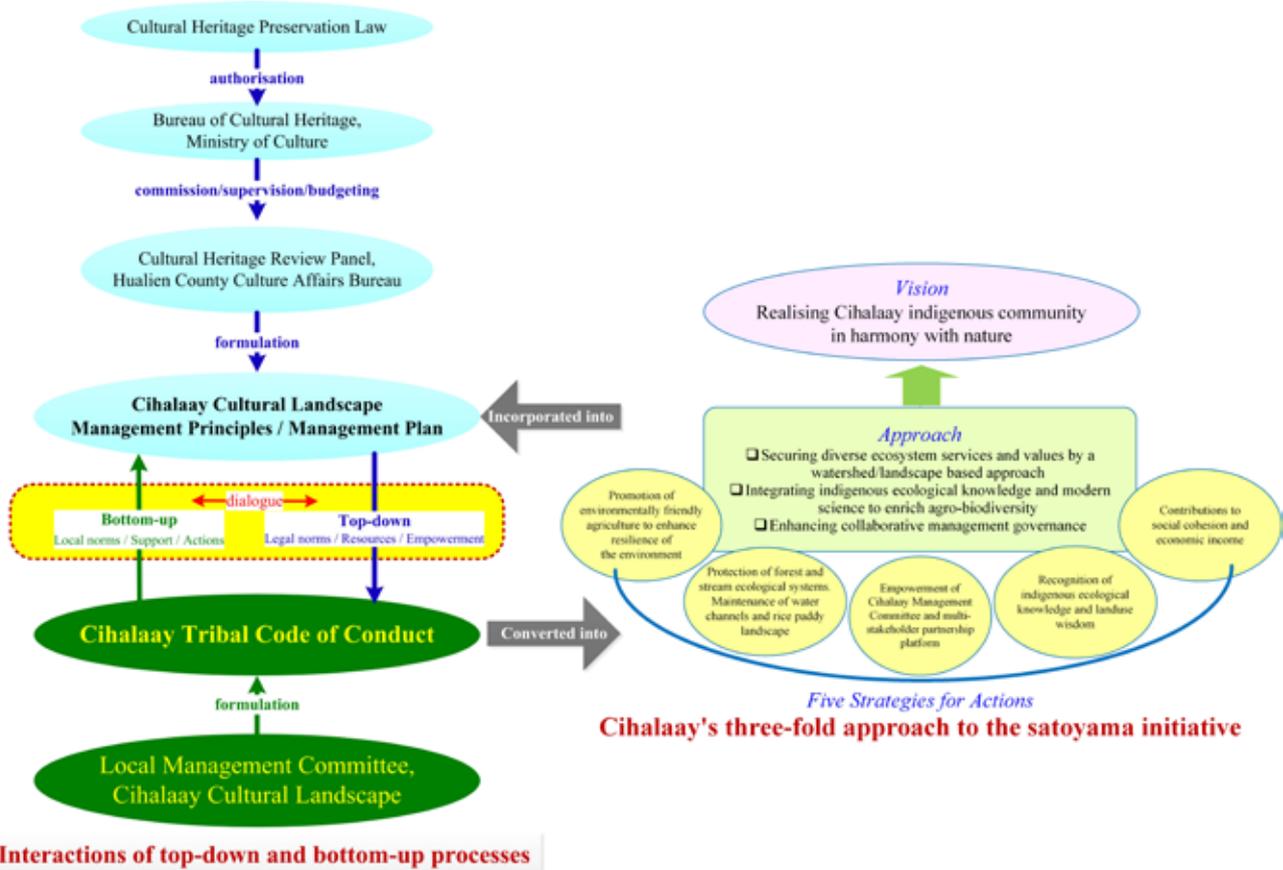


Figure 11. Incorporating local Code of Conduct into Management Principles/Plan in light of the three-fold approach of the Satoyama Initiative (Source: Lee et al. 2016, p. 87)

the natural integrity of mountainous forest areas upstream is largely preserved. The natural forests and streams upstream offer provisioning, regulating and cultural services to the middle and downstream areas. Among the indigenous peoples in Taiwan, the Amis are among the those who best keep and practice the traditional knowledge of utilising

various wild plants. The range of the Cihalaay Cultural Landscape includes the entire watershed that constructs a dynamic mosaic of socio-ecological production landscapes. It provides a good example of close interactions and relationships among local people, land use and nature, and reveals an opportunity for sustainable livelihoods.

3.2.2. Representative and historical value

The Stone Gate Channel was the first reclamation example of non-governmental Chinese-aboriginal cooperation. It was built between 1926 and 1928 to supply irrigation water to 20 hectares of rice paddies in the Cilamitay area of Fengnan village, and functions up until today (Figure 12). The Channel has been of great benefit to the village and has provided local economic value. The other five irrigation channels upstream were built by Cihalaay indigenous people with their bare hands and simple tools. The channels go past several steep slopes and cliffs, and one can still imagine how difficult the construction works were. All of the above reflects the developing patterns and features of irrigation channels and rice paddies in early Taiwan, which is considered to have representative and memorial history as well as cultural value.

3.2.3. Rarity value

Rice terraces in eastern Taiwan are mostly located on alluvial plains or river terraces, whereas the rice terraces in the Cihalaay Cultural Landscape are distributed down along sloping hills, making them a rarity. Additionally, some of the early reclaimed fields have been abandoned for 20 to 30 years, but it can still be seen that small-scaled terraces and walling stone structures have remained intact. Also, large stones along original side slopes can be found in the fields. Such small and irregular-sized reclaimed terraces that conform to the natural environment slowly vanished at a later time due to mechanised bench terracing of rice paddies. Luckily, some spots of the designated cultural landscape have been brought under preservation and therefore have become an example of a “fossil cultural landscape” of early rice terraces in eastern mountainous areas. Furthermore, “Cihalaay” in the Amis language refers to two kinds of stream fish, the Taitung river loach and Japanese monk goby, which were discovered in streams by ancestors of the Amis migrating from Taitung coast. The Amis in the eastern part of Taiwan have the custom to name places after living things, mostly plants, with some after animals. However, to name a place after a species of fish is quite rare.

4. Conclusions

The two-year action research projects have successfully introduced the Satoyama Initiative’s three-fold approach into the formulation of the Cihalaay Cultural Landscape Management Principle and Plan through a multi-stakeholder participation process. Through intense communication in the local forums and workshops facilitated by the research team, local people set up a Local Committee and drew up a Code of Conduct for the management of the potential

Cultural Landscape in late 2011. Based on an analysis of legal and administrative arrangements, the projects facilitated dialogue between the Local Committee and governmental authorities and helped to transform the local Code of Conduct for the Cihalaay Cultural Landscape into its formal Management Principles. The Local Committee and the relevant local authorities jointly designated the site as a legal Cultural Landscape in May 2012, drew up a mid-term Cultural Landscape Conservation Plan and set up a Multi-stakeholder Partnership Platform for implementation of the Plan in mid-2013.

Among the 35 designated cultural landscapes of Taiwan as of May 2012, the Cihalaay Cultural Landscape was the first one that employed a landscape approach and comprised comprehensive elements of a SEPL, including an indigenous village, rice terraces and irrigation channels, orchards, secondary forest, natural forests and streams. The site was also the first to employ a collaborative approach to the planning and management of the SEPL. Due to the above reasons, the Cihalaay Cultural Landscape has become a new paradigm and a best practice recognised by local and central government authorities, including the Hualien County Culture Affairs Bureau and the Bureau of Cultural Heritage of the Ministry of Culture. In addition, two other Satoyama-like landscape and seascape sites were planned in light of the Cihalaay experience and designated as Cultural Landscapes in 2013 and 2014.

Since the designation of the Cihalaay Cultural Landscape, many follow-up activities, from mid-2012 to the present, have been conducted collaboratively by local people, local authorities and the research team, such as ecotourism development, environmentally friendly farming and organic products, community-based environmental education courses for local youth, as well as on-going research on participatory identification and evaluation of indicators of resilience of the Cultural Landscape. The case study shows that a landscape approach based on the frameworks of the Satoyama Initiative and the IUCN protected landscapes can be welcomed by rural people and create a new style of a “living” protected landscape in Taiwan’s national protected area system.

Acknowledgements

This case study report would not have been possible without the kind support and help of many individuals and organisations. Especially, we would like to express appreciation to the Bureau of Cultural Heritage of the Ministry of Culture, the Hualien County Culture Affairs Bureau, the Forestry Bureau of the Council of Agriculture and IPSI’s Satoyama Development Mechanism (SDM) that

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Influencing SEPLS governance policy through action research: an assessment of recreational values to promote sustainable use of the Mabira Central Forest Reserve, Uganda

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Abstract

Increasing pressures on protected areas in the form of intensification of authorised and unauthorised uses requires that governance policies and management approaches be dynamic within reasonable timesframes to prevent degradation and loss. Recreation is one form of protected area use that has not been much emphasised in Uganda's forest reserves. Recreational values of the Mabira Central Forest Reserve were assessed with the objective of promoting a policy shift from emphasis on extractive forms of use to non-extractive ones. The assessment was conducted throughout the forest with greater focus on peripheral areas that would be most accessible for recreation. Landform, land use, cultural and biodiversity values were assessed. Here, we show that the forest has attractions of unique appeal that are currently not being used for tourism. We also present a unique dataset for known attractions that should be valuable in use of the forest for tourism. To make newly described attractions available for recreational purposes and reduce ongoing illegal resource overexploitation, we recommend a policy shift that increases the size of the area allotted to recreation. We also describe infrastructure developments needed to operationalise that policy change. A broad lesson from this study is that where conservation landscapes are becoming degraded from given forms of use, it makes sense to lay more emphasis on alternative, more sustainable uses.

Keywords: Biodiversity; Ecotourism; Forest management; Mabira Forest; Sustainable use; Tourism;

1. Introduction

Mabira Central Forest Reserve (hereafter referred to as "Mabira" or "Mabira Forest") (29,974 ha) was first gazetted in 1932 (Mugumya & Shabomwe 1994). It is situated 54 kilometres east of Kampala city and 26 kilometres west of

Jinja town (Forest Department 1996). It is a government forest managed by the National Forestry Authority (NFA). It lies in an area of gently undulating land interrupted by flat-topped hills which are remnants of the ancient African peneplain. This peneplain was uplifted by tectonic movements which lowered the land south of the reserve

and resulted in the formation of the present Lake Victoria (Pallister 1957 as cited in Ministry of Water and Environment 2010).

From the viewpoint of importance for biodiversity conservation, Mabira is the only remaining large natural forest in central Uganda, the smaller forests having been severely degraded or lost during the last five to twenty years. Its vegetation is classified as medium altitude moist semi-deciduous and is considered to be of sub-climax stage. Two hundred and two tree species have been recorded in the reserve (Forest Department 1996), five of which are of international conservation concern (BirdLife International 2015). According to forest department reports (Forest Department 1996), the reserve is “above average” for Ugandan forests for butterflies and birds, and “average” for other taxa. Mabira is an Important Bird Area with almost 300 species (BirdLife International 2015). There are several bird species of the Guinea-Congo Forests biome that are not well-represented in other protected areas in Uganda (BirdLife International 2015). The forest is one of the four remaining hold-outs of Uganda’s only endemic/near endemic primate, the Uganda crested mangabey (*Lophocebus ugandae*); the others being Kibale National Park, Bugoma Forest Reserve, and Sango Bay forests (Olupot 2013).

The reserve has a checkered history of encroachment. Parts of it were illegally settled in 1953 and then again between 1961 and 1971. These were however easily contained through evictions (Mugumya & Shabomwe 1994). Incidents of encroachment increased from 1971 to 1985, during which up to 7,000 hectares of the forest, mainly east of the reserve, were cut down by the encroachers. These settlers were removed by the end of 1989 (Mugumya & Shabomwe 1994, Ministry of Water and Environment 2010). In early 2007, the government proposed to give up approximately 30% of the reserve for sugarcane farming, but this was withdrawn in October the same year (BirdLife International 2008).

The reserve (Figure 1) is managed under a plan that partitions the forest into three zones; the inner zone, which is a “strict nature reserve”, and the outer zones comprised of the “buffer zone” which includes the recreation zone, and the “production zone”. The strict nature reserve covers 23% of the forest and no activities are permitted there except scientific research and law enforcement. Tourism activities are permitted only in the recreational and buffer zones which cover 22% of the reserve. The production zone which covers 54% of the reserve is allocated to sustainable supply of round wood for Uganda’s plywood and veneer industry (Ministry of Water and Environment 2010). Local communities are permitted to collect non-timber forest products such as medicines and firewood for subsistence use from the production and recreational zones. Local

people are also permitted access to weaving materials such as the rattan cane and raffia palm for commercial purposes from these zones. From the viewpoint of this publication therefore, the peripheral area comprised of the production, buffer, and recreational zones altogether covering 76% of the reserve can be considered a Socio-ecological Production Landscape (SEPL). Therefore unlike most SEPLs that are subject to the jurisdiction of individual land owners, this one is managed by the government.

Local people are permitted to use the forest or access resources within the framework set by the National Forestry and Tree Planting Act of 17 June 2003. According to section 32(1) of the act:

No person shall, except, for forestry purposes and in accordance with a management plan, or in accordance with a license granted under this Act, in a forest reserve or community forest (a) cut, take, work or remove forest produce; (b) clear, use or occupy any land for i) grazing, ii) camping, iii) livestock farming, iv) planting or cultivation of crops, v) erecting of a building or enclosure, or vi) recreational, commercial, residential, industrial or hunting purposes; (c) collect biotic and abiotic specimens; or (d) construct or re-open a road, track, bridge, airstrip, or a landing site (Government of Uganda 2003).

Local people access resources from the forest under section 33(1&2) of the Act, which states:

(1) subject to the management plan, a member of a local community may, in a forest reserve or community forest, cut and take free of any fee or charge, for personal domestic use in reasonable quantities, any dry wood or bamboo; (2) for the avoidance of doubt, no person may, in a strict nature reserve or a site of special scientific interest cut or dry wood or bamboo or other forest produce (Government of Uganda 2003).

The current management plan (Ministry of Water and Environment 2010) further clarifies and details how local communities can access forest resources. In section 2.10.2, it is stated that:

Domestic animals are allowed to visit water and salt licks in the reserve on specific arrangements with NFA, but grazing will require a license. Local communities have specific sites in the forest reserve with special cultural attachments (Ministry of Water and Environment 2010).

In section 2.3, the plan also states that:

Use of rattan cane for hand craft has developed considerably, as has use of leaves of a wild date palm, *Phoenix reclinata*, for making floor mats. Other non-wood products include wild coffee, clay, sand, stones, herbal medicine, fodder, thatching grass etc. However, NFA has no quantified volume of the products taken out and their value (Ministry of Water and Environment 2010).

These resources are intended for collection under collaborative forest management agreements (CFMs) with local community groups. In reality, enforcement of the forest use principles outlined in the act and management plan is a challenge, and the forest is under pressure from both unauthorised uses and overexploitation under permitted uses.

