Adaptation in Forest Management Under Changing Framework Conditions

19-23 May 2014
Sopron
Hungary

Proceedings

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IUFRO Research Groups
3.08.00 – Small-scale forestry
4.05.00 – Managerial economics and accounting

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Faculty of Forestry, University of West Hungary
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Editors:
Endre SCHIBERNA
Magdolna STARK

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Preface

On behalf of the organizers, it is our honour to present the Proceedings of the IUFRO Symposium *"Adaptation in Forest Management under Changing Framework Conditions"*. The Symposium was jointly organized by two IUFRO Research Groups: *Managerial Economics and Accounting* and *Small-scale Forestry*. The common ground for discussion is provided by the importance of social and economic considerations in finding solutions to future challenges of sustainable forest management.

Forests are exposed to a wide range of changes due to their ability to survive for decades and centuries. So is forest management, which must harmonize the shifting demands for the various services of forests with the supply determined by the current state of forests, while maintaining the forests' ability to adapt in the future.

Contributions from all over the world draw a lively picture of how the various large-scale changes are observed and addressed. This variability highlights the importance of such meetings, where researchers can meet and ideas can be shared.

Endre SCHIBERNA

Editor

Rattan Resource Scarcity as a Consequence of Unsustainable Development and National Strategy: Case Study in West Kutai, East Kalimantan, Indonesia

Ramadhani ACHDIAWAN*

Center for International Forestry Research (CIFOR), Indonesia

Rattan was an important source of income for people in upper Mahakam watershed, West Kutai District, East Kalimantan, Indonesia. Before the massive land conversion to coal mining, oil palm and rubber plantation, rattan played role as their bank account. In the past, owner of rattan gardens harvested their rattan stems when they had to send their children to school, held wedding party and other important occasions. However, in a recent decade, they have abandoned their rattan gardens. Some have been converted into coal mining, rubber or oil palm plantations. Domestic rattan furniture and handicraft industries suffered due to raw material scarcity. Since 2011, Government of Indonesia has fully banned export of raw and semi-finished rattan in order to survive domestic industry. However, this policy has worsened the price of rattan in the upstream. Government of Indonesia has to develop national strategy to sustain rattan supply and recognized role of rattan in forest conservation.

* r.achdiawan@cgiar.org

Forest Owners' Perceptions about the Forest Management Adaptation to Climate Change

Laura BOURIAUD* – Vasile-Cosmin COSOFRET – Mihaela MUTU – Liviu NICHIFOREL

Forestry Faculty, "Stefan cel Mare" University of Suceava, Romania

Forest management adaptation to the climate change is a matter of forest type, disturbances regime, but also a matter of forest owners' behaviour face to the climate change issue. A study was conducted in North-Eastern Romania with the aim to identify the perceptions and attitudes of private forest owners regarding the forest management and, particularly, the needs to adapt the forest management to the climate change. The responses to the 130 questionnaires were analyzed with Principal Component Analysis. Most forest owners have few information about climate changes and its possible effects, and they do not believe in their existence. Only few owners believe that taking action to adapt to climate change may reduce the risk of damage by wind, drought, fungi, and insects. The analysis revealed that the adaptation of forest management to the new climatic conditions is not a matter of perceiving the risk of the climate change, but a matter of priorities: for instance, the forest management is problematic in the perception of the forest owners, with many unsolved issues. For example, in relation to private forest management, it appears that forest owners perceived that forest ownership brought them more problems than benefits, e.g. how to guard forests against the firewood theft, or how to obtain harvesting permits or establish forest management plans that will allow them to withdraw timber for the household needs. We conclude that adapting forest management to climate change is in fact pending on forest owners' perceptions and views about the stressing problems of today's forest management.

* Corresponding author: bouriaud@gmail.com

Family Forest Ownership Research in the United States: Past, Present and Future

Brett J. BUTLER[a*] – Sarah M. BUTLER[b] – Jaketon H. HEWES[b]

[a] USDA Forest Service
[b] USDA Forest Service, University of Massachusetts Amherst Family Forest Research Center

Families and individuals own a plurality of forest land in the United States – 114 million ha (282 million ac). This group, collectively referred to as family forest owners, is as diverse as the land they own and continue to be the subject of much research on the threats they face, the benefits they provide, and their general characteristics. A systematic review of the peer-reviewed research literature related to family forest ownerships in the U.S. published since 2000 has been conducted. Coding of the 400+ articles includes: methods and analysis techniques employed; theoretical underpinning; geographic scope and resolution; and, most importantly, the findings. Common threats investigated include: climate change; development; fire; markets; parcellation; and taxation. Solutions discussed in multiple sources include: ecosystem services; education; incentives; markets; policies; social marketing; and new/revised tax policies. While specific future directions are unknown, some intriguing ideas include: landowner dynamics; intra-familial dynamics; micro-targeting; social capital; panel studies; and evidence based practices.

[*] Corresponding author and presenter: bbutler01@fs.fed.us

Dynamics of Family Forest Ownership in the United States

Brett J. BUTLER* – Jaketon H. HEWES – Brenton J. DICKINSON –
Kyle ANDREJCZYK – Marla MARKOWSKI-LINDSAY – Sarah BUTLER

USDA Forest Service

The National Woodland Owner Survey (NWOS) is conducted by the U.S. Forest Service, Forest Inventory & Analysis program in order to better understanding: who owns the forests of the United States, why they own it, what they have done with it in the past, and what they plan to do with it in the future. On a recurring basis, self-administered surveys are sent to randomly-selected private forest owners from across the U.S. Between 2011 and 2013, the NWOS began to resample points for the first time. The previous surveys of these points were conducted between 2002 and 2006. If the same ownership owned the sample point, they were resurveyed; if there was a new ownership at the sample point, they were surveyed for the first time. These results provide the most comprehensive examination of family forest ownership dynamics in the U.S. to date. Topics to be discussed will include changes in forest owners' attitudes, behaviors, and demographics.

* Corresponding author and presenter: bbutler01@fs.fed.us

Risk Preferences and Optimal Management of Uneven-Aged Forests in the Presence of Climate Change: a Markov Decision Process Approach

Stéphane COUTURE* – Marie-Josée CROS – Régis SABBADIN

INRA, UR 875 Applied Mathematics and Computer Science Laboratory, Castanet Tolosan, France

This article determines the optimal management regime of uneven-aged forests in the presence of climatic changes affecting windstorm occurrence probabilities, and takes into account the risk preferences of the forest owner. This study analyzes optimal harvesting by applying a Markov Decision Processes (MDP) framework. Two management types are considered: the exact uneven-aged forest management model in which the forest owner jointly manages all the different stand plots, and the independent uneven-aged forest management model that assumes that the forest owner separately and independently manages each plot of the forest. In the application of this MDP framework, we show that the forest owner tends to converge toward a forest structure which is very close to a normal forest. We also find that the independent model can be seen as a poor approximation of the exact model. We also show that the optimal decisions depend on risk preferences but not on the considered levels of windstorm probability possibly resulting from climate change.

* Corresponding author: Stephane.Couture@toulouse.inra.fr; F-31326 Castanet Tolosan, France

The Culture of Property: Land Use Regulations and Property Rights of Family Forest Owners in Washington State

Janean H. CREIGHTON[a] – Keith A. BLATNER[b*] – Matthew S. CARROLL[b]

[a] College of Forestry - Forest Ecosystems And Society, Oregon State University, Corvallis, Or, USA
[b] School of the Environment, Washington State University, Pullman, WA, USA

Private forest lands in Washington State provide a variety of public resources that many enjoy, such as wildlife, timber, non-timber products, recreational opportunities, and clean water. This paper discusses the relationship between public goods and property rights concerning private forest landowners, and explores possible linkages between property rights conflicts, environmental regulations, and forest fragmentation in Washington State. The emergent issues of significance to the landowners we spoke with regarding development and forest fragmentation are environmental regulations and the impacts on private property rights and overall forest security. The major dimensions surrounding these issues include the attitudes regarding urbanization within the county and the divergence of values between long-time and new residents. We suggest that the parameters of ownership are changing in Washington State, and that a new culture of property exists that may reduce the potential for land-use changes.

[*] Corresponding author and presenter: blatner@wsu.edu; Pullman, WA. 99164-6410

Role of Forest in Society – Perceptions of Forest Owners and General Public

Zuzana DOBŠINSKÁ[a*] – Zuzana SARVAŠOVÁ[b,c]

[a] Department of Economics and Management of Forestry, Faculty of Forestry, Technical University in Zvolen, Zvolen, Slovak Republic
[b] Department of Forest Policy, Economics and Forest Management, National Forest Centre – Forest Research Institute in Zvolen, Zvolen, Slovak Republic
[c] Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Prague, Czech Republic

Abstract - During the last decades the awareness of environmental issues in forest management is increasing because of the change in environmental education. The perceptions of forests, sustainable management and ecosystem services were studied by two surveys. The general public and forest owners were the two target groups. The questionnaires had similar questions, but two different methodological approaches were used - CATI system for general public opinion survey and semi structured questionnaires for forest owners. The second one contained more detailed questions regarding the forest property. All together answers from 1503 respondents (general public) and 150 forest owners were evaluated on following topics: sustainable forestry, main group of ecosystem services, perceptions of forest. The assumption that forest owners awareness of forests differ from general public and their only management objective is economical profit, has not been approved. Results suggest that people are mostly satisfied with the forest management in Slovakia and they understand the trade-offs between different ecosystem services and their utilization.

perceptions of forests / forest owners / general public

1 INTRODUCTION

The awareness of environmental issues in forest management is increasing due to changes in environmental education. According to the national strategy for environmental education adopted in 1996 and revised in 2006 the key factor for environmental education is the education and training towards sustainable development. The so called "environmental minimum" contains following topics: biodiversity maintenance, deforestation, and soil erosion, rational use of natural resources, air, water and soil pollution, depletion of the ozone layer, acid rain, greenhouse effect, energy consumption, waste, urbanization and population explosion (Izakovicova 2010). Forests are an essential component of the landscape and play an important role in environmental education.

Over the last few decades, crucial changes have taken place in the views and demands on forests by society at large. This includes the increased environmental awareness and recreational interests of society (Hajduchova – Sulek 2011). These changes also affect the

[*] Corresponding author: zuzana.dobsinska@tuzvo.sk, SK-96053, ZVOLEN, T. G. Masaryka 24

public's way of looking at the traditional role of forests as producers of raw materials. At the same time the urge to re-orient societies towards increasingly "bio-based economies" results in higher demands for raw material, not only for increasingly sophisticated products, but also for renewable energy (Rametsteiner et al. 2009).

Forests have acquired a new and more global meaning in modern society, going beyond their role as a productive and usable resource. For a growing part of the population, forests represent a space accessible to the public for recreation. At the same time, forests are more and more identified as a natural environment. This new development reflects the needs and preferences of contemporary society and the desire of an increasing urban population for recreation in natural surroundings. It also reflects people's concern over the impending threats to the environment and biodiversity. The wish to preserve the forest is expressed in demands for limiting forest exploitation and protecting areas in a close-to-natural state. For many people, the protection of environment and landscape has become a major criterion for judging overall performance in forest management (Schmithusen 2007).

The meaning of sustainable forest management expands from its primary focus on wood production to include a wide range of different combinations of forest uses meeting economic needs and opportunities as well as addressing dynamically changing social and cultural values (Schmithusen – Seeland 2006). This brings new stakeholders into the forest policy making process. These stakeholders come with perceptions, values, attitudes, and interests regarding forests and the forest sector (Krott 2005). For this article two stakeholder groups were analysed. The first one was the general public and the second one was forest owners.

The aim of this article is to present the awareness of the general public and forest owners on forests, sustainable management and ecosystem services.

2 MATERIAL AND METHODS

The perceptions of forests, sustainable management and ecosystem services were studied by two surveys. The general public and forest owners were the two target groups. The questionnaires had similar questions. The questions for the surveys were prepared with input from several experts in the field, including academics as well as practitioners. The first questionnaire for the general public opinion survey contained 10 questions. The second semi structured questionnaire for forest owners had 44 questions and contained more detailed questions regarding forest property. All together answers from 1503 respondents (general public) and 151 forest owners were evaluated on following topics: sustainable forestry, main group of ecosystem services, perceptions of forest.

General public survey

The survey was carried out by a professional agency. The results of the public survey include the responses collected from January until February 2013. In total, 1503 citizens were contacted via telephone and provided valid responses until February 28, 2013. The age, and residence distribution is shown in the *Tables 1 and 2*:

Table 1. Gender and residence distribution

Gender	Capita	Residence	Capita
Female	726	Urban Areas	819
Male	777	Rural Areas	684

Table 2. Age distribution

Age	Capita
18–24	126
25–39	385
40–54	483
55+	509

Forest owners' questionnaire

The questionnaire for forest owners was sent by regular mail to 639 forest owners in June 2013. The target group were private forest owners preferably members of forest owners associations from different regions in Slovakia. The return rate was 23% (151) by the 10th November 2013. The age, and residence distribution is shown in the *Tables 3 and 4*.

Table 3. Gender and residence distribution

Gender	Capita	Residence	Capita
Female	14	Urban Areas	53
Male	137	Rural Areas	98

Table 4. Age distribution

Age	Capita
18–24	0
25–39	6
40–54	28
55+	117

In this article seven questions (Q) were selected and evaluated. Together with the answers (A) they are presented in *Table 5*.

Table 5. Evaluated questions

General Public Survey Questionnaire		Forest Owners Survey Questionnaire	
Q 4	People have different opinions on why to maintain and enhance forests. Which of the listed options do you think should be the most important in Slovakia?	Q 16	Which of the following options why you own the forest is the most important for you?
A	economic purpose, ecological values, social aspects, other	A	economic purpose, ecological values, social aspects, other
Q 2	How often do you visit the forest?	Q 18	How often do you visit the forest?
A	once a week, once a month, never	A	once a week, once a month, never
Q 3a	How you spend your time in the forest? For what purpose do you go into the forest?	Q 19	How you spend your time in the forest? For what purpose do you go into the forest?
A	recreational, NWFP, other	A	recreational, NWFP, other
Q 3b	I do not go into to forest because:	Q 20	I do not go into to forest because:
A	I don´t feel safe in the forest I have no time I am not interested in my forest	A	I don´t feel safe in the forest I have no time I am not interested in my forest
Q8	People have different opinion on private forest management. In your opinion rate, as in school with marks from 1 to 5, how private forest owners and their associations take care of their forest property.	Q 21	In your opinion rate how private forest owners and their associations take care of their forest property.
A	1, 2, 3, 4, 5	A	1, 2, 3, 4, 5
		Q 22	What are your plans with your forest property in the future?
		A	sell, lease, leave for children, expand, buy new forests, no plans, other
		Q 23	How do you evaluate your forest property in terms of your expectations?
		A	Satisfied, not satisfied, don´t know

Questions were evaluated separately according to their order. The first part of the questionnaires contained general questions relevant for further sampling regarding age, gender, education and residence. Questions 22 and 23 were asked only in the second questionnaire aimed at forest owners. The answers were compared between the both surveys and are presented in figures. Q22 and 23 were evaluated for urban and rural areas because the questions were asked only in the second questionnaire.

3 RESULTS AND DISCUSSION

In the Q4/Q16 public and forest owners were asked about the main purposes that forest should serve for. Most of the public regards ecological values as the most important (83,69%), whereas the forest owners prefer the economic purpose (40,89%). This corresponds with other research conducted in this area by Rametsteiner et al. (2009) where European public places higher value on forest conservation and forests' protective functions than on forest utilisation aspects, contrary to forest owners whose main concern is the economic profit from their property. An overwhelming majority of people in Central Europe, for example, link the economic function of forests mainly to the production of wood itself.

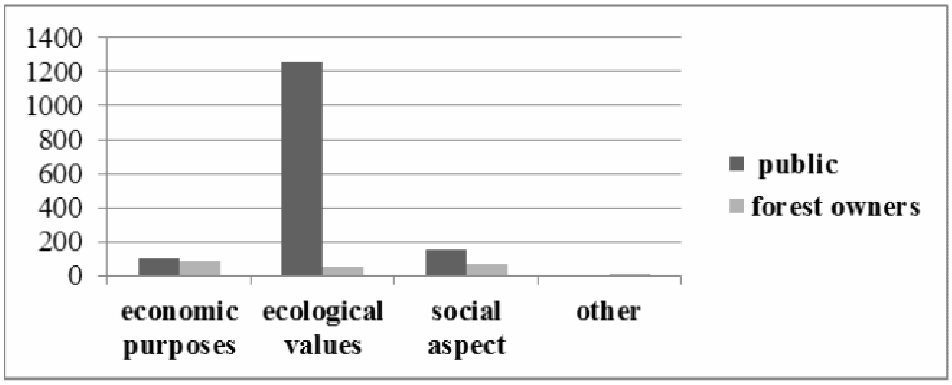

Figure 1. The purpose for maintaining and enhancing forests

The frequency of forest attendance is evaluated in *Figure 2*. Most of the public visits forest once a month (63,41%), whereas the forest owners visit the forest regularly (74,17). In Germany a nationwide quantitative survey concerning forests and forestry was conducted in 2007. 49% of the respondents stated enjoying a visit to a forest. In contrast, only 19% of the questioned German public stated that the forest is not interesting for them (Kleinhückelkotten – Wipperman 2007). In Lithuania of the respondents who had visited forests, 25% said that they visited at least 3-4 times per year (Mizaraite – Mizaras 2006).

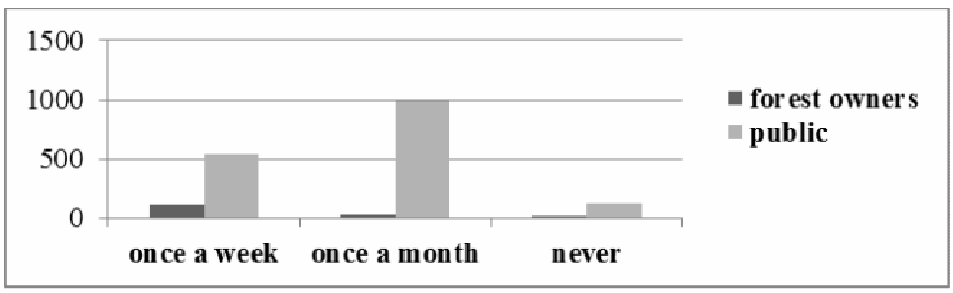

Figure 2. Frequency of forest attendance

From the 123 respondents that stated never going to the forest only one was from the forest owners group, the others were from the public. The main reason for the non-attendance was lack of free time (68) followed by the disinterest of the forest (46). Only 6% of the public does not feel safe in the forest (*Figure 3*).

Figure 3. Reasons for not visiting the forest

The main purpose for visiting forests for both groups was recreation (79,87% of the public and 68,70% of the forest owners), followed by non-wood forest products (*Figure 4*). The recreational category included following activities: tourism, sport, rest, and hunting.

The results in other European countries are similar, e.g. in Germany, 77% of interviewees stated seeing the forest as a place for recreation and relaxation; 55% of the questioned public stated using the forests for recreational walks, other activities included observing nature (42%), collecting herbs (20%), having barbeques and parties (17%), as well as jogging and 'Nordic walking' (17%) (Kleinhückelkotten – Wipperman 2007).

A survey from the Czech Republic stated that the collection of non-wood forest products, such as mushrooms and different kinds of berries, had a high recreational value for people in the Czech Republic (Šišák 2006).

According to a survey in 2007, the most popular forest activities among Swiss citizens were recreation and various kinds of sports activities followed by the gathering of non-wood forest products (Seeland et. al 2007).

In the study conducted by Rametsteiner et al. (2009) interestingly, recreational purposes were not ranked as one of the top two most important benefits by European citizens. This contradicts findings of previous studies and the expectations of forest experts across Europe.

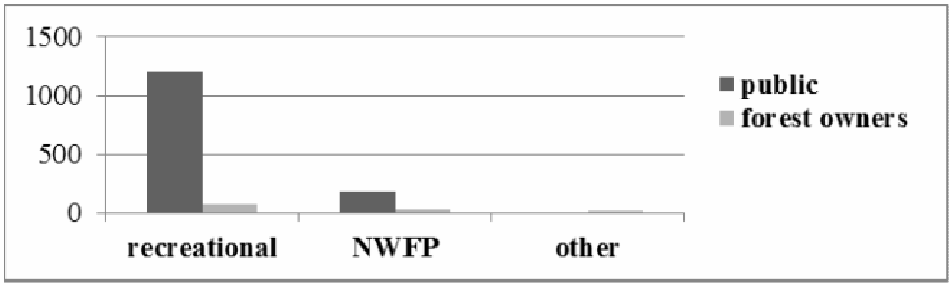

Figure 4. Main ecosystem services forest should provide

In the Q8/21 respondents could rate the forest management conducted by private forest owners. The marks were the same as at Slovakian school system where 1 being the best and 5 being the worst. The general public rated the private forest owners mostly with the mark 2 and 3. Private forest owners themselves marked their management with 2 followed by 1 and 3.

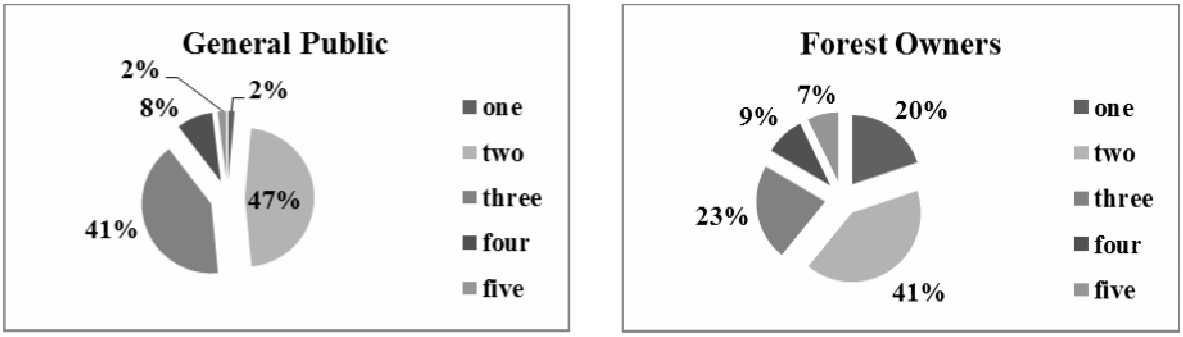

Figure 5 and 6. How are private forest owners managing their forests?

Last two questions were asked only in the second questionnaire for the forest owners. The questions regarded the owned forest property. *Table 6* illustrates the plans with the forest property. The majority of the forest owners plan to leave their property for their children. Interesting is, that people living in rural areas are more keen to keep or expand their property.

Table 6. Plans with the forest property in the future

	sell	lease	leave for children	buy new forests	no plans	other
urban areas	1	2	31	13	0	6
rural areas	0	3	66	23	2	4

Most of the forest owners are satisfied with their property *(Table 7).*

Table 7. Expectations of the owned forest property

	satisfied	not satisfied	don´t know
urban areas	43	3	7
rural areas	78	11	9

Ecosystem services tend to be more important for people living in Central Europe (10.1% rank them as most important topic) compared to other regions. They are considered least important by people in North Western European countries (3.8%). Again a high variation exists across countries in the regions. About 16% of people in Slovakia rank them as most important, followed by Finland (15.3%), and Slovenia (Rametsteiner et al. 2009).

4 CONCLUSIONS

Results suggest that people are mostly satisfied with the forest management in Slovakia and they understand the trade-offs between different ecosystem services and their utilization. As the results of the public survey have demonstrated, the general public has expectations as regards forests and forestry for greater protection and management for ecosystem services (emphasis on ecological values before economic purpose), contrary to forest owners who stress the economic function. In the future there is a need to work with young generation to improve their knowledge about forestry and forests. The education program prepared for schools where the elements of forest pedagogy are included is also in line with these findings. In the next survey that will take place in following years, we are expecting changes in perceptions on ecosystem services and higher trust in foresters.

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Economic Benefits of the Faxinal System in Paraná State (Brazil): Contribution to the Life Quality of Traditional Populations

Ana Paula DONICHT FERNANDES[a*] – Vitor Afonso HOEFLICH[a] – Anadalvo Juazeiro dos SANTOS[a] – Randolf ZACHOW[b] – Evaldo Muñoz BRAZ[c] – Fernando Esteban Montero de OLIVEIRA[a]

[a] Federal University of Parana, Sector of Agricultural Science, Centre for Forestry and Wood Science, Parana, Brazil
[b] Ministry of the Environment, Brazilian Forest Service, Southern Regional Unit, Parana, Brazil
[c] Ministry of Agriculture, Livestock and Supply, Brazilian Agricultural Research Corporation, EMBRAPA, Colombo, Brazil

Abstract – The work is a case study on the sustainable use of forest resources by traditional populations, involving 137 Faxinal families in the Parana state. The objective is to analyze the adequacy of the Faxinal System into the National System of Conservation Units and to quantify the associated economic benefits of doing such. As procedures for data analysis, a descriptive matrix was developed in order to analyze the similitude of the activities and goals of the twelve categories of the SNUC and of the Faxinal System. It was observed that the Sustainable Development Reserve is the conservation unit category with more similitude to the Faxinal System in terms of activities and goals. Concluded the adequacy, the implementation of policy instruments revealed the possibility of an increased average family income over 350%. The results indicated that the implementation of appropriate policy instruments and programs could provide improved income and quality of life for traditional populations.

sustainable forest management / traditional knowledge and culture / faxinal community forestry system / forest policy

1 INTRODUCTION

Rural communities and indigenous groups around the world have participated in the protection of strategic natural resources, and international conventions have sought to translate these practices into universal rules to protect both; resources and populations (Allegretti 2008).

In this context, Silbernagel (2013) indicates that the rational use and the sustainable use of forest resources is guaranteed in goals and actions of the entire system that protects the environment, and therefore aligned to the principles of the United Nations Conference on Environment and Development as to safeguard the multiple roles of forests and forest lands and the promotion of the sustainable forest management.

[*] Corresponding author: anapauladfernandes@yahoo.com.br;

Due to the global demand for the protection of nature, traditional populations became considered as important responsible actors for the natural environment protection in which they are embedded. Within the Araucaria Forest, in the South Central region of Parana, are small villages, since the colonization of the state, with traditional silvopastoral activity in common areas, and a polyculture of subsistence, the Faxinal System (Löwen Sahr 2005). The Faxinal community is formed by juxtaposed plots of several families, which collectively raise their animals on the loose, among areas of the Araucaria Forest (Löwen Sahr - Cunha 2005).

However, its residents have been facing many socio-environmental conflicts that affect traditional communities, such as the reduction of territory and natural resources, the threat of diminishing cultures and traditions and conflicts with external actors, represented by neighbors and government sectors (Hauer 2011). According to Grzebieluka (2010), the Faxinal communities are losing their historical, social and cultural ties due to modern agricultural technological advancement; moreover, some families keep the land and integrate into the industrial agriculture system, while other families gradually sell land to ranchers, who do not integrate into the collective Faxinal System.

The disarticulation of the Faxinal System has economic, social, environmental, political and cultural implications for the peasants who live in this type of organization, which no longer maintains the relationship that once existed with the land and signified their world conception (Löwen Sahr 2005). Löwen Sahr (2011), working on the state of the art of Faxinal communities, presents a recurring situation amidst the traditional agriculture: on one side, resource-poor farmers and on the other side, the Government (environmental agencies and of rural extension) with little capacity to promote sustainable development alternatives.

In this context, Nerone (2000), in one of the first papers presented to the theme centered on Faxinal System, suggests not only to researchers but also to other authorities, a "reeducation look", concluding that there is need for a new approach to unravel the invisibility of the Faxinal System, searching for them "economic outputs that take into account the entire system."

With the given scenario of change in the Faxinal organization and the struggle for its recognition and maintenance of their regional, cultural and social values, the aim of the study was to analyze the adequacy of the Faxinal System into the National System of Conservation Units and to quantify the associated economic benefits of doing such.

2 MATERIALS AND METHODS

2.1 Fundamental Concepts

2.1.1 Faxinal System

Since the beginning of the eighteenth century, within the Araucaria Forest, in the South Central region of Parana, small rural villages are found with silvopastoral activity in communitarian ground, and a polyculture of subsistence, the Faxinal System (Löwen Sahr 2005).

Chang (1988), in one of the classic works on the Faxinal System, associates the formation of the communities to the physical and natural conditions of the region and a set of economic, political and social factors. According to the same author, what makes the Faxinal System an atypical organization is the collective nature of land use for livestock production. The creation is performed on a system of "common breeding", space in which animals are bred on the loose.

The method of land use in the system, according to Schuster and Lower Sahr (2009), can be divided in two areas, separated by fences or ditches: silvopastoral lands (terras de criar) under common use by residents in which the Araucaria Forest is preserved and where their homes and animals are located; and cultivation land (terras de plantar) which is planted by individual families, developed for subsistence farming.

In the Faxinal System both agriculture and livestock production is geared for subsistence, only being marketed surplus production (Lemes et al. 2005). According to these authors, the small profit gained from the sale of surplus is invested in the Faxinal System in order to retain the means for the next generation's production.

In a study proposed by the Environmental Institute of Parana (Instituto Ambiental do Paraná - IAP), it was noted until 1994 the existence of 152 Faxinal communities in the state of Parana. After 10 years, there were at least 44 active Faxinal Systems in the state, composing an area of approximately 26,200 hectares and involving about 3,400 families in various stages of organization (Marques 2004). According to the same study, 52 Faxinal Systems that exist today are considered only communities of individual farmers.

2.1.2 National System of Conservation Units (Sistema Nacional de Unidades de Conservação – SNUC)

Conservations Units (CUs) are territorial spaces, including its environmental resources, with relevant natural features, which have the function of ensuring the representativeness of significant samples and ecological viability of different populations, habitats and ecosystems of the national territory and territorial waters, preserving the existing biological heritage (Brasil 2013).

The Federal Law no. 9,985 of July 18, 2000, that establishes the National System of Conservation Units, divides conservation units into two groups with specific characteristics: the Full Protection Unit and the Sustainable Use Unit. The basic aim of the Full Protection Units group is to preserve nature; being admitted only the indirect use of its natural resources, except in cases provided by law. The basic aim of the Sustainable Use Units group is to reconcile nature conservation and sustainable use of a portion of its natural resources (Brasil 2000).

The management of the SNUC is done with the participation of the three spheres of the government (federal, state and municipal).

- The Ministry of the Environment (Ministério do Meio Ambiente - MMA) is the central body responsible for coordinating the SNUC.
- The National Environmental Council (Conselho Nacional do Meio Ambiente - CONAMA) is the consultative and deliberative body with the task of monitoring the implementation of SNUC.
- The Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade - ICMBio) has the responsibility to implement, support the proposals of creation and to manage federal conservation units.
- In the state and municipal levels, state and local environmental agencies have the responsibility to implement, support the proposals of creation and to manage state and local conservation units (Brasil 2013).

Characteristics of the Conservation Units Categories

According to the classification of the Brazilian Forest Service (Brasil 2013) functions of each category of conservation are as follows, Full Protection:

- Ecological Station (ES) – to preserve nature and to execute scientific research.
- Biological Reserve (BR) – full preservation of biota and other existing natural attributes within its limits, without direct human intervention or environmental change, except for the recovery measures of the altered ecosystems and management actions needed to restore and preserve the natural balance, biological diversity and natural ecological processes.
- National Park (NP) – preservation of natural ecosystems of great ecological significance and scenic beauty, making possible the conduct of scientific research and the development of environmental education and interpretation activities, recreation in touch with nature and eco tourism.

- Natural Monument (NM) – preserve rare, natural, unique or natural sites of great scenic beauty.
- Wildlife Refuge (WR) – protect natural environments that ensure conditions for the existence and reproduction of species or communities of local flora and fauna resident or migratory.

Sustainable Use:

- Environmental Protection Area (EPR) – area generally extensive, with some degree of human occupation, endowed with abiotic, biotic, aesthetic or cultural attributes especially important to quality of life and well-being of human populations, and it has as basic aims to protect biological diversity, to discipline the occupation process and to ensure sustainable use of natural resources.
- Area of Relevant Ecological Interest (AREI) – generally area of small extent, with little or no human habitation, with extraordinary natural features or is home to rare species of the regional biota, and aims to maintain natural ecosystems of regional or local importance and regulate the permissible use of these areas in order to align them with the objectives of nature conservation.
- National Forest (NF) – area under forest cover of predominantly native species and has the basic objective of sustainable multiple use of forest resources and scientific research, with emphasis on methods for sustainable use of native forests.
- Extractive Reserve (ER) – area used by traditional extractive populations whose livelihood is based on the extraction and, additionally, in subsistence farming and keeping of small animals, and has as its basic objective to protect the livelihoods and culture of these populations, and ensure sustainable use of natural resources of the unit.
- Fauna Reserve (FR) – natural area with animals of native species, terrestrial or aquatic, resident or migratory, suitable for scientific technical studies on sustainable economic management of wildlife resource.
- Sustainable Development Reserve (SDR) – natural area which hosts traditional people, whose existence is based on sustainable systems of natural resources exploitation, developed over generations and adapted to local ecological conditions and play a key role in protecting nature and maintenance of biological diversity.
- Private Natural Heritage Reserve (PNHR) – private area, recorded in perpetuity, with the goal of conserving biological diversity; is the exception of the categories in the SNUC, it is the only CU category that remains privately owned after its creation.

2.2 Data source

This research is characterized by being of an applied nature, with qualitative approach. The objectives of the research are regarded as descriptive and exploratory. As technical procedures, we used the literature review and case study.

The Faxinal communities studied belong to the municipality of Mandirituba, 25 km from the administrative center of the municipality and 70 km from the state capital, Curitiba. The city is located at 25^{o} 46' 44" south latitude and 49^{o} 19' 34" west longitude, at an altitude of 925 meters, covering an area of 379,179 km². Its estimated population in 2010 was 22,220 inhabitants.

The municipality of Mandirituba consists of three distinct Faxinal communities: Meleiro community that has all of its area within the breeding community, under common use; the community of Pedra Preta and the community of Espigão das Antas, which currently only part of the area belongs to the breeding community (DESER 2012).

To characterize the Faxinal System in its social, economic and environmental aspects, 137 families totaling 439 people were interviewed in 2012. The questionnaires are resultant from the contract concluded between the Parana Environmental Institute (IAP) and the Department of Rural Socioeconomic Studies (Departamento de Estudos Sócio-Econômicos Rurais - DESER).

2.3 Procedures for data analysis

2.3.1 Matrix of relationship between the requirements of SNUC categories and the Faxinal system

The descriptive matrix was developed in order to analyze the similitude between the twelve categories of the SNUC and the Faxinal System, through the permission or restriction of activities and goals such as dwelling of traditional communities, livestock, agricultural production, extraction of non-timber products, logging, tourism, environmental education, visitation and research, among others.

The different variables were coded numerically regarding permission (1) or restriction (0) of a given activity or goal in the CU category analyzed and in the Faxinal System. Likewise, the activities that are currently undeveloped but have potential for development and application, received the code "1P".

2.3.2 Quantification of economic benefits

The economic benefits resulting from the adequacy of the Faxinal System in one of the categories of the National System of Conservation Units were identified and valued observing instruments and mechanisms for public policy applied to SNUC categories.

This analysis specifically involved the activities developed in the community use area of the Faxinal System, since in the areas located around, destined to the cultivation of perennial and annual species, the situation is no different from other family farmers who do not belong to Faxinal System.

Revenues from activities that have an important role in the monetary income of these families were calculated using information on the number of animals and products sold and their selling price, extracted from the price history received by the producer of the State Department of Agriculture and Food Supply (Parana 2013). The economic benefits were calculated by the increased revenue due to the adequacy of the Faxinal System into a category of the SNUC.

3 RESULTS AND DISCUSSION

3.1 Matrix of relationship between the requirements under the SNUC and the Faxinal System

From the goals/activities of the SNUC management categories identified and based on the results of the assessment of the situation of Faxinal communities, a matrix (*Table 1*) is presented. The matrix lists the activities and goals that make up the twelve (12) conservation units established under SNUC and the definitions for the Faxinal System.

Table 1 shows the restriction in carrying out activities in the Conservation Units categories of the Full Protection Units group, represented by the “0" code, which identifies the absence or refusal of certain activity within the limits of the conservation unity. The same situation is not identified in terms of Sustainable Use Units group, since the primary objective of this group is to reconcile nature conservation with sustainable use of a portion of its natural resources. It can also be observed, the fact that only four modalities of conservation units, in both groups, allow the possession and use of the areas occupied by traditional populations.

With regard to the codes applied to the Faxinal System in *Table 1*, the activities that are practiced in the community received code "1" and the activities that are currently not developed but have potential for development and application, received the code "1P". Variables which are not goals of the Faxinal System such as protecting cultural, archaeological and historical sites and the protection of vulnerable/endemic/rare species, received code "0" in the matrix.

Table 1. Matrix of relationship between the requirements under SNUC and the Faxinal System

	Specific characteristics	Categories of the Conservation Units												Faxinal System
		Full Protection					Sustainable Use							
		BR	ES	NP	NM	WR	EPA	ASEI	NF	ER	FR	SDR	PRNH	
ACTIVITIES	Dwelling communities	0	0	0	0	0	1	0	1	1	0	1	0	1
	Livestock	0	0	0	0	0	1	1	1	1	0	1	0	1
	Timber products exploitation	0	0	0	0	0	1	1	1	1	0	1	0	1
	Non-timber products explotation	0	0	0	0	0	1	1	1	1	0	1	0	1
	Agricultural activities	0	0	0	0	0	1	1	1	1	0	1	0	1
	Direct management/multiple use of natural resources	0	0	0	0	0	1	1	1	1	1	1	1	1
	Indirect management/ multiple use of natural resources	0	0	1	1	1	1	1	1	1	1	1	1	1
	Scientific research	1	1	1	1	1	1	1	1	1	1	1	1	1
	Recreational/ecotourism activities	0	0	1	1	1	1	1	1	1	1	1	1	1P
	Environmental education	1	1	1	1	1	1	1	1	1	1	1	1	1P
	Resource management of fauna / flora	1	1	1	1	1	1	1	1	1	1	1	1	1
GOALS	Protection of historical, cultural and archaeological sites	0	0	1	1	0	1	0	0	0	0	1	1	0
	Preservation/restoration of ecosystems	1	1	1	1	1	1	1	1	1	1	1	1	1
	Protection of vulnerable / endemic / rare species	1	1	1	0	1	1	1	1	1	1	1	1	0
	Sustainable use of natural resources	0	0	0	0	0	1	1	1	1	1	1	0	1
	Protection of landscapes and scenic beauty	0	0	1	1	1	1	1	0	0	0	0	1	1
	Protection of abiotic sites	1	1	1	1	1	1	1	0	0	0	1	1	1
	Watershed conservation	1	1	1	1	1	1	1	1	1	1	1	1	1

Legend: BR – Biological Reserve;
ES – Ecological Station;
NP – National Park;
NM – Natural Monument;
WR – Wildlife Refuge;
EPA – Environmental Protection Area;
ASEI – Area of Special Ecological Interest;
NF – National Forest;
ER – Extractive Reserve;
FR – Fauna Reserve;
SDR – Sustainable Development Reserve;
PRNH – Private Reserve of Natural Heritage.

By interpreting the codes established in the matrix, one can observe that the categories of conservation units Biological Reserve (BR) and Ecological Station (ES) have no differentiation in terms of activities and goals, these being the most restrictive in terms of categories of activities use and visitation. In contrast, the Environmental Protection Area (EPA) is considered the most flexible in the use of natural resources, visitation and occupation.

One can also infer that the Fauna Reserve (FR) and Private Reserve of Natural Heritage (PRNH), despite being classified into the Sustainable Use Units group, do not allow any kind of farming, ranching or extractive activities within its boundaries. According to Souza (2012), the presence of PRNH and FR between the modalities of the Sustainable Use Units group is displaced; it should join the Full Protection Units group, since it only permits the indirect use of its attributes.

In interpreting the results displayed in the matrix of relationship, it appears that the categories of conservation units that allow the housing of traditional communities within their boundaries: the Environmental Protection Area (EPA) National Forest (NF), Sustainable Development Reserve (SDR) and Extractive Reserve (ER) are those that most resemble the Faxinal System according the other variables analyzed. *Table 2* presents a comparative analysis between these four categories under the SNUC in terms of community participation in the management and land issues, to determine the best adequacy for the Faxinal System.

Table 2. Management and land use characteristics of Conservation Units categories

	Management	**Land Situation**	**Land Use**	**Type of Use**
EPA	Not defined under SNUC	Public or Private	Rules and Restrictions	Individual
ER	Deliberative Council	Public Domain	Management Plan	Collective
SDR	Deliberative Council	Public Domain	Management Plan	Collective
NF	Consultive Council	Public or Private	Management Plan	Individual

Legend: EPA – Environmental Protection Area; ER – Extractive Reserve; FR – Fauna Reserve; NF – National Forest; SDR – Sustainable Development Reserve

The SNUC law does not make clear what kind of council is needed for Environmental Preservation Areas (EPAs), however, the majority of EPAs have been treated as consultive councils. By analyzing the issues raised in *Table 2*, was verified that the best way for the Faxinal people to participate in decisions and managing community areas, would be deliberative, since the performance of deliberative councils is guided by the direct participation of communities in decisions.

With regard to the community system of families with land ownership, which is in public domain, this land situation will not implicate in the development of their actions, because the land use will be established in the management plan for these areas, in accordance to the model of conservation unit to be created. Despite the lands of both categories of conservation units, Sustainable Development Reserve (SDR) and Extractive Reserve (ER), be in the public domain, in ER expropriation is already mandatory and in SDR can coexist public domain lands with private areas included in its limit.

As for activities that will be developed by the Faxinal people, these will be validated by a Real Right of Use Contract. The land use should be founded on the management plan that should provide guidelines for the use of the area and the management of natural resources, this being of collective use for the whole community.

Thus, *Table 1* and *Table 2* show that the Sustainable Development Reserve (SDR) adds features and values that emphasize their similarities to the Faxinal System.

3.1 Quantification of economic benefits

3.2.1 Current Revenue

To determine the estimated current revenue generated by the main activities within the Faxinal, it was taken into account the 74 families who practice activities in the community area of 156.2 ha. The unit value of sales in January 2012 and the average income per family are presented in *Table 3*.

Table 3. Production and revenues generated by principal activities per year

Main Activities	Production		Unit Value (US$)	Total Revenue (US$)	(US$/year/family)
Poultry	873	heads	1.24	1,084.73	14.66
Bovines	38	heads	39.87	1,515.13	20.47
Caprine animals	20	heads	21.35	426.99	5.77
Swines	585	heads	12.36	7,231.32	97.72
Eggs	1,294	dozen	0.65	839.83	11.35
Araucaria nuts	1,050	Kilogram	2.56	2,690.01	36.35
Yerba Mate	1,000	Kilogram	2.95	2,946.20	39.81
TOTAL				**1,6734.20**	**226.14**

Table 3 presents the annual income per family, resulting from the commercialization of the main activities within the Faxinal area. It was considered for the unit value: for birds, live chicken with 1.5 kg; for swines, the slaughter weight of 15 kg; and for caprine animals, slaughter weight of 20 kg. Thus, the average annual income per family generated by the current system is US$ 226.14[1].

3.2.1 Economic benefits resulting from the adequacy of the Faxinal System

To determine the revenue increase resulting from the proposed adequacy for the Faxinal System, the economic and financial instruments of public policies that focus on Sustainable Development Reserve (SDR) were identified and its economic benefits were quantified.

As economic incentive instruments, the State Law no. 9,491, of December 21, 1990 establishes the fixing of 5% rates of participation of municipalities in product revenues of value-added tax (Imposto sobre Circulação de Mercadorias e Serviços – ICMS) for environmental conservation (‘ecological’ value-added tax - ICMS-E). Of these 5%, the fountainhead area receives 2.5% and the other half is destined to the conservation unit. Furthermore, the ICMS-E falls as one of the tools that helps municipalities to take care of water sources and supply and surrounding conservation units. In addition, the corresponding value of the ICMS-E transferred in 2012 to the municipality of Mandirituba, was approximately US$ 65,328.77 (PARANA 2012), however, as the municipality is not inserted in the resource table of the ICMS-E generated per conservation unit, it was concluded that this transfer pertains only to the fountainhead areas for public supply.

Thus, it is evident the importance of the Faxinal System be recognized as a Conservation Unit belonging to SNUC as a way to obtain the assurance of payment of 50% of the ICMS-E transfer to municipalities with environmental conservation units. According to Loureiro

[1] Based on the average price of U.S. dollar in August 2013 of R$ 2.342.

(2002) in the case of all Faxinal communities all resources received by municipalities are invested in the Faxinal System itself, in education, health, reform of fence, and road improvement programs; being 25% mandatorily applied in education and 15% in health.

In this case, for the Faxinal people the ICMS-E will contribute to the increase of revenue to the families, since they would no longer spend its own resources to make improvements in infrastructure, in addition they would receive materials and resources from the municipality. As the ICMS-E is shared between families of the Conservation Unit, the value of US$ 65,328.77 would be divided by 137 families from three communities of the city, with the amount to be invested in the community per year for each family of US$ 476.85.

Another form of tax incentive already used in the national scene and applicable to Faxinal System classified into the category of SDR is the exemption from the Rural Land Tax (Imposto sobre a Propriedade Territorial Rural - ITR). Thus, for purposes of calculating the value of exemption from ITR, was taken as a basis the value of US$ 12.81 per hectare, which according to an employee information from the Department of Agriculture of Mandirituba, is the minimum amount paid by hectare of ITR in the city. Being encountered a total of US$ 2,000.85 (divided per 74 families) per year of ITR that would no longer be paid as a tax and thus would remain as income for the families, thus, US$ 2,000.85 divided per 74 families

To the adequacy of the Faxinal System as a Conservation Unit of sustainable use, in the category of SDR, could benefit the families of the Faxinal people through the Environmental Conservation Support Program – Green Grant (Programa de Apoio a Conservação Ambiental - Bolsa Verde). The Program grants quarterly, a benefit of US$ 128.10 (reference value: October 2013) to families in extreme poverty living in priority areas for conservation. The criteria for granting the Green Grant are:

- have per capita income less than US$ 29.89;
- be beneficiaries of the Social Assistance Federal Program “Bolsa Familia”;
- develop sustainable use of natural resources in Conservation Units of Sustainable Use, settlements environmentally differentiated from the Agrarian Reform, territories occupied by traditional communities, quilombos, riverines, extractive or other rural areas defined by an Executive Branch act.

Thus, in *Table 3* are shown instruments and policy programs that could benefit the Faxinal System that was categorized in the new management mode of SDR, which shows an increased average family income per year.

Table 4. Measurement of resulting economic benefits

Instruments and Policy Programs	Revenue (US$/year/family)
Ecological ICMS	476.84
Exemption of ITR	27.04
Green Grant Program	512.38
TOTAL	**1,016.26**

The classification of the Faxinal System into the SDR category leads to an increase in the average annual household income of US$ 790.12, resulting from the difference between the current average annual household income US$ 226.14 *(Table 3)* and the average annual household income US$ 1,016.26 *(Table 4)* after the classification. Lastly, the implementation of these instruments and policy programs could represent an increase in the average annual household income over 350%.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Conclusions

- The Faxinal System in its current form of administration does not guarantee the economic, social and environmental sustainability of traditional resident populations.
- The agricultural income through livestock production within the community area proved unrepresentative of total family revenues, besides creating conflict with the conservation of forest resources.
- The matrix that listed the characteristics of the Faxinal System with the management of the protected areas of the SNUC showed that the Sustainable Development Reserve (SDR) aggregated the largest number of features and values that emphasize its similarities with the Faxinal System.
- The adequacy of the Faxinal System into the SNUC category Sustainable Development Reserve (RDS) allows an increase in the average annual household income of approximately 350% over current revenues.
- The implementation of the instruments and public policy programs as economic incentives, technical assistance, associativism, farm credit, programs for production support, programs to support environmental conservation and programs associated with rural development can increase incomes and quality of life for the Faxinal people.
- Traditional populations are discouraged from reproducing their way of life, both for the occupation of its territory, as the model of current environmental policy of ignoring the conservation potential of these segments.
- In summary, this study illustrates how the traditional populations, destitute of economic strength and political power, become incapable of articulating and formulating alternatives for solving social conflicts and using natural resources.

4.2 Recommendations

- It is perceived that it is essential that the quality of the diversification process be considered, so that families can build a range of alternatives and possibilities of agricultural and non- agricultural income consistent with its rural livelihoods.
- To elaborate a plan of management for the studied Faxinal System by observing the many studies already conducted, including diagnostics of the physical, biological and social environment, with the active participation of community members, establishing norms, restrictions on use, actions to be developed and management of natural resources of the Faxinal community.
- The implementation of public policies for rural and strategies for building alliances between groups linked to forests, have the capacity to promote the integration of extensionist, research and teaching institutions and the various segments of family farming organizations to build and disseminate knowledge, considering the local situation.

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Placing Timber and Timber Products on the Market in the Czech Republic and Related Economic Impacts

Roman DUDÍK* – Luděk ŠIŠÁK

Department of Forestry Economics and Management, Faculty of Forestry and Wood Sciences,
Czech University of Life Sciences Prague, Prague, Czech Republic

Abstract – Placement of timber and timber products on the market in the European Union is governed by Regulation (EU) No 995/2010 of the European Parliament and of the Council of 20 October 2010, laying down the obligations of operators who place timber and timber products on the market. The same provision holds also for the Czech Republic if the so-called operators place on the market timber and timber products listed in Annex 1 to the Regulation. The paper focuses specifics of the Czech Republic at implementing the Timber Regulation into the Czech legal order and their solution. In addition, the paper includes a model quantification of expected costs of two Czech model operators, in our case forest owners, connected in particular with the implementation and maintenance of due diligence systems. Furthermore, main differences are identified between the obligations of Czech forest owners and importers, which follow out from the structure of the due diligence system.

Regulation (EU) No 995/2010 / EU Timber Regulation / operator / due diligence system

1 INTRODUCTION

Pursuant to the Regulation of the European Parliament and of the Council No 995/2010, due diligence systems represent one of tools employed to minimize the risk of placing illegally harvested timber or products derived from such timber on the market of the European Union. During the last several years, one of key issues discussed by international forest forums has been how to prevent the merchandise of illegally harvested timber and products derived from such timber.

On the other hand, it is necessary to bear in mind that to define illegal timber harvesting is not a simple task. Discussions are led worldwide about what exactly can be considered illegal. Here we should point out that an internationally recognized definition of illegal timber harvesting does not exist. What is taken for legal in Vietnam may not be legal in Indonesia and vice versa. According to literature, illegal timber harvesting generally occurs if timber is felled, transported, sold or purchased in contravention with the national law (Heeswijk 2010). Unfortunately, activities that are considered illegal greatly differ in various sources. Some authors even differentiate illegal timber harvesting and illegal forest activities. According to them, illegal timber harvesting is a part of these activities, which also include illegal activities occurring during transport, illegal processing and export, wrong customs clearance or tax avoidance (Guertin 2003). Illegal timber harvesting is generally quite common in most countries that are main timber producers (China, India, Canada, Indonesia and Brazil). The

* Corresponding author: dudik@fld.czu.cz; Kamýcká 129, 165 21 Praha 6 – Suchdol, Czech Republic

extent of illegal timber harvesting in some countries is so large, and the enforcement of law so poor, that detection and punishment are virtually impossible. It is generally estimated that up to ¾ of the tropical timber and up to ½ of the timber for industrial purposes have to do with at least one illegal activity. Particularly problematic regions are the Amazon River Basin, Central Africa, Southeast Asia and Russian Federation (Brack 2006). Thus, countries in these regions can be considered risky in terms of placing on the market illegally harvested timber and products derived from such timber.

The whole issue resolving the placement of timber and timber products on the market (commonly used is also a EUTR acronym – for EU Timber Regulation) stems from a concept of the European Union, which is projected in the following three principal regulations:

- Regulation (EU) No 995/2010 of the European Parliament and of the Council laying down the obligations of operators who place timber and timber products on the market – hereinafter "Timber Regulation" (EU, 2010)
- Commission Delegated Regulation (EU) No 363/2012 on the procedural rules for the recognition and withdrawal of recognition of monitoring organizations – hereinafter "Regulation (EU) No 363/2012" (Commission 2012a)
- Commission Implementing Regulation (EU) No 607/2012 on the detailed rules concerning the due diligence system and the frequency and nature of the checks on monitoring organizations – hereinafter "Regulation (EU) No 607/2012" (Commission 2012b)

The main contribution of the Timber Regulation effective from 3 March 2013 consists in the establishment of a legal instrument, which would have a retroactive effect on preventing the illegal timber harvest through a stricter control over the area of trading timber and timber products. From a global point of view, the restricted illegal timber harvest will positively reflect in the mitigation of climate changes, improvement of the condition of forest ecosystems as well as in economy (providing equal conditions for operators who place legally harvested timber on the market).The principle and purpose of the Timber Regulation indicate that the document applies not only to forest owners but also to raw timber importers etc. The paper further deals with a group of operators represented by forest owners in the Czech Republic.

The aim of the paper is to survey the situation regarding the risk of placing illegally harvested timber and products derived from such timber on the Czech market. The paper brings an analysis of obligations following out for the forest owners from the above-mentioned European EUTR legislation in connection with the implementation and maintenance of due diligence systems. It also identifies relations and conditions upon the fulfilment of which the concerned forest owners can successfully implement the due diligence systems as well as differences between the obligations of Czech forest owners and importers following out from the structure of the due diligence system. Finally, it presents a model bill of costs connected with the implementation of the due diligence system (hereinafter "DDS") by two model forest owners.

2 MATERIAL AND METHODS

Methods employed in the solution of the objectives of this work included an analysis of related data and a method of the economic calculation of model costs connected with the implementation and maintenance of DDS.

The information used in the input analysis of obligations for the concerned forest owners was obtained in particular from the related legal regulations, i.e. from the Timber Regulation,

from the Commission Delegated Regulation (EU) No 363/2012 and from the Commission Implementing Regulation (EU) No 607/2012 with the Timber Regulation being the fundamental EUTR document. The regulation embargoes the placement of illegally harvested timber and products derived from such timber on the EU market. It also applies to timber and timber products imported and for the first time introduced on the EU market. One of basic questions remains to be asked however, "what" is considered the timber and timber products to which the Timber Regulation applies. A full list is presented in the Annex to the Timber Regulation as classified in the Combined Nomenclature set out in Annex I to Council Regulation (EEC) No 2658/87 to which this Regulation applies.

Pursuant to the Timber Regulation, the concerned forest owner is for the purpose of this paper a person, who is a so-called "operator", i.e. any natural or legal person placing timber or timber products on the market or for the first time on the internal EU market. It follows that the operators include entities supplying for the first time raw timber on the market of the European Union (hence of the Czech Republic), but also importers bringing raw timber from countries outside the European Union.

Each member country has to appoint one or several competent authorities responsible for the implementation of the Timber Regulation. State administration bodies appointed in the Czech Republic pursuant to Act No 226/2013 Coll. on the placement of timber and timber products on the market (Czechia 2013a) are as follows:

- Ministry of Agriculture (hereinafter MoA).
- Regional authorities.
- The Czech Trade Inspection Authority.

Further involved are also:

- Forest Management Institute Brandýs n. L. – as a MoA commissioner.
- General Directorate of Customs – as a public administration body reporting and cooperating particularly in the case of imports.

An analysis of the above-stated legal regulations helped to identify obligations of the concerned forest owners (operators) and impacts on them.

The model bill of costs connected with the implementation and maintenance of DDS was applied in two model forest owners in the Czech Republic. The first one is a small owner with up to max. 10 ha of the forest. In this owner, the DDS implementation cost represents a lump sum of 15,000 CZK (MoA 2012). The DDS maintenance is considered as a service provided by an external entity and the cost is set up by expert estimate. The second owner operates a forest property of 1,000 ha and employs up to 5 persons. This owner meets the EUTR obligations through the implementation of the Chain of Custody (C-o-C) system according to stipulations of the CFCS 2002:2013 (PEFC 2014) standard, which includes the PEFC due diligence system. Unit cost of the related items of implementation and maintenance of the C-o-C system including DDS is considered as a service provided by an external entity to be set up by expert estimate. The costs for the two model forest owners are considered without the value added tax.

3 RESULTS

In general, the risk of placing illegally harvested (in the Czech Republic) timber on the Czech market is not high. As to wood raw material harvested in the Czech Republic, the Czech Environmental Inspectorate (CEI) recorded 79 cases of illegal timber harvest in 2008 at a total volume of ca. 35,550 m^3 (MoA 2009). This was on average 450 m^3 of illegal timber per case. Regarding the fact that a total timber volume harvested in the Czech Republic in 2008

amounted to 16.187 million m^3, the share of illegal harvest was only 0.2%. Taking into account other data on illegal harvesting, we can state that in terms of harvested matter, the share of illegal timber harvest in Czech forests does not exceed 1%.

As to the imports of raw timber from countries outside EU-27 for example in 2008, the available data (MoA 2009) indicate they amounted to ca. 49 thousand m^3.

3.1 Obligations of the concerned forest owners

If a forest owner identifies himself as an operator, there are three basic obligations arising for him:

1. The placing on the market of illegally harvested timber or timber products derived from such timber shall be prohibited (the operator is namely an entity, which places timber and timber products on the internal EU market for the first time).
2. Operators shall exercise due diligence when placing timber or timber products on the market. For this purpose, they shall use a framework of procedures and measures hereinafter referred to as DDS as set out in Article 6 of the Timber Regulation.
3. Each operator shall maintain and regularly evaluate the due diligence system, which he uses, except where the operator makes use of a due diligence system established by a monitoring organization.

The operator has essentially two possibilities how to introduce the due diligence system:

1. The operator will introduce a DDS developed by himself:
   a) The operator shall develop a DDS of its own within the frameworks set out in Article 6 of the Timber Regulation with taking into account the actual situation in which he appears.
   b) The operator shall develop a DDS of his own within the frameworks set out in Article 6 of the Timber Regulation while using other systems covering objectives similar as EUTR (this will largely apply to forest certification systems and systems of the consumer chain of forest products) with taking into account the actual situation in which he appears.
2. The operator shall make use of a due diligence system established by a monitoring organization – as set out in Article 8 of the Timber Regulation.

Thus, responsibility for the functional and maintained DDS is either on the part of the operator (in the case of own establishment) or also on the part of the monitoring organization (in the case of establishing DDS for the operator).

3.2 Selected specifics of DDS implementation and maintenance

Each forest owner in the Czech Republic, or a person responsible for the management of such forest, who can be a potential operator, has to bear in mind the following facts:

1. In the first step, the concerned persons (natural, legal, forest enterprises etc.) shall find out whether they are operators from the viewpoint of EUTR requirements.
2. If they are operators, they are obliged to exercise due diligence for which DDS serves.
3. The operators shall establish a due diligence system of their own or shall ask for assistance a monitoring organization recognized by the Commission.
4. The introduced DDS shall include all three elements (1-access to information, 2-risk assessment, 3-risk mitigation).
5. DDS robustness will depend on the situation in which the operator appears. The situation will be different (simpler) for a small forest owner who does not purchase timber and places on the market only timber harvested on his own property which he

operates according to the approved forest management plan or guidelines. For such an owner, some criteria for the risk assessment are not relevant – e.g. sanctions by the United Nations Security Council or by the Council of the European Union imposed on timber import or export and the like. Here, it is necessary to point out that even if the respective criterion is irrelevant for an operator, it needs to be assessed – in this case with the result that the given criterion is irrelevant to the given situation.

