



2012 Yangling International Agri-science Forum
**International Conference on
Traditional Forest-related Knowledge and Culture for Green Economy**
5-8 November 2012, Yangling, China

2012杨凌国际农业科技论坛
林业传统知识文化与绿色经济国际研讨会
2012年11月5-8日, 中国陕西杨凌

EXTENDED ABSTRACTS

Compiled and Edited

Sim Heok-Choh, Liu Jinlong, Yao Shunbo, Syuqiyah Abdul Hamid



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The International Conference on Traditional Forest-related Knowledge and Culture for Green Economy, 5-8 November 2012, in Yangling, China, was hosted jointly by the College of Economics and Management, Northwest Agriculture and Forestry University (NWA&FU); and the Centre for Forest, Environment and Resource Policy Study, Renmin University of China (RUC). The conference was funded by the State Administration of Foreign Academics and the Asia Pacific Association of Forestry Research Institutions (APAFRI) with financial contributions from the Korea Forest Research Institute (KFRI).

This is the fifth conference organized by the Asia Network on Traditional Forest Knowledge and Culture, and is an activity of the IUFRO Working Group on Traditional Forest-Related Knowledge on Tropical and Subtropical Region (09:03:05). This conference was organized as an event of the *Yangling International Agri-Science Forum* sponsored by various ministries and the Shanxi Provincial Government. Thanks go to the many organizations and individuals who had contributed to the success of this conference. In particular: Prof. Dr. Youn Yeochang from Seoul National University, and Dr. John Parrotta from the United State Department of Agriculture Forest Service for technical support. Dr. Luo Yaofeng, Ms. Dong Chunliu of NWA&FU, and Mr. He Zhipeng, Ms. Zhang Minghui and Ms. Lee Jeong Ja of RUC, had assisted in the organizing of this conference from the very beginning. Dr Luo has also assisted in organizing, and responsible for all the logistic arrangements for this conference.

Foreword

Traditional forest-related knowledge and culture is a hot topic in forestry research internationally, and it is also one of the major international forest issues that have been discussed intensively at many recent international forums. The role of traditional forest-related knowledge and culture, including forestry, biodiversity, property rights, and human development, has been steadily gaining recognition in resolving environment and development issues. Asia has a long history of civilization with great diversity of histories and cultures. The huge number of diversified ethnic groups and communities in the Asia region had accumulated a wealth of practical experiences in local forest resource management and utilization practices. These experiences have been guiding local communities in an efficient and orderly way of forestry resource utilization, which brings numerous benefits contributing to poverty alleviation and sustainable livelihoods for the communities. More importantly, for such a long history, relative to the modernization era, traditional knowledge demonstrated ability in sustaining the environments, livelihoods and the nature.

The human race is confronted by many challenges. Despite growing awareness, environmental degradation including climate change, loss of biodiversity, decertification, air pollution, continue to worsen. These situations had further been intensified by recent prolonged global energy, food and financial crises; and underscored by continued warnings from global scientists that the global society is in danger of transgressing a number of planetary boundaries or ecological limits. Green economy, a model based on sustainable development and intended to improve human wellbeing and social equity while significantly reduce environmental risks and ecological scarcities, may be the key to counter these challenges.

Traditional forest-related knowledge and culture could play a vital role in formulating green economy. Firstly, this knowledge has been generated through practical experiences and disseminated from one generation to the next through unwritten and oral communication over hundreds and thousands of years. Being the long-term descendants in the same habitats, local people and communities possess valuable traditional forest-related knowledge and culture through interacting with the proximate ecosystems. These are knowledge and culture about nature, about livelihood, about spirit, and about how to understand selves.

Secondly, one often mistakenly formulate discriminatory regulatory laws and policies for forest management and conservation while ignoring the local people's skills and traditional practices in the name of development or modernization of forestry. These skills and traditional practices had survived the test of time, and could undoubtedly enrich the laws and policies. In addition, incorporating these would give recognitions to the local communities, and ensure better adoption and implementation of these laws and policies.

Thirdly, both traditional knowledge and modern technology are equally important to achieve the Millennium Development Goals. The development of modern forestry must begin with a foundation built from a fuller understanding of local traditional forest-related knowledge, and supplementing and complementing by assimilating with modern scientific achievements. Facing with global climate change and globalization, it is crucial to fully harness the potential of traditional forest-related knowledge, and compounding with modern sciences in the process of environmental development, contributing to a harmonious, prosperous and friendly eco-civilized society.

This conference has the objective of stressing the importance of integrating the traditional knowledge with that of modern scientific processes in guiding sustainable development. The social scientists should work with natural scientists, policy makers and development practitioners to help evolve a holistic model for sustainable forest management.

The Asia Network on Traditional Forest Knowledge and Culture, as an unofficial network established in Kunming of China in 2007, had been organizing regional conferences on traditional forest knowledge and culture annually since then. These events had been hosted by China, Japan and Korea in rotation, and focused on various selected topics. This conference in Yangling is the fifth conference organized by the network, and focused on traditional knowledge and green economy. The conference was jointly hosted by the College of Economics and Management, Northwest Agriculture and Forestry University; and the Centre for Forest, Environment and Resources Policy Study, Renmin University of China; with financial support from Korean Forest Research Institute through the Asia Pacific Association of Forestry Research Institutions (APAFRI) and the Chinese Government.

Thirty-eight participants from China, India, Korea, Vietnam, Philippines, Malaysia, USA and Netherlands, participated in this conference. The conference was divided into five sessions, covering topics ranging from rural development, sustainability of social development, livelihoods to forest policy. The last session was specifically designated to the youths and provided a platform for the young researchers in the region to share their views. The conference has a total of 21 presentations; however, this volume only compiled those related to traditional forest-related knowledge.

Opening Speech – Developing Traditional Forest-Related Knowledge and Culture for Green Economy

Abd Latif Mohmod

Chairman, Asia Pacific Association of Forestry Research Institutions (APAFRI)
Director General, Forest Research Institute Malaysia

Good Morning, Ladies and Gentlemen!

First and foremost, I would like to congratulate the Northwest Agriculture and Forestry University and Renmin University of China for organizing this International Conference of Traditional Forest-Related Knowledge and Culture for Green Economy.

APAFRI is honoured to be given a chance to support this important international conference, with generous financial contributions from the Korea Forest Research Institute (KFRI).

Since 2007, the Korean Government, through KFRI, has allocated a portion of its contributions to IUFRO for activities to be carried out in the Asia Pacific for forestry practitioners of this region. APAFRI is honoured to be entrusted with the responsibilities of managing this portion of the fund. APAFRI has used the 2007 allocation for partially financed the International Conference on Traditional Forest-related Knowledge in Kunming China, the 2008 allocation for organizing an Asia Pacific Forest Health Workshop in Kuala Lumpur, the 2009 allocation for an Asia Pacific Forest Products Workshop in Sri Lanka, the 2010 allocation for the Asia and the Pacific Symposium on Vulnerability Assessment in Manila Philippines, and last year, 2011, APAFRI has organized an Asia and Pacific Workshop on Multinational and Transboundary Conservation of Valuable and Endangered Forest Tress Species in Guangzhou, China. Proceedings for these five events have already been published by IUFRO as IUFRO World Series Volumes 21, 24, 27, 29 and 30.

Ladies and Gentlemen,

The declining world forest area has threatened the survival and cultural diversity of the indigenous communities. This is especially critical for the Asia Pacific region, where 7 out of the world's 17 mega-diverse nations are located. The sustainable management of the rich biodiversity and complex ecosystems in this region has very far reaching consequences on the human wellbeing and national economies.

Is there any value in traditional forest-related knowledge? The answer is affirmative.

Traditional forest-related knowledge concerns the use of biological resources by the local and indigenous communities. It is well known that the rich biological resources in the Asia-Pacific region have been used by the aborigines, natives and other local communities for generations. The utilization and practice has enriched the knowledge and culture of the indigenous and local communities. But, the traditional forest-related knowledge needs a modern and scientific touch for a better understanding towards assimilating them into modern practices.

The theme of the conference which relates traditional forest-related knowledge and culture with the green economy is therefore most relevant at this juncture of human history development, especially in the Asia Pacific region where emerging economies have attracted global attention.

I am glad to note that countries in the Asia-Pacific regions are taking steps to protect not only forest resources but also in documenting traditional forest-related knowledge for long-term benefits of mankind.

We are also happy to note the recent establishment of the Asia Centre for Traditional Forest-related Knowledge hosted by KFRI. With this new development, we are looking forward to more active participation of Asians in the related fields of traditional forest-related knowledge.

Last but not least, I wish you all a very successful and fruitful conference.

Thank you.

Welcome Speech – International Conference on Traditional Forest-related Knowledge and Culture for Green Economy

Huo Xuexi

Dean and Professor, College of Economics and Management
Northwest Agriculture and Forestry University
Yangling, Shaanxi Province, China

Good Morning, Ladies and Gentlemen!

First and foremost, on behalf of the College of Economics and Management, Northwest Agriculture and Forestry University, I would like to welcome all the guests and participants of this conference.

Yangling, the unique state Agricultural Hi-tech Industries Demonstration Zone in China, is the birthplace of 5000 years of Chinese agriculture civilization. The annual Yangling International Agri-Science Forum has become one of the most popular platforms for agricultural scientists to exchange innovative results and achievements. We believe this International Forum will definitely produce far-reaching impacts throughout the country and the world as well.

Northwest Agriculture and Forestry University (NWA&FU) is one of the most prestigious universities in China. The university is co-administered by the Ministry of Education, Ministry of Agriculture, Ministry of Water Resources, State Forestry Administration, Chinese Academy of Sciences, and Shaanxi Province. The university is supported by the Ministry of Education's "Project 985", whose purpose is to build world-class universities in China. The university is also a member of the "Project 211", a new government endeavour aims at strengthening 100 institutions of higher education and key disciplinary areas as a national priority for the 21st century.

Northwest A&F University is actively striving to expand international cooperation and exchange in education, science and technology. The College of Economics and Management (CEM), is one of the biggest colleges in this university. Our college boasts of a long illustrious history started off as the Agricultural Economics and Management Unit in the Northwest National Agro-forestry Higher Specialized School (former name of NWA&FU) founded in 1934. It comprises five departments: Accounting, Finance, Economics, Business Administration, and Agro-forestry Economics and Public Management, offering 10 majors.

Ladies and Gentlemen,

Nowadays, traditional forest-related knowledge and culture is a hot topic in forestry research internationally, and ecological civilization development has

become one of the major issues critical to China. The theme of this conference: “International Conference on Traditional Forest-related Knowledge and Culture for Green Economy” is therefore timely and pertinent. We hope that scientists from the agricultural and forestry education and research institutions worldwide who have gathered here over the next few days would promote development through closer collaboration, innovative problem-solving approaches for mutual benefits. We will also like to take this opportunity to find out new access to the international cooperation and achieve more cooperative success in resources sharing, collaborative research, exchanges of technique services and professional training. Let us work hand-in-hand contributing to the future development of world agriculture and forestry.

With our joint efforts, we believe that this conference would become a high-level forum with profound influences domestically and internationally as well.

Thank you.

Opening Speech – Developing Traditional Forest-related Knowledge and Culture for Green Economy

Liu Jinlong

Director, Centre of Forest, Environment and Resource Policy Study
Renmin University of China
Coordinator, IUFRO 09.03.05

Good Morning, Ladies and Gentlemen!

On behalf of the Centre of Forest, Environment and Resource Policy Study and the Asia Network on Traditional Forest Knowledge and Network, I would like to welcome you to this International Conference on Traditional Forest-related Knowledge and Culture for Green Economy. This event will also be reported as an activity of the IUFRO Working Group on Traditional Forest Related Knowledge in Tropical and Subtropical Region

Ladies and Gentlemen,

The topics of this conference, Traditional Forest-related Knowledge and culture, and green economy, are closely intertwined. We are now at the crossroad of development, better livelihood or soaring living cost, reduce pollution to have clean water and air or continue polluting and cleaning air and water, equity or exclusiveness. Forests are the traditional homes of hundreds of millions of people in local and indigenous communities worldwide. These communities have managed their forests for generations, drawing on the knowledge and wisdom passed down from their ancestors, to meet their needs for wood and non-wood forest products, and for their cultural and spiritual development. This collective knowledge, with its strong link to the past, is critical to the survival and future well-being of local indigenous communities worldwide, particularly, to the sustainability of their distinctive cultural identities and livelihoods, and the integrity and health of the forest ecosystems on which they depend. Now is the time to focus our attention and appreciate this knowledge, in this contemporary world, facing with financial crisis, and economic slowdown. There is a clear need for decision-makers and forest managers to consider relevant knowledge about forest ecosystems and the impacts of forest management options in the development of forest policies and operational practices for the development of green economy.

Ladies and Gentlemen,

Centre for Forest, Environment and Resource Policy Study, Renmin University of China was established in 2010, with the following aims: 1) to develop multidisciplinary and holistic approaches towards sustainable management of forests, biodiversity, wetlands, pastures and land resources in the context of

globalization, commercialization, and rapid social changes; 2) to promote community-based resource management focusing on integration of issues of collective actions, tenure arrangements, benefit sharing, and community organizations; 3) to strengthen the role of traditional knowledge and culture towards sustainable development in the scope of human-nature integration; and 4) to facilitate regional and global learning network on sustainable forestry, environmental and nature resource management. At present, the centre has developed four themes as its research focus: traditional forest-related knowledge and culture, forest transition, climate change and people, and livelihood and governance. Related to traditional knowledge, the centre is involved in the following activities: 1) to document traditional ecological knowledge and culture of ethnic minorities such as Yi, Miao, Tibetan and Mongolian, and analyze its implications to policies and norms; 2) to support community-based biodiversity conservations, and resource management in China at the village level, for conducting multidisciplinary study on transformation with the paradigm of the process and interface of knowledge, power, agency of actors on the local production, livelihoods, culture and social context; and 3) to study integration of traditional knowledge and culture with modern technology, and its policy implication. We have committed ourselves to develop a platform and a centre for the scholars from China, and also the rest of the world to conduct academic research for better livelihood, better way for development, and better environment.

Ladies and Gentlemen,

This conference is the fifth conference organized by the Asia Network on Traditional Forest Knowledge and Culture, which has been the platform for Asian, in particular East Asian countries to gather annually to share our progresses and strengthen regional cooperation academically. The Korea Forest Research Institute has established an Asia Centre on Traditional Forest-related Knowledge, which will also host the secretariat of this network, facilitating regional research and other activities on traditional forest-related knowledge. I believe that traditional knowledge would be rapidly gaining recognition s in forest science research arena, for better forest management, poverty alleviation, towards a better world with harmonization of nature and development, and for green economy.

Best wishes to all in this conference and have a nice stay in China!

New Paradigm toward Asian Centre for Traditional Forest-related Knowledge

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Implications of forest-related knowledge at forest restoration and management in Korea

Korea is well known for its achievements in rapid and successful forest restoration. While the leadership of the government was important factors to this success, the support and duteness of peoples were the fundamental elements in the process of forest restoration. One of the factors of successful forest restoration can be traced to the support and independence spirit to the traditional wisdom embedded in the local people, like HYANGYAK. During the past 50 years, social- and ecological-resilience have been achieved against disturbances like the Korean wars and forest degradations. It is certain that local peoples and communities must have applied the traditional forest-related knowledge in the process of resilience and restoration.

Nowadays, many researchers and decision makers on forests have been emphasizing Sustainable Forest Management (SFM) and Ecosystem Management (EM) for sustainable use of forest resources. However, Asian countries do possess their own typical culture handed down from generation to generation. While exploring and applying these traditional knowledge and culture might require more time and budget, but the database on local bio-cultural diversity will be an investment for many future generations. Western science has contributed to disseminate terms like nature, biodiversity and sustainability, but these concepts are assumed to have risen commonly from traditional societies with many limitations. Limitation of resources can limit the ways of living now days. Therefore, to apply the traditional forest related knowledge (TFRK) into forest restoration and management, we should limit our physical and spiritual boundary of knowledge in resources management. According to the situation on the history and socio-economics of each nation, each country can designate the proper forest policy to restore and manage the forest resources. Indigenous peoples and local communities can assist in the recognition of complex social-ecological systems. Asian networks on TFRK can promote and advance the understanding of complex social-ecological systems and generate new platforms and insights to improve ecosystem management practices for long-term sustainability.

New paradigm toward Asian Centre for TFRK

Forest accounts for 64% of Korea's total land areas. Korea's forest used to be barren in the past, but it has been restored to green and thick forest providing home to various living creatures. Recently, however, biodiversity is on decline due to forest environmental changes such as climate change, and the habitats deteriorated.

In the coming years, there is a need to find a way to restore and manage forest with the emphasis on life and philosophy. Rather than considering forest as mere material resources to take advantage of, one should conserve and utilize forest resources with a new paradigm which focuses on life and relationships in the forest.

In this sense, one needs to shift from the western perspective of ontology to the eastern view of relationships when it comes to managing forest. Our ancestors conserved and utilized forests ecologically, environmentally and economically. Thus, it is necessary for us to reinvent and recreate forest traditional knowledge that our ancestors found and acquired in their lives using science and technologies of today, and apply to our life. At this juncture, it is integral for Asian countries to strengthen traditional forest-related knowledge.

KFRI has a new vision: "With the review of the past, solve the problems of the present and prepare for the future." It demonstrates KFRI's determination to lead a green future based on historical achievements. In order to realize vibrant and life-saving forest, we are committed to utilizing forest traditional knowledge as a tool. To this end, KFRI already established 'Asian Centre for Traditional Forest-related Knowledge' as a hub of oriental forest traditional knowledge. Your support and cooperation would be much appreciated. This conference is therefore very significant and timely since it is being held when forest cooperation among Asian countries are highly required. It is hoped that it will yield fruitful outcomes through your active participation.

Forestry and Forestry Research – Contributing to Greening the Asia Pacific

Abd Latif Mohmod

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The current world environmental crisis has been attributed to the adverse impacts of the declining natural resources, global warming and climate change. All inter-related, and have great impacts on human wellbeing, and national economies in many countries.

The world's total forest area is about 4 billion ha. Of this total, 36% is primary forest. Primary forests, especially tropical moist forests, are well-known for the rich biological resources and complex ecosystems.