These pressures arise from several causes. First is the weak law enforcement capacity of NFA. Second is the fast-rising Ugandan population, estimated to be growing on average 3.4% per year, with Mabira situated in one of the most densely populated parts of the country. This may be contributing to an increase in demand for various forest products, which according to the management plan has been increasing in recent years. The most exploited resources include firewood, timber, and non-timber forest products. The demand for rattan cane has been one of the fastest rising of the commercial non-timber forest products, and this forest is now known to be no longer able to supply rattan. Removal of both timber and non-timber forest products occurs irrespective of zoning status. Third, Mabira, being located close to Uganda's capital city of Kampala, and Jinja (one of the largest towns in the country) and near the rapidly industrialising towns of Mukono, Lugazi, and Njeru, has experienced increasing pressure for resources as forests on private land get depleted. There is therefore a rising demand for forest products to meet the needs of both the population and industry.

Experience from other forests in Uganda, for example the Bwindi Impenetrable National Park, shows that no single approach is sufficient to sustain forest integrity. In this park, each of the six Integrated Conservation and Development strategies (ICDs) that have been employed to promote local community support to sustain park integrity made some contribution to that goal by reducing illegal activities such as timber extraction and agricultural encroachment, reducing incidences of fire outbreaks, and generally improving relations between the park staff and local communities (Blomley et al. 2010). Yet even these may not be enough to achieve the desired state of a protected area as shown by Olupot et al. (2009a).

So far, only three of the six main strategies that have been in Bwindi and other Ugandan parks such as Kibale and Rwenzori Mountains are applied in Mabira. These are: i) law enforcement, ii) community access to forest resources, and iii) tourism. Moreover, their implementation is weak. Law enforcement is thin, community access to resources is largely unregulated, and tourism is poorly developed or promoted. Nature and Livelihoods has been involved in the promotion of tourism in Mabira since 2013 (Olupot 2013) as part of a wider effort to promote sustainable use as a strategy to prevent degradation. The objective of this study was to assess opportunities to expand tourism by recording potential aesthetic and recreational values. This was intended to guide a policy shift towards more sustainable practices and to diversify forest-based livelihoods of the local people.

2. Methods

2.1. Explanation of the meaning of "tourism" as used in this paper

The word "tourism" as used in this paper refers to "ecological tourism", or "Ecotourism", as defined by IUCN's Ecotourism Programme namely:

Environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features — both past and present) that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement of local populations (Ceballos-Lascuráin 1996).

2.2. Survey approach

The survey was conducted from September to October 2015 by a four-man core team comprised of people with substantial knowledge of Ugandan forests (the authors and two others). NFA was involved at all stages of the study, including identification of the project, field implementation, and discussion of the recommendations. In the field NFA was represented by Mr. Michael Ojja, the officer in charge of law enforcement in Mabira. The fourth team member was Mr. Robert Kungujje, a tourism officer / bird expert of Mabira Forest Integrated Community Organisation, MAFICO, and NGO owned by people living around Mabira.

The first step in documenting attractions was to identify locations to visit based on landform features, historical or cultural significance, and biodiversity attractions. Selection of locations was conducted with the help of topographic,

drainage, and vegetation maps. Consultations were also made with NFA field officers and local people to ensure that all known but unrecorded attractions, including cultural sites inside and within the immediate environs of the reserve, were visited.

2.3. Assessment of attractions

Altogether, 24 locations were visited (Figure 1). Upon arrival at selected locations, the team familiarised itself with the area by observing the condition of the forest, landform features, scenery, and noting primates and birds seen. Locals encountered were also asked about historical and cultural sites in their localities. Each location was evaluated for recreational appeal based on four main criteria:

- a) Landform appeal – beauty and/or recreational appeal of natural landform features (e.g. scenic views from hilltops, and scenic views of valleys, rivers and wetlands);
- b) Appeal of biological characteristics – occurrence and abundance of species that would normally be sought by tourists visiting a forest environment (e.g. primates and uncommon bird species, appeal of the forest based on the degree of tree maturity, ranging from mature to heavily degraded);

- c) Cultural value – (historical and/or present) occurrence of cultural sites (ceremonial, spiritual, historical) and potential appeal for tourist visits; and
- d) Aesthetic appeal of surrounding land use practices – types and aesthetic appeal of human developments within visible distance from elevated points (particularly as related to agricultural landscapes and built-up areas).

Each location was rated in the field in a participatory manner for these criteria on a scale of one to ten, whereby one represented the lowest rating and ten the highest. The suitability of each of the locations for campsites or hiking trails was scored on the same scale. Accessibility by motor vehicle was taken into account when scoring for campsite suitability. Ambience as judged from aesthetic appeal, and freedom from noise of human origin were additional criteria taken into account when scoring for campsite suitability. For long distance hiking routes, occurrence of scenic spots and suitability of terrain were additional considerations. The three existing campsite locations were also scored according to the same criteria to facilitate understanding of the recreational value of potential new campsite locations.

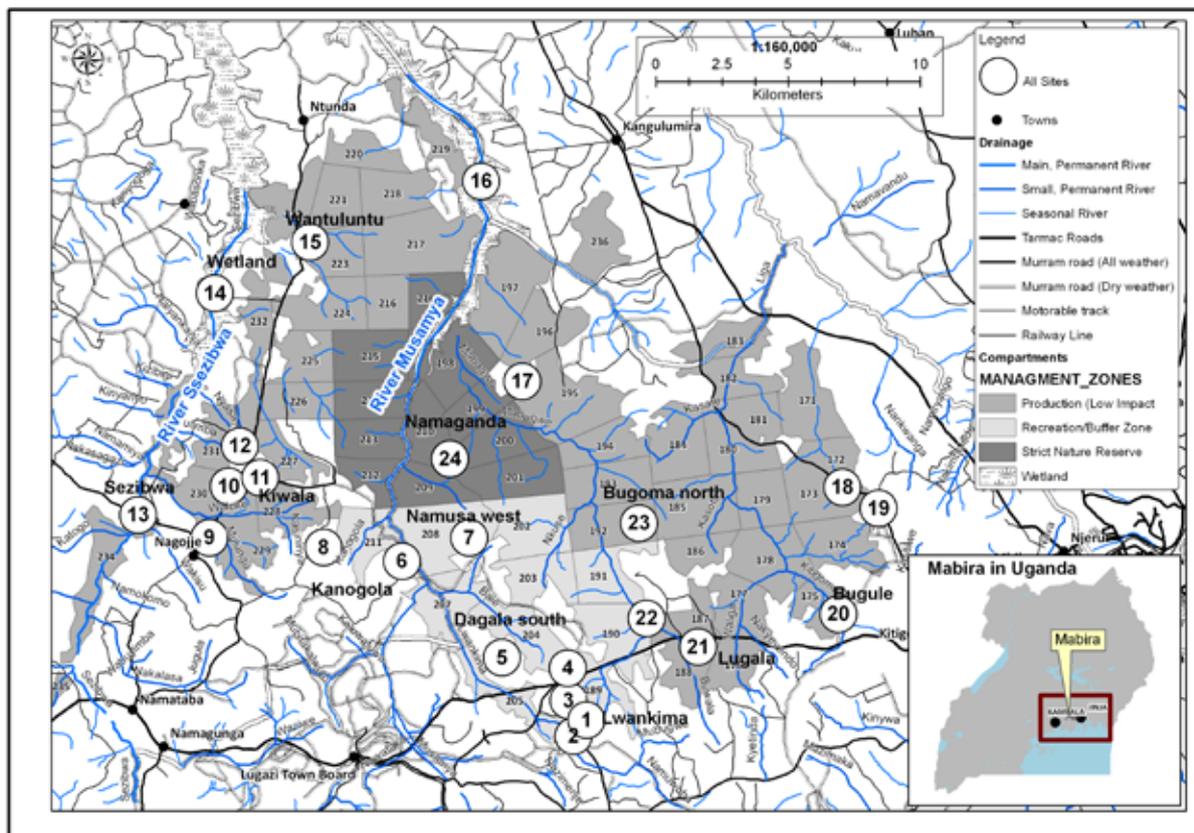


Figure 1. Map of Mabira Central Forest Reserve showing existing management zones and sites visited during the survey (Source: NFA GIS Section)

2.4. Rating of sites for campsites and hiking trail routes

The appeal of each site based on criteria was determined by comparing assigned scores, and selection of locations for potential new campsites and trail routes was conducted by examining the averages of assigned scores. Lugala Compartment (Site 21), Kiwala Hill (Site 11), and Namusa Hill (Site 7) were the highest rated for establishment of new campsites. Bugoma North Hill (Site 23), although assigned a low score in the field, was later considered by the team to have high potential for establishment of a camp in the event of high demand. Overall, the Kiwala Hill and Lugala Compartment areas were the highest rated as potential campsite locations, even higher than locations of existing campsites. All the highly rated sites for campsites were also highly rated for routing long distance hiking trails. Other sites rated highly for potential hiking routes were Namaganda Hill (Site 24, for iron smelting history), Kito Hill (Site 8, for illustration of the Buganda penneplain), and Senda Hill (Sites 18 & 19, for illustration of exotic species dominance of a forest following heavy disturbance) (Table 1).

2.5. Evaluation of biodiversity characteristics of locations highly rated for new campsites and forest around existing campsites

Detailed assessments of site-specific biodiversity values were conducted only for existing or potential new campsites to confirm the appeal of the latter for facility establishment. Assessment focused on taxa that were considered to be of main tourism interest in tropical forest situations, namely primates, birds, trees, and butterflies. Data were collected along one kilometre transects set within a radius of two kilometres or so of potential and existing campsites. Transects were marked out in 50 metre lengths aligned in north, south, east and west directions to cover landforms and forest types in each area representatively. A measuring tape was used to mark transect centerlines and the lengths of each segment.

Large trees (≥ 50 cm Diameter at Breast Height or DBH) within five metres of either side of the transect centerline were identified and DBH recorded (Figure 2). Butterflies were counted within 2.5 metres of transect centerlines. Primate groups or individuals seen or heard from the transect centerline were identified and recorded. Similarly, birds seen or heard from the transect centerline were identified to species level and recorded. For all taxa, efforts were made to avoid multiple recording of the same individuals within the 50 metre transect lengths. The number of trees with buttresses large enough for use for nesting by birds such as Nahan's Francolin (*Ptilopachus nahani*) were counted within five metres of the transect centerlines.



Figure 2. Field team taking and recording DBH of a large tree along the sampling transect. L-R: a volunteer, William Olupot, field assistants, and Gilbert Isabirye-Basuta (Photo by William Olupot)

Data analyses varied by dataset. For birds, analyses were based on totals of the numbers heard and seen. The same approach was used for primates. For all taxa, data were summarised by density. Shannon-Wiener diversity indices (H) and evenness values (H/Hmax) were calculated where appropriate (only trees and birds). Single factor ANOVA tests were conducted to evaluate inter-site differences where relevant. Inter-site comparisons were also made by means of ranks assigned to variables such as density, number of species, species diversity, and evenness. Shannon-Wiener diversity indices were calculated using the following formula:

$$H = -\sum_{i=1}^z p_i \ln p_i$$

whereby H = diversity index, p_i = the proportion of species i relative to the total number of species in each site, and $\ln p_i$ = the natural logarithm of this proportion.

3. Results

3.1. New attractions documented

The following new attractions that are not currently being used for tourism in Mabira were recorded: i) rare primary forest easily accessed from major roads (Sites 15 & 21), ii) location with a rare landscape view combining both forest and scenic agricultural landscape (Site 11, Figure 3), iii) slopes with a gentle climb offering an opportunity for fitness hiking (walks, jogging, biking) (Sites 7, 23 & 24), iv) sites with cultural history as iron smelting or ore collection sites (Sites 24 & 11 respectively), v) a location with potential



Figure 3. Part of the landscape view from Kiwala Hill, Site 11 (Photo by William Olupot)

to experience the forest and two types of commercial agriculture (tea and sugarcane plantations) (Site 11), vi) a location with a high likelihood of seeing the endangered Nahan's Francolin (Site 21), vii) a potentially unique birding location offering an opportunity to view forest, riverine, and savanna wetland birds in one hike (Sites 10-14), viii) a potential river boating route (Sites 13 & 14), ix) suitable locations to showcase the penepalin that existed in East Africa before tectonics leading to the formation of Lake Victoria and the surrounding landscape (Sites 7 & 8), and x) a location with potential to experience the impact of past disturbances in Mabira demonstrated by proliferation of the tree *Brousonettia papyrifera* (Site 19).

3.2. Comparison of overall recreational values between locations of existing campsites and sites highly rated for establishment of new campsites

Sites 11 and 21 were rated higher for campsites than locations of existing campsites. Differences in overall ratings for potential new campsites (Sites 7, 11, 21 and 23) and existing sites (Sites 1, 4 and 6) were however not statistically significant (Single Factor ANOVA, $p=0.82$, $df=6$).

3.3. Comparison of biodiversity characteristics between locations of existing campsites and locations highly rated for new campsites

Assessments of biodiversity values of existing campsites (Griffin, Site 6; Ecotourism Center, Site 4; Rainforest Lodge, Site 1); and potential locations for new camps (Lugala Compartment, Site 21; Kiwala Area, Site 11; Namusa Hill, Site 7; and Bugoma North Hill, Site 23) revealed similarities but also interesting differences presented below by taxon.

3.3.1. Trees

A total of 52 tree species were recorded in the seven sites. Excluding six that were not identified, these represented approximately 25% of the total number known for Mabira. The average density of the trees was 33 ha^{-1} and there was pronounced variation in density between sites (ANOVA, $p=0.049$). The most commonly recorded species was *Celtis mildbraedii* (31 individuals), followed by *Antiaris toxicaria* (20), and *Trilepisium madagascariense* and *Maesopsis eminii* with 14 individuals each. Rankings of sites by tree density, mean DBH, number of species, number of unique species, species diversity, and evenness consistently showed Lugala

Table 1. Site identity and recreational scores by criteria. Mean scores are of criteria other than appropriateness for hiking routes and campsites. Landform appeal criteria consist of landscape appeal and wetland/river features; appeal of biological characteristics criteria includes forest appeal and presence and abundance of primates and birds; and cultural value criteria relate to cultural features. The scoring of aesthetic appeal of surrounding land use practices as a criterion is not included in this table but was zero or negligible for all sites except Kiwala Hill which was considered to score at the level of 8 or higher.