6. The operators are obliged to regularly evaluate and maintain their DDS. This means that after a successful establishment of DDS, they will operatively respond to changes that may have an influence on the potential increase of the risk of placing illegally harvested timber and of products derived from such timber on the market. If the situation –namely on the part of inputs into the production and commercial chain- does not change (see the observed information – 1st element of DDS), then it is appropriate to perform at least once a year a (formal) DDS evaluation and to confirm its efficiency, which may be documented by an evaluation record – basically by a statement that nothing has changed since the DDS introduction/last evaluation. This record will then facilitate the operator to prove upon a check from the part of the competent authority that the DDS is regularly maintained and evaluated.
7. It is extremely appropriate for a successful functioning of DDS that the operator (forest owner or administrator) appoints a person (persons) responsible for the introduction, maintenance and regular evaluation of DDS.
8. It is also advised that the operator describe the flow of wood raw material/wood products from purchase to sale including for example methods used for timber measurement or the kind of documentation used in trade relations and documenting the fulfilment of the 1st element of DDS – providing access to information. Such a comprehensively documented DDS is more transparent and easy to check by competent authorities.
9. The structure and set of data made accessible by operators (see 1st element of DDS) will also depend on whether the concerned timber is harvested on lands intended for the fulfilment of forest functions and hence in line with Act No 289/1995 Coll. on forests and related regulations. Here, the due diligence system can be based on the forest management plan or on the forest management guideline adopted upon a protocol and the following forest management records. Nevertheless, the actual DDS of the operator has to be completed with the 2nd and 3rd element.
10. Timber harvesting outside the lands intended for the fulfilment of forest functions (riparian stands, urban greenery etc.) has to be in accordance with Act No 114/1992 Coll. on nature conservation, landscape protection and related regulations. Among other things, DDS shall be based on data documenting the supplier's ownership or the ownership of the performer of harvest to the subject of harvest (timber) or other authorizations or declarations. With respect to the above-mentioned, Act No 226/2013 Coll. distinguishes the domestic forest production and the other production, too.

3.3 Model costs of DDS implementation and maintenance

The model bill of costs connected with the implementation and maintenance of the due diligence system has been applied in two model Czech forest owners in 2014.

The first owner operates a forest of max. 10 ha:

Lump sum cost item for DDS implementation	15,000 CZK
Lump sum cost item for DDS maintenance	1,000 CZK

The second owner operates a forest of 1,000 ha, employs up to 5 persons and uses the C-o-C system to implement the EUTR obligations:

C-o-C system implementation	
Establishment of the C-o-C system (documentation, internal audit etc.)	20,000 CZK
Certification of the C-o-C system (certification audit)	20,000 CZK
Notification fee to PEFC Czech Republic	2,500 CZK
C-o-C system maintenance	
Maintenance of the up-to-date documentation, internal audit	5,000 CZK
Verification of the C-o-C system functioning (supervisory audit)	15,000 CZK
Notification fee to PEFC Czech Republic	2,500 CZK

1 EUR=27,45 CZK (April 1st, 2014)

The model costs for the DDS implementation amount to 15,000 CZK for the small forest owner and 45,000 CZK for the big forest owner using the C-o-C system to implement the obligations following out for him from the Timber Regulation. The DDS maintenance comes out cheaper for both forest owners (1,000 CZK for the small forest owner and 22,500 CZK for the big forest owner).

4 DISCUSSION

The paper does not resolve the issue of determining when a forest owner is operator or not with respect to various situations in which the forest owner may appear. The paper came to existence because it was necessary to identify obligations following out for forest owners from the EU Timber Regulation. Another reason was an attempt to give the forest owners a simple and clear survey of a sequence of activities they have to implement in the Czech Republic in connection with the EUTR legislation. Although a target group of entities using the results of this work are forest owners in the Czech Republic, in their analyses the authors made use of the related legislation, particularly of legal regulations issued at the level of the European Union that are effective also outside the Czech Republic. From this point of view, the results of the work are applicable also in other EU countries. In addition, it is necessary to mention a specific obligation relating only to Czech operators following out from Decree No 285/2013 Coll. (Czechia 2013b). Pursuant to this Decree, operators have to submit before the end of April of the calendar year data structured as specified in the Annex to this Decree to a body of state forest administration.

The model bill of costs connected with the DDS implementation and maintenance is applied on two model forest owners in the Czech Republic. These model cases are to give a general idea about impacts following out from meeting the EUTR requirements. Calculations that would be more precise would call for a concrete situation of the forest owner. To determine parameters of an average forest owner in the Czech Republic for the purpose of the above calculation of costs may be misleading in many respects. If all forest owners in the Czech Republic are taken into account, an average size of the forest property would amount to less than 3 ha. On the other hand, Forests of the Czech Republic, State Enterprise operates 1,306 million ha of the forest land. Therefore, parameters of the model cases try to cover a larger spectrum of potential forest owners who can be operators. It is clear that the larger a forest owner is, the more complex will be his flows of wood raw material (e.g. with respect to the purchase of wood raw material from other forest owners) and the more complicated and costly will be the DDS establishment and maintenance.

The second model case shows an operator implementing the C-o-C system through which he will be able to prove that the EUTR requirements are met. Moreover, this case can be

applied on using services offered by a monitoring organization since the monitoring organization will not offer its DDS and related services free of cost. The considered unit costs for the respective items were adopted (MoA 2012) or established by expert estimate taking into account a thorough knowledge of actual costs connected with the implementation and maintenance of the C-o-C system in the Czech Republic. In addition, they range within the frameworks mentioned e.g. by Kobylka (2006). At this place, it should be added that the situation of operators with the already introduced C-o-C system would be much easier. These operators will have to expend only costs connected with the modification of their existing C-o-C system according to requirements of the revised standard CFCS 2002:2013, which is based on the C-o-C international standard (PEFC ST 2002:2013) taking into account the EUTR requirements.

5 CONCLUSION

The Timber Regulation is effective as of 3 March 2013 and some (namely small) forest owners still know nothing about its existence. There are also some forest owners who are aware of its existence but know nothing about what it means for them. Contacts with the big forest owners showed that these are largely aware of the existence of the Timber Regulation as well as of obligations following out for them from the document (and from other related legal regulations). However, some of them do not know what to do to be able to fulfil their duties. The results of this work are meant for all these forest owners as well as for competent authorities and other institutions encountering the EUTR issue.

The work analyzes obligations following out for forest owners in the Czech Republic from European and Czech implementing legal regulations in the area of EUTR and concerning the implementation and maintenance of due diligence systems. The result of the work is also the identification of relations and conditions upon the fulfilment of which the due diligence systems can be successfully implemented by the concerned forest owners in the Czech Republic. As to timber illegally harvested in Czech forests, its share in 2008 was only 0.2% and the proportion ranges below 1% over a long term. A part of the results is also a model calculation of costs for the implementation and maintenance of DDS in two model forest owners – operators. For a small owner with a forest sized up to 10 ha, the cost of DDS implementation should not exceed 15,000 CZK. A big owner with a forest sized 1,000 ha may pay even three times more for the DDS implementation. Since the basic analyzed material consisted of three European regulations for EUTR (Timber Regulation (EU) No 995/2010 in particular), an essential part of results can be applied also in other EU countries.

The results of our work indicate that operators, which are common forest owners in the Czech Republic, can readily meet requirements following out from the EUTR legal regulations. The forest owners operate their forests according to the approved forest management plan and place on the EU market timber harvested on their property. The main task for them will be to collect and evaluate in a suitable manner the required data, which they already take records on within their production activities – even if the structure of these data is sometimes different. The more complex the production activities of forest owners will be, given for example by the comprehensive management of other forest properties or timber harvesting on non-forest lands, the more complex, robust and costly will be the related due diligence system.

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The Role of Information in Forming Forest Engineers' Perceptions and Attitudes about Climate Change

Corina DUDUMAN* – Laura BOURIAUD – Gabriel DUDUMAN – Mihaela MUTU – Liviu NICHIFOREL – Ciprian PALAGHIANU

Forestry Faculty, "Stefan cel Mare" University of Suceava, Romania

Global climate change is one of the biggest threats to the environment, with direct consequences for the terrestrial life, and by default of human activity. The analysis of forest managers' knowledge about the importance, causes and effects of climate change is largely justified by the important role they have in adapting or not the forest management to climate change. The hypothesis of this study is that the knowledge and perceptions about the issue of climate change is influenced by information received on the most accessible sources of information (mass media, internet, various dissemination events). Therefore, we have investigated the perceptions about climate change and the sources of information about this issue on a nation-wide sample of forest engineers (N=198). We combined the sociological enquiry with a mass-media search on web specific portals, using specific climate-change related keywords for a period of two years previous to the sociological investigation. The survey results clearly show that the respondents are aware of the importance and seriousness of climate change, yet they tend to negate the anthropic origin of the changes. In the meanwhile, we have surprisingly found that climate change issue had a very low cover in the mass-media, event when catastrophic events such floods occurred. Thus, we have concluded that the role of mass-media in the formation of perceptions and attitudes of forest engineers on climate-change issue is lower than we have previously estimated, and that many other various sources of information have had a role in building the forest engineers perceptions about climate change.

* Corresponding author: corina_m16@yahoo.com

The Impact of Natural Disturbances on the Norway Spruce Special Cultures Situated in North Eastern Romania, in Relation to the Management Type

Mihai-Leonard DUDUMAN[a*] – Nicolai OLENICI[b] – Valentina OLENICI[b] – Laura BOURIAUD[a]

[a] Applied Ecology Laboratory, Forestry Faculty, "Stefan cel Mare" University of Suceava – Romania
[b] Forest Research and Management Institute, Experimental Station of Spruce Silviculture, Câmpulung Moldovenesc, Romania

The Norway spruce special cultures located in hilly areas of North-Eastern Romania (1688 ha only in Suceava county) have been installed between 1960 and 1980 to produce pulpwood for the paper industry. They were located on low slopes, accessible for mechanization, mainly on mean to highly productive forest sites for broadleaved species. The initial rotation of these cultures was established to 40 years, being subsequently expanded to 70–100 years. Due to low intensity and delayed tending works, the competition between the trees was exacerbated, which led to debility and facilitated the increased manifestation of pests, especially after intense drought episodes. The lack of adequate silvicultural and protective works resulted in the degradation of these cultures on larger areas each year, especially in high density stands.

[*] Corresponding author: mduduman@usv.ro

Pinion Extraction and Resource to Fauna: Conflicting Ecosystem Services?

B.S. FICHINO* – R.F. SANTOS – V.R. PIVELLO

University of São Paulo, Brazil

Forests of *Araucaria angustifolia* have been dramatically reduced since the arrival of Europeans in Brazil, mainly due to its wood exploitation. That drastic reduction caused the inclusion of *A. angustifolia* in the Brazilian list of endangered species. Therefore, the main use of Araucaria forests today by the locals is for pinion extraction, presently the most important provision service offered by that forest. However, there is no certainty about forest conservation with this practice. The aim of this study was to evaluate the effects of pinion extraction (provision ecosystem service-PES) under different intensities on the availability of that resource to fauna (support ecosystem service-SES) in natural fragments of *Araucaria* forest. We selected measurable indicators of these services, which were evaluated in 30 sites. Likelihood analyses allowed us to define curves that reflected the trade-offs between SES and PES, which can help on best management practices according to local reality.

* Corresponding author: bsfichino@gmail.com

Changes in Private Forest Management and Planning in Slovenia, 1980–2013

Andrej FICKO* – Andrej BONCINA

Department of Forestry and Renewable Forest Resources, Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia

This presentation reviews private forest management in Slovenia by analyzing changes in key environmental, social, and economic indicators in private forests for the last 30 years. Using Statistical Yearbooks and other related literature we analyzed how forest stand structure, realized cut, silvicultural measures, employment structure and other parameters changed in private forests. We also present recent efforts for changes in forest management planning towards forest owner-oriented forest planning and discuss the possible solutions to better account for emerging owners' interests. In particular, we present lessons learned from recent surveys on forest owners' information needs, decision making modes, and basic understanding of the concept of forest management. Based on the observed trends, we identify failures in current forest resource governance and propose key tasks in forest management planning agenda for private forests in the next decades.

* Corresponding author: andrej.ficko@bf.uni-lj.si; Vecna pot 83, 1000 Ljubljana, Slovenia

An Approach and Framework for Assessing the Use of Woody Biomass as a Bioenergy Feedstock in the United States West Gulf Coast Region

Donald L. GREBNER* – Robert K. GRALA – James E. HENDERSON

Department of Forestry, Mississippi State University, Starkville, Mississippi, United States

For many decades, there has been a great interest in renewable fuels. In the United States, the interest has come from the opportunities to enhance rural development, provide energy security, and mitigate the potential environmental damage posed by climate change. Regions, such as the southern United States, with large areas of forest lands have been very active in the research and development of using woody biomass to promote the development of this nascent industry. Much research has focused on determining the physical quantities of woody biomass, evaluating the financial viability of new production systems as well as estimating the willingness of private forest landowners, mill owners, and urban waste disposal facility owners to provide woody biomass to an emerging renewable fuels industry. Estimating the cost of recovering woody biomass was also an important factor to incorporate in any assessment. This manuscript reviews the existing research in Mississippi as a representative sub-region of the West Gulf Coast Region. The existing literature indicates that additional research is necessary in all areas such as understanding landowner behavior, physical inventories of woody biomass as well as potential markets for mill and urban wood waste. These results will assist policy makers in developing policies for attracting bioenergy companies in developing renewable fuels processing facilities in the West Gulf Coast Region of the United States.

woody biomass / feedstocks / assessments / West Gulf Coast / transportation / willingness to harvest

* Corresponding author: dgrebner@cfr.msstate.edu

Potentials of Forest Planning in Enhancing Ecosystem Services in the Landscape Dominated by Mass Tourism and Private Forest Ownership

Arto HAARA[a] – Raili HOKAJÄRVI[b] – Mikko KURTTILA[a] – Jukka TIKKANEN[b*]

[a] Metla, Finnish Forest Research Institute, Joensuu, Finland
[b] School of Renewable Natural Resources, Oulu University of Applied Sciences, Oulu, Finland

In this paper we will give an overview on four years hands-on development project where forest management practitioners and researchers jointly developed and tested forest planning approaches and practices. The aim of the development was to launch new methodology to support multi-objective forest management in one of the most important tourism centers in north Europe, where there exist increasing and conflicting interest towards forest management practices from the view of other elements of ecosystem services than timber production, including nature tourism, mining, reindeer husbandry and water protection. The paper will describe, with actual data and results, new planning procedures applied in the case study, and consider consistently potentials, drawbacks and limitations of the methodology applied. As a conclusions development proposals will be given, including also critical reflection on researchers´ intervention into conflict-sensitive socio-ecological system with case study methodology.

[*] Corresponding author: jukka.tikkanen@oamk.fi; Kotkantie 1, 90220 OULU, Finland

Balance Impossible? Between Customizing and Comparability of Employee Satisfaction Surveys (ESS)

Christoph HARTEBRODT* – Yvonne CHTIOUI

Forest Research Institute Baden-Württemberg, Germany

Abstract – In a relevant share of cases when multi-objective management systems (e.g. like Balanced Scorecard) are in use, the goal of employee satisfaction is part of the set of strategic goals. Quite frequently this goal is flanked by an indicator, mostly a so-called employee satisfaction index, which is derived from an employee satisfaction survey (ESS). On one hand such a survey has to reflect the characteristics and structure of the enterprises, on the other hand it is known that the question for intercompany-comparison turns up immediately after the disclosure of the results. The paper discusses the results of a meta-analysis of ESS in 7 larger forest enterprises in Germany. The main topics are highlighted and the problems of comparability of customized ESS are shown, focusing on both wording and scales used for their measurement. A methodological approach of dealing with various scales is discussed based on the results of inter- and intracompany ESS. A vision of a common ESS framework is outlined.

Intercompany comparisons of employee satisfaction / Transformation of Likert-scales

1 INTRODUCTION

1.1 Preface

Employee satisfaction is an objective that is on the agenda in almost all larger institutions. Especially if there are multidimensional management systems in use, it can be seen that the goal of 'employee satisfaction' is typically part of the set of strategic targets. A higher share of these 'modern' management systems, e. g. (sustainability) balanced scorecard, use indicators for the measurement of success or failure in executing the strategy. In the case of the employee satisfaction this is mostly an index value and in almost all cases the methodological approach is an employee satisfaction survey (ESS). The literature highlights on one hand the need for the characteristics of the individual organisation to be addressed in ESS, on the other hand the matter of comparability is discussed. As participation of the targeted group is seen as a precondition for later acceptance and success of the related successive measures, the issue of comparability is generally less important in the period of the design of the ESS. This changes notably when the results were published. After a short discussion of the own results, unavoidably the question of "how do we compare to other institutions" comes up. The question and core topic of the paper is whether a balance between customizing and comparability is possible.

* Corresponding author: christoph.hartebrodt@forst.bwl.de; Wonnhaldestraße 4, D-79100 FREIBURG, Germany

1.2 Contents and Scales

Intensive research has been undertaken during the past years related to the topic of employee satisfaction surveys (ESS). There is a consensus that these surveys cover on average all topics which are estimated as being important for employee satisfaction (Borg 2003). However, the opinions regarding what the minimum requirements of such a survey should be differ. Borg (2003) underlines that most surveys show a combination between standard topics and questions related to the particular situation of the institution. This is even the case when the reason for the survey seems to be very specific. This can be explained by the fact that a narrow range of topics can result in a more or less strong refusal by the members of the institution. In addition it can be stated that there is no unique recommendation on what the set of standard topics should be. Nonetheless, desktop research showed that there is a discussion about some kind of an intersection-set of questions, which appears in a relevant number of questionnaires.

Borg (2003) classifies 11 standard contents from the point of view of the members of the institution and 9 performance and strategy-related contents, which are of particular relevance for the institution as such. Borg (2003) derives a structure of three areas of interest from these findings. Hossiep & Frieg (2008) undertook a study in Germany, Austria and Switzerland amongst 820 of the largest enterprises. They identify 19 standard and performance topics and 9 psychological issues which are addressed in ESS. If this set of topics is split up into a stratum, which occurs in more than 50% of the surveys and one which is less frequent, a three-part classification turns out. This three-partite structure is basically confirmed by Bösch (2011) who identifies three standard topics which are part of almost every ESS, five that are frequent and seven contents, which are related to psychological, social or ethical issues. Fischer et al. (2008) do not define areas of interest. They define 12 fields of questions, which are seen as being the most important key drivers for satisfaction and commitment of the employees. Domsch & Ladwig (2000) and the European Foundation for Quality Management (EFQM, cited in Bösch 2011) define 9 areas of interest; however it can be shown that these areas differ.

Finally it can be subsumed that there is some kind of an understanding of important aspects which are part of ESS, but the opinions how to structure these topics differ notably. As a reason for this heterogeneity two main aspects seem to be of special significance, the need to develop a case-related solution (a) and the participation of the employees (b).

(a) Borg (2003) and Fischer et al (2008) point out that the content of any kind of ESS should be related to the objective of the study, which means that the mere use of a standard set of questions would be misleading.
(b) As participation of employees in the stage of the development of ESS is recommended in order to cover all relevant aspects from the point of view of the employees, some very specific contents and / or questions are to be expected. Unless that this can be seen as a constraint with the later comparability of the results, this participation is seen as a precondition for the acceptance of the results and the consecutive measures (ibid.).

1.3 Calculation of Index Values

It can be shown that there are different types of index values which are subsumed under the headline ESS. Bösch (2011) differentiates four types; (1) satisfaction-index, (2) leadership-index, (3) commitment-index and (4) acceptance-index.

Evidence is given that there are various sets of questions, which are related to the respective indices, however there is a wide overlap between these sets and no consensus exists in terms of which question supports which type of index. Despite the fact that there is a discussion about the accuracy of deriving arithmetic means from ordinal and/or nominal scale by coding them with discrete numeric values, this method is applied in almost all cases. After coding the questions, two basic approaches of deriving an index value from the questionnaires are in use.

The first one can be titled as ‘all questions approach’. Here the results of all individual questions are included in the calculation of an index, partially after calculating means of sections and combining these means to an overall index.

Second approach can be subsumed under the ‘index-question’ method. Here a set of questions is included; relatively often some kinds of questions, which are frequently suited to subsume the antecedent section, are used to derive an index from this special type of index.

2 MATERIAL AND METHODS

2.1 Material

As the study was embedded in an ESS-project under the umbrella of a Sustainability Balanced Scorecard (SBSC) project, it was decided to include only larger forest organisation in the German-speaking regions. It was possible to identify six ESS studies from the past six years, which could be compared with the ESS of the state-owned Forest Enterprise of Baden-Württemberg that was carried out in the year 2013. The comparative studies are listed in *Table 1*.

Table 1. List of comparative studies

Institution	Year
State Forest Enterprise of Hesse (HessenForst)	2009
State Forest Enterprise of Bavaria (BaySF)	2010
State Forest Enterprise Saxony-Anhalt	2007
State Forest Enterprise Mecklenburg-West Pomerania (Landesforsten M-V)	2010
Forest Research Institute Baden-Württemberg (FVA)	2010
Forest Research Institute of North-Western Germany (NW-FVA)	2011

2.2 Methods

The study focusses mainly on four topics. It was of special interest whether:

- the ESS forest case study addresses topics, which are seen as being important in the general literature about ESS
- the wording of questions allows for a comparison of individual questions
- the scales applied allow for a direct comparison
- a normalisation of scale can be used in case that comparable questions are evaluated with different scales.

The methodology applied in respect of these areas of interest is described below.

2.2.1 Topics

As it could be shown that different authors used a ‚frequency-approach‘ to classify the importance of the topics, this method was applied in this paper in order to identify the most important topics for further research. Based on a desk research six classifications were combined in a meta-analysis. Borg (2003), Hossiep & Frieg (2008) as well as Bösch (2011) use a three-partite scale, which were included directly into the meta-analysis with three, two and one point respectively. Domsch & Ladwig (2000) differentiate their results into core topics and sub-items. Core topics were valued with two points, whereas sub-items receive a one

point value. Bröckermann & Müller-Vorbrüggen (2010) and Fischer et al. (2008) defined a limited set of key drivers which were coded with two points. The standards of the EFQM were – due to their international significance - ranked higher. In case that a topic is listed in the standards of EFQM three points applied.

In a second step, the comparative questionnaires were analysed whether there are, and if yes, how many questions, which are related to the single topics and are included in the questionnaire. The sum of point related to the individual topics was used to derive a ranking of important topics. For the most important topics the number of questions in the comparative studies was analysed.

2.2.2 Questions and their wording

It is widely accepted that the results of ESS can only be used for comparison studies in case that the wording of the individual questions is more or less identical. Therefore the questions in the ESS were assigned to the list of topics and a text analysis was carried out in which the wording was checked under the point of whether a direct comparability is feasible or not.

2.2.3 Scales

The scales which were used in the questionnaires have been analysed. Of special interest were:

- number of categories
- type of scale (ordinal / cardinal)
- use of a “don’t know” category
- the use of a neutral category
- whether the wording the scale was symmetric or asymmetric.

2.2.1 Normalisation

Based on the analysis of the questionnaires a small set of questions in two comparative studies and the ESS of ForstBW in the year 2013 could be identified, which showed a sufficient similarity of wording but different scales. For this small subset the results have been normalized using the formula:

$$\frac{x_i - x_{min}}{x_{max} - x_{min}} * 100 \qquad (1)$$

x_i = Likert code resp. mean of Likert code
x_{max} = Maximum Likert code
x_{min} = Minimum Likert code

The factors derived from this normalisation were applied to the results of the individual questions in the ESS. *Table 2* gives an example of that kind of normalisation.

Table 2. Normalisation of different scales

Likert code	% Value	Likert code	% Value
6	100	5	100
5	80	4	75
4	60	3	50
3	40	2	25
2	20	1	0
1	0		

3 RESULTS

3.1 Topics

In total 44 topics were identified from which 10 reached more than half of the maximum sum of point derived from the six studies included, which are used furthermore as the most important topics. A second group, which reached a quarter or more of the maximum value, is depicted as well. Here we found 16 topics. At the bottom of *table 3* the topics of lower importance (three points and less) are listed.

Table 3. Priority of Topics in ESS Studies

Topics	EFQM (from Bösch 2011)	Bösch	Bröckermann & Müller-Vorbrüggen	Domsch & Ladwig	Borg	Hossiep & Frieg	Max 16
Leadership / immediate superior	3	3	2	2	3	3	**16**
Cooperation / team (colleagues, service prov. dept.)	3	1	2	2	3	3	**14**
Workplace conditions and safety	3	1	2	2	3	3	**14**
Advanced training / prospects		3		2	3	3	**11**
Function and duties / objectives		1		2	3	3	**9**
Pay / statutory benefits / gratuities		1		2	3	3	**9**
Staff retention / fluctuation	3	1	2			3	**9**
Working atmosphere	3	1	2		3		**9**
Communication / information		1		2	3	3	**9**
Processes / internal organisation	3	1	2		3		**9**
Customer orientation / customer retention		1	2		2	2	**7**
Job satisfaction / overall satisfaction		1	2	1	3		**7**
Identification / commitment / emotional bonding		1	2		3		**6**
Assertion of strategy		1			2	3	**6**
Image / communication / attractiveness		2		1		3	**6**
Management of innovations		1			2	2	**5**
Motivation, performance / productivity				1	2	2	**5**
Workload/ stress / burnout		2		1	1	1	**5**
Equitableness and acceptance		1		1	1	1	**4**
Empowerment/ accountability and freedom / participation		2			1	1	**4**
Self-respect and perspectives		2		1	1		**4**
Quality (Products/Services)					2	2	**4**
Motivation		1	2	1			**4**
Work-Life-Balance		2			1	1	**4**
Change management					2	2	**4**
Project management					2	2	**4**
Topics of less importance	Uncertainty of employment ; Deficits / Potentials for improvement ; Change of legal status, Reorganisation, Fusion ; Engagement ; Discrimination ; Confidence in management und enterprise ; Working hours schemes ; Media ; Social capital ; Diversity ; Mobbing ; Demographic change ; Confidence; Management instruments ; Health management ; Career planning / career supervision; Management trends ; Psychological contracts						

The analysis of number of questions related to the most important topics in the ESS used for comparison with the latest survey amongst the members of ForstBW showed that seven out of ten of the very important topics are addressed in the forest ESS as well. However, it has to be kept in mind that the intensity in terms of number related questions differs notably. The topics "payment, statutory benefits, gratuities', 'staff retention, fluctuation' and 'working atmosphere' are covered weakly in the studies (*Table 4*)

Table 4. Coverage of key topics in ESS in forest institutions

	Bavaria 2010	Hesse 2009	Saxony-Anhalt	Mecklenburg-West Pomerania	North-Western Research I.	Research I. Baden-Württemberg	Average Number of Questions
	Numbers of Questions						
Leadership / line manager	16	11	4	9	4	5	8.2
Cooperation / Team (colleagues, service providers, departments)	9	8	1	0	1	3	3.7
Workplace conditions and safety	5	3	1	11	4	7	5.2
Advanced training / prospects	4	5	5	6	2	3	4.2
Function and duties / objectives	5	6	3	8	1	5	4.7
Pay / statutory benefits / gratuities	1	2	1	0	0	0	0.7
Staff retention / fluctuation	0	0	1	0	1	0	0.3
Working atmosphere	3	1	1	0	2	2	1.5
Communication / information	16	9	3	11	7	4	8.3
Processes / internal organisation	8	4	5	3	8	5	5.5

3.2 Wording

Below for two topics the translation of the set of questions used is shown. It appears that the questions can differ widely and that only in a small share a direct comparability can be approved (*Tables 5 and 6*).

Table 5. Example for different wording of questions related to the topic 'Leadership / line manager'; subtopic appreciation

Original wording in German	**Equivalent wording in English**
Das Verhalten meiner direkten Führungskraft mir gegenüber ist von Wertschätzung geprägt.	The behaviour of my line manager is charactised by appreciation.
Mein Vorgesetzter spricht seine Anerkennung aus, wenn ich gute Arbeit geleistet habe.	My line manager expresses his appreciation, when I did a good job.
Ich bin mit der Wertschätzung meiner Arbeit durch meinen direkten Fachvorgesetzten zufrieden.	I am satisfied with the appreciation of my line manager.
Ich bekomme Lob und Anerkennung von meinem direkten Fachvorgesetzten gezeigt.	My line manager shows commendation and appraisal.
Werden von ihrer Führungskraft gute Leistungen erkennbar gewürdigt?	Does your line manager recognize a good performance in a visible way?
Mein Vorgesetzter lässt mich auf verschiedene Art wissen, dass meine Leistungen anerkannt werden.	My line manager lets me know in different ways that my performance is recognised.
Erkennt ihr Vorgesetzter gute Leistungen lobend an?	Does your line manager commend a good performance?

Table 6: Example for different wording of questions related to the topic 'Cooperation / Team (colleagues, service providers, departments)'

Original wording in German	**Equivalent wording in English**
Zusammenarbeit zwischen den Organisationseinheiten.	Cooperation between the individual units.
Die Zusammenarbeit meines Teams mit anderen Arbeitsbereichen innerhalb der Dienststelle ist so, dass wir gute Arbeitsqualität erbringen können.	The cooperation of my team with other units works in a way that we can achieve a good quality.
Mit anderen Fachbereichen wird gut zusammengearbeitet	The cooperation between the units works well.
Die Arbeit in meinem Team funktioniert gut	The work in my team works well.
Wie zufrieden sind sie insgesamt mit der Zusammenarbeit mit Kollegen aus andern Abteilungen/Teams?	How satisfied are you in general with the cooperation with colleagues from other departments?
Zwischen meiner Abteilung / Arbeitsgruppe und anderen Abteilungen / Arbeitsgruppen besteht eine gute Kooperation.	Between my department / group and other departments / groups exists good cooperation.
Wie beurteilen sie die Zusammenarbeit mit den Kollegen anderer Abteilungen/ Gruppen?	How do you assess the cooperation with colleagues working in other departments / groups?
Zusammenarbeit mit anderen Abteilungen/ Teams (internen Kunden oder Lieferanten)	Cooperation with other departments / teams (internal customers or providers)
Aus meiner Sicht ist die Zusammenarbeit a) innerhalb meiner Abteilung reibungslos b) zwischen den Abteilungen gut.	From my point of view the cooperation a) in my department works unobstructed b) between the departments is good?
Die Zusammenarbeit zwischen der Zentrale und den Forstbetrieben funktioniert reibungslos.	The cooperation between the general office and the local units runs smoothly.
Internationale Zusammenarbeit: a) Ist die Zusammenarbeit mit Kollegen in anderen Ländern ein Bestandteil ihrer täglichen Arbeit? b) Wenn ja, funktioniert diese internationale Zusammenarbeit gut?	International cooperation: a) Is cooperation with colleagues in other countries a part of your daily work? b) If yes, does this cooperation work well?

The six questionnaires had 521 subtopics in total grouped by the 44 topics listed above. For 76 subtopics more than one wording could be identified. The number of different wordings was 10 in maximum; however two to four wording alternatives cover 70% (*Table 7*)

Table 7. Number and share of differently worded questions related to a subtopic

Number of Wordings	>10	8	7	6	5	4	3	2	Sum
Absolute Frequency [N]	2	2	3	6	9	7	14	33	76
Share [%]	2.6	2.6	3.9	7.9	11.8	9.2	18.4	43.4	100

Due to the qualitative nature of text-analysis the subsequent *table 8,* in which the number and share of comparable questions is shown, allows for only a rough estimate about the possibilities of direct comparability of questions. Given that it becomes visible that only in about 40% more than half of the cases were more than one wording could be identified more than 50% of the questions could be used for more or less direct comparison with regard to their wording. Recalling that a use of different scales applies (see also *table 9*), the number of cases in which wording and scale allow direct comparison tend to be negligible.

Table 8. Directly comparable questions

Directly comparable questions	>75	74,9 - 50	49,9 - 25	<25
Number [N]	14	18	9	35
Share [%]	18.4	23.7	11.8	46.1

3.3 Scales

Table 9 shows the number of different types of scale which were used in the six questionnaires.

Table 9: Types of scales

	Alternatives						Ordinal Scale	Nominal Scale	Symmetry		Neutral Alternative		"Don't know" Alternative	
	2	3	4	5	6	>6			yes	no	yes	no	yes	no
1				x				x		x		x		x
2		x						x		x		x		x
3	x							x		x		x		x
4	x							x	x			x		x
5	x							x		x		x		x
6		x						x		x		x		x
7			x					x		x		x		x
8				x				x		x		x		x
9					x			x		x		x		x
10						x		x		x		x		x
11					x		x		x			x		x
12					x		x			x	x			x
13				x			x		x		x			x
14				x			x		x		x		x	
15				x			x			x				x
16			x				x		x			x	x	
17			x				x			x		x		x
18			x				x		x			x		x
19			x				x			x	x			x
20		x					x			x		x		x
21		x					x			x		x	x	
22		x					x		x		x			x
23	x						x		x			x		x
Sum	4	5	5	5	3	1	13	10	8	15	5	17	3	20

The analysis of the applied scale shows a tremendous variability. In only seven questionnaires we found 23 types of scale, without mentioning these questions which are related to demographic aspects. The number of alternatives shows an almost equal distribution between 2 and 5, 6 alternatives was less frequent and more than 6 alternatives was applied only one time. Roughly 60% of the scales are ordinal scales. 7 from 13 ordinal scales are symmetric in that sense that the wording is identical except for the word that indicates whether the answer is proven true or false (e.g. agree totally / agree widely / disagree widely /

disagree totally). Most parts of the ordinal scale were so-called 'forced scales' where no neutral position is offered and where the respondent has to make a choice whether he agrees or not. Only 3 types of scales offered the "don't know" alternative.

3.4 Comparability and Benchmarking

The results presented above gave already hints that the level of comparability could be low, when the search for benchmarks for the 2013 ForstBW ESS was started. This expectation proved true. It was possible to identify 12 questions, which could be used for intra-company benchmarking. For only 9 questions a sufficient comparability was seen to be used for the comparison with two other forest institutions. As we warranted anonymity these institutions are characterised with 'Org. 1' and 'Org. 2'. In both cases the scale differed and a normalisation was carried out as described above (see section 2.2.4)

The *figures 1 and 2* depict the results of the inter- and intra-company comparison.

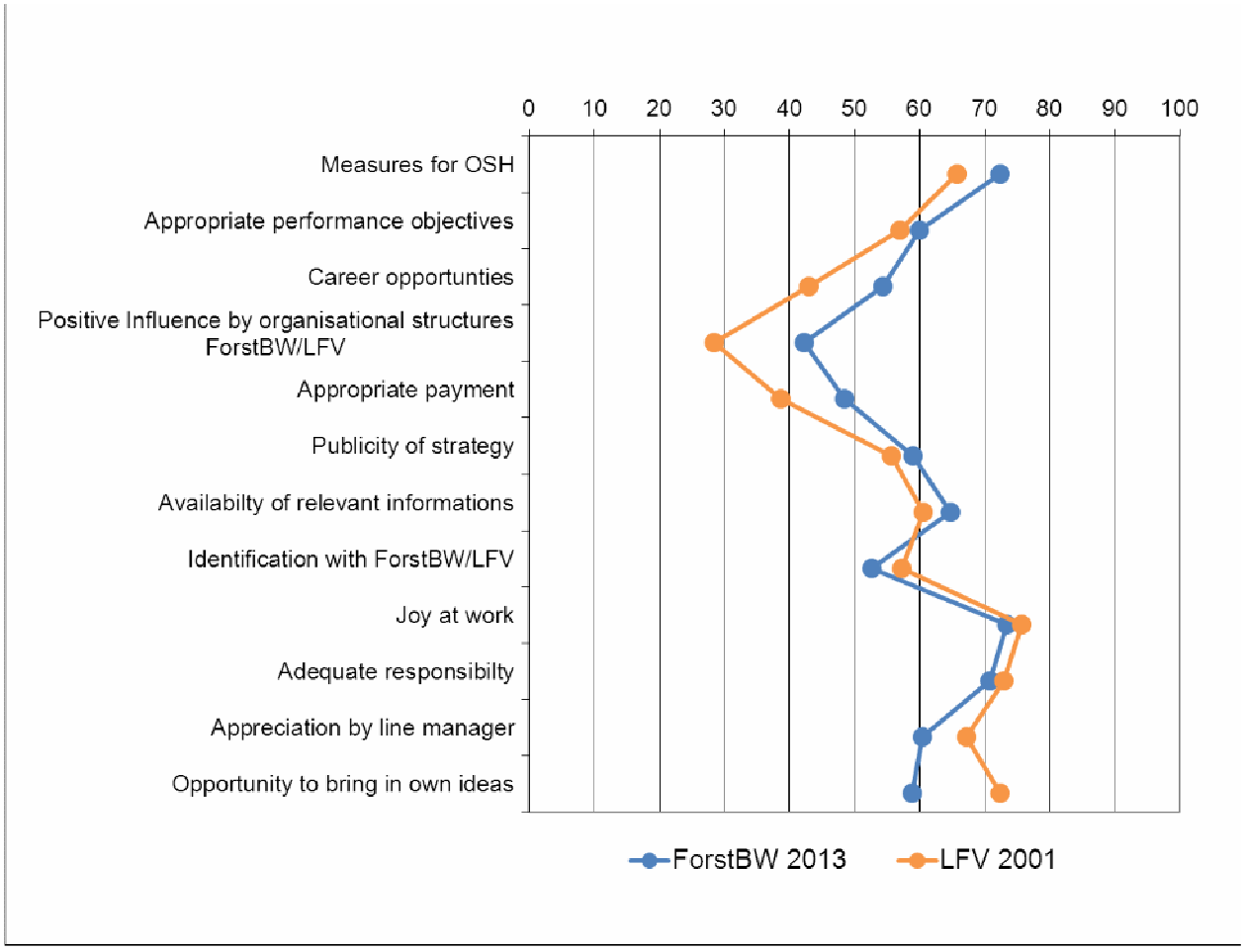

Figure 1. Intercompany benchmarking

It is visible that the pattern of the answers of the employees of ForstBW is quite similar in the years 2001 and 2013. In the year 2001 a five-point Likert scale was in use, whereas in 2013 a six-point scale was applied. After the normalisation to a '100% scale' we found values that are better and some which are worse. This can be seen as a strong indication that there is no bias caused by the normalisation. The absolute difference does not exceed 14%. The averages are very similar (ForstBW 2013 = 60, LFV 2001 = 58), the coefficient of variation is smaller to some extent in 2013 (0.15) if compared with 2001 (0.24).

The intercompany differences are shown in *figure 2*. The differences of the means are insignificant if comparing ForstBW with Org. 1 (1%), but can reach a notable amount in comparisons with Org. 2 (7%). The absolute values show the same characteristic. There are similarities and differences. The latter one reaches with 27% in maximum a higher level compared to the values of the intracompany comparison. The coefficients of variations are at an astoundingly equal level (0.12, 0.12, 0.11). Again, it can be concluded that the normalisation allows for similar findings and as well for the detection of various levels of satisfaction.

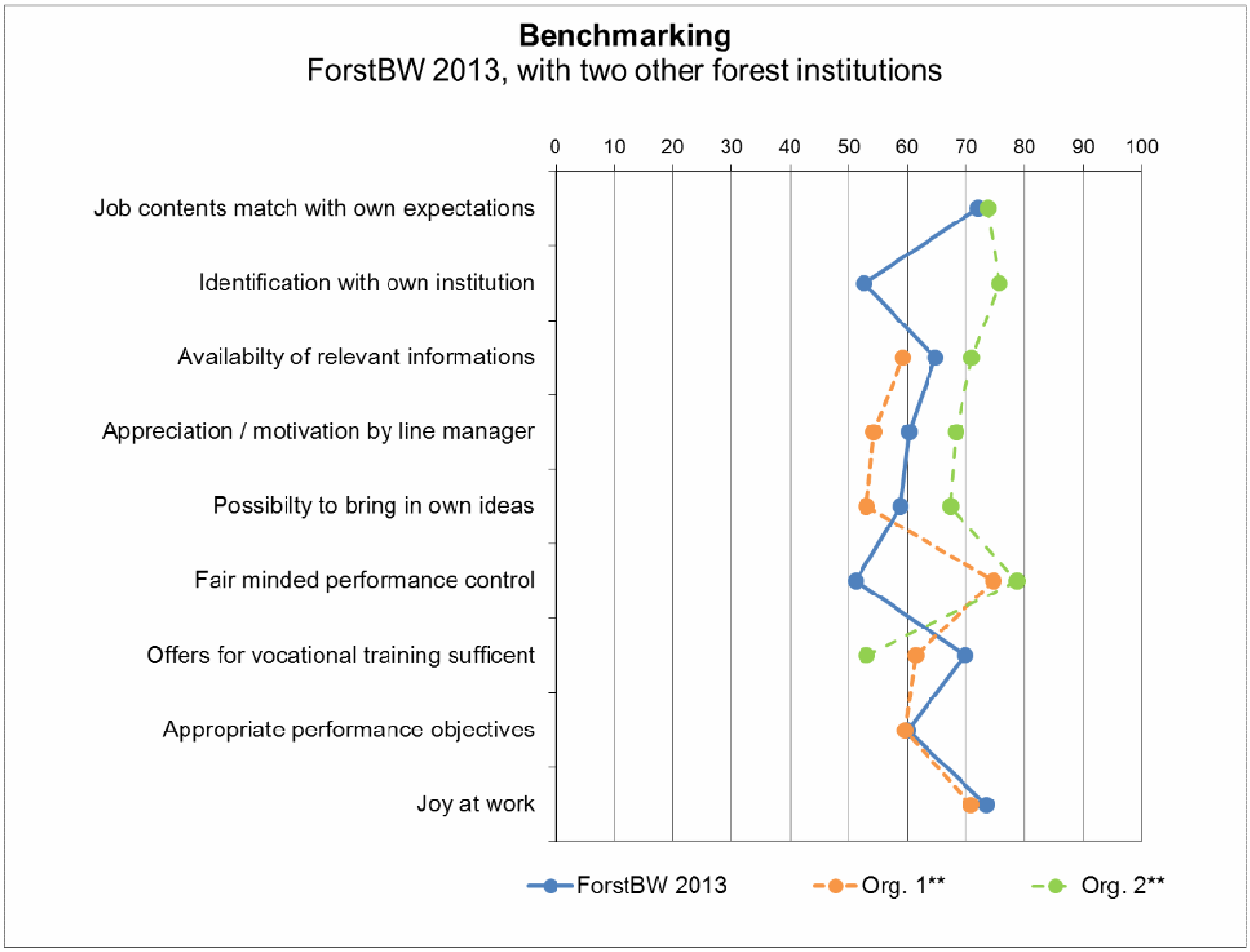

Figure 2. Intercompany comparison

4 DISCUSSION

4.1 Topics

Already the choice of topics in the individual ESS shows a wide variability. Even from the 10 most important topics only 6 were addressed with at least one question. An analysis of the topics of middle and lower importance (not depicted in the paper) shows that a case-related choice of the contents prevails. Thus it can be stated that forest ESS show the same selective or institution-related approach as described for ESS in other sectors. As participation plays a relevant role in almost all cases, this situation is not surprising. As shown above, the number of questions related to the different topics varied tremendously. Consecutively, the importance of the topics can be very different in all cases where the satisfaction index is

calculated on the basis of the individual questions. The selection of topics and questions is related to the total number of questions in the individual ESS which is different too- what can be put in relation to the intensity of the single EES. Therefore, it has to be stated that the comparison of the overall indices should be avoided because of the fact that the issues addressed and the intensity of the ESS cannot be compared fully.

4.2 Wording

The analysis of the wording of the questionnaires reveals that there is no use of any kind of standards and even no desire visible to use wording from other ESS. It can be assumed that the design of the questionnaires is more driven by the developers, be it that this has been done by the institution itself or from a consultant involved. In the latter case it is rather probable that here the standards of the consultant influence the wording, because of the fact that this reduces the time and effort needed to develop the questionnaire. A tendency that the consultants prefer their own wordings would be as well supported by the fact that the offer of benchmarking data can be a profitable side business after the ESS. With regard to the forest ESS it has to be stated that there were almost no identical questions and even the share of comparable questions is low. Together with a finding that the wording does not always meet technical standards such as addressing only one topic in a single question or using only positive or negative statements in a section of a questionnaire, it has to be concluded that the chance for comparisons is limited on the level of individual questions as well.

4.3 Scales

The results of the scales applied in the six ESS used for a comparison to the ESS of ForstBW carried out in 2013 were almost self-explaining as 23 different scales could be identified in the underlying questionnaires. It has to be questioned first, whether the questionnaires were designed professionally. The number of scales and changes of scale should be limited because there is always the risk that the respondent does not realize this change and gives his answers on the basis of the scale of the previous sections. As there is almost no chance to verify whether the scales have been used properly, the results can be misleading.

4.4 Comparability and Benchmarking

The possibilities for an in-depth benchmarking are very limited. This applies especially for the benchmarking of the employee satisfaction indices. The selection of topics and number of questions varies widely and even the way in which the indices were calculated can differ. Together with the use of different scales, partially more than one scale is used in a single ESS questionnaire; it was not possible to make assumptions about the differences of the overall satisfaction in different forest institution. This leads to a situation that benchmarking data are more or less unavailable or have to be bought from consulting enterprises unless it is not known whether these data are comparable or not. It can be assumed that the price of the benchmarking data increases notably the costs of the whole analysis.

The analysis of the scales offered a detailed insight in the heterogeneity of the individual questionnaires and alternatives for the responses. Recalling that only seven questionnaires are included in the analysis, it became obvious that in the most questionnaires a multitude of scales is applied. An in-depth analysis of the questionnaires shows that there is frequently a change of scale from one part of the questionnaire to the next. Partially the scales are changed even from question to question. This is conflicting with the dominant recommendation in literature that the change of scale has to be avoided to a maximum extent. However, there are hints that this problem is limited in questionnaires which are used to develop some kind of employee satisfaction index. Here the developers were more aware that a change of scale can

provoke errors during the completion of the questionnaire. Nevertheless, it has to be stated that the degree of professionalism could be notably improved. The wish to evaluate the opinion in respect to very specific topics is not necessarily linked to the need to use different answer-scales.

However, there is one circumstance that helps to carry out comparison of equally worded questions in case that only the number of categories applied differs. Recalling that the number of questions included in an inter- and intracompany comparison was very limited (9 respectively 12questions, see above) there are strong hints that a normalisation of the scales could be applied. The ESS in ForstBW were executed in almost the same situation about three years after a harsh reorganisation and in awareness that the degree of dissatisfaction was high. As more than two-thirds of the people of the study overlapped, the basic hypotheses must be that no larger differences in the overall satisfaction are given, but variations in respect of different items are to be expected. The results above achieved after the normalisation of a five- and six-point Likert scale have proven these hypotheses.

4.5 Summary

The results reveal that forest ESS are highly customized at the moment. The possibilities to make a meaningful benchmarking are limited to single questions and even here, some but no significant uncertainties remain in case that different scales had been applied. This situation is mainly driven by the requirement to include the target groups in the development process of the ESS. In addition, it cannot be excluded that the consultants involved work in that direction too, because any use of standardized questionnaires would reduce the need to involve them. Moreover, the sale of benchmarking results is an, at least potential, side-business too. Furthermore, what reduces the interest of consultants to use standard questions or index calculations as well. Thus it must be stated that the value of the ESS is at present limited to an intracompany time series. However, it has to be kept in mind that organisational changes are permanent concomitants that may hinder or prevent the realisation of meaningful repetition of the ESS.

As the results reveal that there are topics, which are of interest in most forest enterprises and that the present wording and design of the questionnaires does not always reflect best practice standards. It can be assumed that the choice of professionally-worded questions from a publicly available set of questions could improve the individual ESS without necessarily hampering the requirement to cover the issues which are of special interest in the respective institution.

5 CONCLUSION AND OUTLOOK

At present it can be stated that in the German-speaking region we found customized ESS, with very limited possibilities to undertake any kind of benchmarking. Furthermore, a large potential of these surveys, which are always cost-intensive undertakings, is not used. At least two approaches can be identified which can lead stepwise to improved possibilities for intercompany comparability.

A kind of database, in which properly worded questions related to individual topics are available during the design of new ESS, can facilitate and fasten the process of the development in a way that the time consuming wording of questions is replaced by the choice of questions. In case that at least the former users of these questions or even better (anonymized) benchmarking data are available in the database too, a cost-free and reliable comparison becomes basically possible. Identical scales are useful; however the normalisation of scales seems to be a feasible approach to bridge that gap.

In case that there are already existing ESS in an institution, any change of the structure of the questionnaire or even questions and its wording must be discussed carefully, because a time series of identical repetitive ESS is a value as such. Here an inclusion of a set of additional index questions related to the most important topics (see table 3) which can be used to derive a sort of intercompany standard for employee satisfaction indices could offer the chance to compare at least the overall employee satisfaction or the satisfaction in some thematic areas. These index questions could be seen as a subset out of the database discussed above.

Such a subset could be used as well for intermediate "snapshot-ESS" between the more comprehensive and therefore more expensive regular ESS, which are frequently carried out in longer time intervals.

The balance between customizing and benchmarking is not given yet. However, it seems possible to make progress using a more incremental approach without risking the loss of the own data and experiences. Therefore, it is less a technical problem to come closer to a balance, it needs the desire to enhance the transparency by using benchmarking data.

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Integrated, Participatory Sustainability Management in the Context of Functional Subsystems of Forest Enterprises

Christoph HARTEBRODT* – Yvonne CHTIOUI – Kathryn HOWARD – Reinhard AICHHOLZ

Forest Research Institute Baden-Württemberg, Freiburg, Germany

The sustainability issue has gained importance during the last two and a half decades. As the transformation to a sustainable economy is far from being an automatism, instruments to foster sustainable development are required. This paper introduces firstly the concept of a comprehensive management system of sustainability in forest enterprises. The need for a participatory approach is described. The necessity for the use of different instruments is derived from the existence of various subsystems (Manufacturing / provision of services, Management, Communication and Information). A short overview about the general role of evaluation and former findings is given. After that an advanced perspective on process of evaluation is introduced. It can be shown that the success of a management system is dependent on different influencing factors. From this it follows that a multi-perspective has to be used. A first outline of such an approach is given, the sub-methods are sketched and the complementary role of direct and indirect evidence in process evaluation is described.

* Corresponding author: Christoph Hartebrodt@forst.bwl.de; Wonnhaldestraße 4, D-79100 Freiburg, Germany

Readiness of Forest Officers for Adaptations in Forest Management Planning

Christoph HARTEBRODT* – Julia SCHMITT

Department of Forest Economics, Forest Research Institute Baden-Württemberg, Freiburg, Germany

Abstract – Under the framework of a society that enhances the demand for different kinds of ecosystem services, the "Forest Management Planning" (FMP) has changed notably over the last decades. As a consequence of budget constraints and the fact that the present forest planning system of the State Forest Administration Baden-Württemberg is in operation since the year 2000, these systems have to be developed further. As the group of the forest officers on the county level is the largest user group, it was decided to start a participatory process in order to derive the most relevant requirements of that group. A survey within the Board Members followed. In order to gain an insight into the requirements and preferences we used the pairwise comparison method. The paper highlights the preference structure in respect with (1) the goals of FMP, (2) target groups, (3) the FMP process, (4) tasks, (5) and the outputs of FMP. It can be shown that the average understanding of forest officers tends to be more traditional and internal than proactive and stakeholder-oriented. The pairwise comparison approach has been proven successful.

Forest Management Planning / Integrated Planning / Internal Participation / Readiness for Change / Plurality of Opinions

1 INTRODUCTION

The role of Forest Management Planning (FMP) has changed notably during the last decades. Until the late seventies FMP was mostly seen as an internal, mostly technical procedure, primarily focusing on the productive function of forests. Especially under the framework conditions of a densely populated county with a (on average) highly educated population, the role of forests has changed more and more towards a supplier of various ecosystem functions. Except for all kinds of timber processing industries and an initially small, but meanwhile increasing number of private timber consumers, the societal interest is mainly concentrating on recreational and environmental functions of forests. Together with this shift in interests the demand for participatory processes has grown larger. Whenever the use of instruments is foreseen, which are related to a sustainable development, participation is a standard step during development, implementation and mostly during the use of the respective instrument (e. g. sustainability reporting (GRI 2103) and the Agenda 21 processes (Heinrichs 2007, Feindt – Newig 2005). There are substantial findings that planning procedures are seen as good opportunities for communication with and participation of various kinds of stakeholder groups (Sheppard 2005, Joint FAO/ECE/ILO Committee 2000, cited in Beck 2011).

* Corresponding author: Christoph Hartebrodt@forst.bwl.de; Wonnhaldestraße 4, D-79100 Freiburg, Germany

It is not only the external participation, however, that contributes to the success of FMP systems. As these systems are used by a potentially maximum share of members in almost each forestal institution, the acceptance of the FPM and other instruments in place can be seen as a key success factor for their application. A means to achieve a sufficient level of acceptance is the involvement of users in the development process (Hartebrodt 2009). Consecutively, not only external participation has to be considered, but also internal participatory processes have to be part of the revision of existing instruments.

The change of the societal requirements resulted, at least in Germany, in an increasing dispute between forest owners and/or administrations and stakeholder groups. In particular, environmentalists are generally sceptical and mistrusting towards timber harvesting or at least towards a higher share of traditional management practices. Owners and forest practitioners highlight the increasing demand for all kinds of wood-based raw materials and underline the important role of forest utilisation in a bio-based regenerative economy. The willingness to adopt new requirements in the management practices differs widely despite the fact that a relevant part of these requirements rests on the present legal framework, for instances the European Framework directive 'Flora, Fauna, Habitat' (European Commission 1992). This directive leads (among other things) indirectly to the presently upcoming idea of implementing the so called integrated management plans, which cover both the management of forest production and the management of ecological issues (European Commission 2013).

2 AIM OF THE STUDY

The purpose of the study was two-fold. First, the objective was to develop a deep and detailed insight into the preferences and requirements of different internal user groups of FMP. The pattern of the preferences was foreseen to be used as a set of decisive criteria for the ongoing revision process of the FMP system. Of special interest was the question, whether forest practitioners are ready for an integration of external requirements in FMP and the involvement of stakeholder groups in the FMP process.

Second, it was of interest, if, and to what extent, elements of a decision support system and the related participatory processes are suited in the context of such kind of revision process. In detail it was planned to analyse the consistency of the results in various substrata, the ability of the process to provide additional information about the hetero- or homogeneity of the opinions and the acceptance in the decision process.

3 CASE STUDY

The forest administration of Baden-Württemberg is organised as a so called unity forest administration responsible for all types of forest owners (state-owned, communal and private). The state forest service manages the state forest, is responsible for assistance and (technical) support of other forest owners as well as for the distribution of financial allowances. The state forest administration is essentially responsible for the "planning, preparation, organisation, management and supervision of all kinds of forest management activities" (LWaldG 2012: §47 (1) [translation by the author]) in communal forests. Communal authorities can decide whether to take over this responsibility or not; however, as the state service is free of charge most communal bodies do not. Part of this 'service-package' is the process of the FMP, which takes place every 10 years. The FMP is carried out by one department of the middle administrational level. As most communal bodies make use of the

state service, there is consecutively mostly one FMP process in place. The revision of this process is used as a case-model for the present study.

Before a final decision about the general structure of the revised FMP process could be made, the board of managers decided firstly that the needs and requirements of the main user group, which is the forestal staff on the county level, should be studied in a way that is able to produce reliable, trustworthy and presentable results. The main areas of interests (later on dimensions) were objectives (1) and tasks (2) of FMP, as well as tools and products (3) and data / information (4) provided by FMP. The CEO defined the need that a clear prioritisation should be undertaken in respect of all dimensions. During the process the decision was made to identify the most important user groups (5) and relevant process steps (6) as well. It has to be mentioned that there are two FMP – traditions (western and eastern part of Baden-Württemberg).

After a mid-term presentation of the results gathered amongst representatives of the county level it was decided to involve the departments of top- and middle-level management and those of the state forest research institute.

4 METHODS AND DATA

4.1 Methods

Workshop with Representatives of the County-Level

The results concerning the opinion of the members of the county level were collected during two workshops (WS) in December, 2013. In order to determine whether there is a notable difference within the county, one WS was carried out in the western and one in the eastern part of the province. One had, however, also the option of attending either WS. The WS-procedure in the 1-3 and 5-6 (which are discussed later in the paper) dimensions were as follows: Based on a proposed list of items in each dimension the participants developed a final list, discussed it in terms of their present use and its frequency on the county level. This in-depth discussion was documented on posters and presented during the final evaluation session as background information for the participants.

For the final evaluation of the priority of each item we used the pairwise comparison approach (comp. Saaty 2008), which is seen to be suited for the prioritisation of intangible factors. Based on an Excel solution it was possible to transfer the lists of items into a (hard copy) questionnaire, which was filled out by the participants at the final evaluation session. *Figure 1* depicts one completed questionnaire.

The pairwise comparison was transformed into a percentage by using a matrix that transforms the individual comparisons into a percental preference (Niklas 2002). This is executed in a way that in case that the preferred item listed in the rows is more important than the column, a code 2 is used; code 1 is applied if equal importance (=) is seen and 0, when the item (row) is valuated as being less important. The sum of the codes related to the individual item (row) is used to derive the importance in percentages of the respective item by dividing by the total sum of codes. *Figure 2*shows the transformation of the questionnaire shown in *Figure 1*. The average value for the individual group (workshop 1, workshop 2, departments) was calculated as a mean-value of the individual questionnaires.

For the use of these preferences for interpretation it has to be taken into account that the maximum of the percental preference is related to the number of items evaluated. The respective formula is: $100/ (N_{Items}/2)$. Thus the maximum is limited to the twofold rate of the average priority; the minimum preference value is zero.

0=weniger wichtig(Zeilenkriterium < Spaltenkriterium) 1= gleichgewichtig (Zeilenkriterium = Spaltenkriterium) 2= wichtiger (Zeilenkriterium > Spaltenkriterium)	Gesetzl. Auftrag Nachhaltigkeitssicherung	Betriebssteuerung Betriebsleitung Land	Betriebssteuerung Betriebsteile UFB	Zentrale Datenhaltung öffentl. Wald	Einheitliche Datenstruktur	Kundenzufriedenheit	Fortbildung	Klärung Eigentümer Zielsetzung	Gewichtungswerte (Σ)	Gewichtungsprozent
Gesetzl. Auftrag Nachhaltigkeitssicherung		2	2	2	2	2	2	1	13	23
Betriebssteuerung Betriebsleitung Land	0		1	1	1	0	1	0	4	7
Betriebssteuerung Betriebsteile UFB	0	1		2	2	1	1	1	8	14
Zentrale Datenhaltung öffentl. Wald	0	1	0		1	0	0	0	2	4
Einheitliche Datenstruktur	0	1	0	1		0	1	0	3	5
Kundenzufriedenheit	0	2	1	2	2		1	1	9	16
Fortbildung	0	1	1	2	1	1		0	6	11
Klärung Eigentümer Zielsetzung	1	2	1	2	2	1	2		11	20
Summe									56	100

Figure 1(left) and 2(right) .Questionnaire used for the complete pairwise comparison and conversion in percental preferences

Surveys in the Top- and Middle-Level Management and Research Institute

It was to be expected that in management the evaluation forms would be prepared by a member of the staff, but would have to be authorized by the head of department. The use of the questionnaires for a complete pairwise comparison is comparatively time-consuming and does not immediately lead to the percental results, which could be approved easily by the heads of department. Consecutively, a different questionnaire was used in which the individual items had to be evaluated using a four point (forced) Likert scale (++ = important, + = somewhat important, – = somewhat unimportant, – – = unimportant). In order to receive comparable results in terms of a percental evaluation, the Likert values were used. The coding in the evaluation matrix was as follows: 2 was given if the Likert value of the row was higher that the value of the item in columns, 1 in case of equal preference and 0 when the row-Likert value indicated less importance (*Figure 3*).

Items	Likert Value (row)	Item 1	Item 2	Item 3	Item 4	Item 5	**Sum**	**Percental Preference**
Likert Value (Column)		++	+	--	-	+		
Item 1	++		2	2	2	2	**8**	**40**
Item 2	+	0		2	2	1	**5**	**25**
Item 3	--	0	0		0	0	**0**	**0**
Item 4	-	0	0	2		0	**2**	**10**
Item 5	+	0	1	2	2		**5**	**25**
Sum							**20**	

Figure 3.Conversion of Likert scale evaluation into percentaged preferences

4.2 Data

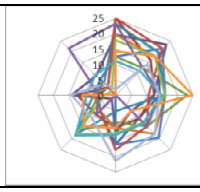
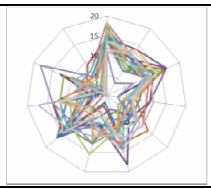
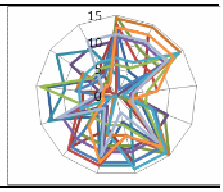
We received 13 completed questionnaires in WS 1 und 22 in WS 2. These were questionnaires in which fully pairwise comparison was performed. Except for the dimension "Tasks", where we received 14 questionnaires, we had 13 from the various departments of ForstBW. Here the Likert scale version was used.