However, as human population increases and more land converted to other uses, it is estimated that there is a 0.4% annual decrease of primary forest. There are many reasons contributing to this continuous decline. Converting to large scale agriculture is one of the main factors that continue to reduce forest covers, especially in developing countries. Rapid industrialization as experienced by many countries in this region during the past decades, has further depleting natural resources. The accelerated urbanization in many of these fast developing countries, has also contributed to unsustainable and unrecoverable land conversion with permanent loss of forest covers.

For many this may have been viewed as direct conflict with food security as well as poverty eradication; however biodiversity sustainability could contribute to climate change mitigation and adaptation and sustaining environmental services as a whole, with far more serious consequences beyond food security. While there is an increasing awareness of the critical functions of forests, and thus increasing efforts to sustainably manage forest resources, decline of forest covers, especially in the tropical developing countries, continues.

The declining world forest area has also threatened the survival and cultural diversity of the indigenous communities, estimated to comprise about 5% of the world population with between 250 and 300 million people. The world indigenous population manages 11% of the world's forest lands and customarily own, occupy or use 22% of the world's land surface, protect and manage 80% of the planet's biodiversity. They are located in or adjacent to 85% of the world's protected areas. About 60-70% of the world's total indigenous peoples resided in the Asia-Pacific region.

Of the total estimated 7,000 languages in the world, more than 4,000 are spoken by indigenous peoples. It was predicted that up to 90% of the world's languages

are likely to become extinct or threatened with extinction by the end of the century.

Out of the 17 mega-diverse nations in the world, 7 are located in the Asia-Pacific region: Australia, China, Indonesia, India, Malaysia, Papua New Guinea and Philippines. This means 41% of the 17 mega-diverse nations in the world are found in the Asia-Pacific region. It is well known that the rich biological resources in the Asia-Pacific region have been used by the aborigines, natives and other local communities for generations. The utilization and practice have enriched the knowledge and culture of the indigenous and local communities. In the past, global economic development has been largely focused on economic growth from the utilization of natural resources. This focus has brought along both positive and negative impacts to the indigenous and local communities living within or near to the natural resources. On the positive side, natural resource utilization brought about improvement in livelihood of local communities with the availability of basic infrastructure and facilities such as roads, schools, healthcare services, piped water and electricity, and accessibility to urban centres.

On the other hand, modernization and urbanization of the rural landscapes have brought about some negative impacts such as environmental degradation as well as the erosion and loss of traditional forest-related knowledge. This is to have far reaching impacts on the culture and long-term sustainability of the indigenous and local communities.

Besides environmental crisis, the international community is facing a global health crisis. With modernization, there is general quality improvement of health of the human population. In the meantime, more and more modern diseases have emerged while solutions have yet to be found for old diseases and illnesses. International and national communities realize that the answers and cures to various health problems might be found in the rich biological resources. In recent decades, companies have begun to comb the natural forests looking for the right and effective medicines.

An obvious erosion and loss of traditional knowledge is the lesser use of medicinal plants among the indigenous and local communities. With modernization, the younger generations prefer modern over traditional medication as modern medicine is now more accessible compared to the past. Under such circumstances, the passing of traditional knowledge from one generation to another is disrupted.

And, the people having such traditional knowledge are the indigenous and local communities who practice traditional medication in their culture. These communities were and are approached by scientists and visitors seeking these traditional cures.

It is within this context that there is a need to rediscover the traditional forest-related knowledge. The indigenous and local communities have such knowledge.

In the meantime, we need to protect the traditional forest-related knowledge so that the intellectual property rights do not fall into the hands of peoples and companies with vested interests.

The protection, conservation and sustainable utilization of forest genetic resources based on traditional forest-related knowledge are important to forest-dependent communities and development of value-added natural products that can create more employment and generate national income.

As an example, Malaysia, one of the 17 mega-diverse countries in the world, is well-known for its richness in biological resources. Malaysian forests are home to at least 15,000 species of flowering plants and trees. The rich plant genetic resources in particular has potential in developing various herbal, pharmaceutical, health care and bio-technological products for the benefits of society at large. This is closely related to the potential international trade of plant genetic products. In downstream processing activities, there is increasing awareness and realization that traditional forest-related knowledge on the forest genetic resources can be further developed for commercial application, particularly the development of bio-technology, herbal, pharmaceutical, nutraceutical and cosmeceutical industries. Such product development could lead to enhancement of international trade. The Forest Research Institute of Malaysia, of which I am the Director General since 2008, has embarked actively on various activities in research and development in the sustainable utilization of the rich natural resources in our tropical forests. As one of the premier research institutions on tropical forestry, FRIM has been active in many regional and international forums. Its many achievements in forestry research over the years had gained FRIM more than a dozen awards, nationally and internationally.

The Asia Pacific Association of Forestry Research Institutions (APAFRI) is an NGO with over 66 institution members from over 20 countries in the Asia Pacific region. APAFRI is a non-governmental organization currently hosted by the Forest Research Institute Malaysia. Its objective is to promote collaborative exchanges among institutions to enhance and increase the forestry research and conservation capacity in the Asia Pacific. Its other role is to act as a catalyst, facilitator, and to become an information hub for dissemination of results on research and other activities relevant to forestry within the Asia Pacific and to the world at large. It was officially launched in 1995, during a meeting of the *Heads of Forestry Research in the Asia Pacific* in Indonesia. Over the past nearly 20 years APAFRI has organized many events in the form of meetings, workshops, seminars, symposiums and conferences, within the region with the primary objective to enhance collaboration between the members and also for information exchange. These events cover a very wide scope, ranging from general forestry, poverty reduction, traditional knowledge, pest and diseases, conservation and sustainable utilization, to forestry for climate change mitigation and adaptation. The ultimate aim is to contribute to building up the critical mass necessary for the sustainable management of the precious forest resources in the region.

APAFRI is continuously exploring opportunities to work with the other regional and international organizations on activities and programmes which will, directly or indirectly, contributing to forestry research and development in greening the Asia Pacific region. The opportunity to participate in forums such as this one here this week would be invaluable for APAFRI, both to promote our efforts in raising the awareness of the vital contributions of forests to human wellbeing, and in the process to further enhance our linkages with other organizations with similar and related objectives.

Green Growth Strategy and Role of Forestry in South Korea

Youn Yeo-Chang

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Since Korea had been divided into two states, not only the socio-economic but also ecological systems, and had evolved in different paths. South Korean forestry has experienced a transition to sustainable one which provides a sound basis for green growth of national economy. The forest land has been rehabilitated with participation of people and backup of economic development during the 1970~80s. The economic development enabled the households, which used to rely on wood fuels for heating until 1960s, to substitute fuel wood with fossil fuels and atomic energy. The urbanization shifted population to urban centres away from forest lands and helped restoration of forest ecosystems once seriously damaged by overexploitation by people.

The Government adopted a new policy of economic development in 2008 when the President announced a new vision of low-carbon economy as the main strategy of national development. The policy is called "low carbon green growth strategy (LCGGS)". The Government proposed a bill for implementing the new economic strategy to the National Assembly which passed the Act of Low-Carbon Green Growth in 2009. The Act was followed by another Act on Trading of Carbon Emissions Credits. The spirit and principles of the law have been laid down by the international agreements for mitigating climate change by reducing greenhouse gases (GHGs), namely UNFCCC and Kyoto Protocol. The green growth strategy supported by the two Acts has been implemented by the Government and it is expected to continue in the coming years.

The LCGGS requires the forest sector to play an important role in sequestration of CO₂ and maintaining the carbon stock so that the national carbon emission level can be lowered substantially. The LCGGS also demands forest policy to actively provide ecosystem services to the people for their health and leisure. The Government enacted a law for promoting the forest function of absorbing and maintaining CO₂, and is preparing a national inventory system for forest carbon which can be used for accounting the reduction of greenhouse gases emissions by land use, land use change and forestry activities. It is expected to see forest owners to be compensated for improving the forest carbon stock by sustainable forest management with the legal and technological supports. If the forest service of regulating GHGs emissions is acknowledged and realized with payments either by means of subsidy or via emissions trading, this could improve the financial performance of forestry and foster forest investment in South Korea.

The LCGGS sheds a new light onto forestry in South Korea of which the main value is appreciated for ecosystem services rather than mere production of forest products. The forest policy should be coordinated with participation of multiple stakeholders for new forestry with forest services incorporated in the decision-making of forest management, especially by private forest owners which own two thirds of forest lands.

Application of TFRK in Forest Resource Management: A Case Study in Malaysia

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Since the Earth Summit in 1992, there is increasing concerns at international and national levels for preservation of biological diversity and sequestration of carbon in countering global warming and climate change. Forest management has taken an obvious change from providing “sustained timber yield” to multiple functions. However, such change to sustainable forest management does not necessarily include the concerns of local community (Trosper and Parrotta 2012). In the meantime, sustainable forest management could not afford to side-line the indigenous communities who have rich experience in managing the forests in their vicinity. The world indigenous population manages 11% of the world’s forest lands; customarily own, occupy or use, 22% of the world’s land surface; and protect and manage 80% of the planet’s biodiversity. They are located in or adjacent to 85% of the world’s protected areas. Of the world’s total indigenous peoples, about 60-70% is located in the Asia-Pacific region (Galloway-McLean 2010). Hesitance to engage the indigenous peoples in sustainable forest management is partly due to the doubt whether the indigenous peoples are able to manage a specific forest area. This case study in Malaysia shows that local indigenous communities could contribute to modern scientific forest management via eco-tourism activities.

Brief historical background of the *Semai* aborigines

The *Semai* aboriginal community, mainly forest dependent, is one of the 18 sub-ethnic groups of aborigines (known locally as *Orang Asli*) in Peninsular Malaysia (Lim 1997). The *Semai* people are mostly concentrated in central Peninsular Malaysia. Of the total 178,197 aborigines in Peninsular Malaysia in 2010 (JAKOA 2011), about 30% was *Semai* living within or at the forest fringes.

This case study focuses on the *Semai* aborigines in Ulu Geroh Village, an inland settlement located 12 km away from Gopeng town in the state of Perak, living in the forest area for many generations. Before the British colonization of Malaya (currently known as Peninsular Malaysia) in the last quarter of the 19th century, the forest resources practically met all the subsistence needs of the entire aboriginal community. Hill padi (paddy) cultivation was a common practice to provide rice for the households. Villagers obtained their vegetables and meat needs through harvesting of wild vegetables and hunting. The forest resources were building and handicraft making materials. Medicinal plants from the forests were the best form of medication. The *Semai* lived in small groups, normally of

15 to 35 households each. In the 1930s, the *Semai* began to cultivate rubber trees (a commercial crop introduced by the British) as they needed cash income to buy materials such as sugar, tea, coffee, salt and clothing.

In 1948, when the communists were active in the Gopeng area, the *Orang Asli* became the victims where they were forced to provide food, materials and information to these insurgents. An Emergency was declared by the British Administration in 1948. As a move to cut off the ties between the communists and the *Semai*, the British Administration shifted about 150 *Orang Asli* villagers in the area to Sungai Siput (Selatan), also in the state of Perak. By 1960, after the Emergency was officially declared ended, about 200 *Orang Asli* were allowed to shift back to their homes in Ulu Geroh while some of the villagers chose to remain in Sungai Siput (Selatan).

In the late 1960s, with increased population, part of the former hill padi area and forest land was opened for rubber cultivation. In the 1980s, when the rubber price declined, the *Semai* in Ulu Geroh also followed the general trend switching from rubber to oil palm cultivation. Economic is the main pusher for this gradual change in land use. Unlike rubber which takes seven years to mature before harvesting, the oil palm yields fruits after just three years.

By 2012, all 242 ha (686 acres) of rubber land cultivated by the *Semai* in Ulu Geroh were converted to oil palm. Over the years, the *Semai* in Ulu Geroh has developed into four smaller settlements (between 70-140 people each) with a total population of about 415 villagers. These villagers are animists, Christians and Muslims. Wooden or brick houses were built by the Department of Orang Asli Development (JAKOA). All four villages are located within the Bukit Kinta Forest Reserve while their cultivated areas fall within and outside this forest reserve. The villagers now practice both traditional and modern economic activities. Some households continue to cultivate hill padi while many have chosen to purchase rice from the modern market. As sweeten farmers, a minority of *Semai* practice slash and burn agriculture. Villagers in general carry out hunting, gathering of forest produces and trading in durian (*Durio zibethinus*), petai (*Parkia speciosa*), rattan, bamboo, honey, resins, insects and Rafflesia buds for cash. The oil palm yield now provides a more regular source of income. By the 1990s, the *Orang Asli* in Ulu Geroh found a new source of income from the development of eco-tourism. As the village is relatively easy to be accessed by laterite road from Gopeng town, some local and foreign visitors began to visit the village to see the famous Rafflesia flowers and buying butterflies harvested by the villagers.

Application of TFRK in forest management

The *Semai* aborigines are knowledgeable about the flora and fauna in their vicinity. In particular, Ulu Geroh area which is known to be the home of the famed rare flower Rafflesia (*Rafflesia cantleyi*), the world's largest flower and can only be found in the tropical rainforests of Southeast Asian countries such

as Malaysia, Thailand, Indonesia and the Philippines (Siti-Munirah 2012). Ulu Geroh is also a site rich in another rare species of butterfly, Rajah Brooke Birdwing butterfly (*Trogonoptera brookiana*). The Rafflesia is listed by Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as an endangered plant, facing high risk of extinction; while the Rajah Brooke butterfly is listed as threatened. Ulu Geroh is the famous Rafflesia sanctuary where there are eight small populations of this species (Wong and Gan 2008). In total, over 60 species of butterflies have also been identified in Ulu Geroh of which 53 are common, 6 uncommon and 3 are rare (Foong 2004). The Rajah Brooke Birdwing butterfly is a protected insect under Malaysia's Protection of Wild Life Act 1972. Due to its beauty, the Rajah Brooke Birdwing butterfly is highly sought after by collectors.

Since 1990s, the existence of the Rafflesia flower and butterflies has been threatened by the rampant collection by the aborigines for sale. The Rajah Brooke Birdwing butterfly and other butterflies were sold to local traders at a low price of RM0.10 (US\$0.03) each. It meant villagers had to collect many butterflies to earn a reasonable amount of cash income to sustain livelihood. Each butterfly was mounted by the middlemen and sold to local and foreign tourists for RM15 (US\$5) each. The *Orang Asli* in Ulu Geroh also guide visitors to see the Rafflesia flowers (Randhawa 2004). In 1998, Malaysian Nature Society (MNS) members visiting the areas found the declining flower population due to over harvesting by the *Semai* people. In 2000, with the assistance of aborigines at Ulu Geroh, MNS carried out a six-month study on the Rafflesia flower, a project sponsored by International Union for Conservation of Nature (IUCN). The study found that there were healthy colonies of the Rafflesia in several compartments within the Ulu Kinta Forest Reserve easily accessible and thus justifiable to conserve the area.

In 2002, with the assistance of MNS, a small grant was obtained from the United Nations Development Programme (UNDP) Small Grants Programme to start a conservation and training programme at Ulu Geroh which was completed in 2004. The project focuses on community development and capacity building in eco-tourism and conservation to prepare the *Semai* for their role as stewards and a local support group while simultaneously helping to support the local community. The project trained the aboriginal villagers to appreciate the natural resources and to act as nature guides with the ultimate aim of becoming the stewards of the nearby forests. The project was supported by the Department of Orang Asli Development and Perak Forestry Department. MNS taught the locals to mount the butterflies themselves. Consequently, they earned more income from fewer butterflies thus uplifting their economic wellbeing and conserving the butterflies (Randhawa 2004).

Application of TFRK in forest management took a further step when in 2004, a group of 20 *Semai Orang Asli* later organized themselves with a collective name of *Sahabat Eko-Pelancongan dan Memulihara* (SEMAI) or Friends of Eco-tourism and Nature Conservation (Anon 2004) under the MNS Rafflesia Conservation project. This conservation project is a working partnership with the

Perak Forestry Department, Perak Orang Asli Development Department and MNS. Under this project, MNS aims to develop a site for conservation of the Rafflesia and Raja Brooke Birdwing. Later, local guides were given a two-week nature guide course in Kuala Gula, Perak, organized by the National parks and Wildlife Department (Perhilitan), Tourism Ministry, Danish International Development Agencies (Danida) and Wetlands International. The *Orang Asli* guides bring tourists to see the Rafflesia flower, Raja Brooke butterflies and a scenic waterfall in the jungle. Visitors pay a fee of between US\$7-18 per person to visit these selected sites.

Results and discussion

Application of TFRK in forest management is now bearing fruits. In 2012, there were 16 *Orang Asli* guides leading several tour groups. This enhances their confidence besides gaining more experience in guiding the tourists. The process of empowerment has also helped to inspire new ideas to further develop eco-tourism using TFRK.

This case shows that the local villagers have learnt to apply their traditional knowledge in managing forest area and developing eco-tourism project with the assistance of government agencies and NGOs. The forest conservation project has turned the aboriginal *Semai* into stewards for the rare and endangered Rafflesia, and protected Rajah Brooke Birdwing butterfly, besides generating supplementary income from eco-tourism. It is evident that to achieve long term forest sustainability, new approaches involving empowerment of local communities to manage natural forests, and selective combinations of traditional and modern scientific management practices may prove to be a way forward.

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Critical Issues Related to Traditional Forest-related Knowledge and Culture

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As China is one of the ancient civilizations, traditional forest-related knowledge (TFRK) in China have evolved over centuries, and are very rich, diverse and complex due to the country's great ecological, geographical, social, economical and cultural diversity. Within this rich diversity, TFRK has been developed by farmers throughout the whole China, accumulated through people's livelihood, culture, beliefs and religions. This document aims to provide an overview of TFRK, develop a normative framework to describe TFRK and its implications to on-going policy debates on forest management in China.

China has been enjoying rapid social and economic progress under the dominant discourses of "open" and "reform" policy. These dominant discourses to some extent were translated into different concepts and given names such as *modern scientific and technological improvement*, *globalization*, and *standardization*. During the past 30 years, these discourses had triumphed over those so called backward ideas and beliefs such as traditional knowledge. More and more academicians have woken up to realize the importance of TFRK in sustainable development (Liu 2006, Pei 2007).

Glimpses of TFRK in China

Fengshui forests and holy trees

Fengshui, which started as early as the Qin Dynasty (Zhong 2007), has been popular and important in rural people's daily life. The *Fengshui* of a site is now routinely examined when a new house or grave is constructed. *Fengshui* forests can be strictly protected man-made or natural forests which have consequences to people's life with the mystical insight of *Fengshui*, and people grant to *Fengshui* in regard to wishes of safety, longevity, family prospect, prosperity, and career (Guan 2002a).