Site Name	Site code	Elevation (m)	Landscape appeal	Wetland / River	Forest appeal	Primates	Birds	Cultural	Hiking route	Campsite	Mean score
Rainforest Lodge (existing campsite)	1	1268	3	1	8	7	4	2	8	8	5.1
Najjembe South	2	1263	5	1	7	7	8	1	8	2	4.9
Radio Hill	3	1357	3	1	5	2	5	1	4	2	2.9
Najjembe North (existing campsite)	4	1208	2	4	6	8	7	2	7	6	5.3
Dangala Hill	5	1313	7	1	1	1	4	1	5	2	2.8
Griffin Campsite (existing campsite)	6	1170	3	7	4	6	7	4	7	6	5.5
Namusa Hill	7	1313	6	1	8	5	6	1	8	7	5.3
Kito Hill	8	1330	8	1	1	3	4	1	6	2	3.3
Nagojje F. Station	9	1125	2	6	2	3	5	5	2	6	3.9
Kiwala-Waluke	10	1145	3	3	6	4	4	1	4	1	3.5
Kiwala Hill	11	1242	9	1	1	1	3	1	9	9	4.3
Kiwala Enclave	12	1148	6	4	6	8	5	8	8	9	6.8
R. Sezibwa Bridge	13	1087	2	6	4	7	8	4	8	1	5
R. Sezibwa	14						8		8		8
Wantuluntu West	15	1091	5	1	8	8	7	1	6	6	5.3
Musamya Swamp	16	1082	5	5	2	1	7	1	4	1	3.3
Zintengeze Encl.	17	1132	7	5	7	7	5	2	2	1	4.5
Senda Hill	18	1182	1	1	2	2	4	1	8	2	2.6
Senda Hill	19	1290	8	1	1	1	3	1	1	1	2.1
Bugule	20	1201	4	7	4	8	6	2	4	7	5.3
Lugala	21	1317	2	6	9	6	6	2	8	9	6
Buwala	22	1210	1	6	6	8	6	1	7	5	5
Bugoma North Hill	23	1330	3	2	7	7	7	3	8	5	5.3
Namaganda Hill	24	1262	7	1	8	2	6	8	8	2	5.3

Table 2. Ranking of sites by tree variables. Ranks are considered only preliminary as the dataset is considered small. The word "Area" refers to forest surrounding existing or potential campsites.

Site code	Existing* or potential campsites						
	23	6	11	21	4	1	7
Site name	Bugoma North Hill	Griffin Campsite Area*	Kiwala Hill Area	Lugala	Najjembe North*	Rainforest Lodge Area*	Namusa Hill
Variables							
Tree density (no./ha.)	38	31	35	41	37	15	34
No. of species	18	20	14	21	16	13	12
No. of unique species	5	7	0	5	4	3	3
Mean DBH	64	74	59	77	60	63	74
No. buttressed	1	7	2	20	1	0	10
Diversity Index (H)	0.72	0.65	0.62	0.82	0.66	0.34	0.58
Evenness (H/Hmax)	0.20	0.19	0.17	0.22	0.18	0.13	0.17
Rank by variable							
Tree density (no./ha.)	2	6	4	1	3	7	5
No. of species	3	2	5	1	4	6	7
No. of unique species	2	1	7	2	4	5	5
Mean DBH	4	2	7	1	6	5	2
No. buttressed	5	3	4	1	5	7	2
Diversity index (H)	2	4	5	1	3	7	6
Evenness (H/Hmax)	2	3	5	1	4	7	5
Mean of ranks	2.9	3.0	5.3	1.1	4.1	6.3	4.6
Final rank	2	3	6	1	4	7	5

West as the superior site for these variables, taking a number two position only in the number of unique species (in this case referring to species recorded in only one site) recorded. It was followed by Bugoma North, Griffin, Najjembe North (Ecotourism Centre), Namusa Hill, Kiwala area which includes Kiwala Hill and neighboring forest compartments, and the Rainforest Lodge area (Table 2).

3.3.2. Birds

A total of 73 bird species were recorded in the seven sites amounting to 24% of the approximately 300 species known for Mabira. Of these, 32 were among the 75 listed as IBA trigger species (BirdLife International 2015). Nahan's Francolin (*Ptilopachus nahani*), the only endangered bird species occurring in Mabira, was recorded only in the Lugala site. Sites differed noticeably in number of species and in other variables analysed for birds; the obvious difference (ANOVA; $P < 0.0001$) occurring in numbers recorded per site. Griffin was found to be the number one site, overall followed by Lugala West, Najjembe North (ecotourism site), Kiwala, Namusa, Bugoma North, and Najjembe South (Rainforest Lodge), in that order. None of the species that were recorded along River Ssezibwa during the site scoring

exercise were recorded in the transects. If included, the Kiwala Hill area would by far have been the superior site, at least in the number of species a visitor can potentially encounter there (Table 3).

3.3.3. Butterflies

Counts of butterflies also showed major differences across sites (ANOVA; $P < 0.0001$) with the largest number counted in Namusa Hill followed by Najjembe South (Rainforest Lodge area), Kiwala, Bugoma North, Griffin, Lugala, and Najjembe North (Ecotourism Centre), in that order (Table 4).

3.3.4. Primates

Although local people report that the tanzania/vervet monkey (*Chlorocebus tantalus*) occurs in Mabira, only two species were encountered during this survey: the Uganda crested mangabey *Lophocebus ugandae* (Figure 4) and the Redtail monkey *Cercopithecus ascanius* (Table 5).

Table 3. Ranking of sites by analyses of bird records. Ranks are only preliminary as the dataset is limited. The word "Area" refers to forest surrounding existing or potential campsites.

Site Code	Existing* or Potential Campsites						
	23	6	11	21	4	1	7
Site name	Bugoma North Hill	Griffin Campsite Area*	Kiwala Hill Area	Lugala	Najjembe North*	Rainforest Lodge Area*	Namusa Hill
Variables							
"Density" (seen + heard)	134	232	181	221	203	64	195
Total number of species	30	37	34	36	39	15	28
No. unique of species	1	3	5	2	11	0	2
No. of threatened species	0	0	0	1	0	0	0
No. of IBA trigger species	14	17	17	19	19	7	15
Diversity index (H)	0.577	0.923	0.740	0.890	0.834	0.280	0.751
Evenness (H/Hmax)	0.118	0.169	0.142	0.165	0.157	0.067	0.142
Ranks of variables							
"Density" (seen + heard)	6	1	5	2	3	7	4
Total number of species	5	2	4	3	1	7	6
No. of unique species	6	3	2	4	1	7	4
No. of threatened species	2	2	2	1	2	2	2
No. of IBA trigger species	6	3	3	1	1	7	5
Diversity index (H)	6	1	5	2	3	7	4
Evenness (H/Hmax)	5	1	3	2	6	7	3
Mean rank	5.14	1.86	3.43	2.14	2.43	6.29	4.00
Final rank	6	1	4	2	3	7	5

Table 4. Ranking of sites by the number of butterflies counted. Ranks based on butterflies are highly uncertain due to the limited nature of the dataset. Butterfly activity can be highly variable and accurate ranking depends on obtaining a representative sample that controls time of day, weather and season. The word "Area" refers to forest surrounding existing or potential campsites.

Existing* or potential campsites	Site code	No. counted	Rank
Bugoma North Hill	23	113	4
Griffin Campsite Area*	6	80	5
Kiwala Hill Area	11	125	3
Lugala	21	73	6
Najjembe North*	4	32	7
Rainforest Lodge Area*	1	157	2
Namusa Hill	7	238	1

Table 5. Primates occurred in each site. Ranking is not possible without reliable data on densities. Nevertheless, the results are significant as this represents the first systematic assessment involving large to medium-sized mammals in the reserve. The word "Area" refers to forest surrounding existing or potential campsites.

Existing* or potential campsites	Site code	Species detected / Remarks
Bugoma North Hill	23	Mangabey; hard to explain why redtails would not occur here as well
Griffin Campsite Area*	6	Mangabey; Redtail
Kiwala Hill Area	11	Mangabey; Redtail
Lugala	21	Mangabey; Redtail
Najjembe North*	4	Mangabey; Redtail
Rainforest Lodge Area*	1	None but both are known to occur here according to prior experience by these researchers
Namusa Hill	7	None and are very rare here according to a local informant

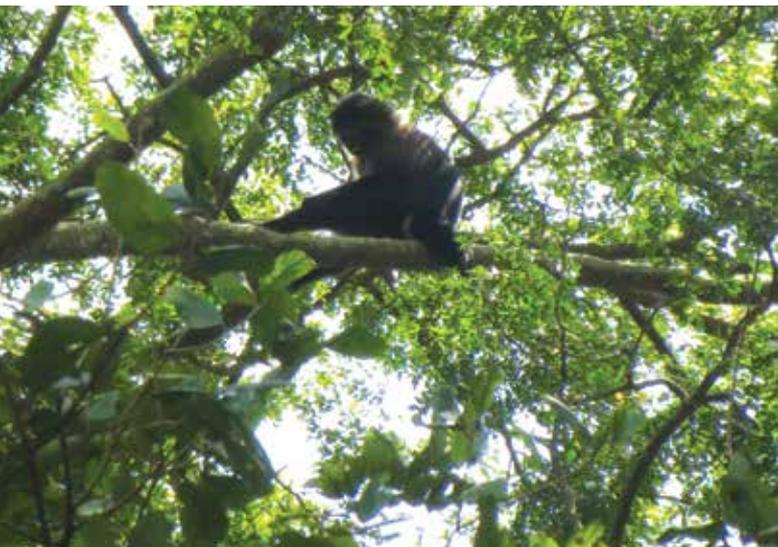


Figure 4. Picture of the Uganda Grey Cheeked Mangabey taken at Site 12 (Photo by William Olupot)

4. Discussion

Results show that the Mabira Central Forest Reserve has more attractions than are currently recognised. If fully utilised, these attractions can contribute to alternative livelihoods for the local people while reducing pressure from illegal use of the forest (Figure 5). Local communities could benefit from tourism jobs and an expanded market for local produce. Illegal resource extraction would likely be deterred by the increased presence of people using the forest non-extractively.

The anthropogenic pressure to which Mabira is subjected is not unique as such pressures have been documented in comparatively well-protected forests and result in measurable effects on flora (e.g. Olupot et al. 2009a, Olupot et al. 2009b). But the pressures here require more attention than they are currently receiving. They are both species-specific and generalised.

These pressures have occurred over approximately a century, increases coinciding with periods of political instability and / or weak enforcement (Mugumya & Shabomwe 1994). During this study, it became apparent that species like the rattan cane (*Calamus deeratus*), the raffia palm (*Raphia farinifera*), the forest understory shrub *Acalypha neptunica*, and the wild rubber tree *Funtumia africana*, are harvested to a point in which supply is no longer possible from at least some locations. The urgency of the need to address conservation issues of this forest is reinforced by the fact that many natural forests in Central Uganda have recently been lost to exotic trees such as *Pinus* and *Eucalyptus* species, and to small holder farming. Nature and Livelihoods is implementing activities to relieve pressures on the forest

by promoting alternative livelihoods, forest restoration, and recreational use. However, efforts like these in themselves would not be sufficient to curtail unauthorised forest use. Law enforcement needs to be strengthened and a wide range of alternative forms of use need to be employed.

By advocating for greater use for tourism, we do not argue against uses currently authorised by NFA, such as subsistence use of non-timber forest products by local communities. We however argue that illegal and over extraction of resources needs to be curtailed. Our interactions with local communities during this study suggest that there is consensus on this issue. In addition to tourism promotion and enhanced law enforcement, this issue can be addressed by empowering community-managed collection of forest products through training in use of appropriate tools, such as community-based monitoring and engagement in resource restoration.

To promote sustainable use through tourism, new campsites need to be established to make use of the identified recreational and educational values. Results from the “campsite-level” assessment of biodiversity point towards the exceptional potential of the areas around Site 11 and in and around Site 21. If confirmed through a more detailed survey, inter-site similarities are an indication of what a visitor might expect to experience irrespective of the site they visit. The differences illustrate what could be unique to each location that visitors might want to experience.

This study has provided information that can promote sustainable use of the reserve through better use of recreational values. Information provided can also contribute towards development of a tourism strategy for the reserve by providing some of the information needed to answer the following questions: How could tourism management be improved? How could tourists’ experiences be enhanced? What opportunities are being missed? What would the reserve management like to communicate to the visitor? (IUCN, n.d.) By advocating for strengthening of tourism activities as an approach to promote sustainable use of the reserve, the SEPLS (Socio-Ecological Production Landscapes and Seascapes) concept mainstreamed into sound landscape use would include: resource use within the capacity of the environment, promotion of cyclic use of natural resources, multi-stakeholder participation and collaboration, contributions to sustainable socio-economics, and ensured recognition of local traditions and culture (Satoyama Initiative 2010).



Figure 5. Illustration of unsustainable use ongoing in the reserve. Picture illustrates an illegally established track used to ferry out illegally cut timber at Site 21. In the centre of the picture, the researchers inspect the track. (Photo by William Olupot)



Figure 6. Large strangler fig with the supporting tree long dead and decomposed. Trees such as this are used by the locals as sites for healing. Picture taken from Site 12. (Photo by William Olupot)

5. Conclusions and recommendations

Results from these assessments, though limited in analysis of biodiversity values, are sufficient for guiding policy at the protected area level. From a global perspective, they serve to illustrate that in some cases, recreational values of a given landscape are not usually fully understood. Where conditions permit for a given landscape, assessments may need to understand tourism values to a full extent so that they may be used to promote sustainable use. For purposes of day-to-day management of tourism in Mabira, more detailed information is needed on biodiversity and cultural values (e.g. Figure 6), particularly from campsite locations so that visitors can know the specifics of what to expect to find where. Such information would also be needed for future monitoring of impact of this form of use.

Based on results from this study, we recommend the following changes bearing on policy and decision making on recreational use of for Mabira:

- i) Widen the recreational zone to include compartments to the west lining the Nagojje-Ntunda Road and those to the south abutting the Kampala-Jinja Road. We do not imply that changes in existing CFM agreements or other legal access of these areas by local communities should occur. However, the policy of managing those areas for round wood production needs to be reviewed.
- ii) Set-up new tourism camps as soon as possible at Sites 11 & 21.
- iii) Set up at least two new long distance hiking trails; one running from Site 11 to 13, then along the Sezibwa river from Site 13 to 14, then a road trail to Site 15. Another road trail should run from Site 15 to 11, and another should connect Sites 7, 24, & 17.
- iv) Manage hunting to ensure that at threatened species and those of tourism interest are better protected. Currently, we are not aware of any hunting threatening these categories but from knowing that hunting is rcommon in this forest, we know that it could pose risk to such species in future.
- v) Further assess the recreational values of Rivers Sezibwa and Musamya.
- vi) Record the cultural history of Namaganda Hill and Kiwala Hill Area, traditional beliefs and practices associated with River Sezibwa, and identify additional sites of major cultural significance.
- vii) Conduct an assessment of medium to large mammals in the reserve to inform forest management. The current status of Nahan's partridge, *Ptilopachus nahani*, also needs to be established through a forest-wide assessment.
- viii) Assess impact of authorised extractive practices on abundance and distribution of resources harvested, vulnerable non-target species and ecosystem services, and conduct restoration activities where necessary.

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Community agrobiodiversity management: an effective tool for sustainable food and agricultural production from SEPLS

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Abstract

Different strategies that go beyond a conservationist approach are required for the management of SEPLS and their agrobiodiversity. It is necessary to actively integrate agrobiodiversity into the overall issue of sustainable development, giving equal consideration to the three dimensions of it – economic, ecological and social sustainability. The “4C” approach of the M. S. Swaminathan Research Foundation has been an effective tool for conservation through sustainable management of production landscapes. This approach pays concurrent attention to the Conservation, Cultivation, Consumption and Commerce of components of agrobiodiversity. This case study from the Malabar region of the Western Ghats Mega Endemic Biodiversity Centre (Wayanad, Kerala) synthesises four complementary field action research programmes which have together contributed in mainstreaming the concepts of SEPLS in the policy and developmental planning of local self-governments. These programmes are presented here as four separate cases which followed different methodologies and actions. A seed care movement centred on rice has saved a large number of indigenous landraces cultivated in Wayanad. A detailed socio-ecological appraisal of paddy lands has helped researchers, people and policy makers to value the agroecosystem. The multi-level education, communication and training programme over a period of around 15 years has lent a hand to the people and local self-governments in devising a sustainable agrobiodiversity management plan.