5 RESULTS

5.1 Objectives of FMP

The results show – generally speaking – that the traditional objectives of FMP such as assurance of sustainability and the use of operative management are ranked best from almost all groups. The objectives related to potential new objectives or external use of FMP (*subsequently written in italics*) show normally a clearly lower preference in percentages (*Table 1*).

Table 1. Objectives of FMP

FMP as a means for:	Mean WS 1***	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
- assessment of sustainability as a responsibility of the public administration	17.6	0.39	14.4	0.15	11.0	0.31
- operative management on local level	15.8	0.25	12.5	0.19	9.9	0.36
- operative management on board level	10.5	0.58	10.1	0.24	12.2	0.23
- assure customer / user satisfaction**	12.0	0.46	10.3	0.33	5.3	0.55
- provision of a standardised data structure	7.9	0.54	8.2	0.33	10.3	0.27
- clarification of strategic forest management goals	17.3	0.22	*	*	7.9	0.58
- vocational training	12.7	0.35	8.1	0.43	3.1	0.83
- centralised data storage on state level	6.2	0.85	6.6	0.37	9.3	0.37
- assessment of sustainability for individual forest enterprises / associations	*	*	11.6	0.31	6.8	0.69
- *valuation and management of ecosystem services*	*	*	*8.4*	*0.53*	*7.2*	*0.61*
- *external quality control*	*	*	*6.9*	*0.61*	*6.3*	*0.64*
- *enhancement of transparency for stakeholder groups*	*	*	*3.0*	*0.94*	*5.3*	*0.66*
- *provision of a framework for participatory processes*	*	*	*	*	*5.3*	*0.70*
Maximum preference in percentages	25.0		18.2		16.7	
Pattern of heterogeneity						

* Not proposed, discussed and evaluated in the respective workshop. This is a clear indication of lower importance. It leads, however, to a slight average increase of the preference values in WS 1.
** Satisfaction in terms of satisfaction with the whole organisation and their offers.
*** One non matching item was removed from the list.

The coefficients of variation (CV) show mostly a lower or medium level with regard to the traditional objectives. However, even the CV provides only an overview of the variations of the preference patterns of the individual respondent. Based on the percental preference net-graphs give an insight into the homo- or heterogeneity related to the individual dimension and respondent. Despite the fact that individual differences are given, it can be stated that there is a lower heterogeneity on the county level in comparison to the valuation of the departments.

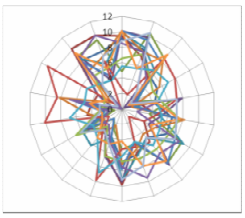
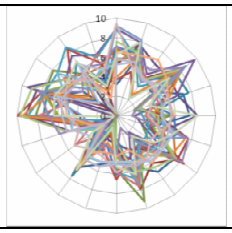
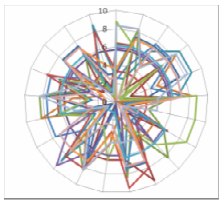
5.2 Tasks of FMP

It has to be mentioned again that the traditional tasks such as the control of the realisation of the forest management plans are in the front. With regard to new requirements the medium preference of the "integration of Natura 2000 management planning" task indicates that this aspect has gained importance in the last few years. There is strong evidence that the (already existing) use of external stakeholder is not seen as a preferred task of the FMP on the county level, whereas these functions are evaluated on average with more or less equal importance by the various departments. The heterogeneous pattern shows significant similarities between the observed in the dimension 'objectives' with an overlap of the preference pattern on the county level and relevant heterogeneity on the department level *(Table 2).*

Table 2(part 1): Tasks of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Control of FM-Plans realisation	7.7	30.4	6.5	14.1	5.7	41.7
Planning of ranger districts	8.1	30.1	6.4	26.7	5.1	45.9
Data base for GIS Applications	7.3	24.3	5.8	30.0	6.4	32.6
Planning on stand level	7.0	40.0	7.1	17.8	5.2	42.9
Inventory of basic forest data on stand level	6.8	31.8	4.9	39.3	6.2	27.0
Proliferation of detailed data for individual stands	6.4	37.8	6.1	23.9	5.1	52.6
Integration of Natura 2000 management planning	5.4	40.7	4.6	25.2	6.2	32.8
Harmonisation of conflicting goals	*5.7*	*31.9*	*4.5*	*39.9*	*5.0*	*51.6*
Database for reporting	4.5	36.7	4.8	36.7	5.9	42.2
Database for financial planning	6.2	34.5	5.1	31.3	3.7	68.6
Control of silvicultural standards	6.1	24.7	4.5	30.6	4.1	56.9
Database for in depth analysis of special cases	4.6	48.4	4.4	37.9	5.3	48.6
Silvicultural training	6.3	32.4	4.4	28.4	2.3	97.1
Vocational training	5.0	44.0	3.5	38.1	3.1	70.4
Provision of information for forest certification(FSC/PEFC)	*3.6*	*69.2*	*2.0*	*66.6*	*5.3*	*47.7*
Integrated (environmental. managerial planning) in stand level	*	*	*5.2*	*36.8*	*4.8*	*38.2*
Process development	3.6	35.8	3.0	54.3	3.1	78.6
Database for Sustainability Balanced Scorecard	*3.3*	*74.5*	*	*	*5.1*	*47.4*
Database for proliferation of information based on the act on information about environment	*2.4*	*129.0*	*	*	*5.0*	*43.5*

Table 2(part 2): Tasks of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Forest monitoring	*	*	*	*	4.3	59.1
Information on areas suitable for compensation for environmental relevant impacts	*	*	*	*	*2.9*	*98.2*
Maximum percental preference	10.5		11.8		9.5	
Pattern of heterogeneity						

* Not evaluated. Due to the lower share of non-evaluated items there is no relevant impact on the average preference pattern of the other items.

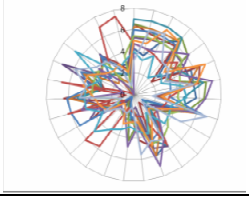
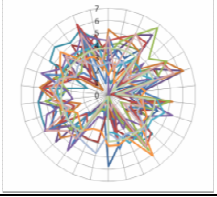
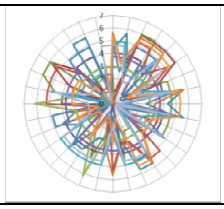
5.3 Tools and Products of FMP

The high preference for traditional output of FMP is even stronger on the county level, when the question for tools and products is raised. The highest percental ranking receives the total felling budget, stand register, and planning information on stand level. The evaluation of the departments' questionnaire shows a more evenly structured preference pattern. As in the other dimensions examined, the role of new products meets on average wide scepticism amongst the representatives of the county level, but the high CV indicates that a smaller part of the group has a different view on these externally used products. With regard to the preference pattern of the individual evaluator it can be shown that we have here a tremendous heterogeneity in all groups. The requirements seem to vary significantly among different regions or under a different thematic scope of the departments *(Table 3).*

Table 3 (part 1): Tools and Products of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Total felling budget	5.5	0.19	4.5	0.24	4.1	0.34
Resuming of silvicultural measures	4.9	0.23	4.5	0.20	4.1	0.34
Forest GIS	4.7	0.31	4.5	0.22	4.2	0.30
Stand register	5.5	0.17	3.5	0.43	4.0	0.36
Managementplans for individual stands	5.4	0.26	4.0	0.36	3.6	0.47
Digital maps	5.3	0.22	3.4	0.36	4.3	0.26
Digital stand information	3.4	0.33	4.1	0.22	4.3	0.21
Resuming of activities in areas under different kinds of treatment (planting. pruning. harvesting ...)	5.2	0.22	3.2	0.42	2.7	0.49
Traditional (hardcopy) maps	5.3	0.21	3.0	0.47	2.7	0.54
Permanent comparability between plan and completion on stand level	4.1	0.43	4.3	0.17	2.6	0.51
Plan for individual ranger districts	4.7	0.31	3.6	0.39	2.3	0.70

Table 3 (part 2): Tools and Products of FMP

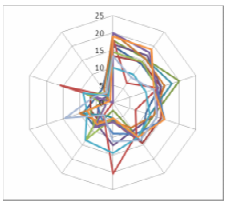
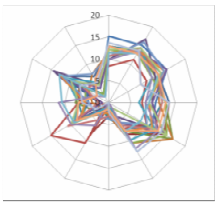
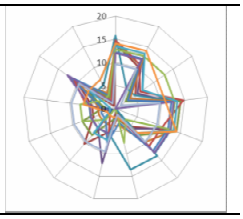
	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Standard reports	3.3	0.46	4.4	0.18	2.9	0.54
Digital cadastral information	2.9	0.47	3.5	0.34	4.0	0.26
Information about structure and spatial affiliation of land parcels	3.4	0.49	3.8	0.24	3.2	0.40
Maps about specialised questions	3.6	0.37	3.8	0.23	3.0	0.44
Management summary for decision-makers	4.1	0.38	3.4	0.30	2.7	0.58
Special analysis	2.6	0.64	3.7	0.22	3.4	0.32
Mapping of forest habitat types	*2.5*	*0.70*	*3.5*	*0.42*	*3.4*	*0.36*
Strategic management planning on enterprise level	4.2	0.31	2.1	0.53	2.9	0.56
Provision of time series	2.4	0.45	2.7	0.47	3.3	0.42
Felling plan structured by timber-assortments	3.8	0.43	1.5	0.62	2.9	0.66
Operations analysis	2.9	0.39	2.6	0.44	2.6	0.87
Management contract between owner and manager	0.0	0.00	4.7	0.24	3.2	0.54
Experts' opinion for the management of the elapsed period	2.3	0.43	2.8	0.33	2.2	0.64
Specialised analysis for different zones	0.0	0.00	3.4	0.32	3.5	0.55
Forest statistical report	1.8	0.44	2.0	0.82	2.8	0.47
List of individual stand matching special criteria	0.0	0.00	3.5	0.30	2.3	0.65
Digital information for external stakeholders and partners	*1.7*	*0.89*	*1.5*	*0.94*	*2.3*	*0.78*
Digital GIS information for external stakeholders and partners	*1.8*	*1.02*	*1.4*	*0.96*	*2.3*	*0.78*
Map of Natura 2000 areas	*	*	*	*	*3.5*	*0.22*
Description of present state of stand level	*	*	*	*	3.0	0.56
Dynamic maps which depict changes over time during a planning period.	*	*	*	*	1.8	0.70
Maximum percental preference	6.9		6.9		6.3	
Pattern of heterogeneity						

* Not assessed on the county level

5.4 Users of FMP

The analysis of the preferred user groups shows a clear result. There is a wide consensus, that the stately FMP system should be suited for a wide range of forest users. Except for the private forest owners, which are not favoured by the departments, all ownership types and managers of different levels show a distinct and greater importance. The comparatively low CV related to the forests users indicate a low heterogeneity, which is additionally supported by the heterogeneity patterns *(Table 4).*

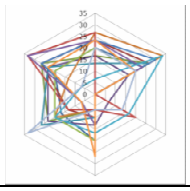
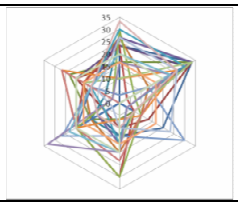
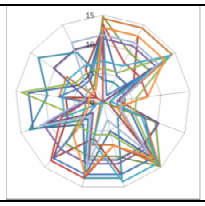
Table 4: User groups of FMP

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Owners and managers of state forest land	14.2	0.18	11.5	0.13	13.2	0.12
Owners and managers of communal forest land	16.8	0.19	13.8	0.09	11.5	0.21
Owners and managers of private forest land	14.3	0.25	12.4	0.16	5.5	0.65
Managers on board level (state forest)	12.2	0.13	10.7	0.21	12.8	0.11
Managers on local level (including forest rangers)	12.4	0.19	12.8	0.18	11.7	0.32
Other administrations	*7.8*	*0.38*	*7.6*	*0.37*	*9.0*	*0.37*
Hunters	*2.5*	*0.60*	*2.1*	*0.51*	*3.2*	*1.15*
NGOs	*5.2*	*0.79*	*3.2*	*0.80*	*5.8*	*0.56*
Citizens	*8.0*	*0.65*	*7.1*	*0.51*	*5.6*	*0.48*
Timber consumers	*6.6*	*0.59*	*5.9*	*0.44*	*4.3*	*0.68*
Forest associations			*8.5*	*0.43*	*5.2*	*0.45*
Certifiers			*4.4*	*0.46*	*9.1*	*0.32*
Adjacent forest owners					*3.3*	*0.66*
Maximum percental preference	20.0		16.7		15.3	
Pattern of heterogeneity						

5.5 Process Steps

It can be stated that there are two process steps which are ranked best in all groups. This is the joint inspection of the individual stands and a discussion about the core objectives to be executed during the next ten-year planning period. The potential role of the FMP as a platform for participatory processes was only assessed on the department level and was not seen as being an important part of the FMP process. However, as it is normal for new aspects it showed a high CV indicating different opinions on the departments' level.

Table 5: Importance of process-steps in the FMP-process

	Mean WS 1	CV WS 1	Mean WS 2	CV WS 2	Mean Dept.	CV Dept.
Joint inspections (district ranger and a member of FMP organisation)	23.1	0.38	24.4	0.38	19.5	0.43
Discussion about a set of objectives	20.0	0.28	20.3	0.43	23.3	0.22
Debriefing	17.7	0.46	16.3	0.44	16.9	0.50
Negotiations during FMP process	13.1	0.48	14.9	0.54	19.2	0.45
Participative processes with external stakeholders	*	*	*	*	*11.9*	*0.89*
Mid-term meeting	4.4	1.69	9.4	0.82	10.0	0.97
Maximum percental preference	40.0		40.0		33.3	
Pattern of heterogeneity						

6 DISCUSSION

6.1 Objectives

The results give a clear indication that traditional goals are absolutely predominant. FMP as a means to control the forest enterprise on the local level or to ensure the legal obligation to manage forests in a sustainable manner are emphasised homogenously on the county level and on the department level. The results from the two workshops on the county level show a wide overlap, hence we can conclude that the underlying hypothesis that no relevant regional differences exist was proven successfully. However, it is evident that some differences remain as well. The clarification of the set of goals of the individual owner is much more important on the county level and the same applies for the satisfaction of most communal users of FMP. Still, this is as well the internal use of FMP. All ‘new’ objectives are of lower priority on average, on the local level the results indicate that there is a tremendous scepticism towards an integration of such kind of objectives when designing a new FMP processes. It has to be pointed out that a higher CV indicates that there is a lower part of representatives who displayed a different opinion. The awareness seems to differ notably on the local level, which corresponds with the wide variety of framework conditions reaching from condensed urban areas to rural landscapes. One should expect that these “new objectives” are of much higher relevance on the upper management levels. Despite the fact that the average evaluation shows a higher ranking on the department level than in the county, it has to be stated that there is no common evaluation of these new potential objectives on the department level as well.

6.2 Tasks of FMP

Firstly, it has to be mentioned that the plurality of opinions is mostly higher when individual task of FMP are analysed. Only for roughly 50% of the tasks we found a lower CV (<0.40),

which indicates that there is a broader consensus about the importance of the individual task; only in five cases are these tasks, which are seen as being of greater relevance in all groups. With regard to the operative tasks of FMP analysis shows that the requirements of the local level are completely different from those of the departments. County members voted definitely for tasks, which are in context to silvicultural activities on the stand and district level, whereas the departments showed a higher affinity to external functions of FMP such as certification, the controlling of strategic goals in the Sustainability Balanced Scorecard e.g. Here we identify a notable difference between the requirements of the different management levels and consecutively a point of future disputes in case that the revised version of FPM is not able to cover both the preferred tasks of the local level and the wider range of tasks evaluated as being important by the departments.

6.3 Process steps

Above all, it has to be realised that the heterogeneity of opinions about the importance of individual process steps is on a medium level, but there is no differences on average between the two workshops on county level. With regard to the FMP processes it turns out that there are only two process steps which are seen as prevalent: first, a joint inspection of the individual stands by the local ranger and the person who is responsible of the FMP; second, a discussion about the set of objectives, which receive homogenously high preference in percentages. Accordingly to the findings discussed below the possibility of the integration of external stakeholders meets wide scepticism. Again, the exclusion of externals becomes visible and again, it can be shown that is not only the opinion on the county level. On the department level the heterogeneity, indicated by a high CV of 0.89, indicates various points of view on it. Unless it is known that there is a high demand from external stakeholder groups (environmental NGOs play the most substantial role) no common understanding whether a framework for an external participation should be integrated in the FMP process was developed so far even on the medium and upper management level.

6.4 Tools and products

The results of the analysis of the tools and/or products provided by the FMP mirror those of the tasks and objectives. Again, traditional products/tools are characterised by a homogenous higher or medium preference. It can be shown that the preference structure of the department level differs substantially from that of the counties, where products which can be used directly from the field foresters are ranked - foreseeably- higher. Half of the products - mostly traditional ones - are evaluated to have a limited heterogeneity, and such is the case especially on the county level. The notably higher heterogeneity observed for products, which are suited to be used by or even dedicated mostly for externals, highlights the greater differences between the counties and departments in terms of relevance of participation and issues such as ecosystem services.

6.5 Users

The importance of different users of FMP is very homogenous when we consider the traditional users and stakeholders, which are the various communal enterprises (here especially on county level) and the representatives and managers of state forest land on local and board level. New, mostly external, users are seen very sceptically on the county level. Other administrations and certifiers receive a homogenous but only medium high preference on the department level. Citizens and forest associations are in general of low importance. The higher CV indicates again that it needs the direct perception of a demand from external stakeholder groups, which can be observed only locally or in some departments, which are

confronted with external requests. Consequently, the results reveal that it is again the traditional mind-set that dominates the approach regarding the users of FMP. It can be questioned whether this is forward-looking in a time, where political decision-makers have decided to publish detailed information and data from the FMP to the public.

6.6 Summarising comments

The patterns of the preferences confirm the expectations. For most members of the forest administration FMP has to fulfil primarily the traditional functions for the silvicultural activities. However, the heterogeneity even on the county level shows that the demand for new aspects differs widely. This corresponds with the tremendous variability of the framework conditions under which forest management takes place in Baden-Württemberg. It varies from forests situated close to urban congestions, which are to some extent heavily influenced by a high share of academically educated people, to rural regions, where primary productions play a significant role. It has to be stated that up to now no widespread intrinsic motivation to adopt these new aspects exists, it is more an externally forced local shift in areas, where a higher demand for societal participation has developed. Furthermore, this plurality of opinions is not limited to the county level. On the middle and top management level the heterogeneity is similar, but evidently and expectably the perception of the increasing demand of stakeholders for information and products from FMP is higher.

From a methodological point of view it can be confirmed that the pairwise comparison methods, which have met scepticism before the beginning of the process, have proved successful. The results show a clear consistency over the individual dimensions. Forest management experts and decision-makers from the state forest enterprise unanimously stated that the results are to the point. The ability to arrange the individual items into a matrix with the axes corresponding to the importance and consentaneity can be used as guidance for strategic decisions about the core objectives and structural components of a future FMP-Process. Despite the fact that the results proved in almost every case the existing hypotheses, the additional information about the degree of consensus and presentability in the future process were identified as a benefit of the process.

7 CONCLUSIONS, RECOMMENDATIONS AND OUTLOOK

The questionnaire and pairwise comparison methods can be seen as helpful tools when a clear prioritization is needed. Particularly the opportunity to deliver results, which are - due to its participant’s absolute anonymity - more or less uninfluenced by hierarchical structures, is suited to derive an insight into the individual opinions in a group and reduce the chance to show tactical response behaviour.

The number of assessment criteria related to a topic or a dimension should be limited to 15–20 items. Questionnaires, which require up to 450 entries, are very time-consuming and are only applicable in groups with a high willingness for cooperation. Means for reducing the number of items can be seen in a preselection using less sophisticated methods or the use of a higher number of dimensions or topics. When using (hardcopy) questionnaires the result cannot be displayed in a workshop setting. This non-visibility leads to some degree of disappointment amongst the participants. The use of digital surveying methods is, when applicable, better suited when the results should be presented immediately. Furthermore, it reduces the workload of data entry tremendously. Excel applications can be designed easily.

The percental preferences can and will be used as a framework for the application of a decision support tool. At the present stage this will be a utility analysis in which different structurally diverse FMP alternatives are compared using the percental preferences as utility

values. The data could be used in other decision support systems (DSS) such as the Analytical Hierarchical Process. Regardless of which DSS is used, only the structured data derived from the evaluation process described above will allow for an undertaking of further supportive activities such as sensitivity-analysis or a comparison of different variations of the upcoming FMP in the ongoing development process in a reliable und trustworthy manner.

Acknowledgements: We thank the uncomplaining participants from the county level workshops, who actively completed questionnaires for about an hour and our students, who helped us with compiling and entering all the data in a complex system.

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One Landscape, Different Occurrences – Regional Trends of Black Forest Farming within the Last Years

Wolfgang HERCHER*

Forest Economy, Forest Research Institute of Baden-Württemberg, Freiburg, Germany

Abstract – Travelling from the Northern Black Forest Region near Pforzheim to the southern parts to the border of Switzerland, at first the variation of the construction and exterior of the older traditional farmhouses is at first striking. But with a closer look attention the diversity of the regional geological and physiographical characteristics is obvious. This is connected with the changing entangle of agricultural farmland and forests in these rural areas. This could suggest, that the still ongoing modifications of these private farm forests have to be thoroughly examined very carefully under regional factors. No matter what kind of adaption for the farm forest enterprises was unavoidable, mostly these processes of adaption have needed money. And the farm-forests were able to deliver this money for the most part. The data from the „Accountancy Network Small-Scale 5-200 ha" is a mirror of the structural change and mechanization that has taken place since the 1970s. The peaks of the several waves of investment activities oscillate from € 200 to more than several thousands of Euro per farm and year. Those very regional facts are compared with several county district statistics. The present situation is discussed and a possible perspective is designed at the end of the paper.

Farm forest / Agricultural change / Mechanization / Rural development

1 INTRODUCTION

Farming in main basis employment represents the main source of income and thus the means of existence. The share of farmers with farming as main income varies across the country of Baden-Württemberg. Within the whole state of Baden-Württemberg, notwithstanding all regional contrasts, the proportion in mountain regions is generally smaller than in lower situated areas. Based the Full-time farmers represent at the moment 33% of all farms of Baden-Württemberg and in whole Germany 45%. Commercial farms are generally larger (Ba-Wü: on average 54 ha UAA) and are found more often in better climate therefore lower areas such as regions with intensive fruit, vegetable and agricultural farming or animal husbandry.
In the majority of farms with older owners, the continuation of the farm is not ensured. Only in about one third of the farms with owners that are 45 years of age or older, there is a person, who can take over the farm after a certain period of time. The general rule applies: the larger the holding, the greater the likelihood of farm succession. Therefore, agricultural holdings that run on a full-time basis and cultivate generally more land have better farm succession prospects than the ones that run on a part-time basis.

* wolfgang.hercher@forst.bwl.de; Wonnhaldestraße 4, D-79100 Freiburg, Germany

The percentage of farms on part-time basis is significantly higher in the mountainous regions than in other parts of Baden-Württemberg. As an example, the agricultural statistics accounts in the Northern Black Forest Region for 72% of the farms on a part-time basis, whereas e.g. in the Lake of Constance Region and its back-country 50% of the farms are still managed on a full time basis.

So we have an indication that these facts have a progressive influence on those combined agricultural and forest farms that concentrate traditionally in the mountain ranges of Baden-Württemberg *(Figure 1)*.

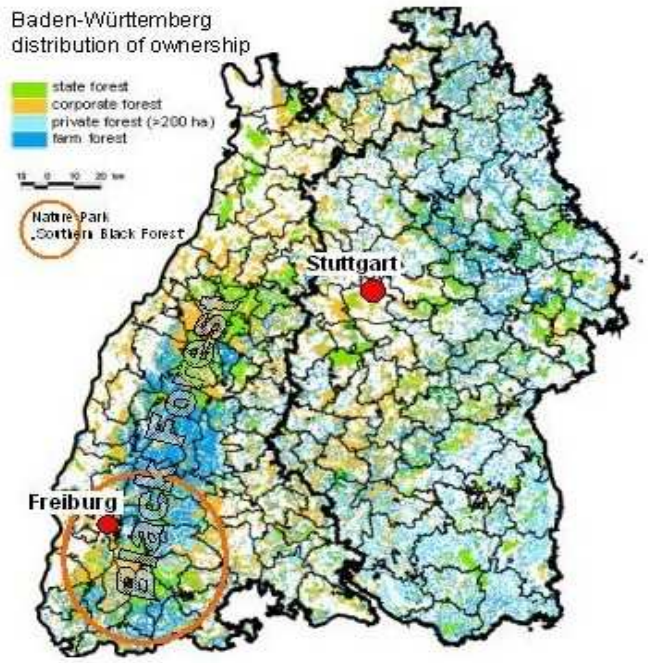

Figure 1: Concentration of farm forest (dark blue) in the mountainous areas of Baden-Württemberg
Source: ForstBW – state forest administration of Baden-Württemberg

2 THE QUESTION OF REGIONAL PECULIARITIES

The end of World War II and the reconstruction of houses and facilities in the following decade led to the beginning of a profound structural transformation in all sectors in Germany. On one hand, the bombed industrial complexes had to be rebuilt and due to new technical knowledge, they developed into the most efficient ones in Europe. On the other hand, all sectors of agriculture were gripped by a deep structural change and mechanization. In the state of Baden-Württemberg such a “hot spot” in view of change dynamics was the city of Stuttgart and its rural surroundings.

Stuttgart has developed into a leading town for car-construction, electronics and automatism. The enormously raising production has required a higher number of engineers, workers and skilled employees. This has had an influence on combined farms in quite a big circle around Stuttgart. Beginning with a minimum income level, the heads of the farms give up agriculture to work in the factories near Stuttgart. The interest of the emerging mostly precision mechanics industry to get staff from the surroundings was that high, that the companies organized their own bus- transfer system. One rural region that was affected by this process was the subdued northeastern part of the Black Forest near the town of Calw. The rapid industrialization of the capital on one hand went along with a big structural change in the rural outskirts on the other hand.

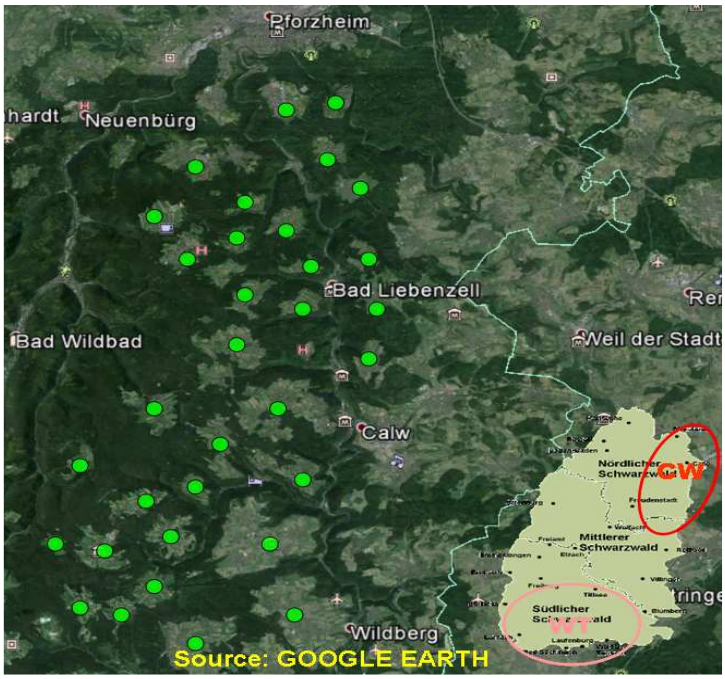

Figure 2: Spots of historical clearances of forest in the subdued part of the Black Forest, called "Waldhufen" is a special type of village near the town of Calw

In contrast to the Stuttgart region in the Southern Black Forest region near the town of Waldshut ("WT") the process of industrialization and modernization of the agriculture occured at a more leisurely pace. The frontier to Switzerland with its relatively high import taxes and a textile-based industry prevented a faster growth in that region. The farms in the more elevated zones above the Rhine are characterized by a sloppy agricultural land and farm forests that hindered a very fast mechanization because the first tractors were rather constructed for the flat lands and were therefore too heavy.

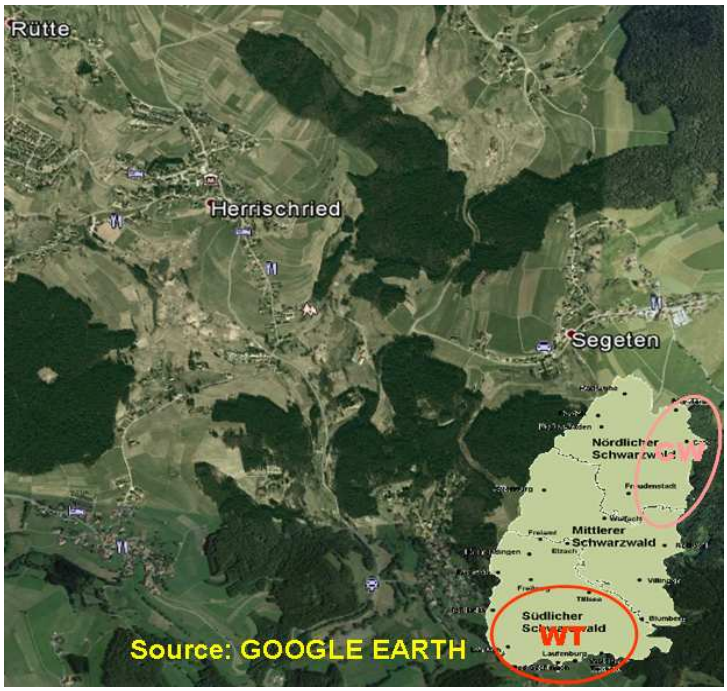

Figure 3: Mosaic of bigger clearances of forest the landscape interrupted with farm forest areas at the more sloppy or northern angled hills near Waldshut

But nevertheless, mechanization took place in the places even miles from anywhere and today different types of light, short and maneuverable tractors are setting the scene. Up to the World War II hard cash was normally rare in the farm forest enterprises. With the period of reconstruction of the towns and the establishing of new quarters for the displaced people from the eastern part of Germany. This busy building activity stimulated the wood market to a high level. For one cubic-meter of spruce log with normal quality one had to pay some 160 German Marks, for one cubic meter of pulp wood some 80 DEM. The monthly wage of a craftsman was about 180 DEM, therefore a head of a farm could buy with one cubic meter about 80 hours of craftsmen e.g. to repair a big one roof farmhouse. Tab. 1 shows a listing of the first tractors that had been bought by participants of the accountancy network system that represents 5 – 200 ha farmforests in Baden-Württemberg. For a good all-wheel drive tractor you had to pay in the 1960's about 6000 DM. Old datasets of a former feasibility study shows that the enterprises paid a good part of those investments not with logs but with pulp wood! About 80 cubic meter pulpwood was enough to be sold to the paper factory of Albruck nearby the border of Switzerland to pay for the tractor!

Table 1: The first tractors - beginning of mechanization in the Black Forest (Source: TBN 5-200 ha)

Type	Tractor_category	HP	KW	Year_startup	Bruttoinvestment €
MAN	all-wheel-drive	20	15	1956	3000
MAN	all-wheel-drive	42	31	1954	5113
MAN	all-wheel-drive	18	13	1955	5113
Holder	all-wheel-drive	20	15	1964	5113
MAN	all-wheel-drive	24	18	1960	5624
Alt-MAN	all-wheel-drive	28	21	1961	6000
Holder	all-wheel-drive	29	21	1970	6136
Deutz	all-wheel-drive	52	38	1970	6136
Alt-Unimog	all-wheel-drive	20	15	1965	7669
Eicher	all-wheel-drive	45	33	1969	8181

3 COMPARISON OF THE COUNTIES CALW AND WALDSHUT

While visiting farm forest enterprises in the whole Back Forest since 1985 the author has observed the varying structural changes of the two counties of Calw and of Waldshut. In the area of the "Waldhufen", called spotted villages of "CW", the installation of communal industrial areas within the last two decades was striking. A new instrument for rural counties with a subsidy program encouraged the communities to built new industrial parks together with a neighbor community at their common borders. Within agriculture the process of concentration of farmland seemed to accelerate. In extreme cases only the forest property was left from the former combined farm forest enterprise. The question was, whether a better chance of nearby income from exterior work accelerates the process of giving up agriculture. The farm forests are now dominated by spruce, while in the past there had been nameable portion of pines. About 49300 ha or 62% of the whole surface (79800 ha) is covered with forest land. The state forest is the biggest woodland owner (22500 ha), followed by community forest with 19000 ha. Some 16% or 8000 ha are managed of some 8000 private woodland owners. These private woodland owners are organized in an forestall organization called "Forstbetriebsgemeinschaft" in the county of Calw. The beginning of this association was in 1996, when 28 woodland owners of the city of Bad Teinach launched the first initial organization. The aim of this incorporated society as to support the woodland owners in their management of their forest and to overcome the penalties of size, shape or defragmentation. Timber selling is of essential interest, yearly some 3000 to 5000 cubic meter timber are sold by the staff of this "Forstbetriebsgemeinschaft". Today they have to attend 233 members and 1540 ha forest land (http://www.fbg-calw.de/Ueber_Uns.html).

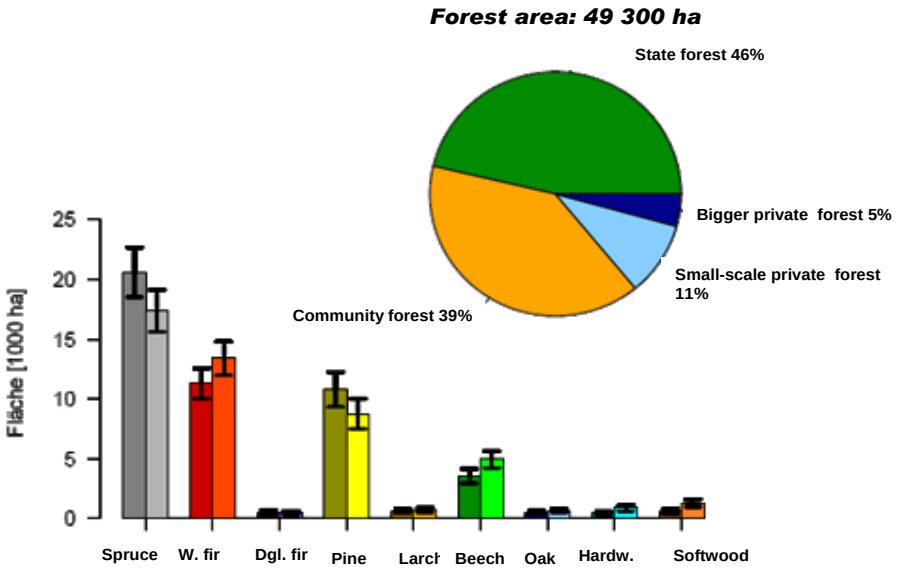

Figure 4: County of Calw – distribution of ownership and tree species (the difference in the numbers is due to statistical reasons)
Source: FVA Dpt. of Biometrics

The county of Waldshut in the Southern Black Forest was shaped by mostly smaller farms and is characterized by very difficult and steep terrain in the meadows and arable land. Two decades earlier many people worked in the textile sector and the industry parks were dominated by big textile factories. But the international competition with clothes moving several times around the globe to be sold at last in Europe forced the factories to stop the production.

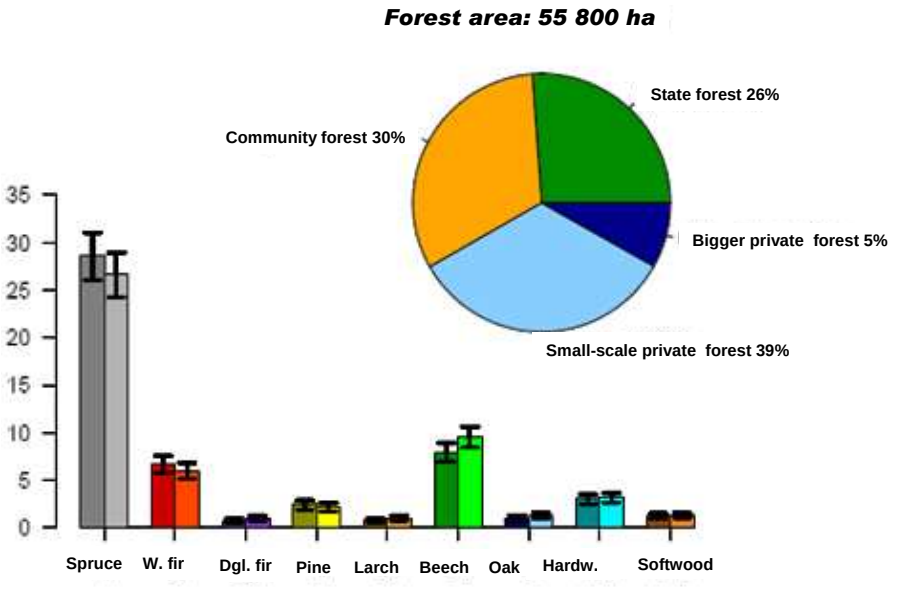

Figure 5: County of Waldshut – distribution of ownership and tree species (the difference in the numbers is due to statistical reasons)
Source: FVA Dpt. of Biometrics

Another alternative to get money from outside was to work in the chemical industry in Switzerland. In the last years, those kinds of commuters grew very rapidly. Today about 25% of all dependent employment persons are working in Switzerland or in France.

About 55800 ha (49%) of the total 113115 ha are forest land. The State of Baden-Württemberg owns 26% and communities 30% of the forest. The most important ownership represents private forest with a percentage of more than 44%. In contrast of the county of Calw, a lot of forestal associations exist in Waldshut, the "Forstbetriebsgemeinschaften" (FBG's). Most were founded in the early 1970's and are thus much older and have a longer tradition than in Calw.

According to the place of the headquarter or the operation area they are named after villages or landscapes as following: FBG Bernau, Vorderer Hotzenwald, Bettmaringen, Dachsberg, Weilheim, Energieholz Hochrhein, etc.

A big problem for the extension service is the defragmentation of the private forests. In the past people divided up the parcels every generation for the heir had to pay the brothers and sister that had to leave the farm. In the county of Waldshut some 55000 private parcels exists withina total private forest area of circa 25000 ha, one parcel accounts less than half a hectar!

4 METHOD AND MATERIAL

Controlled by law, there exists in the European Community, in whole Germany and the State of Baden- Württemberg several statistical data that is publicly available. First task was to guarantee that in both counties, Calw ("CW") and Waldshut ("WT"), comparable data exists that refers to the development of the combined farms of these two regions.

The sources of the required statistical data are the following:

- Statistisches Bundesamt, Bodennutzung der Betriebe – Agrarstrukturerhebung
- Statistisches Bundesamt, Bodennutzung der Betriebe - Landwirtschaftlich genutzte Flächen
- Statistisches Landesamt Ba-Wü, Struktur- und Regionaldatenbank
- Statistisches Taschenbuch, Landkreis Waldshut
- Landesanstalt für Entwicklung der Landwirtschaft und der ländlichen Räume, Schwäbisch Gmünd (LEL)

Furthermore there is data available in the coverage of the Accountancy Network System of small- scale forestry 5-200 ha in Baden- Württemberg. The Forest Research Institute works together with ca. 30 farmforest enterprises in the Calw region and with 34 units near Waldshut. To examine the fluctuation of investment-rates, a relational database-system of the following capital equipment for the forest branch since 1979 or earlier exists:

- Tractors used in forest
- Winches
- Forest equipment for the tractor
- Chainsaws
- Brush cutter
- Wood splitter
- Debarking machines
- Wood bundler
- Wood gripper etc.

The question was whether the emphasis of all available data provides enough evidence to suggest, that the structural change of CW and WT is distinctly different in terms of:

- Speed
- Intensity
- Effect
- Concerned sectors.

5 RESULTS

One very important indication of agricultural change gives an examination of the development of the land utilization in the last decades. The figures stated below show a very dynamic rate of decreasing of agricultural land-use together with a steep increase of settlement and traffic land-use at the end of the 1980's. From 1988 to 2001 the increase of settlement areas reached a rate of 15% in both counties *(Figure 6)*. Striking is the different growth of forest land. Whereas in the county of Calw the annual rate of growth remained static on a value of 1.5%, the increase of forest land-use in the county of Waldshut started at a rate of 1.1% to have a then slight rising rate of 1.9% - 2.5% in 2006. Now we have still an increasing reforestation rate of about 2.8%.

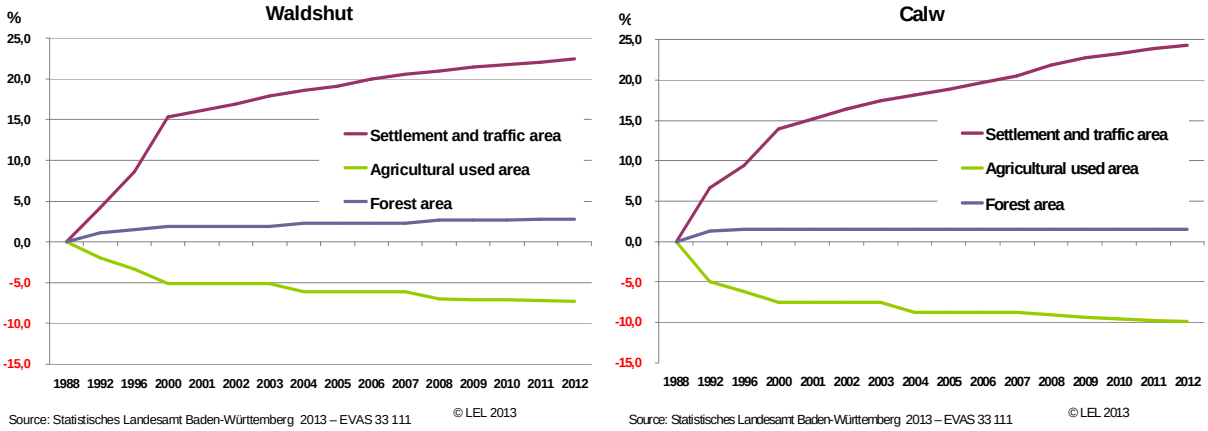

Figure 6: Waldshut & Calw – development of land-use; index 1988 = 100%
Source: Regional office of development of agriculture and rural zones „LEL" Schwäbisch Gmünd, Dept. of "Ländliche Entwicklung und Landschaft"

Yet another slight distinction is the development of the settlement and traffic area in both counties. The rising rate seems to be a little bit steeper in the Calw region. A subsidy program to install commercial zones was introduced to boost the regional economy. The flat agricultural areas were ideal for that purpose.

To estimate the drive of structural change one can examine the development of size-classes of the farm forest enterprises. For every region a kind of "growth threshold" exists. There is a level of minimum size-interval where we still get a growth of number of farms. Underneath this frontier the number of farms is declining, above this line the number of farms is rising *(Figur 7)*.

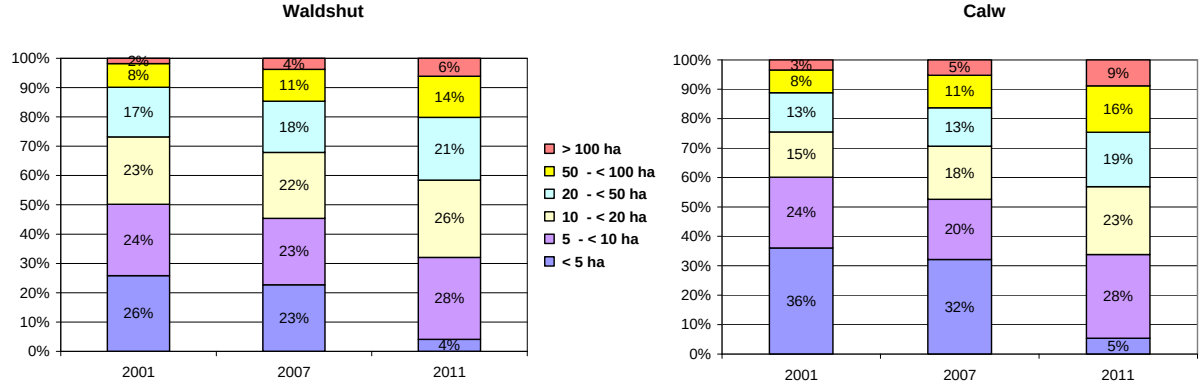

Figure 7: Waldshut & Calw – development of farm size classes
Source: Regional office of development of agriculture and rural zones „LEL" Schwäbisch Gmünd , Dept. 3"Ländliche Entwicklung und. Landschaft"

The analysis of structural statistic data of the two counties show that this zone of "growth threshold" is situated somewhere above 50 ha *(Figure 8)* .In the county of Waldshut the average size increased from 19.4 ha in 2001 to 30.9 ha in 2011. In the region of Calw the size increased in the same period from 19.5 ha to 37.2 ha. The process of adaption seems to be more dramatic in the Calw region than in Waldshut *(Figure 8).* In the last decade, nearly half of the farms gave up farming. The forests, however, remained mostly a private property.

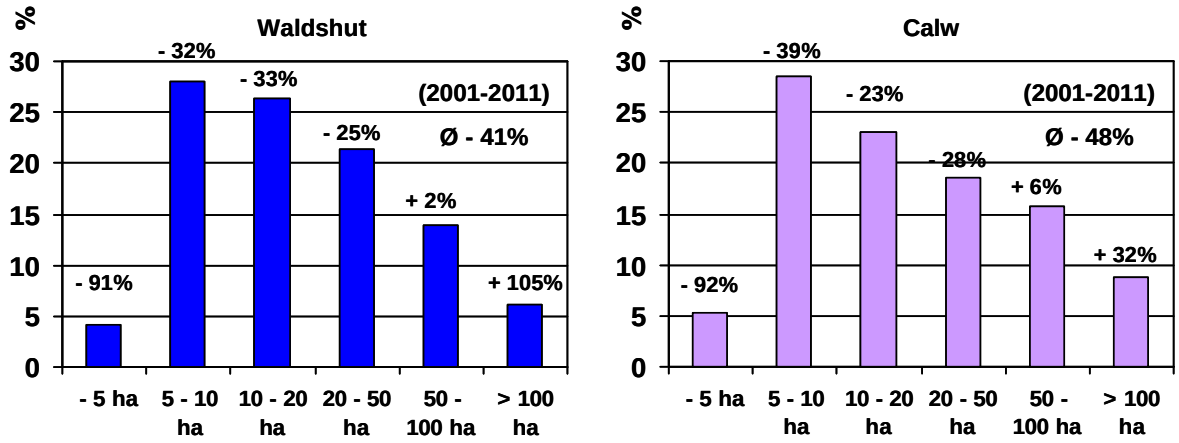

Figure 8: Waldshut & Calw – distribution of size of farms 2001-2011
Source: Regional office of development of agriculture and rural zones „LEL" Schwäbisch Gmünd , Dept. 3 "Ländliche Entwicklung und. Landschaft"

Because of the relatively flat shape of the Calw region, it is rather possible to hold ones agricultural size nearby the "growth threshold"-zone than in the rough landscape of the Southern Black Forest. The heavily soaring fuel prices, the negligence of agricultural support for the tractors and the defragmentation, make it uncomely to lease or buy agricultural land far away. Therefore just growing to survive was no solution for the south, some farms scored in quality. Supported by Nature Park subsidies a significantly higher percentage of the farms are organically managed farms and sell their products often directly at the farm or at cooperative village shops *(Figure 9).*

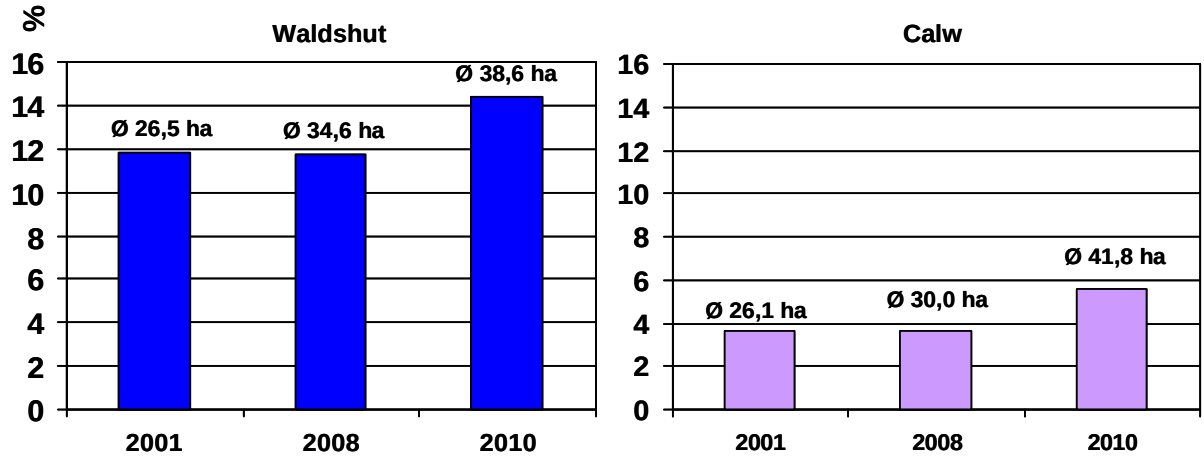

Figure 9: Waldshut & Calw – proportion of organically operated farms
Source: Regional office of development of agriculture and rural zones „LEL" Schwäbisch Gmünd , Dept. 3 "Ländliche Entwicklung und. Landschaft"

Up to now we have observed the development of the agricultural part of the farms of both counties. The question now is, what kind of effect the structural change has had to the forest

part of the farm. First, one has to admit that the data of the "Agrarstrukturerhebung" and the EU-adapted "Gemeinsamer Antrag" (complete form for agriculture and forest of a farm) is not statistically evaluated for the farmforests. For this reason, we have to revert on the annual data and accessory interviews of the "Testbetriebsnetz Kleinprivatwald", the acountancy network system small-scale forestry of the FVA situated in Freiburg.

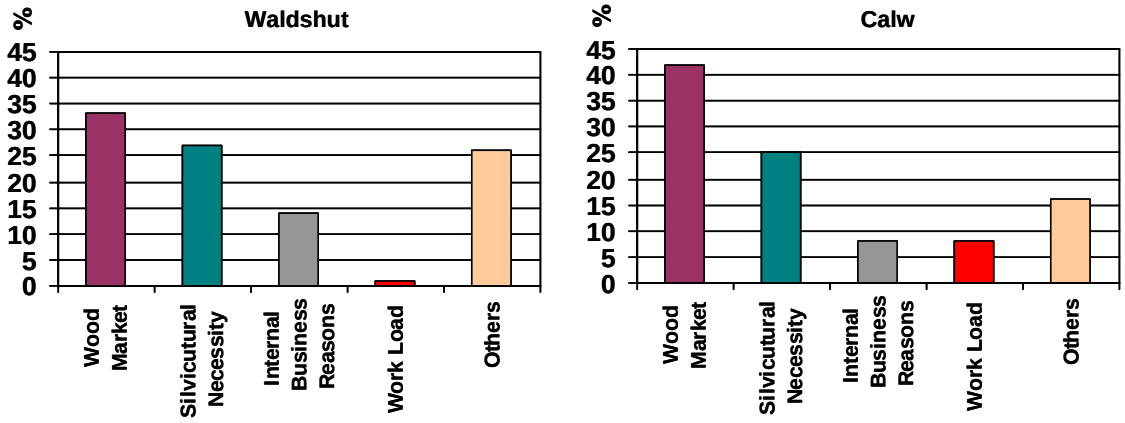

Figure 10: Waldshut ("WT") & Calw ("CW") – Answer to the question: "What is the most relevant reason for the recent level of wood-cutting?"
Source: FVA, accountancy network system small-scale forestry 5-200 ha

A very interesting subject is the mental attitude and internal reasoning of the farmforest owners, before looking at the hard facts of e.g. annual cut, proportion of own work and family income from the forest part of the farm. Since 2010, we have asked the farmers some questions about the most relevant factors in terms of the intensity of forest works in the recent business year. As shown in *Figure 10*, the farmers from the north have a slight tendency towards market reasons, when they decide to work in their forest. Due to the higher degree of diversification and direct marketing the farmers of the Waldshut region seem to be more considerate on other important work on the farm or other reasons.

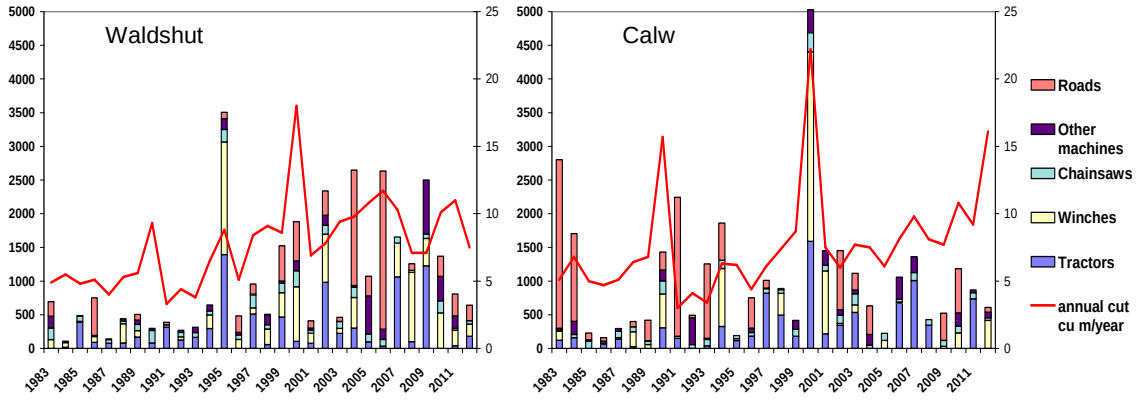

Figure 11: Waldshut ("WT") & Calw ("CW") – forestry investments and annual cut of 30 farms
Source: FVA, accountancy network system small-scale forestry 5-200 ha

Another worth-knowing question is whether one can get some signs about tendency towards investments. From examples of free economy we know, that if the annual investment rate declines underneath the level of writing-off, this is an alert sign for the economical implicitness to keep on development and growth. *Figure 11* shows the course of investments and the annual cut of timber of the participating farms of Waldshut and Calw.

DISCUSSION

Structural change in agriculture will continue at any place and at any time. Only a few farm forests will remain at full-time basis in the Black Forest. Society and politics have to decide if, or what kind of support will be necessary to keep the meadows clear and the forest stable to deliver timber and energy. The problems associated with meadows and pastures feeding down are in some areas already highly visible. Whereas in former times one received a rent to have an external herd of cows on his own meadow, one has to pay for the transport today. Direct marketing to get an added value for the farm is not possible for all farms. If the density of farm shops exceeds a critical value, none of the farms would earn enough money to survive.

What about the forest part of the farms? In our modern world the job profile of the successors of the farms is drifting more and more away from the profile of a farmer or forest worker. One day the owner will hire forest companies to cut the trees or do the thinning. A survey of private small scale owners of a big forest association near Waldshut wanted to know, what the woodland owners would rather want: a cooperative to do or manage the forest for them. The result was a pin wall with ten of the most often-cited topics:

Figure 12: Woodland owners' most often cited topics
(Source: FBG "Vorderer Hotzenwald")

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LANDESANSTALT FÜR ENTWICKLUNG DER LANDWIRTSCHAFT UND DER LÄNDLICHEN RÄUME LEL SCHWÄBISCH GMÜND. Strukturdaten Baden-Württemberg 01/2012 (Excel; 1,5 MB)

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Decision Support System to Assess the Role of Ecosystem Services in Adapting to Shifting Framework Conditions

Donald G. HODGES[a*] – D. Stuart HALE[b]

[a] Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, Tennessee USA
[b] ecoReata; Abingdon Virginia USA

Abstract – Increasing demands for ecosystem services and natural capital, along with growing ecosystem markets, require that all natural resource values be incorporated into management and policy decisions. Rural communities and small-tract owners, however, rarely have the necessary resources to properly value ecosystems services and apply the information to sound management decisions, resulting in at sub-optimal production levels for these non-timber services. These deficiencies are likely to be more critical with changing framework conditions, and in some cases may contribute to these changes through reduced production. This paper will describe a decision support system being developed to quantify and value ecosystem services using open-source, field-collected data, and geospatial data-mining techniques. The system will be used to assess a range of ecosystem services and markets for hardwood forests in the southern US, as well as the potential value of these services under various management alternatives, with a web-based interface. The results will allow managers and landowners a cost-effective method to assess management options.

natural capital / non-timber valuation / forest management

1 INTRODUCTION

Markets for ecosystem services exist to varying degrees across the globe. Land and asset managers have worked to create and promote markets and typologies as income sources for landowners and investors. In the United States, robust markets have developed primarily because of regulatory actions such as the Clean Water Act (CWA) that requires mitigation to support its goal of "no net loss" of wetlands. Conversely, other voluntary markets, such as carbon, have wavered, driven mostly by consumer demand and corporate social responsibility (CSR). Programs such as the Natural Resources Conservation Service (NRCS) Conservation Reserve Program (CRP) have experienced great success and by providing support and subsidies to farmers for practicing proper conservation methods. In addition, recent revisions and current enforcement of CWA and Endangered Species Act (ESA) have allowed markets and private 'banks' to develop to encourage mitigation efforts. This combination of regulatory and voluntary markets represents the current options in the US for ecosystem service markets.

* Corresponding author: dhodges2@utk.edu; 274 Ellington Plant Sciences Building; 2431 Joe Johnson Drive; Knoxville, Tennessee 37996-4563; USA)

Another great challenge is to develop these markets to a scale that is feasible for capital development and institutional engagement. As stated previously, regulatory actions have provided a demand in some markets, while consumer preference or corporate social responsibility have encouraged other opportunities. Often, however, management restrictions, administrative/ transaction costs, and lack of understanding have squelched market development. Efforts of non-governmental organizations (NGOs) such as the Katoomba Group and The Nature Conservancy (TNC), and the recently formed Office of Environmental Markets (OEM), under the US Department of Agriculture, have provided functioning markets and education sources for landowners on natural capital. These programs have demonstrated a commitment to marketing ecosystem services and have worked to provide market stability and mitigate investment risks.

Since much of the public goods from ecosystem services in the United States are generated on private lands, the benefits will be enhanced through a management focus on this ownership class. Approximately 56 percent of US forestlands, around 420 million acres, are privately owned (Heinz 2008) and approximately 85 percent of that provides goods and services to the landowners (USFS 2010). A recent transition in forest ownership of large forests tracts from industrial timber and mineral companies to organizations such as Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs) (for more information see Gunnoe – Gellert 2010, Binkley et al. 1996, Block - Sample 2001, Zinkhan et al. 1992) have altered management goals and strategies. These new owners, often in the interest of recruiting long-term investors, have adopted investment and management approaches to maintain and enhance ecological conditions. This is most apparent in the wide adoption of sustainable forest management and the accompanying third party certifications, known as eco-labeling. Additionally, these new ownerships differ from past in that they are in the business of managing natural capital and assets, as opposed to owning surface and timber in support of other operations such as sawmills and mineral extraction.