Fengshui theory considers good *Fengshui* shall include good land contour, lots of water, abundant forest and bushes. Abundant forest is a symbol for good *Fengshui*. No cutting promotes good luck, and deliberate damage will bring bad fortune. Good *Fengshui*, abundant forest and good fortune are always strongly linked (Guan 2002b). A number of academicians believe that *Fengshui* forests developed out of spiritual purpose seeking for harmony between people and nature (Yang 1999).

Fengshui forests are very common in Daoism areas in China. They are usually established at the village entrance, graveyards, hill at the back of the village, a backyard, and/or a temple (Yang 1999). *Fengshui* forests are categorized into three types according to location: village *Fengshui* forests, graveyard *Fengshui* forests, and temple *Fengshui* forests (Guan 2002c). Guan (2002b) reported approximately 133 ha of forests were defined as village *Fengshui* forests by an ancestor of the Huang family who had emigrated to the Letu Village in Fujian Province, southwest China about 300 years ago. Now this virgin forest is very unique within the region. It is officially protected through its status as a National Nature Reserve.

“Kong forest” is the grave for Kongzi (Confucius) and his family. According to legend, Kongzi’s followers brought the tree species from their hometown and planted them around the grave of Kongzi. This grave forest now covers 2 million m² and has been maintained for 2400 years. The trees are now huge and there are more than 100 000 ancient matured trees.

It was not until 1990 that many Chinese scholars realized the value of *Fengshui* forests to modern forest management (He and He 2000). However, as *Fengshui* is still considered as a kind of feudal superstitions, *Fengshui* forests cannot be officially recognized by the Chinese forestry authority. As such, China’s contemporary forestry legislative framework do not support or reflect any of these traditional forest management practices, including *Fengshui* forests (Liu 2006).

From the research on *Fengshui* forests of the *Buyi* Minority in Guizhou Province, Yuan and Liu (2009) reported that *Fengshui* forests and associated collective knowledge is an integral component of the rural life. These were based on their long historical experiences and their religions or beliefs in the dynamic interrelation between people and nature, and passed through generations by legends, folklores, and festivals. *Fengshui* forests and the magic meanings attached to them, could be considered as one of the facets to maintain distinguished cultural identities of *Buyi* community, which provide an empirical approach to interpret their life, fortunes and mishaps, as a collective (village as a whole) and as individuals, contributing to maintaining the harmony between people and nature, as well as between households. *Fengshui* forests in a village has a symbolic meaning for a collective to be a community, a group of people living together sharing the same fortunes, akin to a unified group.

Knowledge and perspectives of *Fengshui* forests can be very inclusive or merged with other religions and/or modern western systematic knowledge as well to manage forests for diversified products and environmental services. It has been integrated into the Chinese culture and as part of local culture. It can be predicted that *Fengshui* forests will be an important component for China’s mountainous rural communities. A critical question is when and how the government authorities will reflect this fact in its legislative framework and forestry development policy?

Some traditions of natural forest management

Greenbelt boundaries

Long (1995) described that within the *Jinuo* Minority permanent greenbelts have been used as clear boundary markers between villages. These greenbelts also serve as a seed reservoir which facilitates the regeneration of fallow field.

Water source forests

These are quite common in the minority regions of southwest China. Each ethnic village possesses an area of *water source* forest. Usually the *water source* forest is located in a valley near the village. Sometimes it covers a little watershed. Most of the water for human and livestock consumption is from the *water source* forest.

Fire protection forests

In a remote minority region where shifting cultivation is still practised, fire protection strip which is a continuous greenbelt is usually established between two forest areas. The width varied from a few meters to more than 10 m. The grass, shrubs and ground litter in this fire protection forest would be cleared. In many regions where shifting cultivation no longer been practised, the fire protection forests still exist, which could preserve biodiversity as well.

Fuelwood forest

In Liuyang County of Hunan Province, there are forests traditionally managed for fuelwood collection by one or a few villages. These forests were managed by associations of elected villagers. There are about 14 000–20 000 ha of forests with this type of management, about 10% of total forests in this county. In central Southern China, this practice is not rare, but has been ignored by the local forest officers. Forestry governmental agency believes these forests are under collective management with poor economic returns, thus they should be allocated to individual households for private management.

Some traditions in plantation

Chinese fir plantation

In western Hunan Province and southeastern Guizhou Province, Chinese fir plantation has a history of about 400 years. A local custom, known as the “*Eighteen-Year Chinese fir plantation*”, requires a couple to plant hundreds of Chinese fir trees when a girl is born. When she grows up to 18-year old, these trees are ready to be harvested for her marriage dowry. Although Chinese fir was planted and harvested generation by generation, the soil has never been degraded and productivity remains the same for hundreds of years. However, with the application of modern technology, including fertilization, gene improvement, and best control of spacing, the second generation of Chinese fir plantation would suffer rapid yield decline, in some places about 20%, and the third generation drops by about 50%.

Pruning practices for fuelwood

In Yunnan *Dai* Minority, a kind of trees was planted along the roadsides and farmlands, and were pruned for fuelwood production. In Huanghuaihai Plain area, shortage of fuelwood was prevailing for many decades. In nearby villages, *Salix* or *acacia* was planted and pruned for fuelwood production.

Traditional regulations and enforcement

The *Fengshui* forest in the *Buyi* ethnic villages in Guizhou Province is strictly protected (Yuan and Liu 2009). There are many regulations for protecting *Fengshui* forests. In the *Buyi* village of Guntang, the regulations include: No cutting of trees, no land reclamation and no burning for ash. Even if a tree dies, nobody can cut it but have to let it decays naturally. The tree branches of the dead trees also cannot be used as fuelwood because someone may cut them purposely and wait to collect these as fuelwood. Violation of the regulations will be seriously punished. The regulations indicate that trees in the *Fengshui* forests can only be cut for some communal purposes, such as for the special pole for dead person but the pole must be kept by the village head; or cutting and selling the trees for building village road.

The local regulations could tackle some small damages to the *Fengshui* forests better than government regulations. Local villagers could notice violations and damages easily, and tackle them very quickly through oral instructions (Chen 1999). There are some special festivals which can emphasize the regulations, such as the March Third Festival or Sowing Festival in Guntang village of Guizhou, which guarantying award and punishment to be carried out well (Yuan and Liu 2009). Weng *et al.* (2003), and Wang and Tu (2006), have the same findings which indicated that Village Regulation contains forest management components and facilitates self-governance in forest resource management. Whether it is in the oral or written form, the villagers must obey them strictly. But enforcement of local regulations still needs government support in some cases. He and He (2000) pointed out that local regulations have been used in local governance by government, and some local governments have also helped the enforcement of these local regulations. In fact, Guan (2002a) mentioned that ancient Chinese government also had managed *Fengshui* forest officially and issued official regulations to protect *Fengshui* forest.

Understanding the role of traditional forestry-related knowledge in development

For the past two decades, TFRK has been a central issue attracted increasing attention from practitioners in many disciplines, including anthropologists, development experts, foresters and local communities. Anthropologists prefer to put traditional knowledge into the scope of culture. Many cases illustrated that core cultural elements are integrated with daily forest management practices and the lifestyle of traditional community people. Thus TFRK has been viewed as knowledge with the characteristics of practical, collective, and is location-

specific (Anja 1999), and as monolithic and culturally bounded systems (Van Der Ploeg 1993). It is fundamental that culture should never be evaluated in terms of good or bad, or whether modern or outdated.

The growing interests on indigenous knowledge stemmed from the belief that many development failures are due to the prominence of modern, scientific knowledge over local, traditional knowledge. During the 20th century, the world economy has grown 16.5 times in Gross National Production. However, forest related environmental and social problems including loss of biodiversity, climate change and desertification, the degradation of natural ecosystems, and the continuously increasing world discrepancy between rich and poor, are all challenging the wisdom of people. As a result, social conflicts have become more obvious. Competition for resources, cultural conflicts and monopoly over technologies, has become the main inducements of disputes between nations and ethnic groups. However, disappearance of traditional knowledge and culture is a fundamental reason for these problems. The development orientation of human beings is perplexed. Every new development practice, theory and methodology, could be supported by a philosophical norm, and would be questioned by other philosophical frameworks. Scientific knowledge has dominated the course of development with its modern values of culture, standards and organizational structure, which have penetrated every cell of human life. The protection and utilization of traditional knowledge still has relative weak appeal in this regard.

More and more evidence has shown that TFRK is essential to maintaining sustainability and complexity of natural eco-systems. Its role in sustainable forest management, rural development and the maintenance of local culture are irreplaceable. More people and organizations have realized that the harmony between development and the environment in local context involves research of the philosophical and cultural background for protection of the diversified traditional knowledge. In practice, research institutes and researchers should learn from the farmers and supplement scientific technology with traditional knowledge (Yuan and Liu 2009). However, there is another dilemma in which the poor farmers normally think that the shortage of capital and advanced technology is the cause of their poverty. They would like to request financial and technical assistance but neglect the role of their traditional knowledge.

TFRK is a valuable resource which normally does not require large investment, particularly in relation to the potential for the pharmaceutical, and animal and plant breeding, industries. Its value has been highlighted as characters of indigenous communities dependent on forests and may potentially have high commercial values. Furthermore, emphasis is placed on its environmental value and potential for contribution to sustainable management of natural resources.

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The Establishment and Future Direction of Asian Centre for Traditional Forest-related Knowledge

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Background and purpose of Asian Centre for Traditional Forest-related Knowledge

The three East Asian countries—China, Japan, and Korea—have been holding the international symposium on Traditional Forest-related Knowledge (TFRK) since 2008, and the fourth symposium was held on Jeju Island, Korea, in 2011. During the Jeju symposium, the three countries—China, Japan, and Korea—came to an agreement on establishing an Asian Centre for Traditional Forest-related Knowledge on 25 November 2011.

The objective is to share the TFRK; and build and maintain a sustainable research network in Asia. The Asian Centre for Traditional Forest-related Knowledge shall also promote exchanges and sharing of experiences by organizing meetings and workshops for practitioners in Asian countries towards further enhancement of joint and collaborative research on TFRK related topics.

Commemorative ceremony of Asian Centre for TFRK

The official title is “아시아 산림전통지식센터” in Korean, and it is currently hosted by the Korea Forest research Institute (KFRI). KFRI has allocated an office on the second floor of the Research Complex at KFRI campus in Seoul, Korea. The Center is administered by the Chief of Centre (position currently assumed by the Division Director of Forest Ecology, KFRI) and an Executive Secretary (assumed by a research scientist in charge of TFRK in the Division of Forest Ecology, KFRI).

A Commemorative Ceremony was held at this office on 12 September 2012. During the ceremony, a tablet made of the wood from a 90-year-old *Zelcova serrata* tree with the Hangul character was done by the famous painter *Donghun*(東軒) Lee YH. This tablet shall served as the sign board for the Centre, and hang on top of the entrance to its current office on the second floor of the Research Complex, KFRI campus in Seoul.

Future directions for Asian Centre for TFRK

TFRK can be designated as the total expression of folklore represented as the form of cultural heritage, biological (genetics) resources and traditional intelligence succeeded from generation to generation within the specific groups (tribes and natives) or areas (Parrotta and Troster 2012). Prior to the establishment of this international network, three countries: Korea, China and Japan, have been conducting joint symposiums on the related topics since 2008. Since then, a total of seven countries and about 170 individuals have participated in these symposiums. The setting up of this Asian Centre for Traditional Forest-related Knowledge could promote closer collaboration towards sharing of information and supporting new research paradigm on related topics among Asian countries. The first task of the Centre is to create a database on TFRK. The TFRK database would be organized categorized into the following five categories: 1) Humanities-Beliefs, 2) Bio-cultural Environment, 3) Living Environment, 4) Production Skills, and 5) Socio-economic Policy. Details are as in Table 1. In addition, this Asian Centre for TFRK will publish regular newsletters and set up a website to enhance interaction and communication.

Table 1. Classification of traditional forest-related knowledge and associated research topics.

Category	Contents
Humanities - Beliefs	Traditional Wisdom, Tales, Legends, Seasonal Customs, etc.
Bio-cultural Environment	Mountain Range of Baekdu-daegan, Forest Garden, Royal Tomb Forest, etc.
Living Environment	<i>Maeulsoop</i> , <i>Sanganmaeul</i> , etc.
Production Skills	Exploration and Extraction of Useful Material, Classical Architecture, Traditional Deforestation, Beekeeping, Traditional Paint, etc.
Socio-Economic Policy	Forest Transition, National and Asian networks, etc.



Figure 1. The tablet and memorial photograph of participants taken during the commemorative ceremony for the Asian Centre for Traditional Forest-related Knowledge at the Research Complex, KFRI campus, Seoul.

The Institutionalization of Sa-Tree and Its Significance in Forest Culture and Environment

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The Sajik altar (Seijitan) of Beijing is located in the western part of the space between Tiananmen and the Inner Gate to the main palatial buildings in the Forbidden City, while Taimyo is in the eastern part. This is the culture and traditional knowledge, which has originated from the late Neolithic or early Bronze-age sylvanistic, the reverence of grandiose tall tree (Yi 2012) and the later ancient urban planning, probably from the Zhou period of Central Plains in China.

In a previous study, the species of Sa-trees of Xia, Shang, and Zhou, the ancient chiefdom confederacies and kingdoms (Figure 1) were inferred to as a local pine species (*Pinus massoniana*) for Xia, cypress (*Platycladus* or *Thuja orientalis*) for Shang or Yin, and Chinese chestnut (*Castanea mollissima*) for Zhou (Yi 2012). These Sa-trees were the object of worship as the Earth God. The ancient people had a sylvanistic culture that includes a sylvanistic tree, the precinct, and the ritual under a mode of thinking. Along the civilization process, which has started from the late Neolithic or early Bronze-age, this ancient sylvanistic culture has started being incorporated into the State Ritual regime which includes Heaven Ritual, Earth Ritual and Ancestor Ritual. The regime has been transmitted up to the pre-modern times of China with the Sajik altar of Beijing as one of its evidence. This work has been done to elucidate further the historical process of institutionalization of Sa-tree into a State Ritual and precinct.

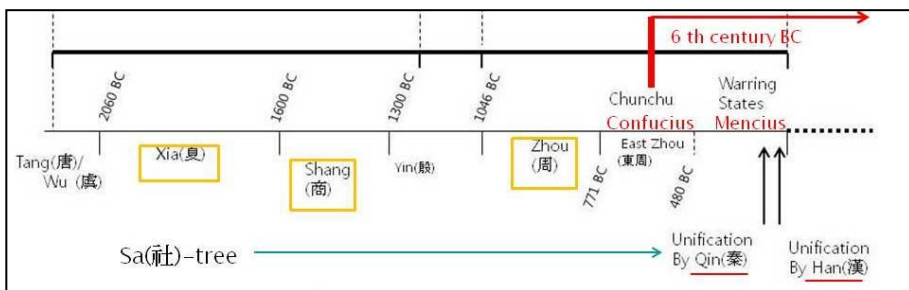


Figure 1. The periodization of the Central Plains of China.

Methodology: Text identification and archaeological data

Focusing on the sylvanistic culture of ancient Central Plains in China, historical evidences were explored in Chinese classical books and historical records. The relevant texts of Sa-institution were identified in 'Kwanzu' by Kwanzung (4th century BC), 'Chunqiu-Zuozhuan' by Zuo Qiuming (5th century BC), 'Shiji' by Sima Qian (145~90 BC) and 'Lichi' (1st to 3rd centuries AD). The places of the cultural centres like capitals of the legendary chiefdom confederacies and kingdoms of ancient Central Plains (Xia, Shang, Zhou) and dukedoms (Lu and Sung) can be identified to a considerable extent by the synthesis of archaeological findings and current archaeological reports and records (Chang 1986).

Results

The beginning of Sa-tree sylvanism, Sa-ritual as a State Ritual, and Incorporation of crop deity

According to the classic Kwanzu, Sa-tree and the ritual appear to have started being institutionalized from 'Wu' chiefdom confederacy of the late Neolithic or early Bronze Age before Xia (Figure 1). Based on the archaeological findings of the Longshan culture (Chang 1986), the Wu chiefdom confederacy appears to have existed before 21th century BC in the south western region in Shanxi Province, to the north of Yellow River and to the west of the Taihang Mountain range. The legendary King Yao of Tang and King Shun of Wu had ruled over the Central Plains around the period.

Based on Kwanzu and Shiji, the formal ritual seemingly had started being set up during the period of Xia with the divine entity of the Earth God as a local pine species located around the centre of the precinct in the Erlitou culture (Chang 1986). The precinct may have been set up by an extensive ground one-step higher than the common plain with a grandiose tall tree in the centre and it allowed many people to come together for public meetings. The succeeding Shang (Yin) had changed the species into cypress as the divine entity different from that of Xia. There must have been a place of Sa-precinct at Anyang's Yinshi culture. In Shiji by Sima Qian, there is a description of King Wu with his generals and soldiers in alignment at the Sa-precinct of the last capital of Yin for a Sa-ritual, informing to the Sa-deity of the conquest of Yin at around 1046 BC (Figure 1). During the Bonze-Age Zhou period that served Sa-tree of chestnut, Jik (Ji) as the crop God appears to have been incorporated into the Sa-ritual and precinct (Xi 1999). The completion of Sajik or Seiji with altar is likely to have been achieved during the early Zhou period at the capital Fenghao to the west of the current Xian. The question of when an altar was incorporated into the essential component of the Sa-precinct is still in need for further elucidation.

The functions of Sa-precinct in ancient and medieval periods in China

Sa-precinct had at least three functions. First, it had been used for revering the Earth God which is the counterpart to the Heavenly Emperor revered by Heaven

Ritual (Suburb Ritual) in the ancient times of Xia, Shang and Zhou. When a new king, duke or marquis was crowned, a state ritual was performed at Sa-precinct. Second, Sa-precinct was a place of judgment where the verdict were proclaimed and serious criminals were punished or even beheaded. Third, Sa-precinct was the place of military alignment either before waging a war with the state ritual for triumph or just for the soldier disciplining. Another function is likely to have been a venue for communitarian gatherings and festivals.

The overlapping of Zhou-style and Shang-style regional Sa-institutions in the early Zhou

Though Zhou had chosen chestnut as their capital's Sa, some dukedoms and marquisdoms under the supreme Zhou may have used either the same species as that of Zhou or different species. In some cases, there were two Sa-precincts in a dukedom, one of Zhou style and the other of Shang style. Dukedoms like Sung and Lu retained influence by the previous supreme Shang or Yin.