Keywords: Community agrobiodiversity management; Genome saviours; SEPLS; Western Ghats; 4C approach

1. Introduction

Resource use practices followed in SEPLS by communities including indigenous people that are often poor farmers, herders or fishermen have received wide recognition in international documents, such as the Convention on Biological Diversity (CBD) and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). Nagabhatla and Kumar (2013) observe that biodiversity conservation and management today is characterised

by an important divide. On the one hand, there are classical conservation approaches concentrating on in-situ conservation in protected areas and ex-situ modes under the auspices of (mostly) governments. On the other hand, there is the practice of biodiversity in agricultural landscapes (on-farm) being managed by local communities. Community management efforts, which revolve around age-old traditional knowledge, practices and beliefs, help in better maintenance of biodiversity and ecosystem services. Agrobiodiversity preserved in such production landscapes

has a critical role to play in dealing with the issue of under-nutrition. Hence dynamic conservation of agrobiodiversity needs to be placed as a high priority in the national development agenda for leveraging nutrition in agriculture and alleviating poverty and malnutrition (Kumar et al. 2015, p. 474). Unfortunately, the poverty-ridden custodians of agrobiodiversity are increasingly confronted with severe socio-economic constraints, which render maintenance of the socio-ecological services difficult (Swaminathan 2000, p. 117). It is also given that on-farm conservation offers a unique opportunity to link up conservation objectives with poverty. Farmers participate in conservation initiatives only if these activities support their livelihood strategies (Méndez, Giessman & Gilbert 2007, p. 148).

India is one of the most agrobiodiversity-rich countries of the world with over 160 crop species with hundreds of varieties, 325 crop wild relatives and around 1,500 wild edible plant species, as well as diverse domesticated animals, including birds (National Academy of Agricultural Sciences 1998). After CBD, necessary policies and measures came into force for conservation and sustainable use of India's agrobiodiversity (Nayar, Singh & Nair 2009; Ministry of Environment and Forests 2009). Two specific measures are national legislation, namely the Protection of Plant Varieties and Farmers' Rights Act of 2001 and the Biological Diversity Act of 2002. Though these efforts have proven that the strength and opportunities of India are heading in the right direction, the attempts however have not led to any large scale conservation or enhancement of agrobiodiversity on-farm in the country. On-farm management of agrobiodiversity, in production landscapes of the Western Ghats, a biodiversity

hotspot and a UN-accredited World Heritage Centre, has become difficult due to an array of reasons. Kerala, from where this case study is prepared, has very specific regulations to conserve production landscapes, the wetland paddy fields. The Kerala Conservation of Paddy Land and Wetland Act of 2008 does not allow the conversion of paddy land. Despite all the regulations provided under the act, paddy fields are being converted extensively for other purposes across the state. It is in this context that the interventions in community agrobiodiversity management of the M. S. Swaminathan Research Foundation (MSSRF) over nearly two decades need to be synthesised and analysed for replication and up-scaling. The 4C approach¹ adopted has been an effective tool for conservation through sustainable management of production landscapes. This approach pays concurrent attention to the Conservation, Cultivation, Consumption and Commerce components of agrobiodiversity. Out of the many credible programmes, four relevant cases from the Malabar region of the Western Ghats Mega Endemic Biodiversity Centre (Kerala) are synthesised here.

1.1. The centre of action - Wayanad District in Kerala

Wayanad is a hilly terrain in southern Western Ghats and lies at an average altitude of 750 metres above sea level (Figure 1). The district of 2,136 square kilometres is unique for its rich wealth of flora and fauna and for the diverse cultures that inhabit the land. Wayanad is a high range agro-ecological zone having moderately distributed monsoons (Kerala Agricultural University 2011). Narrow valleys surrounded by low range undulating hills and steep slopes characterise typical paddy fields in Wayanad (Figures

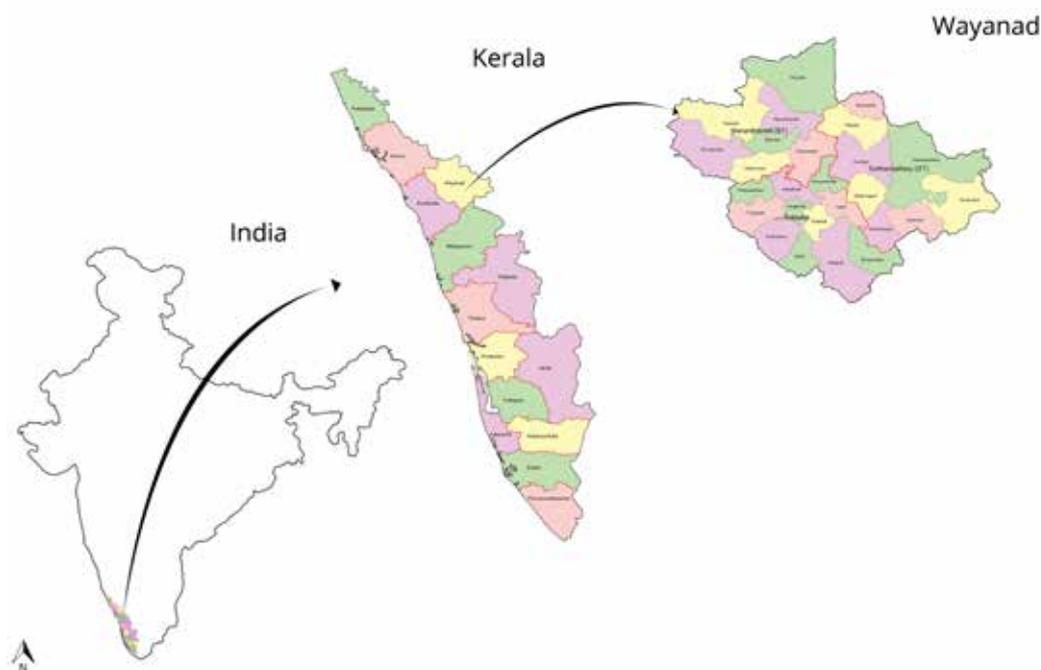


Figure 1. Location of Wayanad (Source : MSSRF archive)



Figure 2. Paddy and associated landscapes – a view from Wayanad (Photo from MSSRF archive)

2&3). The total geographic area is 212,966 hectares with a total cropped area of 174,190 hectares (Department of Economics and Statistics 2015). The contribution to the state’s foreign exchange earnings through cash crops (pepper, cardamom, coffee, tea, ginger, turmeric, rubber and areca nut) is significant (Kumar, Gopi & Parameswaran 2010, p. 141). The genetic diversity in paddies is also notable with over 20 landraces cultivated that have peculiarities in response to flood, drought, pests and diseases (MSSRF 2001; Parameswaran, Narayanan & Kumar 2014, p. 705). Floristic exploration of the district has recorded nearly 49% of the flora of the Kerala State and more than 10% of the flora of India. This study has reported a total of 596 endemic taxa in which 15 are exclusive to the district (Narayanan 2009). Nair (1911) explains that the name Wayanad is believed

to be derived from Wayanad meaning upper land or from Vayalnadu meaning land (nadu) of paddy fields (vayal) or from Vananadu meaning land of forests (Vanam). Wayanad is notable for its large Adivasi² population, which accounts for 18.53% and is the largest among the districts in the state (Office of the Registrar General and Census Commissioner 2011). They can be broadly classified into farming communities (Kurichya, Mullukuruma), agricultural labourers (Paniya, Adiya), artisan communities (Uralikuruma) and hunter-gatherer communities (Kattunaikka). Others are Thachanadan mooppan, Karimbalar, Pathiya and Wayanadan Kadar. Wayanad also has the largest settler population in Kerala (Nair 1911; Indian Institute of Management 2006).

2. Methodology, results and discussion for the four cases synthesised

2.1. Case 1: Seed Care Movement for saving the landraces and landscapes

The idea of Prof. M. S. Swaminathan to have a conservation continuum—on-farm to ex-situ—has resulted in the establishment of a number of national level gene banks in many countries and the Svalbard seed vault (Swaminathan 2009). However, current global trends in the conservation of plant genetic resources (PGRs) are to work directly with farmers rather than through gene banks, and hence in-situ on-farm conservation has become more important, while ex-situ collections are considered only to be back-ups for PGR management. MSSRF’s community agrobiodiversity programme over the years has made concentrated efforts to study, devise and implement agrobiodiversity management centred on rice paddies in Wayanad (Table 1). Its seed care movement has promoted conservation of seeds of indigenous

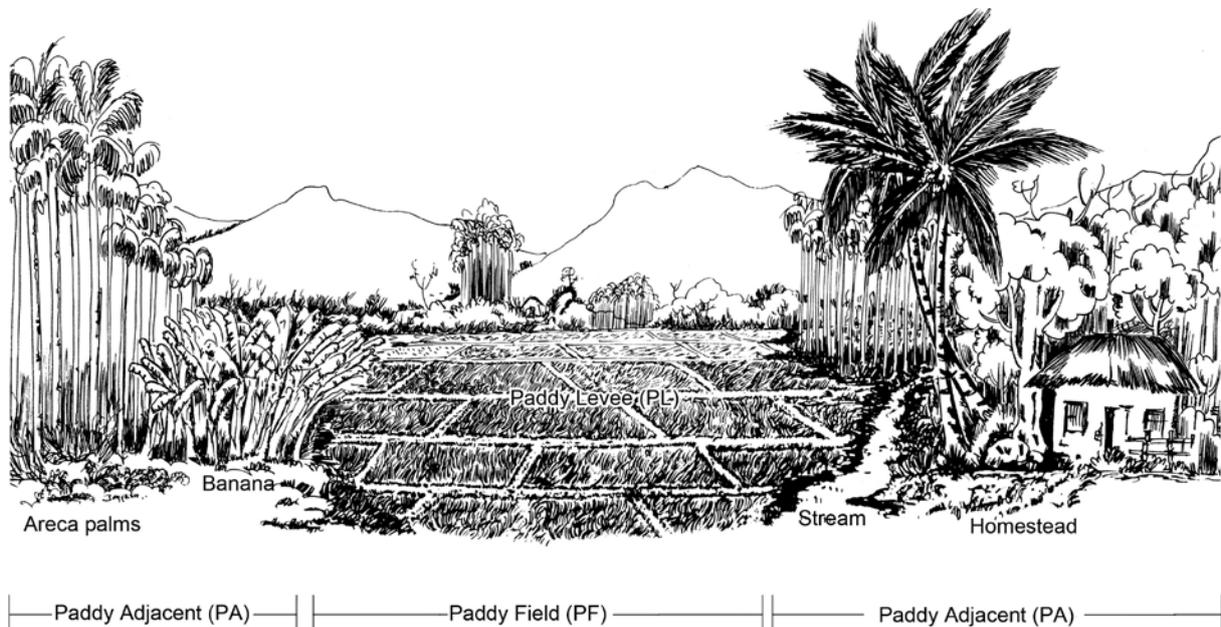


Figure 3. A model landscape (Source: Parameswaran, Narayanan & Kumar 2014, p. 711, sketch by Jayesh P. Joseph, MSSRF)

Table 1. Methodology chronicle - 4C Continuum in promoting the conservation and enhancement of agrobiodiversity and SEPLs of Wayanad (Source: Kumar, Parameswaran & Smitha, 2015)

Time line	Area of intervention - 4C Continuum	Methodology involved
1998 onwards	Conservation (on-farm)	Survey and documentation of PGRs (Fig. 4); awareness raising programmes; documentation of Farmers' Varieties, facilitation of Farmers' Rights & Recognitions (Fig. 5); promoting seed villages for the production of quality seeds.
2000 onwards	Consumption	Awareness generation on the nutritional/medicinal characteristics of the PGRs; Promotion of home nutrition gardens with nutritious yams, taros and leafy greens.
2000 onwards	Cultivation	Formation of farmer cluster groups; participatory genetic purification, production and distribution of quality seed for extending the area of cultivation; community gene and seed banks.
2005 onwards	Commercialisation	Market survey and study; exploring on-farm/off-farm enterprising opportunities and promoting value added products from PGRs and establishing market linkages; promoting farmer-owned marketing ventures.

varieties of small-holder family farms. This movement has been facilitated since 1998 by involving major farming communities, especially the Kurichya, Kuruma, Pathiya and Wayanadan Chetty to promote the conservation and sustainable use of indigenous crop varieties, and later was taken up by four grassroot institutions³ (Kumar, Parameswaran & Smitha 2015).

The Seed Care movement has mobilised primarily rice farmers who cultivate traditional varieties, and clustered them into seed villages, to serve as seed banks. SEEDCARE has been spearheading the processes of community mobilisation, awareness generation for PGR management, quality seed production and management of seed and gene banks of traditional crop varieties. Farmer-participatory purification (Arunachalam 2000, p. 3) was adopted for selection and purification of seeds sourcing the expertise of lead farmers. Trainings were also provided, such as those on purification techniques, seed and grain management and mechanisation, to help the community in their efforts to conserve speciality varieties (Smitha 2014; Kumar, Parameswaran & Smitha 2015).

Among other crops, yams and aroids used to serve as "life saving" crops during periods of seasonal and acute food scarcity. These are low water footprint and resilient crops that have the potential to help poor and marginal farmers adapt to the vulnerabilities of climate. MSSRF has recorded 30 to 40 cultivated varieties of them from Wayanad and adjoining regions (Varieties of *Dioscorea alata*, *D. bulbifera*, *D. esculenta*, *D. pentaphylla*, *D. hispida*, *D. hamiltonii*, *D. kalkapershadii*, *D. oppositifolia*, *D. pubera*, *D. bulbifera*, *D. tomentosa*, *Colocasia*

esculenta, *Alocasia macrorrhizos*, *Xanthosoma sagittifolium*, *Amorphophallus companulatus*, *Maranta arundinacea* and *Canna indica*). The intervention began with a participatory research study to access traditional knowledge on wild edible resources, the gender dimensions of its management and present livelihood options (Narayanan, Swapna & Kumar 2004), as well as individual research on the yam varieties of Wayanad (Balakrishnan 2009). The studies showed that many tribal and rural families continue to conserve a wide range of plants to meet their food needs. Women are more skilful in managing the surrounding landscape and are the chief knowledge-holders and conservationists. Following these studies, the experience in promoting sustainable utilisation of the indigenous and traditional agricultural seed wealth of the

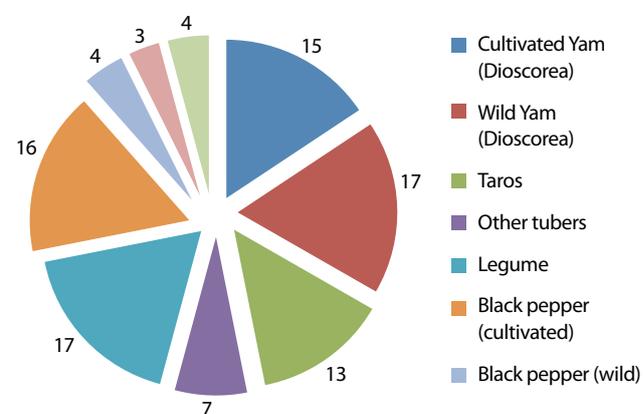


Figure 4. Number of crop varieties maintained in germplasm garden of MSSRF and conserved through the seed care movement, excluding paddy varieties (Source: Kumar, Parameswaran & Smitha 2015)

Wayanad district showed that improving the capacities of the small and marginal farmers would result in improved decision

making in land use and thereby improved agroecosystem governance (Table 2).