Increasing demands on ecosystem services and more widely recognized values of natural capital and assets, along with growing ecosystem markets (both regulatory and voluntary), require that all natural resource values be incorporated in management and policy decision making. Rural communities and owners of small forest parcel (e.g. < 10 ha), however, rarely have the necessary resources to properly value these ecosystems services and apply this information to sound management decision making. This project will establish a methodology for quantifying and valuing ecosystem services using open-source, field-collected data, and geo-spatial analysis data-mining techniques to develop the needed information. Additionally it will determine the feasibility of developing a web-based decision support framework that can be used by forest managers and landowners to assess specific forested properties. The project results will serve rural communities and businesses as a decision making tool in addition to accounting for and demonstrating overall natural capital and ecosystem values, thereby enriching local economies and ecosystem and human health. Furthermore, the project will demonstrate methods of how certified sustainable forests and multiple-use management cooperate with governmental and private goals to provide the greatest values to landowners and the public.

2 PROBLEM SIGNIFICANCE

Approximately 57 million acres, or approximately 13 percent of private forests, are owned currently by these investment organizations (Heinz 2008). These owners and their management strategies present a good opportunity to bring ecosystem service markets to scale, because they are already in the business of natural capital asset management. As a

result, these services as goods could allow for not only asset diversification, but also additional revenue streams and value-added products.

At this time, most of the management of TIMOs and REITs focus on developing and managing timber and the investment value of the property. The immaturity and uncertainty of ecosystem markets, not to mention the capital investment and risks, have limited large landowners from participating on the scale that could support and sustain long-term market growth and development. However, many landowners have stated a willingness to examine or participate in these emerging markets (Waage 2007, Hodges et al. 2010). One perception is that the management of these services may conflict with or encumber traditional management. Another is administrative and transaction costs may outweigh benefits in application or the marketing of services, particularly on small parcels. These are certainly valid and true concerns, yet with the efforts being made to bring markets to life, the overlap of management potential, and the increasing scarcity of the ecologic goods, now could be an excellent time to introduce this management to the strategies of these organizations (Ahn et al. 2002, Binkley et al. 2006, Sohngen - Brown 2006, Alig 2007, Fernholz 2007).

The supply of forest ecosystem services is particularly difficult to assess on small parcels of privately owned land. Not surprisingly, prior research has revealed that property rights deter private landowner participation in ecosystem management schemes (Rickenbach et al. 1998). Even though private industrial forest landowners may focus their management on timber products for which markets exist, recent studies have shown that a majority of private forest landowners (PFLs) in the United States are interested in non-timber benefits such as aesthetic enjoyment, privacy, closeness to nature (Blatner et al. 1991; Butler – Leatherberry 2006). As current ownership surveys reveal, PFL owners may value non-timber goods and services more than economic returns from timber products. However, intergenerational transfer of forest assets and increasing demand of rural lands for urban development may result in ineffective management or loss of forestland in the long run (Best 2004).

3 DECISION SUPPORT MODEL DEVELOPMENT

The final product of the project will be a web-based system to assess a range of ecosystem services and markets on hardwood forests in the southern Appalachians, and the potential value of these services under various management alternatives. The results will allow managers and landowners a cost-effective method to assess their management options with minimal data collection, and identify potential markets or those services requiring additional information and management.

The site at which the data needed to develop the web-based model will be collected is the University of Tennessee Forest Resources AgResearch and Education Center in Oak Ridge, Tennessee. This property is comprised of 2,260 acres, 250 of which are designated as the UT Arboretum. The property is certified as an American Tree Farm, with its most recent recertification occurring in 2012. The property consists predominantly of mixed mesophytic hardwoods, and is used for a wide range of research projects related to forestry and wildlife, as well as a number of other topics. In addition to the research and education focus, the property is managed as a working forest, with active timber and wildlife management programs and serves as an important recreational site for residents of Oak Ridge and surrounding communities. The combined landscape, vegetative, ecosystem services, and market data collected at this site will be used to identify, value, and model critical management variables, such as cover type, slope position, biomass, and others. This will then allow for predictive models to be used in management valuation and decision-making on other comparable landscapes at local and regional levels.

Table 1 provides the process by which the decision support model will be developed. The first phase will entail building a geo-spatial database for the project area from publicly available sources including aerial photographs, digital elevation models, soil surveys, census data, tax assessment information, and hydrologic data from several sources (National Wetland Inventory, National Hydrography Dataset, National Water Information System). The next task will require developing inventory protocols for the variables of primary interest in the area – timber, carbon storage, geomorphic data, and selected ecosystem service markets. Specific data to be collected in the inventories, which will consist of securing the information electronically in some cases and field data collection in others, include regional data for temperature and rainfall; geomorphic variables including percent slope, altitude and operability; hydrologic information on wetlands and perennial and intermittent streams; transportation networks; population and select demographic variables; land use; management constraints; and conservation variables such as historic or cultural features, recreation areas, public lands, and unique ecosystems or communities. A significant effort will be expended in conducting a field inventory of the forested stands to determine timber volumes, carbon sequestration potential, and total biomass - all also required for carbon sequestration programs. This will include tree species, product classes and volumes, carbon, total biomass (above and below ground), and growth.

Phase 2 will involve compiling and valuing potential ecosystem service markets in the region. This will include identifying existing markets in the area and will encompass a wide range of provisioning, regulating, and cultural ecosystem services. Locally, these will be concentrated primarily on timber, carbon, watershed, biodiversity and recreation markets. After the markets have been identified, prices for the various services will be estimated based on comparable sales in existing markets as well as values derived from other approaches such as income capitalization. In addition to existing prices, information will be developed regarding market specifications (units, requirements, suitability variables, and current and projected demand) as well as the risks – market, physical, and regulatory.

The third phase will entail analyzing the combination of geospatial data and local ecosystem markets to determine a suitable model for land-based project viability. This will be accomplished through various model analysis including linear regression. Furthermore, by estimating the total economic and market values associated with the various ecosystem services for the area, identifying the relationships between the physical data and individual ecosystem service levels, a market suitability index and comparative valuation model will be created to apply to alternative management scenarios.

Lastly, this project research will be promoted to engage public and corporate involvement. This will include web presences, social media, topical posts, organizational and academic presentations, and direct landowner engagement, all including SEO, keyword, and media optimization strategies. This outreach will be achieved through an active public relations and marketing campaign, but also through direct liaisons, training, and web interfaces tapping and maximizing information technologies. Additionally, one intended product from the research results is a decision tool for landowners and managers for analyzing ecosystem markets. A unique component of the project is the ‘for-profit’ partnership, necessitating that outcomes include original products that are relatable and carried into the public/private marketplace.

Table 1. Summary of Tennessee Natural Capital Project (TennNatCap)

Project Goals	Actions	Tangible Outcomes
Build geo-spatial database for project area	• Forest inventory of project area including timber and carbon resources • Geomorphologic analysis • Gather open-source data relevant to land-based natural capital	Combined geo-spatial database
Compile and value local ecosystem markets	• Research and market analysis of existing and potential ecosystem markets • Establish price estimates	List of local and regional ecosystem markets along with price estimates
Analyze combination of geospatial database and local ecosystem markets to determine suitable model for land-based project viability	• Apply statistical methods for determining relational factors of ecosystem services and landscape variables necessary for market scalability.	Functional model for ecosystem markets engagement.
Provide and promote functional model	• Provide services for landscape analysis and ecosystem market suitability analysis.	List of services and methods for application.

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New Trends in Public Opinion on Forestry in Japan

Ryoko ISHIZAKI*

Forestry and Forest Products Research Institute, Japan

From a previous analysis of the results from ten public opinion polls conducted by the Japanese Cabinet Office since 1976, the following noteworthy new trends in public opinion relating to forestry have been observed in the 2000s: (1) the emergence of new types of advocates for wood production, (2) the increase in the number of people who believe that forestry management practices that are not economically efficient and profitable should not be pursued, and (3) the emergence of a 'reverse preference' for forestry, in which urban residents tend to believe that wood production is an important forestry service and also that they see the protection of the livelihoods of mountain villagers as more important than rural residents do. This study investigates the background and nature of these changes in public opinion on forestry in Japan and discusses their possible influence on forest management.

* ryokoi@affrc.go.jp

Natural Resource Enterprises: Payments to Landowners for Ecosystem Services from Forests and their Management in the USA

W. Daryl JONES*

Department of Wildlife, Fisheries and Aquaculture, Mississippi State University, MS, USA

Abstract – Mississippi landowners were found to diversify incomes from forests through fee-access outdoor recreation, including hunting, angling, wildlife watching, and other nature-based activities (Jones et al. 2005). The Natural Resource Enterprises (NRE) Program at Mississippi State University educates private landowners, resource agencies, and local communities about recreational enterprises, conservation, and integration of these activities with sustainable forestry through educational workshops. Since 2005, we have conducted 70 landowner workshops in 10 U.S. states and Sweden and trained over 4,000 landowners and community leaders in outdoor recreational business development and conservation practices**.** At events, participants learn how to start NRE businesses and ways to implement forest management and land and water conservation on their properties. Survey results revealed that our programming has initiated over 1,000 new outdoor recreational businesses on an estimated 1.2 million hectares of forest and agricultural lands, generating over $14 million in additional incomes on family farms in the U.S. NRE development on rural lands benefits landowners and local communities through promoting payments for ecosystem services supported by sustainable forests.

1 INTRODUCTION

Ecosystem services can be defined as the direct and indirect contributions of ecosystems to human well-being (2). These services support human survival and life qualities in a number of ways. Ecosystem services can be categorized in four primary types, including provisioning, regulating, habitat, and cultural services. Provisioning services are products from ecosystems such as food, water, wood, fiber, genetic, and medicinal attributes. While regulating services are benefits to society from ecosystems including climate regulation, natural hazard regulation (i.e., coastal zone protection from hurricanes resulting from coastal wetlands, water quality and quantity from watersheds, waste management, and environmental benefits to agriculture (pest control and pollination)). Habitat services refer to wildlife and fisheries habitats within ecosystems that enhance biodiversity of species and genetic variability among individual species. Lastly, cultural services are societal benefits derived from healthy ecosystems such as spiritual and religious enrichment, scholarly enrichment, outdoor recreation, and aesthetic values of the environment. Natural resource conservation, stewardship, and wise-use land management practices can provide these ecosystem services to society particularly when

* djones@cfr.msstate.edu; Box 9690, Mississippi State, MS 39762, USA

commercial and private landowners are given economic incentives to manage lands in environmentally-friendly ways.

Outdoor recreation, including recreational hunting, angling, wildlife watching, and ecotourism is one avenue that incentivizes natural resource conservation and sustainable land-use practices on private lands in the U.S. while providing ecosystems services benefitting society at large. Demand for quality outdoor recreation is popular throughout the world. U.S citizens (87.5 million) spent over $145 billion (U.S. dollars) on wildlife-related recreation in 2012 (5). Past research found that revenues collected in 1998 from fee hunting on private lands in Mississippi ranged from $2,964 to $5,254 on average per landowner or $7.50–$14.28/ha, depending upon the region of the state evaluated. Net revenues averaged from $1,539 to $3,244 per landowner or $3.95 to $9.66/ha (3). During 2005-2008, outdoor recreation increased Mississippi rural property values by 52% or $1,615/ha and those tracts that were leased for recreational hunting averaged over $61/ha (6). Property characteristics that influenced sales price were hectares of bottomland hardwood forests, pine-hardwood forests, and agricultural lands that were managed to benefit wildlife. Expenditures for outdoor recreation (hunting, angling, wildlife watching, horse trail riding, and etc.) produced $2.7 billion in economic impact to Mississippi in 2008 (4). Despite the economic and environmental benefits of fee-access outdoor recreation, only 10–14% of Mississippi non-industrial, private landowners participated in these businesses on their properties in 2005 (3) primarily due to concerns in accident liability and incompatibility with traditional agricultural and forestry land uses. Similar trends in revenues and land values associated with fee-access wildlife and fisheries recreation have been documented in other southern U.S. states (8, 9).

Marginal lands, such as agricultural field borders, wetlands and wetland forests, and riparian corridors along watersheds, are often difficult to farm or manage for timber due to flooding problems or regulatory restrictions (7). However, these properties are ideal for conserving wildlife and fisheries habitat and can be readily enrolled in fee-access recreational businesses and governmental cost-share assistance programs. Revenues from fee-access recreation on private lands were substantially greater on forested and managed agricultural lands, particularly bottomland hardwoods and forested riparian buffers along watersheds. This finding reveals that forest landowners can generate income from conservation and restoration of lands that were marginal for agriculture or development (3, 6) while providing associated ecosystem services from these lands that benefit local and regional communities. This study also revealed that fee-access recreation and wildlife habitat conservation with the latter being promoted by governmental cost-share assistance programs were compatible with agriculture and forestry, thereby providing additional incentive to landowners to diversify enterprises on their properties while encouraging land and water conservation.

Natural resource enterprises may include outdoor activities, wildlife-related recreation, and associated amenities such as hunting, angling, wildlife watching, agritainment or farm tours, horse trail riding, and rural bed and breakfast accommodations. Establishing these types of enterprises on family farms and forests provide multiple benefits including the diversification of income streams, land ownership retention, conservation and stewardship of the land, improved watershed integrity, reduced regulatory measures for environmental protection (state and federal wetland regulatory protection programs), and sustainable rural development (3, 6).

2 NATURAL RESOURCE ENTERPRISES PROGRAM

The Natural Resource Enterprises Program (NRE) (www.naturalresources.msstate.edu) was established in the Department of Wildlife, Fisheries, and Aquaculture and Cooperative Extension Service at Mississippi State University to educate rural landowners in the U.S. about fee-access recreational business development, wildlife and fish habitat management on farm and forest lands, and compatible land-use practices. Historically in the U.S., educational materials for natural resource enterprise development, though available, have been difficult to locate. As a result, landowners may not be aware of training opportunities and resources available. Working with program partners, we have developed educational workshops, demonstrations, and resources to inform landowners, agency professionals, and community leaders about enterprise opportunities, wildlife habitat management, and sustainable land uses on private lands. The NRE Program partners with federal resource agencies and state land grant universities, farm bureaus and agricultural trade organizations, U.S. state agencies, non-governmental organizations, and private-sector firms. Partners are actively trained in NRE and land management approaches and participate in workshops. Through these partnerships, we offer on-the-ground educational demonstrations and workshops to assist private landowners in outdoor recreational business development and conservation practices on their lands to enhance natural resources, including wildlife and fish and their associated habitats, located on the farm.

3 WORKSHOP PROGRAMMING

NRE workshops provide landowner participants with the opportunity to learn from and interact with resource and agency professionals and existing operators of outdoor recreational businesses. We conduct workshops on properties that are in agricultural or forestry production and that also support a fee-access outdoor recreational enterprise.

During workshops, participants are given learning experiences including instructional lectures from resource professionals and field tours on properties supporting a fee-access recreational business. During the lecture sessions, speakers from universities, resource agencies, and organizations discuss topics, such as revenue potential of outdoor recreational enterprises, business planning and management, legal considerations and liability reduction, governmental cost-share assistance, and habitat management considerations on the farm.

Workshop participants tour host properties during afternoon sessions to observe enterprise operations and wildlife and fisheries management integrated with agriculture and forestry. Each workshop attendee receives educational materials about enterprise operations, business management and marketing, liability reduction, wildlife and fisheries management, cost-share assistance programs, and other topics pertinent to establishing and managing an enterprise.

4 PARTICIPATION

Workshops have been well received by past landowner and resource agency participants. From 2005 and 2014, the NRE Program and partners have conducted over 70 landowner workshops and demonstrations in 10 U.S. states, including Alabama, Arkansas, Indiana, Louisiana, Michigan, Minnesota, Mississippi, Oregon, South Carolina, and Tennessee. Attendance at these events has been exceptional with nearly 4,000 participants, including an estimated 3,500 landowners with landholdings located in the 16 U.S. states. The program participated in a conference and series of workshops sponsored by Lunds University (Dr. Marie Appelstrand) and

Swedish Forest Agency to promote fee-access outdoor recreational enterprises within local communities in central Sweden.

To evaluate impacts from workshops conducted with private landowners, participants were mailed a comprehensive survey entitled Natural Resource Enterprises Landowner Survey that requested information about land-use practices, NRE businesses and conservation that have been implemented on farms since respondents attended a workshop, and additional information required to manage their properties. The Dillman method of survey design and administration was used in construction and mailing of the questionnaire to landowners (1).

5 RESULTS

In June 2013, questionnaires were mailed to attendees of past NRE workshops from 2011 to present. Respondents to this questionnaire mailing were pooled with respondents from the survey mailing conducted in 2011 to landowners who attended workshops from 2008-2011. The survey was divided between sections with questions related to landownership, cost-share program participation, types of NRE's initiated on private lands and revenues collected from new business start-ups, informational needs on land management, and respondent demographics. Overall, the questionnaire response rate was 34%, yielding an N size of 514 landowners (pooled from an estimated 30 workshops) who owned lands in 16 U.S. states.

Respondents utilized the NRE website assertively and primarily sought information about wildlife management on their properties, business resources for establishing an NRE business, and to see when upcoming events were being offered by the program. Other methods preferred for learning about NRE establishment in addition to attending workshops was watching videos (75% viewed or were interested) and using our resource binder provided to attendees (65% of respondents). Resource materials that were primarily sought were wildlife management (82%), timber management (80%), legal issues (76%), wildlife supplemental plantings (74%), agritainment enterprises (63%), fee hunting (62%), and NRE business planning (62%).

Most workshop attendees were landowners (91%) and had the following land uses on their properties: agriculture (78%), forestry (63%), personal recreation on property (61%), fee-access recreational businesses (22%), and vegetable production for sale (18%). In terms of landownership, respondents (n=462) owned 220 hectares on average. Land covers on properties owned were primarily forested (averaged 148 hectares/respondent) followed by agriculture (79 hectares) and other lands such as fallow fields and wetlands (41 hectares). Agricultural area were distributed as row crops (averaged 79 hectares), pasture (26 hectares on average), and aquaculture ponds (5 hectares on average). Forested lands were broken out as predominately planted pines and bottomland hardwood forest, 74 hectares and 59 hectares on average, respectively. Mixed pine hardwood forests averaged 44 hectares followed by upland hardwoods (39 hectares), natural pine (20 hectares) and recently harvested cutover tracts averaged 14 hectares on average. Other lands owned by respondents consisted of wetlands and flooded fields (averaged 10 hectares), food plots for wildlife, roads, and rights of way (averaged 8 hectares), and fishing ponds (averaged 3 hectares).

Conservation practices were implemented by respondents (n=328) on an aggregate 5,856 hectares representing about 50 hectares per farm reported. Diverse practices were reported by respondents on their properties and included mowing (56% of respondents), wildlife plantings (50%), herbicide application (43%), disking (34%), use of prescribed fire (30%), and forest management (29%). In terms of conservation practices information requested, respondents reported wildlife plantings, herbicide application, pond management, forest thinning, and prescribed burning were the subjects most sought after. Over one-half of

respondents reported that they had requested assistance from extension staffs, agency biologists, or other land management experts to implement conservation on their properties.

Nearly one-half of respondents reported that they had lands enrolled in Farm Bill cost-share conservation programs and averaged $7,146 in annual contract payments, accounting for payments in excess of $1.25 million U.S. dollars. Conservation Reserve Program was the most popular program with 97 landowners reporting participation on 82 hectares on average per farm. Wetlands Reserve Program had 29 farmers participating with an average of 57 hectares enrolled, followed by Wildlife Habitat Incentives Program with 52 participants averaging 19 hectares enrolled and Environmental Quality Incentives Program with 49 landowners averaging 15 hectares enrolled.

One hundred and sixty-four respondents (30%) reported initiating an NRE business on their lands in 2011-2013 with 46 landowners establishing hunting leases, 40 fee hunting operations, and 30 landowners starting fishing or agritainment venues. On average, landowners committed 329 hectares from their farms and forests to these outdoor recreational businesses, totaling over 54,000 hectares among all respondents. In terms of hunting species featured on lands, white-tailed deer (n=101) and wild turkey (n=62) were the most popular game species, followed by squirrel species, waterfowl, mourning dove, and rabbit. Landowners starting NRE businesses collected on average $13,851 per farm, totaling nearly $2.3 million in aggregate cash flows from NRE's initiated *(Table 1)*. Inferring these averages to the total number of landowners attending past workshops, an upper limit of new NRE business start-ups would equal 1,050 new NRE's established on an estimated 1.2 million hectares of forest and agricultural lands, accounting for an aggregate cash flow of $14.5 million U.S. dollars. Overall, respondents (69%) reported that revenues met their income expectations. When asked why landowners initiated these operations, most reported it was due to income potential from NRE businesses (96%) along with interest in land conservation management, recreational potential on their lands, to improve wildlife and fish on their property, and for personal hobby and enjoyment.

Lastly, most respondents did not have a business plan for their NRE and needed help in drafting such a document. Most of their business customers to their NRE's were adult hunters, families, and out-of-town guests through word of mouth approaches. In terms of future NRE programming, respondents favored workshops and were most interested in taking advanced training seminars in NRE establishment which we offer. Most respondents were male (63%), older than 56 years of age, over 90% Caucasian, college graduates, and slightly more than half lived on the property reported in the survey.

Table 1: Expected income of landowner respondents from natural resource enterprises developed on their properties in the U.S. from 2008–2013.

Expected income from enterprise development	Number of responses (n=164)	Percentage (%) of total responses
$0 – $1,000	76	46
$1,000 – $10,000	47	29
$10,001 – $25,000	17	10
$25,001 – $50,000	13	8
$50,001 – $75,000	6	4
$75,001 – $100,000	1	1
$125,001 – $150,000	1	1
Over $150,000	3	2

6 CONCLUSION

Past research has shown that private landowners earn additional revenues from their properties through fee-access outdoor recreational businesses. As a result, we have developed workshops to educate private landowners about fee-access outdoor recreational enterprise development and integrated conservation practices on their properties. Survey findings revealed that workshop participants believed that they had become more knowledgeable about enterprise operations and associated land management and had implemented outdoor recreational businesses and associated conservation on their properties. Landowners earned income from these businesses and earnings met landowner expectations.

Multi-state stakeholder collaboration among land-grant universities, federal and state resource agencies, conservation and agricultural trade organizations, and private-sector groups has been vital in the design and implementation of comprehensive outreach programming to attract and educate forest landowners and agricultural producers at workshop events in the U.S.

Outreach programming promoting fee-access recreation and conservation on privately-owned U.S. lands can benefit landowners and local communities through sustainable economic development, environmental conservation, and land stewardship and retention. It is believed that this hands-on approach of participatory teaching, marketing, and information dissemination through workshop programming is effective at delivering quality information to landowners in rural America who often times have difficulty in acquiring knowledge and skills. In this fashion, we can assist landowners in rural landscapes to diversify family incomes on their lands while enhancing land and water conservation, thereby strengthening local economies and providing ecosystem services and quality outdoor recreation on the U.S. land base that might not otherwise be provided if incentives were not present.

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Evaluation of the Adoption of Commercial Forestry by Smallholder Farmers in Kenya

Benson KANYI* – Rose KIRERA

Tree Biotechnology Programme Trust, Kenya

A sample size of 380 farmers was fixed, who were elected randomly from 6 locations in Kenya under stratified random sampling technique to assess the impact of tree growing on farmlands. The objective was to investigate the status of tree growers in selected parts of Kenya. The information collected through the questionnaire was analyzed statistically. The most dominant tree on the farm was Eucalyptus species with an average of 101 trees per farm and Grevillea robusta with an average of 62 trees per farm. The tree species sold by most farmers was Eucalyptus. Central with 10399, had the highest number of tree growers compared to other locations followed by Rift valley that produced a mean total of 8488 trees. Kajiado and Kitale had the least number of trees grown recording 6003 and 5809 respectively. Western (7909), coast (6279) and eastern (7909) locations had moderate numbers of trees compared to other locations.

All the sampled locations indicated that most tree growers had planted trees ranging from 1–10000 in number. Also the number of those planting more than >40000 trees in all locations were very few. 84% of the farmers interviewed indicated that they grow trees mainly for electricity transmission poles while 3% of the respondents revealed growing trees for saw timber production. Others (13%) indicated to have engaged in multipurpose use (firewood, charcoal, electric poles). There is a linear relationship between the number of trees planted and the size of the farms in coast and western however rift valley and Kitale there is no closer relationship between the size of the farm and the number of trees planted. The percentage number of trees harvested at between 0-4 yrs was highest in central location (76.7%) compared to Kitale that had recorded on 50%. According to the study, it is estimated that most of these farmers came to know about the prospects of commercial tree growing through a neighbors (51.7%), and word of mouth friends (21.7%), while others knew through informed sources such as the media (12.9%).

Farmers are not willing to invest in tree growing for commercial purposes due to market uncertainties and lack of sufficient information on marketing. 47.40% of the total respondents indicated they lack market while 52.60% revealed the easiness of accessing market. To resolve these problems necessary steps should be taken in time. It is evident from the study that farmers are willing and able to plant a wide variety of tree species, when their direct benefits are made clear.

* Corresponding author: bkanyi@tree-biotech.com

Stand Improvement in Family Forests: the Role of Beliefs, Attitudes and Social Pressure

Heimo KARPPINEN* – Sami BERGHÄLL

Department of Forest Sciences, University of Helsinki, Finland;

Forest owners' beliefs, attitudes, norm pressure and perceived controlling factors concerning stand improvement (SI) intentions were studied using Finnish survey data (n= 2116). The Theory of Planned Behaviour (TPB) was applied and tested by estimating structural equation models. TPB theory appeared to be a good fit. Subjective norm was the most important explaining factor and attitudes had smaller explaining power. Perceived behavioural control had an inhibiting influence on SI. Female owners' intentions were more influenced by norm pressure than the male persons' intentions. In the youngest and oldest age cohorts the norm pressure was clearly the most dominant explaining factor. The more urban was the residential area of the forest owner, the more important was the norm pressure from outside. From the policy point of view, this responsiveness and need of professional advice of the younger, "new", urban and female forest owners is worth noting: the most important referent was the extension personnel of the local forest management association.

attitude / belief, family forest / social norm / SEM model / stand improvement

* Corresponding author: heimo.karppinen@helsinki.fi; P.O. Box 27, 00014 University of Helsinki, Finland

Small Scale Forest Landowner Risk Perceptions and Social Acceptability of Forest Management Approaches to Address Invasive Forest Pests

Jessica E. LEAHY[a*] – Crista STRAUB[b]

[a] University of Maine, USA
[b] Unity College, USA

Small-scale forest landowners increasingly need to adapt to changing conditions, including responding to invasive forest pests. In the northern New England region of the United States, landowners face threats from two forest pests: the Asian Longhorned Beetle (ALB, *Anoplophora glabripennis*) and Emerald Ash Borer (EAB, *Agrilus planipennis*i). Our study examined landowner risk perceptions and social acceptability of forest management approaches to these invasive forest pests with a representative sample (mail survey with a response rate of ~50%) from three states (Maine, New Hampshire, and Vermont). We found that only awareness of forest pests was related to risk perceptions. However, forest values, landowner rights, and place attachment all influenced landowner preferences for forest management and policy responses. Natural resource managers, policy makers and others desiring engage small-scale forest landowners more effectively to respond to invasive forest pests can use our findings. Ultimate, this research will help landowners and others manage long-term risks in forestry and lead to greater sustainability.

[*] Corresponding author: jessica.leahy@maine.edu

Is Efficiency a Sign for Professionalization? Analysis of FOAs in Slovenia Using DEA Method

Vasja LEBAN[a*] – Ulrich SCHRAML[b] – Lidija ZADNIK STIRN[a] – Janez KRČ[a] – Špela Pezdevšek MALOVRH[a]

[a] Department of Forestry and Renewable Forest Resources, Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia,
[b] Chair of Forest and Environmental Policy, Faculty of Environmental and Natural Resources, Albert Ludwig University, Freiburg, Germany

Abstract – As one of post-socialist countries, Slovenia has faced many problems in the last decades, resulting in insufficient management of private forests. Due to restitution the share of privately owned forests is still increasing and exceeds 75%. Forest Owner Associations (FOAs) have been established in order to reduce some negative effects that small-scale private ownership has on forest management. Today, after thirteen years of active cooperation, some FOAs seem to have grown out of their infancy and the question of professionalization has become an important issue in forestry discourse. This study evaluates the efficiency of FOAs using Data Envelopment Analysis. Two different models were constructed based on inputs (e.g. number of new members per year, number of steering committees) and outputs (e.g. number of realized activities, length of constructed forest roads). The results reveal that different levels of efficiency exist among FOAs in Slovenia, thus identifying preconditions for professionalization of work. This study can consequently be perceived as an attempt to improve private forest management through FOAs.

private forest management / forest owner associations / efficiency / data envelopment analysis (DEA) / Slovenia

1 INTRODUCTION

Since the early 1990s, many European countries (e.g. Central, South-Eastern and Eastern) have been experiencing enormous changes in their economic, political and social life, which has also affected the forestry sector (FAO 2000, Ziegenspeck et al. 2004). During the transition process from a planned to a market economy and to democracy Slovenia started the process of land restitution and privatization. Through this processes, the ownership rights of state forest land have shifted to private individuals. Many of the new private forest owners who emerged are small forest owners (Weiss et al. 2012) with little or no knowledge or experience of forest management. Moreover, Ziegenspeck et al. (2004) showed that motivational factors of many owners are shifting from economic towards social and ecological.

[*] Corresponding author: vasja.leban@gmail.com;Večna pot 83, 1000 Ljubljana, Slovenia

In Slovenia 75% of forests are privately owned (ZGS 2013). Private forest management is far from optimal and is the result of a diverse ownership and property structure. This diversity is displayed in a large number of private forest owners (around 314.000) and co-owners (around 489.000), small forest property (on average less than 3 ha) and large fragmentation (3 plots on average) (Pezdevšek Malovrh et al. 2010, ZGS 2013). The effects of such ownership and property structure are for example reflected in insufficient exploitation of natural resources, decreasing economic value of forests, lower exploitation of financial funds for investments and low value and marketing of timber (Mori et al. 2006).

Providing the owners with a fresh incentive for forest management is therefore one of the key issues. The solution lies in the activities related to encouraging cooperation among forest owners. Therefore, FOAs have been recognized as "an appropriate instrument to achieve better results in forest management" (Pezdevšek Malovrh 2009, p. 391), and are potentially an effective means for addressing the constraints and challenges faced by small-scale forest owners (Hägglund 2008, Weiss et al. 2012, Kittredge 2005).

In Slovenia cooperation of private forest owners is still developing. The first FOA (FOA Mirenske doline) was established in 2001 (Pezdevšek Malovrh 2010). Today, less than one percent of all forest owners in Slovenia are members of 23 FOAs (Mori 2013). All FOAs are members of the Slovenian umbrella organisation at the national level – the Federation of forest owners' organisations. The situation in the field of cooperation is improving annually and FOAs are becoming one of the equal and relevant stakeholder groups in the Slovenian forest policy arena. Furthermore, hints to encourage FOAs professionalization have already been indicated, although only one FOA member recently (in 2012) decided to establish a forest cooperative (Mori 2012, Valentar 2012). Therefore, the aim of our paper was to find out, using Data Envelopment Analysis (hereafter DEA), the efficiency of FOAs in Slovenia from the technical-economic and social-educational points of view.

2 METHODOLOGY

2.1 Data Envelopment Analysis (DEA)

Taking into consideration multiple inputs and outputs of FOAs, the DEA method has been applied for determining the efficiency of FOAs. The method was developed in 1978 by Charnes, Cooper and Rhodes with the intent to evaluate educational public programs of the U.S. federal government (Charnes et al. 1978). The DEA method is based on linear programming which calculates the optimal (i.e. minimum or maximum) value of the objective function of Decision Making Units (hereafter DMU) subject to linear equality and linear inequality constraints (Charnes et al. 1978, Huguenin 2013).

The model assumes constant returns to scale (CRS); the alternative name for CRS model is CCR model (Huguenin 2013). We supposed that there are n different DMU_k, $k= 1, ..., n$, where every DMU_k needs m different inputs $i, i= 1, ..., m$, in order to produce s different outputs $r, r= 1, ..., s$. Precisely, DMU_k needs x_{ik} units of input i to produce y_{rk} units of output r. For both, x_{ik} and y_{rk} we supposed to be non-negative and every single DMU_k has at least one positive input or output.

However, in DEA the efficiency of an individual DMU_k (θ_k) is represented by the maximum ratio of the weighted sum of inputs and weighted sum of outputs (1) subject to linear inequality (2) for all DMU_j, $j=1, \ldots, n$, and non-negative values of weights u_r and v_i (3):

$$\max \theta_k (u, v) = \sum_{r=1}^{s} u_r y_{rk} \Big/ \sum_{i=1}^{m} v_i x_{ik} \quad (1)$$

subject to:

$$\sum_{r=1}^{s} u_r y_{rj} \Big/ \sum_{i=1}^{m} v_i x_{ij} \leq 1 \qquad j = 1, \ldots, n; \quad (2)$$

$$u_r, v_i \geq 0 \qquad r = 1, \ldots, s; \qquad i = 1, \ldots, m \quad (3)$$

Furthermore, there are two linear programming models available: (a) input-oriented, aiming at maximizing the objective function of outputs with constant levels of inputs, and (b) output-oriented, where inputs are minimized while outputs maintain the same values. Due to the discretionary character of outputs and feasibility to effect outputs' values, the output-oriented model has been chosen in this analysis. The output-oriented primal linear program consists of the objective function which minimizes the sum of inputs (4), and *n+1* constraints (5), (6):

$$\min \theta \left(= \sum_{i=1}^{m} [v_i x_{ik})] \right. \quad (4)$$

subject to:

$$\sum_{i=1}^{m} v_i x_{ij} - \sum_{r=1}^{s} u_r y_{rj} \geq 0 \qquad j = 1, \ldots, n; \quad (5)$$

$$\sum_{r=1}^{s} u_r y_{rk} = 1; \quad (6)$$

$$u_r, v_i \geq 0 \qquad r = 1, \ldots, s; \qquad i = 1, \ldots, m \quad (7)$$

Due to practical reasons it is more common to use a dual linear program which is derived from the primal linear program ((4), (5), (6), (7)), (Johnes 2004). Besides fewer constraints in the dual model, i.e. *m+s* constraints and *n* variables, the dual linear program allows to calculate lambda values (*λ weights*). DMU_j with non-zero lambda values are recognized as units of an efficiency reference set (Sherman – Zhu 2006, Cooper et al. 2000). The output-oriented dual linear program maximizes the efficiency of individual DMU θ_k (8), where the weighted sum of outputs of DMU_j, *j=1, ..., n,* is equal or bigger than the weighted sum of outputs of analysed DMU_k (9), the weighted sum of DMU_j, *j=1, ..., n,* is equal or lower than the weighted sum of inputs of analysed DMU_k (10), while λ_k values are equal or bigger than zero (11):

$$\max \theta_k \quad (8)$$

subject to:

$$\theta_k y_{rk} - \sum_{j=1}^{n} \lambda_j y_{rj} \leq 0 \qquad r = 1, \ldots, s; \quad (9)$$

$$\sum_{j=1}^{n} \lambda_j x_{ij} \leq x_{ik}; \qquad i = 1, \ldots, m; \quad (10)$$

$$\lambda_j \geq 0; \qquad j = 1, \ldots, n \quad (11)$$

Relative efficiency of individual DMU_k is calculated subject to the efficiencies of all other DMU_j (Shiba 1997). DMUs with efficiency outcome 1 are labelled as efficient, while other DMUs with efficiency outcome less than 1 are labelled as inefficient DMU's relative to

other DMUs in the set. Inefficient DMUs have the potential to increase the level of outputs with lesser inputs (Sherman – Zhu 2006). Furthermore, inefficient DMUs can improve their efficiency by either 'imitating' peers (i.e. reference units) assigned to each inefficient DMU or in compliance with calculated target values (Cooper et al. 2000, Huguenin 2013).

2.2 Input data – FOAs inputs and outputs

In this paper two models have been developed as to reflect the efficiency of fulfilling different tasks related to improvement of forest management and strengthening the educational and social aspects of FOAs (DMU) (e.g. Shiba 1997, Viitala – Hänninen 1998, Šporčić et al. 2009). Each FOA has listed different tasks in statutes (i.e. member's consulting, education and informing, joint timber marketing, joint purchasing of labour and protective equipment) which support members to achieve their goals related to forest management. On the basis of FOAs' tasks two models with corresponding inputs and outputs have been designed. The models have been named the technical-economic model and the socio-educational model. The choice of inputs and outputs for each model has proved to be a critical step and the most time consuming process of model building (e.g. Shiba 1997, Viitala – Hänninen 1998, Šporčić et al. 2009). After literature review, potential inputs and outputs for the analysis have been selected and discussed with the representatives of FOAs. For both models, a final version of inputs and outputs has been generated in consensus with the representatives. Accordingly, the input and outputs considered in these models are presented in Table 1.

Table 1. Input and output data selected for efficiency measurement

	Technical-economic model						**Socio-educational model**				
	Inputs		Outputs				Inputs		Outputs		
DMU Name (FOAs)	Average number of new annual members (n)	Share of average income per member in 2012 (%)	Amount of wood for auctions in 2012 (m^3)	Length of newly constructed roads in 2012	Number of joint purchasing of labour and	Number of different performed activities in	Average number of new annual members (n)	Number of members of steering committee in	Total number of performed activities in	Number of connections with other entities in	Number of different performed activities in
FOA Lipniške doline	31	2,9	0	0	1	4	31	7	3	5	4
FOA Luče	1	8,3	0	0	0	3	1	10	3	2	3
FOA ob reki Krki	9,7	1,2	0	1,4	1	6	9,7	13	4	3	6
FOA Pod Gorjanci	10	1,3	0	0	0	4	10	5	5	4	4
FOA Šaleške doline	31,5	1,1	17	0	0	5	31,5	5	4	7	5
FOA Sopota-Laško	1	1	22	6	2	7	1	6	9	10	7
FOA Tisa Solčava	3,4	2,4	10,7	0	0	4	3,4	11	2	2	4
FOA v občini Metlika	7,4	1,4	12	0	3	6	7,4	13	7	5	6
FOA Vrhe Vremščica	8,4	1,2	0	2	1	6	8,4	11	8	7	6
FOA Tisa Domžale	19	0,7	52	0	1	5	19	3	9	0	5
FOA ob Kolpi in Lahinji	28,1	0,4	41	5,4	5	7	28,1	13	14	4	7
FOA Gorenjske	40,3	0,5	0	0	0	4	40,3	5	10	3	4
FOA Mislinjske doline	17,1	0,5	800	1	0	6	17,1	2	7	5	6
FOA Pohorje Kozjak	15	0,7	0	0	0	4	15	3	3	4	4
FOA Mirenske doline	18,9	0,4	5	5	0	6	18,9	5	10	5	6
FOA Gornji Grad	11,4	1	0	0	0	4	11,4	2	4	1	4
FOA Kupljenik	3,8	3,7	0	1,78	0	3	3,8	4	1	3	3

In order to collect data for analysis a questionnaire has been designed and a survey of all FOAs representatives (21 FOAs that were active in 2012) has been conducted face-to-face or via email. The survey was conducted in the second half of 2013. The response rate was exactly 81 %. According to the response rate of the surveys 17 FOAs, three different inputs and six different outputs have been included in the analysis *(Table 1).*

3 RESULTS AND DISCUSSION

Basic descriptive statistics of inputs and outputs used in the analysis is presented in *Table 2.* Wide variations in both inputs in outputs are noticeable. Such variation implies that there are big differences between conditions under which individual FOAs operate. These differences are not unexpected, since the sample involves all FOAs with different duration of operations and involvement of forest professionals in steering committees.

Table 2. Descriptive statistics of variables used in DEA models

			Average	St. dev.	Max	Min
Inputs	I1	Average number of new members per year(n)	15,1	11,7	40,3	1,0
	I2	Share of average income per member in 2012 (%)	1,7	1,9	8,3	0,4
	I3	Number of members of steering committee in 2012 (n)	6,9	4,0	13,0	2,0
Outputs	O1	Amount of wood for auctions in 2012 (m^3)	56,5	192,2	800,0	0,0
	O2	Length of newly constructed roads in 2012 (km)	1,3	2,1	6,0	0,0
	O3	Number of joint purchasing of labour and protective equipment in 2012 (n)	0,8	1,4	5,0	0,0
	O4	Number of different performed activities in 2012 (n)	4,9	1,3	7,0	3,0
	O5	Total number of performed activities in 2012 (n)	6,1	3,5	14,0	1,0
	O6	Number of connections with other entities in 2012 (i.e. communities, NGOs) (n)	4,1	2,4	10,0	0,0

3.1 Basic information about FOA's

Based on survey results FOAs in Slovenia in 2012 had an average of 113 members and they had been active for 6 years. From the year of establishment of individual FOA until 2012 the number of members increased on average by 5,2 times. In other words, every FOA gained 15 new members each year. Furthermore, every individual FOA performed in 2012 an average of 3 professional courses/trainings, 1 excursion/field trip and 2 meetings for all members. In total, more than 100 different activities were performed by all FOAs. The most important activity, which is also included in FOA's statutes, is education and informing. In addition, every FOA had on average 4 connections with other entities (i.e. local communities, NGOs, other civil societies). Kittredge (2005), Rickenbach et al. (2006) and Weiss et al. (2012) concluded that educating and informing are two key advantages for members of FOAs. In addition, educational and informing activities together with networking with other entities have been found as a beneficial factor to improve FOAs' efficiency in terms of social capital (Adam – Rončević 2003).

Furthermore, on average 7 persons were members of steering committees per FOA. Usually these 'leaders' are the most eager-to-work and they might be labelled as charismatic leaders and in most cases, having a crucial role (Weiss et al. 2012). Surprisingly, only 3 analysed FOAs had built a network of common purchasers, while the majority of members had one or several individual commerce purchasers. Weiss et al. (2012) found out that *joint timber trade* is/was one of the most important factors for the success of FOAs in the Czech Republic. In terms of Olson's

(2002) Collective action theory similar services and activities serve as an incentive for joining FOAs and a potentially easy-to-achieve upgrade for professionalization.

3.2 Relative efficiency of FOAs

In the second part of the study we have studied the efficiency of FOAs' operation in terms of technical-economic and socio-educational aspects. Table 3 represents an aggregate of relative efficiency's results, some basic statistics and FOAs' corresponding ranks. These total ranks have been calculated on the basis of both CCR efficiency ranks' sum. The average CCR efficiency of the technical-economic model of the analysed FOAs stands at 57,5 %. In other words, FOAs would on average achieve 42,5 % more outputs with the same level of inputs in order to become efficient. Since enhancing and increasing the economic power of private forest owners is one of the main objectives of FOAs' activities (Malovrh 2006), the technical-economic model reflects activities aiming to increase the economic power of individual forest owners. Four FOAs have been efficient (FOA Mislinjske doline, FOA Sopota, FOA Mirenske doline and FOA ob Kolpi in Lahinji), while 13 FOAs have been recognized as inefficient.

Decision-makers should be concerned about the relatively high share of inefficient units below average – 69,2 % inefficient FOAs have achieved efficiency below average. The least efficient FOA scored as 11,6 % in efficiency (FOA Kupljenik). Moreover, due to a low share of FOAs' performing activities included in the model, FOAs should consider improving these activities in the future. It is now clear that with just little improvements (e.g. change of number of members, extending some activities) and clear vision these units could be ready for professionalization.

Table 3. Relative CCR efficiency results and corresponding ranks

	Technical-economic model		**Socio-educational model**		**Total rank**
DMU name	CCR	Rank	CCR	Rank	
FOA Mislinjske doline	1	1	1	1	**1**
FOA Sopota-Laško	1	1	1	1	**1**
FOA Mirenske doline	1	1	0,836	4	**3**
FOA Tisa Domžale	0,638	6	1	1	**4**
FOA ob Kolpi in Lahinji	1	1	0,535	10	**5**
FOA Gornji Grad	0,457	10	0,836	4	**6**
FOA Pohorje Kozjak	0,554	9	0,619	6	**7**
FOA v občini Metlika	0,808	5	0,358	13	**8**
FOA Vrhe Vremščica	0,616	7	0,433	12	**9**
FOA Šaleške doline	0,389	13	0,614	7	**10**
FOA Gorenjske	0,399	12	0,591	8	**10**
FOA ob reki Krki	0,603	8	0,348	14	**12**
FOA Pod Gorjanci	0,375	14	0,508	11	**13**
FOA Kupljenik	0,116	17	0,547	9	**14**
FOA Luče	0,429	11	0,253	17	**15**
FOA Lipniške doline	0,162	16	0,340	15	**16**
FOA Tisa Solčava	0,238	15	0,295	16	**16**
Number of efficient DMU's	4		3		
Number of inefficient DMU's	13		14		
Share of efficient DMU's	23,5%		17,6%		
Average efficiency	0,575		0,595		
Minimum relative efficiency	0,116		0,253		
Number of DMU's below average	9		10		
Share of inefficient DMU's below average	69,2%		71,4%		

Likewise, relative efficiency results of the socio-educational model in terms of FOAs' operation are similar to the technical-economic model. On average, the efficiency of FOAs in the second model stands at 59,5 %. 17,6 % of FOAs were efficient. The share of inefficient units below average amounts at 71,4 % and is thus higher than in the technical-economic model, even though the average efficiency is higher and the minimum efficiency achieved stands at 25,3 %.

Even though there are no differences between the models' average efficiencies, *Table 3* reveals differences between efficient performances on an individual FOA's level. Thus, for example, *FOA ob Kolpi in Lahinji* has been efficient from the technical-economic aspect, while inefficient in terms of their socio-educational activities. Conversely, *FOA Tisa Domžale* has been efficient in performing socio-educational activities, while inefficient in performing technical-economic activities.

Moreover, we wanted to find out what affects the efficiency of individual FOAs. Thus, ratios between projected and empirical values for each input and output have been calculated. These ratios enable us to determine whether an input or output is more or less important in calculating efficiency and what is its contribution to efficiency (Šporčić et al. 2009). In other words, ratios represent the main sources of inefficiency for each model. Table 4 shows average relative values for each input and output. For the technical-economic model the output *Number of different performed activities in 2012* is the source that on average contributes the most to FOAs' efficiency. In 2012 FOAs should produce on average 58,5 % more than the produced output O1, 108,1 % more than the produced output O2, 61,5 % more than the produced output O3 and 293,7 % more than the produced output O4 in order to become CCR efficient from the technical-economic point of view. On the other hand, the output *Number of connections with other entities in 2012* contributes the most in the socio-educational model. To become CCR efficient from the socio-educational perspective FOAs should produce 126,2 % more than the produced output O4, 222,6 % more than the produced output O5 and 243,4 % more than the produced output O6.

Table 4. Sources of inefficiency for each model

			CCR technical-economic model	**CCR socio-educational model**
Inputs	I1	Average number of new members per year (n)	100,0 %	100,0 %
	I2	Share of average income per member in 2012 (%)	100,0 %	
	I3	Number of members of steering committees in 2012		100,0 %
Outputs	O1	Amount of wood for auctions in 2012 (m^3)	158,5 %	
	O2	Length of newly constructed roads in 2012 (km)	208,1 %	
	O3	Number of joint purchasing of labour and protective equipment in 2012 (n)	161,5 %	
	O4	Number of different performed activities in 2012 (n)	393,7 %	226,2 %
	O5	Total number of performed activities in 2012 (n)		322,6 %
	O6	Number of connections with other entities in 2012 (e.g. communities, other NGOs) (n)		343,4 %

Previous researches have shown a positive relation between the size of FOAs and efficient businesses (Feliciano – Mendes 2011, Lönnstedt – Norlin 2012). In order to perceive the status in Slovenia we divided FOAs in 'large groups' with more than 90 members and 'small groups' with less than or equal to 90 members. The boundary was calculated with the help of median value. Results *(Table 5)* show that the average efficiency value rises with the increasing size of a FOA. In addition, the average efficiency also improves with the

increasing number of performed activities. The share of units in each group is equal for both variables and more FOAs with fewer members and fewer performed activities are present. However, in terms of collective action we can conclude that the likelihood of a successful and efficient FOA's operation is higher in 'large groups' with more than 5 annually performed activities (Olson 2002).

Table 5. Average efficiency of Slovenian models with respect to their size and number of performed activities

		Share of units	Technical-economic model	Socio-educational model	Average (both models)
Number of members in year 2012 (n)	Less than or equal 90	52,9%	0,322	0,411	**0,366**
	More than 90	47,1%	0,765	0,802	**0,783**
Number of total performed activities in year 2012 (n)	Less than or equal 5	52,9%	0,334	0,511	**0,423**
	More than 5	47,1%	0,751	0,689	**0,720**

It is crucial to emphasize that some authors (e.g. Kittredge 2005, Lönnstedt – Norlin 2012) have recognized certain negative effects of 'large groups' resulting in 'increased distance' between the association and the members, and a decrease of benefits that (a growing) association provides for its individual member. On the other hand, Kittredge (2005, p. 675) established that "*large organizations with thousands of owners negotiate strong prices*" and therefore more efficiently represent the member's interests. On the other hand, the same author deliberates that too large organisations might "*lose touch with membership roots*" (Kittredge 2005, p. 677). Therefore, it is essential for Slovenian FOAs to take into account the main purpose of their future activities.

4 CONCLUSIONS AND GUIDELINES FOR FUTURE DEVELOPMENT

The question of efficient operation of FOAs in terms of possible professionalization was raised in this study. Some authors across Europe have recognized that many FOAs are facing inefficient operation (e.g. Shiba 1997, Schraml 2005, Feliciano – Mendes 2011). Moreover, measurement and improving of efficient operation has been proved to be an important factor influencing organisation's development (e.g. Sowlati 2005). Efficiency was measured by the DEA method, a powerful optimisation method based on linear programming. When designing two models we assumed constant returns to scale as we assume that FOAs can linearly change the level of inputs and outputs without having an effect on (the overall) efficiency (Huguenin 2013).

Although a relatively recent occurrence many FOAs in Slovenia have proved to be very successful. Furthermore, we have shown that some Slovenian FOAs fulfil most of the conditions for a potential (partial-) professionalization including organisational, technical and social aspects. The success of Slovenian FOAs has been presented to the general and professional public several times (e.g. Krajčič – Mori 2006, Medved – Malovrh 2006, Mori 2012, Valentar 2012). In addition, the question of further FOAs' development towards professionalization has been raised several times in the past as well.

Cooperation of forest owners for efficient and successful forest management has also been recognized by policy-makers and written in the national legislation (Resolution of national forest program and Forest Law). Encouraging cooperation does not only benefit individual forest owners, but rather a myriad of interests emerging from the general public and influencing rural development, gross domestic product, ecological stability and social value of forests (e.g. Ziegenspeck et al. 2004).

The benefits of membership in FOAs are manifold and non-members are deprived of these benefits. However, FOAs should not aim only at increasing members and the number of activities, but they should invest in attentive recognition of their needs and objectives. An efficient operation of FOAs is a result of rational and personal member's behaviour. FOAs' endeavour for professionalization should strive to enrich members with additional human, educational and technical capital without harming social relationships. Furthermore, FOAs eager to step in the professionalization process should aim at finding competent forest professionals and capable managers who would guide FOAs members and their decisions towards better economical status. Finally, in order to achieve the best results decision-makers of (efficient) FOA's are encouraged to discuss among members about their willingness for professionalization. The efficiency of individual FOA might also change in time, thus longitudinal data collection and analysing in the future is recommended.

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Development and Possibilities for Close-to-Nature Forest Resource Management in Hungary

Béla LETT[a*] – János GAL[a] – Magdolna STARK[a] – Norbert FRANK[b]

[a] Institute of Forest Resource Management and Rural Development, Faculty of Forestry, University of West Hungary, Sopron, Hungary
[b] Institute of Silviculture and Forest Protection, Faculty of Forestry, University of West Hungary, Sopron, Hungary

Abstract – Legal regulations of the activities of forest managers were fundamentally changed by the legislature of the past decade, and little is known about the actual change in forest management practices. Based on the data collected by the State Forest Service the study investigates the changes of the past 15 years and presents the influencing factors, first of all the species and sectorial characteristics and differences

In the study both the area of final cuts and regenerations are presented by modes, sectors and species. The main factors influencing forest resource management are site (which can be modified by climate change) and the corresponding species or stand type. Based on these possibilities of close to nature forest management can be evaluated on a more realistic basis. The sum and average values for the whole country are too general; the country consists of sectors with different forest assets management properties.

forest assets management / final cutting methods / regeneration methods

1 INTRODUCTION

The law LIV of 1996, the new forest law put forest management on new foundations in the period after the change of the political system. This period was closed by the law XXXVII of 2009, also a forest law, fully changing the ecological foundations and attitudes of forest management. The forestry law of 1996, its ministerial decrees and regulations completely changed the regulation of activities of forest managers which then modified the everyday practice. Little is known about the scope of this change and therefore we decided to make a preliminary analysis based on the data of the year 2000.

To characterize forest assets management we present the change of utilizations and regenerations modes in the first decade of the 21st century (2000- 2009/2010 and 2008/2009).

We consider year 2000 as a basis so that changes can be made visible.

The combinations utilization and regeneration modes are permanently related to forest assets management concepts so in our study we put an emphasis on investigating factors related to changes. Among these the most important are site and species appropriate to that site which is emphasized in the study, so the position and possibilities of the state and private forest management are fundamentally different.

* Corresponding author: lettb@emk.nyme.hu; H-9400 SOPRON, Bajcsy-Zs. u. 4., Hungary

Taking first plantings and completed regenerations into consideration there is a time period of about fifteen years available to investigate the structure of regenerations.

To have a more realistic view of the close-to-nature forest assets management there would be a possibility to investigate primary functions and regions besides looking at differences in sectors.

Controlling intentions along facts and knowing the pace and segments of changes would be of advantage when planning future measures.

2 MATERIALS AND METHODS

The study is based on the primary analysis of data published by ÁESZ. MGSZH, and Forestry Directorate of NÉBIH: Report on afforestations and utilizations in the years 2000-2010.

When analyzing forest assets management we investigate utilization and regenerations modes and their performance. Forestry authority prepared lists about several utilization - regeneration mode combinations since 2000 with new categories for the individual modes. In this study we do not investigate data about planning in the forest management plans.

The material used in this study was selected from these lists, and for a general overview we selected two times (though the modes for utilization 2000–2010 and regeneration 2000–2008/2009 differ slightly).

We have an intention to look back to the year of 2000 to make changes noticeable (of course some years bring random elements, but there are insufficient periods for calculating averages about the new forest assets management regulations and the appearance and registration of first plantings also changes).

In this study we can analyze the data by differentiating between state (common) and private ownership forms.

3 PRODUCTION, PROTECTED AND NATURA 2000 FORESTS

Because of the change in legal environment we investigated the forest assets management in the new primary function categories.

The area of final cuttings in the production forests is double of that in the protected and Natura 2000 forests (and nearly half of this area is black locust). Forest assets management (and its elements) is strongly influenced by the utilization of exploitable stands on protected and Natura 2000 areas in the next 10–20 years, the limiting regulations of their regeneration and the encouragements for species changes. One fifth of the utilization possibilities consist of black locust and poplar stands on the protected and Natura 2000 areas, which is another long term problem. Similar question is the role of conifers (spruce – lowland and barren lands, present situation and future vision); conifers on protected and Nature 2000 areas make up half of the area on production areas for the same species.

Because of the large difference in species proportions the area and volume relations show also big difference among production and protected forests (*Table 1*)

With the Natura 2000 designations (and with their interpretation by the authorities) the area of forest with non-production functions has practically doubled, and the proportion of stands with native species on protected/Natura2000 areas is higher than on production areas.

Besides the stock variables of forest management (forest area – FA, growing stock – GS) also special attention is given to the flow elements of forest assets management (area of cuttings – AC, volume of cuttings – VC). The possibilities for cut (final cuttings) are presented by the area and volume stands designated for cutting in the next decade based on their individual cutting age.

Table 1. Species relations in production, protected and Natura 2000 forests

Species	Forest area (FA)		Area of final cutting (AC)		Growing stock (GS)		Volume of final cutting (VC)	
	Production (Th. ha)	Protected Natura (Th. ha)	Production (Th. ha)	Protected Natura (Th. ha)	Production (M m^3)	Protected Natura (M m^3)	Production (Th. m^3)	Protected Natura (Th. m^3)
Beech	22,0	88,0	2,5	6,1	8,0	31,4	1,3	3,1
Oak	166,2	222,0	10,0	19,0	32,1	52,0	3,5	6,5
Turkey oak	102,2	104,1	12,1	11,5	22,1	23,1	3,8	3,6
Other hardw.	80,4	120,3	8,6	10,7	13,8	22,7	2,1	2,8
LRHW	***370,8***	***534,4***	***33,2***	***47,3***	***76,0***	***129,2***	***12,9***	***19,2***
Black locust	376,6	70,3	74,7	7,2	39,6	8,5	11,8	2,6
Hybrid popl.	93,1	30,7	31,8	10,0	10,9	5,0	5,0	2,1
Bl.l.+Hyb.popl	*469,7*	*101,0*	*106,5*	*17,2*	*50,5*	*13,5*	*16,8*	*4,7*
Poplars	46,3	27,2	8,1	4,7	6,6	5,9	1,9	1,6
Other softw.	43,8	56,0	6,6	8,2	9,4	13,8	1,9	1,3
Conifers	141,5	71,4	14,8	6,5	34,0	20,1	4,0	2,1
Softw.+con.	*231,6*	*154,6*	*29,5*	*19,4*	*50,0*	*39,8*	*7,8*	*5,0*
Non LRHW	***701,3***	***255,6***	***136,0***	***36,6***	***100,5***	***53,3***	***24,6***	***9,7***
Total	1072,1	789,9	169,3	84,0	176,5	182,5	35,2	25,5

Legend: LRHW= long rotation hardwood

Another important question of the Hungarian forest assets management is in how far the possibilities on protected and Natura2000 areas can be utilized.

Beech has a high emotional sensitivity from the side of the society but its volume is low in the whole country. Because of the overwhelming proportion of the protection function we use close-to-nature solutions with a balance between production and protection goals.

In case of black locust and hybrid poplar only the area is protected and the management of these species is considerable in both volume and financial terms. It is also difficult to define how nature-close these are (forest – plantation). The attitude of nature protection is basically condemnatory and the problems can be handled on a very long run. The proportion of coniferous stands has considerably diminished, their health state is critical; it is possible and necessary to replace these stands with other species.

There is a critical situation in the groups of oak, turkey oak and other hardwoods, where the proportion of production forests is more than one third and is close to half.

4 FINAL CUTTING AND REGENERATION MODES

4.1 Area and volume of final cuttings by sector and cutting modes

The combinations of final cutting – regeneration modes is of vital importance for forest assets management. First we present the data on final cuttings (and those of regeneration, which are nearly identical).

The two sections are defined by sector (state and private) and modes of cut (clearcut and regeneration cut).

At the flow data and especially at the area of final cuts *(Table 2)* but also at volume *(Table 3)* the possibilities of private forestry are considerable, particularly in black locust and hybrid poplar stands.

Table 2. Area of final cuttings 2000 – 2010

Unit: ha

Sector	Clear-cut	Regen. cut	Shelt. cut	Final cut total	(Sel. cut)	(Stock maint.)	Unr. cut	Oth.	Total	CC %
2000										
State + community	8211	3465	–	11676			108		11785	69,7
Private	8823	534	–	9358			35		9392	93,9
Total	**17034**	**3999**	**–**	**21034**			**144**		**21177**	**80,4**
(%)	**80,4**	**18,9**	**–**	**99,3**			**0,7**		**100**	
2010										
State + community	7780	3342	241	11363			449		11812	65,9
Private	9356	792	41	10188			48		10236	91,4
Total	**17216**	**4134**	**285**	**21635**			**499**		**22134**	**77,8**
(%)	**77,8**	**18,7**	**1,3**	**97,7**			**2,3**		**100,0**	

To selection cut and stock maintaining cut the authorities do not assign area for regeneration obligation.