Lu was the dukedom granted to the first son of Tan, the Duke of Zhou after the conquest of Yin by the first King Wu at the 12th century BC. The capital of Lu is the current Qifu in Shandong Province. Tan, the Duke of Zhou, was a brother of the first King Wu of Zhou and the regent during the early reign of the second King Sung. The Heaven (Suburb) Ritual which was exclusively conducted by the King of Zhou was also allowed for the duke of Lu as an exception among dukedoms and marquisdoms.

The existence of two Sa-precincts at the dukedom of Lu was identified in 'Chunqiu', the historical record for an event at the 6th century BC (504 BC); "Yanghu, a general of Lu, took oath with the Duke of Lu and the aristocrats at Zhou-Sa (precinct) and met the common people of the dukedom at Bo-Sa (precinct)." In the sentence Zhou-Sa means the Zhou-style Sa-precinct, probably with chestnut as Sa-tree, and Bo-Sa means the Yin-style Sa-precinct, probably with cypress as Sa-tree.

In the dukedom of Lu, even though the duke family worshiped their ancestor of Tan, the first Duke of Zhou, there seems to have been two Sa-precincts, which may have been distant away from each other. The ruling class appears to have gathered at Zhou-Sa, but the common people appear to have gathered at Bo-Sa for the public meeting, at which a general took oath to many people. In this case, the function of Sa-precinct was the public meeting place, at which a person took oath.

Sung was the dukedom granted to Weizu Kai of Yin royal family. It was established after the revolt of the former Yin crown prince and different brothers of King Wu of Zhou against the second King Sung and Tan, the Duke of Zhou, at the 12th century BC. The capital of dukedom Sung is the current Shangkou in Henan Province. The dukedom Sung was allowed to conduct ancestor worship to Shang (Yin) ancestors at its Jongmyo. Book of Odes contains the lyrics of Shang ritual music (Confucius 551-479 BC). Because the duke family was of

Shang origin, they may have established Bo-Sa or Shang-style Sa-precinct with cypress as the Earth God at the former area of Shang.

According to *Shiji* by Sima Qian, the first emperor of Han accepted the suggestion by the officials for Ministry of Courtesy and ordered to construct regional Sa-precincts for local people in counties, marquidoms and dukedoms across the entire united empire and let the people to revere Sa-deity at the local precincts.

Difficulty of identifying Sa-precinct sites

The Sajik altar (or Seijitan) of a previous ancient or medieval kingdom has been often demolished by the ruling elites of the succeeding kingdom or dynasty. For instance, the first emperor of Han (Earlier Han) destroyed the Sa-precinct of Qin after he re-united China Proper after about two or three decades-long turmoil. And the capital of subsequent kingdom and dynasty often moved to different site. The former capital will be abandoned completely, often left to deteriorate. For example, the Earlier Han has its capital at Xian, but the first emperor (Liu Xiu) of the Later Han set up Luoyang as the capital to the east of the former capital. The Sa-precinct of Earlier Han in the capital Changan (Xian) may have had a Chinese elm species, as the sylvanistic culture of first emperor of Han (Liu Bang)'s hometown served the elm species as the Sa-tree at the regional Sa-precinct.

Discussion

Culturo-social forestry includes the culture and traditional knowledge of interaction between humans and forests, such as sylvanistic, *neungwon* forests (for royal tombs), village forests (*mauel* forests) in contrast to the production forestry for timber (Yi 2010). Joseon Dynasty of Korean Peninsula (1392~1910) retained a different version of the sylvanistic culture of Sajik pine (Yi and Chun 2009) as the symbol of culturo-social forestry as well as production forestry.

The sylvanistic culture of China surrounding Sa-tree has a long history of institutionalization within the framework of State Rituals. Different from Jongmyo or Taimyo which was mainly for the royal and aristocrat families, Sa-institution was set up for all the people for a state (marquidom, dukedom, kingdom). Thus, culturo-social values of Sa-institution harbour a greater significance for modern people and need to be revitalized in a modernized form and mode of thinking as the cultural heritage available for forest and environmental landscaping, conservation and afforestation in Northeast Asia. The species of Sa-trees has not only the cultural meaning, but also has the biological and environmental implications as one of the best 'cultural bio-species' of China (Yi 2007). Many of these species are being planted today for afforestation and landscaping in the Central Plains in China. The species of ancient sylvanistic trees and forests of China need to be utilized in a sound and positive way for contributing to green economy by providing cultural ecosystem services (Yi 2010).

Sylvanistic culture is also found today in many parts of the world, for example in minority communities in mountainous regions in Southern China. The relics of sylvanistic culture are also found in some rural areas in Korea today. Sylvanistic culture is also the concept that is modernizable. The ancient cultural phenomenon and traditional knowledge system of the Manchuro-Korean region and Central Plains in China have a unique feature. The sylvanistic culture before 20th century BC in both regions started being incorporated into the State Ritual regimes from the time of the Neolithic and early Bronze-age chiefdom confederacies and kingdoms (Yi 2012).

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Study on the Cypress Culture and Protection in the Mausoleum of Yellow Emperor in Shaanxi Province

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China has a long history of civilization and cultural development including the evolution of rich traditional knowledge systems that influence many aspects of the peoples' lives (Liu 2007). The accumulation of knowledge about forest resources has enriched the cultures and livelihoods of people. In China, the traditional culture of cypress is an expression of the people's mental and emotional sustenance, eternal pursuit, ancestor worship and ritual; and the spiritual value of cypress is the embodiment of the forests as a basis of national civilization (Li 2004).

Methodology

The study site is in the Mausoleum of Yellow Emperor, located in Huangling County, Yan'an City, Shaanxi Province, China. The old trees and buildings round the tomb were documented and additional information were gathered by conducting interviews with officials of the administration bureau of the Mausoleum. Surveys of villagers around the communities outside the tomb further supplemented the information collected. The objective is to document the stories behind the ancient cypress, and to discover the relationship between the tomb and cypress protection.

Results

Description of the old cypress tree and forest

The oldest cypress tree

The oldest cypress was said to be planted by Yellow Emperor. The tree is about 5000 years old, 19 m tall, and 11 m in circumference at ground level. It ranks the first among the cypresses and is regarded as the "No.1 cypress in China". After more than 50 centuries, the trunk of this cypress is covered with cracks and wrinkles as deep as the face of an old man, but its crown is still lush and full of vigour. This cypress is currently the largest one in China. For thousands of years, this cypress receives people's respects, worship and love, like the great honour bestow to the Yellow Emperor.

Han Emperor Wudi's cypress for hanging armour

Also named the 'Tree General', this cypress, planted near the Mausoleum of Yellow Emperor is 14 m tall and 5 m in circumference at ground level. Over 3000 years old, it is covered with scars in regular patterns on its bark, seemingly with nails broken inside. According to the historical records, Emperor Wudi of Western Han Dynasty had his armour hung on this tree when he paid respect to the Mausoleum of Yellow Emperor on his way back after his inspection to the northern border. Thus, as early as 2000 years ago, emperors came to the mausoleum to pray for peace, and a long and prosperous life.

Dragon-horn-shaped cypress

There are two dragon-horn-shaped cypress trees, also named the twisted cypress, one on each side at the top of the "Dragon Lying Hill". These two cypress trees have no more branches and leaves, but are still full of vitality, just like a pair of dragon horns. Ancient Chinese regarded the dragon as their totem, and *Feng Shui* masters had considered these two dragon-horn-shaped cypress trees as symbol of the Yellow Emperor Mausoleum and which had been receiving special protection.

A forest with big/old cypress

The forest area surrounding the Yellow Emperor Mausoleum is about 90 ha, including cypress covering an area of 80 ha. There are more than 83 600 old cypress trees, including 34 600 that are more than a thousand years old. These old cypress trees are regarded as China's oldest and largest cypress population. What really amazing is that, this old cypress forest is located on the Loess Plateau in Northern Shaanxi. The Loess Plateau is one of the most serious eroded areas, with an average annual rainfall of only 200 mm to 500 mm. This type of arid climate can only support very sparse vegetation. However, the mountain which the Yellow Emperor Mausoleum stands is full of green, vast area of old cypresses.

Protection of the old cypress tree

Descendants of the Yan and Huang Emperors

Yandi (炎帝) and Huangdi (黄帝) are both the ancestors of the Huaxia people. They are both part of the Yanhuang tribe. Centuries later, the Huaxia evolved into the Han Chinese, which is the majority Chinese today. In Chinese historical accounts, the Yellow Emperor is credited with improving the livelihood of his tribe of nomadic hunters. He taught them how to build shelters, tame/domesticate wild animals, and grow the five Chinese cereals. He invented wheels/carts, boats, and clothing, the bow sling, the early Chinese astronomy, the Chinese calendar, mathematics, musical notes and so on.

The Mausoleum of the Yellow Emperor

The Mausoleum of Yellow Emperor is the burial site of the Chinese legendary Yellow Emperor, located in Huangling County, Yan'an City, Shaanxi Province, China. The Mausoleum is located on the Qiao Mountain, north of Yan'an proper. In 1961, the Chinese State Council proclaimed it as the first National State-

Protected Great Cultural Site, with the identifier "Ancient Tomb No.1". The Mausoleum was an important location where generations of emperors and famous people paid regular homage to the Yellow Emperor.

Protection of the old cypress tree

The cypresses around the mausoleum of Yellow Emperor have been well protected during all the dynasties through more than 5000 years. The regular rituals and large scale cypress planting started from the Spring and Autumn Warring States Period (770–256 B.C.). In the Mid-Tang period, mainly in Dai Zong period (761–779), the Emperor decreed the planting of about one thousand cypresses.

In 1061, Emperor Renzong of the Song Dynasty decreed the mass planting of cypress trees at the complex, as well as stationed three officials to protect the Mausoleum and the cypresses. In 1325, during the Yuan Dynasty, an Emperor issued a decree protecting the tomb site and all the cypress trees and animals in the surrounding forest. After the founding of the People's Republic of China, cypresses around the Mausoleum were provided with better protection and management. During the annual Tomb Sweeping Day (4/5 April), the public memorial ceremony for the Yellow Emperor always ended with planting cypresses.

Relationship between the Chinese cypress culture and cypress forest protection

Ancient cypress worship in China

The Chinese cypress worship has a long history, which drives cypress planting and protection enthusiasm. The ancient Chinese believe that the cypress tree has the function of exorcism. Since the Zhou Dynasty (1046 B.C.) the emperor's coffin must be made of cypress wood and people would plant cypress trees would also be planted outside the ancestral hall of worship. The cypress grows tall and straight, with astonishing resistance to cold, so it has also been used as a symbol of justice, nobility, longevity, and immortality. Chinese usually plant cypress with pine and willow around tombs as the symbol of immortality.

Ancient cypress funeral and ritual culture

In China, people generally plant the pine and cypress around graves, symbolizing immortality and memory of the loved ones passed away.

National Cypress Spirit

Cypress does not wither through winter. It has high tolerance and resistance to snow and wind. The cypress has become the representative species of gritty and strong vitality. Chinese like cypress, not only because of its form and aesthetic appearance, but also worship and admiration of its noble spirit.

Discussion

Cypress - Emotional sustenance of the spirit of the ancients

The development of modern forestry is dominated by the Western scientific forestry thinking, however, this case study revealed that for over 5000 years, the Chinese has considered the forest as their spiritual and worship object, which demanded much effort in managing and protecting the forests.

Effects of worship and homage for the ancestor on the protection of the cypress

According to traditional Chinese beliefs, cypress brings luck. In the ancient customs of Chinese, planting cypress around the cemetery has always been an important and essential activity. The ancestor worship rituals generally include process of planting cypress, so this custom and culture of Chinese promotes the protection of cypress forest till today.

Cypress- eternal pursuit of humans

Cypress, being an evergreen, the ancient Chinese had placed their hope for eternal life in it, and is seen as one of the most spiritual existence in nature. Eternal pursuit, embodied in it is the old desire of continuation of individual's life. The feeling of passing time and life brings not only helplessness and sadness, but more with the active spirit of cherishing every living moment and loving life, that is, to reach the eternal life through the self-improvement of personality.

The Chinese cypress culture and its modern meaning

Cypress culture is an important part of the Chinese forestry culture. For a long time, the Chinese have been accustomed to see the forest as nothing more than natural resources, and the forestry industry only as material acquisition sector, lacking the realization of taking it as the source of national civilization. With the development of society, the forestry culture continues to inject new contents and new meanings, so a comprehensive understanding of the role of forestry cultural components would have important implications for sustainable forest management.

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Cultivation and Uses of Non-timber Forest Products Using Traditional Knowledge in the Northwest of Vietnam

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Traditional knowledge has been developed and used by 54 ethnic minorities of Vietnam for ages. It is very important issue in terms of balancing the ecological environment and creating income for local people. Understanding and using appropriate traditional knowledge particularly in the context of current global warming and commercialization are crucial to sustain natural resources and livelihood of local communities.

This paper presents the traditional knowledge on cultivation and uses of Non-timber forest products (NTFPs) in the Northwest of Vietnam, where 23 ethnic minorities settle. To get insight into the issue, three ethnic minorities of *Thai*, *H'Mon* and *Kho Mu* in Dien Bien Province of the region were selected for the study. For each ethnic minority, the methods of PRA and RRA were applied in typical villages to attain necessary data and information.

The results showed that there are many NTFPs species growing in natural forests of the region. Even though the NTFPs species normally scatter in natural forests, they are very important resources for the livelihood of local people, mostly ethnic minorities. Many of NTFPs species have been locally harvested and used for food, medicine, material, daily uses and commercial purposes using traditional knowledge.

Some local communities have their own regulation to manage and harvest main NTFPs. The traditional knowledge is rarely written or published, but transferred from family to family and from generation to generation. Each ethnic minority has its own knowledge and culture in using and managing NTFPs. Due to a fast growing population and bad management of natural forests, NTFPs resources recently have been severely declined.

Furthermore, the environment and land are getting worse for growing and cultivating NTFPs. This leads to the investment of modern technology as a mechanism of the government to improve living standards of local people. However, modern technologies in many cases are helpless to solve the problems because they are not in line with the indigenous way. This is even more serious in the context of global warming and commercialization currently happening.

In short, traditional knowledge on NTFPs cultivation and uses should be comprehensively researched and developed in the region. Furthermore, modern technologies applied should base on or in line with traditional knowledge. Finally, in order to improve local economy and sustain the ecological environment, ethnic minorities should be further involved in the development activities such as planning, monitoring and evaluation.

Documenting Traditional Forest-related Knowledge in *Dong* Minority Regions in Southwest China

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China has 5000 years of civilization, and the Chinese has a long history of hunting, gathering and farming associated with forests. It thus has accumulated rich traditional experiences in forest management practices. With its rich diversity of geographical and climatic conditions, traditional-forest related knowledge (TFRK) has been developed by farmers throughout the whole China with great diversity, inherited through people's livelihood, culture, beliefs and religions. As one of the minority groups in China, the *Dong* people live in remote, boundary mountainous areas of Hunan, Guangxi and Guizhou Provinces for a long time. There are about 3 million *Dong* people in China. They live in or near forests and they depend on forests for their livelihood. They regard forest as the god's place, and cutting trees must get the permission from the god by lighting a candle or performing other religious activities (Wu 2004). For centuries, they have practised slash-and-burn agriculture, gathering of forest produce and hunting. They have developed a set of traditional forest knowledge, which has been inherited generation by generation. However, the ethnic group's local forest management practices are not recognized by most researchers (Yang 2007). Policy makers and practitioners are not interested in that as well. This paper intends to document the local forest management practices of the *Dong* ethnic group in China and to raise interest and concern, contributing to on-going policy debate on forest management in China.

Methodology

Data were collected from interviews and observations/visits. These field data were supplemented with secondary data from several references.

Documenting TFRK of *Dong* minority

Holy trees and forests

Fengshui forests and holy trees

Fengshui forest is also called holy hills, holy trees, or dragon hills. *Dong* people believes that "everything has its own soul". Hence, mountains, rivers, old trees, scenic forests, huge stones, flora and fauna, can all be their worship targets. They

worship nature's creations, believe that the power of God would bring people peace and health. They pray for the harmony between human beings and nature. These traditions play a supportive role to protect forest. *Fengshui* forests have a vital role in *Dong* people's daily life, contributing to biodiversity, soil and water conservation, and also landscaping, architecture and religious believes. Almost all *Dong* villages have their own holy forest. They keep this forest for beauty, for water conservation and for ancestors' spirits. It is not allowed to cut any tree from this forest. It can only be used for some special purposes with the *Zhailaos*¹ approval, e.g. collective road construction, as firewood for the aged people to get warm in public place.

Life tree (life guarantee tree)

Some trees are given special meaning and special function to safeguard those 5- to 6- year-old children. Usually, there is one big tree in the village which plays this function. When the child is at this age, parents would come to that life tree with a fortune-teller to pray for the child's safety and luck. This life tree is kept very well and no one would deliberately damage it.

Ancestor tree

In some villages, there is one big tree which is given special meaning (like an ancestor and should be respected): no one can touch it, if you did, you will be fined. There is one case that one local doctor who did not believe that the ancestor tree cannot be touched, got infected with some kind of allergy in the same evening after he touched that tree.

Forests or trees with cultural meaning

Eighteen-years-Chinese-fir-plantation

Chinese fir is considered as holy tree species by the *Dong* people. This is also the unique timber tree species for plantation. Chinese fir forests have to be replanted and tendered after they are harvested. It is a common practice that the parents will plant fir trees when a baby is born. The main purpose is for the child's marriage later, such as for furniture making. They plant the trees for the children to use because there is no road for them to transport the trees to the market. These fir trees planted by the poor family could then use to lessen the financial burden of the parents for the child's marriage. If their children are capable, there is no need for the parents to plan these trees because the children can earn enough for their marriage (Gu 2007, Wu 2008). Eighteen-years-Chinese-fir-plantations are carefully managed, intercropped with other crops such as maize, soybean, Chinese cabbage and carrot during the first five years. These trees are usually in a small parcel of land of about 0.1 ha with around 100 trees. These trees are normally planted near their cottage so that the trees can be easily managed. The villagers know that the saplings have to be planted in a certain direction, otherwise, they cannot grow well.

¹ Local prestigious persons who are very important in dealing with daily and trivial affairs in the village.