Table 2. Major outputs/outcomes of the seed care movement (Source: Kumar, Parameswaran & Smitha 2015)

Outputs	Outcomes
<ul style="list-style-type: none"> On-farm conservation of 25 indigenous varieties of rice and 15 varieties of yams and taros. Recognising the conservation efforts of rural and Adivasi communities (Parameswaran 2014, 2015b) ⁴ Legal recognition to 25 rice varieties as Farmers' Varieties⁵ by the Government of India (Parameswaran, 2015a) and their wider cultivation through 10 Seed Villages by involving 250 farm families. Education on the need for diverse consumption by reaching out to over 1, 00,000 families and establishment of 500 home nutrition gardens at rural and tribal households. 	<ul style="list-style-type: none"> Increased awareness on the value of heterogeneity and diversity in landscapes and landraces. Genetic erosion checked. Ensured conservation of the provisioning and regulating ecosystem services from SEPLS Increased awareness on the ecological, economic, cultural and spiritual dimensions of resource management. Local self-governments' lead role in annual Seed Fest & policy consultations.

2.2. Case 2: promoting cultivation of medicinal and aromatic varieties of rice

The rice conservation programme was launched in recognition of the importance of rice fields and landraces (Box 1) from the point of view of agrobiodiversity. The farmer participatory seed purification (Arunachalam 2000, p. 3) and multiplication programme has produced tonnes of quality seeds of these varieties. The System of Rice Intensification (SRI) method of cultivation was also introduced in the district. Later, in consultation with different stakeholders including farmers, local self-governments, agricultural departments, scientists and practitioners, policy documents were prepared on the possibility of promoting rice cultivation in the district. Adding efforts to the preliminary interventions, speciality rice varieties were selected for mass multiplication and market linkages were created for generating economic stake in conservation (eds. Nampoothiri et al. 2007).

2.2.1. Promoting wider cultivation of Navara: a '2500 year-old' medicinal rice

Among the rice varieties cultivated in Wayanad, the cultivar known by the names Navara or Njavara and Chennellu is considered a high-value medicinal rice. Documents show that it has been in cultivation in Kerala for about 2,500 years since the time of Susruta, the Indian pioneer in medicine and surgery. Navara is reported to have multiple uses and to be a very nutritious, balanced and safe food for people of all ages. Rice paste of this variety is recommended for external application to rejuvenate muscles and thus offers vitality. A detailed survey was undertaken for this variety and four distinct ecotypes within Navara were reported for

the first time. Then efforts turned to conservation of Navara in its full genetic variability on-farm and revival of rice paddies. The market linkages created for this speciality rice were welcomed and more farmers have started cultivating Navara (eds. Nampoothiri et al. 2007). Our successful pilot clinical study has also elucidated the effective use of the rice against neuro-muscular disorders (Guruprasad et al. 2014, p. 63).

Box 1. Some of the high-value farmers' rice varieties of Wayanad and adjoining regions (Source: Kumar, Gopi & Parameswaran, 2010, p. 144)

- Veliyan (MannuVeliyan): Drought and flood tolerant
- Chettuveliyan: Flood resistant
- Chennellu: Holy and medicinal rice
- Kaima, Gandhakasala, Jeerakasala: Scented rices
- Mullanpuncha: Drought resistant
- Thonnuran Thondi: Short duration famine crop
- Kalladiyaryan: Highly drought resistant
- Chenthadi: Flood tolerant variety

2.3. Case 3: a socio-ecological appraisal for devising a sustainable agrobiodiversity management plan

This transdisciplinary research taken up in 2010⁶ has had direct links to the policy decisions on conservation and sustainable utilisation of agrobiodiversity, looking into the causes and consequences of land use change in rice-based farming systems in Wayanad. Central to this framework was the integration of both academics' and practitioners' knowledge in order to find solutions to

Recognizing Farmers for their Efforts in the Conservation of Landscapes & Landraces – A case from The Western Ghats, India

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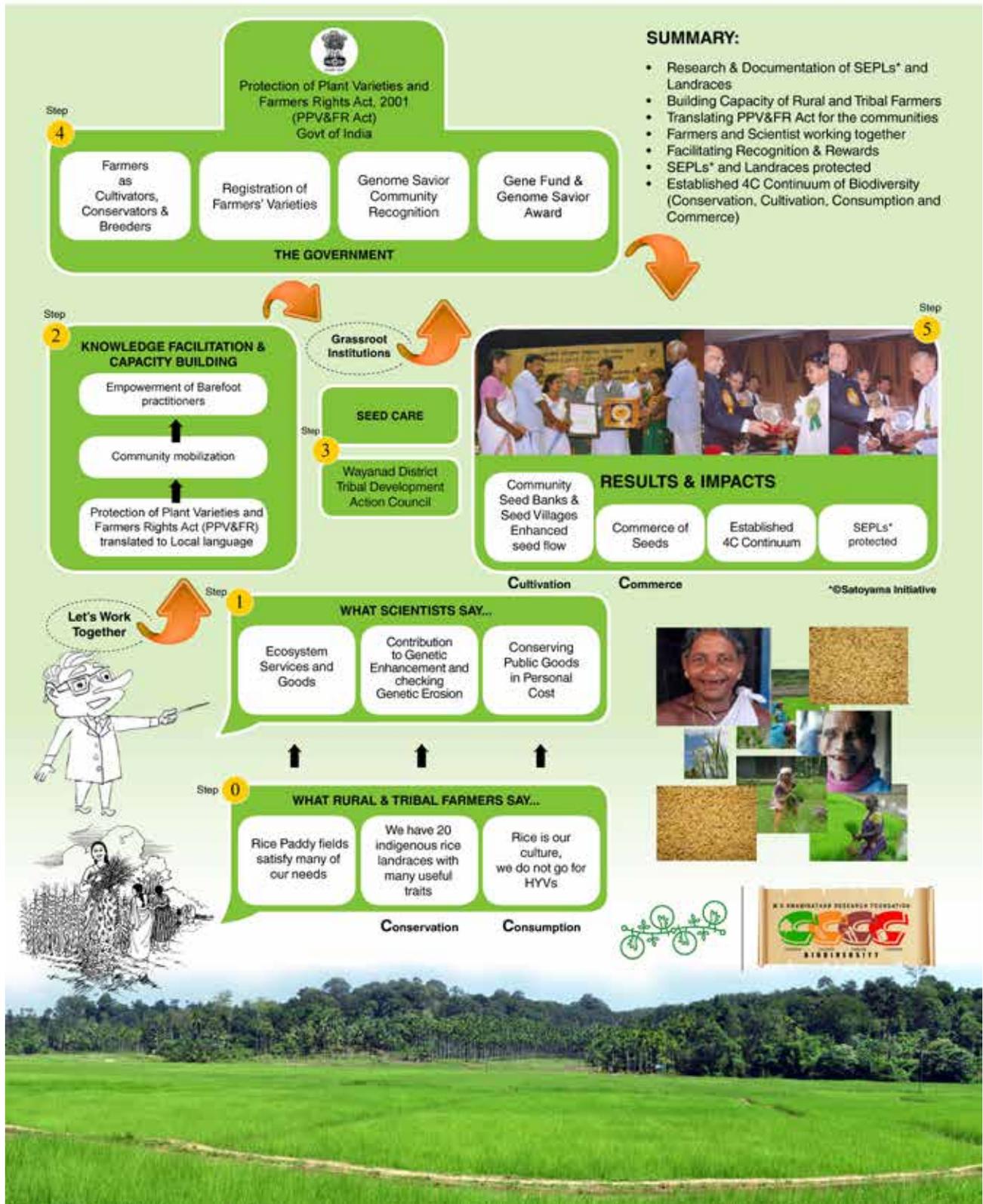


Figure 5. MSSRF's efforts in recognizing the farmers for their contribution in the conservation of Plant Genetic Resources (Source: Community Agrobiodiversity Centre 2013)



Figure 6. Conversion of paddy field for alternate crops (Photo by Prajeesh Parameswaran)

real-life problems. The erosion of rice agrobiodiversity in Wayanad was analysed from the disciplinary domains of ecology, economics, and social sciences. Conversion of rice fields to grow other crops or even for non-agricultural land use was assumed to be one of the major reasons for the erosion of agrobiodiversity in Wayanad (Figures 6 and 7). Studies have shown that factors such as cost of production, availability of agro-inputs and labour, family income, and marketing opportunities, all influence cropping decisions. Moreover, existing social structures, gender relations, family setups, culture, and education further interact with farmers' decision making processes. In this context, the project has explored the socio-ecological complexity of the rice farming system. Ecological research has improved understanding of farmers' ecological knowledge, their seed system and the plant diversity associated with rice ecosystems along a



Figure 7. Conversion of paddy field for housing purpose (Photo by Prajeesh Parameswaran)



Figure 8. Researcher interacting with farmer as part of the floral diversity study (Photo by M. K. Nandakumar, MSSRF)

gradient of agricultural intensification and land use change. The economic study has assessed the factors that influence farmers' decisions in regard to alternatives to rice-based farming systems. Furthermore, this included an evaluation of rice ecosystem services in comparison with alternative land uses. The social science component was aimed to analyse gendered knowledge, changes in power structures within families and the societal relations with nature concerning land use change (Chattopadhyaya et al. 2012; Arpke, Parameswaran & Werner 2013; Arpke et al. 2013).

An exploration under this programme, with the participation of stakeholders of paddy lands (with Prior Informed Consent, Parameswaran 2013; Figure 8 and 9), has studied the floral diversity associated with the paddy land (Parameswaran, Narayanan & Kumar 2014, p.707) and summarises that the flowering plant diversity of paddy associated landscape is rich and harbours 15% of the total angiosperm species reported in the District (Figure10). As an agroecosystem, the rice fields also provide a range of tangible and intangible services to the local community (Figure11). Quoting Department of Economics and Statistics (1983 and 2013), Parameswaran, Narayanan and Kumar (2014, p. 712) have suggested acting urgently in response to the drivers of land use change that happens in these parts. An assessment of the impacts of agricultural practices and land use change on communities of plants, spiders and leafhoppers of rice fields has suggested that cultivation practices and land use change should be considered in strategies for sustainable agriculture since they are interlinked (Betz, Parameswaran & Tschardtke 2013).



Figure 9. Farmer consultations (Photo by Prashob P. P., MSSRF)

An investigation among the Kuruma, Kurichya and Paniya tribal communities has showed that the socio-ecological system is highly modified. Deforestation is the major driver of environmental change, the loss of natural resources and consumption habits (Betz et al. 2014, p.578). The whole exercise aimed to generate transforming knowledge towards sustainable use of agrobiodiversity through a multi-lateral approach of action research and policy advocacy in a partnership mode. Regional and state level landuse visioning exercises, aimed to move away from problems toward a positive, pro-active, solution-oriented approach, were inspiring to the stakeholders including policy makers (Arpke, Parameswaran & Werner 2013). Accordingly, the local land users and decision makers were enabled to assess the current situation and devise strategies for future land resource use.

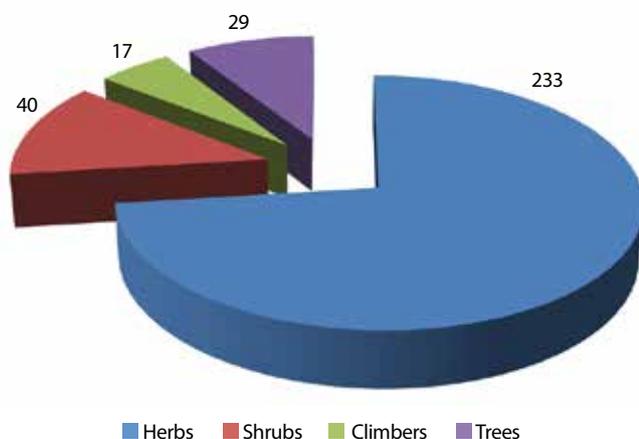


Figure 10. Number of species reported from paddy associated landscapes by habitat (Source: Parameswaran, Narayanan and Kumar 2014, p.712)

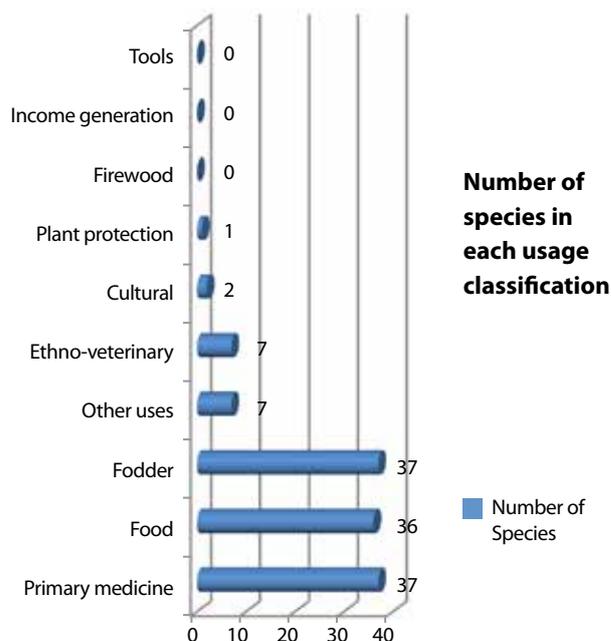


Figure 11. Number of species and their usage classification - from paddy fields and paddy levees (Source: Parameswaran & Kumar 2015)

2.4. Case 4: capacity enhancement programme for local self-governments in agrobiodiversity management

A prominent feature of the three key pieces of legislation that deal with sustainable management of India’s production landscapes namely, the Protection of Plant Varieties and Farmers’ Rights Act 2001 (PPV&FRA), the Biological Diversity Act 2002 (BDA), and the Scheduled Tribes and Other Traditional Forest Dwellers’ (Recognition of Forest Rights) Act 2006 (FRA), is the greater recognition of the rights of tribal and local communities which are critical to the conservation, sustainable use and active enhancement of biological diversity. The PPV&FRA has specific provisions that recognise farmers’ rights to save, use, sow, re-sow, exchange, share or sell their farm produce, including the seed of a protected variety. The BDA identifies the right of local communities to equitably share the benefits arising out of the use of biological resources. Likewise, the FRA grants the right to access biodiversity and community rights to intellectual property and traditional knowledge related to forest biodiversity and cultural diversity.

These acts place considerable power in the hands of local self-governments, the Panchayath Raj Institutions (PRIs) in helping the implementation of the provisions of “community rights” outlined in them. For instance, the Forest Rights Act demands the Grama Sabha to function for recognising forest rights and regulating access to forest resources. One of the envisaged utilisations of the Gene Fund provisions in the PPV&FRA is capacity building on ex-situ conservation at the local body level, particularly in regions identified as agrobiodiversity hot spots and for supporting in-situ



Figure 11. Release of PBR, Kottathara Grama Panchayat, Wayanad 2004 (Photo from MSSRF archive)

conservation. BDA also demands the implementation of provisions through PRIs. However, even in a progressive state like Kerala a large majority of the elected members and officials of PRIs are deprived of the critical knowledge that is needed for developing biodiversity integrated developmental plans. Hence, the challenge was to empower the functionaries of local bodies to enshrine these provisions and integrate them into local development plans.