Table 3. Volume of final cuttings by modes of cut and sectors 2000 – 2010

Unit: Thousand m^3

Sector	Clear-cut	Regen. cut	Shelt. cut	Final cut total	(Sel. cut)	(Stock maint.)	Unr. cut	Oth.	Total	CC %
2000										
State + community	2017	1252	–	3269			322	39	3630	55,6
Private	1627	125	–	1752			104	22	1878	86,6
Total	**3644**	**1377**	**–**	**5021**			**426**	**61**	**5508**	**66,2**
(%)	*66,1*	*25,0*	**–**	*91,1*			*7,8*	*1,1*	***100***	
2010										
State + community	1801	1209	95	3107	41	1	456	31	3635	49,5
Private	1813	2370	12	2062	4	5	99	18	2187	82,9
Total	**3629**	**1447**	**107**	**5184**	**45**	**6**	**556**	**49**	**5841**	**62,1**
(%)	*62*	*24,8*	*1,8*	*88,8*	*0,8*	*0,1*	*9,5*	*0,8*	*100*	

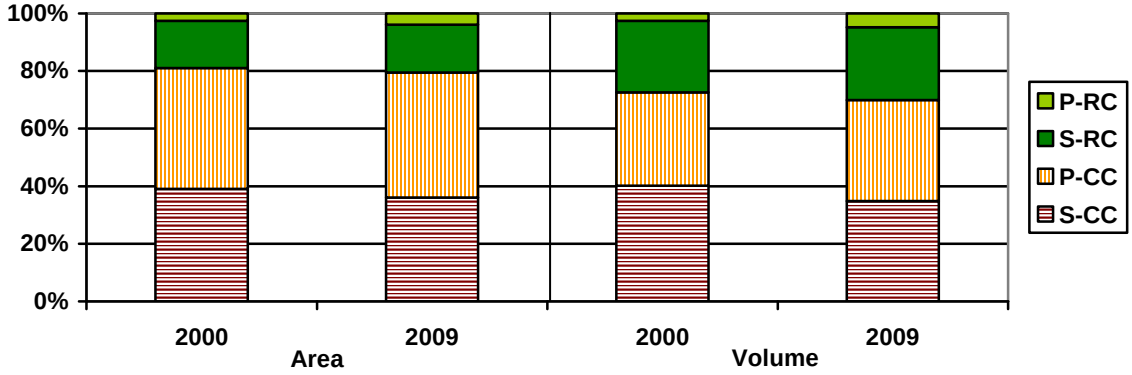
Cutting modes in 2010 were extended with modes which were not present in the statistics in 2000 (shelterwood cut, selection cut, growing stock maintaining cut). In the statistics of 2010 the new elements of utilization appeared, the volume of which is minimal. Shelterwood cut generates obligation for regeneration, to selection cut and growing stock maintaining cut – the volume of which is negligible – the authorities do not assign obligation for regeneration.

The basic consequence is the change of proportion of clearcuts which is similar in terms of area and volume, but is different in magnitude (because of the already mentioned difference in specific volume). Regenerations cuts did not increase considerably in volume or in proportion, shelterwood cut, selection cut and growing stock maintaining cuts just appeared and are in the phase of planning. The numbers of utilization (and consequently those of regeneration) show a steadiness typical for sustainable management and we cannot expect a sudden change in volume because of the strong determination.

4.2 Volume of final cuttings 2000–2010

Comparing the data from 2000 and 2010 no considerable shift in area, volume, proportions or sectors can be observed but a little change is noticeable from clearcut to regeneration cut (regeneration cut also increased in private sector). Clearcut is still determining in private forestry. *Figure 1* shows the proportions, their differences and change in time.

The difference between the sectors in final cut – regeneration modes is considerable because of the stable difference in the forest assets of the state and private sector and change of this is a slow process determined by many other factors.



Legend: S-CC = State, clearcut; P-CC = Private, clearcut;
S-RC = State, regen. cut; P-RC = Private, regen. cut

Figure 1: Distribution of final cuts by modes and sectors 2000–2009

4.3 Volume of final cutting by species and sectors

In 2000 the statistics of final cuts by species provided the volumes as total, not divided by clearcuts and regeneration cuts, so the table was completely different. The data in *Table 4* show the differences between the sectors by species.

Table 4. Volume of final cuts by species and sectors 2010

Species	**Clearcut**		**Regen. cut**		**Shelterw. cut**		**Total final cut**	
Total	(Th. m^3)	(%)	(Th. m^3)	(%)	(Th. m^3)	(%)	(Th. m^3)	(%)
Beech	22,4	0,4	428,6	8,3	49,4	1,0	500,3	14,7
Oak	344,7	5,9	392,2	6,7	23,0	0,4	760,0	13,3
Turkey oak	209,2	3,6	463,6	7,9	14,6	0,3	687,4	3,0
Hornbeam	71,5	1,2	78,6	1,3	6,9	0,1	157,0	2,4
Other hardwoods	101,2	1,7	20,5	0,4	4,4	-	126,2	43,0
LRHW	749,0	14,4	1353,5	26,1	98,3	1,9	2230,9	25,6
Black locust	1317,4	22,6	6,3	0,1	1,3	-	1325,0	15,5
Hybrid poplar	805,8	13,8	0	-	-	-	805,9	41,1
Black l.+ hyb.popl.	2123,2	41,0	6,3	0,1	1,3	-	2130,9	2,4
Poplar	124,8	2,1	2,0	0	0,2	-	127,0	0,6
Willow	31,6	0,5	-	-	-	-	31,6	2,8
Other softwood	123,4	2,1	20,3	0,3	2,4	0,1	146,1	10,0
Conifers	477,2	8,2	34,9	0,6	5,6	0,1	517,7	15,9
Other sw and con.	757,0	14,6	57,2	1,1	8,2	0,2	822,4	57,0
Non LRHW	2880,2	55,6	63,5	1,2	9,5	0,2	2953,3	14,7
Total (Th. m^3)	**3629,2**		**1447,0**		**107,9**		**5184,1**	
(%)		**70,0**		**27,9**		**2,1**		**100**

Legend: LRHW= long rotation hardwood

Table 4 continued. Volume of final cuttings by species 2010

Species	**Clearcut**		**Regen. cut**		**Shelterw. cut**		**Total final cut**	
State	(Th. m^3)	(%)	(Th. m^3)	(%)	(Th. m^3)	(%)	(Th. m^3)	(%)
Beech	16,1	0,5	368,6	11,9	47,1	1,5	431,8	13,9
Oak	274,4	8,8	336,3	10,8	20,5	0,7	631,3	20,3
Turkey oak	164,8	5,3	378,5	12,2	13,3	0,4	556,6	17,9
Hornbeam	46,8	1,5	57,2	1,8	5,2	0,2	109,2	3,5
Other hardwoods	68,0	2,2	17,2	0,6	4,0	0,1	89,2	2,9
LRHW	570,1	18,4	1157,8	37,3	90,1	2,9	1818,1	58,5
(%)	*31,4*		*63,7*		*4,9*		*100*	
Black locust	410,8	13,2	2,0	0,1	0,3	–	413,1	13,3
Hybrid poplar	323,5	10,4	–	–	–	–	323,5	10,4
Black l.+ hyb.popl.	*734,3*	*23,6*	*2,0*	*0,1*	*0,3*		*736,6*	*23,7*
Poplar	67,8	2,2	1,8	0,0	0,2	0,0	69,8	2,2
Willow	18,5	0,6	–	–	–	–	18,5	0,6
Other softwood	42,3	1,4	19,7	0,6	2,4	0,1	64,4	2,1
Conifers	368,3	12,4	28,5	0,9	2,4	0,1	399,1	12,8
Other sw and con.	*496,9*	*16,0*	*50,0*	*1,5*	*5,0*	*0,2*	*551,8*	*17,8*
Non LRHW	1231,2	39,6	52,0	1,6	5,3	0,2	1288,4	41,5
(%)	*95,6*		*4,0*		*0,4*		*100*	
Total (Th. m^3)	**1801,3**		**1209,8**		**95,4**		**3106,5**	**100**
(%)		***58,0***		***38,9***		***3,1***	***100***	
Private								
Beech	6,3	0,3	59,9	2,7	2,3	0,1	68,5	3,3
Oak	70,3	3,2	55,7	2,5	2,4	0,1	128,4	6,2
Turkey oak	43,4	2,0	85,0	3,9	1,2	0,1	129,6	6,3
Hornbeam	24,6	1,1	21,4	1,0	1,5	0,1	47,5	2,3
Other hardwoods	33,1	1,5	3,3	0,2	0,2	–	36,6	1,8
LRHW	177,7	8,6	225,3	10,9	7,6	0,4	410,6	19,9
(%)	43,3		54,9		1,8		100	
Black locust	901,3	43,7	4,3	10,1	0,9	–	906,5	44,0
Hybrid poplar	477,6	23,1	–	–	–	–	477,6	23,1
Black l.+ hyb.popl.	*1378,9*	*66,9*	*4,3*	*10,1*	*0,9*	*-*	*1384,1*	*67,1*
Poplar	56,6	2,6	0,3	–	–	–	56,9	2,8
Willow	12,9	0,6	–	–	–	–	12,9	0,6
Other softwood	80,2	3,7	0,6	–	0,1	–	80,8	3,9
Conifers	107,0	6,9	6,5	0,3	3,2	0,1	116,7	5,7
Other sw and con.	*256,7*	*12,4*	*7,4*	*0,3*	*3,3*	*0,1*	*267,3*	*13,0*
Non LRHW	1635,6	79,3	11,7	0,6	4,2	0,2	1651,4	80,1
(%)	99,0		0,7		0,3		100	
Total (Th. m^3)	**1813,4**		**236,9**		**11,7**		**2062,0**	
(%)		**87,9**		**11,5**		**0,6**	**100**	

Legend: LRHW= long rotation hardwood

The proportion of the state and private forests in area and volume are nearly similar, but the species distribution and therefore the management conditions are substantially different. In private forestry black locust is overwhelming and the role of hybrid poplars is also important.

The majority of final cuttings in state forestry consist of broadleaved hardwood stands (58.5%). In these stands clearcut does not reach one third of the area (in the case of beech not even 5%) while in other species this proportion is 95%.

In private forestry the share of broadleaved hardwoods is only one fifth, black locust (44%) and hybrid poplar (23%) are in majority. With other species clearcut is nearly 99%, while in the case of broadleaved hardwoods the situation is similar to that in state forests.

Using clearcut or regeneration cut depends mainly on species but other factors and stand characteristics can also influence the decision.

Behind the differences in final cutting – regeneration modes between sectors *(Figure 2)* are the differences in species, so the differentiation is for the long run. In the species composition of regeneration cuts the difference is much smaller (beech is important in state forests) and in clearcut oak is important in state forests.

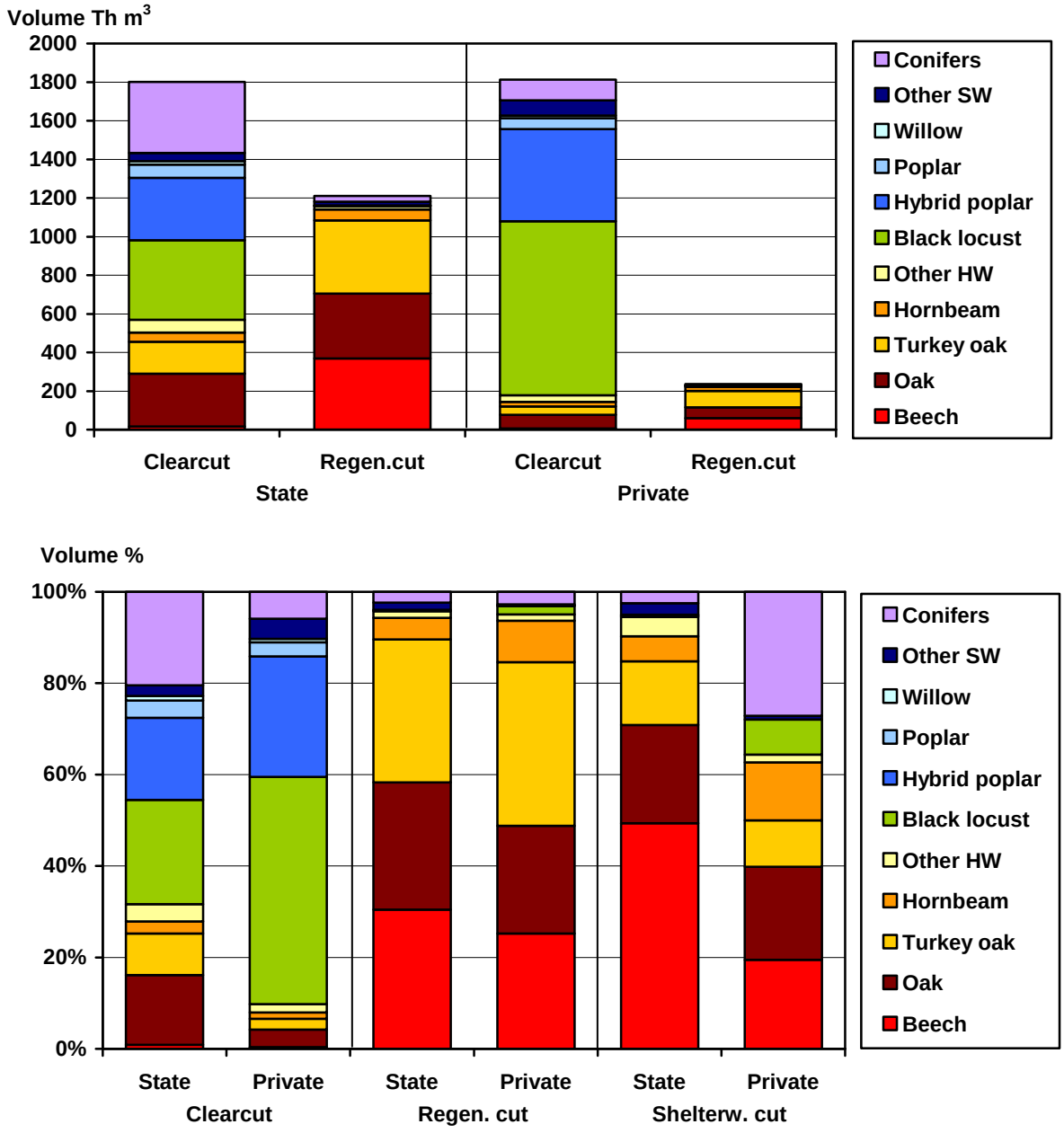


Figure 2. Comparison of state and private forest assets management

Based on the data in *Table 4 and Figure 3* the following statements can be made:

- in beech the proportion of regeneration cuts are higher in private forestry
- proportion of regeneration cuts in turkey oak is higher than in oak (similarly to beech) in both sectors
- regeneration cuts are negligible in short rotation stands and no increase is expected

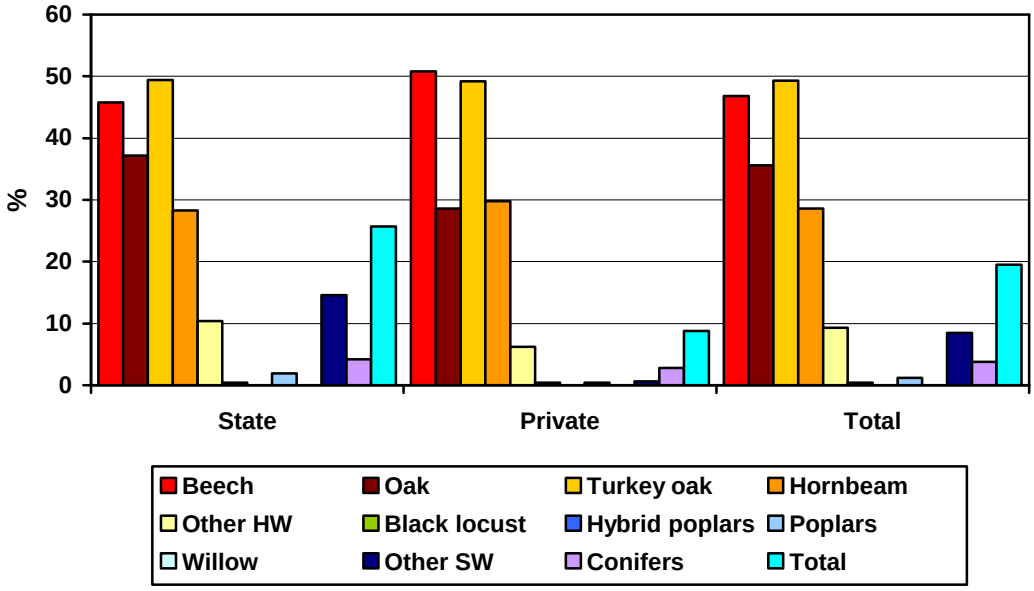


Figure 3: Proportions of regeneration cuts (2010)

Annual final cuttings have stabilized, the changes do not have a tendency, the increase of conifers is steady and a decrease is inspected with hybrid poplars *(Figure 4)*

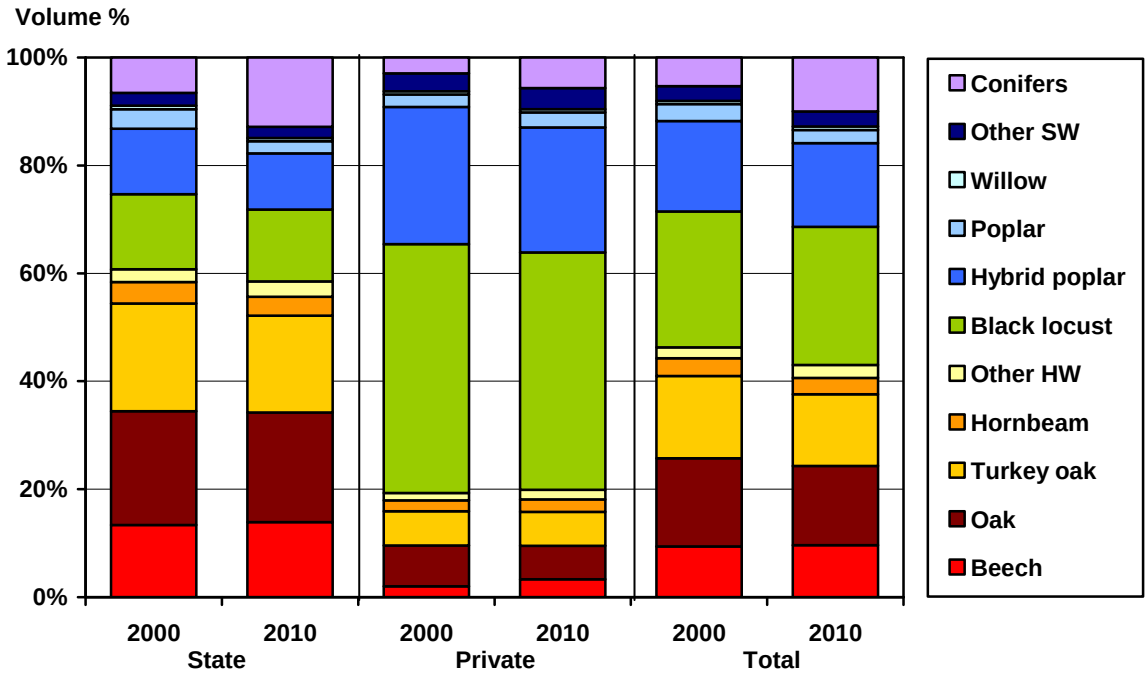


Figure 4. Change of final cutting by species (2000–2010)

According to proportion of final cut species form groups with good separation *(Table 5)* and rotation age is an important influencing factor:

- below 55%, conifers because of the age structure
- between 55–70%, native stands with high rotation age (but also other softwood in the state category)
- final cut proportion is over 70% in the case of short rotation age
- with some species the final cut proportion is lower in the state forest as in private forest, the rotation age is higher,
- there is no substantial change in time because of the stabile species structure, only slow change is to be expected,
- the final cut proportion is two-third in the state forest, and about three-quarter in the private forest

Table 5. Change of final cut proportions (2000–2010)

Unit: %

Species	State		Private		Total	
	2000	2010	2000	2010	2000	2010
Beech	70,1	53,7	62,1	58,1	69,4	54,6
Oak	69,7	69,7	67,5	65,9	69,3	69,0
Turkey oak	76,0	72,7	57,8	75,1	75,9	73,2
Hornbeam	47,3	54,0	56,8	66,2	49,1	57,2
Other HW	53,8	54,2	66,3	68,5	56,3	57,5
Black locust	79,9	78,3	87,1	82,9	84,4	81,4
Hybrid poplar	78,2	81,4	79,3	82,7	78,8	82,2
Poplar	60,4	73,9	71,1	75,7	76,6	74,1
Willow	47,1	70,3	61,1	79,6	60,7	74,2
Other SW	51,5	47,6	68,8	78,1	57,7	60,9
Conifers	33,6	58,7	26,2	51,2	31,8	56,9
Total	66,1	66,1	74,7	76,4	68,9	69,8

5 PERFORMANCE AND CHANGE OF COMPOSITION OF REFORESTATION

5.1 Mode and performance of reforestation (2000–2009)

The forest assets management of the 2000's was determined by the financing along the same principles but with different practices: funds for supporting forest assets and normative financing of regeneration. The effects if its termination in 2008 will be detectable only after several years).

The proportion of regeneration cut has not reached one-fifth in the state owned forests, and within this artificial regeneration is more than natural seed origin in clearcuts. In private forestry natural regeneration can be applied only with several species, but black locust coppice regeneration reduces artificial regeneration thus reducing costs for the forest manager (*Table 6, Figure 5*).

In the forest assets management of the state owned forest use of regeneration cut has exceeded one-quarter (we will get back to this when discussion species distribution. There is still more artificial regeneration in regeneration cuts (with its high costs) than seed origin in clearcuts.

The first plantings in 2000 and the completed reforestations in 2008/2009 can be compared; regeneration cuts slightly decreased, artificial regenerations and coppice regenerations increased at the expense on natural seed regeneration.

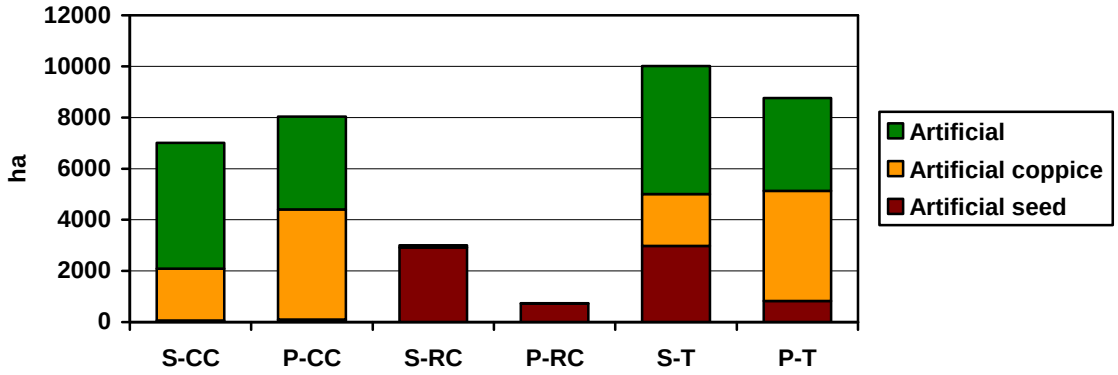
In the vegetation year 2008/2009 there is no considerable change in the area and proportions of regeneration cuts, perhaps the natural seed regeneration increased in private forestry.

Table 6. Regeneration – First planting (2009)

Unit: ha

Mode of regeneration	State			Private			Total		
	CC	RC	Total	CC	RC	Total	CC	RC	Total
Natural seed	63	2920	2984	95	726	821	158	3646	3804
Natural coppice	2027	–	2027	4309	–	4308	6336	–	6336
Artificial	4916	83	4999	3624	7	3631	8540	90	8630
Total	**7007**	**3003**	**10010**	**8028**	**733**	**8761**	**15034**	**3736**	**18770**
Additional plant.	1939	918	2857	677	45	722	2630	964	3594

Legend: CC = clearcut; RC = regeneration cut;



Legend: S-CC = State – clearcut P-CC = Private – clearcut
S-RC = State – regeneration cut P-RC = Private – regeneration cut
S-T = State – total P- T = Private – total

Figure 5. Final cuttings – reforestation first planting by sector (2009)

Annual replacements of plants are attached to the first plantings, though there are no data available on the distribution of species or on the mode of regeneration.

We will investigate the data of the afforestation for the last year in more detail. The combination of clearcut and natural regeneration from seed hardly occurs, and artificial regeneration and regeneration is also rare (regeneration cut and coppice regeneration does not occur at all). There are considerable differences between state and private management in terms of cutting and regeneration modes:

The proportion of natural regeneration from seeds does not reach 20% proportion and is mainly concentrated on state forests. One-third of the regenerations are done naturally, but from coppice (the distribution of the coppice regenerations by age and species needs a separate investigation because of the still existing old stands).

Neatly half of the regenerations are artificial regeneration after clearcut.

There is a considerable difference between sectors in regeneration after clearcut, in case of state forests two-third is regenerated artificially, while in private forests the proportion of natural coppice is higher. In case of regeneration cuts seed natural regeneration is dominant.

5.2 Comparison of regenerations by species and sector

In the previous chapter we presented the relation of utilization and regeneration and the differences in sectors. These sectorial differences can be explained by the difference of species of regeneration. In private forestry clearcut is dominant (and within this mainly black locust and less hybrid poplar) and regeneration cut is marginal. On the species level there is little difference between sectors in the utilization and regeneration modes. *(Table 7 and Figure 6)*

Table 7. Regeneration and first planting by species (2009)

Unit: ha

Species	Clearcut		Regeneration cut		Total	
	State	Private	State	Private	State	Private
Beech	75	13	945	191	1020	204
Oak	1571	660	970	260	2541	920
Turkey oak – other hw.	755	286	1053	281	1808	567
LRHW	**2401**	**959**	**2968**	**732**	**5369**	**1691**
Black locust	2065	4748	–	–	2065	4748
Hybrid poplar	681	1306	1	–	682	1306
Other softwood	1231	889		–	1232	889
Conifers	629	127	34	1	663	128
Non LRHW	**4606**	**7070**	**35**	**1**	**4641**	**7071**
Total	**7007**	**8029**	**3003**	**733**	**10010**	**8762**

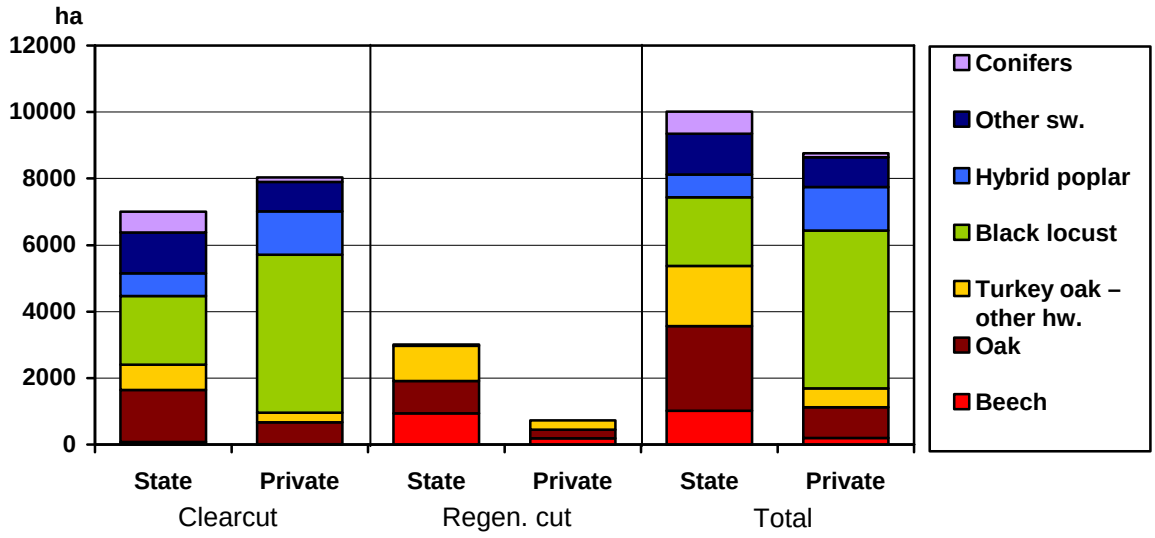


Figure 6. First planting of regenerations by species (2009)

5.3 Change of regeneration modes and performance

Taking into consideration the two dates of finished regenerations and first plantings (2000, 2009) the four series of data can be used to investigate an approximate time period of fifteen years. The distribution of regeneration cut – clearcut comes from final cuttings and to these three regeneration modes can be assigned: natural regeneration from seeds and coppice and artificial regeneration. The distribution of cutting modes (clearcut and regeneration cut) and regeneration modes (natural seed, natural coppice, artificial) by sectors is presented in *Table 8* and *Figure 7.* The species composition and its change show the difference between management in the sectors.

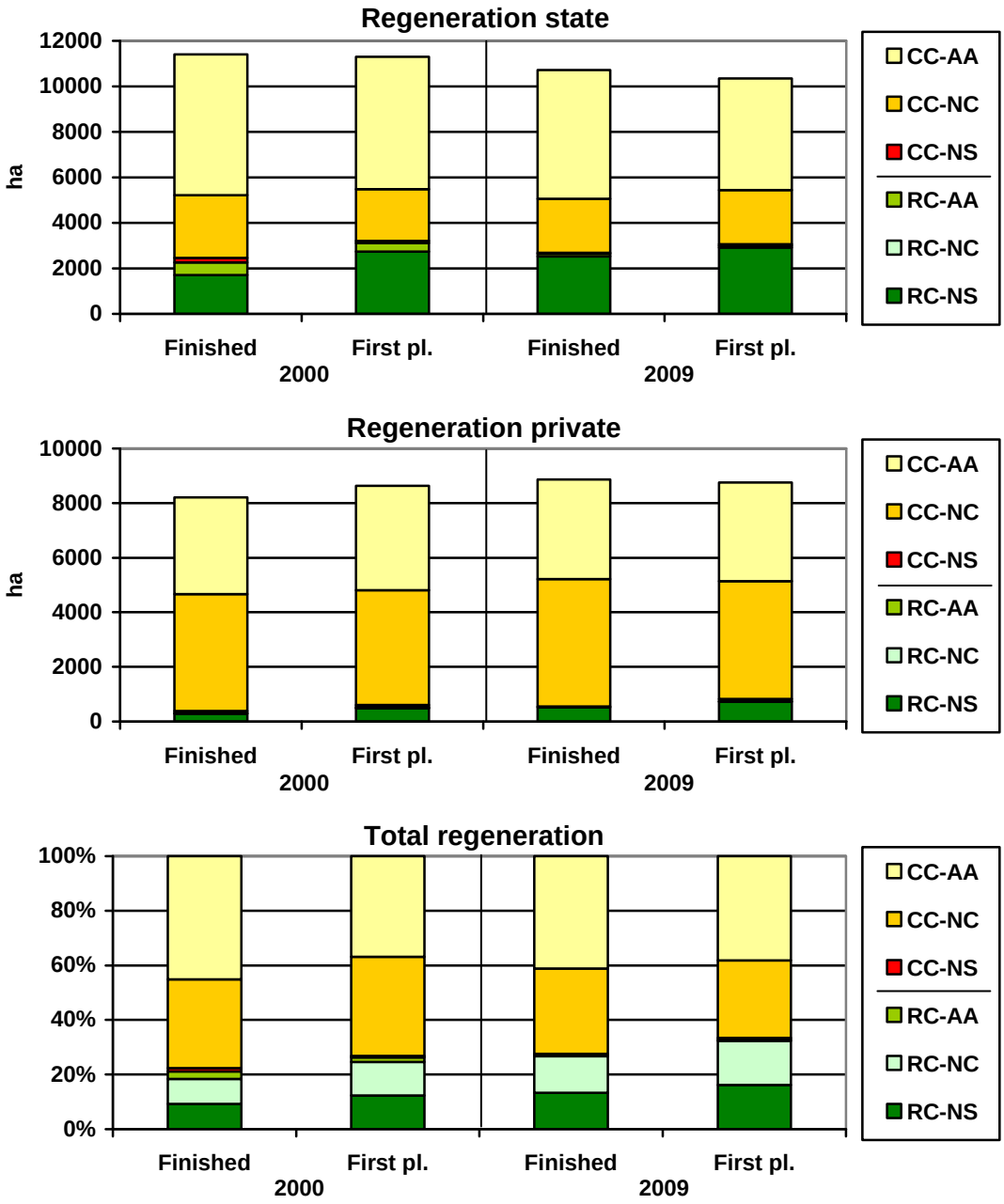
Table 8. Change regeneration mode and performance

Final cut and regeneration mode	State (ha)				Private (ha)			
	2000		2009		2000		2009	
	Finished	First plant.	-	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
NRS	1701	2729	2515	2920	287	487	516	726
NRC	–	1	–	–	3	3	–	–
NR	1701	2730	2515	2920	290	490	516	726
AA	550	389	130	83	21	40	5	7
Total	***2251***	***3119***	***2645***	***3003***	***311***	***530***	***521***	***733***
Clearcut								
NRS	204	95	36	63	76	71	29	95
NRC	2755	2268	2373	2373	4273	4204	4668	4309
NR	2959	2363	2409	2436	4349	7275	4697	4404
AA	6197	5814	5664	4916	3542	3836	3645	3624
Total	***9156***	***8177***	***8073***	***9788***	***7891***	***8111***	***8312***	***8028***
Total	**11407**	**11296**	**10718**	**12791**	**8202**	**8641**	**8863**	**8761**
T-NR	*4660*	*5093*	*4924*	*5356*	*4639*	*4765*	*3213*	*5129*
T-AR	*6747*	*6203*	*5794*	*4999*	*3563*	*3876*	*3650*	*3631*

Total

Final cut and regeneration mode	Area (ha)				Proportion (%)			
	2000		2009		2000		2009	
	Finished	First plant.	Finished	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
NRS	1988	3216	3030	3647	10,1	16,1	15,4	19,3
NRC	3	4	–	–	-	0	-	-
NR	1991				10,1	16,1	15,4	19,3
AA	571	429	135	90	2,9	2,2	0,7	0,5
Total	***2562***	***3649***	***3166***	***3737***	***13,1***	***18,3***	***16,1***	***19,8***
Clearcut								
NRS	280	166	65	159	1,4	0,8	0,3	0,8
NRC	7028	9472	7091	6412	35,8	47,5	36,1	33,9
NR	2308	9638	7156	6571	37,2	48,3	36,4	44,7
AA	9739	9650	9345	8597	49,7	48,4	47,5	45,5
Total	***17047***	***16288***	***16500***	***15168***	***86,9***	***81,7***	***83,9***	***80,2***
Total	**19609**	**19937**	**19666**	**18905**	**100**	**100**	**100**	**100**
T-NR	*9299*	*9858*	*10186*	*10217*	*47,4*	*49,5*	*51,8*	*54,0*
T-AR	*10310*	*10079*	*9480*	*8688*	*52,6*	*50,5*	*48,2*	*46,0*

Legend: NRS – Natural regeneration seed
NRC – Natural regeneration coppice
NR – Natural regeneration
AA – Artificial afforestation
T-NR – Total natural regeneration
T-AR – Total artificial regeneration



CC = Clearcut; RC = Regeneration ct
NS = Natural seed; NC= Natural coppice; AA = artificial afforestation

Figure 7. Change of mode and performance of regeneration in state and private sector

5.4. Change of species composition in regeneration

The difference between modes of cut and regeneration method combinations is primarily defined by the species conditions (and site differences determining these conditions, *Table 9, Figure 8*).

With the species black locust, poplar and conifers clearcut is dominant as final cutting mode, and as regeneration natural coppice is typical for black locust, otherwise artificial regeneration with plants is usual. Different proportions of regeneration cuts (natural regeneration with seeds) by species can be mentioned with broadleaved hardwoods with long rotation age, where the difference between sectors is smaller and the change is more evident in the first plantings (thus appearing in planning)

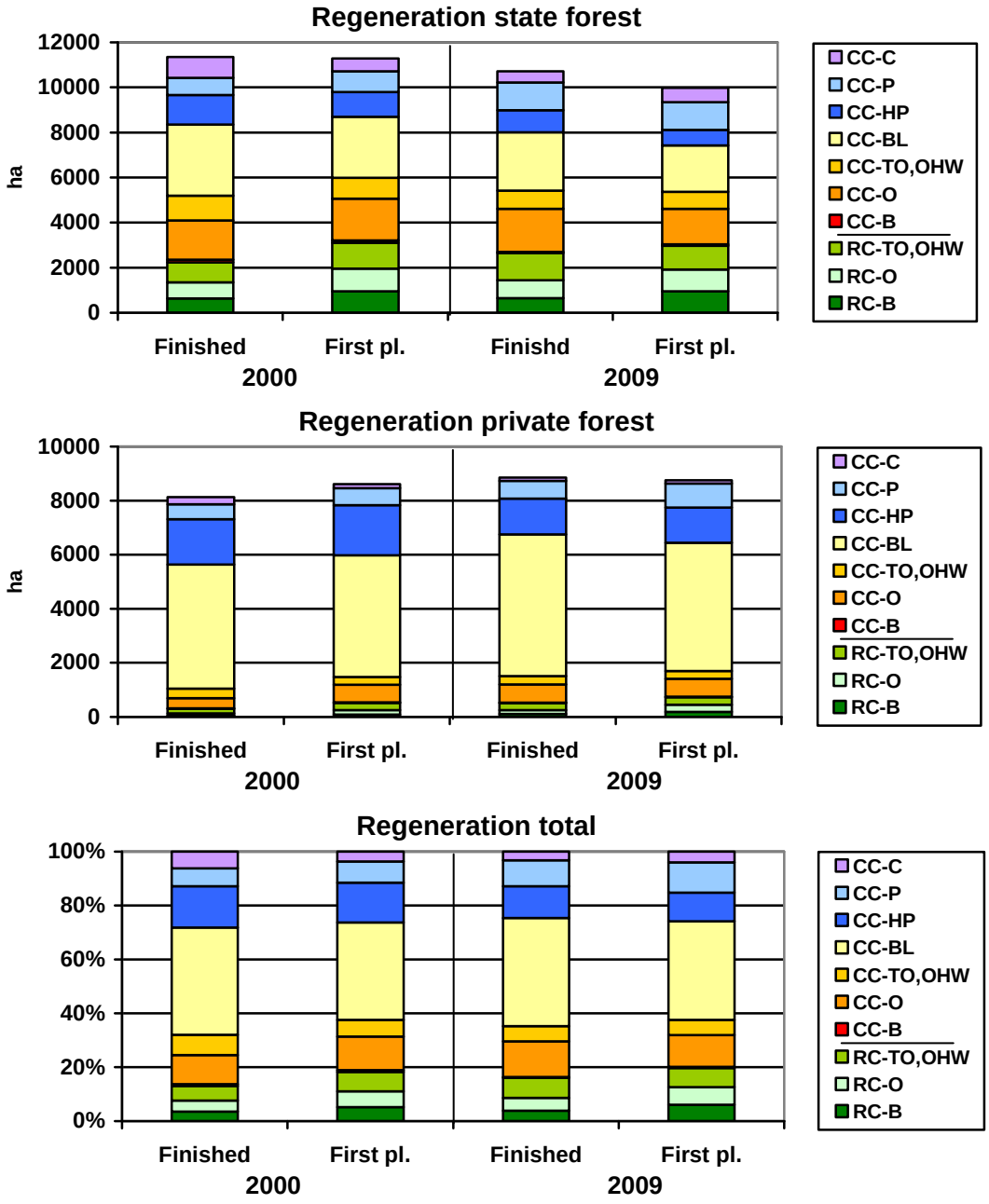
Table 9. Change in species structure of regeneration

Species	State (ha)				Private (ha)			
	2000		2009		2000		2009	
	Finished	First plant.	Finished	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
Beech	628	955	642	945	60	84	110	191
Oak	714	995	797	970	77	169	145	260
Turkey oak - OHW	897	1156	1199	1053	163	270	262	281
LRHW	2239	3106	2638	2968	300	523	517	732
Total	***2251***	***3119***	***2645***	***3003***	***311***	***530***	***521***	***778***
Clearcut								
Beech	120	109	56	75	14	21	10	13
Oak	1736	1841	1919	1571	381	643	677	660
Turkey oak - OHW	1104	937	811	754	349	293	303	286
LRHW	2960	2877	2786	2400	744	957	990	959
Black locust	3156	2706	2589	2065	4600	4495	5241	4748
Hybrid poplar	1312	1099	973	681	1674	1851	1320	1306
Poplar	759	924	1224	1231	545	634	666	889
Conifers	927	564	502	628	268	156	123	127
Total	***9156***	***8177***	***8073***	***7007***	***7891***	***8111***	***8342***	***8705***
Total	**11407**	**11296**	**10718**	**10010**	**8202**	**8641**	**8863**	**9483**

Total

Species	Area (ha)				Proportion (%)			
	2000		2009		2000		2009	
	Finished	First plant.	Finished	First plant.	Finished	First plant.	Finished	First plant.
Regen. cut								
Beech	688	1039	753	1137	3,5	5,2	3,8	6,0
Oak	791	1164	942	1231	4,0	5,8	4,8	6,5
Turkey oak - OHW	1060	1426	1462	1335	5,4	7,2	7,4	7,1
HVFK	2539	3629	3157	3703	12,9	18,2	16,0	19,6
Total	***2562***	***3649***	***3166***	***3737***	***13,1***	***18,3***	***16,1***	***19,8***
Clearcut								
Beech	134	130	65	88	0,7	0,7	0,3	0,5
Oak	2117	2484	2596	2243	10,8	12,5	13,2	11,9
Turkey oak - OHW	1453	1220	1115	1045	7,4	6,1	5,7	5,5
LRHW	3704	3834	3776	3376	18,9	19,2	18,9	17,9
Black locust	7756	7201	7883	6901	39,6	36,1	40,1	36,5
Hybrid poplar	2986	2950	2323	2007	15,2	14,8	11,8	10,6
Poplar	1304	1558	1891	2127	6,7	7,8	9,6	11,3
Conifers	1195	720	626	754	6,1	3,	3,1	4,0
Total	***17047***	***16288***	***16500***	***15168***	***86,9***	***81,7***	***83,9***	***80,2***
Total	19609	19937	19666	18905	100	100	100	100
Total hardwood	6243	7463	6933	7079				

Legend: OHW = other harwdoods
LRHW= other hardwoods with long rotation age



CC = clearcut; RC = Regen. cut
B=beech; O=oak; TO=turkey oak; OHW=other hardwood;
BL=black locust; HP=Hybrid poplar; P=poplar; F C=conifers

Figure 8. Change of species structure in regenerations

5 SUMMARY

Modification of regulation of forest management changes the practice of forest management in a fundamental way. The analysis attempts to quantify these changes.

To characterize forest assets management we use the modes of final cuttings and regenerations, these are permanently connected to the concepts of forest assets management.

Conditions and possibilities differ considerably ion state and private forestry, the change of protected and Natura2000 designations also follow the changes.

In 2010 new final cutting modes appeared (shelterwood cutting, selection cutting, stock maintaining cutting) which were not present in the statistics of 2000, but their volume is not yet significant.

When analyzing the structure of regenerations a period of about 15 years can be analyzed taking first plantings and finished regenerations into account. The three regeneration modes are: natural regeneration from seeds and coppice (the latter is exclusive with black locust) and artificial regeneration.

With the species poplar and conifers clearcut is typical final cutting and regeneration is done by planting.

The effect of modification of regulations can first be observed at the broadleaved hardwoods with long rotation age and first on the level of planning. Clearcut was not practiced with beech stands, the main field of changes will be the cutting mode – regeneration mode combinations with oak stands.

SOURCE OF DATA

MgSzH Erdészeti Igazgatóság (2000; 2009; 2010): Beszámoló az erdősítésekről és a fakitermelésekről [Report on afforestations and cuttings] (in Hungarian)

Users' Perception on Recreational Trails of Urban Forest in Central Taiwan

Shyue-Cherng LIAW[a*] – Wan-Jiun CHEN[b]

[a] Department of Geography, National Taiwan Normal University, Taipei, Taiwan
[b] Department of Economics, Chinese Culture University, Taipei, Taiwan

Abstract – Urban forested trails are important recreational resources for populated urban areas. The purpose of this research aims to study users' awareness, satisfaction, and economic valuation toward three recreational trails of urban forest in Chang-Hua County where there are 1.3 million populations. Based on the on-site questionnaire (n=397), respondents often visit these recreational trails. The main motivations to visit forested trails include nature sightseeing, exercise and hiking, and relaxation and taking a rest. Through the factor analysis, respondents' awareness toward forested trails could be summarized into four factors including trail function, public participation, management, and eco-tourism. Respondents' satisfaction toward forested trails could be also classified into three factors including trail characteristics, trail resources, and trail facilities. In addition, this study uses a non-market valuation method, the contingent valuation method to assess the willingness to pay of respondents for three populated trails. Respondents value the forested trials positively.

awareness / satisfaction / economic valuation / eco-tourism

1 INTRODUCTION

Urban forested trails are important for recreation in nearby populated urban. Urban forested trails are one of the natural landscape elements that provide benefits to the urban public with a natural and historical heritage value. An urban forested trail is a green corridor run across an urban foresty area in healthy natural ecosystems. It provides outdoor recreation opportunities (Fábos, 2004).

The purpose of this research aims to study visitors' awareness, satisfaction, and economic valuation for three recreational trails of urban forest in Chang-Hua County where there are 1.3 million populations. In this study, the ecomomic value of urban forested trails is estimated based on variables of visitors' demographic features, protection opinions, interaction and satisfactions with trails.

Although we have some understanding of the value about urban forestry such as parks and greenways by hedonic property methods, the conventional method of hedonic evlaluation method is infeasible for valuating urban forested trails, as relevant property is not exist. Therefore, this study evaluates the economic values for the urban forested trails by contingent valuation method through setting a hypothesis market for the trails for visitor as the trail users.

* Corresponding author: liaw@ntnu.edu.tw

2 STUDY SITES

The study area is three urban forested trails in Bagua Mesa beside Changhua metropolitan in central Taiwan. Since the Bagua Mesa is close to Changhua metropolitan area, there is a high demand for recreational use for the public. Taiwan Forest Bureau had refurbished many ancient mountainous trails in Bagua Mesa to meet the high recreational demand of the public from Changhua metropolitan. Many local communities beside the trails had cooperated with Taiwan Forest Bureau through implementing community forestry program in these three trails with activities about environmental education, biodiversity conservation advocacy and resource investigation.This study chooses three significant and unique trails as the study site. The three trails are Taoyuan Village Park Trail (TVT trail), Chingshui Rock Park Trail (CRT trail), and Ershui Trail System (ETS trail). These trails are located in low-elevation forested rural mountains in Bagua Mesa.

3 ESTIMATION OF ECONOMIC VALUES

This study aims to shed light on the values of services for both the recreational use and conservation of resources of the ecological corridors of urban forested trails by non-market valuation method. Few studies directly apply CVM to evaluate the value of urban forested trails which serve as corridors for urban ecotourism.

Most studies on the value of urban forest had applied hedonic valuation method to assess the value of recreation and amenity by taking property market as proxy for non-market environmental services. However, there is no suitable property market to be the proxy for the services provided by urban forested trails. In general, the urban forest trails do not directly next to the residential real estate and the recreational services of urban forested trails are not only bounded to the property price of the vincint real estate. Therefore, CVM is superior to other assessment techniques, such as hedonic property method, in valuating the trails. CVM is able to assess WTP for a hypothetical change from the current multiple services of the forested trails which are designed for urban recreational purposes.

Visitors are primary stakeholder groups for the reacreational use and conservation. CVM can reliably assess the willingness of visitors to pay for the forested trails by setting up a simulated market (Chen and Liaw, 2012). CVM was first applied by Davis (1963) to study the recreation value of forests and has since been widely applied for valuating services of natural resources, such as recreation, environmental damage and environmental protection (Smith et al., 1986; Shaw et al., 1999; Lee and Han, 2002; Baral et al., 2008).

The eliciting techniques of CVM questionnaires have changed from openended to closeended questions to increase the response rate. This study applied closeended questions in questionnaire design to make respondents compare the bidding value and their received service value from the urban forested trail.

However, various biases regarding CVM valuations in a hypothetical market have been noted. The primary biases identified by Venkatachalam (2004) include design bias, operational bias, hypothetical bias and strategic bias. Nonetheless, reasonable and reliable results can be achieved through careful study design. Arrow et al. (1993) had indicated that the US National Oceanic and Atmospehric Administration (NOAA) panel recommended the use of a closed format in CVM studies for its advantages of being incentive compatible, simple and cognitively manageable (Flachaire and Hollard, 2007). A closeended question is therefore applied in this study on the basis of utility difference theory (Hanemann, 1984). This study follows the suggestions of Arrow et al. (1993) and Venkatachalam (2004) in attempting to prevent such biases.

4 THE MODEL

Based on a utility theoretical background, a logistic econometric model is used for the empirical analysis. An individual is assumed to make consumption plans (*Y*), enjoy environmental service from the trails (*z*), and take resource conservation and self-protection actions (*s*) to maximize the utility (*U*) within his or her budget constraints.

$$\max_{Y,s} \quad U = U(Y, z; s) \tag{1}$$

$$s.t. \quad Y + ps = M. \tag{2}$$

where *p* is the price of conservation and self-protect activities and *M* is income. The resource conservation and self-protection actions can be taken to ensure the current environmental services and reduce the risk of life and property loss. Visitors can take resource conservation and self-protection actions. These actions include:

(1) fulfilling practices of ecotourism, involving in trail participating management through goventment policy;
(2) being involved in the decision making and practice processes of trail protection to prevent possible risks in sensitive locations;
(3) preparing and adapting for special weather events;
(4) protecting life and property by accessing soil-and-mud sliding warning system and weather reports;
(5) and if severe weather is reported, avoiding outdoor activities in the trails.

Solving the constrained utility maximization problem in Equations (1) and (2), and substituting an optimally chosen level of actions of conservation and self-protection, s_*, and optimally consumed plans, Y_*, yield the indirect utility functions as $V(p,M,z)$. The indirect utility function associated with the current ecological and environmental services (z_1) is $V_1(p,M,z_1)$, and the indirect utility function becomes $V_0(p,M,z_0)$ when part of the ecological service reaches an unsustainable level (z_0) at which neither residents' property and lives nor the outdoor recreation facility for visitors are protected. V_1 is greater than V_0.

Following this utility model, a logistic function as in Equation (3) is used for empirical econometric estimation, and then the economic values can be derived by Equation (4).

$$P(Y) = \left\{1 + \exp^{-(\alpha+\beta A+X'\Phi)+e}\right\}^{-1} \tag{3}$$

where $P(Y)$ is the probability of the respondent saying 'yes', *A* is the bidding value, *X* is a vector of independent variables, including opinions to the trails, interactions with the trails, satisfaction with the trails, and demographic characteristics of the respondents, α, β, Φ are parameters, and e is the random error. Estimation of WTP requires random errors implying incomplete knowledge about the respondent's preferences:

$$WTP = \frac{\alpha + \overline{X}'\Phi}{\beta} \tag{4}$$

With a large sample, the distribution of the WTP derived from Equation (4) will approach normal. The mean WTP was calculated by numerical integration of the expected values of WTP. The confidence intervals of a normal distributed WTP were calculated as shown in Equation (5).

$$CI_{1-\alpha}[E(WTP)] = E(WTP) \pm t_{\frac{\alpha}{2}} \sqrt{\frac{\sigma^2}{N}} \tag{5}$$

where, σ^2 is the variance and N is the sample size.

5 THE SURVEY

An on-site questionnaire survey was used to collect data during February-August 2009. To design a reliable questionnaire, earlier comprehensive understanding for the achievements and challenges on local govennance of the urban forested trails, ecotourism, and Local participatiory program, was made through related literature review, field participatory observation approaches, and through non-structured focus group interviews for key figures in villages such as community directors, supervisors, and representatives. The questionnaire interviews were committed by four trained interviewers, which interviewed visitors along the trails by a systematic sampling method.

The bidding range and the seven bidding values were designed on the basis of WTP from pilot by assuming that the population distribution of WTP could be reliably derived from the pilot survey. The seven bidding values were 2,500, 2,000, 1,500, 1,000, 600, 200, and 100 NTD (New Taiwan Dollars, 30 NTD = 1 US$ in 2009). These bidding values were randomly assigned to respondents in conducting the survey. A total of 397 respondents completed the questionnaire. *Table 1* shows the numbers of completed questionnaires in the study sites for the seven bidding values. *Table 2* shows the distribution rate for the response for the the randomly assigned bidding values. There are declining trends for the willingness of paying the asked bids with increases in the value of the bids.

Table 1. Numbers of completed questionnaires for the study sites

Bidding	TVT	CRT	ETS	Total
100	20	20	19	59
200	20	16	19	55
600	21	21	19	61
1000	17	18	21	56
1500	21	16	19	56
2000	19	17	19	55
2500	18	17	20	55
Total	136	125	136	397

Table 2. Response rates for the the randomly assigned bidding values (%)

A	δ^y	δ^n
100	61.02	38.98
200	63.64	36.36
600	39.34	60.66
1000	44.64	55.36
1500	30.36	69.64
2000	20.00	80.00
2500	18.18	81.82

Note: δ^y and δ^n denote “yes” and “no” response for the willingness to paying the bidding value from the respondents.

Donation is a feasible payment vehicle for eliciting the WTP in CVM in Taiwan, rather than mandatory schemes such as tax and entry fees. Respondents tend to protest against paying additional tax. They already pay taxes to the government to deal with all aspects of public affairs. They are not sure that the additional payment would go to the funding for dealing affairs about the trails. Therefore, the hypothetical payment vehicle in this study is the community organization of the local co-management residents. Respondents were asked

whether or not they would be willing to pay a randomly assigned value toward the funds hypothetically operated by the participating communities to launch and develop forestry conservation on the trail.

The statistics for visitors from the survey are shown in *Table 3*. Most visitors come from Changhua Metropolitan. The most common educational levels for the respondents are college and senior high school. The visitors are commonly engaged in the industrial or service sector, and residents in Changhua County. Visitors visit the trail very often, at least once a week, and stay 0.5-1.5 hours per visit.

Table 3. Statistics of demographic variables for visitors

	TVT		CRT		ETS		Total	
	No	%	No	%	No	%	No	%
Gender:								
Male	70	51.5	68	54.4	59	43.4	197	49.6
Female	66	48.5	57	45.6	77	56.6	200	50.4
Age (years old):								
18-30	12	8.8	15	12.0	31	22.8	58	14.6
31-45	26	19.1	57	45.6	64	47.1	147	37.0
46-60	73	53.7	44	35.2	40	29.4	157	39.5
>60	25	18.4	9	7.2	1	0.7	35	8.9
Education:								
Elementary	19	14.0	6	4.8	2	1.5	27	6.8
Junior highschool	23	16.9	7	5.6	5	3.7	35	8.8
Senior highschool	31	22.8	41	32.8	44	32.4	116	29.2
College	58	42.6	57	45.6	78	57.4	193	48.6
Master or PhD	5	3.7	14	11.2	7	5.1	26	6.6
Occupation:								
Agriculture sector	2	1.5	3	2.4	4	2.9	9	2.3
Business sector	12	8.8	21	16.8	27	19.9	60	15.1
Industrial sector	16	11.8	38	30.4	27	19.9	81	20.4
Service sector	20	14.7	17	13.6	29	21.3	66	16.6
Public sector	11	8.1	10	8.0	15	11.0	36	9.1
Housewife	36	26.5	17	13.6	26	19.1	79	19.9
Other	39	28.7	19	15.2	8	5.9	66	16.6
Place of residence:								
Changhua county	134	98.5	100	80.0	85	62.5	319	80.4
Others	2	1.5	25	20.0	51	37.5	78	19.6
Visiting frequency:								
Very few: once a year	6	4.4	29	23.2	30	22.1	65	16.3
Few: once in 1-6 monthes	9	6.6	27	21.6	46	33.8	82	20.7
Moderate: at least once a month	5	3.7	13	10.4	1	0.7	19	4.8
Very often: at least once a week	116	85.3	56	44.8	59	43.4	231	58.2
Stay time (hours):								
< 0.5	10	7.4	4	3.2	3	2.2	17	4.3
0.5 – 1.5	91	66.9	32	25.6	52	38.2	175	44.1
1.5 – 2.5	30	22.1	58	46.4	58	42.6	146	36.8
> 2.5	5	3.6	31	24.8	23	16.9	59	14.8

6 PERCEPTIONS OF THE VISITORS

6.1 Interactions of the visitors

The visiting frequency is classified into four levels (Alexandris and Carroll, 1997): (1) Very few: once a year; (2) Few: once in 1-6 monthes; (3) Moderate: at least once a month; and (4) Very often: at least once a week. The stay time (hours) per visit is classified into four categories: (1) <0.5; (2) 0.5–1.5; (3) 1.5–2.5; (4) >2.5.

The trails are their recreational favorites with high attractions. Data in *Table 3* shows that a high proportion of the visitors visit the trail at least once a week and stay for 1–2 hours. They visit the trails very often and stay shortly. The relationship of the visitor interactions and the demographic features are analyzed by t-teat and ANOVA test *(Table 4)*. The results evidence that the visiting frequency differs across all the visitors of the demographic features included in this analysis. The stay time only differs for the features of educational levels, occupations, place of residence, and three destinations of trails, while it does not differ across gender and age.

Table 4. Relationships between visitors' interaction and the demographic features

	Gender	Age	Education	Occupations	Place of residence	Three destinations of trails
Visit frequency	0.036*	0.000#	0.000#	0.000#	0.000#	0.000#
Stay time	0.261	0.222	0.018*	0.006#	0.000#	0.000#

(* : $\alpha < 0.05$; # : $\alpha < 0.01$)

6.2 Motivations

As indicated by Janowsky and Becker (2003), forested trails provide the public places for recreation. The popularity of natural amelity had been an important quality indicator for a spot of outdoor recreation (Meitner, 2004). In the cases of three urban forested trails, most visitors come to visit the trails with suplendid natural amelities for exercise, hiking (TVT visiors), and relax and rest (CRT and ETS visitors). Additionally, some come on the purpose to be away from the crowds and to enjoy the quiet and lonely. Trail management should focus on this demand of the visitors. The recreational planning and management for the trails should pay particular attention to the protection of netural amelity through maintening and conserving the natural resources. On the perspective of preventive medicine to enhance public health, trail renovation is an important strategy to provide the public places for exercise (Reed *et al.*, 2004).

Table 5. Motivations of the visitors

	TVT		SRT		ETS		Total	
Motivation (multiple choice)	No	%	No	%	No	%	No	%
Natural amelities	75	55.1	83	66.4	99	72.8	257	64.7
New Experience	10	7.4	14	11.2	10	7.4	34	8.6
Stop-by (not on purpose to visit)	2	1.5	9	7.2	13	9.6	24	6.0
Ecological knowledge	14	10.3	22	17.6	23	16.9	59	14.9
To challenge natural adventure	12	8.8	12	9.6	7	5.1	31	7.8
Exercise and hiking	124	91.2	105	84.0	102	75.0	331	83.4
Relax and rest	95	69.9	109	87.2	103	75.7	307	77.3
To join special activity	5	3.7	4	3.2	7	5.1	16	4.0
To be away from the crowds and to enjoy the quiet and lonely	41	30.1	38	30.4	31	22.8	110	27.7
Others	11	8.0	16	12.8	21	15.4	48	11.6

6.3 The opinions of the visitors

Regarding to the reality of the trails, 15 items of opinions of the visitors about the trails are designed for three trails. The survey of these 15 items is reliable (Cronbach's α=0.78). The Likert's five scale measurement is applied for each item.

The results shows high mean value for that the visitors agree that the trails offer recreation opportunity to relax and relieve stress, and the trails increase their quality of life as they close to the nature. A healthy ecosystem in the forest is very important for the quality of trails. They would much more willing to participate in resource management as they conceived that recreations on the trails can improve their environment (Austin, 2004).

On the contrary, low agreement had shown about the management practices of the user pay to use, cap limits for the number of entrance people, and seansonal closure for recovery, even though these practices can effectively enhance the quality of recreation and the quality of the environment. Therefore, for enhancing the effectiveness of the recreational management and resource conservation, particular attentions should be paid to communicating people and seek consensus on these practices.