Married women's forest

Dong women have higher position and they have accumulated their own wealth. Married woman could buy forest in her husband's hometown, and the forest belongs to her and she can manage and market it herself. A married woman may also still has forest in her hometown and in most cases are she would cut the trees and give back to her own family.

"Dalaogeng"

Trees are planted when two good friends are mutually regarded as brothers. Trees are planted to witness their friendship forever. These trees are managed very well for showing their life-long friendship.

Planting technologies and harvesting management

Tree-planting technologies

Planting tree is one of the main activities for many important events such as festivals, weddings and funerals. The typical tree planting practice starts with using fire to clear the land. There is no fertilizer and manure used. Weeding is done regularly during the first three years. Soybean and chili pepper are intercropped during the first three years as well. Intercropping is not practised after the first three years, as the crops would interfere with the tree growth and the saplings' leaves will turn yellow. The plating spacing is 3m x 3 m, unlike modern practice which is 2.5 m X 2.5m. The villagers think that the narrower spacing is would be too crowded for the trees to grow well, and the trees will grow slower after six years.

Harvesting technologies and management

The villagers know the best time to cut the trees. They will cut the tree when the tree crown cannot grow anymore. They used to cut the trees when they matured one by one; but trees are cut in the whole parcel all at once now. While previously, they will sell the trees to meet daily needs, now, they are selling the trees for extra incomes. Pine trees, fir trees and coal-making trees are not allowed to cut in some villages. Trees around the paddy fields should only be cut by those who need to plough the field. They have their own rules about the width of clearing.

Tree transferring regulations

If some households need money urgently or other reasons, their trees are sold to other persons and these persons will cut the trees several years later. Sometimes, the first buyers sell the trees to others again. However, the villagers have their own and effective contract. If there is any conflict, amended documents are added. Conflicts are not difficult to solve (Luo 2006). There are also other traditional management rules, such as the customary forest regulations, *Jingping wenshu*², village stone plaque regulations.

² One written contract that indicates good, systematic and reasonable ownership, user rights, benefits sharing about forest land.

Conclusion

The forest management practices for *Dong* people had been in existence for so many years and played a very important role in sustainable forest management. However, existing government management usually neglects this management models and practices. Cultural and ecologic anthropology has strong influence in the traditional management practices, but this is often misunderstood and negatively criticized (Yang 2004). In this aspect, local management practices should be incorporated into the existing management system for effectiveness and sustainable forest management.

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Traditional Forest-Related Knowledge and Culture of Indigenous Peoples in the Cordillera, Northern Philippines

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There were different types of cognitive systems (i.e. knowledge, skills, and practices) which could be expressed through language, oral traditions, spirituality, and worldview (UNESCO 2012). In responding to various environmental concerns, different types of knowledge systems were employed. However, the question lies on what particular type of knowledge will be most effective in forest conservation and green economy. This paper focuses on the traditional forest-related knowledge and how it evolved through time based on its history in the Philippines. In particular, this study focuses on the different knowledge systems for natural resources management in the Cordillera as practiced by the people with different beliefs, culture, and traditions. This was adapted from the recently published journal article entitled *Traditional Forest Conservation Knowledge/Technologies in the Cordillera, Northern Philippines* (Camacho *et al.* 2012).

Indigenous knowledge was considered as a set of skills, attitudes, and practices, innate inside a particular group and was evident through the existence of different indigenous groups preserving their communities even up to this generation. In the Philippines, traditional forest-related knowledge is more popularly known as indigenous knowledge. One example of which was the famous Ifugao Rice Terraces built by *Ifugaos* and was considered as one of the New Wonders of the World.

Results and discussion

There were different indigenous knowledge/technologies in Northern Philippines, specifically in Cordillera in Luzon. First, *Ifugaos* have the *muyong system* – a traditional forest management system for the long-term sustainability of the rice-based terrace cultivation system. It can be viewed as a forest conservation strategy, a watershed rehabilitation technique, a farming system or an assisted natural regeneration strategy. The second one is *ala-a* – a communally managed forest where resource-sharing is practiced and is intended for collecting fuel, construction materials, food, medicine, and other products that may be used in the household or farm.

Camacho *et al.* (2012) also revealed that the other indigenous communities: the *Isnags* and *Tingguians* have *lapat* – a century-old system of prohibiting the exploitation of natural resources within a designated area over a period of time. These areas maybe forest stands where rattan vines and lumber are regularly gathered, a fishing section of the river, a forest area where swiddening or hunting is carried out. These also include the prohibition of gathering the fruits of certain trees. The *lapat* system enables forest areas to recover from man-made disturbances and can be observed through regeneration of trees and reproduction of wildlife in depleted areas.

Meanwhile, seven resource conserving systems were observed by the *Ikalahans*. First is the *inum-an* or *kaingin*, their major livelihood source, is the traditional farming practice of the *Ikalahans* following several steps, such as selection of the site, clearing of the site, burning of the felled trees, shrubs and other vegetation, planting of sweet potato, and fallowing. Second is *kinebbah* which is a system that allows soil to “rest and recuperate” by allowing grass, herbs, and vines to grow and produce humus and topsoil where site may be used again as *inum-an* after some time. The third one is *gen-gen*, a system of combining soil terracing and composting to ensure replenishment of soil nutrients through time. When the sweet potato, their main crop, is already old - usually 8 to 10 months after planting, the *Ikalahan* woman selects good stems as planting materials. These cuttings are stored under the shade for three days before planting. The rest of the biomass are then buried in a contour trench dug across the face of the field resulting to a series of contoured humps that looks like mini-terraces and filled with composting materials which provide fertility to the soil while preventing soil erosion.

The fourth resource conserving system revealed was *day-og*, another resource conserving system of the *Ikalahans* which results into fertile and productive garden with canals providing good drainage through a series of steps: a) making a series of holes about 20 cm deep along canals; b) filling the holes with grasses and leaves; c) covering the excavations with the same soil scooped out earlier; and d) planting crops directly on top of these contraptions. Each *day-og* section of about 3 or 4 sq m is separated by a canal from the adjacent section. Planting of sweet potato and other vegetables are done immediately or a few days after the *day-og* preparation. The result is a fertile and productive garden with the canals providing good drainage. The fifth one was *balkah*, or vegetative terracing planted with tiger grass, which is also employed by the *Ikalahans* to maintain soil fertility and prevent soil erosion. The distance between each *balkah* depends on the slope hence, the steeper the area, the closer the *balkah*. The tiger grass is planted along the contour to form a semi-terrace structure after 4 to 5 years. This technique is done by the *Ikalahans* mainly to reduce the slope to maintain soil fertility and prevent erosion. By using tiger grass, the farmers beside from having a mechanism for controlling soil erosion would also have a long-term source of material for making soft brooms. The sixth one was *tuping*, another resource conserving system which also prevents soil erosion by constructing rice terraces in high areas. It is a local term of the *Ikalahan* for riprap which involves building a mosaic-like fitting and piling of rocks on top of

each other to form a retaining wall which prevents soil erosion in stream bank and road banks. Lastly, *pamettey* is the local name for the homemade pesticide used by *Ikalahans* to control plant pests and diseases by using ash, red chili, and certain local plants with bitter and unpleasant taste as ingredients.

Conclusion and recommendation

All these practices were found to be effective in improving the productivity and quality of the land but the main challenge now is to transfer these practices to the next generation. It was also revealed that the mainstream Philippine society affects the manner these indigenous people manage their resources including the natural balance between their community's needs and their resources' capacity to produce their needs. This shows that there could be threats to the integrity of their communal resources. It is recommended that the government and other stakeholders should take part in forest management approaches implemented by the indigenous people who obviously had implemented time-tested solutions in the different environmental concerns. Moreover, one must realize that the forest management approaches employed by the local people treats the forests as lifeshed where human existence is connected with land, forests, and water.

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Sustainable Forest Ecology Management: Religious Faith, Believes and Practices

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There are thousands of tribal forest villages found within and at the vicinity of the deciduous forest covers in India. In the north-eastern extended part of the Chhotanagpur plateau area of India, tribal communities are living based on forest products harvesting for centuries. Socio-cultural practices of these communities are very much configured with the surrounding forests, hilly tracks, rivers and unfertile-undulating physiography (Malhotra *et al.* 1995). It is because of the dry-unfertile terrain, tribal forest dwellers mostly depend on forest products harvesting to sustain their livelihoods.

The area was selected for this research fieldwork for the following reasons:

- 1) Indigenous people have been living in the districts of West Midnapur, Purulia and Bankura, the south-western part of West Bengal, India, for centuries.
- 2) Their live, believes, faiths and practices are mostly structured by the surrounding natural environment including the forests, hills, rivers and undulating barren topography.
- 3) Tribal people are considerably dependent on forest products for different purposes.
- 4) Indigenous practices are still noticeable in this part of India.
- 5) There is lack of other job opportunities, except forest products harvesting.

For the collection of empirical data stratified sampling was done to select interior and forest fringe villages where residents are mostly dependent on natural products. Following the selection of forest villages, a random sampling was done to conduct household survey. About 200 households were surveyed from six forest fringe villages. Two villages were selected from each district. More than 35% of the total household from each village were selected for the household survey. Apart from household survey, interviews, elite interviews, group discussions, participation and direction observations were also used for firsthand data collection. Participatory appraisal technique was also used to involve native villagers to generate more data and information.

Throughout the research it was noticed that to protect the original forest ecology including its flora and fauna, a number of forest pockets are considered as sacred zones, from where collection of forest products for daily household needs or for commercial purposes are strictly prohibited. Therefore, these areas are quite undisturbed and a rich number of floral and faunal species are available in these sacred areas which may not be found in adjacent forest areas today. Only

for the production of medicines, villagers occasionally collect some plant or animal species according to the instructions the village Vaidya (tribal traditional doctor) from these sacred zones (Das and Chaudhuri 2008). Villagers believe that the Goddess of Forest bestowed her blessings on these plant species as these species are from sacred places. This research shows that the number of plant and animal species is always higher in sacred places compared to its adjacent forest areas. Therefore, research on these sacred places could be explored to get information on the number of plant and animal species which might be available in the past in surrounding forest areas too. The research findings will also be useful to discover the nature and features of ancient biodiversity of the surrounding forest covers.

These sacred groves are protected just by the religious faith, believes and practices of tribal forest dwellers, even during the utmost pressure of forest degradation (Ghosal 2010). Study of sacred places shows how and why some plant species were accorded more attention by the indigenous forest dwellers compared to other species. At the same time, why associate species, which may not have direct use in tribal communities, are important for the protection of native biodiversity can be revealed. Traditional forest related knowledge of tribal communities that have developed through century old socio-cultural practices in India can be disclosed better through the study of these sacred groves (Ghosal 2012).

Bhakat and Pandit (2003, p. 230) stated that, "Sacred groves are tracts of near-virgin forests, the vestiges of an ancient practice in which people protected forest patches. A repository of medicinal plants.... Sacred groves are small patches of native vegetation traditionally protected and managed by local communities. Named differently in different parts of India, these groves are mainly found in tribal dominated areas and managed by local people for various reasons. ... Sacred groves, in general, act as a nursery and storehouse of many of the local ayurvedic, tribal and folk medicine."

In the interior, (particularly tribal) forest villages, forests play a major role in cultural and spiritual life. If the cultural practices of the indigenous forest communities are studied carefully a great deal of knowledge about a number of forest products could be revealed. From birth until death, the use of forestry is obvious in tribal forest communities in the research area. The purposes and uses of forest products by these forest communities are sometime distinctly different to the normal uses of forest products by outsiders or non-forest residents. For example, outside the forest, Sal (*Shorea robusta*) leaves are mainly used for plate making, whereas during cultural and religious festivals forest villagers use such leaves for multiple purposes.

For the sustainable management of fast diminishing Indian forest covers, study of religious faiths, believes and practices by the indigenous people would be a promising step in the future. Discovering of traditional forest related knowledge will not only be useful to reduce the problem generated by the imported forest

management policies, but also will be useful to save the traditional forest related culture and at the same time protecting the native forest biodiversity.

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Traditional Knowledge and Practices in Harvesting Wild Honey by Indigenous People of Palawan, the Philippines

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The Palawan group of islands in the western part of the Philippines has been considered as the country's last frontier of rich flora and fauna diversity. Indigenous to Palawan are three main ethnic indigenous people groups (IPs), namely: a) *Bataks* numbering around 400 households and inhabiting the northern central part, b) *Tagbanuas* in the central Palawan area with about 7,000 households, and c) *Palau'an*, the largest group with 30,000 households who inhabit the southern part of the island. Some Muslim minorities occupy the southernmost part of the island and islets facing the border of Malaysia. All the rest are the majority who are Christians and long time migrants from Luzon and other neighbouring bigger islands such as Visayas and Mindanao.

One important non-timber forest product (NTFP) that is plentiful in the local communities in Palawan is the wild honey. Honey gathering has been an integral part of IPs existence that has become part of their culture and rituals. The Forest Products Research and Development Institute, International Tropical Timber Organization (ITTO) in collaboration with *Nagkakaisang Tribu ng Palawan* (NATRIPAL) an association of indigenous groups of Palawan; worked hand-in-hand to document the experiences and insights of the local people in the establishment and operation of commercializing wild honey collection. The main focus was on the harvesting methods which based on traditional knowledge, indigenous beliefs and practices.

Methodology

The study included three local communities in the entire province of Palawan: Kayasan in Puerto Princesa City; and Campung Ulay and Punta Baja both located in Rizal town in southwest Palawan. Data and information were collected from assessments of the areas and interviews of IPs knowledgeable in actual gathering, processing and marketing of wild honey.

Results and discussion

In Palawan, there are two honeybee species: "ligwan" (*Apis dorsata*) and "pukyutan" (*Apis cerana*). Honeybees thrive best where sources of pollen and

nectar are plentiful such as in forests, plantations of commercial crops (coffee, rubber and coconut) and areas with flowering grasses, shrubs and plants.

Collection of Wild Honey

Honey gathering in Palawan is a male-dominated activity with the women participating only in the processing and marketing of the honey. Skills are acquired through going with more experienced gatherer. Skills tend to be handed down from father to son.

A typical honey gathering expedition (Figure 1) starts with an individual or a group of two to three members (usually family members) who go out to the forest and locate dense areas of flowering trees. Familiarity of the flowering seasons of various species of forest trees and their location in the forest will determine a successful hunt. Foragers are also in constant lookout for indicators of hive presence, such as: 1) droppings (yellowish dots) of bees along river rocks; 2) presence of young hives, indicative of a nearby large hives; and 3) directions of the flight of bees.



Figure 1. A typical honey gathering in Palawan.

A pair of good, sharp eyes, during the hunt is an advantage, too. The better wild honey comes from the “pukyutan” bee (*Apis cerana*) whose nests can be seen high up in the branches of the towering manggis trees (*Koompassia excelsa*). Manggis is found only in Palawan but not elsewhere in the Philippines and this honey is therefore a local specialty.

Once a hive is located, a member of the team climbs up with a smudging fire (using coconut husk and fresh leaves) to produce a thick, white smoke as shown in Figure 1. The climber then determines whether the hive contains matured honey or not. The bees are driven off and rendered lethargic by the smoke. Care is done not to kill, scorch or squeeze any bee as it would provoke them to sting. One informant revealed that bees with their heads upward are not hostile. Bees with heads down and with their wings fluttering are those that are on the attack. A breathing sound emanating from a hive is indicative of a surprised colony which may turn hostile. It is normal for a climber to be stung. But accordingly, if the sting is less than seven times, the bees are not agitated and it is safe to

proceed. Beyond seven stings means the whole swarm might attack, thus the gatherer has to utter stronger prayers to pacify the bees or get down the trees as fast as he could.

To harvest the hives containing the honey, the gatherer cuts the upper part of the hive slightly above the combs containing the eggs, leaving an inch or two of the hive containing honey. This is done to leave some food to the colony and to allow the hive to regenerate (two weeks after the harvest) but honey maturation requires a longer period. The honey-laden comb is lowered down a plastic container attached to a rope and collected by those waiting below. Processing of honey is done in the village, or on site but away from the hives.

During the peak seasons of honey gathering, which coincides during summer time starting from February to April, a team of gatherers usually stays two to three days at a time foraging. On the average, 10–20 hives are located per trip and the average yield per hive is about 8 l. In one honey-gathering season, families devote 80% of their time to the activity, returning only to restock on food and to process and sell their honey. A honey gatherer related that for the past three years, his family was able to harvest an average of 30 containers of 20 l each (about 600 l) for the whole season. This is translated to an income of PhP10 500 (about US\$ 260).

Traditional and Indigenous Beliefs and Practices in Honey Gathering

Honey gathering among the IPs of Palawan has been an integral part of their existence and is part of their culture and rituals. The *Batak* hunter-gatherers of Palawan perform the “lambai” at the onset of the honey season (Figure 2). They would spend days in small camps at special sites in the forest to perform the rituals. The spirits of the honeybees are honoured with prayers, dances, songs and the instrumental music. Further, the *Bataks* believe that incorrect performance of the “lambai” results in poor harvests of brood and honey.

Meanwhile, following interviews with other IPs have furthered showed other interesting observations of the rituals and taboos of honey collection. They narrated that bees are very sensitive to body odour and will attack gatherers with unpleasant smells. The bees are also sensitive to the smell of blood and will get aggressive and irritated to the smell of dead bees and scorched wings (Figure 3).

Before a swarm attacks, a lead bee marks its victim by buzzing past or releasing an odour which leads other bees to the target. Gatherers discourage eating of honey near hives, believing that the bees will swarm and not return to the same spot (Figure 4). On the other hand, the *Tagbanuas* believe that a hive is a gift to the finder by the guardians of the forest and the bees. Because of these, they offer prayers and thanks to these guardians so that they will be led to the hives (Figure 5).



Figure 2. *Bataks* perform “lambai rituals”.



Figure 3. Bees sensitive to body odour and smell of blood.



Figure 4. No eating of honey near hives.



Figure 5. *Tagbanua* offers prayers and thanks to guardians of forest.

Conclusions

The Palawan traditional forest-related knowledge and practices (PTFRKP) are a function of the need for these IPs to survive. Further, the PTFRKP elements may not have scientific basis but in a way capable of protecting the natural resource base of the environment.

The three IP communities in Palawan are just examples of group of people who are capitalizing on the diversity of local forest products like wild honey. There are similar activities elsewhere in Palawan and throughout the Philippines. Not all products collected will justify significant investment but in some cases, simple development techniques will be enough to make a significant increase to the incomes of the communities.