MSSRF undertook a genetic and legal literacy campaign at the PRI level soon after the BDA and rules came into operation in the year in 2004 in three agrobiodiversity hotspots with a core objective of empowering the elected member of PRIs to make decisions on access to genetic resources, benefit sharing and seed management. Kerala was the first state to setup the



Figure 12. A policy consultation as part of the Wayanad Community Seed Fest 2015, participated in by farmers, scientists and policy makers (Photo from MSSRF archive)

State Biodiversity Board and pioneered the implementation of the BDA. Likewise, Wayanad was the first district in Kerala to constitute Biodiversity Management Committees (BMCs)⁸ and complete preparation of People’s Biodiversity Registers (PBR)⁹ in all Grama Panchayats. It was MSSRF’s effort that contributed to PBRs in four Grama Panchayats in Waynad, Kerala before the state government’s efforts (Figure 11). The PBR model was synthesised from different models that were then available (Gadgil 1996, 2000) and adapted to local situations. Later, the methodology and format developed and adopted by MSSRF was recommended by the National Biodiversity Authority. MSSRF had done the translation of the BDA to Malayalam, the regional language, and also made an illustrated user-friendly manual of the act (Kumar et al. 2010, p. 46; MSSRF 2005). The model was also consulted upon by the Kerala State Biodiversity Board while they developed the PBR format based on the guidelines issued by Government of India (National Biodiversity Authority 2013). Although the Wayanad district had formed BMCs in all the Grama Panchayats, the majority of BMC members were unaware of their roles, responsibilities and powers. Lessons learned from the rights awareness campaign and capacity building efforts emphasised the need for more grassroots level awareness and empowerment programmes for decentralised bodies to ensure effective implementation of legislation on agrobiodiversity and related community rights.

3. Conclusion

All of these cases in a bio-cultural heritage site like Wayanad intended to generate transforming knowledge towards sustainable use of agrobiodiversity and SEPLs through a multi-lateral approach of action research and policy advocacy in a partnership mode. The policy documents



Figure 13. State Minister for Agriculture visiting the agrobiodiversity exhibition of Wayanad Community Seed Fest, 2015 (Photo from MSSRF archive)

prepared out of these exercises have had a wide reach in regional, state, national and international consultations (MSSRF 2009, 2010; Werner & Nagbhatla 2013; Arpke, Parameswaran & Werner 2013; Arpke et al. 2013; Werner & Höing 2014). Even though the Governments of India and Kerala have enacted various acts and implemented various schemes for promoting agrobiodiversity conservation and the management of production landscapes, these measures could not gather the desired results. The relevance of these four cases is so important at this juncture, where the conversion of agricultural land and dwindling diversity in genetic resources have become the biggest challenges to agrobiodiversity conservation at the farm level. Also, the initiative is important in view of the likelihood of climate change impacts. Based on these pilot efforts, MSSRF along with its grassroots institutions has fuelled a number of programmes in the district envisioning the knowledge sharing and conservation of agrobiodiversity by ensuring its sustainable and equitable use. One such programme is the Community Seed Fest initiated in 2015, the primary aim of which is to create awareness among farmers and other local communities on farmers' and community rights related to biodiversity (Figures 12 & 13). From 2016 onwards, along with Kerala State Biodiversity Board, MSSRF has begun operating a five-year programme to strengthen five selected BMCs of the district and to help them in sustainable and equitable use of bio-resources. This programme is envisaged for the entire tenure of the newly constituted BMCs, the locally constituted environmental 'watchdogs' (Department of Environment and Climate Change 2013; Nandakumar 2013).

Our efforts suggest that different strategies are required for the on-farm management of agrobiodiversity and SEPLS

that go beyond a conservationist approach. Some of the actions (especially for capacity enhancement) required towards this are suggested in Table 3. Rather it is necessary to actively integrate agrobiodiversity into the overall issue of sustainable development, giving equal consideration to the three dimensions of it-economic, ecological and social sustainability. Conservation issues, cultivation knowledge, consumption awareness and commercial aspects all need to be integrated into one overarching policy strategy. Theoretically, this concept seems to be logical, but nevertheless, more examples of successful implementation on larger scales are needed.

Achieving sustainable benefits that contribute to food, nutrition and health, as well as income and livelihood security of the poor and vulnerable communities that are traditionally the managers of SEPLS is one of the major objectives of the International Partnership on Satoyama Initiative (IPSI). Historically, SEPLS management has contributed to improved resilience of production landscapes and seascapes and achieved three globally beneficial outcomes, such as (i) ecological intensification, (ii) maintenance of biodiversity and (iii) a culture of sustainable consumption and distribution. Nevertheless, these outcomes are almost absent in the present day food and agricultural production system. This issue can be addressed by urging for a landscape/seascape approach in land use planning and optimising the use and deployment of agricultural biodiversity in production systems, as well as synergising the activities of a large number of actors working for sustainable food and agriculture production. An empowered IPSI member organisation platform can effectively link the IPSI activities with relevant players for

Table 3. Capacity development actions required at the local level in SEPLS management (synthesised from the successful models mentioned in the cases from Wayanad and different stakeholder meetings)

Areas for capacity enhancement	Stakeholders
Science and technology for the better utilisation of biodiversity and ecosystem services of SEPLS	Local community members (the stewards of SEPLS)
Transdisciplinary approach in evidence building on status and services of SEPLS	Local community, SEPLS specialists including scientists and practitioners
Participatory approach in designing and delivering projects that address to climate vulnerabilities and food & nutrition	Local community, SEPLS experts, government servants (key officials concerned with land use, climate risk management and food production)
Relevance of SEPLS in sustainable production of food, nutrition and health	Local community and general public
Knowledge on mainstreaming SEPLS in National-provincial-local programmes	Policy makers

encouraging innovations and transferring science and technologies that help in sustainable management of genetic resources and habitats. Finally, to conclude, there is a need for hand-holding of local institutions like community agrobiodiversity centres with democratically elected and empowered local self-governments to integrate the notion of SEPLS in real-life and livelihood actions and to mainstream its concepts.

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- 1 The integration of the 4C dimensions of genetic resource management—conservation, cultivation, consumption and commerce. The 4C framework as visualised by Professor M. S. Swaminathan includes: (i) enhancement and sustainable use of biodiversity that comprises in situ, on-farm and ex-situ conservation involving seed bank and community gene banks of varieties; (ii) promotion of low external input sustainable agriculture; (iii) food security and nutrition through revitalisation of traditional food habits; and (iv) creating an economic stake in conservation for concurrently addressing the cause of conservation and livelihood security through value addition and marketing methods.
- 2 Adivasis is an umbrella term for indigenous or tribal population groups in India (Rath 2006).
- 3 Wayanad Agricultural and Rural Development Association (WARDA) is an umbrella organisation of farmers and development practitioners from the district; JEEVANI is a farmers' organisation for the conservation and cultivation of medicinal plant species; Wayanad District Tribal Development Action Council (WDTDAC) constituted by and for Adivasis has a motto to serve their sustainable development and SEED CARE, and is an association of traditional agricultural crop conservators.
- 4 Kurichya and Kuruma adivasi communities of Wayanad were recognised with the Second Plant Genome Savior Community Recognition in 2008 and award money in 2010-2011, under the provisions of the Protection of Plant Varieties and Farmer's Rights Act, 2001.
- 5 The provision of registration of farmers' varieties under the Protection of Plant Varieties and Farmer's Rights Act allows the farmers to register varieties which have been traditionally cultivated and evolved by the farmers.
- 6 Project BioDIVA (<http://www.uni-passau.de/en/biodiva/home/>), a collaborative research project of Leibniz University and University of Passau, Germany with M S Swaminathan Research Foundation.
- 7 The Kerala Panchayat Raj Act (1994) envisages a three-tier local self-governance system comprising a District Panchayat, Block Panchayat and Grama Panchayat (Village Panchayat). Under each Grama Panchayat, Grama Sabha is a body with all persons whose names are included in the electoral rolls relating to a village comprised within the area of a village panchayat and convened by the representative Panchayat member. It is a powerful and responsible grassroots body which helps and directs the three-tier system to work for people and development.
- 8 The BDA warrants every local body to constitute a Biodiversity Management Committee (BMC) within its area for the purpose of promoting conservation, sustainable use and documentation of biological diversity including preservation of habitats, conservation of farmers' varieties and breeds and chronicling of knowledge relating to biological diversity. BMC is a powerful body which decides on the sustainable utilisation of the bio-resources under its area and the equitable sharing of benefits arising out of the use of such resources. It can also act on local environmental issues including those related to land use.
- 9 As per the Biological Diversity Act (2002), PBR is to be mandatorily prepared and periodically updated by each local self-government documenting the biodiversity of their area and traditional knowledge associated with it, in a participatory mode. As a comprehensive database, PBR is envisaged as a powerful tool in the management and sustainable use of bio-resources.

Strengthening local capacity for conserving medicinal plants and improving livelihoods through domestication and integration of LBSAP in planning process

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Abstract

Strengthening local capacity in biodiversity conservation and livelihood improvement is considered to be one of the important outcomes of Local Biodiversity Strategy and Action Plan (LBSAP) preparation and implementation. This study is based on a project conducted by the Kathmandu Forestry College (KAFCOL), which engaged local communities in three ecological landscapes in preparing LBSAPs, based on the framework provisioned in the National Biodiversity Strategy and Action Plan (NBSAP) of Nepal. At least 2,300 households were supported to develop LBSAPs in three ecological landscapes. The objective of developing LBSAPs as a capacity development initiative was to translate the NBSAP's vision, principles, strategies and priority actions at the local level through a mixed methodological approach involving household surveys, key informant interviews, and focus group discussions for data collection. This study covers the LBSAP's four-fold objectives including full integration of biodiversity conservation into the institutional planning process; conservation and sustainable utilisation of local resources; community participation; and enhanced human wellbeing. The process involved four phases including stakeholder consultations and analysis, constituting of a local biodiversity committee, defining roles and responsibilities of SHs, priority identification and implementation and adaptation of LBSAPs. Of the three LBSAPs supported, the case of the high hills village, Syafru Village Development Committee (VDC), has already demonstrated the enhancement of livelihoods of poor communities, particularly through one of the LBSAP's activities (domestication of medicinal plants). This study focuses on the initial activities under the LBSAP conducted in Syafru VDC, which concentrated on the domestication of medicinal and aromatic plant (MAP) species to prevent their unsustainable use through illegal and excessive harvesting in the National Park area around the VDC. The study revealed that the total annual average income of the beneficiary increased from NPR 147,942 to NPR 170,566 (1 USD = 106 NPR) in two years (2014-2016). Overall, the beneficiaries' income has increased by 10 percent in the two-year period. Income from medicinal plants alone was from NPR 25,021 in 2014 to NPR 45,943 in 2016, which is 92% of the total change. The LBSAP contributed to build the capacity of local communities to reduce poverty from 44% to 29% in the study area.

Keywords: LBSAP; Biodiversity; Livelihoods; Medicinal plants; NBSAP-Nepal;

1. Introduction

The rural landscape that encompasses the agrarian economy, fragile ecology and complex and differentiated society is changing rapidly in Nepal, creating new opportunities (road link to China border) and competition among traders for extraction of medicinal plant resources. Despite this rapidly changing environment, the rural economy in Nepal is still based on subsistence agriculture. The preparation of Local Biodiversity Strategy and Action Plans (LBSAPs) has an important role to play in rural communities for conservation and livelihoods. This importance is due to the potential for medicinal plant resources to be conserved at the local level through effective implementation of LBSAPs that can contribute significantly to the country's national-level biodiversity conservation strategy and people's livelihoods (Pandit et al. 2009, Rasul et al. 2012). Prior to the development of LBSAPs, the government and other stakeholders recognised that the goal and objectives of the National Biodiversity Strategy and Action Plan (NBSAP) could not be fully achieved without effective management of biodiversity at the local level (Pisupati 2007). Preparation and implementation of the LBSAP is the first step towards initiating and systematising the efforts of local bodies, primarily the Village Development Committees (VDCs), which are the smallest local administrative units in Nepal, but also municipalities, towards meeting the requirements and goals of the NBSAP. The VDC is the local political body or administrative unit consisting of nine village wards. The

purpose of VDCs is to organise village people at the local level and to create partnerships between communities and the public sector. A VDC has the status of an autonomous institution and the authority to interact with the more centralised institutions of governance in Nepal. In order to promote local efforts in biodiversity conservation, there is a need for an institutional mechanism to engage VDC members in the developing and implementing of conservation strategies.

The National Biodiversity Strategy and Action Plan (NBSAP) was revised in 2014 through a consultative process of research, deliberation and documentation. To translate the NBSAP's commitments into local action, Nepal required such a mechanism that linked biodiversity conservation efforts at the VDC and municipality level as a pilot project. The government had foreseen that starting biodiversity conservation activities in all approximately 4,000 VDCs and increasing the number of municipalities of the whole country would be a great burden for Nepal or any country (GON/MOFSC 2014). Therefore, the government, in consultation with the pilot project implementer, the Kathmandu Forestry College (KAFCOL), decided that piloting LBSAPs in selected districts could reduce this national budget burden. During the course of the revision of the NBSAP, the study team of KAFCOL held several community meetings and discussions in 15 districts covering all three ecological and five development regions. This has already created some forms of awareness of the benefits of sustainable use of biodiversity