The principle of 'user pay to use' reflects the relationship between rights and responsibilities. The expenditures are made when people use the resources. The advantages of user fees include (1) compliance for the justice of benefits, (2) effective allocation of resources, (3) increases financial sources for the trail management, and (4) enhance the responsibility of the users.

Moreover, the common congestion for the trails on holidays has affected the quality of recreation and has impacted the environment of the trails and the ecology of the forest. As indicated by Arnberger and Haider (2005), congestion management would be the foci of forest recreation managegent to alleviate conflicts among users on their benefits when congestion reduces recreation quality.

The principle of 'user pay to use' has become increasingly popular to be the safeguard for release the stress from over-crowd, conservation recreational resources and the ecology and environment. Following this principle, those who really need the resources can get resources by paying. This can make the user cherish the trails, and set fund for environment management.

Table 6. Visitors' opinions about the trails

	TVT	CRT	ETS	Total
1 trails can help to close to the nature	4.61	4.71	4.67	4.66
2 trails are useful for environmental education	4.31	4.49	4.54	4.44
3 trails offer places for recreation	4.40	4.56	4.60	4.52
4 trails help conserve historical and cultural heritages	3.61	4.39	4.18	3.97
5 trails help visitors relax and relieve stress	4.68	4.73	4.64	4.68
6 healthy forestry ecology can enhance quality of trails	4.56	4.68	4.59	4.61
7 local demand and participation are vital for trail refurbishment	4.29	4.29	4.43	4.34
8 trails can drive local economic development and income increase	3.52	3.76	4.08	3.79
9 local adopting and maintaining trails are appropriate	4.27	4.27	4.26	4.27
10 local participatory management is appropriate	4.40	4.38	4.40	4.40
11 favor co-tourism over mass-tourism for the trail recreation	3.71	3.82	3.43	3.65
12 cap to limit the number of visitors	2.55	3.20	3.54	3.10
13 need some close time allow the flora and fauna to recover	2.63	3.58	3.74	3.30
14 agree to the principle of 'user pay to use'	2.00	2.58	2.49	2.35
15 Agree with regular monitor for ecological status	4.29	4.50	4.40	4.40

According to the factor analysis for the opinions about the trails (BTS = 1988.848, KMO = 0.838, and significant with p=0.000), the survey are feasible for factor analysis. The fifteen factors are reduced into four dimensions: (1) function of trails, (2) public participation, (3) management, and (4) ecotourism.

Table 7. Factor analysis for visitors' opinions about the trails

Opinions about the trails	functions of trails	public partici-pation	manage-ment	eco-tourism
1 trails can help to close to the nature	0.825			
3 trails offer places for recreation	0.799			
5 trails help visitors relax and relieve stress	0.730			
2 trails are useful for environmental education	0.699			
6 healthy forestry ecology can enhance quality of trails	0.609			
4 trails help conserve historical and cultural heritages	0.471			
15 Agree with regular monitor for ecological status	0.406			
9 local adopting and maintaining trails are appropriate		0.772		
8 trails can drive local economic development and income increase		0.742		
10 local participatory management is appropriate		0.686		
7 local demand and participation are vital for trail refurbishment		0.561		
13 need some close time allow the flora and fauna to recover			0.852	
12 cap to limit the number of visitors			0.836	
14 agree to the principle of 'user pay to use'			0.751	
11 favor co-tourism over mass-tourism for the trail recreation				0.821
Variation (%)	22.56	16.30	15.34	7.04
Cumulative variation (%)	22.56	38.86	54.20	61.24

Seven from the 15 items are categorized into the fuction of the trails, four for the participatory management of the trails, three for management and one for ecotourism development. The forested trails in the study area should follow the practices of eco-tourism for their development, rather than mass-tourism. In addition, impacts of congestions can reduce the quality of recreation and the health of the local ecological environment.

The relationships of the opinions and the the demograpbic variablesa are tested by t-test and ANOVA Scheffe method. The results are shown as *Table 8.*

Table 8. Relationships between demographic features and visitors' opinions

	Gender	Age	Education	Occupation	Place of residence	Three destination trails	Frequence	Stay time
Trail function	0.331	0.724	0.547	0.239	0.837	0.038*	0.721	0.541
Public participation	0.272	0.388	0.013*	0.160	0.802	0.207	0.031*	0.566
Management	0.389	0.000#	0.000#	0.003#	0.000#	0.000#	0.000#	0.061
Ecotourism	0.322	0.966	0.552	0.766	0.046*	0.000#	0.637	0.746

(* : α<0.05; # : α<0.01)

The opinions about the function of the trails differ among visitors across three trails. The opinions about local participation differ among levels of education and visit frequency. The opinions about the management of the trails differ among age, education level, occupations, places of residence, three desinations of the trails, and the visit frequency. The opinions about ecotourism differ among places of residence, and three destinations of the trails.

6.4 Satisfactions

Satisfaction is referred to the assessment of visitors for the interaction experience from the services provided. This study designs 12 items for satisfactions for the visitors to assess their experiences about the trails. A typical five-level Likert scale was applied to meaures each items of satisfactions: 5=strongly agree (or satisfied), 4= agree, 3=undecided, 2=disagree, 1= strongly disagree. High Cronbach's α value (0.86) shows high reliability of the survey of satisfactions. The means of the 12 item are shown in *Table 9.*

Table 9. Satisfactions of the visitors

	TVT	CRT	ETS	Total
1 botanic resources for both flora and fauna	3.62	3.86	3.87	3.78
2 non-batanic resources (cold and clean air, water and splendid landscape)	3.75	3.95	3.63	3.77
3 historical and cultural heritage	3.31	3.78	3.40	3.49
4 safety of the trails	3.66	3.82	3.66	3.71
5 congregations	3.68	3.84	3.86	3.79
6 interpretation facilities	3.24	3.34	3.27	3.28
7 the length of the trails	3.76	4.01	3.85	3.87
8 the slope of the trails	3.85	3.97	3.81	3.87
9 recreational facilities such as pavilions and seats	3.09	3.59	3.67	3.45
10 public facilities such as washrooms and parking lots	2.57	3.30	3.43	3.09
11 convenience of transportations	3.77	3.63	3.38	3.59
12 overall satisfations	3.85	3.98	3.80	3.87

Most visits satisfied with the trails, especially with the slope and length which widely vary for the visitors to freely choose from. In addition, the visitors satisfied with the the cozy and safeth of the trails and also satisfied with the flora and fauna resources around the trails. Lindsey (1999) pointed out that there are high demand for facilities along trails such as restroom, and parking lots. For example, the visitors lived far away demand parking lots.

The results of factor analysis (BTS = 1873.354, KMO = 0.844, and p=0.000) in *Table 10* shows that the 12 satisfaction items are reduced into three satisfaction categories – attributes of the trails, resources in the trails, and facilities equuiped for thee trails. The relationship of the visitors' satisfaction and demographic variables is tested. The results are shown in *Table 11.*

Student t-test and ANOVA Scheffe method are applied for testing the relationships of satisfaction and demograohic variables. The satisfactions on attributes of the trails are significantly varied among gender, educational levels, and visiting frequency. The elder is much more satisfied than the young. The elementary-educated is much more satisfied than the higher educated. Higher satisfaction is occurs among who often visit. Additionally, the elder much more satisfied on the resources in the trails than the young. For the satisfaction for the facilities equipped on the trails, the satisfaction of the visitors significantly vary among age, education, occupation, across three trails.

Table 10. Factor analysis for visitors' satisfaction

	Attribute	Resources	Facility
7 Length of the trails	0.808		
8 Slope of the trails	0.797		
4 Safety of the trails	0.720		
5 Congregations	0.670		
12 Overall satisfaction	0.646		
11 Conveniences of transportation	0.587		
1 Bonatic resources (flora and fauna)		0.798	
3 Historical and cultural heritage		0.734	
2 Non-botanic resources (cold and clean air and water and suplendid landscape)		0.724	
9 Recreational facilities such as pavilions and seats			0.858
10 Recreational facilities such as washrooms and parking lots			0.817
6 Interpretation facilities			0.410
Vaviation (%)	28.36	17.91	15.01
Cumulative variation (%)	28.36	46.27	61.28

Table 11. Testing results for the relationship of visitors' satisfaction and demographic variables

	Gender	Age	Education	Occupation	Place of residence	Three destination trails	Visit frequence	Stay time
Attribute	0.426	0.034*	0.000#	0.474	0.634	0.071	0.008#	0.849
Resources	0.208	0.038*	0.584	0.136	0.474	0.235	0.329	0.318
Facility	0.310	0.000#	0.030*	0.040*	0.353	0.000#	0.082	0.118

(* : α<0.05; # : α<0.01)

7 EMPIRICAL RESULTS OF THE ECONOMIC VALUE

The empirical logistic models are estimated for the three studied trails for the main users - visitors. This logistic regression for visitors includes the variables for categories of (1) visitors' opinions about the trail, (2) visitors' interactions with the trail, (3) visitors' satisfaction with the trail with their recreational experiences on the trails, and (4) demographic characteristics. A series of related variables are designed in the questionnaire. Only significant variables are kept in the regression results by operating extrapolative and interpolative robustness. *Table 12* shows the definitions and descriptive statistics for visitors. The estimated results of the logistic regression for the visitors are reported in *Table 13*. The variables included in *Table 13* pass the Chi-square test and Student t-test with no high colinearity between the regressors. The Chi-square test was used to test associations between categorical variables and the Student t-test was used to test the correlations of continuous variables.

Table 12. Definition and descriptive statistics of variables for visitors

Variable	Definition	TVT	CRT	ETS
1. Opinions about the trail				
A-Po-To-Pay[a]	Agree with 'user pay to use' principle	2.00 (1.04)	2.58 (1.23)	2.49 (1.09)
A-Monitor[a]	Agree with regular monitoring to understand the ecological status	4.29 (0.90)	4.50 (0.59)	4.40 (0.61)
2. Interactions with the trail				
Freq	Times of visits in a year	94.15 (89.50)	48.49 (46.19)	45.32 (48.20)
Stayhr	Length of stay (hours per visit)	1.39 (0.59)	2.12 (0.90)	1.87 (0.80)
Mot-Lea-Eco	Dummies, visit motivation is 'to learn local ecological knowledge' =1, otherwise =0	0.10 (0.31)	0.18 (0.38)	0.17 (0.38)
Mot-Try-Cha	Dummies, visit motivation is 'to challenge natural adventure'=1, otherwise =0	0.09 (0.28)	0.10 (0.30)	0.05 (0.22)
Mot-Peace	Dumies, visit motivation is 'to be away from the crowds and to enjoy the quiet and lonely'=1, otherwise=0	0.30 (0.46)	0.30 (0.46)	0.23 (0.42)
3. Satisfaction with the trail				
S-T-Convenient[a]	Satisfaction with convenience of transportation	3.77 (0.81)	3.63 (0.88)	3.38 (1.00)
4. Demographic variables				
AGE1	Dummies, aged 18-30 = 1, otherwise = 0	0.09 (0.28)	0.12 (0.33)	0.23 (0.42)
OC6	Dummies, housewife=1, otherwise = 0	0.26 (0.44)	0.14 (0.34)	0.19 (0.39)
Income	Yearly household income (10,000 NTD)	64.96 (57.88)	67.20 (41.09)	69.38 (49.87)
5. Bidding				
A	Bidding value in the first stage (NTD/year)	1104.00 (841.70)	1090.40 (842.50)	1137.00 (846.80)

Note: Standard errors are in parentheses. [a] A typical five-level Likert scale was applied: 5=strongly agree (or satisfied), 4= agree, 3=undecided, 2=disagree, 1= strongly disagree.
Only the statistics of significant variables in the regression analysis are reported. The insignificant variables are excluded.

Table 13. Estimated results for visitors for the logistic regression

Variable	TVT	SRT	ETS
Intercept	–4.4665	–4.4383	–0.8231
	(1.5689)**	(1.4190)**	(0.7604)
A-Po-To-Pay		0.4383	0.6923
		(0.1733)*	(0.2339)**
A-Monitor	1.0975		
	(0.3579)**		
Freq		0.0135	
		(0.0048)**	
Stayhr		0.5920	
		(0.2515)*	
Mot-Lea-Eco	–1.8133		
	(0.8116)*		
Mot-Try-Cha			–3.0160
			(1.3288)*
Mot-Peace			1.2814
			(0.5588)*
S-T-Convenient		0.5585	
		(0.2617)*	
AGE1			1.4389
			(0.5517)**
OC6			–1.5345
			(0.6302)*
Income	0.0123	–0.0019	–0.0034
	(0.0040)**	(0.0054)	(0.0045)
A	-0.0017	-0.0008	–0.0014
	(0.0004)**	(0.0003)**	(0.0003)**
Log likelihood	–61.61137	–68.2839	–64.8983

Note: Please refer to *Table 12* for variable definitions and statistics of the variables.
Standard errors are in parentheses. * and ** denote significance at 5% and 1% levels, respectively.

For the estimated logistic regression models, the bidding values assigned to the respondents (variable A) have significant negative signs across all model specifications. These negative signs indicate that the tendency for the responses diminishes with the offered bidding values. In addition to demographic variables, individual opinions about the trail, personal interactions with the trails, satisfactions with experiences on the trail are significant in the logistic regression function.

The local three ruban trails are the main placeses for the visitors in Changhua County for recreation and exercise. The payment probability for TVT visitor increase with the ir agreement to that their visiting motivation is 'to learn local ecological knowledge' and agreement with that regular monitor can help in understand the ecological status of the trail.

Income only significantly affects visitors' response to payment for TVT trail. Income has no significant effects on WTP for visitors of CRT and ETS trails.

Agreement to 'user pays to use' principle, can increase the probability of paying for CRT and ETS visitors. The visitors WTP for CRT trails is higher for the visitors with higher

visiting frequency and longer stay time. The satisfaction with the convenience of transportation are positive related the the payment probability for CRT visitor.

The ETS trail is attractive to young people (aged 18-30) which revealed a higher payment tendency in this study. However, there is lower payment willingness for housewife. The visitors WTP for ETS trails are higher for the young visitors whose visits are motivated by 'to be away from the crowds and to enjoy the quiet and lonely' and been attracted by natural adventure for challenging. The ETS trail offers the young an opportunity to run away from the hubbub with natural advanditures.

Income as an indicator of purchasing power and affordability for the payment, income effecs can be estimated through the logistic regression. The income variable among the logistic regressions of this study is significant for TVT visitors. The income effects are significant for these three groups of people. However, this income variable is not significant for the SRT and ETS visitors.

Table 14 reports the estimated economic values. According to the confidence intervals of the estimated visitos' WTP for these three trails, the WTP is not significant different from each others, even though the average values of WTP vary slightly (highest in ETS, followed by CRT and TVT). That is, the values generated from the recreational benefits of the three trails are identical for the visitors.

From the results of the logistic regression, an intimate relationship of the visitors to the trails had made them benefit from the trails for recreations.The visitors often occationally come to visit for recreation from the nearby Chuanghua Metropolatan. Visitors live nearby with higher the sense of place and the recognitions for the trails trails. Especially, the quality of the trails is maintaned to a satisfactory level, since the local community has involved in the co-management program to sustain the natural resources

Table 14. Economic values of the three trails (NTD/year)

	TVT	CRT	ETS
Mean	493.83	601.18	616.45
Medium	594.10	685.95	726.50
95% confidence interval			
Upper bound	625.40	824.69	769.73
Lower bound	362.27	377.67	463.18

8 CONCLUSIONS

Based on the questionnaire and statistic analysis, results show that respondents, including tourists (n=397) often visit these nearby forested trails and stay there for a long time. The main motivations for respondents to visit forested trails include nature sightseeing, exercise and hiking, and relax and rest. Through the factor analysis, visitors' awareness toward forested trails could be summarized into four factors including trail function, public participation, management, and eco-tourism. Visitors' satisfaction toward forested trails could be also classified into three factors including trail characteristics, trail resources, and trail facilities. They also highly are satisfied trail characteristics and local resources. The economic values of recreation form the three systems are high.

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NTFP and its Economic Contribution to the Surrounding Community in Gunung Walat University Forest

Chiharu MAEDA[a*] – Yuei NAKAMA[b] – Iin ICHWANDI[c]

[a] The United Graduate School of Agricultural Science, Kagoshima University, Japan
[b] Faculty of Agriculture, University of the Ryukyus, Japan
[c] Faculty of Forestry, Bogor Agricultural University, West Java, Indonesia

Gunung Walat University Forest (GWUF) is managed by Faculty of Forestry, Bogor Agricultural University in Indonesia. The total forest area is 359 ha, which is mostly covered by agathis (Agathis loranthifolia) and pine (Pinus merkusii) trees planted from 1959. Although GWUF adopt non – cutting system, all expense can be covered from self – income generating activities such as resin production and public services. In 2013, 40 farmers of the surrounding community tapped resin from agathis and pine in GWUF. They got a salary of Rp 2,000 per kg (US$ 1 = Rp 11,000) for resin collection from agathis, and Rp1,600 per kg from pine. The total household income was about Rp14 million per year on average, and average income from resin was about Rp10 million per year, accounting for 71% of their total household income. Resin production in GWUF not only covered self-income, but also contributed to farm economy of the surrounding communities. GWUF is an example on a small scale forestry management without cutting trees.

* Corresponding author: chiharu.maeda.21@gmail.com

Landowner Views of the Benefits, Threats and Geographic Extent of their Woodland "Landscapes"

David W. MCGILL* – Ana Maria ERAZO

Division of Forestry and Natural Resources, West Virginia University, Morgantown, West Virginia, USA

Recently, the USDA Forest Service has been promoting landscape scale stewardship and cross-boundary collaboration through research, publications, programs and projects to preserve forests and to understand how to manage forests under changing conditions. This federal agency has been working with public and private partners "to promote landscape scale conservation to restore ecosystems on a landscape scale". Previous research has established that woodland owners often "speak a different language" than natural resources professionals and hence may not comprehend the idea of landscape management. We carried out a mail-based survey to assess woodland owners' views of their own local landscapes and the major benefits and threats found therein. The intent of this project was to allow them to share their own concept of what constitutes "landscape". Woodland owners from six counties in five widely-dispersed areas of the state of West Virginia were selected to participate in this project. This paper will describe the results of the survey.

* Corresponding author: dmcgill@wvu.edu; P.O. Box 6125, Morgantown, West Virginia 26506-6125 USA

Targeting Private Forest Owners Groups for Effective Policy Decisions and Implementation in Slovenia and Bosnia-Herzegovina

Špela Pezdevšek MALOVRH[a*] – Donald G. HODGES[b] – Mersudin AVDIBEGOVIĆ[c]

[a] Department of Forestry, Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenia
[b] Department of Forestry, Wildlife and Fischeries, University of Tennessee, Knoxville, TN, USA
[c] Faculty of Forestry, University of Sarajevo, Sarajevo, Bosnia and Herzegovina

Forest and forest-related policies in many southeast European countries have changed considerably in the past few decades due to the unprecedented scale of socio-political changes. The collapse of Yugoslavia in the early 1990s forced a significant evolution of private forest policies in the countries arising from the break up. During the Yugoslavia years, private forest ownership was unattended or even ignored by national forest policy. As a result, few policies existed in the new countries to guide decision makers on private forest management, and the resulting initial policies were developed with little or no consideration of or input from private forest owners. We evaluated private forest owners in two southeast European countries, Bosnia-Herzegovina and Slovenia, and classified them by actual management behavior, willingness to cooperate and the expectations of this cooperation and the importance of ownership, property, and socio-demographic characteristics in the classification. Based on the results, appropriate strategies were identified to target each owner group with a different combination of regulatory, incentive-based, and informational policy approaches. Three owner clusters - were identified in each country. Policy options for each group were then provided, based on Smart Regulation principles and requirements. The results reveal that several policy types are needed to reach the three private forest owners types and this variety of policy options covers a wide range of policy approaches.

Private forest owners / Forest owners' typologies / Policy instruments / Smart Regulation

[*] Corresponding author: spela.pezdevsek.malovrh@bf.uni-lj.si; Večna pot 83, 1000 Ljubljana, Slovenia

The Responses of Forest Owners in Japan to Expansion and Reduction of Demand: a Case Study of Kitayama Forestry, the most Expensive Forestry in the World

Keito MINEO*

Graduate School of Agriculture, Kyoto University, Japan

Kitayama forestry, practiced in the northern part of Kyoto City, Japan, is a unique forestry method that forms a specific artificial forest landscape to produce decorative sugi (*Cryptomeria japonica*) logs for traditional architecture. Demand for such logs expanded rapidly until the 1980s, but dramatically decreased by 1995: the sales volume in 2013 was approximately 10% of the peak in 1988. Decreased production has resulted in the abandonment of forestry activities and a degraded landscape. This study used interviews to analyze how Kitayama forest owners adapted to these changes, and reveal what is needed to overcome the problems caused by the decreased demand. Kitayama forest owners adapted to expansion by increasing production areas and introducing monocultures by giving up fuel wood, taruki logs, and mushroom production. When demand decreased to below a sustainable level, innovations such as marketing techniques and new goods and services were needed. However, we found that cooperation between owners or sectors and risk-taking were lacking, impeding innovation.

* mineo.keito.78n@st.kyoto-u.ac.jp

Forest Engineers' Perceptions about Adapting Forest Management to Climate Change in Northern-Eastern Romania

Mihaela MUTU* – Corina DUDUMAN – Laura BOURIAUD – Liviu NICHIFOREL – Iulian-Constantin DANILA

University of Suceava, Romania

Is increasingly likely or even accepted the idea that the climatic parameter changes can affect the environment and the forestry ecosystems. In this context new provocations appear for forest mangers to understand, prevent and improve these changes.

This study presents perceptions, opinions and attitudes of forestry engineers about the climatic changes and the impact of those on the forest management in two counties in northeast of Romania. The research question is based on the hypothesis that the forest engineer's attitude towards the forest management adaptation to climate change is more important on the forest ecosystem than the climate change affects itself.

The study was made with some sociology specific research methods help, the interview was used as a data collection method. So, 74 interviews were taken to the forest administrators from the national forestry district, forest administration from private forestry districts, included representatives from Suceava's Territorial Inspectorate for Forestry and Hunting. In making of the interviews was followed: the identification of the attitudes and the perception on climatic changes formation way, the identification of the perception about the effects of climatic changes on forestry ecosystem and the identification of the perception about the forestry management adaptation to the vulnerabilities and risks generated of climatic changes.

The results show that most of the interviewed persons find information about climatic changes in mass media and on internet. They consider that climatic changes are obvious and that these are the result of human activities but also of natural causes. More, climatic changes will accentuate the catastrophic events and extreme temperatures variations. Conform to majority of the interviewed persons, the forestry ecosystems will be much vulnerable to wind damage, to illness/insects attacks. Also, stands drying phenomena will happen more often.

As an adaptation measure of forestry management to climatic changes are seen the increase of the forest surfaces with the promotion in those composition of more resistant species and mixtures of stands. The interpretation of the recorded data shows that the climate change enhance into the forest managers attitude an orientation towards more conservative practices, based on the model of continuous forest cover (low-intensity-based forestry, with repeated interventions aiming to promote natural regeneration). Overall, the fact that forestry is based on natural regeneration mainly may eventually facilitate the adaptation of the forest to the climate change without any antropic influence.

* Corresponding author: corina-m16@yahoo.com

Main Environmental Loads in Forests of Sopron and their Acceptance by Citizens

Gabriella Mária NAGY* –Botond HÉJJ

Institute of Forest Resource Management and Rural Development,
Faculty of Forestry, University of West Hungary, Sopron, Hungary

In our research we survey the load and types of tourism in the Sopron Hills, furthermore we examine the material and immaterial benefits of the forests for the local population.

Our research was made on built elements and their system interconnections in the forest environment which was then related to results from questionnaires made among forest visitors. The results showed that expectations towards touristic infrastructure in forests are ever-growing, even reaching the expectation level towards an urban space environment.

We observed with the majority of respondents that the typical activity, the support and needs for infrastructure development depends on the forest visiting frequency. There is a higher need for infrastructure development with more frequent visiting attitude.

The sensitivity towards different kinds of environmental load appeared to be independent of the frequency of forest visits; it appears to be a generational characteristic.

Our surveys show, that more than 60% of visitors in the Sopron hills are local residents, and further 10% arrive from within 50 km, thus 70% of visitors are familiar with the area. About 15% of respondents said that their last visit in Sopron forest was more than one year ago. Therefore it seems to be clear, that the surrounding hills of Sopron are the key recreational targets for citizens of the city.

The rejection of personal involvement in environmental developments is inversely related to the frequency of forest visits. This is a traditionally untapped potential for forestry to involve citizens into touristic developments and maintenance.

A general result of the research was that respondents show a higher tolerance towards touristic load and lower towards pollution than expected.

* Corresponding author: gbrll_nagy@emk.nyme.hu; H-9400 SOPRON, Bajcsy-Zs. u. 4., Hungary

Mathematic Function Relations in Quality of Life Model in Forest Assessment

Gabriella Mária NAGY* – Botond HÉJJ

Institute of Forest Resource Management and Rural Development,
Faculty of Forestry, University of West Hungary, Sopron, Hungary

Our survey was made in Sopron forests, which are the closest ones to the city. These forests are managed by a state owned forest company Because of the special position of these forests their main aim is to provide recreational services to the citizens of the city and to visitors.

In order to measure this well-being function of the forests we created a quality of life index, which uses classical environmental value assessment and QoL methods as well.

In the model we assessed economic, natural and human influences on the forest. This model is able to characterize the local society's and community's attitudes towards the environment.

We proved that there are certain relations between objective (classical environment assessment methods) and subjective elements (QoL methods) and these can be expressed in a multi-variable model.

* Corresponding author: gbrll_nagy@emk.nyme.hu; H-9400 SOPRON, Bajcsy-Zs. u. 4., Hungary

Stakeholder Evaluation of Long-Term Changes in Framework Conditions of Forestry in Scotland

Maria NIJNIK[a*] – Anatoliy NIJNIK[b]

[a] The James Hutton Institute, Aberdeen, Scotland United Kingdom
[b] Environmental Network Ltd, United Kingdom

This paper concisely analyses some of the most recent developments observed in Scottish forestry. It explores the economic, environmental and social aspects of forestry, and stakeholder perceptions concerning forest multiple ecosystem services. Recent developments in forestry provide challenges for scientists and practitioners: How can dominant stakeholder attitudes concerning woodlands be characterised, and how can they be translated into policy design? How do people perceive the long-term changes in framework conditions of forestry? What possible futures of Scottish woodlands are seen through the eyes of forest-related stakeholders? This action research follows a semi-qualitative route and applies the Q-methodology. The emphasis is on stakeholder participation and on the developing of capabilities to enhance the end-user involvement in decision making processes concerning the inclusion of woodlands in Scottish countryside. Findings improve an understanding of the diversity of existing attitudes towards forestry (including small scale forestry), under changing framework conditions, and on the increased role of Scottish woodlands for the economy, environment and people.

[*] Corresponding author: maria.nijnik@hutton.ac.uk; Craigiebuckler, Aberdeen AB15 8QH, Scotland, UK

The Present Situation of Common Forests in Japan

Ikuo OTA*

Department of Forest Resources, Ehime University, Japan

Abstract – During the long feudal era of Japan, common forests had established almost all over the country. Common forests as common pool resources were necessary for rural village dwellers who depended largely on forest products and byproducts in their daily household uses and farming activities. However, in the process of modernization after the Meiji Restoration which took place in 1868, such common forests had to be reorganized their ownership status. Some common forests were divided and distributed into local individuals, some were legally designated as local common property of the hamlet people, some became community forests belongs to newly established municipal government, and others were confiscated by the state. This paper aims to describe historical change and the present situation of the former common forests. It is important to recognize that small-scale private forests are closely related to common forests in many of rural mountainous areas in Japan.

Common forest land modernization law / common pool resources / production forest association / profit share plantation forest /, property ward forest

1 INTRODUCTION

Common pool resources have been attracting more and more attention in recent years. The tragedy of the commons is heavily criticized as an economic theory, but the reality of common forests in Japan is in critical situation. Governmental policy to discharge the old conventional forest use since the Meiji Restoration has been destroying the system of common forest over the country. In addition, because of the depopulation of rural mountainous area as well as spread of lifestyle that does not depend on forest resources after the rapid economic growth in 1960s and 1970s, abandonment of forest management in small-scale private forests and also common forests are widespread.

In this paper, historical change of policy directions related to common forests in Japan is summarized. Subsequently, resent situation and difficulties that common forests are facing are analyzed. Intimate relationship between common forests and small-scale private forests at local level is one of the key factors to promote the modernization of forestry. Lastly, changes of managerial behavior in the common forest system are investigated.

* ikuota@agr.ehime-u.ac.jp

2 HISTORICAL CHANGES OF COMMON FOREST IN JAPAN

2.1. Beginning of the common forest

During the long feudal eras in the middle age, a great majority of Japanese people were peasants with or without their own farmland. Rice cultivation was in the central position of the agriculture, and it was normal for the villagers to work together in the paddy field at the time of rice planting and harvesting. Mutual help within the community members was indispensable because the village was designated as an unit to pay the tribute rice for the lord (Kasahara 1989).

Distinguished characters of rice cultivation were its high productivity and continuous cropping at the same field. There was no need to make a fallow periodically unlike the three field system in Europe, but it was necessary to put natural fertilizers such as compost in the field during winter time. Forest was critically important for supplying natural fertilizers as well as firewood for daily uses of farmers.

The common forest system was considered to be established gradually in the middle age. At that time, land register system was not formulated, and backyard forests on the mountain slopes belonged to landlord or nobody. It was necessary for farmers to correct fodders, fallen leaves, branches, shrubs, thatches, wild vegetables, mushrooms and firewood from surrounding forests, and rules had to be created to avoid overuse of the resources. In this way, use right for the common forest was established regardless of its ownership.

From a standpoint of lords, such traditional use of forest by local farmers was unavoidable in order to ensure harvest of rice crop and tribute. Therefore, rules of the common forest was created by the farmers but lords had obliged to accept the use of forest. A common forest might not belong to single village but to a few neighboring villages together. We can find some cases of protection forests and prohibition of special tree species or forest areas directly managed by lords in certain area, but they were the exceptions. In most cases, forests near the village were to be used as the common forest by farmers. As long as the forests were managed sustainably, lords did not need to complain to the farmers.

In the Edo Period, which lasted until the last half of the 19th Century from the beginning of the 17th Century, rules of the common forest were strictly determined by each villages. Entry period, tools for gathering and transporting fodder and firewood, quota of each forest product, and provision of labor for management practices were under the regulations. Because of heavy use of organic materials, forest stands usually became dwarf or coppice forests. However, its sustainability of producing necessary materials for the farmers had been kept for hundreds of years.

2.2 After the Meiji Restoration

Meiji Restoration, which aimed at the overthrow of the Edo shogunate and construction of the modern state, started in 1868. The new government opened the window to foreign countries after 260 years of isolation, and rushed the introduction of education, technology and legal system from the West. Scientific forestry was also introduced in those days mainly from Germany.

The Meiji government considered that land registration system was critically important for governmental budget to ensure tax income, and nationwide reform of land tax system was proceeded. The government tried to establish the system of property tax in accordance with the land area included forestland, instead of the previous system of agricultural land tax with tribute rice. However, reform of the common forests was not an easy task. In case a common forest registered as private land by dividing to farmers, the owners who got some pieces of forestland had to pay tax every year. In most cases, the common forest did not produce any

cash products but self-consumptive goods, therefore farmers hesitated to own forest as private property. Farmers had wanted to keep their common forest as the common pool resources of the villagers. They rather needed traditional use right without property right which made them responsible for tax payment. The government, however, needed clear distinction between public and private possession. They planned to get property tax from private forests, and to earn money from timber sales from public forests or land disposal.

Governmental policy of rapid reform of the common forests caused a lot of disputes. In case a common forest forced to belong to the municipal government, traditional use right was the crucial point of interest for the farmers. There was no big problem if the use right had recognized as it was by the local government, but otherwise disputes took place. For the farmers, agricultural system and the way of life would not change regardless of the governmental policy.

As a result of social conflict between the government and farmers, former common forests had changed into several different types of ownership during the Meiji Era. National forest is one of the major transform of the former common forest. The government might or might not accept traditional use of local farmers including firewood correction on the national forest. Profit share plantation forest was the other type of relationship between the government and local villagers. In this case, the government lent a part of national forest to villagers and villagers proceeded silvicultural activities so as to share the profit of final harvest (Murota and Mitsumata 2004).

Communal possession was another major type of ownership. Villages were the owner of the common forest and it was undividable. The use right of the forest had been kept after the transform, but the situation should be drastically changed with the merger of the municipalities. It caused difficulties in many cases afterward.

Private shared register was the other type. The forest was owned by the group of people, usually the patriarch of each household. In this case, the forest was transferable but the group had to pay property tax. It was rare to divide the common forest into individual farmers at the early stage, but such type of privatization slowly proceeded.

In 1889, the government introduced the new system of municipality. Cities, Towns, and Villages were designated as the fundamental local government with legal person status. In order to organize assembly and public office, a certain scale of the people were required to make a municipality; at least 300 to 500 households were necessary to be a village. This governmental order forced to merger small natural villages into the new official Towns or Villages. It resulted drastic decrease of the number of municipalities from 71,314 to 15,859 within one year.

In most of the cases of this merger, communal forests belonged to natural villages had to change their status again because the natural villages were no more to exist as a unit of the commune. Principle philosophy of the Meiji government was to distinguish the land ownership so as to utilize the land efficiently and strengthening public finances for the development of the country. Therefore, the government tried to eliminate the ambiguous ownership status like local commons in this occasion. Some of the communal forests forced to be in municipal possession, and others became shared registered forests or divided into private property. There were some cases to stay as the communal forest after the new municipality order.

In order to transform the status of communal forests smoothly, the government created a new organizational framework named “property ward”. A property ward forest was a former common forest which legally transferred to the newly established municipality but traditional use right was given to those who were in the former natural village to which the forest belonged. Therefore, management of the property ward forests would be expected to be done by the villagers, and revenue from it also were to be used for these people. The property ward was not just for forest but other land or property including agricultural field, pastureland, pond, graveyard, and hot

spring (Izumi et al. 2011). These property legally owned by the municipal government but only specially designated people belonged to the property ward had its use right. In case that a former common forest belonged to several neighboring villages and these villages became a part of different municipalities, a special organization that spanned two or more municipalities might be created for taking over the forest as a unit.

2.3 Changes after the World War II

The number of municipalities had decreased gradually since 1889. According to the statistics of the Ministry of Internal Affairs and Communications, total number of municipalities dropped down to 12,315 in 1922, and 10,520 in 1945. Under the occupation of the United Nations after the World War II, Japanese society was transformed into democracies from empire. Major laws as well as the constitution was renewed, and the Local Government Act was newly established in 1947 to facilitate decentralization.

In 1953, "Towns and Villages Merger Promotion Act" came into force. The government aimed to enlarge the scale of the municipalities at least 8,000 or more people so as to provide efficient official services including primary and secondary schools, fire fighting and ambulance, health, and social welfare. Following the above mentioned act, "New Municipality Construction Promotion Act" was came into force in 1956. This act aimed to promote to create bigger municipalities with merger including cities as well as towns and villages. Both of the acts were time-limited to five years, and at the end of the second act period, the number of municipalities dropped to 3,472 in 1961.

Along with this reform of the local government system, many of the former common forests had to experience a big change of its status again. A lot of new property ward forests had created from the old municipal forests so as to keep the use right for the limited group of people within the new municipality. However, in many cases, municipal forest transferred to the new municipality and began to be managed as a public forest instead of a local commons. One of the reasons of the fact was weakened relations between the local people and their former common forest. Another reason was policy direction to manage and utilize public forest for all the citizens under the name of democracy.

Forest Law was also amended in 1951. In this amendment, a new type of forestry cooperative named "production forest association" was created. It was different from the forest owners cooperative. The forest owners cooperative was the organization of individual private forest owners for facilitating forestry activities including variety of forest practices and timber sales. Activities of forest owners cooperatives were provided by contract basis for members and non-members (Ota 2012a). On the other hand, the production forest association was the group of people who manage their forest by themselves as a specially designated status by the law. In other words, forest owners and management organization were the same entity designated as the production forest association. This organization was created to promote efficient forest management with group of forest owners, but it also was to be a transform of former common forest.

In 1966, Common Forestland Modernization Law came into practice. During the years between late 1950s and early 1970s, Japan experienced a high economic growth period. Timber demand far exceeded domestic supply, and timber price rose up year by year. The government rapidly developed infrastructure and rules for importing timber as well as facilitating the increase of domestic timber production both from public forests and private forests. This law was one of the policy measures to facilitate domestic timber production. The government aimed to modernize the forestland ownership especially of former common forests so as to promote efficient forest management. As a result of this policy, about three thousand production forest associations were established. Average size of a production forest association was roughly about 100 ha (Handa 2001).

3 PRESENT SITUATION

3.1 Recent trend of forestry in Japan

Forestry has been worsening its business situation for several decades in Japan. Industrial roundwood production volume had been decreasing from about 53 M m^3 in 1967 to 16 M m^3 in 2002. Share of the domestic timber was lost to imported ones. Although the volume is increasing slowly after 2003, unfavorable condition has not changed significantly up to now.

Governmental forest policy was partly successful but was failure on the whole. The Basic Forestry Law of 1964 aimed to expand domestic timber production by small-scale forest owners as a central actor with the help of forest owners cooperatives. Production forest associations were also expected to play an important role. However, the policy objective of increasing timber production was not achieved. Contrary to the prosperity of urban area, agriculture and forestry faded in countryside. Depopulation in rural area became a social problem since 1960s.

Expansive afforestation was almost the only successful policy measure. It was a nationwide project to convert natural broadleaved forests into softwood plantation began in the mid 1950s. Presently, there are about 10.3M ha of plantation forest which composes 41.2% of total forest in Japan, and great majority of these plantations were established during the period between 1950s and 1970s. These forest resources are going to mature today.

After the turn of the Century, the government actively promoted merger of the municipalities again. Many depopulated villages and towns were to join in the large municipalities or even in the big cities. The number of municipalities was 3,229 in 1999 but it dropped down to 1,719 in 2014. This change might affect the status of property ward forests and other types of former common forests as was in 1960s, but it is not appeared to be a serious problem so far.

3.2 Existing state of former common forests

It is very hard to know exact area of former common forests. One of a reliable research suggested that over 3M ha used to be the common forests (Takei et al. 1989). Considering the situation in the Edo Period that most of the forests surrounding the villages were to be used as the common forest by local farmers, total area might be much more than that.

There are many different types of ownership in former common forest in Japan. The followings are the list of the ownership of former common forest today:

- Shared register
- Representative of the group
- Private individual
- Hamlet
- Partial-affairs association
- Property ward
- Municipality (city, town, or village)
- Agricultural cooperative
- Corporation
- Temple and shrine
- Production forest association
- Prefectural forest
- National forest
- Approved territorial bond group

Within the above category, property ward and production forest association are popular. There are 2,341 property ward forests and 3,186 production forest associations. Total area of the former is 1,0467,000 ha and that of the latter is 383,670 ha (Ministry of International Affairs and Communications, Forestry Agency 2014). Approved territorial bond group is a relatively new organization that the government established to be a property owner. This was legally authorized by the amendment of the Local Autonomy Act in 1991. Some of the old styled ownerships including shared register, private individual, and hamlet changed the ownership into this category since then. Approved territorial bond group is an officially approved organization that represents the people living nearby somewhat like a natural village in feudal era, so that it is more convenient to own and use the former common forest than other ownerships.

Regardless of the ownership types, utilization of the former common forest is not active today. The reason is simple. Lifestyle of the rural people has changed and none depends on forest resources for their agricultural nor daily uses. Coppice forests are just abandoned and become over clouded dark forest stands. Huge area has converted from dwarf broadleaved forest into softwood plantation, but many of them are also abandoned because of an economic reason, i.e. continuous decrease of timber price.

There are also other way of utilization such as golf course, ski resort, summer cottages and other recreational purposes. Maneuver land of the Self Defense Forces in Yamanashi Prefecture is a noteworthy case of lucrative utilization of the former common forest. In these cases, management organization of former common forest just earn money as a landowner for leasing the forestland.

4 DISCUSSION

Common forests were essential for the subsistence of farmers. Even in the rapid modernization period after the Meiji Restoration, farmers heavily depended on common forests. However, the government wanted to establish newly introduced Western land register system by destroying old and ambiguous use right customs. A lot of conflicts and lawsuits had happened under such situation. The government had to mix enforce measures and conciliatory measures to manage the people, and this is why many different types of ownership of the former common forest exist today.

The Meiji government aimed to transform the former common forest into national and municipal forest in order to facilitate efficient management of forest resources. Public ownership was considered to be a better way of managing forest than private ownership. However, on the other hand, the government was forced to permit traditional uses of forest resources on public land for the former common forest users in many cases. Their policy was full of contradiction from the beginning.

Common Forestland Modernization Law in 1966 was a turning point. Based on the strong policy direction of expanding domestic timber production by Basic Forestry Law in 1964, the government actively admitted to establish production forest associations on the former common forests. This meant the promotion of private forest organization rather than public ownership. If a former common forest was divided into individual farmers, all of them were to be small-scale owners. The idea of production forest associations was to integrate these individual forests into a middle or a large scale unit. Expansive afforestation was a good tool for converting useless broadleaved forests into productive softwood forests with having governmental subsidy on such land. It was a meaningful trial under the situation at the time.

However, the purpose of this act had not fully achieved. Beside the fact that not all of the former common forests transformed into the production forest association, forestry activity on

production forest associations had been shrinking gradually with a declining economic situation of domestic forestry. Small-scale forest owners as well as the production forest associations as the group of small owners lost motivation to invest on their forests. The situation was mostly the same for the property ward forests and other types of the former common forests.

Increasing number of absentee forest owners is another problem. The production forest associations are required to manage its forest by themselves by the law. However, aging and reducing number of residents make big obstacles for the management of the forest. Naturally, operations are going to diminish year by year.

There is a more severe problem in the former common forest. In case of selling the shared register forest, it is required to have signatures of all the members, but it is extremely difficult to get signatures of all the members in reality. In most of the cases, some members have already moved out the village generations ago, and there is no ways to make a contact with the offspring at all. Therefore, the forest has to be left as is forever. There is no legal measures to remedy such problems. It is one of the reasons for increasing abandoned forest in Japan.

Even though there are many difficulties in front of the former common forests, they are still important in Japanese forestry. Most of the private forests are small in scale. Average size of private individual ownership is 5.7ha, and 800,000 out of 900,000 private forest owners are holding less than 10ha of forestland (Ota 2012b). On the other hand, the size of former common forests is much bigger than individual ownership, and it means they have a possibility to play a responsible role for domestic timber production and sustainable forest management in this country. New policy measures and new legislations are needed to facilitate the effective utilization of the former forests.

5 CONCLUSIONS

Small-scale forestry in Japan have many problems. Issues of common forest is one of them. Efficient utilization of the former common forest are very important for domestic forestry, but governmental policy to renovate them has been failed for many decades.

Considering the historical trend and present situation above, the author gets to a question whether not there is a inherent contradiction to the modernization of the former common forests. Critical importance of common forests in former days was on its subsistent needs by farmers, but it has been totally changed. There must be no reason to keep the common forest as a common pool resources without common necessity of the people. Is the softwood plantation forest qualified for the common pool resource for local people?

What is required for us from now would be to regain the old community to live together with the neighbors. There is a need to change the lifestyle of excessive individualism today into more co-working and co-sharing ones, and utilization of the former common forests will be of value in such a community.

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Perceived influence and Real Power of Stakeholders in Forest Management: a Case Study in Italy

Alessandro PALETTO[a*] – Jessica BALEST[a] – Isabella De MEO[b] – Grazia GIACOVELLI[a] – Gianluca GRILLI[c]

[a] Consiglio per la Ricerca e la sperimentazione in Agricoltura – Forest Monitoring and Planning Research Unit (CRA-MPF), Villazzano, Trento, Italy
[b] Consiglio per la Ricerca e la sperimentazione in Agricoltura – Agrobiology and Pedology Research Centre (CRA-ABP), Florence, Italy
[c] Department of Civil, Environmental and Mechanical Engineering, University of Trento, Italy

Abstract – In the European countries, the current forest use aims to enhance all goods and services supplied by forest ecosystems, taking into account the multiple needs and interests of modern society. In order to improve the multifunctionality of forests and to incorporate stakeholders' opinions in participatory forest planning, it is important to analyze decision making process characteristics. Successful participatory forest planning requires a thorough analysis of stakeholders' perceptions and preferences. The aims of the paper is to investigate the differences between stakeholders' perceived influence and real power in forest management. A questionnaire survey was carried out among 51 forest stakeholders in a case study in Italy. Perceived influence was measured by asking stakeholders to rate on a 5-point scale the extent to which they can influence six forest management issues. Real power was analyzed using the social network analysis (SNA), investigating the relationships that stakeholders have with each other in the network. Real power was measured using a Freeman's degree centrality measure, which focuses on the direct ties coming in and out for each stakeholder. The results of the study suggest that in many cases stakeholders have a distorted perception of their own power.

decision making process / power / participatory approach / social network analysis / Valle di Non (Italy)

1 INTRODUCTION

Power plays a fundamental role in social interactions, and it serves as an organizing principle in the social sciences (Russell 1938). Power can be defined in different ways. According to Weber (1947), power is defined as "the probability that an actor within a social relationship will be in a position to carry out his own will despite resistance". In this way, power can be considered as the ability of an individual in a relationship to exert influence on another person, in order to obtain the expected outcomes (Simpson et al. 2014). The possible strategies in order to influence a person can be direct or indirect: the first type is visible and unambiguous, while the second is less visible and more subtle. Weber's power definition was analyzed and re-elaborated by Dahl (1961) in his theory of community power. The fundamental principle of the theory is that society is a pluralistic society, where community interests are represented by means of open processes. In this pluralistic

[*] Corresponding author: alessandro.paletto@entecra.it; p.za Nicolini 6, 38123 Villazzano di Trento, Italy

society power is exercised by a specific actor, while other actors are prevented from doing what they would like to do. If the power can be defined the potential to influence and is a basic force in social relationships (Keltner et al. 2003), influence can be considered the exercise of power (Turner 2005). Actors who have a clear objective attempt to influence the behavior of someone else, for achieving their goals.

In sociological perspective the concepts of power and influence have clear definitions, but in the everyday reality are closely inter-related. The interactions between individuals or groups are shaped by patterns of power and influence (Lasswell – Kaplan 1950). Power finds its sources in the threat to use instruments for causing damages, in the control of tools that restrict the action of others, and in all elements that can be detrimental. The most common power resources are strength, knowledge, prosperity, capital (material, immaterial and social) and organization. It is important not to confuse power with its resources, because resources alone do not necessarily translate into power. Concerning influence, a person has influence on another when the behavior of the second seems different from previously after the pressure of the influence of the first. It is a sort of mediate power, able to modify behavior of other actors without orders or threats. On the other hand, the influence is a kind of social relationship that modifies the original behavior of someone by means of e.g. communication, charisma, persuasion (Nye 2008).

In the last decades, the importance of the concept of power was recognized also in the environmental and forestry sciences, thanks to the emergence of participatory approach in natural resources management. In particular, in the ambit of forest management major issues are the multiple uses of forests and the presence of multiple stakeholders with their views, expectations and objectives concerning forest management (Mendoza – Martins 2006). In this situation the analysis of stakeholders power is relevant, in order to understand the role and the influence of different stakeholders (Paletto et al. 2012). In particular, this issue is important when the decision making process is influenced by few powerful stakeholders, while a large number of stakeholders is passive and without a real power.

Another main issue when dealing with participatory forest management is to distinguish between power and influence of stakeholders. Inter alia, it is important to analyze perceived influence, that is defined as "the believed ability to affect other actors' behaviors or beliefs by effectively controlling resources (e.g. information, ability to make decisions, etc..) skillfully and willfully" (Weible 2005).

Starting from these considerations, the present study considers the perceived influence as the perceived individual capacity to influence the decision making process, and the power as the real capacity to influence the decision making process. The main aim of the research is to define a method useful for comparing stakeholders' perceived influence and real power. The proposed method was applied in a case study in North Italy (Valle di Non, Trentino-Alto Adige region), characterized by multiple stakeholders interests and high relevance of forest resources both from the economic and social point of view. Power was quantified through the analysis of stakeholders' relationships and networks (social network analysis), while information on perceived influence was collected through a questionnaire survey of forest stakeholders. Finally, results of perceived influence and real power were compared in order to highlight behaviors of the different stakeholders' categories.

2 MATERIALS AND METHODS

2.1. Study area

The study area is the Valle di Non, in Trentino-Alto Adige Region (North-East of Italy). Valle di Non is a rural valley (596,7 km^2) with a well-developed agricultural industry (apple and grape production) and forestry sector. The labor force employed in the primary sector is

around 20% of the total labor force of the valley. The forest area is around 350 km^2 (59% of total area) and the main forest types are Norway spruce (*Picea abies* (L.) H. Karst.), Scots pine (*Pinus sylvestris* L.) and European larch (*Larix decidua* Mill.) dominant forests. Broadleaves forests, mainly European beech (*Fagus sylvatica* L.) forests, are concentrated in the low part of the valley. Considering the forest property, forest areas are mainly public and common forests (80%), managed by municipalities and self-organization of common forests called *Amministrazioni Separate per i beni di Uso Civico* (ASUC). Forest management is conducted according to Forest and Wildlife Service of Autonomous Province of Trento guidelines. The remaining 20% of forests belong to small private owners (Grilli et al. 2014).

Valle di Non is also important from the touristic point of view, with 370,597 tourist presences and 108,966 tourist arrivals (year 2012). In reasons of the characteristics of the valley - low availability of sport infrastructures, high levels of forest land use - the tourist presences are concentrated in the summer season. Tourist infrastructures in Valle di Non count 59 accommodations (hotels, residence, bed & breakfast) for a capacity of 3,010 beds.

2.2 Methodological framework of the research

The research framework, aimed at comparing was structured in three stages: (1) stakeholder analysis, (2) questionnaire survey, (3) statistical analysis and comparison of the data collected with the questionnaire.

The stakeholder analysis was conducted to identify relevant stakeholders. The first step was a brainstorming session between project researchers and local experts (forest managers and planners). A preliminary list of stakeholders was identified and then the sample was completed with a snowball sampling technique: names of other potential stakeholders are collected from the initial group. This sampling method is usually employed in the investigation of social networks and social dynamics (Noy 2008). At the end of the stakeholder analysis, 51 stakeholders were identified and classified in four main categories: 25 public administrations (municipalities, ASUC, Forest and Wildlife Service of Autonomous Province of Trento), 7 associations (alpine clubs, local hunting and environmental associations), 13 forest-wood chain actors (forest enterprises and sawmills), and 6 tourism sector actors (hotel keepers, agencies of tourism development).

During the second stage, a questionnaire survey was conducted among selected stakeholders through face-to-face interviews. The questionnaire was aimed at assessing stakeholders' perceived influence and power in the participatory forest planning. The questionnaire included 17 closed-form questions and was subdivided in four thematic sections ("organization information", "personal information", "social and human capital", "forest management and local tradition"). A preliminary version of the questionnaire was prepared by the researchers previously involved in the stakeholder analysis and pre-tested with the local experts.

In the third stage of the research, the questions of the section "social and human capital" were processed and analyzed from the statistical point of view using XLStat 2012. Data analysis focused on the following aspects: (1) stakeholders' personal perception of their influence on the decision making process, (2) real power of stakeholders in terms of relational embeddedness, and (3) correlation between the two above mentioned aspects.

2.2.1 Perceived influence

The perceived influence of stakeholders on forest management decision making process was assessed by the statements of the respondents. Stakeholders were asked to evaluate the influence of their organization in relation to six key-issues of forest planning and management. The key-issues were the following: (1) forest management for the production of timber, bio-energy and non-wood products (mushrooms and wild berries); (2) forest

management for recreation, tourism and landscape purposes; (3) forest management for the protection against natural hazards (landslides, rockfalls, avalanches); (4) forest management to maintain and improve biodiversity and habitats; (5) environmental qualification (quarries and landfills restoration), (6) management of wildlife (mainly ungulates). Each of the five issues was scored using a 5-point Likert scale (from 0=no influence to 4=very high influence).

The data collected with the questionnaire were statistically processed and the main descriptive statistics (mean, median, standard deviation) were calculated. The aggregation of all key-issues was used as indicator for describing the perceived influence of the groups. Besides, the non-parametric statistical test of Kruskal-Wallis was applied in order to evidence differences between categories of stakeholders in relation to each single key-issue. The non-parametric statistical tests were chosen because the data distribution is not normal and the number of observations is low. All statistical tests were assessed at the α=0.05 level.

2.2.2 Power

The real power of stakeholders was assessed on the basis of the relational embeddedness, using the social network analysis (SNA) method. SNA is a formal theory to define and analyze the relationships that organizations or individuals (stakeholders in general) have with each other and it focuses on positions and structural patterns of actors (Wasserman – Faust 1994, Scott, 2000). Analysis of social networks allows to unpack the social factors and provides information about knowledge exchange. Practical applications of SNA are rather limited in forest sector. Tikkanen et al. (2003) studied the regional network of forest-related organizations in northern Finland, Harshaw and Tindall (2005) employed a social network approach to examine the role of social capital in the relationships between people and forested landscapes in Canada, Vennesland (2004) analyzed the importance of networks in forest-based rural economic development in Norway, while Paletto et al. (2012) applied the SNA in a participatory landscape forest planning study in Italy.

In the present paper, SNA was applied to highlight power distribution among forest stakeholders. In particular, network centrality was used and quantified in order to analyse the role and position of stakeholders in the network. From the theoretical point of view, network centrality is a fundamental concept to account for actors' social status, power and satisfaction with group activities (Bavelas 1950, Leavitt 1951). Some researches showed a positive relationship between centrality in the network and power (Brass 1984, Krackhardt 1990). Despite this, not all measures of centrality can be considered an appropriate indicator of actor's real power (Mizruchi – Potts 1998). According to Freeman (1979), degree centrality was defined as the number of alters to whom an actor is directly tied and represents the ability to communicate directly with others (level of communication activity). Considering these theoretical assumptions, in this research the degree centrality was considered as a measure of the real power of individual stakeholders. Information useful to assess the degree centrality was collected through the survey questionnaire. Specifically, two type of information were collected: (1) number and type of stakeholders with which the respondent has a professional relationship in the field of forest planning and management (six key-issues), (2) strength of relationships. It is important to emphasize that only collective stakeholders (organizations and associations) were considered in the analysis. The strength of relationships was evaluated distinguishing three types of ties strength: very weak, weak, strong. Strong ties are comprised of all of those types of relationships in which either the stakeholders are involved in an emotional manner, while weak ties are those relationships established by different stakeholders among which communication is sporadic and where emotional intensity is generally low (Granovetter 1973).

The graphic elaborations and the degree centrality values were realized with the softwares NetDraw and UCINET 6.0 (Borgatti et al. 2002).

The Freeman's formula used to calculate the degree centrality is the following:

$$Dc\ (n_i) = \sum_{k=1}^{n} a\,(n_i, n_k)(N\ -1)^{-1}$$

Where:
D_c = degree centrality
a_{ik} = arc between nodes (1 when there is a connection between n_i and n_k, 0 when there is not a connection between n_i and n_k).

The degree centrality calculated for each stakeholder was aggregated in categories of stakeholders (public administrations, associations, forest-wood chain actors and tourist sector actors).

3 RESULTS AND DISCUSSION

3.1 Perceived influence

Observing the aggregate result (all key-issues together) for individual stakeholders perceived influence, we observe that values are included in a range between zero and 23. The highest values were recorded for the following stakeholders: Brèz municipality (P_i total=23), Forest and Wildlife Service of Autonomous Province of Trento (P_i total=20), Dambel municipality (P_i total=19) and a sawmill located in Sarnonico municipality (P_i total=18).

Statistical results (mean, median and standard deviation) of the perceived influence per category of stakeholders are reported in *Table 1*. Taking into account the median value as synthetic indicator of perceived influence we re-classified the level of influence of the different categories of stakeholders in the following way: median=0 very low influence, median=1 low influence, median=2 medium influence, median=3 high influence, and median=4 very high influence.

Public administrations consider medium their level of influence on four issues (wood production, forest recreation, hydrogeological protection and biodiversity conservation) and low and very low for wildlife management (P_i mean=1.08) and environmental qualification (P_i mean=1.56). The total level of influence of the public administrations is 9.72.

Representatives of the associations declared a high and very high level of influence on two forest management issues: biodiversity conservation (P_i mean=2.50) and forest recreation (P_i mean=2.00), while for the other issues the level of influence is quite low. The high level of influence on biodiversity conservation issue is mainly affected by answers of hunting associations representatives. This is reasonable because they contribute to the wildlife population census and to the provincial hunting plan. The total level of influence of this category is equal to 8.43.

Actors of tourism sector declared a low or very low level of influence for all forest management issues; according to these declarations the total level of influence of this category of stakeholders is 2.67. It is interesting to highlight that their perceived influence is low (P_i mean=0.67) also on the valorization of tourism and recreation in forests. This scarce perceived influence is not surprising, since the decision making process in Valle di Non is mainly driven by public administrations. Otherwise, it is important to underline that such a low score may be interpreted also as a scarce interest of these actors in natural resources management. In such a case, this result could be more worrisome, because tourism in Valle di Non is mainly nature-based and the tourism actors are expected to be the main drivers of tourism and recreational activities in forest.

Finally, the forest-wood chain actors declared a low level of influence on three forest management issues (wood production, forest recreation and biodiversity conservation) and a

very low level of influence on the others three issues (protection against hazards, environmental qualification and wildlife management). The highest level of influence is on wood production (P_i mean=1.62).

Table 1. Mean, median and standard deviation of perceived influence on six key-issues of forest management per categories of stakeholders.

	Wood production	Recreation in forest	Protection against hazards	Biodiversity conservation	Environmental qualification	Wildlife management
All stakeholders (n=51)						
Mean	1.51	1.51	1.19	1.65	1.16	0.86
Median	1	2	1	2	1	0
St.dev.	1.31	1.36	1.21	1.42	1.22	1.28
Public administrations (n=25)						
Mean	2.00	1.92	1.57	1.96	1.56	1.08
Median	2	2	2	2	1	0
St.dev.	1.10	1.32	1.27	1.30	1.26	1.47
Associations (n=7)						
Mean	0.67	2.00	1.50	2.50	1.29	1.43
Median	0	3	2	4	1	1
St.dev.	1.21	1.90	1.38	1.97	1.60	1.51
Tourism sector actors (n=6)						
Mean	0.17	0.67	0.33	0.67	0.67	0.20
Median	0	1	0	1	1	0
St.dev.	0.41	0.82	0.52	0.82	0.82	0.45
Forest-wood chain actors (n=13)						
Mean	1.62	0.92	0.77	1.15	0.54	0.38
Median	1	1	0	1	0	0
St.dev.	1.45	1.04	1.01	1.28	0.78	0.65

The non-parametric test of Kruskal-Wallis shows statically significant differences between categories only for the perceived influence related to wood production (*Table 2*). For this key-issue, the influence of public administrations and forest-wood chain actors is significantly higher than the other categories of stakeholders.

Table 2. Results of non-parametric test of Kruskal-Wallis for the six key-issues

	Wood production	Recreation in forest	Protection against hazards	Biodiversity conservation	Environmental qualification	Wildlife management
K Observed value	13.415	6.938	7.112	7.236	7.127	4.787
K Critical value	7.815	7.815	7.815	7.815	7.815	7.815
p-value	0.004	0.074	0.068	0.065	0.068	0.188
Hypothesis	H_1	H_0	H_0	H_0	H_0	H_0

3.2 Power

In *Table 3* are reported the results of social network analysis, with the degree centrality values for all stakeholders in the network, while in *Table 4* are shown the main statistics, considering the categories of stakeholders.