The study leads to the conclusion that honey gathering, as commercial activity, is a very viable activity at the level of the gatherer. The technology offers the following advantages: a) low capital input; b) high returns per unit of time spent; and c) low technical requirement needed by the gatherer.

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Ecological Roles of Korean People for Sustainable Use of Acorns

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Acorns served an important role in early human history and were a source of food for many cultures around the world. The poor in ancient Greece would eat acorns as their food; and in the Jomon Period of Japan, acorns were harvested, peeled and soaked in natural or artificial ponds for several days to remove tannins, then processed to make acorn cakes. In ancient Iberia they were a staple food, according to Strabo.

Despite this long history, acorn is currently not a significant source of calories for modern societies. However, acorn still has been commonly utilized in Korean Peninsula. The oak trees cover about 67% of area under deciduous tree species and concentrated in the mid-southern part of Korea (Korea Forest Research Institute 1996). However, little study has been conducted to find out the fundamental reasons for the popular use of acorns and the recent change of acorn use in Korea. It is known that the oaks had been intentionally planted at the village area to replace the main food of rice in case the rice production declines (Lee *et al.* 2007). Recently, urban sprawl has decreased the number and size of oak stands and continuously gathering and collecting acorns can threaten the distribution of oak stands. Therefore, this study was conducted to determine the fundamental reason for the popular use of acorns in Korea and to suggest management guideline for the conservation of oak trees in Korea.

Methodology

An old Korean literature: Annals of Chosun Dynasty was reviewed, together with scientific papers on the distribution and regeneration of the red oaks (*Q. acutissima* and *variabilis*) among six main oak species. To quantify human acorn use, information on the normal use of acorns per one person was obtained from the website of Korea Forest Administration (www.forest.go.kr) and related agricultural publications.

This information was supplemented with the import and export statistics of acorns of ATKATI (Agricultural Trade of Korea Agro-Fisheries & Food Trade Information, www.kati.net). Nine *Maeulsoop* were selected to identify the diameter at breast height (dbh) distribution of *Q.acutissima* trees. The Ecopath with Ecosim (ver 6.3.8133.0) software was used to model the acorn volume with the interaction of human use, animal use and tree regeneration rate.

Results and discussion

The history of acorn use in Korea

Historical sites excavated at the east seashore of Pohang City revealed acorn hollows specially established to produce acorns during 6,500–6,200 BC (Hwang and Yoon 2002). Also, it was reported that nine historical sites showed evidences of cultivating tree nuts (Tsuji 1995, Ko 1995) during prehistoric periods. In the analysis of Annals of Chosun Dynasty, the term *Dotori* was mentioned a total of 31 times. During the Chosun Dynasty, officials would collect certain amounts of acorns from each county. Acorn had been prominently mentioned during 1451–1500. Collecting the acorns was an alternative way for preparing against famine year. There are also records from old literature describing the use of acorn by common people (Chang 1989). '*Dotori*' also means the nuts for wild boar (Hong 2005), and the nuts for wild boar were mentioned in the literature of *Hyangyakgugupbang* written in 1417. Therefore, Korean people have been utilizing acorns as food since 6,200 BC as alternative against famine year with low rice production all over the country. The popular use of acorns could be credited to the government's actions to reserve the acorns against varying harvest volumes of the main agricultural crops. Nowadays, Koreans still enjoy collecting and gathering the acorns from all over the country for some special dishes and also as a diet food. Hence, eating acorn has a long history resulted from the poverty-enduring wisdom of ancestors in mountainous monsoon regions in the Korean Peninsula.

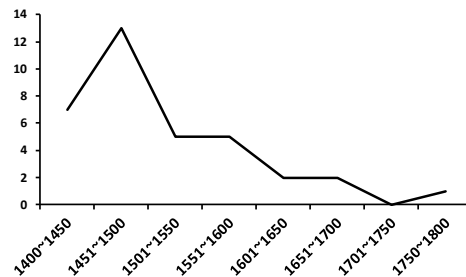


Figure 1. Yearly mention frequency of *Dotori* in Annals of Chosun Dynasty.

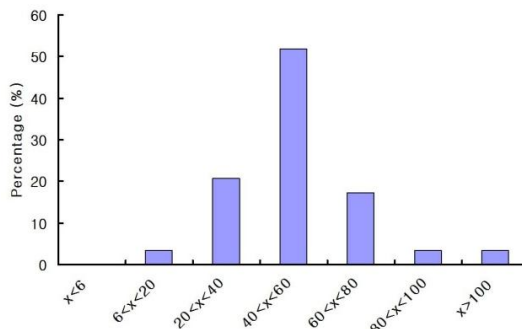


Figure 2. DBH distribution of *Q. acutissima* at the study sites.

Techniques to use acorns

In autumn, farmers collect the acorns (Tsuji and Yim 1986). Acorns were known to contain approximately 4–9% tannins in autumn (Kim 1995). Koreans have adopted the method of hydrolyzing tannin by suspending and continuously agitating the acorn powder in water (Kim and Shin 1975, Tsuji and Yim 1986, Kim 1995). Some devices for gathering and collecting acorns such as wooden mallets and acorn strainer made of *Lespedeza* spp. are still being used in some local areas (Tsuji and Yim 1986, Ko 1995). Gallic acids of acorn powder extracts were reported to have antioxidative activity (Kim 1995).

Distribution of Q. acutissima

Among the main six oak species, *Q. acutissima* bears relatively large amounts of acorns, and is one of the main species abundant in near village areas located at low elevation areas of mountains (Kim *et al.* 2008, Kim *et al.* 2009). The stands of *Q. acutissima* have been decreased by urban sprawling and the low survival rates of seedlings and saplings due to habitat deterioration and decrease of tree population. *Q. acutissima* has high rate of sprout growth and high growth rate at poor forest areas (Kim *et al.* 1981, Kim *et al.* 1984, Kwon *et al.* 2002). Among the six oak species, *Q. acutissima* and *Q. variabilis* belong to the red (black) oak (Song 2002, Park *et al.* 2006, Takamatsu *et al.* 2007), and they inhabit temperate region with annual mean temperature ranging from 5–14°C (Chung and Lee 1965, Yim 1968). The dbh of *Q. acutissima* from seven *Maeulsoop* showed normal distribution pattern. Therefore, there are few seedlings and saplings to succeed the current stands of *Q. acutissima*. This can be related with the intense use of *Q. acutissima* and trampling effects of people at the *Maeulsoop*.

Modelling the acorn volume

To model the acorn use, the traditional normal use of acorns was assumed to be 40kg/year/ha derived from the national statistics of acorn use. In case of conventional use, the acorn use was estimated as 120kg/year/ha - three times that of traditional use. The basic initial value of acorns was set as 300kg/m²/year, and the other factors are: raptors - 0.07, frugivorous birds - 0.9, granivorous birds - 1.1 and rodents - 1.3, respectively. Three trophic levels of multistanza were used in the regeneration of oak trees, saplings and seedlings. The modelling result showed that, in conventional way, the remaining acorn volume drops rapidly and will be depleted within 100 years. On the other hand, in traditional way, the decrease of acorn volume progresses in a lower ratio and acorns are still available within 200 years. More precise and field-based constant values in acorn models would need to be developed in the future. However, the negative impact of conventional acorn use was clearly found in the model. Korean people have developed and invented the traditional use of acorns in time of food shortage but contemporary use of acorns for special or diet food will do harm on the interaction networks among humans, animals and oaks. With official actions for preventing excessive collection of acorns, Korean should preserve the traditional wisdom and sustainable use embedded in complementary use of acorn.

Table 1. Basic statistics of conceptual model of acorn use between humans and animals.

Group name	Habitat area (fraction)	Biomass in habitat area (g/m ²)	Z (/year)	Production / biomass (/year)	Consumption / biomass (/year)	Unassimil. / consumption
Raptors	1	0.07		1	50	0.2
Frugivorous birds	1	0.9		1.2	80	0.2
Granivorous birds	1	1.1		1	100	0.2
Rodents	1	1.3		1.8	100	0.2
Oaks						
Oaks trees	1	300000	0.1		5000	0
Oaks saplings	1	1362239	0.08		7557.85	0
Oaks seedlings	1	5213.332	0.01		20057.53	0
Detritus	1	20				0

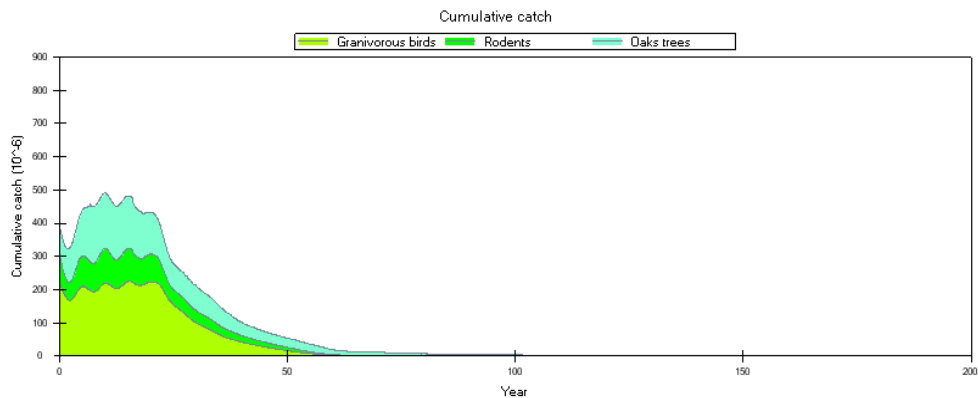


Figure 3. Estimation of conventional use of acorns in two hundred years.

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Traditional Forest Related Knowledge Mitigation and Adaptation to Climate Change: A Study on Forest Dependent Communities in Drought Prone Areas of West Bengal, India

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In an era of global climate change forests are required to be managed in such a way that they play a multifunctional role such as contributions to mitigation of climate change through carbon storage and livelihoods improvement of forest-dependent people (Benayas *et al.* 2009, Canadell and Raupach 2008, Chazdon 2008, Chhatre and Agrawal 2009, Pandey 2002). Traditional local knowledge plays an integral role in building climate resilience. Climate change has increasing impacts on rural poor populations, threatening livelihoods, food security, agricultural production and the forest on which people depend for their subsistence. Communities apply traditional knowledge in early warning systems that calculate risks or detect extreme weather events, droughts or floods. They use it in adapting subsistence strategies for agriculture, fishing and forestry, and improving water and resource management; enhancing ecosystems; selecting which resources to use to mitigate or adapt to climate change effects. The application of traditional knowledge is not only confined to the forestry section but also covers water management, soil conservation, biological control of pests and diseases, ecological agriculture and livestock practices enhances food security and prevents or alleviates poverty.

The paper addresses two responses to climate change: mitigation and adaptation. Reducing emission from deforestation and forest degradation has assumed to be a cost effective mitigation option of the climate change debate. In India, deforestation and degradation of forest is the result of illicit felling of trees, illegal encroachments, forest fire, over-exploitation of forest products and poverty. Water resource is also threatened by climate change and the shortage of water is acute in the drought-prone areas of India. The government of India has adopted Joint Forest Management (JFM) as a principal approach for community-based forestry. Under JFM the effective involvement of village communities in evolving sustainable forest management systems has been looked upon as an important approach to address the long-standing problems of deforestation and land degradation in India.

Some studies indicate that farmers do perceive that climate is changing and adapt to reduce the negative impacts of climate change (Mertz *et al.* 2009). Studies further show that the perception or awareness of climate change (Akteer and Bennett 2009) and taking adaptive measures (Hassan and Nhemachena 2008) are influenced by different socio-economic and environmental factors.

There are some literatures which study the impact of JFM on the wellbeing of the people and the impact of non-timber forest products on the subsistence and livelihood of the forest dependent communities (Sarker and Das 2008, Campbell 1993). However, the above studies on JFM fail to provide the insights into the environmental improvement strategy like decline in illicit felling of trees, prevention of forest fires and sustainable management of forests.

Given the backdrop, the objectives of this study are three folds. First is how JFM helped to reduce illicit felling of trees, reduce area under illegal encroachments, forest fire prevention and control through the involvement of local communities. Second is to examine household's adaptation options to reduce the adverse effect of climate change. In addition, the paper addresses the local knowledge of the forest dependent community to harvest and conserve the scarce water resources in the drought area.

Methodology

The study was conducted in West Bengal. The total recorded forest area in West Bengal is 1.19 million ha, which constitutes 13.38% of the geographic area. The study was carried out in the district of Bankura. This study was conducted in four villages- Bandhgaba, Dhansimla, Rangakula and Khayarakura, both are tribal based villages located in Sonamukhi forest area in the district of Bankura, one of the drought prone districts of West Bengal, consisting of 100 households in 2010. 25 households from each village have been selected on the basis of random sampling. The field work combined interviews and discussions with the local people and interviews with local experts and school teachers and other knowledgeable elders in the villages. A total of 100 structured household interviews were conducted.

Results and discussion

Forest fire is the most important cause of deforestation with incalculable harm to the forest area. Apart from destruction of plantations, it damages biodiversity including killing of wild animals thereby causing habitat destruction. Though, forest fire can be natural as well as man made, but carelessness of man is the cause of about 95% of the forest fires. The causes of forest fire in India include getting of fresh blade of grass, fodder, etc. Collection and use of non-timber forest products such as fires set for the purpose of collection of honey, Sal (*Shorea robusta*) seeds, and flowers of Mahua (*Madhuca indica*). etc.

A set of national guidelines on forest fires, which was issued to all states in 2000, stressed the importance of community involvement in forest fire prevention and control through the existing JFM programme (Hiremath and Schmerbeck 2007). Kumar Nanda and Sutar (2001) studied the management of forest fires through local communities in selected tribal districts of Orissa State, concluded that the forest dependent communities are interested to protect

forests and prevent forest fires because forests are of their sources of livelihoods.

Carbon sequestration and JFM

The carbon sequestration value of community-based forest protection is certainly substantial. A recent study in India found that carbon sequestration rates in regenerating forests under community and JFM systems ranged from 3.5 t of carbon per ha per year in the Western Ghats to 5.4 t C per ha annually in southwest Bengal. Even relying on more conservative valuations of carbon sequestration rates for dominant Indian forest ecosystems, JFM initiatives may already be capturing 5 to 10 million t of carbon annually.

Illegal encroachment of forest and JFM

In many areas JFM has helped to reduce area under illegal encroachments. For instance, in Andhra Pradesh nearly 12 percent of the encroached forest land has been vacated since the JFM programme was initiated (Mukherji and Rangachari 2000).

Afforestation and JFM

The centrally sponsored afforestation schemes are implemented via a two-tier system consisting of Forest Development Agencies (FDA) and JFM committees, which allow greater participation of the community in planning and implementation. The purpose of the National Afforestation Programme is to make JFM a central and integral part of all afforestation projects in the country. Thus, JFM helps to conserve forest resources in India. The following figures (Figures 1 and 2) show that trends of forest cover and planted forests are on the rise.

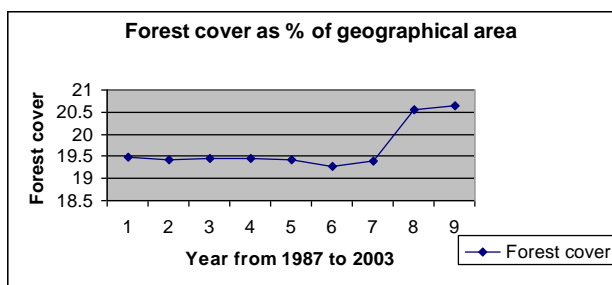


Figure1. Forest cover as percentage of geographical area.

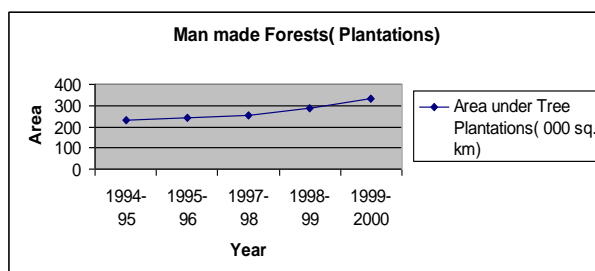


Figure2. Planned or Manmade forest.

Watershed management and JFM

Watershed management is adopted on a large scale for conserving rainwater and soil, and also for increasing production of rainfed systems. In the study area, which is, drought-prone, the local communities are taking interest and participating in watershed development, mainly to get additional water supply for drinking and irrigation. The additional water supply from watershed turned out to be the most important output, followed by increased production of grass for the livestock.

Role of Forest Protection committee in protecting forests in West Bengal

The forest protection committees under JFM are involved in reducing illicit felling of trees, reducing seized timber and protecting forest from the illegal loggings. Their active participation helped to reduce the illicit felling of trees over years (Figure 3). The volume of timber seized with the help of forest protection committees showed a declining trend (Figure 4). The number of people involved in logging also falling in West Bengal, as indicated by the number of people arrested in connection with loggings (Figure 5). This suggests that the forest protection committees and through the process of consolidation of JFM conserve the forest resources in West Bengal.

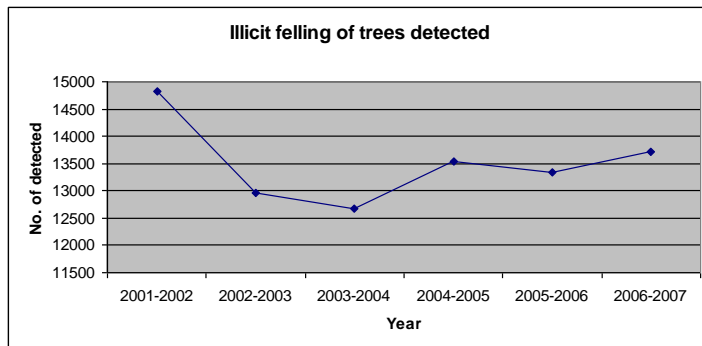


Figure 3. Illicit felling of trees.

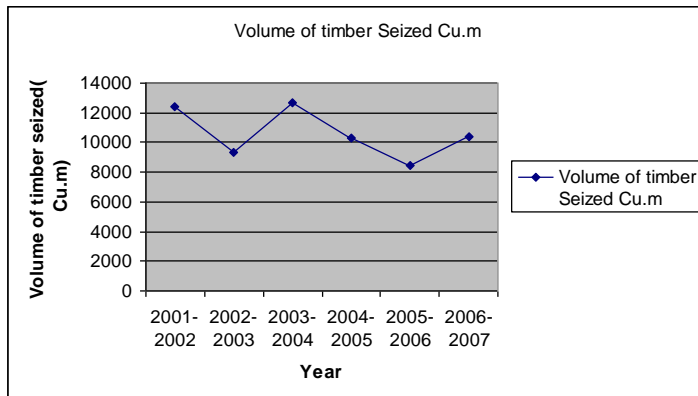


Figure 4. Volume of timber seized.