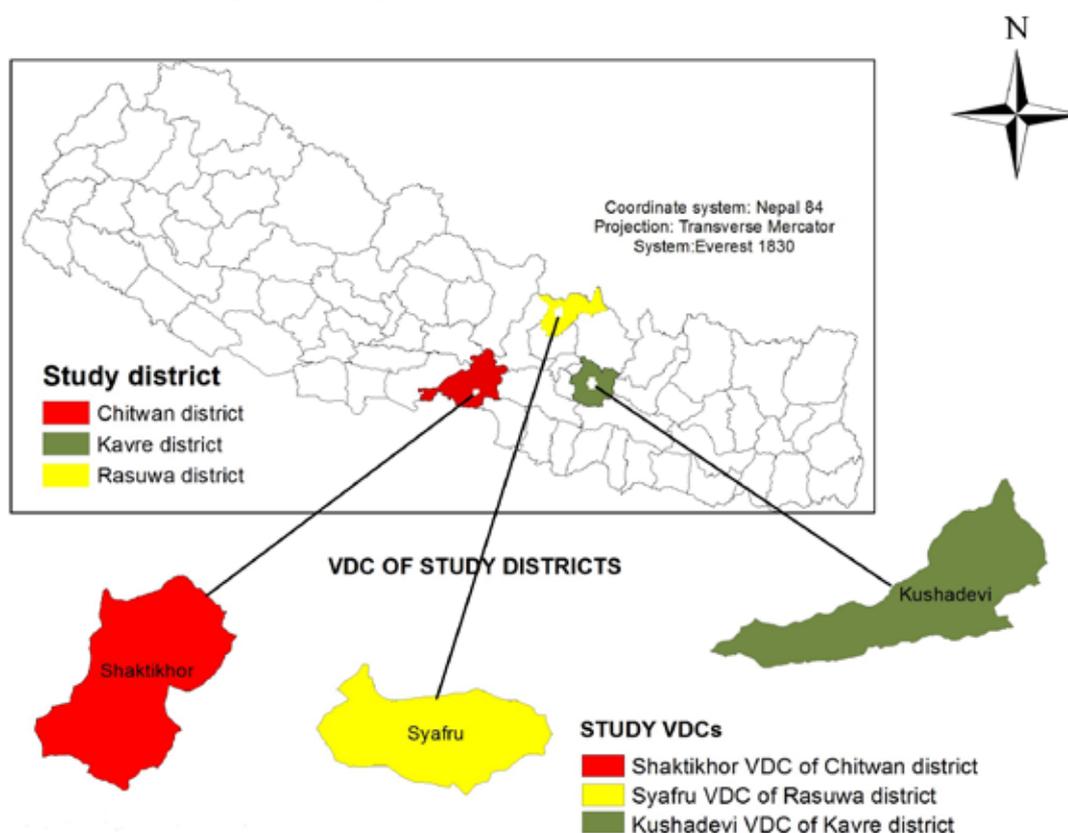


Figure 1. Location of three study Village Development Committees (VDCs) areas

at the local level. In order to maximise this initiative, piloting of the development and implementation of LBSAPs was provisioned for in 30 VDCs of 15 districts. Of these 30 VDCs, KAFCOL launched pilots in three VDCs (one for each ecological zone) with the support of Satoyama Development Mechanism funding, one of the IPSI collaborative activities (Figure 1). The main objectives of this assignment were to document the bio-resources, identify issues and threats to biodiversity, and prepare the local (VDC level) biodiversity strategy and action plan in three ecological landscapes of Nepal. These VDCs include Syafru VDC of Rasuwa District (High Hill, 1700 to 4300 m), Kushadevi of Kavre (Middle Hill, 1500 to 2500 m) and Shaktikhor VDC of Chitwan (Low Hill, 280 to 1359 m, also referred to as "Inner Terai"). The Kathmandu Forestry College took overall responsibility for project implementation. Syafru VDC has a total population of 3,272, and agricultural biodiversity comprises 114 species and forest-related biodiversity 210 species. Tourism is the main economic activity. Kushadevi VDC has a total population of 8,973 people with 211 agriculture-related species and 212 forest-related species. Agriculture is the main income source in Kushadevi VDC. In Shaktikhor VDC, there are a total of 9,498 inhabitants, and agriculture species are 150 and forest species are 286. This VDC lies in a tropical climatic zone. Similar to Kushadevi, farming is the main livelihood strategy in Shaktikhor.

The goal of this project was to support the local communities through their VDC to develop a sustainable plan through integration of effective administration, biodiversity conservation and maintenance of environmental goods and services, development planning and growth of the local economy. The main purpose of the project is to enhance the human, institutional and sustainable financial capacities for the implementation of the Satoyama Initiative. The project started with the main four objectives:

- To document the bio-resources of the three VDCs under study;
- To conduct a comprehensive biodiversity threat analysis in each VDC;
- To investigate priority biodiversity issues and threats for planning; and
- To develop a Local Biodiversity Strategy and Action Plan (LBSAP) for each VDC.

This paper aims to demonstrate how the LBSAP can be a useful instrument to consolidate specific activities for biodiversity conservation. It presents a case study of the development and implementation of the LBSAP in Syafru VDC, which included promoting the domestication of medicinal and aromatic plant (MAP) species to contribute both to the sustainable use of MAP and to the improvement of local livelihoods. MAP domestication and use has not only conserved local medicinal plant resources but has also been a means for strengthening local livelihoods (Arnold 1995, Pandit et al. 2009, Rasul, et al. 2012). This activity was conducted in Syafru VDC and neighbouring Ramche VDC and integrated in the Syafru VDC's LBSAP. The following section will first outline the activities and processes in the development and implementation of LBSAPs in all three pilot VDCs, before presenting the case study of Syafru VDC (including Ramche VDC).

2. Discussion of activities and processes

The project activities were implemented in five phases as depicted in Figure 2.

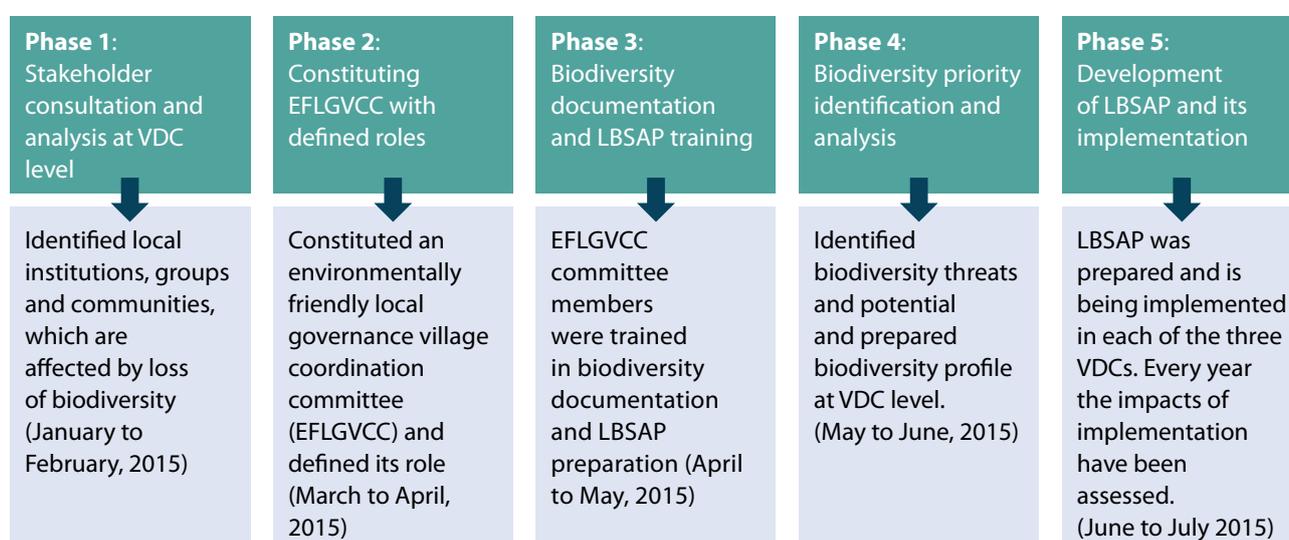


Figure 2. Activity implementation process (author's elaboration)

Phase 1: Stakeholder consultation and analysis

Under the project, the three VDCs were engaged in a consultation process to first identify the institutions, agencies, communities and groups of people that have been affected or are likely to be affected by loss of biodiversity. During the last two decades, there have not been any local level elections, and therefore the VDC Secretary is responsible for coordinating all activities in the VDC. The main stakeholders in the VDC include members from agriculture and forestry or protected area related institutions and user groups. Stakeholder consultations were conducted to:

- Identify priority issues;
- Clarify how core functions of various stakeholders impact biodiversity (positively and negatively);
- Identify the necessary interventions aimed at the direct and indirect conservation and promotion of biodiversity at the local level, which have the potential to complement the ongoing NBSAP process;
- Solicit inputs from stakeholders on initiatives they would like to see incorporated into the LBSAP; and
- Identify opportunities for collaboration that the VDC or municipality can make use of or promote (adopted from ICLEI, UNU-IAS and CBD Secretariat, 2011).

Table 1 shows a total of 101 participants in the stakeholder consultations. Female participation was higher in Kushadevi than in the other two VDCs. The high hills had the lowest numbers of participants due to remote settlements and lower education on biodiversity issues. Syafru VDC participants mainly represented *Tamang* and *Sherpa* communities that migrated from Tibet, and in the latter two VDCs participants included representatives from *Brahmin* and *Chhetri* ethnic groups. In addition, Shaktikhor VDC has a similarly high population of *Chepang* hill tribes, that were also represented. The female participation during implementation of the LBSAP increased substantially in all three VDCs to reach a female representation of about half of the total participants. The reason behind the lower participation of women in the beginning was simply due to a low level of understanding on biodiversity.

The team in consultation with local people identified the following general issues and threats:

1. Absence of an institutional mechanism for biodiversity conservation at the local level;
2. Weak institutional capacity to effectively manage biological resources and broader environmental issues;
3. Inadequate awareness and knowledge gaps in biodiversity conservation;
4. Over-harvesting and over-use of terrestrial biodiversity;
5. Appearance of alien and invasive species;
6. Excessive use of chemicals (pesticides, fertilisers) and fishing by poisoning and explosives;
7. Loss of fresh water ecosystem and wetland habitats; and
8. Lack of mainstreaming biodiversity in local economic development.

Phase 2: Constituting the biodiversity committee and defining roles

The visiting team (six forestry graduates and Team Leader) of KAFCOL, the project implementer, facilitated the formation of the biodiversity committee, known as an “Environmentally Friendly Local Governance Village Coordination Committee” (EFLGVCC), in each of the VDCs under the leadership of the VDC Secretary. Both in the high hills VDC (Syafru) and the middle hills VDC (Kushadevi) the EFLGVCC has seven committee members, and the Inner Terai (Shaktikhor) VDC has only four members (Table 2). The main role of the committee is to develop a biodiversity plan, implement it and to carry out observation and reporting to the VDC Secretary. Membership was defined based on local significance. For instance, buffer zone and national park staff were included in the committee of Syafru VDC, while the other two VDCs have members from the District Forest Office and Range Posts. In Kushadevi’s committee a local school teacher and a women’s group representative were included.

Table 1. Participants in stakeholder consultations (Source: Training and meeting records)

Meeting	Date	Number of participants	
		Male	Female
Middle hills, Kushadevi VDC	April 14, 2014	29	6
Inner Terai- Shaktikhor VDC	April 22, 2014	24	22
High hills, Syafru VDC	April 23, 2014	13	7
	Total	66	35

Table 2. VDC level biodiversity committee- the 'Environmentally Friendly Local Governance Village Coordination Committees' (EFLGVCC) (Source: Field survey, 2014)

Syafru VDC (High hills)	Kushadevi VDC (Middle hills)	Shaktikhor VDC (Inner Terai)
1. VDC Secretary- coordinator	1. VDC Secretary- coordinator	1. VDC Secretary- Coordinator
2. Buffer zone user group council representative	2. Ranger, Range Post Office representative	2. Ranger, Range Post Office representative
3. Langtang National Park representative	3. Agriculture Service Centre representative	3. Agriculture Service Centre representative
4. Agriculture Service Centre representative	4. Women's group representative	4. Local NGO representative
5. Buffer zone user group representative	5. Farmer group representative	
6. Local legal representative	6. Local school teacher representative	
7. Local faith healer (locally called Jhakri)	7. Local veterinary office representative	

Phase 3: Biodiversity documentation and training

The first training workshop was held at the Dhulikhel Height Resort on 13 April 2014. The biodiversity committees were trained on how to develop LBSAP during the documentation process. Two research assistants (B.Sc. Forestry graduates) per site were involved in the documentation of biodiversity resources including resources available in forest and agricultural lands, immediately after the first training. Biodiversity resources are those species that are available for the community for a wide range of uses, primarily for their livelihood, but also those not directly used but which have other values such as cultural or recreational values. Species have been broadly classified into categories like cereals, vegetables, fruits, cash crops, livestock and many others. Data revealed that the highest biodiversity was found in Shaktikhor followed by the Kushadevi and Syafru VDCs with 442, 414 and 324 species, respectively. Species richness varied with altitude, water availability, agriculture practices and forest abundance in general.

Phase 4: Biodiversity issues and prioritisation

As a result of stakeholder consultations, eight main biodiversity issues and threats were identified. Specific threats from high hills included stealing of non-timber forest products (NTFPs) and medicinal and aromatic plants (MAPs) from common pool resources, expansion of rural roads, damage to agro-biodiversity by wildlife, poisoning of wildlife and insect/pest infestation. In addition, medicinal plant species such as *Swertia chiraita*, *Valeriana jatamansi* and *Rheum australe* were almost at the verge of extinction locally. In the middle hills, threats included extinction of local species (red grain wheat, Judi rice and Bhaudaure maize varieties), hybridisation, infrastructure development and chemical fertiliser use. Similarly in the Inner Terai

(Shaktikhor), increased numbers of invasive species, loss of habitat, forest fires, use of hybrids and high use of chemical fertilisers were the high priority threats (SDM final report, 2014).

Phase 5: Development of LBSAPs and implementation

All three VDCs prepared their own LBSAPs based on the information prepared in the above four phases. As mentioned above, this report focuses on local capacity enhancement to improve biodiversity and livelihoods of Syafru VDC (high hills). We thus present the summary of the plan of this VDC only (Table 3). In the plan, six priority strategic issues have been identified (Table 3, column 1). Based on these issues, action points and funding sources have been indicated for each of the strategies. Of these six strategies, the following sections mainly focus on actions directly targeting medicinal plant conservation and livelihood improvement outcomes from the high hills area.

3. Methodology

To assess impacts related to biodiversity conservation and livelihood improvement outcomes of the LBSAP, we used a multi-pronged approach to collect relevant information. Both quantitative and qualitative information were collected in February 2014 and updated in February 2016 by KAFCOL, NAF and the IGES research team. This information was integrated and sequenced to enhance understanding of the impact situation of the project area at a two-year interval (i.e. 2014 and 2016). In 2014, a detailed household survey of 182 households was conducted including focus group discussions (FGDs) and key informant interview (KII) surveys. In 2016, only 37 selected households (Syafru: 21 and Ramche: 16 households) were interviewed and two

Table 3. LBSAP of Syafru VDC (Source: KAFCOL 2014)

Strategies	Actions	Funding source
1. Developing an effective biodiversity conservation mechanism and capacity of VDC and municipality to effectively manage biodiversity and broader environment	<ul style="list-style-type: none"> Constitute a EFLGVCC and network of local stakeholders to support biodiversity conservation activities in VDC Define role and responsibilities of stakeholders Assign biodiversity conservation work to one of the VDC members, who would be acting as a focal point at the VDC Integrate biodiversity considerations into VDC level plan 	<ul style="list-style-type: none"> VDC block grant Social mobilisation funds of District Development Committee (DDC) Langtang National Park (LNP) funds
2. Controlling illegal or overuse of biological resources	<ul style="list-style-type: none"> Domestication of locally threatened high value species Support to establish community gene bank and seed promotion programme Encourage planting of local species 	<ul style="list-style-type: none"> LNP funds District Agriculture Development Office programme funds District Forest Office programme funds
3. Construction of bio-engineering agri-roads	<ul style="list-style-type: none"> Awareness campaign regarding green roads (planting trees along gravel roads across agricultural lands) Promote local rules that inhibit or restrict use of bulldozers 	<ul style="list-style-type: none"> Access to constituent assembly member's fund (10 million NPR) VDC grant funds
4. Reducing excessive use of chemicals and ban on use of explosives and poisoning of fish	<ul style="list-style-type: none"> Promote organic pesticides Training on compost making Strict enforcement of laws against explosive use and poisoning 	<ul style="list-style-type: none"> District Agriculture Development Office programme funds DDC basket funds
5. Eradicating or controlling invasive alien species that negatively impact local biodiversity	<ul style="list-style-type: none"> Promote use of invasive plant species in making bio-briquette, where feasible Involve local people in eradicating or controlling invasive species Use invasive species such as <i>Eupatorium</i> as feedstock for livestock 	<ul style="list-style-type: none"> Subsidies from LNP Seek funding from conservation agencies
6. Link biodiversity conservation to job creation and entrepreneurship in MAP cultivation	<ul style="list-style-type: none"> Skill and entrepreneurship training Provide support to establish small-scale cottage industry Domestication of locally threatened high value plant species (NTFP/MAPs) 	<ul style="list-style-type: none"> DDC and VDC basket funds Access to LNP income (30-50%) NGO/project funds

FGDs and six KII surveys were conducted. KIIs were mainly with the staff of Langtang National Park, the District Forest Office and community leaders. Quantitative information was mainly collected from household surveys, and qualitative information was collected through FGDs and KII surveys. FGDs and KIIs mainly complemented the data collected from household surveys. Some of the questions included issues such as change in medicinal plant conservation and income, impacts on agriculture and forest resources, challenges faced, fear for the future concerning loss of biodiversity, and perceived benefits from domestication, as well as future plans of action.