SNA results concerning real power of stakeholders show significant differences between individual stakeholders and categories of stakeholders (*Figure 1*). Forest and Wildlife Service of the Autonomous Province of Trento are individual stakeholder with the highest values of degree centrality (D_c=137), followed by two municipalities (Malosco municipality D_c=78 and

Brèz municipality D_c=87) and an ASUC (D_c=63). A high number of stakeholders has values of degree centrality rather low (D_c lower than 20). At the light of these differences, we can assert that forest sector network in Valle di Non is a highly centralized network, where one stakeholder (Forest and Wildlife Service) plays a key role, both in terms of power and prestigious. This kind of network presents the main advantage of rapidity and ease in decision-making, and the possibility for administrators to manage the forests of the valley with a unique and homogenous management approach. Conversely, this centralized network presents the main disadvantage in the risk of a low participation in decision-making and of a de-empowerment of the other stakeholders of the area.

Besides, *Figure 1* shows that within stakeholders categories there is a different distribution of power. In particular, it is important to highlight the marginal role of tourism sector actors: 3 hotel keepers have no ties with any other actor in the network and the others tourism sector actors are all in marginal positions, confirming the result derived from the perceived influence analysis. Instead, the forest-wood sector actors are in "key positions" in the network, in particular three sawmills (sawmill Sarnonico D_c=54, one of the two sawmills (number 1 of Clès D_c=36, sawmill Drès D_c=35) and two forest enterprises (forest enterprise Darmine di Taio D_c=38, forest enterprise Livo D_c=36).

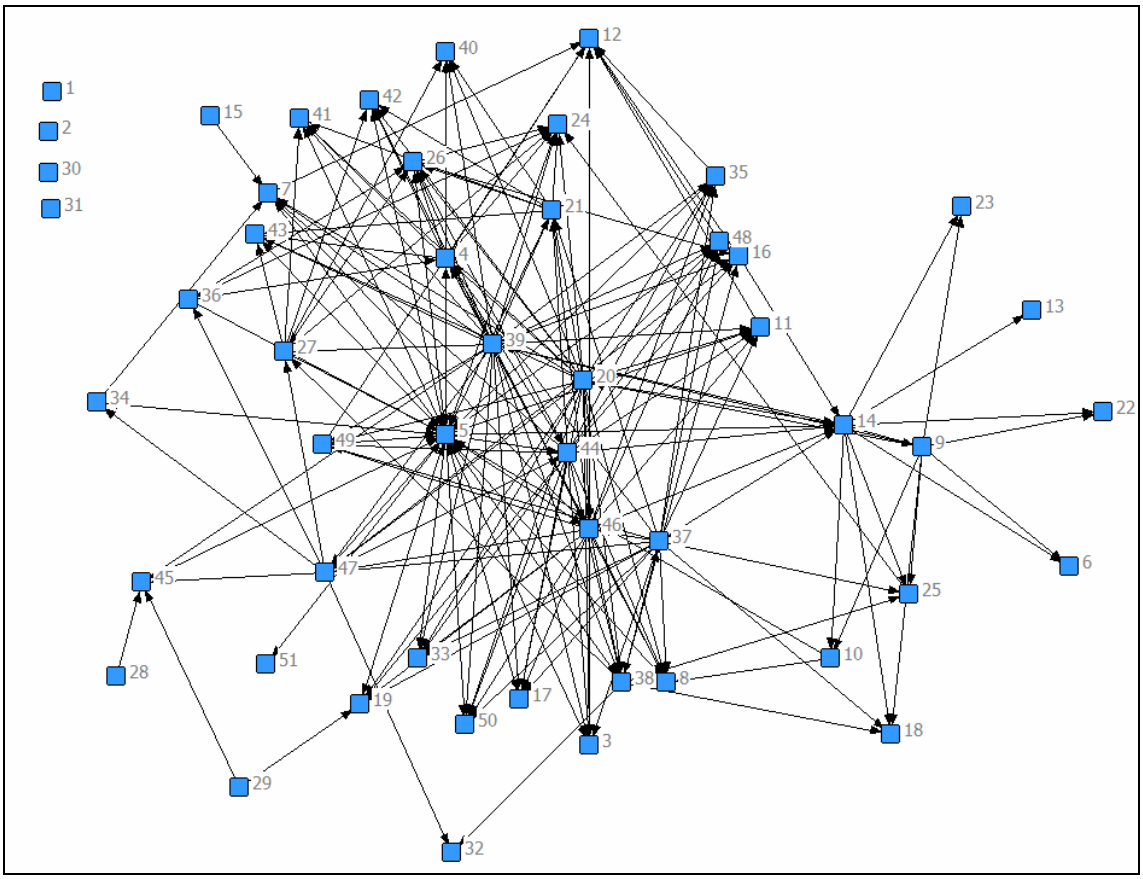

Figure 1. Social Network Analysis (SNA) of the forest sector stakeholders in Valle di Non

To better understand real power distribution, it is important to make a distinction between indegree and outdegree centrality for the interpretation of the values in *Tables 3* and *Table 4*. Those actors who show elevated values of outdegree centrality occupy a central hierarchical position in the network, and are therefore able to directly reach a high number of actors. Nevertheless, this position does not ensure clear cut prestige since the acknowledgment of the other actors (indegree centrality) is required.

Table 3. In-degree, out-degree and degree centrality values per each stakeholder

Code	Stakeholder	Out-degree	In-degree	Degree
1	Hotel keeper in Tuenno	0	0	0
2	Hotel keeper in Fondo	0	0	0
3	Tuenno municipality	3	15	18
4	Taio municipality	15	18	33
5	Forest and Wildlife Service	78	59	137
6	Sawmill Fondo	0	6	6
7	Fondo municipality	3	20	23
8	Castelfondo municipality	2	18	20
9	Sawmill (1) in Castelfondo	26	3	29
10	Sawmill (2) in Castelfondo	6	6	12
11	Cavareno municipality	3	15	18
12	Consortium of municipalities	0	3	3
13	Sawmill Sarnonico	36	18	54
14	Sarnonico municipality	3	0	3
15	“Futuro Sostenibile” association	6	14	20
16	Hunting association Sarnonico	3	15	18
17	Denno municipality	0	12	12
18	Forest enterprises Malosco	3	15	18
19	Malosco municipality	72	6	78
20	Sawmill Flavon	3	6	9
21	Sawmill (1) in Clès	21	15	36
22	Rumo municipality	0	5	5
23	Sawmill (2) in Clès	0	6	6
24	Sawmill Drès	9	26	35
25	ASUC Vigo di Ton	3	12	15
26	Forest enterprise Darmine di Taio	18	20	38
27	ASUC Masi di Vigo	21	11	32
28	Hunting association Vigo di Ton	3	0	3
29	Hotel keeper Romeno	6	0	6
30	Hotel keeper Malosco	0	0	0
31	Sawmill Livo	0	0	0
32	Hotel keeper Clès	0	5	5
33	Provincial hunting association	0	15	15
34	Ton municipality	6	6	12
35	SAT (mountain association) Fondo	6	15	21
36	Romallo municipality	12	9	21
37	SAT (mountain association) Taio	23	6	29
38	Forest enterprise Livo	21	15	36
39	Brèz municipality	81	6	87
40	Forest enterprises Romallo	1	17	18
41	ASUC Marcena	1	17	18
42	ASUC Mocenigo	1	17	18
43	ASUC Mione-Corte	1	17	18
44	ASUC Lanza	54	9	63
45	SAT (mountain association) Clès	3	12	15
46	Agency of tourism Fondo	40	10	50
47	Sfruz municipality	18	15	33
48	Sporminore municipality	5	15	20
49	Dambel municipality	6	15	21
50	Coredo municipality	0	15	15
51	Nanno municipaility	3	15	18

Table 4. Mean values of in-degree and out-degree centrality per category of stakeholders

Category of stakeholder	In-degree	Out-degree
Public administrations (n=25)	17.32	10.44
Actors of forest-wood chain (n=13)	7.08	16.92
Associations/NGO (n=7)	8.29	18.86
Actors of tourism sector (n=6)	2.00	2.00

Public administrations is the category with a greater concentration of power and this fact is mainly explained by the values of in-degree centrality, that for public administrations shows a mean value of 17.32, while for the forest-wood chain actors and the associations is equal respectively to 7.08 and 8.29.

Conversely, the out-degree centrality values are higher for the latter two categories of stakeholders (forest-wood chain actors mean OD_c=16.92, associations mean OD_c=18.86) than for public administrations (mean OD_c=10.44). This result can be interpreted as a unidirectional flow of requests for technical advice or financial support from the various stakeholders towards public administrations.

3.3 Correlation between perceived influence and power

The correlation between perceived influence and real power is analysed to investigate if there is a corrispondence or a deviation between these policy issues, and to understand reasons for different trends. The Spearman correlation between the perceived influence and the values of in-degree, out-degree and degree centrality are reported in *Table 5*. Results show a statistically significant correlation between the perceived influence and the values of in-degree centrality (r=0.562) and degree centrality (r=0.388). For the fact that the degree centrality is the sum of in-degree and out-degree, it is important to focus on the differences between these two indicators (*Figure 2* and *Figure 3*). The correlation between in-degree centrality and perceived influence is relatively high because indegree can be considered a good indicator of the prestige and prominence of a stakeholder. A stakeholder is considered prestigious and prominent, if he is particularly visible to the other stakeholder in the network and the number of his ties in the network is high. Stakeholders in a prominent position in the network have a greater ease of influencing the choices of others stakeholders. This can be considered an indirect form of power.

Table 5. Spearman correlation between perceived influence and in-degree centrality, out-degree centrality and degree centrality

Parameters	In-degree centrality vs. perceived influence	Out-degree centrality vs. perceived influence	Degree centrality vs. perceived influence
r	0.562	0.189	0.388
p-value	<0.0001	0.183	0.005
α	0.05	0.05	0.05

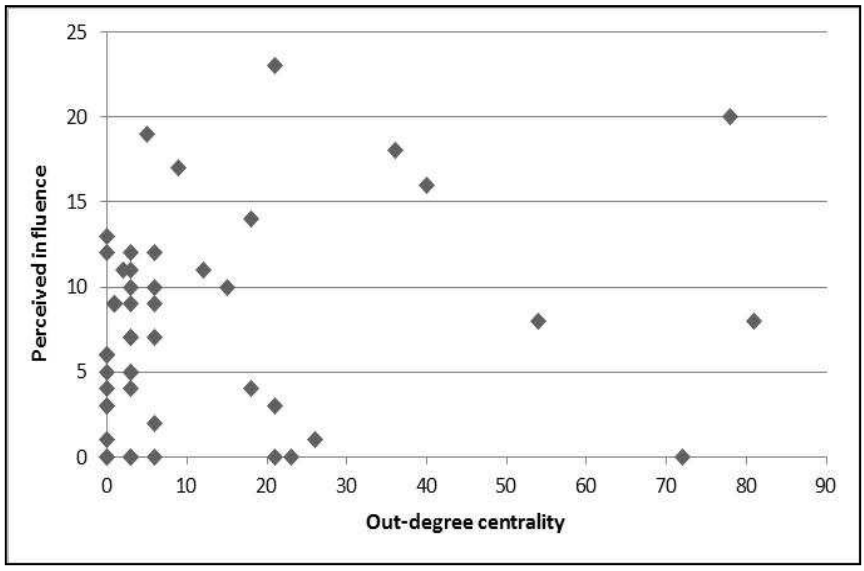

Figure 2. Scatterplots between perceived influence and out-degree centrality

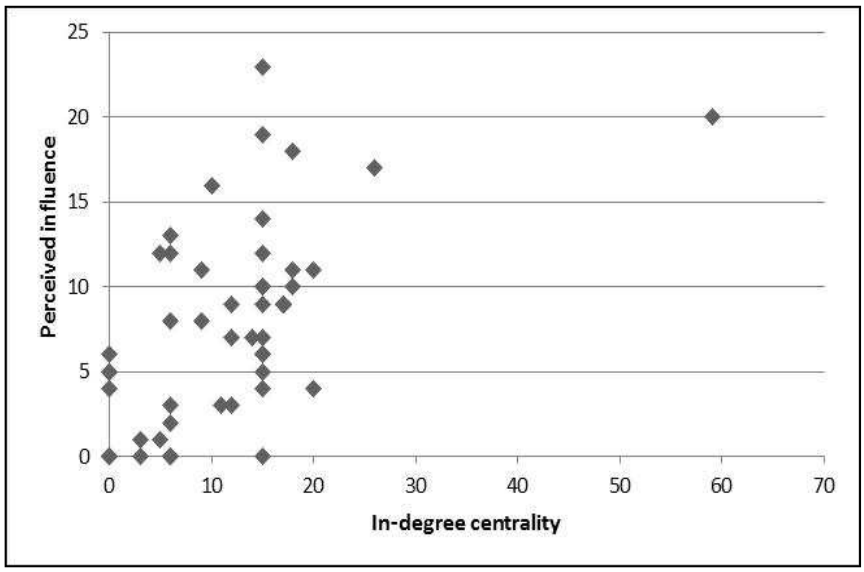

Figure 3. Scatterplots between perceived influence and in-degree centrality

The Spearman correlation between the perceived influence and the indicators of real power shows that some stakeholders have a distorted perception of their own power. A limited number of stakeholders have a perceived influence higher than the real power, and in this group fall some hotel keepers and associations. Instead, the key actor of the network - the Forest and Wildlife Service of the Autonomous Province of Trento - declares a level of influence far below its real power. A similar situation is reported for some municipalities such as Malosco municipality (P_i=0, D_c=78), Brèz municipality (P_i=8, D_c=87) and an ASUC (ASUC Lanza P_i=8, D_c=63). The first interpretation for this differences is tied to a distorted perception of the reality: there are actors that overestimate their influence in the society they are living in and actors that, on the contrary, underestimate their power. Another interpretation for these differences could be of strategic nature: those actors who hold positions of power in the society said not to be conscious of their role of prominence.

4 CONCLUSIONS

In the last decades, the scientific literature concerning the techniques and methods for collection and analysis of social preferences in natural resources management has experienced a rapid growth (Trakolis 2001, Tarrant – Cordell 2002, Kumar – Kant 2007, Rodríguez-Carreras et al. 2013, De Meo et al. 2013, Paletto et al. 2013). Despite this growth of interest, the analysis of the relationship between power of social actors and decisions taken during the management process is still a little-studied field. The present work tries to contribute to the scientific debate on this field focusing on the issue of relations between real power of actors and perceived influence.

In this framework it is relevant to highlight that perceptions shape behaviors more than real power. In fact, if actors perceive a centralized structure of influence in the decision making process, most stakeholders would prefer to have relationships with the actor with more (perceived) influence. On the other hand, if there is a decentralized structure of (perceived) influence, actors recognize an interdependence among stakeholders and would be more available to cooperate in a participatory process for obtaining their goals (Bobbio 2006, Elster 1998). Perceived influence could be more explicative than real power in understanding decision-making behaviors (Pruitt – Thomas 2007).

Results of the present research demonstrate that the analysis of the differences between perceived influence and real power could give decision makers information useful to understand the stakeholders' behavior, to search the opportune integrations between actors and to choose suitable methods to give everyone the due consideration.

Moreover, the results show that single stakeholders and categories of stakeholders could have a rather distorted perception of influence on decisions, and a clear vision of power distribution is not foreseen.

This kind of information combined with other qualitative and quantitative information provided by SNA can improve the participatory process, reducing possible distortions of information among the decision makers. What is clear from the Valle di Non case study is the centralized structure of the decision making, with few actors having a high level of power and a dual role in being an intermediary for particular interests and, concomitantly, an important decisional center.

Authors want to evidence that, to better manage a situation of conflicting interests and trade-offs between stakeholders' objectives, the network should be as much inclusive as possible. In particular, in the Valle di Non case study, a deeper involvement of the tourism sector actors could play an important role in conservation strategies, since tourism is known to have an important role in this field (Bookbinder et al. 1998, Gössling 1999). On the other hand, a higher power of the forest wood chain actors could affect decision towards a more intense timber harvesting scenario. In any case, an inclusive network society stimulates the debate around natural resources, allowing to increase awareness about other stakeholders' interests and facilitating shared decisions.

Concerning the adopted methodology, survey questionnaire and social network analysis gave the advantage of being simple and require a limited number of data. Limits of the method could be related to the typical disadvantages of face to face interviews such as: higher need for personnel involvement, necessity of interviewer training, higher costs of the data collection, unavailability of some stakeholders to be interviewed, incomplete answers to some questions.

Finally, it is of course necessary to point out that relations between real power and perceived influence and, in general, studies concerning relations between social network and forest management are influenced by a combination of factors and deeply rooted in the local

context. For this reason, case-study surveys offer ideas and insights that could be used to improve this field of research.

In particular, future steps of this research must be focused on alternative measures of real power through other indicators and the comparison between these indicators and SNA data.

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Simultaneous Analysis of Forest Adaptation and Mitigation

Jean-Luc PEYRON*

ECOFOR, Paris, France

Forests are impacted by climate change through trends and extreme events. They may adapt and deserve to be adapted to these gradual or brutal phenomena. They can also mitigate climate change through carbon sequestration, storage, and substitution. Adaptation and mitigation are different responses to climate change and have to be distinguished. But they are also interrelated since carbon regulation is a key for mitigation and influenced by forest adaptation. Forest adaptation and mitigation may be simultaneously analyzed through an economic model integrating, for a given forest stand, not only adaptation and mitigation but also different aspects of adaptation (trends and extreme events) and different aspects of mitigation (sequestration, storage and substitution). Such a model will be presented and discussed. It allows comparing forest management under adaptation strategies, mitigation strategies or both. Such an analysis is interesting to integrate adaptation and mitigation, and could be an example for the same issue at a more aggregated level incorporating the whole economy.

* peyron@gip-ecofor.org; 42 rue Scheffer, 75116 Paris, France

Towards a Sustainable Private Forestry: the Developments of Two Decades in Estonia

Priit POLLUMÄE* – Henn KORJUS

Department of Forest Management, Institute of Forestry and Rural Engineering,
Estonian University of Life Sciences, Tartu, Estonia

Abstract – Research on private forestry has been insufficient in Estonia and a broad overview on the processes is still missing. This paper is based on literature review and authors´ previous work in the field. We aim to analyse such developments and compare them with other CEE countries. Also we look these developments in the perspective of institutional change and sustainable forest management. The shift towards a market economy and private ownership has influenced the management of Estonian forests. If in 1993 private forests accounted only 3% from all woodlands then by 2011 this number had increased to approximately 50%. 1 million hectares of forest is owned by 97 000 private owners. We found that the management of these forests has very much been influenced by the institutional environment i.e. by the norms and beliefs but also by the legal framework. In a transition situation the sustainable management of forests comes into question.

institutional change / transition / forest owner / forest policy

1 INTRODUCTION

Estonia was occupied by the Soviet Union in 1940 which among other resulted in land nationalization. After World War II collective farms were established leaving people without rights to private land use and forest management. During the Soviet occupation, about 60% of forests were managed by the state, 38% by the collective farms and 2% by the military. All previous farm forests were managed and utilized under soviet principles. Up to 1990-es no major changes occurred in the ownership of forest resources and thus the focus of forest-related research had been mainly on forest management, silviculture and forest planning.

After regaining independence the land restitution and privatization processes began in 1993 aiming to restitute and privatize more than half the forests in the country. Together with these processes also forest industry was privatized. This new era of changed political, economical and social conditions has changed significantly the whole forestry sector in ways people often miss to notice. It has to be highlighted that these different changes have also been going parallel e.g. focusing on sustainable forest management in a transition economy with new forest owners emerging. All this gives an interesting opportunity to study these processes and their relationships.

* Corresponding author: priit.pollumae@student.emu.ee; Kreutzwaldi 5, TARTU, Estonia

The aim of this paper is to:

- give an overview and summarize how Estonian private forestry has developed during the past two decades;
- compare the different developments with other Central and Eastern European (CEE) countries;
- describe the institutional change within the forest sector with a particular focus on private forestry and;
- analyse sustainability problems of private forestry in the context of institutional change.

This study on private forestry in Estonia is based on literature review and the authors´ previous work. Research of private forestry in Estonia has previously been rather modest. It would be therefore necessary to have a broader perspective and overview about the developments. With this paper we hope that a more in depth analysis of such developments will be initiated.

2 PRIVATE FORESTRY IN ESTONIA

2.1 Re-establishment in 1990-es

Following the regaining of independence in 1991 there was a shift towards introducing private property. Regards forests and land in general this happened with the land reform. Before these processes a vast majority of the forests belong to the state and the rest to collective farms. With the land reform (issued with the Law of Land Reform (1991)) former private forests were returned to their rightful owners or their heirs. However, as Meikar – Etverk (2000) point out the transition from one economic regime to the other began already in the end of 1980-es. In addition to restitution, privatization took also place and to some extent it is still ongoing[1]. The land subject for privatization has been former private land where no claims were submitted. The land reform has been a subject of criticism as Meikar – Etverk (2000) conclude: "between 1993 and 1998 the share of private forests has risen four times, but the reform itself has developed slower than hoped". *Table 1* gives an overview on the owners of forest land in 1990-ies.

Table 1. Owners of forest land in 1990-es (from Meikar – Etverk 2000)

Year	State forest		Private forest		Total	
	1000 ha	%	1000 ha	%	1000 ha	%
1993	1969.9	97	70.5	3	2040.4	100
1994	1956.0	96	85.1	4	2041.1	100
1995	1929.6	95	110.5	5	2040.1	100
1996	1880.7	92	159.4	8	2040.1	100
1997	1829.9	90	210.2	10	2040.1	100
1998	1739.6	85	300.5	15	2040.1	100

[1] According to the Estonian Environmental Information Centre forest land subject to privatization still accounts for 14,8% of the total forest area (Keskkonnateabe Keskus, 2012).

In 1993 the first Forestry Act was put into force. Before that the Forest Code of Soviet Estonia was valid. The new act from 1993 expanded the meaning of forestry as elsewhere in Europe – forests were seen as ecosystems putting more emphasis on their protective and environmental functions (Muiste et al. 2005). Kallas (2000) indicates that the most important part of that act is that the private forestland ownership was acknowledged. An important fact is also that the legislative arrangements forbid any large scale harvesting operations on private lands which were subject to restitution but without any claims from former owners or their heirs. Meikar – Etverk (2000) highlight that for these reasons in 1997 the normal use of approximately 600 000 hectares of forests was hindered. Yet as the forest yearbook (Metsakaitse- ja Metsauuenduskeskus 2004) underlines: "*from 1993 to 1999 harvesting volumes grew rapidly*" *(Figure 1 and Figure 2).*

2.2 Rapid developments in 2000-es

By the year 2000 there was approximately 570 000 hectares of private forests accounted in the cadastral register in Estonia (Metsakaitse- ja Metsauuenduskeskus 2004) and the harvesting volumes started to balance. The goals for the 2000-es were set with the approval of the Estonian Forest Policy (1997) which among the others highlighted that due to the low profitability of small-scale forestry the state will provide assistance to enable larger forest management units by supporting forest owners' cooperation. Sustainable forest management goal was also highlighted in the Forest Policy. A new forest act was approved in 1998, yet even this act was changed 12 times until in 2007 another act was declared valid (Muiste et al. 2005).

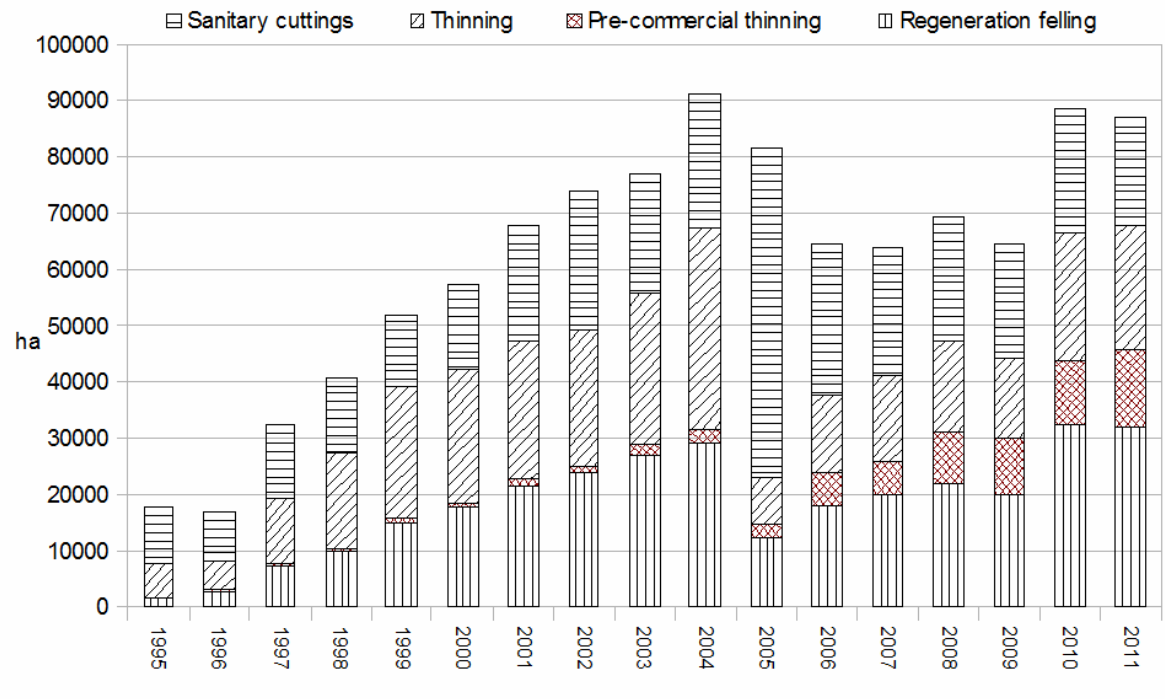

Figure 1. Felling area by felling types in private forest between 1995–2011 (source: Keskkonnateabe Keskus 2012)

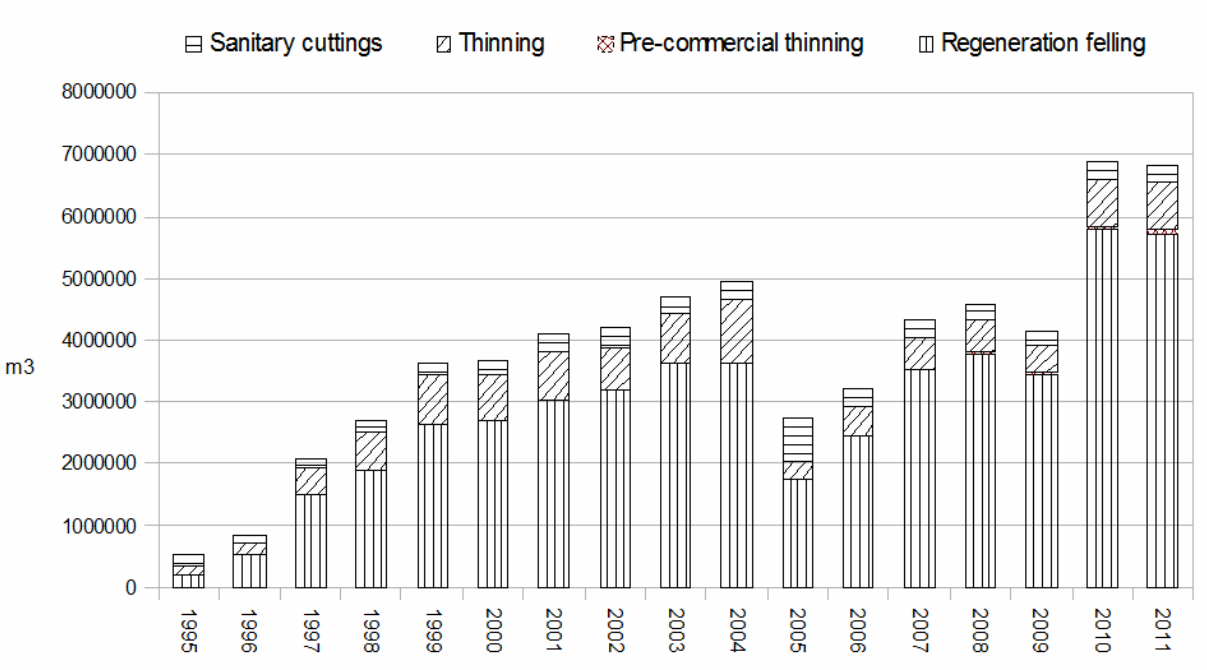

Figure 2. Felling volumes by felling types in private forest between 1995–2011 (source: Keskkonnateabe Keskus 2012)

2.3 Current status

Twenty years after regaining independence forests cover 2.2 million ha (50,6% of the total land area) in Estonia from which private ownership accounts for 45,3% (Keskkonnateabe Keskus 2012). In 2011 there were 97 272 forest owners in Estonia i.e. 4001 legal entities (companies etc.) and 93 271 private persons (Forinfo 2011). These private persons covered 74% of private forests (~750 000 ha) while legal entity forest owners covered 26% (~260 000 ha). The Forinfo (2011) study showed that an average forest holding is 10.39 ha i.e. in case of private persons 8.02 ha and legal owners 65.66 ha. The Forinfo (2011) study shows that in Estonia 55.8% of private individuals (52 000) own forest properties up to 5 ha while covering 13.5% (101 000 ha) of the total forests belonging to individual owners. Same figures for legal entity forest owners are 45.7% (~1800 owners) and 1.2% (3200 ha).

According to the Forest Yearbook 2011 (Keskkonnateabe Keskus 2013) in 2011 the total harvesting from Estonian forests according to harvesting documents was roughly 10.7 million m^3 from which ~6.9 million was in private forests (3.4 million from private individuals´ forests and 3.5 million from legal entity owners´ forests). It seems that owners with larger forest areas are more keen to take on timber sales compared to owners with smaller estates (Toivonen et al. 2005, Põllumäe et al. 2014b). It is known that even if a felling permit is issued forest owners won´t or can´t use them with a 100% success rate. This might be due to bad harvesting conditions or sudden changes in the market demand.

2.4 Examples from other CEE countries

In the EU-15 private land ownership has had a long history, but in the CEE countries it has been fragmented over a long period of time. With the thrive towards Europe and democracy the CEE countries have undergone a huge change. Privatization and restitution has been a common characteristic in all former CEE countries but the processes have differed in terms of rate and speed. The overall objective has been quite the same – to have an effective market-oriented economy which would provide prosperity.

In forestry these processes have resulted in quite huge differences between CEE countries. A quite recent UNECE (2010) study shows for example that based on reports issued between 2006-2007 Latvia, Hungary, Serbia and Slovakia had a quite balanced private-public ownership relationship of forest and other wooded land. In some cases yet, the share of public ownership still very much exceeds private ownership – Bulgaria, Czech Republic, Lithuania, Poland and Romania. In 2007 Estonian forest share was similar to the countries in the first group: the public-private forests were quite balanced (Metsakaitse- ja metsauuenduskeskus 2008). It is also important to highlight that at least in the Estonian case a significant part of forests were at that time still subject to privatization.

Also a quite significant problem in private forestry is ownership fragmentation. Niskanen et al. (2007) underlines for example that the structure of private forest ownership in many CEE countries might not be favourable for sustainable forest management. An UNECE (2010) study shows that in nine European countries[2], 86% of all private forest holdings belong to size classes of up to 5 ha and these forests cover 19% of the total reported private forest land. Comparing nine European countries – Austria, Denmark, France, Germany, Greece, Hungary, Ireland, Netherlands and Spain – Wiersum et al. (2005) found a median size of a forest holding to be 3 ha. According to Vilkriste (2005) the average size of a private forest holding is 7.2 hectares. For Lithuania Mizaraite – Mizaras (2005) indicated this to be 4.6 hectares.

The problems with forest fragmentation seems to issue be an all over Europe. One of the possibilities to overcome this problem is cooperation in forest owners organizations or cooperatives. Still it seems that this possibility us not much used e.g. Wiersum et al. (2005) found that in nine EU countries only a third of forest owners are members in specific management organizations. Lazdinis et al. (2005) gives a detailed overview about the situation of forest owners cooperatives and concludes: "*institutionalised cooperation is private forestry in Lithuania is in its initial stages*". They also indicate that the shifting interests of forest owners pose difficulties in establishing cost-effective management units. Wiersum et al. (2005) also concludes that the traditional European ways of small-scale forest management is changing and that the economic dependency of management is decreasing.

3 INSTITUTIONAL CHANGE AND FORESTRY

Within the whole transition process institutional change (i.e. rules of the game) has been taking place. The structure of the forestry sector has changed, the state had to rethink its role in the sector. Also several reforms in the forestry administration occurred touching both the management of private and public forests. New concepts were overtaken and policies were formed.

These policies are meant to direct people's perceptions and expectations towards a common goal. It is argued by Kallas (2002) that policies will produce desired results if the informal norms are complementary to the proposed rules or regulations. This in fact means that formal rules should be reflections of social norms and common understanding? It is within the New Institutional Economics (NIE) that ideology comes into light. Besides a fully working market, competition, rational actors and a transaction cost minimizing efficient decisions there are ideologies i.e. shared mental models and frameworks about the surrounding and its set-up. Schlüter (2007) concludes that to understand the process of institutional change it is important to understand the ideologies of various actors. The importance of different ideologies in forest owners decision-making is also reflected by the results of different research on forest owners values (e.g. Põllumäe et al. 2014a). Due to the strong forestry traditions, long production processes and forest ownership fragmentation institutional learning is difficult (Schlüter 2007).

[2] Austria, Belgium, Bulgaria, France, Hungary, Latvia, Lithuania, Slovakia and United Kingdom

It is Williamson (2000) who describes four different levels of social analysis within the context of NIE. The first level is formed by informal customs, traditions and religion with a frequency of 100-1000 years. The second level evolves formal "rules of the game" i.e. formal institutions (e.g. property rights) with a frequency of 10 to100 years. The third level is made of governance i.e. the formal "play of the game" with a frequency up to 10 years. The lowest level consists of resource allocation rules (prices, quantities etc.) with a continuous frequency. In these levels different theories apply and at the same time Williamson (2000) highlights that they are connected and they form a system. Forestry and forest owners operate and make decisions therefore in a very complex situation and at the same time learn about the success of different decisions. One of the most important part from this overview is the fact that the transition economies are struggling within the second level – how to get the formal rules right. Obviously this is influenced by the shared customs and traditions and also by the way people "play the game".

An illustrative example could be re-introducing private forest ownership. It is a change in how property rights are being seen and it is strongly influenced by the historical background, peoples understanding about private forest ownership (their norms). It is being constantly shaped and modified by how forest owners act and how the actions are being governed.

4 SUSTAINABILITY AND PRIVATE FORESTRY

4.1 The concept

The Bruntland report defines sustainable development or sustainability as *"the development that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED 1987). This concept has increased its importance also in natural resource management. The Sustainable Forest Management concept is very much based on the same principles. It is defined as: *"The stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, and that does not cause damage to other ecosystems"* (MCPFE 1993). Once a sustained-yield understanding has evolved to a more complex system of different forest functions and criteria with a focus on sustaining forests as ecosystems with a possibility of multiple-use. In a forestry-in-transition situation Nijnik (2004) suggests that government intervention is very important not only in terms of providing tools for an efficient timber supply, but also to complement and balance the economic function of forest management with social and environmental aspects.

4.2 Issues

During and within the past two decades many problems have risen in private forestry in Estonia e.g. low efforts to reforest or regeneration activities, lack of interest in stand development, low harvesting rates, illegal logging, fragmentation and lack of cooperation between forest owners, low institutional and financial support for forest management activities, not enough investments in private forestry, public mistrust and distorted media image of private forestry.

Urbel-Piirsalu – Bäcklund (2009) found the following socio-economic factors that influence the dynamics of private forestry:

- Forestry policy and land reform;
- Poor legislative control;
- The transitional economy in Estonia;
- The taxation system;

- Size of average forest holding;
- Urban forest owners;
- Forestry statistics.

According to the National Forest Development Programme (NFDP) until 2020 (Keskkonnaministeerium 2010) the baseline for reforestation in private forests is 20% of the total final felling area. The aim is to increase this to 40% by 2020. The main ways to improve reforestation and stand development are nowadays subsidies that are given to forest owners through the state foundation Private Forest Centre. While logging peaked in 1998-2002 nowadays the industry has to depend also on imported wood. At the same time the annual harvested volume is ~2/3 of the optimum (Keskkonnaministeerium 2010) and most of the shortage can be accounted to private forest owners´ lack of interest in forest management. There are several reasons for that e.g. high taxation, owners distance from the forest, market situation etc. Whatever external influences there are to form the forest owners decision-making it is clear that the forest owners themselves are with different values, objectives and management motives (Põllumäe et al. 2014a).

In Estonia forest owners organizations (FOA) started to develop in the beginning of the 1990-ies but the low interest (~6% of forest owners are engaged) towards FOAs is still a significant problem in the sector. Mostly FOA members in Estonia are larger forest owners who are slightly more interested in forest management (Põllumäe et al. 2014b). Cooperation between forest owners occurs usually on a voluntary basis although the state can use certain policy tools to make cooperation more attractive to owners (Põllumäe – Korjus 2012). The governments has acknowledged this problem and now this is being targeted also in the NFDP. The NFDP until 2020 (Keskkonnaministeerium 2010) puts forward ambitious goals – 500 000 ha of private forests should be covered by owners with FOA memberships (baseline 150 000 ha) and during the 10 year period these forest owners should put 5 M m^3 of wood on the market (baseline is 65 000 m^3). The possible positive effects of cross-boundary cooperation are highlighted in many studies (Kittredge 2003, Kittredge 2005, Lazdinis et al. 2005) yet cooperation between forest owners in Estonia is still in a phase of development.

Since 1993 the harvesting pace went up and illegal logging increased. Results from Hain – Ahas (2005) indicate that up to 70% of harvested timber from private forests is related to legal violations. The forest yearbook 2002 (Metsakaitse- ja Metsauuenduskeskus 2004) indicates that in 2001 1089 illegal harvesting cases were identified i.e. 141 000 m^3 of wood was cut illegally (in 2000 the respective numbers were 1681 and 170 000 m^3). The official statistics says that between 2000 and 2009 the number of offences has decreased roughly ten times (Keskkonnateabe Keskus 2012). Illegal logging and other offences have decreased significantly and are not as important compared to the early 1990-es. But still, Urbel-Piirsalu – Bäcklund (2009) conclude *´From the analysis of statistical evidence about logging and regeneration together with the clarifications received from the interviews it can be concluded that Estonian forestry is not on a sustainable path´*.

5 CONCLUSIONS

About 20 years ago private forestry emerged again in Estonia after being half a century set aside. The broken ties between people and land were once again connected and forest management was put in private hands. With a shift towards market-oriented economy the sustainable use of natural resources was also raised and new concepts like SFM were overtaken to the govern forestry.

The development of Estonian private forestry has been very much influenced by the privatization process as Lazdinis et al. (2005) conclude in case of Lithuania: *"it has been the main*

axis for change". The authors agree with Lazdinis et al. (2005) argument that the restructuring of the whole sector is really an evolutionary process. We would modify this thought that the development of Estonian private forestry as a whole has been an evolutionary process. The developments and changes have been extremely rapid and both policy makers and forest owners had to cope very quickly with new approaches. Still, 20 years later, the sector faces a number of difficulties, but most importantly, the full potential of the sector has still to be reached.

Although natural conditions are very different in all CEE countries they still share a common pattern as for their legacy of transition (Nijnik et al. 2009). They also conclude, and the authors here agree, that in CEE countries problems like fragmented ownership, lack of knowledge in SFM and in muliple-use of forests can be observed. At the same time it can be observed that compared to many CEE countries Estonian private forest holdings are in an average much larger. In fact the average Estonian private forest holding is bigger also compared to "older" European countries like France, Germany and UK. Looking at the forest owners it seems that the processes in Europe are very much the same with the number of "new" or absentee forest owners growing. With the restitution process this has happened in Estonia as well.

With the re-establishment of private forestry and the introduction to the SFM concept the management of forests changed. Private landowners started to make decisions based on their existing knowledge, beliefs and markets. The "play of the game" was very much shaped by the resource allocation characteristics since the rules were either not excising or weaker in the transition period. Within the two decades better institutions have been developed and the regulations have gone more liberal. It could be of course debated whether the current policy rules are in line with social norms or not. It seems that in many parts the NIE concept of institutional change can explain some of the developments in Estonian private forestry. Yet it would require a more in depth analysis.

Many of the sustainability issues that have raised during the two decades are rather similar in many CEE countries. If we look at the different problems in the frame of NIE institutional change we see that some of them can be quite well explained. For instance illegal logging which was a major problem in the beginning of 90-ies. Due to the hard economic conditions of the transition and very weak rules and regulations the (illegal) markets pushed for logging. All this resulted in public mistrust and distorted media image of private forestry which is still a problem the sector has to deal with. It could also be argued that due to the Soviet occupation many forest owners distrust cooperatives and therefore won´t participate in associations. Also these sustainable problems could be analysed more thoroughly in the future.

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Entrepreneurship Development of Non-Timber Forest Products in the Republic of Croatia

Stjepan POSAVEC[a*] – Karlo BELJAN[a] – Ana FORNAŽAR[b]

[a] Department of Forest Inventory and Management, Faculty of Forestry, University of Zagreb, Zagreb, Croatia
[b] Research Centre for Other Forest Goods and Services 'Josip Resel', Croatian Forest Research Institute

Abstract – The forestry branch, with small- and medium-scale enterprises (SMEs) plays an important role in rural development, recreation and forest-based tourism activities. According to FAO, non-timber forest products consist of goods of biological origin other than wood derived from forests, other wooded land and trees outside forests. Of particular importance for rural population are mushrooms, medicinal and aromatic plants, berries and herbs. They provide an additional forest value and potential for the development of new forest products and services. The aim of research was to analyze the added value chain for NTFP, cooperation between pickers and processors, and determination of key drivers and obstacles for the development of the NTFP market in Croatia. Research included 27 SMEs as Non Timber Forest Products processors. The amounts collected per one enterprise were on average 16.5 tons/year of mushrooms, 153.5 tons/year of aromatic and medicinal plants, and 2.2 tons/year of berries and other fruits. The legal framework is not conducive to the business environment due to high prices of the licence to collect (annually) issued by the Ministry of Nature Protection and market fees. The main obstacles for the development of the national market include unfair competition, lack of education (NTFP collecting and processing) and an undeveloped national market.

non-timber forest products, small – medium enterprises, rural development

1 INTRODUCTION AND PROBLEM MATTER

For the purpose of this research, non-timber forest products are defined as natural products (excluding animal or wood-based products) collected from more or less managed forest resources and, in some cases, with a proportion harvested from cultivated sources (FAO 1995).

More than two billion people around the world depend on non-timber forest products (NTFPs) for food, shelter, medicine, fuel, and cash income. Despite their importance for sustaining rural livelihoods, alleviating rural poverty, biodiversity conservation, and facilitating rural economic growth, NTFPs have not received the sustained and systematic support given to conventional agriculture and forestry. Instead, they remain largely neglected by national and local government development strategies and donor priorities, and are often overlooked by the formal private sector. Where markets for NTFPs do exist, informal trade

[*] Corresponding author: sposavec@sumfak.hr; Svetošimunska 25, P.O.BOX 442, 10 002 ZAGREB, Croatia

has in many cases led to over-harvesting and to opaque trading structures and inefficient markets. According to the latest Forest Resource Assessment (2010), 720 kg of honey, 5 000 kg of mushrooms boletus sp., 5 000 000 kg of fodder (hay) and 10 000 kg of raw material for medicine and aromatic products were collected annually in Croatia. Data for the NWFP category "fodder" are estimated because there is no reliable data on the quantity and value of removals. This category also includes grass and wild herbs that grow in small forest clearings. Data for NWFP categories "food" (mushrooms, honey) and "raw material for medicine and aromatic products" are also estimated because there is no reliable data on the quantity and value of removals.

Forests in Croatia are characterized by extremely high species richness. The wealth in terms of biodiversity is mirrored in the abundance of Non-Timber Forest Products (NTFPs) collected from the forests by local populations. Among the NTFPs, mushrooms, medicinal and aromatic plants, berries and herbs stand out as of particular importance - both in terms of subsistence value and potential for generating cash income at a village level. Little is known about the functioning of local NTFP markets. For this reason, research into local and regional markets, marketing patterns, problems and opportunities is both timely and important. Primary products such as NTFPs are linked to final consumers through so-called value chains. A value chain describes a full range of activities required to bring a product or service from conception, through the intermediary phases of production (transformation and producer services inputs), delivery to final consumers and final disposal after use (Kaplinsky, 2000). A value chain links the steps a product takes from the farmer to the consumer. It includes research and development, input suppliers and finance. The farmer combines these resources with land, labour and capital to produce commodities.

Forest management is still traditionally oriented and focused on timber. The main income sources are derived from fuel and technical wood. Even so, forestry and the wood industry branch contributes to the national GDP with 1.4% (Annon 2012).

Local, regional, national, and international trade of NTFPs can significantly contribute to community and household economies in this region. As a result, marketable NTFPs can provide an important means for economic growth and sustainable forest management in local communities. However, there is not enough information about NTFP collection, utilization, and entrepreneurship in the country despite their great potential and positive effects on communities and households. An increasing pressure was placed on forestry when countries started to search for economic benefits from their natural resources. Timber productivity as the most important income has been studied extensively, but NTFPs have not been studied despite their evidently high value and diversity. The overall goal of research was to analyze the organization and cooperation within the value chain of NTFPs and their commercialization in the Croatia. In order to achieve this, the paper has the following objectives:

- Determine the quantities of NTFPs
- Determine the importance of key individuals in driving entrepreneurship in the market for NTWPs;
- Determine the extent of the organization and cooperation among the actors within the NTFPs value chain.

Entrepreneurship has typically been defined as an action, process, or activity. This involves a number of aspects such as social acceptance of entrepreneurial behaviour and individuals who are willing to take the risk of creating new firms and capital activity to share risks and benefits involved. Hence, entrepreneurship capital reflects a number of different legal, institutional, and social factors and forces. Taken together, these factors and forces constitute the entrepreneurship capital of an economy, which creates a capacity for entrepreneurial activity (Storey 2003). Thus, entrepreneurship capital manifests itself in the

creation of new firms. David Audretsch and Roy Thurik (2004) state that entrepreneurial capital can contribute to growth and development by injecting diversity and serving as a conduit for knowledge spillovers, leading to increased competition.

The role of enterprises and entrepreneurship in economic development is likely to increase in the future because of the limited possibilities to expand public sector activities in most European countries. Especially in the forest sector, small- and medium-scale enterprises (SMEs) play a central role in the employment of people in local processing, recreation and forest-based tourism activities. SMEs have an advantage of being able to use local knowledge and locally available material and resources in their production. Furthermore, business opportunities in local forestry-wood-processing-chains, if innovative and competitive also in exogenous markets can bring the highest added value to rural areas and closer to the origin where trees are growing. Essential for the success of local forest-based enterprises e.g. wood and non-wood processing industries is to find suitable market niches, build new innovations and have good business management competency. Non-timber forest products (NTFPs), which include all biological products other than timber, are a traditional source of household income in rural areas. They provide an important means for economic growth and sustainable forest management in local communities.

2 MATERIAL AND METHODS

2.1 Object of research

Non-wood forest products and services comprise different forest fruits, mushrooms, handicrafts from wooden and non wooden material, and especially social services such as recreation, tourism, hunting, etc. (Sabadi et al. 2005, Vuletić et al. 2009). The maximum NTFP quantities that can be collected over a year are determined by the State Institute for Nature Protection. The Ministry of Environment and Nature Protection in Croatia issues a licence for the collection of wild plants and their parts for the purpose of processing, trade and other transactions. In forests managed by the company "Hrvatske Šume" Ltd, NTFPs can only be collected with a licence issued by a forestry office. A collection fee is also charged. This refers to collecting mushrooms, chestnuts, asparagus, truffles and other forest products. Recreational collectors of above-ground mushrooms are obliged to pay 50, 100 or 200 kuna to the nearest forest office, depending on whether they use a daily, weekly or monthly licence, whereas licences for other products are calculated according to quantity. The fee for chestnuts picked in state forests is 5 kuna per kilogram, while a bunch of asparagus or black bryony is 10 kuna. These products are picked free of charge in hilly-mountainous areas.

Estimated values (for the FRA 2010) are the medium market values: honey 15 HRK/kg, mushrooms 40 HRK/kg, hay 0.75 HRK/kg, raw material for medicine and aromatic products 1 HRK/kg, other edible animal products 50 HRK/kg. Values for Christmas trees, forest seeds, trophies and wild meat are calculated on the basis of actual market values.

More intensive use of non-wood forest products and services could be an opportunity for the development of small and medium entrepreneurships which can foster economical development in rural areas.

Tannin used in industry is produced from oak, spruce, willow and alder bark, and from oak wood and especially chestnut wood. Resin harvested from pines, larches, firs and spruces is a very interesting industrial material, and so is tannin contained in the cones. In Croatia, resin was harvested from black pine, Scots pine and Aleppo pine. Plants that contain medicinal substances are used in the pharmaceutical industry and plants that contain essential oils (needles, cones) are used in the cosmetic industry. Certain plants are used for pesticide production. In Croatian forestry, linden is the source of bast fibre. Wicker willows, cork oak (cork) and reed are also widely utilized. Walnut, hazelnut, chestnut, raspberry, blackberry,

cornelian cherry, rosehip fruit, and others are used for human food. Mushrooms are particularly important as food. In rural homesteads fruits of forest trees (acorns, beech nuts, etc.), as well as browse and leaf litter, serve as food for livestock. In addition to industrial processing, medicinal plants are also used in popular medicine. Forest honey is an important substance serving as food and medicine.

The company "Hrvatske Šume" Ltd, issued a Regulation on Secondary Forest Products and a Regulation on Truffle Collection, which stipulate their use in accordance with the Forest Law (2005), the Nature Protection Act (2013) and the "Hrvatske Šume" Statute. According to the Forest Planning Regulation, the use of secondary forest products includes grazing, browsing, feeding on acorn, collecting mushrooms and medicinal plants, picking seeds and fruits, collecting frogs and snails, using sand, gravel and stone, and utilizing humus and clay. Apart from the Forest Law (2005) and Nature Protection Act (2013), this area is also regulated by the Ordinance on Cross-Border Transport and Trade in Protected Species (2009), Ordinance on the Collection of Protected Wild Growing Plants for the Purpose of Processing, Trade and Other Reasons (2008), and Ordinance on Mushroom Protection (2002).

2.2 Methodologi

Primary data were collected through a survey with two different semi-structured questionnaires, one for companies active in the field of NTFPs (buyers, processors and traders) and one for pickers (collectors) in the field. The necessary data were collected over a period of two to three months, starting from May to September 2012. The semi-structured questionnaires for companies gave important answers and information, such as: types of NTFPs a company is dealing with; the market for the products (national or international (export); the interviewee's opinion of the stability of NTFPs markets; cooperation with local population and evaluation of the cooperation; the average prices per NTFP (buying/selling); identifying the main problems in business (process of NTFPs buying, selling, trading); capacity of the company and percentage of capacity utilization; use of marketing tools (PR, Advertising, Branding) (to determine the most successful, the importance of marketing tools); business environment and cooperation with other companies (private, state), documentation necessary for the process (buying, selling, exporting, processing etc). The collected data were processed with statistical program for data processing – SPSS.

For the purposes of this research, non-timber forest products are defined as natural products (excluding animal or wood-based products) collected from more or less managed forest resources and, in some cases, with a proportion harvested from cultivated sources.

Value chain analysis is a methodology that differs from other market chain analysis methodologies, such as the chain analysis advanced by Porter (1985, 1996).

For this purpose the basic characteristic of a value chain was market-focused collaboration: different business enterprises work together to produce and market products and services in an effective and efficient manner. Value chains allow businesses to respond to the marketplace by linking production, processing and marketing activities to market demands. Vertically aligned means that companies are connected from one end of the primary production process (e.g., farmer’s field), through processing, and possibly into the final marketing stages where consumers purchase a finished product. At each stage the product value increases. This is different from other types of alliances, such as the collection of agricultural producers consolidating supply, which would be considered a horizontal alliance, because in a value chain the value added to the product is acknowledged. Normally, the term value chain is applied when vertical alliance includes three or more companies, known as links, in the supply chain.

3 RESULTS

The total number of respondents was 27: the youngest respondent was 27 years old and the oldest was 66 years old. Their mean age was 48.19 years. The majority of the respondents were female (55.6 %), and their companies were mostly situated in cities. The education level was very interesting: 44% of the respondents were academically educated. As many as 74% of the respondents were also company owners. The mean number of employees in the companies was 11.44: the minimum number was 1 employee and the maximum was 130 employee. The mean number of seasonal workers employed was 12.86. The minimum seasonally hired worker was 1 and the maximum was 150. The mean number of working hours per year in this sector was 14. 9630. The minimum number of working years was 3 and the maximum was 45 years. All but one of the researched companies have dealt with NTFPs since their establishment. The main activities of the companies involve mushrooms (24%), aromatic and medicinal herbs (39%), berries and other fruits (37%).

As a type of supply processors are equally satisfied with different supply types (own buying places (8%), use other buying places (4%), pickers come in our company (31%), own picker list and contact them (24%), village visit (33%).

The main reasons for buying NTFPs are trustworthiness and reliable norms of behaviour, as well as mobile communication and cooperation; on the other hand, the fact is that customers may wait for a month for get paid. More than 50% of the respondents use their own cars or vans for transport. The mean distance from the company to the buying points is 63.67 km, with the minimum being 1 km, and the maximum 300 km. The mean number of people/companies that the processors cooperate with is 55.11, while the minimum is 1, and maximum 800. The highest mean value of buying (7.98/kg) and selling price (12.59/kg) is for mushrooms and the lowest is for berries and other fruits (3,893/kg). The maximum value of buying (20/kg) and selling (27/kg) price is also for mushrooms (20/kg). Cash is the most frequent (more than 70%) method of payment. The average prices per NTFPs are shown in *Table 1.* As expected, mushrooms have the highest price on the market.

Table 1. Average buying and selling prices (EUR/kg)

	Mushrooms		Aromatic and medical herbs		Berries and other fruits	
	buying	selling	buying	selling	buying	selling
Mean	7.98	12.59	5.79	8.44	3.89	7.253
Minimum	2	3	1	2	0.5	2
Maximum	20	27	13	15	13.5	20.2

The majority of the processors (81.5%) did not change the price of a product in the past year. The main problems of buying include lack of buying points and high price of NTFPs. The important activities which influence selling price are packaging and their buying price. About 74% of the processors export their products.

The stability of the NTFPs market received the mean grade of 2.38. According to this mean grade, the respondents evaluate the market of NTFPs as not stable (5-very stable).
Well developed distribution channels and familiarity of the product/ name (brand) rank among important marketing tools. The respondents chose branding as the most important marketing tool.

Table 2. Average NTFP margin for a company

NTFPs margin (Eur)	mushrooms	herbs	berries
Mean	4.61 (57%)*	2.65 (45%)*	3.36 (86%)*
Minimum	1	1	1.5
Maximum	7	2	6.7

*margin percentage increased

Mushrooms have the highest buying and selling price on the market. Aromatic and medical herbs coming second (Table 1). Payment in cash is the exclusive method on the market. The price for mushrooms is 57% higher, for aromatic and medical herbs 45%, berries and other fruits 86%. Although berries and other fruits have such a rapidly valued added price, their selling price is very low (7.23 Euro/kg) (Table 2).

Since marketing tools are insufficiently developed, the majority of the respondents did not answer or did not specify their answers in this part of the survey. For example, marketing tools are described as a good factor but respondents are not aware of its importance. If the respondents had financial means, they would invest in direct communication, advertising on TV and radio, branding and newspapers. More than 11% would invest in marketing in order to gain more profit. Almost half of the processors (48%) offer training courses to the pickers, and 81.5% have a web site.

The capacity of a company for mushrooms is 16 479.23 kg on average, for aromatic and medicinal plants 153 555 kg, and for berries and other fruit 2206.67 kg. The average percent of utilization is around 50 % (Table 3).

Table 3. Company's average capacity and utilization percentage

	Mushrooms		Aromatic and medicinal plants		Berries and other fruits	
	average capacity (kg)	average utilization (%)	average capacity (kg)	average utilization (%)	average capacity (kg)	average utilization (%)
	16479.23	51.77	153 555	49.65	2206.67	59.40
Maximum	140 000	90	1 500 000	100	15 000	100
Minimum	30	10	45	5	30	5

3.1 Entrepreneurship environment

Inadequate legal framework and unfair competition form a bad business environment. Cooperation between the processors and other enterprises (both private and public) is at a high level (85.2%). Of these, 25% cooperate with "Hrvatske Šume" Ltd., 33.3% with the Ministry of the Environment and Nature Protection and 55.6% with the Ministry of Agriculture. As many as 52% of the respondents point out subsidies as the most important benefit of cooperation with the Ministry of Agriculture. 55.6 % of the respondents find that the amount of necessary documentation is too large, while 51.9% think that time spent on collecting the necessary documents is reasonable.

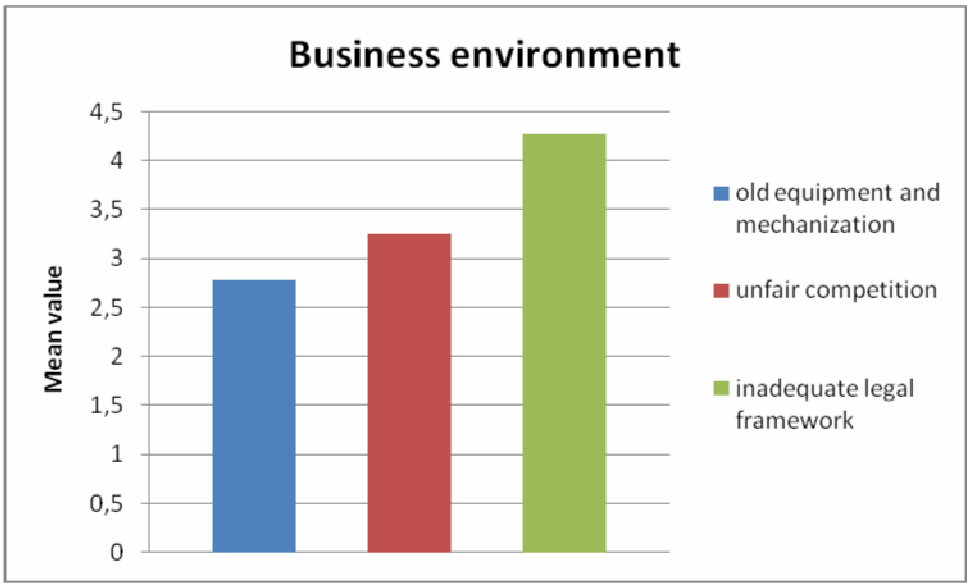

Figure 1. Business environment overview

Rising prices for the NWFP on the European market, growing demand, resource rents as qualitative natural resources with close to nature forest management are possible drivers for production of NTFP.

Some of the barriers for the local entrepreneurs are investments in technology, human resource skills, needs for improvements in organisation and marketing issues such as advertising, labelling and branding. According to the respondents, the main obstacles for development of national market are: unfair competition, lack of education (NTFP collecting and processing) and undeveloped national market.

3.2 Added value chain for mushrooms

A value chain is an alliance of enterprises collaborating vertically to achieve a more rewarding position in the market (Barnes 2004). A value chain is one of the key concepts of strategic management. Successful management with primary and support activities results in a difference between the value of products sold and the costs needed for their production.

According to Porter (1996), primary activities include: input supply, production, marketing and sale, and service delivery. Support activities include input procurement, research and development of new products and services, human resource management, administration and infrastructure. Margin shown in the value chain is a difference between the total value and total costs of performing the primary and support activities (Porter 1996).

A value added chain was analyzed on the example of secondary forest products - mushrooms.