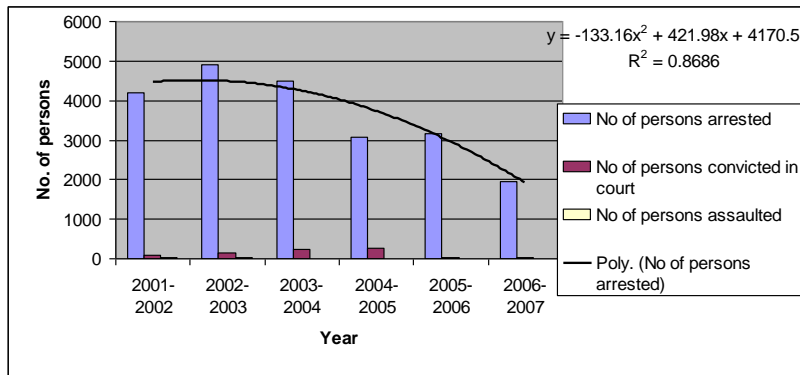


Figure 5. Number of people arrested for logging.

Over extraction of forest products and JFM

In the study area of West Bengal forest protection committee restricted the collection of NTFPs in excess of own requirement in JFM areas. The over extraction of fuelwood is completely prohibited in the JFM areas. This restriction on the use of forest products helps to reduce the degradation of forests.

The household's adaptation options are identified in order to reduce the climate change impact like migration, formation of self-help group (SHGs), accessibility of non-timber forest products (NTFPs) and livestock rearing and shown in Table 1.

Table 1. Adaptation strategy by the households in the four villages of the Bankura District.

Adaptation strategy	Bandhgaba Village (% of household responses (Yes))	Dhansimla Village (% of household responses (Yes))	Rangakula Village (% of household responses (Yes))	Khairakura Village (% of household responses (Yes))
Water harvesting in the form of digging and drilling for drinking water	100	20	100	100
Distress migration	76	56	4	8
Collection and sale of non-timber forest products	84	92	76	84
Formation of Self-Help Groups	4	8	24	24
Livestock rearing	92	88	92	92

Source: Field Survey

Conclusions

JFM does help to reduce illicit felling of trees, reduce area under illegal encroachments, forest fire prevention and control by community involvement and to enhance the forest cover through afforestation programme. Secondly, about 85 000 Forest protection communities are involved in the management of forests to arrest deforestation and land degradation in India. More than 17 million ha of degraded land are managed under JFM. Thirdly, forest protection committee restricted the collection of NTFPs in excess of own requirement in JFM areas. The over extraction of fuelwood is completely prohibited in the JFM areas.

This paper has also identified the household's adaptation options like migration; formation of Self-help Group, water harvesting and accessibility of non-timber forest products and livestock rearing. The paper has important policy implication for forest conservation, sustainable forest management practices, and rural development.

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Impact of *Hani* People's Traditional Knowledge on Forest Biodiversity

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Forests have always provided great material and non-material wealth especially for sustaining livelihood and environment (Lawrence 2007). It contributes important economic, social, cultural and ecological values for human society, and is the survival and livelihood base for some local and indigenous communities widely spread from South Asia to Africa, post-communist Europe to Latin America. Some inhabitants have even adored their forests as god. Thus they had generated and accumulated abundant experiences, practices and knowledge on the conservation and utilization of forest biodiversity. These have been collectively known as traditional ecological knowledge (TEK) (Wenzel 1999, Huntington 2000), indigenous knowledge (IK) (Gadgil *et al.* 1993) or traditional knowledge (TK) (Barrance 1995, Xue *et al.* 2009). During past decades, the values of traditional knowledge and the benefits of community-based management have been demonstrated in many case studies (Berkers *et al.* 2000). The present study was formulated to identify the key factors of traditional knowledge which affected the forest biodiversity also by case study of the *Hani* community in Yunnan Province, southwest of China.

Methodology

Located in Yunnan Province, southwest of China, the Yuanyang County is well-known for the grand *Hani* Rice Terraces, which in 2010 has been recognized as one of the Globally Important Agriculture Heritage Systems (GIAHS, established by FAO) and also been nominated as one of the candidates of Cultural Heritage of the World submitted by China in 2013. The *Hani* Rice Terraces is a complex agriculture eco-system, which is integrated by interacted forest-village-terrace fields-rivers and is with distinct vertical elevation gradient. Forest takes an important role in this complex system for providing water resource and maintaining the balance of the system. Realizing the significance of forest, the *Hani* people take seriously measures to protect and sustainable use the forest. Their forests are divided into two types by tenure: collective forest managed by the community, and private forest owned by each household. Generally, every

Hani village possesses more than one special protected collective forest that is known as the Holy Forest. Besides, there is another rehabilitated forest which was recovered from farmland since 2001, and belong to households. This study covers all the three types of forests: the Holy Forest, Private Forest and Rehabilitated Forest; and discusses the causes resulted in the difference among these forests.

Qingkou Village, a typical *Hani* community with a population of 988, was selected as the research site. The quadrat sampling method is adopted to survey community structure and tree diversity by measuring nine 20x20m quadrats selected randomly from the Holy Forest, Private Forest and Rehabilitated Forest (three quadrats from each type of forest). Addition information on traditional culture, forest management and government policy on forest were gathered from interviews of the elders (the nominal, spiritual leaders of village), *Mopi* and *Migu* (priests of *Hani*), villagers, leaders (administrative leaders of village) and the town officials.

Results and discussion

Difference of community structure

There is a significant difference among the Holy Forest, Private Forest and Rehabilitated Forest in community structure (Figure1). The tree layer is very predominant but the shrub and herb layers barely exist in the Holy Forest. Whilst, the Private Forest community is very distinctly layered into the three layers, and the herb layer occupies predominantly the Rehabilitated Forest. The other notable distinction is that the Holy Forest is over-matured, the Private Forest near-matured and the Rehabilitated Forest young growth.

Difference of tree biodiversity

Based on the measurements from the nine quadrats, the Private Forest has the maximum number of tree species, 27 compared to 17 in the Holy Forest. The Rehabilitated Forest has the minimum of only nine species. The tree biodiversity index shows a similar trend (Figure 2). Further, there is notable difference on tree species among the three forest types: compared with Private Forest, the Holy Forest's construction/utility species diversity is much richer, and the Rehabilitated Forest is mono-species with artificial planted *Alnus nepalensis*.

Forest related traditional knowledge of Hani people

The traditional knowledge of the *Hani* people on forest comprises their religion and faith, festivals and rites, customary laws and traditional management. *Hani* people believe in nature religion, which means that they adore nature. *Hani* people worship the sun, the moon, mountain, river, wildlife and other natural matters, and they have special ceremonies for these worships. Human-nature harmony ideology deeply influences *Hani* individual in their thinking, actions and living. When the *Hani* establish a new settlement, they must select at least one exuberance forest as the Holy Forest, and the number of the Holy Forest depends on the dimension of the village, e.g. Qingkou village has three Holy

Forests for different worships function. The adjacent larger Quanfuzhuang village has seven Holy Forest.

The *Hani* people have developed a lot of traditional festivals and rites for worshipping the patron gods of the village and the mountain which are directly related to forest. The most important religious festival for *Hani* people, the *Angmatu*, is the ceremony to worship their village god in the Holy Forest. This is also the *Hani* New Year celebrated in the tenth month of the Lunar Calendar. All male adult villagers have to take part in the *Angmatu* celebration and each household has to provide a meal to the Holy Forest for the village god. The whole rite is guided by the *Migu*, and the process ends with a feast for all in the Holy Forest.

As the basic unit of *Hani* society, each village has developed a series of customary laws for managing natural resources and solving the domestic disputes among the villagers and grievances with other villages. The *Hani* customary laws involve almost every aspect of livelihood, as well as the utilization, management and protection of forest. The traditional management of forest of *Hani* is mainly reflected in tenure definition and diversified utilization of forest. They divide the forest into collective type and private type by tenure. The collective forest belongs to the village collectively, and the private type belongs to individual families. These two different forests provide different services. The collective forest is to serve as water catchment to supply sufficient water for agriculture and human consumption, as a habitat for wildlife and also as the religious platform. The private forests supply wood products such as timber, and non-timber forest products like herbs and potherbs.

Impacts of traditional knowledge on forest

Combined with the sociological investigation on traditional culture and management of local community, the analysis indicates that: the different utilization and management practices are the main causes to the above mentioned marked difference of the community structure and tree diversity, while religious practices, customary laws and indigenous forest management are the crucial factors among others. The strict protection of religious culture and customary laws on the Holy Forest maintains its original tree layer, but regular large-scale worship activities caused excessive disturbance which led to near zero undergrowths. Indigenous forest management has achieved sustainable utilization in the Private Forest. The Rehabilitated Forest faces the threats associated with mono-species, and invasion of *Eupatorium adenophorum* as a result of mismanagement. This is due to lack of active participation of local community in this government-implemented program and the limited time for local residents to create new management measures.

This research shows that community-based forest management can lead to more efficiency in the areas where there are strong local institutions and rules managing natural resource (Hays 2006, Ellis *et al.* 2008). Participatory forest management could be another feasible approach (Lawrence 2007). Defining the tenure clearly, ensuring equitable benefit sharing, and establishing and implementing effective rules and developing powerful institutions are essential

for sustainable utilization of forest (Ostrom 2009, Ostrom 2010). As 22% of all forested land in developing countries and 11% worldwide is owned and operated by local and indigenous communities(White and Martin 2002), it is therefore necessary to recognize, adapt and integrate traditional culture and indigenous forest management of local community when government develop and implement forestry policies.

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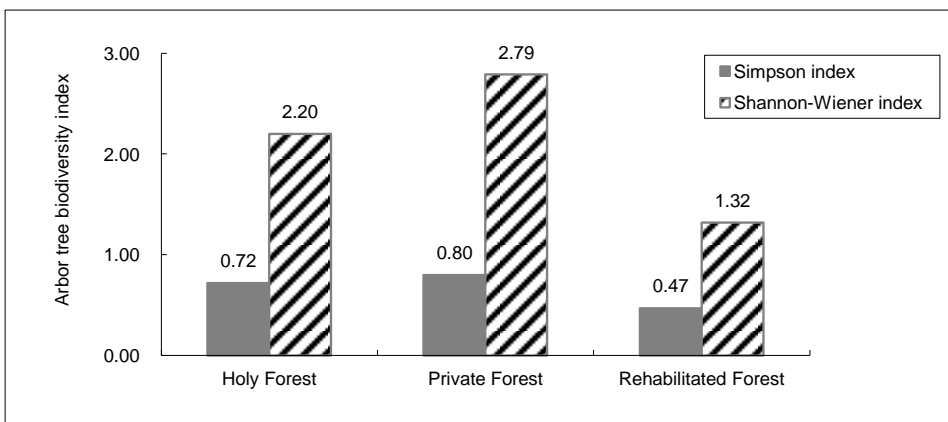


Figure 1. Comparison of tree biodiversity among the Holy Forest, Private Forest and Rehabilitated Forest.

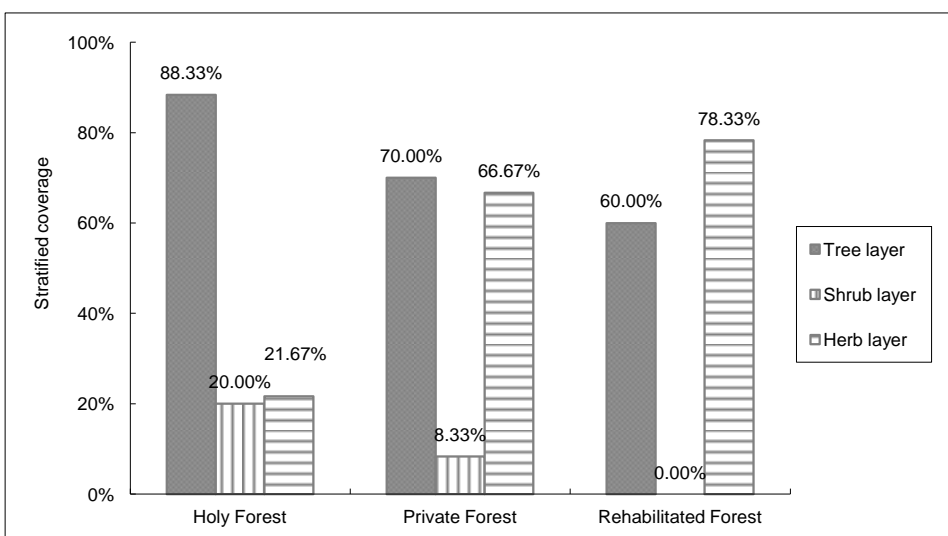


Figure 2. Comparison of community structure among the Holy Forest, Private Forest and Rehabilitated Forest.

A Study on Collaborative Management for Korean Village Groves

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Korean village groves are the heritage sites of Traditional Forest-related Knowledge (TFRK), which contain the history and culture of ancestors for thousands of years. They are the common pool resources as they have been directly related to the life of the villagers and protected by them. However, as time went by, many village groves were damaged and many remained without proper management (Kim and Jang 1994).

In theory, there are four theoretical land management regimes for village groves 1) privatization, 2) governmental regulation, 3) self-organized governance, and 4) co-management regimes. Co-management regimes are widely used in a range of common property resources – forests, pastures, wildlife, fisheries, watersheds, or protected areas. Co-management will enhance the efficiency and the equity of the common property resource management (Berkes and Preston 1991, Jentoft 2004, Carlsson and Berkes 2005, Sandstrom and Widmark 2007).

Then, which management system is effective in order to preserve the Korean village groves? Organization in charge of grove management is one of the most critical factors that influence the loss of Korean village groves (Kim and Youn 2005, Koo *et al.* 2010). However, so far, there has been no study on the management organizations of Korean village groves conducted through empirical and theoretical analysis.

The objectives of this research study are: 1) to understand how village groves are being managed, 2) to identify the roles that each stakeholder plays, and 3) to analyze how the cooperative relations are among the stakeholders who participate in management of village groves.

Methodology

34 village groves in Namwon City were chosen to investigate which stakeholders are participating in the management of the village groves. Information was collected by means of a questionnaire and field survey. The village groves were divided into two groups, namely self-management and co-management according to the number of participants in management. The village groves were regrouped into three cases: private, state or village commons depending on the ownership. Six village groves were selected to represent the six groups and social network analysis (SNA) was applied to investigate the management status

and the degree of cooperation between stakeholders for each village grove. A total of 143 survey responses were studied through social network analysis.

A matrix that shows the presence or absence of interrelations among the stakeholders who have interests in the management of village grove was created. A complete network with the degree of a relationship expressed in number was employed. The characteristics of the network structure based on the way the stakeholders are participating in management of the village grove and the relationship between main players were analyzed.

Results and discussion

From the field survey conducted in the 34 village groves located in Namwon City, 16 (47%) villages managed the groves by themselves. Ten (29%) village groves are managed by more than one management bodies in cooperation. There are three groves (9%) being managed by private individuals. Three (9%) are not managed and two (6%) are managed by the government. Table 1 shows forms of ownership according to type of management body

Table1. The ownership according to management body.

Management body	Government	Village	Individual	None	Collaboration	Total
Ownership						
State	1	5	-	1	1	8
Village	1	9	-	-	6	16
Private	-	1	3	2	3	9
Other	-	1	-	-	-	1
Total	2	16	3	3	10	34

In the case where the village manages the grove by themselves, village-owned groves account for nine which is the largest in number, followed by those owned by the government. On the other hand, all the village groves managed individually are owned privately. Those village groves are not being managed are owned either by government or by individuals, and all owned by the villages are being managed. As for the village groves managed by more than one management bodies, six are village-owned, three owned privately, and one government-owned.

The stakeholders who participate in the management of Korean village groves are the village representatives, villagers, township officers, city officers, NGO (none-governmental organization), and researchers. Among them, the village official representative is at the centre of the network of these stakeholders and plays a role bridging villagers and government. Also, rarely NPOs and researchers take part in management of village groves.

Table 2. Partnership between stakeholders according to ownership of village grove.

	State owned	Village owned	Private owned
Density of connection	0.0999	0.0939	0.0555
Inclusiveness of connection	0.6250	0.8439	0.4382
Degree centrality	2.4500	2.1135	1.0000
Between centrality	5.0335	7.5450	2.7370

Table 2 shows the network characteristics according to ownership. In case of state-owned and village-owned groves, densities of connection were 0.0999 and 0.0939, respectively, showing similar scores, whereas privately owned groves showed a slightly lower score. As for inclusiveness of connection, village-owned groves scored the highest (0.8439) followed by state-owned and then privately owned groves. As for between centrality, likewise village-owned 7.450, followed by state-owned and privately owned groves.

Table 3. The partnership between stakeholders according to numbers of management.

	Self -management	Co-management
Density of connection	0.0559	0.1103
Inclusiveness of connection	0.4701	0.8013
Degree centrality	1.2456	2.4633
Between centrality	3.9950	6.2140

Table 3 shows comparisons among the network characteristics according to types of management. Self-management scored 0.05 and co-management 0.11 in density of connection. As for inclusiveness of connection, there was a large difference between self-management which scored 0.47 and co-management 0.80. As for degree centrality too, a big difference was observed between self-management (1.24) and co-management (2.4). Between centrality showed that self-management was 3.990 and co-management 6.2.

This result shows that the 'co-management' groups have a higher level of cooperation and better managed than the 'self-management' group. In conclusion, a co-management regime seems to be more effective where various participants take part in order to manage village groves properly.