4. Background on Syafru VDC

At an altitudinal range of 1700-4380 metres, Syafru VDC has a temperate climate in the upper hills and a subtropical to sub-temperate climate in the lower foot hills. A total of 621 households (HHs) reside here with the majority being *Tamang*, with some *Sherpa* and *Dalit* people. Men have a slightly higher population than women, 1,172 and 1,099 respectively. Major occupations are hotel business and agriculture. *Pine* and *Rhododendron* constitute the major forest types and agriculture is dominated by barley, millet, buckwheat, potato and maize. The cultivation of non-timber forest products (NTFP), especially *Swertia chirayita*, *Paris*

polyphylla and *Valeriana jatamansi*, began a decade ago. The domestication of medicinal and aromatic plant species, particularly *Swertia chirayita*, known locally as *Chiraito*, in Syafru and Ramche VDCs of the Rasuwa District, was promoted as part of a project led by the Nepal Agroforestry Foundation (NAF), which is associated with the Kathmandu Forestry College. The farmers and other VDC stakeholders decided to incorporate and upscale the domestication of medicinal and aromatic plants (MAPs) as part of the KAFCOL-led LBSAP project.

A large part of this VDC's area falls within the Langtang National Park and Buffer Zone. Syafru is one of the 18 VDCs of the Rasuwa district and lies in the central region of Nepal, which is also famous for Gosiankunda Lake that has both religious and environmental significance (Figure 1- Syafru VDC). Non-timber forest products (NTFP), including MAPs are at risk of theft from common lands, particularly the national park and community forest due to their high economic value. According to local traders, every year the complaints of theft have risen. Additionally, rampant collection and illegal trade of these MAPs/NTFPs have also increased the risk of extinction in the long run. Both the earlier NAF and the KAFCOL-led LBSAP projects have aimed at reducing the pressure on MAPs by supplying the market with plants that are cultivated on private farmland.

5. Project results and outcomes

5.1. Increased sufficiency and availability of MAP seeds and seedlings

Despite the initiation of domestication of MAPs over a period of five years (2004 to 2009), the MAP sub-sector supported only the self-reliance of local people. There was no marketing of MAPs. The seeds and seedlings were bought from outside. The area was fragile and degraded. The cultivation of cereal crops was almost impossible. Therefore, the LBSAP's priority was to increase self-sufficiency in seeds and seedlings of medicinal plants locally and to sell externally for household income. The project to develop and implement the LBSAP has made a significant contribution to the production and distribution of seeds and seedling of MAPs in the project area and has had a spillover effect beyond the project area. The number of home nurseries increased from 73 in 2014 to 122, almost double, in 2016 (Table 4). On average, these farm households produced 10,831 seedlings in 2014 and 19,831 seedlings per household in 2016 (Table 4), which is a significant contribution of the project in the promotion of medicinal plants on private lands.

Table 4. MAP seedling production by trained farmers in project VDCs in 2011 (Source: FGD and field survey, Feb 2014 and Feb 2016)

Village	Home nurseries		Seedling production per household	
	2014	2016	2014	2016
1. Syafru	43	84	14,342	26,460
2. Ramche	29	38	7,320	13,203
Total	73	122	10,831	19,831

Annually the project farmers produced 6.2 million seedlings in two VDCs. Additionally, the trained farmers and other individual farmers have also learned from the project and established home nurseries, which are believed to have increased conservation efforts by the farmers.

5.2. Local capacity enhanced in management of biodiversity resources

The project has made a significant contribution to enhancing the technical and managerial capacity of farmers in the management of community forest MAP resources and livelihood improvement. To encourage farmers towards the implementation of LBSAP and to enhance their skills and knowledge, the KAFCOL-led project held various training and consultation meetings as part of the LBSAP. This has enhanced the skills and knowledge of farmers. According to project staff and available reports during the final assessment, eight slots of MAP nursery management, cultivation and harvesting trainings were organised for about 100 famers from 2013 to 2014, and 393 farmers in 2015 and 2016.

Farmers' group formation and institutionalisation is one of the important activities of the LBSAP project. Altogether 14 farmer groups per site were formed during the entire project period. About half of the members in farmer groups were female. While women were initially more reluctant to participate in the consultations, they became equally involved in project implementation, particularly as a result of their engagement in the documentation of biodiversity resources. An authorised executive committee comprising seven to eleven members with a chairperson, secretary, treasurer and other members was formed in each group with active participation and consensus of all stakeholder farmers. Altogether, 293 households (>50%) were organised into 28 local groups for conservation and domestication of biodiversity resources. The majority of farmers organised into groups were from marginalised ethnic groups including *Tamang* and *Sherpa*. An average of 22 households were organised into each group with a good mix of male and female headed households. The group members were trained on group dynamics, group functioning, coordination

and domestication of MAP in their farmlands. These groups have formed a network of their own and are already registered into a cooperative per village. They are running saving credit programmes and marketing agricultural and forest products, particularly MAPs.

As a result of both the LBSAP development and implementation process and economic incentives from selling MAPs, a better sense of coordination and institutionalisation was observed among the users forming a good network in order to market the products and fetch more profit. The MAP federation has done risk and uncertainties analysis of their products and started addressing the risk. For instance, before the LBSAP was prepared, there were very few traders, and farmers had to depend on them to sell their products. Now they sell on their group's behalf keeping some margin in their federation. Previously these benefits were diverted to a middle man. Every group is functional based on the group's mandates and operational guidelines. Every decision is well recorded and endorsed in the presence of members and according to formal structures. All the farmers benefit equally because they have an equal share in the group.



Figure 3. Many medicinal plants are found in one terrace riser (Photo by Bishnu Hari Pandit)

5.3. Increased MAP diversity in forests and farms

FGD held in Syafru and Ramche VDCs revealed that the LBSAP implementation has significantly contributed to the increase of medicinal plant diversity in forests and farms, particularly on plant species (such as *Swertia chirayita* (Chiraito), *Valeriana jatamansi* (Sugandhawal) and *Rheum australe* (Padamchal), *Berginia ciliata* (Pasanved) and *Paris polyphylla* (Satuwa), as well as fodder and grasses (*Leucaena diversifolia*, *Flemingia congesta*, rai grass, cocks food), fruits, and other trees (e.g. walnut, ground and tree apples) (Figure

3). *Swertia chirayita* production is one of the main income generating activities (IGAs) of the farmers in the study area. Table 5 demonstrates that due to private land plantation, many species have been protected in community forests and national park areas.

Table 5. Species found in private, community and national park areas (Source: FGD, 2016)

Private farm lands	Community forests	National parks
Chraito, Sugandhwal, Satuwa	Chraito, Jatamansi, Nirmasi, pakhanbet, Sunpati, Dhupi, Yarsagumba, Panchaule, Bojho, Dalechu, Padamchal, Majheto, Sugandhwal, Satuwa	Chraito, Sugandhwal, Satuwa, Pakhanbet, Kutki, Padamchal, Thulo okhati, dhupi sallo

5.4. Change in land use patterns among the project beneficiaries

People have gradually become motivated to cultivate MAPs in their private farmlands as an integral part of the farming system. Small changes in land use patterns have been observed among the project beneficiaries. Average land holding size of the project beneficiaries, including all types of land, was 10.4 Ropani, of which almost two Ropani (1.9 in Syafru) increase of MAP cultivation is a great contribution to preserving forest resources (Figure 4). This is attributed to the fact that farmers introduced wild MAP species in their barren and marginal land for increased production of MAP.

Table 6. Change in land size (Source: NAF/MSFP 2015)

Village	Land cultivated with MAPs (Ropani*)		Change
	2014	2016	
Syaphru	1.0	2.90	1.9
Ramche	1.50	3.1	1.6
Total	1.25	3	1.75

* 20 Ropani = 1 ha

5.5. Change in livestock herd size among the project beneficiaries

Except for large animals (buffalo and cattle), there has been a decrease in other herd sizes in the last two-year period. It is interesting to note that the overall livestock number per household remained the same (Table 7). This indicates that local people's focus is now on MAP cultivation and whoever has increased his/her income from MAP sale, tends to



Figure 4. MAP nursery and cultivation area increased (Photo by Bishnu Hari Pandit)

increase the number of large animals as a matter of prestige. The herd size of buffalo has increased for milk production and sale along the Kathmandu-Dhunchu transportation route. As the overall livestock number has not changed, impacts on the vegetation and overall biodiversity of the farmland, buffer zone and national park area are limited.

Table 7. Change in livestock herd size before and after the project (Source: Household survey 2014 and 2016)

Type of livestock	2014	2016	Change (in no.)
1. Buffalo	1.20	1.24	0.04
2. Cow	4.08	4.51	0.43
3. Sheep/goat	4.00	3.67	-0.33
4. Pig and others	0.20	0.06	-0.14
Total number of animals	9.48	9.48	-2.5

5.6. Change in level of food sufficiency at household level

Food sufficiency is measured counting the support from one's own farm products and purchases with other cash income generated from sale of household level farm products. In 2014, ten percent of farm households could support food for only three months from their own products, a figure that declined to six percent in 2016 (Table 8).

Table 8: Change in food sufficiency level (Source: FGDs 2014 and 2016)

Food sufficiency level	Two time periods	
	2014 % HH	2016 % HH
1. Sufficient for three months	10	06
2. Sufficient for six months	65	61
3. Sufficient for 12 months and above	25	33

Similarly, 65 percent of farm households had food sufficiency for six months in 2014, while this share declined to 61 percent in 2016. More importantly, 25 percent of farm households in 2014 had food sufficiency for six months, a share which increased to 33 percent in 2016 (Table 8). Similarly, a significant change was observed in sources of income to complement the food deficit among the project beneficiaries; more than half of the farming households have changed their sources of income to reduce the food deficit (Table 9). Farmers reported that dependency on wage labour and working for tourists declined marginally, as household income was complemented by MAP and livestock income significantly. Farmers reported that the income from MAP and sale of livestock products has reduced the frequency of borrowing loans from relatives or neighbors and wage labour in 2016.

5.7. Change in household income among the project beneficiaries

The study revealed that average household income increased from NPR 147,843 in 2014 to 170,566 at current price (Table 9). An absolute increase of income by NPR 22,723 per household was mainly due to the sale of domesticated MAP. Other jobs, pensions, tourism, livestock and forest product income have also contributed to household economy. The mean income generated by households from NTFP/ MAPs was only NPR 25,021 in 2014, while it increased to NPR 45,943 in 2016, which is 92 percent of the total change. The first highest source of income change is from MAPs (27%) and second highest change in income is from remittance in 2016 (18%), followed by livestock (14%), jobs and pensions (10%) and tourism (8%). The increase in MAP income is attributed to the domestication of high value medicinal plants in private farmlands. This has reduced dependency on forests for collection of MAPs, which represents a mere one percent increase in 2016. The decrease in income from wage labour, food crops and remittance is an indication of the shift in the rural people's livelihoods towards growing MAPs in their farmlands.

Table 9. Change in mean household income (NPR) in two time periods (Source: Field survey in 2014 and in 2015 by NAF)

Income source	2014		2015		Change	Change %
	NPR	%	NPR	%		
1. Food crop	22,144	15	20,203	12	-1,941	-9
2. Livestock and livestock products	21,036	14	23,206	14	2,170	10
3. Cultivated MAPs/NTFPs	25,021	17	45,943	27	20,922	92
4. Wage labor	7,624	5	5,200	3	-2,424	-11
5. Tourism and hotel business	11,570	8	14,000	8	2,430	11
6. Job and pension	13,796	9	16,708	10	2,912	13
7. Forest products	10,000	7	13,306	8	3,306	15
8. Remittance	36,652	25	32,000	18	-4,652	-20
Total	147,843	100	170,566	100	22,723	100

6. Lessons learned and way forward

6.1. Lessons learned

It was observed that many rural households of the study area had migrated from their village due to fear of declining productivity two to three years ago. But now, they are slowly returning home due to the attraction that on-farm MAP production has developed. Therefore, policies should concentrate on optimising the environmental outcomes of the significant recent changes in household livelihood strategies. Integrated resource management plans that capitalise on the labour-migrant households' lower dependency on agriculture and natural resources (e.g. programmes encouraging the conversion of marginal or abandoned farmland to high value forests) can enhance both rural people's livelihoods and the sustainable use of existing resources. This is demonstrated by the fact that 120 farming households have their own home nurseries of medicinal plants.

The domestication of selected medicinal plants has significantly reduced the legal (i.e. authorised) and illegal collection of these and other MAPs in the protected areas and community forest. Locals are rarely involved in illegal extraction, but rather play an increasingly important role in reporting any cases of illegal collection by outsiders to the authorities. This is an indication of raised awareness among the local communities, and shows that the MAP domestication and its inclusion in the LBSAP has contributed to MAP conservation.

Despite an exciting improvement in food security over the years due to the integration of MAPs into the existing farming system, local communities are still suffering from shortages of food and periods of hunger. Therefore, there is still scope for increasing the medicinal plant cultivation areas to generate higher household income, which in turn decreases migration. However, it is important to take into

account the importance of traditional practices as well as the protection needs of agro-biodiversity.

Before the LBSAP was developed, NAF as the initial project implementer had been promoting MAP domestication in this area, but these activities were not institutionalised. Likewise, the marketing of MAP products was done at an individual level. But with the development of LBSAPs, various stakeholders from the district level to the local (VDC) level have concentrated their efforts on both biodiversity conservation and the livelihoods of local communities. This has resulted in the establishment of a MAP cooperative network at the VDC level. Therefore, stakeholders' commitment is very important for the success of the programme as it creates two main benefits: firstly, every stakeholder has a sense of ownership of the programme, and secondly, this commitment provides the institutional base to further promote the programme's activities.

6.2. Way forward

Required follow-up steps include:

- There is a need to regularly follow-up on implementation and monitoring of the LBSAP;
- Forest and farm land inventories are needed for monitoring changes in biodiversity;
- Local government capacity strengthening activities are still required;
- The main stake and responsibility should rest on local government to implement a full phase LBSAP.

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