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Forest-Related Policy Interventions to Local Traditions of the Dong Minority: A Case from Shangxiang Village of Hunan Province, China

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Shangxiang, a typical *Dong* minority village, located in the hinterlands of Tongdao Dong Autonomous County in Hunan Province, has kept relatively pure traditional culture of the *Dong* ethnic minority, who lives on agriculture and forestry. Increasing marketization has seemed the intertwining of national forest-related policies and the traditional forest-related knowledge in the village. This paper narrates two stories of Shangxiang: “the protection of Houlongshan” and “the timber use in home rebuilding projects after fire disasters”, to show how policy interventions of “the forestland tenure reform” and “the government aid” mingled with traditional knowledge

Study details

From 28 June to 6 July 2012, questionnaire survey to 28 households in the Shangxiang village was conducted. This was to collect basic information of household resources, livelihood, production, forest management and traditional knowledge in both household level and village level. In-depth interviews were also held with key villagers, such as the oldest man for the history, the village head for the current situation and the young leader for the social network of the village. These were supplemented with information gathered from group interviews with elder men for the *Fengshui* map; and with village leaders for information on the forestland and the rebuilding after fire. Lots of informal information about the village, particularly the traditional culture, were gathered from the interactions with the villagers while staying in the village during the study.

There were 191 households and the population was more than 800 in this village, with relatively simple farming lives. The village has abundant forest resources and has accumulated traditional knowledge for managing the resources since hundreds of years ago. It has customary rules and folk agreements, which include the followings:

- (1) Drum tower, *Fengyu* (wind and rain) Bridge have been the public places for making common decisions by a group of selected male elders in most cases. Women were not welcome to these public places, and even

until now, women also rarely go there. The primary school in this village has around 100 years history and being considered as startup of modern education in the county, and being considered as one of public spaces for community decision making.

- (2) As the houses in the village are mainly made of wood, fire prevention is very critical. There is a fire alarm system in the village whereby at 9:00 pm every evening, a villager will walk through the village beating a gong and calling out to remind every villager to be careful with fire.
- (3) The area of Houlong Mountain is currently 8.7 ha. In 1808, the villagers had sworn a blood oath and reached an agreement that no one should cut trees on the Houlong Mountain, otherwise he would be punished by heaven, and he would need to slaughter a pig for sharing with all the villagers.
- (4) There are other customary rules, such as mutual assistance without any conditions.

These folk agreements are all the traditional knowledge. However, with increasing marketization, policies of the state often in conflict with the traditional knowledge in this small village.

Results and discussion

Collective Forest Tenure Reform and the Protection of Houlong Mountain

In 1950s, the area of Houlong Mountain was five times larger than now. During the period of “Great Leap Forward”, the village cut down 80% of the original *Fengshui* forest leaving behind only 8.7 ha.

In late 2007, when the Collective Forest Tenure Reform was launched and allocating collective forest to individual households, it was decided that the Houlong Mountain shall remain to be managed by the village as a whole. At the same time, however, the village allocated another collective forest to the households. Villagers maintained that the remaining 8.7 ha was for the sake of protecting the village from mountain fire, upholding the blood oath 200 years ago, and also adhering to the *Fengshui* theory.

The case shows that modern policy is adapting to the traditional knowledge, in formulating local natural resource management practice. In this “integration model”, outside policies intervention can be reinterpreted through the lens of village traditions by community people, and then will be integrated with the village tradition as indicated in Figure 1.

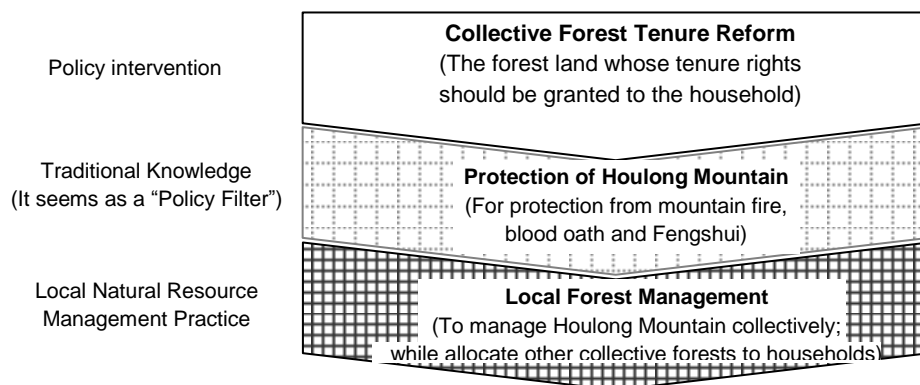


Figure 1. Integration model for the relation between policy intervention and traditional knowledge in local natural resource management practice.

Timber use of government aid and local resilience in home rebuilding projects after fire disasters

Wooden houses are the crucial link between nature, society and people in *Dong* villages. So timber use is an important issue for *Dong* village. There were two large fire disasters, one in the 1950s and the other in March of 2012. In the 1950s, the rebuilding was by households themselves. Mutual helps from other villagers, or even from outside relatives were usual. The timber for building houses were from household itself or from relatives at a very low price. So the size of new house was decided by available timber quantity.

On contrary, in 2012, the fire disaster has attracted attention of the entire county. It was with the help of the government that the fire was finally put off. Then the government intervened the rebuilding of the village, and new houses were uniformly planned and built by outsiders. Villagers accepted the government's help at first. The full process seemed very natural. Then, however, timber had to be bought at a higher price because of the rebuilding dominated by the government by a formal process, and the quality of rebuilt houses was generally poor for lack of effective monitoring. The higher price and poorer quality made villagers unhappy.

Compared with the former case, outside intervention was not filtered by the traditional knowledge here, thus has conflict with the tradition. Though the interventions from government brought a wider range of resources, local resources and capacity of management and monitoring were not utilized. Outside interventions which disregarded local tradition, on increased the costs of rebuilding and decreased the efficiency and finally led to the real conflict. This "conflict model" has outside modern policies in conflict with the village tradition, resulted in failed village and forest management practices. It can be demonstrated by Figure 2.

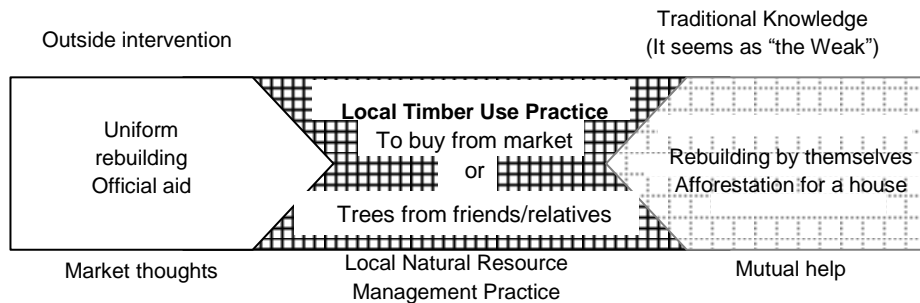


Figure 2. Conflict model for the relation between policy intervention and traditional knowledge in local natural resource management practice.

Recommendations

According to the two cases mentioned above, a proposition can be concluded: the encounter between national policy intervention and traditional knowledge in communities may take the form of integration or in conflict. When tradition is more dominant, the two would integrate into a new practice; otherwise, the two in conflict would lead to failure and unacceptable outcomes.

Based on the proposition, there will be three relevant issues: (1) Under the background of marketization and globalization, in what kind of events tradition would be more dominant and in what kind of events modern intervention would be more dominant? (2) Tradition should be passed on to the next generation only by daily lives, but the trend of finding jobs outside makes the inheritance worried. So would tradition be weaker in the future and when interventions introduce, conflicts would happen more and more? And (3) what are additional lessons that one could learn from these? A perspective of actor-oriented approach would provide more comprehensive and dynamic awareness of the interaction between tradition and modern interventions at the interface (Long 2001).

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TFRK in Korean Proverbs

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With increasing interest in indigenous knowledge on resource management, traditional forest-related knowledge (TFRK) has gained prominence. As a field developed to understand alternative perspectives on modern environmental issues, with the specific features of “traditional”, traditional ecological Knowledge (TEK) or TFRK explores the indigenous understanding of nature and its resources and thereby formulates alternative theories on natural resources management. However, TEK and TFRK have not yet gained sufficient scholarly attention, especially from Asian scholars, when compared to modern sciences, even though many countries possess rich cultural resources which can be a starting point of TEK or TFRK research. These cultural resources include existing landscape features, local management practices, and even stories and proverbs.

Berkes (1993) stated that as a qualitative, holistic, moral, and spiritual field TEK needs to include empirical examinations based on experimental approaches to data obtained by local resource users. Proverbs, therefore, are an especially appropriate source in researching TEK or TFRK, as proverbs include histories, thoughts, religious beliefs, literature, superstitions, customs and cultural systems (Song 2006) of a certain ethnic group.

In this regard, this paper describes the appreciation towards forests and trees in traditional Korean society. This was done by examining forest-related Korean proverbs, and linking these with some related practical examples of forest management at the village level. The specific examples are the pine tree protection policy of Joseon Dynasty, the case of song-gye, and a village forest called Sillim located in Wonju, Gangwon Province. It also shows how traditional belief systems are interrelated with the acquired forest management practices. As a result, this study aims at developing an integrated perspective of Traditional Ecological Resource Knowledge (TERK), so as to contribute to the current TEK and TFRK academic discourses.

Methodology

In order to analyze forest-related proverbs, proverbs associated with trees and forests have been collected from two major representative proverb dictionaries in Korea. These proverbs were classified into groups that share similar themes. After the categorization of the proverbs, some practical examples within existing landscapes are discussed in connection with the analyzed proverbs.

Results

A hundred and sixty-six relevant proverbs have been found, and these were classified into two groups under the theme: the species of trees/plants mentioned, and the functions of proverbs. The most frequently mentioned tree/plant species is the pine tree, with a frequency of 17 times. This result is similar to that of the frequency analysis of tree/plant species in forest-related legends reported by the Korean Forest Research Institute (2011).

Table 1. Frequency analysis of tree species in forest-related proverbs and legends.

Frequency of Mentioned Tree Species	Legends (41) (KRFI. 2011)
Pine Tree, 17 times	
Nut pine, 5 times (always with pine tree)	
Persimmon tree, 5 times	Pine tree, 13 times
Willow, 4 times	Ginkgo, 7 times
Bamboo, 4 times	Camphor tree, 2 times
Mulberry tree, 3 times	Elm tree, 2 times
Peach tree, 3 times	<i>Caragana sinica</i> , 1 time
Jujube tree, 3 times	Zelkova, 1 time
Ginkgo, 2 times	Birch, 1 time
Royal foxglove tree, 2 times	Chestnut tree, 1 time
Birch, 2 times	Oak, 1 time
Cassia bark tree, 2 times	Royal foxglove tree, 1 time
Bumalda , 2 times	Ginseng, 1 time
Alder tree, 1 time	Nut pine, 1 time
Honey locust, 1 time	Fir tree, 1 time
Oak, 1 time	Oak species, 1 time
Plum tree, 1 time	Broadleaf tree, 1 time
Zelkova, 1 time	Pagoda tree, 1 time
Kalopanax, 1 time	
Tea tree, 1 time	
Trifoliolate orange, 1 time	

This implies that the pine tree is a species that has been grown most widely and commonly in the Korean Peninsula, and has been placed in a variety of spiritual and cultural activities of the Korean people, which, as a result, some scholars labelled this as pine tree culture (Lim *et al.* 1997). In fact, the pine tree is also mentioned in the Korean national anthem. Some examples of pine tree culture in the past include a pine tree protection policy in the Joseon Dynasty and the song-gye. The pine tree protection policy is understood as governmental efforts in ensuring its favoured resources for national emergencies and needs (Yun 2004). Whereas song-gye was a self-governing local organization that set rules voluntarily to preserve the environment and sustainable use of the species by village people in the Joseon Dynasty (Yun 2004).

Second, the proverbs are also categorized based on their functions. The analyzed functions are: 1) religion and belief, 2) care of forests, 3) living organism-related knowledge, 4) customs, 5) disaster, 6) ecology of tree, 7) metaphor for humans, and 8) seasonal knowledge. In particular, some proverbs that illustrate the ecology of trees also provide insight into the people's perspective on the sustainability of life. For instance, the proverb "if the pine shoot grows tall, comes a bumper year" indicates that spring rain was much appreciated in Korea. In the Korean climate, as spring rain falls in the dry season, the use of water, a factor restricting primary productivity, increases, and, as a result, photosynthesis is activated. This positively influences the growth of buds of pine trees in spring. Therefore, thanks to the spring rain, buds grow well, and rice-planting works well. Other spring rain related proverbs such as "spring rain is rice rain" or "housewives become generous when spring rain falls" can also be interpreted in the same vein.

Another interesting group of proverbs is that related to people's traditional customs. There are a few proverbs containing 'a shade tree' which usually stands at the entrance of a traditional Korean village. The shade tree sometimes becomes many trees as in a grove, which is called a 'village grove' or 'village forest' (Kim and Kang 2007). This village forest served as one of the key centres of a village community, together with the well. If the area surrounding the village well was the communal place where villagers obtained water, the village forest was where people conserved water (Society for Forests and Culture 2006). Such practices and customs have formed unique landscape features and culture in villages. Spiritual rites such as Dong-je are observed once or twice a year as part of the village forest culture (Choi 2004). Some of village forests still exist, such as the Tutelary Forest of Seongnam-ri in Wonju, Gangwon Province, which is a good example of a village forest that has historical, spiritual, and ecological functions.

Further research

The present study provides a useful understanding of the fact that traditional proverbs are good information sources for TEK or TFRK research, as the indigenous ecological knowledge reflected in proverbs can be related to examples of existing landscape elements. In analyzing forest-related proverbs, it has been found that the Korean people used to cherish trees and had developed distinctive forest related practices and cultures. Pine tree culture and village forest culture are discussed as two empirical examples in this study. A more developed methodology in analyzing proverbs as well as more scientific and holistic approach in linking the proverb analysis with empirical examples could be useful for further research along this line. The comparison of forest-related proverbs among other Asian nations would also be another interesting subject for future research.

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Programme

4 November	Participants picking up at Xianyang International Airport/ Registration	
5 November		
Morning	Opening of 2012 Yangling International Agri-science Forum Forum presentation	
Afternoon	Meeting Room of South Campus Library	
	Opening	Prof Zhao Minjuan
14:00-15:40	Dr. Abd LATIF Mohmod, Chair APAFRI, DG FRIM Prof. HOU Xuexi, Dean College of Economics and Management, NWAUFU Dr. LIU Jinlong, Director CFRPS Dr. KOO Gil Bon, DG KFRI – New paradigm toward Asian Center for Traditional Forest-related Knowledge <i>Prof. Henk FOLMER</i> –The impacts of management reform on irrigation water use efficiency in the Guanzhong Plain, China	
15:40-16:10	Tea break and group photo	
Session I:	Resource management and rural development	Prof Yin Runsheng
16:10-16:40	<i>Dr. Abd LATIF Mohmod</i> – Forestry and forestry research – contributing to greening the Asia Pacific	
16:40-17:10	<i>Prof. YOUN Yeo Chang</i> – Science, tradition, culture and for sustainable society: the case of forestry	
17:10-17:40	<i>Dr. QIU Zeyuan</i> – Watershed management: A case study in Neshanic River Watershed in New Jersey, USA and implications to managing watersheds in China	
18:00-19:00	Welcome dinner – Yuanzhongyuan Restaurant, South Campus of NWAUFU	
6 November	Meeting Room of South Campus Library	
Session II:	Understanding TFRK and sustainable society in the context of contemporary world	Dr. Sim Heok Choh
08:30-09:00	<i>Dr. LIM Hin Fui</i> – Application of TFRK in forest resource management: A case study in Malaysia	
09:00-9:30	<i>Prof. LIU Jinlong</i> – Critical issues related to traditional forest-related knowledge and culture.	
9:30-10:00	<i>Dr. SUNG Joo Han</i> – The establishment and future direction of Asian Centre for Traditional Forest-related Knowledge	

- 09:50-10:10 Tea break
- Session III: TFRK in Asia – policy perspective Prof Youn Yeo-Chang**
- 10:30-11:00 *Prof. Yi Cheongho* – The Institutionalization of Sa-tree and its significance in forest culture and environment
- 11:00-11:30 *Dr. LUO Yaofeng* – Study on the cypress cultural and protection in the mausoleum of Yellow Emperor in Shaanxi Province
- 11:30-12:00 *Dr. Pham Duc Chien* – Cultivation and uses of non-timber forest products using indigenous knowledge in the Northwest of Vietnam
- 12:00-13:30 Lunch – Yuanzhongyuan Restaurant, South Campus of NWAUFU
- Session IV: Understanding TFRK for livelihood Prof Yi Cheong-ho**
- 14:00-14:30 *Dr. YUAN Juanwen* – Documenting traditional forest-related knowledge in Dong Minority Regions in Southwest China
- 14:30-15:00 *Dr. Leni D. CAMACHO* – Traditional forest-related knowledge and culture of indigenous peoples in the Cordillera, Northern Philippines
- 15:00-15:30 *SOMNATH Ghosal* – Sustainable forest ecology management: Religious faith, believes and practices
- 15:30-16:00 Tea break
- 16:00-16:30 *Dr. Arsenio B. ELLA* – Traditional knowledge and practices in harvesting wild honey by indigenous people of Palawan, the Philippines
- 16:30-17:00 *Dr. PARK Chan Ryul* – Ecological roles of Korean people for sustainable use of acorns
- 17:00-17:30 *Dr. Jyotish BASU* – Traditional forest related knowledge mitigation and adaptation to climate change: A study on forest dependent communities in drought prone areas of West Bengal, India
- 17:30-18:00 *Prof. Yi Jae-Seon* – Traditional Knowledge on forest plants in Gangwon Province of Republic of Korea
- 18:00-19:00 Dinner – Yuanzhongyuan Restaurant, South Campus of NWAUFU
- 7 November Meeting Room of South Campus Library**
- Session V: Youth Forum on TFRK Prof Park Chan Ryul**
- 08:30-08:55 *YANG Jingbiao* – The impact of *Hani* People’s traditional knowledge on forest biodiversity
- 08:55-09:20 *LEE Eun-Hee* – A study on collaborative management for Korean village groves
- 09:20-09:45 *Zhang Minghui* – Forest-related policy interventions to local traditions of the *Dong* minority: A case from Shangxiang village of Hunan Province, China
- 09:45-10:10 *KIM GoWoon* – TFRK in Korean Proverbs
- 10:10-10:30 Tea break

10:10-11:10	Open forum	Prof Liu Jinlong
11:10-11:40	Discussion and summary	Prof Liu Jinlong
11:40-12:00	Closing remark	Prof Liu Jinlong
12:00	Lunch – Yuanzhongyuan Restaurant, South Campus of NWAUFU	

Afternoon: Visit to Agricultural History Museum **Dr. Luo Yaofeng**

November 8 Terracotta Warriors, City tour of Ancient Xi'an

November 9 Departure from Xi'an

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