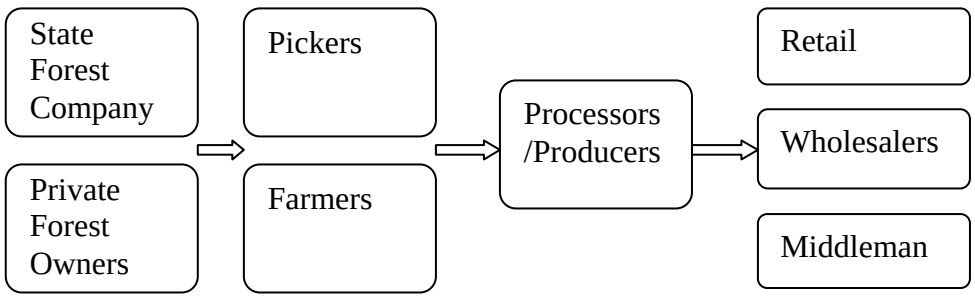

Figure 2. Added value chain scheme

The company "Hrvatske Šume" apply the Forest Law (2005) through their forest administrations and offices. The Forest Law contains special regulations concerning picking mushrooms. This Law is based on a conventional forest management method and fully complies with the European Union directives. A part of the Law closest to the European Union relates precisely to the use of forests, wooded land and products. The Regulation on Mushroom Protection, passed by the State Administration of Nature Protection, stipulates who, when and where has the right to pick mushrooms. Commercial pickers, after paying an annual or monthly membership, are issued a card by the Ministry of Nature Protection and Spatial Planning, which allows them to pick up to ten kilograms of mushrooms, whereas pickers who collect mushrooms for their personal use are limited to two kilograms.

Pickers: Picking is seasonal labour that takes place during the vegetation period (May - September). Pickers usually come from the ranks of poor, socially endangered groups. It is often the case that families have no other source of income other than the one generated from collecting and selling plants. Nevertheless, the number of people interested in collecting plants is significantly decreasing. Pickers usually perform the initial (basic) drying and cleaning, and only rarely cutting the plant material, before selling it.

Farmers (OPG): Farmers usually cultivate medicinal plants on the basis of a contract made with a known buyer. This refers particularly to organic production, where farmers must be registered and must document the entire production process (in accordance with the standards of organic production).

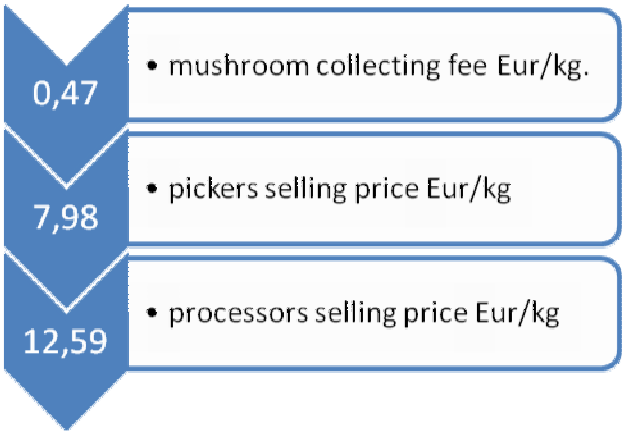

Figure 3. Value added chain for mushrooms

The average mushroom collecting fee in the Republic of Croatia is relatively low and amounts to 0.47 Euro/kg for all mushroom species. Collecting permit is issued for the quantity and not for mushroom species. Processors who as a rule buy mushrooms from pickers in the form of raw products pay about 8 Euro/kg on average (Figure 3). After processing, the market price of final mushroom products is 12.5 Euro/kg on average. A three-degree value added chain increases the value of the product multiply through the process of collecting and processing.

Processors/Producers: companies that perform initial processing of raw material or perform more complex processing of medicinal and aromatic plants - blends of herbal teas (loose tea or tea bags) and teas in tea bags, produce and manufacture cosmetic and pharmaceutical products and different types of food. Production is usually limited to drying, cutting and extraction of essential oils, with the exception of several large companies which also produce the already mentioned final products. In most cases, activities of producers and processors include further processing, packing, product design and development, sale, market linking (they own drying facilities and equipment).

Retailers place their products on domestic markets, while wholesalers participate in the international market. The middleman acts between pickers, farmers and buyers or between domestic and international markets.

Differences in prices at different levels of value chains for mushrooms, and medicinal and aromatic plants are significant. Pickers pay on average about 1- 2 €/kg of delivered plant material. Retailers achieve the highest price, whereas the retail price is much higher than that paid to the pickers. In 2014, for example, a kilogram of dried mushrooms is about 40 Euro/kg.

The majority of the interweaved entrepreneurs are a part of the distribution channel: Supplier (pickers) - Processor (enterprise) -Wholesalers - Retailers - Consumers.

4 CONCLUSION

The development of entrepreneurship with secondary forest products in Croatia is conditioned by the legislative environment and the problems of establishing a legal market of these products. However, the greater the barriers to the entry, the higher the level of profitability.
Due to difficulties of controlling the use of natural resources over a large area, there is fear of overexploitation and destruction of some secondary forest products habitats. Entrepreneurs do not have sufficient means to invest in improving the sale and modernizing production. Insufficient investment in certification and branding results in unstable product quality. For the purpose of control and supervision of sustainable management and protection of forests as one of the most valuable natural resources, the company "Hrvatske Šume" Ltd have since 2010 been accredited under the norm HRN RN 45011:1998 to carry out expert supervision of organic production on the basis of the approved certificate.

In view of the above and with the goal of improving the quality and quantity of production of secondary forest products, several Key Successful Factors (CSF) should be defined and developed: (a) undertake better control of quality and compatibility with (international) standards; (b) improve product quality; (c) increase the supply of necessary quantities; (d) set competitive prices; (e) pack and label the products adequately; (f) ensure reliable delivery; (g) perform professional business; (h) invest in marketing; and (i) develop the image of the country of origin.

NTFP Value chains are governed when parameters requiring product, process, and logistic qualification are set which have consequences up or down the value chain encompassing bundles of activities, actors, roles, and functions.

On the other hand, efficient government policy makes it easier for the firm to construct economic rents by providing better access to human skills, and better infrastructure and more efficient financial intermediation than in competitor countries. In this case, a government may protect producers from unfair competition, not just through firm-specific policies such as import-controls, but also through factor-specific policies such as controls on illegal market.

Climate changes, e.g. drought, changes in vegetation and loss of some habitats significantly affect the decreased quantity of the collected NTFPs. Only those producers who have their own controlled cultivation may supervise production and ensure the necessary quality of their products. In these cases, however, they are faced with a problem of procuring high quality seeds and planting material. Although the importance of secondary forest products as a part of forest ecosystems and their effect on sustainable forest management have long been recognized, the obtained results indicate the need for further research into how much these products affect the economic, ecological and sociological aspects of rural development of the country and its population.

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Forestry and Agriculture in Agrarian Commons

Tine PREMRL*

Slovenian Forestry Institute, Ljubljana, Slovenia

We are presenting some of the results obtained during the analysis of agrarian commons (AC) in Slovenia. Who presents a new forest owner type? Research includes the results of three meetings with AC in different regions with a different main land use and geographical landscapes: Alpine mountains with mountain grazing activities, Pannonia plains with agriculture, and Mediterranean plains with forestry focus in AC. We are presenting some of the common features of AC in selected regions. We find that in Slovenia there are 547 AC which were re-established on 77,486.47 hectare of land after reinstitution in 1994. Their territory representing 3,67% of Slovenia. Until nowadays previous land use models is the most preserve in Alps mountain region. We have also included comments about the relationship to the material benefits of membership related to members' status especially interesting in »forest commons«.

* tine.premrl@gozdis.si; Večna pot 2, 1000 LJUBLJANA, Slovenia

An Integrated Optimal Rotation Length Model for Wind-Throw Risk in a Changing Climate: New Tools for Adaptation in Forest Management

Vadim SARAEV* – David EDWARDS

Forest Research, Midlothian, Scotland, UK

Currently around 50% of all primary damage by volume to European forests is attributed to extreme weather events. In UK the frequency of storms is expected to increase under climate change. Yet the forestry sector has limited access to economic models that inform decisions around wind-risk management alongside the delivery of multiple ecosystem services. This paper describes the development of an optimal rotation length model that accounts for timber production, carbon sequestration, and wind-risk at forest stand level. The approach combines empirical yield and wind-risk models with information on prices, costs and interest rates to maximise economic return. Its application as a decision support system is being tested through in-depth social research in 'live' decision-making contexts with public and private sector forest planners and policy-makers in Scotland. The model will inform felling and restocking decisions under current and potential future framework conditions, in particular changes in timber and carbon prices, and wind-risk under alternative climate change scenarios.

* Corresponding author: vadim.saraev@forestry.gsi.gov.uk; Northern Research Station, Roslin, Midlothian EH25 9SY, Scotland, UK

Historical Relationships between Communal Forests and Small-Scale Private Forests in Japan

Noriko SATO*

Department of Agro-Environmental Sciences, Kyushu University, Fukuoka, Japan

Although market economy rests on the premise of private property ownership, in Japan, there remain communal forests (Iriai) from pre-modern times. In recent years, these forests have been drawing attention in their role as "Commons." Previous studies, however, have focused mainly on the customs and systems in the traditional use and have not adequately explored the relevant social structure. Therefore, this study conducts a historical examination on the relationships between communal and small-scale private forests. In the process of modernization in Japan, communal forests were incorporated into government-owned land at the national and local levels – to strengthen the financial base – and land allocation to the communal members was promoted. Many communities, however, still hold communal forests and altered forests of Iriai origin. Recently, these forests have been positioned as a core asset that can be used to consolidate thinning practices among owners of small-scale private forests; they also form a platform for interactions among generations, which strengthen the community identity.

* sato.noriko.842@m.kyushu-u.ac.jp; Fukuoka, 812-8581, Japan

Chances of Small-Scale Utilization of Non-Wood Forest Product s under Changing Political and Economic Conditions in China

Julia SCHMITT[a*] – Volker HOFFMANN[b]

[a] Forest Economy, Forest Research Institute of Baden-Württemberg, Freiburg, Germany
[b] Institute of Social Sciences in Agriculture, Hohenheim University, Germany

Abstract – Following agriculture reforms, China has implemented a large-scale redistribution of forest tenure rights, from communal management to individual households. Additionally, through government reforestation and land conversion programs, large areas of young forests have been established. They are rarely managed for timber, but provide income for forest owners from non-wood forest products (NWFPs), e.g. bamboo, mushrooms and medicinal plants. A study on the local, national and international NWFP value chains analyzed income generation opportunities for small-scale NWFP collectors. The analysis concludes that long-running, local, and uncontrolled value chains with low quality demand provide collectors with moderate income, while adequate processing skills enable them to access markets and to generate higher revenues by integrating processing. Contrary to that, newly-developed, high-price or international value chains have high barriers to entry, due to strict requirements in quality and food safety. However, their growing market share could, as a result of increasing consumer demands in food safety, provide sustainable and high income for small-scale collectors in the future.

Non-Wood Forest Products (NWFPs)/ China/ Value Chains/ Agroforestry

1 INTRODUCTION

Rural areas in China have undergone dramatic changes in the last decades, affecting around 70% of the population in China. Still, between 700 and 900 million people live in the countryside. Agriculture accounts for almost 15% of GDP and half of all employment, even though, only 10.2% of China's land area is suitable for agriculture (Tso, 2004). Furthermore, the average size of land holdings per household is only around 1/3 hectare, (Diao et al. 2000, p. 2) and is constantly shrinking for industrial areas, growing towns and due to environmental destruction (Lichtenberg & Ding 2008, p. 63). Consequently, China faces a huge challenge to secure food production and improve living conditions for its farmers. As a result, additional income generating activities, such as forestry, is essential for the rural population. This is especially true in the mountainous western provinces of China, where the share of agricultural land is lower and the share of forest land per person is considerably higher than the national average (Shi et al. 1997, p. 14).

[*] Corresponding author: Julia.Schmitt@forst.bwl.de, Wonnhaldestr. 4, 79100 Freiburg, Germany

While agricultural land was redistributed for individual management after 1978, forests remained partly collective until the revised Forestry Law of 1998, which granted private management of forests in the form of the so-called Contract Responsibility System, CSR (Miao & West 2004, p. 283). Yet, while the implementations of this law, as well as management practices are very different regionally (Weyerhaeuser et al. 2006, p. 375), 80% of the collective forests in China have been managed individually by 2003 (Hyde et al. 2003, p. 10). Until 2010 *"the world's largest redistribution of forest tenure rights"* allocated the majority of public forests for individual or village use (The World Bank 2010, p. 8).

Following the changing forest policies, tenure arrangement and management objectives, China's forest area and its quality have transformed radically. After a period of massive deforestation, the Chinese government has implemented several large-scale, inter-regional forest programmes. The largest of these programmes, in terms of scope and funding are the Natural Forest Protection Program (NFPP), the Program of Conversion of Cropland to Forest (SCLP), Three-north Shelterbelt Development Program and the Shelterbelt Development Program along the Yangtze River Basin (SFA, 2004). They mainly include the following activities:

(1)A logging ban in natural forests in the upper and middle reaches of the main rivers,

(2)The afforestation and closure of mountains and volatile lands (deserts), and

(3)Return of converted forestland to forestry. (SFA 2002, 13).

In the last 30 years, the establishment of over approx. 100 million ha of new forest area has been reported (SFA, 2005). This area was mainly completed with plantations from Chinese spruce, pine, larch, poplar (clones) and eucalypt in which biodiversity and its associated environmental services are minimal. This, however, is particularly important, as the poor rural population not only depends on timber, but also on a divers set of NWFPs, which "*are tied to the diversity of natural forests"* (Rozelle et al. 2000, p. XVIII).

This has created large areas of mostly young forest stands, with the unbalanced age structure leading to the fact that *"forests available for harvest are rather limited"* (Wang et al., 2004). In addition, regionally different and sometimes unclear harvest rules and quota prevent farmers from managing their forest for timber (The World Bank, 2010, p. 15).

In this situation non-wood forest products (NWFPs), such as bamboo, mushrooms and medicinal plants can provide returns from the forest on an interims basis. NWFPs have traditionally served as subsistence food, cash crops and as a 'safety net' for the rural poor, who cannot sustain their livelihood with agricultural production alone. They are especially important in China, where the utilization has a long history and markets are well established. China is the largest NWFP producer, processor and trader in the world, with millions of small-scale farmers participating in these value chains. In addition to wood products, NWFPs have an important value in the Chinese economy: In 2003 the export value was $4.139 billion (SFA, 2004), making China the world's leading exporter for NWFPs (Burgener 2007, p. 8). Within China, NWFPs have a high importance in the diet and health care of the rural population, with a high share of the collection and consumption conducted for subsistence that never enters the official statistics (FAO 2002, p. 49).

NWFPs can be collected from the wild or produced in the understory or in combination with growing forests in agroforestry systems. Examples of these are the black fungus, Mu Err (*Auricularia auricular* and *polytricha*), which grow on decaying trunks or wood chips in the forest. Different bamboo species provide bamboo shoots or building and crafting materials. Medicinal plants, such as Thorowax (*Bupleurum chinense*) or Astragalus (*Astragalus membranceus*) are perennial herbs, naturally distributed in forests in northern, central and eastern China. Various vines, such as Jiaogulan (*Gymnostemma pentaphyllum*) grow in the understory of natural forests in southern China.

Based on these possibilities for small-scale forestry in rural China, this article is concerned with the extent to which farmers are able to participate in and benefit from involvement in different NWFP value chains.

2 STUDY SITES

In the framework of a Sino-German research project between the Chinese Academy of Forestry (CAF), the World Agroforestry Centre in China (ICRAF-China), Freiburg University and Hohenheim University, the value chains of wild vegetables, bamboo shoots, Mu Err mushrooms, and three medicinal plants were analyzed. Two study sites (see *Figure 1*) cover temperate, subtropical and tropical forests in China. Semi-structured questionnaires were used to gather qualitative and quantitative information from households, supplemented with expert interviews, participant observations, and market surveys.

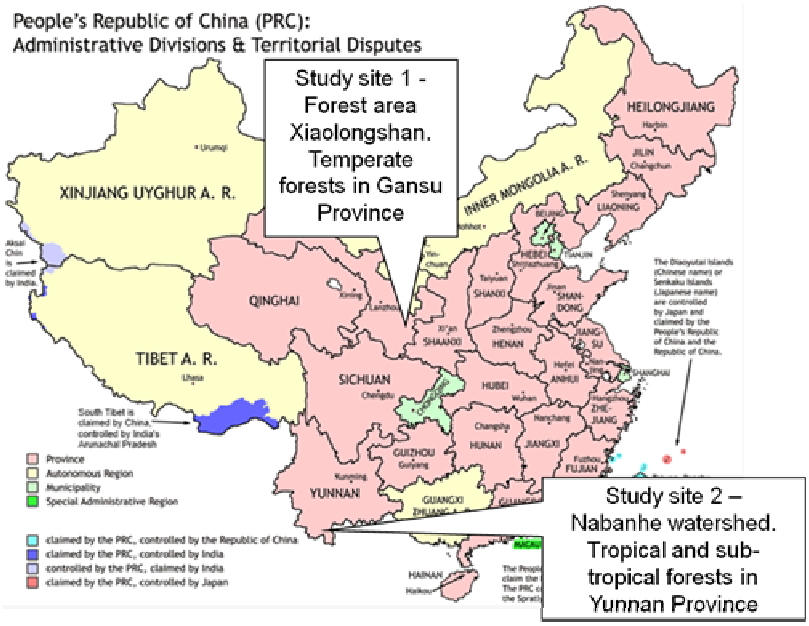

Figure 1: Map of China with the two study sites
Source: http://en.wikipedia.org/wiki/File:China_administrative.png

3 METHODS

Value Chain Analysis and the Sustainable Livelihood Approach provide the theories and tools to describe and evaluate existing NWFPs value chains.

The Value Chain Analysis as described by Kaplinsky & Morris (2001) looks at inter-linkages in a production network, uncovering distribution patterns, dependencies and inequalities in income generation by identifying actors, product flow, spatial distribution and mapping the value chains. Analysis of internal governance and value adding served to clarify dependencies, coordination and power distribution between value chain actors, while the study of external governance revealed the institutional framework of NWFP trade.

According to the Sustainable Livelihood Approach (DFID, 1999) the livelihood of a farmer is built up on different forms of capital, which are mediated by the institutional setting within which they are deployed, see *Figure 2*.

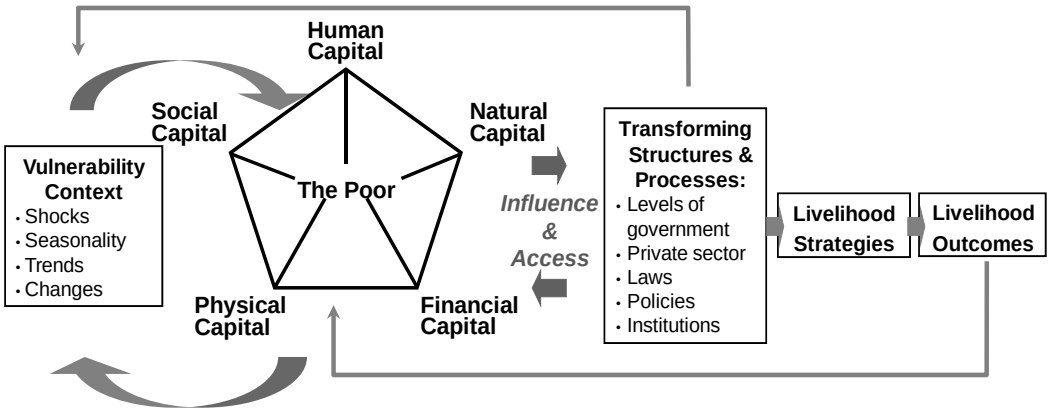

Figure 2: DFID's Sustainable Livelihood Framework (adapted after DFID, 1999)

Each capital provides opportunities for rural producers to adopt certain livelihood strategies that determine livelihood outcomes. They include the Human Capital (knowledge and skills to collect or process NWFPs), Natural Capital (ecological sustainability control of forest resources), Financial Capital (income, farm gate price range, farmers' share of revenue), Physical Capital (collection and processing facilities, processing technology, infra-structure), and Social Capital (social recognition within the community for collecting NWFPs or the connection with traders). The Sustainability/Vulnerability context was analyzed by looking at the stability of value chains, price development, and seasonality of NWFP utilization. All parameters were ranked in a three unit scale.

4 RESULTS

4.1 Value chain analysis

Results of the value chain analysis show that wild vegetables, bamboo shoots, Mu Err mushrooms, and medicinal plants from small-scale farmers in China go to local, national, and international markets.

Local value chains go from the collector or producer (small-scale farmer), sometimes through intermediate traders, to local farmers' markets in small towns, villages, along roadsides, as well as restaurants and shops. Products can be sold on local markets by market traders or directly by farmers, illustrated in *Figure 3.*

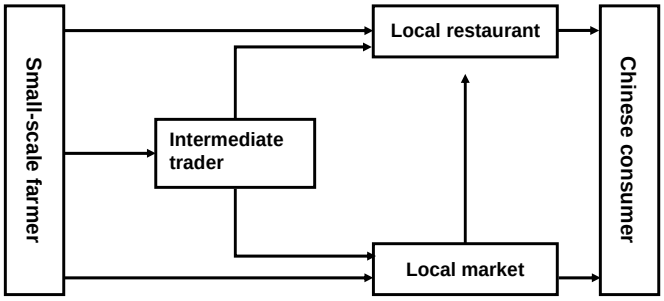

Figure 3: Simplified local value chain map of NWFPs

National value chains go from small-scale collectors or producers through different and extended networks of inter-mediate traders (village-based trader, long-distance trader, wholesale trader in local or regional markets) to farmers' markets in Chinese cities (mostly for dried products). Alternatively, NWFPs go from small-scale farmers and agro-business producers to processing factories. From there, they are delivered to supermarkets, pharmacies and hospitals (shown in *Figure 4*).

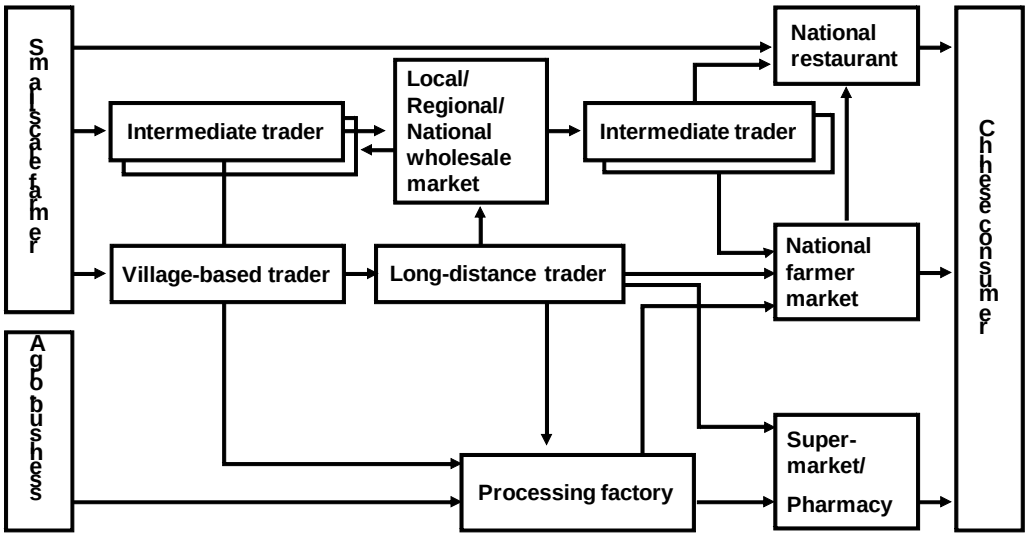

Figure 4: Simplified national value chain map of NWFPs

International value chains of Mu Err mushrooms, bamboo shoots and medicinal plants produced in China and sold in Germany pass through two distinct types of value chains to the final consumer in Germany. The last actors of the first value chain are Asian shops, restaurants and internet shops. The second value chain starts mostly from agro-businesses and ends in large-scale supermarkets or pharmacies in Germany. The first value chain is considerably longer and involves more and different actors than the latter one. Furthermore, the internal governance of the two value chains is significantly distinct. The following *Figure 5* shows the two value chains through which the NWFPs enter the German market.

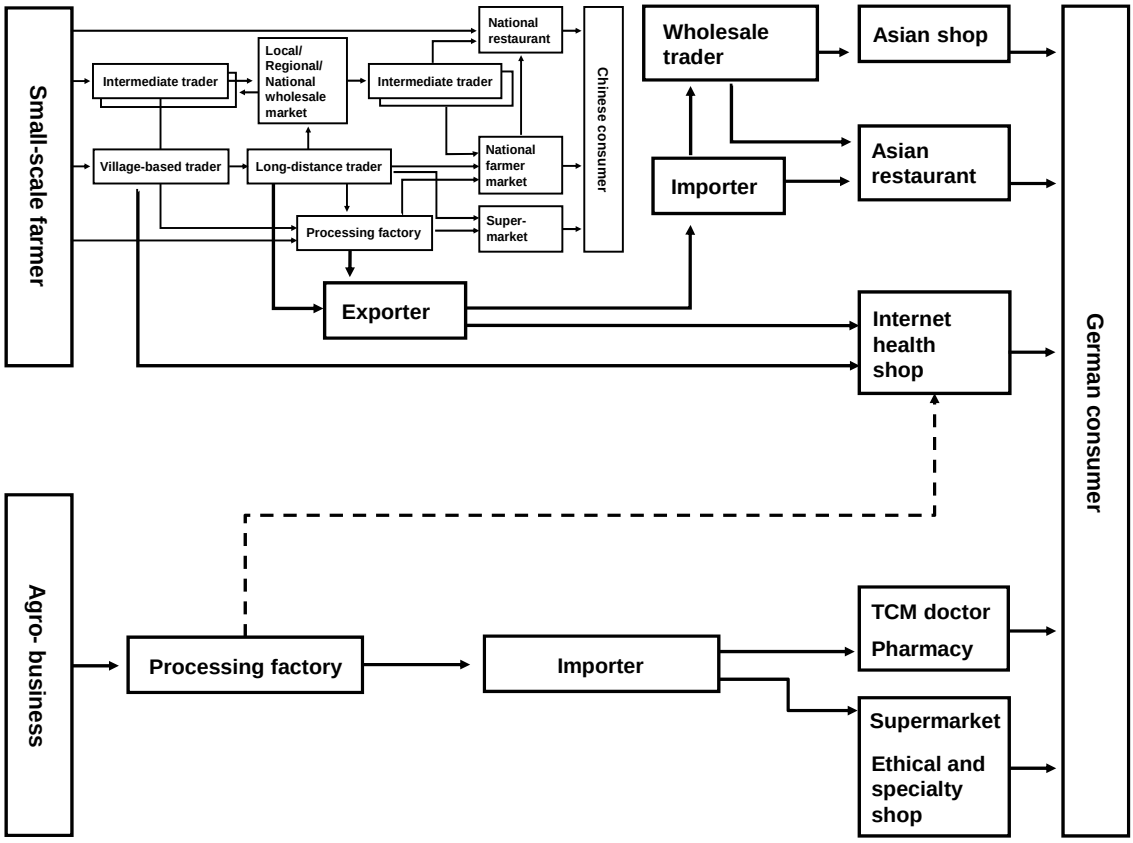

Figure 5: Simplified international value chain map of NWFPs

Examining value chains and defining their characteristics revealed the existence of two distinct value chain types: First, a farmer-trader value chain, which goes from small-scale farmers to local, national and international farmers' markets (illustrated in the upper part of *Figure 5* above), and second a supermarket/pharmacy value chain which goes from agro-production firms to national and international supermarkets and pharmacies (illustrated in the lower part of *Figure 5*).

4.1.1 Farmer-trader value chain

The farmer-trader value chain starts from small-scale farmers and passes through a network of traders, wholesale markets, exporters and importers to local, national farmers' markets and restaurants, as well as international markets (e.g. Asian shops and restaurants in Germany). The farmer-trader value chains are highly complex, involving many intermediate traders and wholesale markets, and creating various parallel value chains. These value chains range from three actors to more than six actors. They have an open information flow on local and national levels, low commitment between suppliers and buyers, and low to medium processing complexity and quality requirements (e.g. no food safety control or traceability).

Farm gate to retail price increase (see *Figure 6*) is evaluated as moderate (up to 500%) on all markets, with farmers achieving a high (above 50%, shown in *Figure 7* below) or medium (between 5 and 50%, shown in *Figure 8* below) share of revenue of the retail price. Exceptions are internet based value chains of medicinal plants, where farmer-trader value chain characteristics are combined with very high price increases (above 11,000%) and very low farmers' share of revenue (below 2%).

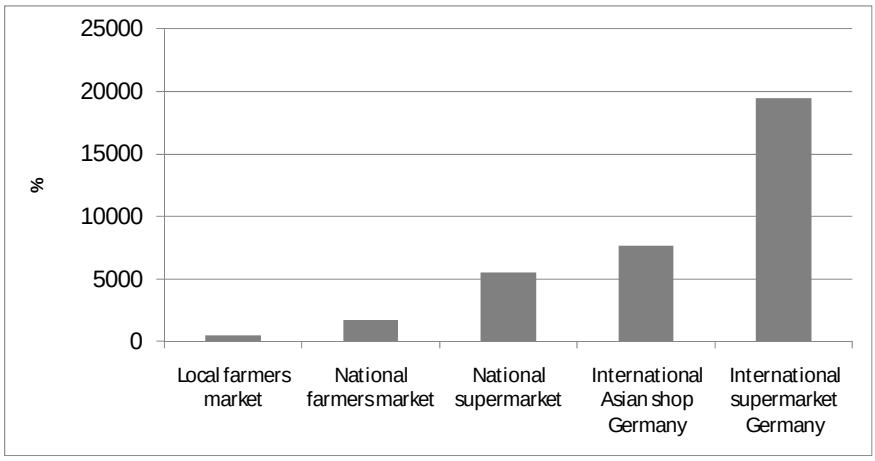

Figure 6: Farm gate to retail price increase of fresh and canned bamboo shoots

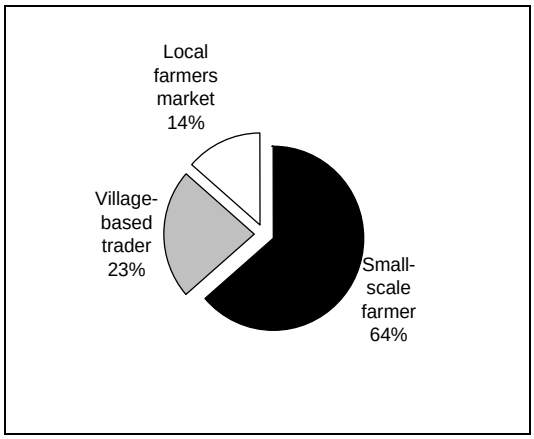

Figure 7: Revenue shares in local value chains of dry bamboo shoots

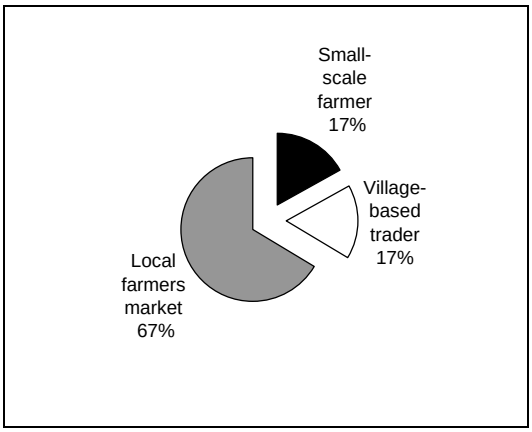

Figure 8: Revenue shares in local value chains of fresh bamboo shoots

External governance theoretically involves national ("Quality Safety, QS") and international (e.g. ISO 9000/22000, or Hazard Analysis and Critical Control Points, HACCP) standards for food products, as well as Good Manufacturing Practice (GMP) certificates for medicine. However, regulations are rarely enforced within China. Furthermore, unprocessed Traditional Chinese Medicine enters the EU as an agricultural product (such as herbs or tea), thus avoiding strict medicine regulations.

4.1.2 Supermarket value chain

The supermarket/pharmacy value chain runs mainly from vertically integrated agro-production and processing companies to large-scale food companies and importers, who provide the brand name for the product, to supermarkets, pharmacies and ethical shops (organic, fair trade, etc.) in the national and international markets. Small-scale farmers rarely participate in these value chains, unless they are externally supported by development agencies or projects (e.g. in ethical certification). Supermarket/pharmacy value chains are short to medium (three to six actors involved), in national, as well as international markets. They are dominated by a few large-scale firms that combine many steps in the value adding process (production with own plantation bases or contract farming, processing and packaging/branding) and well-known importers and retailers, who closely monitor the value chain. The information flow is closed, the commitment between supplier and buyer is strong and the processing complexity and quality requirements are strict due to professional processing (canning, high end retail packaging) and food safety controls.

The farm gate to retail price increase on the national market is evaluated as medium (200-500%), and high on international markets (4,000-36,000%), with small-scale farmers theoretically having a medium share of revenue of the retail price (17-30%) in national markets (shown in *Figure 9* below) and a low share (<1%) of revenue in international markets (shown in *Figure 10*).

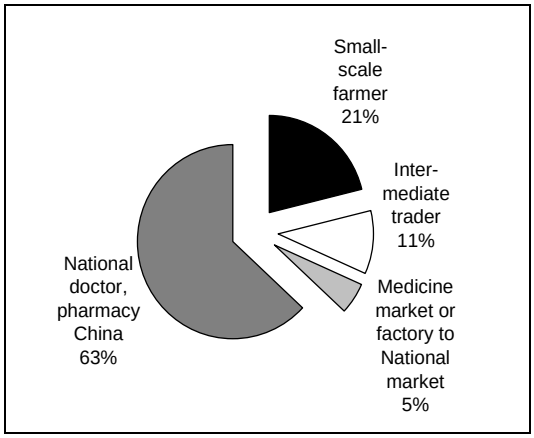

Figure 9: Revenue shares in national pharmacy value chain of Astragalus

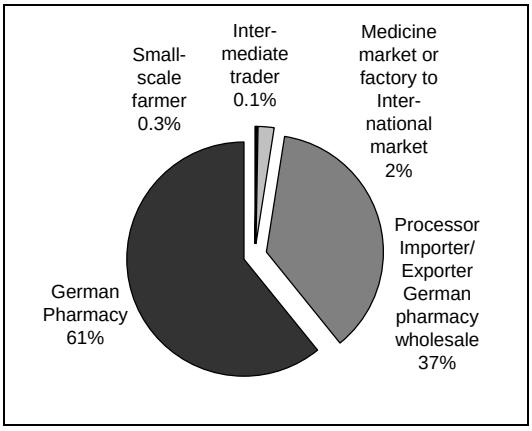

Figure 10: Revenue shares in international pharmacy value chain of Astragalus

The external governance involves the supermarket standard International Food Standard (IFS), different ISO standards (9000/14000/22000) and HACCP guidelines or voluntary (organic, fair, etc.) standards for food products. Medicinal plants demand GMP certificates.

5 FARMERS' LIVELIHOOD ASSESSMENT

5.1 Farmer-trader value chain

Farmer-trader value chains are characterized by the following implications on famers' livelihoods: Farmers have high abilities in Human Capital, i.e. knowledge and skills about markets, products and processing technique on local and national level. In international markets knowledge capital is low, because information about target markets, retail prices, and external governance cannot be obtained by farmers. However, their skills on processing allow farmers to take part in these value chains, also on international level, including processing, i.e. value adding in dry product chains.

Natural Capital is ranked neutral in all markets, because no correlation between value chain types and sustainability measures in forest resources was detected.

The Financial Capital showed a more diverse picture. The farm gate price range showed no direct correlation with retail target markets (local, national or international). Higher quality products achieve higher prices, regardless of the retail market. However, as high quality products are more likely to end up on national and international markets, farmers' income possibilities in local markets is classified as neutral, while national and international markets provide a positive income asset. In value chains of dry products, farmers' share of revenue in relation to the retail price is high, thus showing that value adding takes place at farmers' level for dried products.

The analysis of Social Capital showed that, even though only poor farmers were participating in NWFP value chains, the knowledge about cash crop NWFPs created a social recognition within the community. Furthermore, connection to international traders increased the reputation of participating farmers. Therefore, participation in national and international value chains provides positive Social Capital, while Social Capital in local value chains is negative.

Farmers have the production facilities and processing technology, i.e. the Physical Capital to participate in the processing of dry products for local, national and international markets. In canned or vacuumed product value chains, farmers are excluded from the value adding process due to the lack of processing technology. The infrastructure of selling opportunities is evaluated as positive in all markets.

The Sustainability/Vulnerability context in local and national value chains proved positive, because of their long term existence, as well as optimistic price development and demand outlook. International value chains however, have a short duration. Price development and demand are increasing, but remain unstable. Seasonality exists for all products, which is an income limiting factor for fresh products. Moreover, prices fluctuate highly according to the season. Structures and processes in farmer-trader value chains create a positive framework for small-scale farmers. Where hygienic conditions, food safety or certification issues are reasonably easy to achieve, small scale farmers with low monetary resources for investment are able to participate.

5.2 Supermarket value chain

Due to the fact that in both study sites no supermarket/pharmacy value chains that included small-scale farmers existed (besides bamboo shoot factories), the influence of value chain participation onto farmers' livelihoods could not be measured for all parameters. However, the analysis of farmers' ability to participate in supermarket value chain and the theoretical analysis of farmer participation show the following results: Farmers have no Human Capital in the form of knowledge about target markets, retail prices, transportation costs to markets, and external governance. Furthermore, the skills for processing according to quality requirements (e.g. hygienic standards and food safety) are lacking.

Natural Capital in supermarket value chains is ranked positive, because controlled production and harvesting in supermarket value chains may support the implementation of sustainability measures.

Analyzing the Financial Capital showed that supermarket value chains have higher farm gate prices (without considering production costs) due to high quality standards. Consequently, potential farmer participation would provide a positive Financial Capital. Yet, high retail prices in supermarkets and pharmacies are in contrast to the low revenue share of the farm gate price of producers and collectors, thus providing a weak power position within the value chain.

Looking at the Social Capital reveals that the participation in this value chains could provide a positive reputation for farmers, as supermarkets offer mostly cash crop NWFPs. Furthermore, the connection to professional, not village-based traders bestows additional Social Capital on participating farmers.

Regarding Physical Capital, small-scale farmers have no ability to provide the necessary production and processing technology needed for quality requirement in supermarket/pharmacy value chains. Moreover, high seller-buyer commitment in supermarket value chains and closed information flow offer little sale opportunities.

The Sustainability/Vulnerability context in supermarket/pharmacy value chains is two-folded: the short duration of value chains leads to a negative evaluation. However, increasing demand and optimistic price development are promising factors. Seasonality exists for all products, and is therefore a limiting factor in supermarket value chains, due to the fact that farmers are only able to sell unprocessed products for food safety reasons. Structures and processes in supermarket/pharmacy value chains provide a negative framework for small-scale farmers. High requirements in hygienic conditions, food safety or certification exclude the participation of small-scale farmers.

6 DISCUSSION

6.1 Internal governance

Value chains, in which small-scale farmers participate, are mostly long. This leads to the fact, that revenues have to be split between more actors (Neumann & Hirsch 2000, p.68). Yet, this network of traders in long value chains gives small-scale farmers the chance to participate in national and international commercialization and connects them to markets. Contrary to findings in South America, the value chains for NWFPs in China are not driven by a few key entrepreneurs, but are built on a big network of traders and trading firms (compare te Velde et al., 2005), where many of them operate informally. In short supermarket value chains farmers might have the prospect to earn a higher share of the income. In reality, however, supermarkets work mainly with large-scale agro-production firms due to food safety reasons, quality control and to secure supply as described for agriculture products, produced for Carrefour in China (Hu & Xia, 2007). The English supermarkets, for example, bypass wholesalers and directly work with producers and specialized importers in order to control products' quality and traceability in fresh fruit markets (Dolan et al. 1999, p. 15). Moreover, this commitment to suppliers plays an important role in determining the sustainability of the overall chain (Marshall et al., 2006). Supermarket value chains provide high commitment between actors, and would therefore better serve small-scale farmers needs for sustainability.

Another important aspect of positive participation in NWFP value chains is information. Information on markets, prices and production and processing skills is a central part of Human Capital for farmers if they are to receive a fair share in commercialization. The

information flow has also been shown to be a key variable in accessing markets for small-scale farmers in South America (Marshall et al., 2006).

Processing complexity and quality requirements of NWFPs in farmer-trader value chains and supermarket value chains differ significantly. High and consistent quality of NWFPs is required in the supermarket value chain, while no specific requirement is needed to participate in farmer-trader chains. Therefore, quality requirements can present a barrier to entry in the supermarket NWFP value chain, but not in the farmer-trader value chain (compare Canz, 2005). Especially in international markets, quality requirements may be far above domestic standards, thus raising demands on producers as well as requirements for monitoring and control from international buyers (Gereffi et al., 2005).

6.2 Value chain organization, standards and external governance

The main difference between value chains, as is visible in their maps, is not the difference in retail market location (local, national or international), but the differentiation into farmer-trader value chains (i.e. long, uncoordinated and unorganized) and supermarket value chains (i.e. vertically integrated and food safety controlled). To date, Chinese farmers are able to participate in farmer-trader value chains, but are not able to participate without external support in supermarket chains. Yet supermarket value chains continue to gain importance; they seem to be the value chain type of the future, because of increasing consumer demands for food safety.

In China, the "traditional" farmer-trader value chains are increasingly replaced by super-market value chains (more supermarkets, introduction of certification labels, such as "QS" in food and GMP in medical production). Since the first supermarket opened in 1990 in China, the share of supermarkets has been constantly growing. In 2004 supermarkets already had a 24% share in retail sales of in 12 large cities (Hu & Xia 2007, p. 2).

The same development can be observed internationally. In international markets food safety (e.g. traceability) is increasingly growing in importance. Consumers want safe products and are willing to pay extra. For that reason supermarket value chains are established. Due to the low-level of vertical coordination and the high number of informal traders in farmer-trader value chains, controlled food safety is very difficult.

At present, because of the imperfect agri-food distribution system and infrastructure, the cost of food sold in supermarkets is generally higher than that of farmers' markets in China (Hu & Xia, 2007). As a result, farmers' markets and farmer-trader value chains still hold a significant share on the Chinese market. Yet, the development and enforcement of standards, even if it excludes the participation of small-scale farmers at the moment, has in the long-run also positive aspects: they advance production and processing skills in producing countries and help to reduce external costs, such as the loss in biodiversity or environmental pollution (Kaplinsky et al. 2011, p. 1188).

Yet, food safety is an important aspect in establishing external governance either by value chain actors directly (i.e. supermarket standards) or by third actors (e.g. Food Hygiene Laws, EU import regulations, etc.). Pesticide residues and the content of heavy metals are the major concerns regarding NWFPs produced in uncontrolled systems, such as small-scale cultivation and wild collection (EFSA, 2009). The rising proportion of certified products on the Chinese and international markets demonstrated that certification in general is a suitable instrument to communicate food quality and to ensure consumers' confidence in the product. In the light of several food safety scandals in China, food quality certification is likely to increase in importance for both domestic and international markets.

Food quality or safety certification – focusing solely on the end product – must be clearly distinguished from organic certification that also considers the production environment, in order to assess the impact of NWFP certification on food quality. The quality of the product is

the absolute priority for most consumers – whatever the production environment. Yet, to achieve product quality, control of the entire value chain, including harvest, storage, process, transport and so forth, is essential. For domesticated NWFPs, i.e. NWFPs cultivated outside natural forests, control of the production chain appears to be feasible and the adoption of product quality standards can be considered as a first successful step towards organic certification. However, the certification of food quality encounters significant difficulties with the traditional collection of NWFPs in forests. Low collection volumes, the involvement of numerous and often informal collectors, transporters and traders, as well as a lower quality control of the collected product, make it very difficult to comply with food quality standards. In some cases, food quality might be improved by the introduction of new collection, transport and storage techniques. But in general, certification of food quality favours organic crops produced under controlled conditions, rather than wild NWFPs. Hence, an increased consideration of wild NWFPs in certification schemes for food quality would provoke difficulties in guaranteeing and maintaining high food safety standards. At the same time, high food safety standards can be considered a barrier to entry to NWFP value chains for small-scale farmers.

6.3 Voluntary measures

Recent studies suggest that NWFPs which are certified or marketed with a specific label such as “organic” or “community-traded” have the potential for higher financial returns than conventional goods (Marshall et al., 2006). As the commercialization of certified NWFPs is still marginal in China, it is very difficult to evaluate the revenue potential. The current benefits of NWFP certification for small-scale farmers and collectors are certainly small. Due to the low level of vertical coordination and the high number of informal traders, controlled certification is very difficult in farmer-trader value chains. Even though certified NWFPs targeting international markets generate significantly higher retail prices than NWFPs at local markets, these high revenues mostly fall to traders or agro-production firms on national and international level, not to farmers.

Large-scale agriculture companies dominating the export markets for organic certified products, such as soy beans, rice and legumes, also occasionally include single, marketable NWFPs, such as mushrooms, medicinal plants and fruits, in their product portfolio. These companies often add out-grower schemes to their plantation base, thus including small-scale farmers into supermarket chains. However, this is possible because many of the small-scale participants are agricultural labourers at the plantation, therefore, trained in controlled or certified agriculture. Moreover, most certification systems relevant for NWFPs are area-based. As NWFPs are mostly collected in state or collective forests, many collectors working without formal authorization are not able to participate in certification and are vulnerable to expulsion. Furthermore, the profound linkages between the local politics and the complexity of tenure and access rights in a region makes it extremely difficult to target external support on rural poor, suffering from a lack of investment capital and social organization. On the other hand, NWFP certification may stimulate social organization, land reform and formalization of access rights, which would improve the situation of collectors and producers. In China thus far, examples of NWFP certification of organized small-scale farmers are rare and limited to cases where they are supported by international NGOs or development organizations. One example is the Baoshan Forest area in Yunnan, where certification of forest products, such as pine nuts, walnuts, medicinal plants and mushrooms, collected and produced by farmers is in progress, supported by the World Agroforestry Centre (ICRAF-China) (Stark et al., 2006). Yet, the costly and laborious application of voluntary certification makes the value chain more complex thus putting small-scale farmers at a power disadvantage.

7 CONCLUSIONS AND RECOMMENDATIONS

The conclusions drawn are that farmer-trader value chains provide farmers with an moderate, but stable income, where a high share of revenue implies a strong power position (for price negotiation, to avoid substitution, etc.) within the value chain. Furthermore, abilities of knowledge on markets and processing skills, especially in local and national farmers' markets give farmers the possibility to make educated decisions on where, when and to what price to sell their produce.

Contrary to that, supermarket/pharmacy value chains have high barriers to entry for (unorganized) small-scale farmers, because they have high requirements in quality, hygienic standards in processing, and food safety (that may demand investment in technology, production facilities or certification). This excludes small-scale farmers at this moment, yet supermarket value chains seem to be the system of the future, because of increasing consumer demands in food safety. Furthermore, their characteristics would provide sustainable and high income, due to high commitment in supermarket chains, if farmers were able to participate.

Recommendations for small-scale farmers who include NWFPs on their forest land into their product portfolio would be to concentrate in the short run on processed (dried) products in farmer-trader value chains, because of comparably high returns. In the long run, the participation in the promising supermarket value chains would be desirable. This could be supported by the following approaches:

Haggblade et al. (2002) argue that the introduction of grades and standards will play an important role in helping rural enterprises succeed in an increasingly liberalized and un-protected market. Especially in China, with its negative food safety reputation, the introduction (and enforcement) of standards will help farmers to participate in supermarket value chains, which become more and more important. Slowly raising national food production standards would give farmers the time to adapt and therefore help them to participate in high quality value chains.

This adaption process could be supported by the national agriculture extension programme, which has already successfully implemented agricultural modernizations (e.g. in bamboo (INBAR, 2004) and Mu Err production) in China.

Furthermore, farmer associations could provide small-scale farmers with the possibility to better access agriculture extension knowledge, credits, better marketing, production and processing facilities, as well as the communication with buyers. Especially when supported by NGO's. NGO activity and participation in a farmer association had positive influence on farmers' skills and the participation in supermarket value chains with higher incomes (Barrett et al. 2012, p. 724). Additionally, Barrett et al. (2012, p. 725) found out that firms prefer to work with farmer associations to reduce transaction costs and secure minimum quantities. Therefore, a pro-active approach to seek-out and support farmer associations by food companies would create a win-win situation for both actors. The legal framework for farmers associations in China is however unclear. Allow and support farmer associations would benefit small-scale farmers.

Alternatively, agricultural companies can include contract farming with small-scale farmers instead of big agriculture businesses, possibly in combination with plantation cultivation. So-called controlled out-grower-schemes can be applied in wild collection of products, small-scale conventional (agroforestry) farming, as well as organic production. However, a large transfer of knowledge is needed to train participating farmers. Yet, this input makes sure that the commitment of involved production firms are of long term nature. A pre-condition for that would, however, be the expressed consumer demand for small-scale farmer products.

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Environmentally Oriented Forest Management – Prospects of Sustainability

Sergei M. SINKEVICH*

Forest Research Institute of Karelian Research Centre Russian Academy of Science (FRI KRC RAS), Petrozavodsk, Russia

About 30% of the forest lands in the Southern Karelia are the protective forests around water objects. These forests are needed for preservation of rivers purity, as habitat, and as timber source. The prospects of human activity at them should be estimated in various aspects: ecological, social, economic and legislative. Silvicultural possibilities of selective cuttings which are permitted in the protective forests, are exhausted. The problem is complicated by climatic changes which reduce the safe frosty period for thinning. As a result both today's and future financial effect are decreased. The social aspect is closely connected with ecological, however for social activity direct economic reasons are needed. Besides, imperfection of the forest legislation is the source of some problems. Small and medium forest business isn't focused on the solution of these difficult questions. For sustainable development of forest economy the scientific support of the large forest enterprises and common efforts on improvement of the forest legislation are required.

* sergei.sinkevich@krc.karelia.ru; 11 Pushkinskaya St., 185910 Petrozavodsk, Karelia, Russia

Rural Community Effects of Timberland Ownership Change

Larry TEETER* – Connor BAILEY – Becky BARLOW

Auburn University, USA

Since 1990, corporations in the forest product industry have divested themselves of as much as 26 million acres of commercial timberland in the United States, with most of this divestiture occurring in the past decade. The new owners, primarily Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs), will shape the future of the forest products industry and the larger rural economy because they will determine management objectives for this land. Changes in management strategy/practices could result in the loss of employment in 'woods work' sectors as well as in value added processing of wood products. As traditional forest related employment declines, how might that affect the character of current rural economies? This paper reports preliminary findings of a 5-year project studying the widespread ownership change of timberland, drawing on several smaller studies supported by the project.

* Corresponding author: teeter@auburn.edu

Delimitation of Forestry within the Framework of the Austrian Farm Accountancy Data Network

Philipp TOSCANI* – Walter SEKOT

Institute of Agricultural and Forestry Economics,
University of Natural Resources and Life Sciences, Vienna, Austria

Abstract – The Common Agricultural Policy of the European Union relies on empirical data provided by farm accountancy data networks. In Austria, this sample is representative not only for agriculture but also for farm forestry and does provide some forestry-specific information. However, sector statistics as well as a specific assessment of profitability and efficiency are hampered by the fact, that most inputs are not differentiated between the two lines of business. This deficiency is now overcome by means of a set of models, which are derived from the network of farm forests, which is in fact a small sub-sample of the agricultural network. Ultimately, representative results in terms of full cost accounting for farm forestry in Austria can be achieved. The paper explains the approach and highlights the significance of the results, small scale farm forestry making up almost half of Austria's forests.

forest accountancy data network / farm accountancy data network / farm forestry / full cost accounting / Austria

1 INTRODUCTION

In Austria like in many other European countries, small scale farm forestry (SSFF) is a substantial element of the forest sector. According to the agricultural census, farm forest enterprises manage some 46.9% of the total forest area (BMLFUW 2013, P.304), the upper threshold level for the delimitation of small scale forestry being 200 ha of forest land.

In spite of the great significance of SSFF within the sector, comparatively little economic data is available. The established monitoring schemes typically focus on bigger estates, although specific guidelines for forest accountancy data networks in farm forestry have been developed (Hyttinen et al. 1997; Niskanen - Sekot 2001). Even in the few cases where respective investigations exist the samples suffer from budget constraints, the small units of investigation being associated with comparatively very high fixed costs for data collection. Ultimately, the population of farm forests may be represented by a small and significantly biased sample as is the case in Austria (Hyttinen - Kallio 1998a,b; Sekot, 2000, 2001, 2006).

Farm forestry typically being characterized by a close relationship between agriculture and forestry, the idea is appealing to derive more representative forest–related information from agricultural investigations. The Common Agricultural Policy of the European Union requests national Farm Accountancy Data Networks (FADN) of a certain standard, so that a

* Corresponding author: philipp.toscani@boku.ac.at, Feistmantelstraße 4, 1180 Vienna, Austria

respective infrastructure for monitoring farms is available. The Austrian FADN provides exceptionally favorable pre-conditions for an extension towards forestry, as the sampling frame considers not only agriculture but also forestry and forestry revenues as well as some forestry-specific ratios are part of the dataset by standard (Hyttinen - Kallio 1998b). So far, however, the Austrian FADN still suffers from a major drawback, the inputs being not comprehensively delimitated between agriculture and forestry. Consequently, it is not possible to assess the profitability of small scale farm forestry. In order to overcome this hindrance, a framework for full cost accounting in regard to the forestry part of the farms making up the national FADN has been proposed by Brenner (2010). The idea is to perform an ex-post delimitation of forestry in the accounts of farms which record several agricultural and forestry inputs jointly.

2 GOALS AND RESEARCH QUESTIONS

The concept developed by Brenner (2010) is to be verified and applied in regard to the dataset of the year 2012. In essence, recent improvements of the recording system of the FADN in regard to forestry issues are to be assessed and proposed solutions for splitting up the remaining, undifferentiated inputs are to be tested. The general idea is to utilize the FADN as a research infrastructure more thoroughly and to extend its significance in regard to forestry as well as to the total economy of farm.

The investigation focuses on the following research questions:

i. How to best utilize the data of the network of small-scale farm forests (SSFN) for specifying the models needed for deriving various items of cost which are not recorded as such in the FADN?
ii. How can the forestry-specific inputs be assessed properly as well as comprehensively at farm level given the limitations of the FADN?
iii. To what extent do the results differ from and exceed the information provided by the network of farm forests?

3 MATERIAL AND METHODS

Ultimately, all of the data for this investigation stems from the Austrian Farm Accountancy Data Network. The representative sample of the FADN is augmented by a small, purposive sub-sample (the SSFN) which provides comprehensive and more detailed information on forestry.

3.1 Farm Accountancy Data Network (FADN)

The Austrian FADN exceeds the requirements imposed by European regulations by acknowledging not only the agricultural but also the forestry share of standard output. Hence, the sampling frame comprises also farms dominated by forestry or even pure forest holdings (Hyttinen - Kallio 1998b). The respective quota sample is based on the agricultural census of 2010 and represents in essence privately owned farms with a standard output of between 8,000 € and 350,000 € and a maximum forest area of 200 ha (till 2012). The sampling frame refers to a population of 99,657 farms which corresponds to some 60.4% of all farms and 57.5% of all Austrian agricultural and forestry enterprises (BMLFUW 2013, p. 304). The FADN represents 82.6% of the forests classified as farm forests or 38.7% of the total forest area. The vast majority of farms (92.4%) owns also at least some forest area. On average, the sampled farms manage 16 ha of forest land. In 2012 the sample comprised 2,201 voluntarily

participating farms corresponding to a sampling percent of 2.2%. Of these, 7.5% were registered as forest enterprises, their forestry share of standard output exceeding the threshold level of one third. The investigation is based on a sophisticated scheme of book-keeping (BMLFUW 2014).

Generally recorded, forestry-specific data comprise apart from some other items of minor interest timber and non-timber revenues as well as subsidies, forest area, cutting volume and the assessed tax value of forestry. Consequently, at least some representative results on farm forestry may be derived from the FADN (Sekot 2006). However, only some of the inputs used to be documented specifically: family working days, workers' working days and cost for forest plants are generally available in the datasets up to the year 2011. Starting with 2012, several amendments were put into practice in order to improve the delimitation between agriculture and forestry: Nowadays, costs for contractors are recorded separately for forestry and agriculture. Fixed asset accounting acknowledges a so-called 'forest factor' for each asset which allows to apportion the respective depreciation to forestry. As regards the outputs, revenues from rendering contractor's services associated with forestry such as harvesting can be identified.

3.2 Small Scale Forestry Network (SSFN)

Given the limitations of the FADN, profitability of farm forestry can be assessed at the level of a forestry-specific sub-sample only (Sekot 2006). In 2012, 110 (5%) of the farms participating in the FADN provided supplementary information on forestry costs and revenues and are documented in terms of full cost accounting. This purposive sample is biased towards bigger units in terms of forest area, the minimum threshold level being set to 5 ha (Hyttinen - Kallio 1998a,b). Nevertheless, the sample is not restricted to units classified as forest enterprises, which are defined by a share of forestry on standard output of at least one third. Although the results are by no means representative for farm forestry as such, they use to be referred to as proxies and are regularly acknowledged in the annual agricultural report (Sekot 2000, 2001; BMLFUW 2013, p. 91 f.). The SSFN started in 1972 already. However, individual data and consistent time series are available from 1999 onwards only. Consequently, the period from 1999 to 2012 is referred to in this analysis, encompassing the data of some 1,562 master balance sheets. In contrast to the FADN, a scheme of cost accounting is applied similar to the one underlying the network of bigger forest enterprises. Inputs are recorded separately at the level of four cost centres: silviculture, harvesting, infrastructure and administration. The computed profits are to some extent ambiguous, however, the associated costs being dominated by imputed items such as family labour, use of tractors and depreciation (Sekot 2006).

3.3 Modelling and analysis

Those cost items, which are not recorded specifically in regard to forestry within the accounting framework of the FADN are to be assessed following the schemes developed by Brenner (2010). The general idea is to derive respective figures by means of ratios which are established on the empirical basis of the SSFN and applied individually to each farm of the sample. In order to obtain specific results, respective ratios refer to variables which are generally available in the dataset of the FADN such as forest area or volume of harvest. Some cost items require a two-step approach, respective ratios involving an item like tractor cost which for itself has to be generated. Inflation-adjustment by means of the consumer price index is applied in order to make monetary values of different periods within the SSFN compatible.

The analytical approaches are kept quite simplistic and no sophisticated statistics are applied, taking into account the envisaged routine application as well as the fact, that any improvements to be achieved are still to be considered as proxies only. Analysis is restricted to simple linear regressions without formal verification of the preconditions for parametric approaches. Figures on R^2 are just to give a rough impression and hence no further ratios are documented. In terms of validation, the individual figures are imputed for all units within the SSFN in 2012 and compared to the originally recorded ones by means of correlation analysis. Pearson's r is referred to as the respective coefficient of correlation.

4 RESULTS

The results comprise three major parts, thereby reflecting the initially stated research questions. At first, the preferred scheme for utilizing the data of the forestry sub-sample is assessed before the background of alternative specifications. Secondly, approaches for deriving figures for each type of cost at the level of the individual farm are specified. Numerical results for the accounting period 2012 are presented in the subsequent section, thereby addressing once more the issue, how different datasets derived from the SSFN may affect results.

4.1 Reference data for model specification

Regression parameters as well as descriptive variables depend on the set of empirical data underlying the analysis. Hence, the range of entities as well as periods taken into account for the estimation of parameters is crucial. A short time span may result in great fluctuations of the parameters, especially in case the sample may be affected by significant fluctuations (Sekot 2007b). Conversely, smoothing the fluctuations by referring to cross-section time series covering several years irrespective of any fluctuation within the sample may lead to sluggish adaptation. In order to eliminate the effect of varying samples, one may instead refer to a panel in terms of a stable set of entities.

A continuous application should not rely on static models but requires a dynamic framework where all the parameters are regularly updated, at best annually. Dynamic panels which consist of a stable set of x entities over the past n years and are reconsidered every year acknowledge changes of the sample with a time lag of n years. Consequently, the resulting parameters might show sharp changes from one year to the next, especially in case one or several big entities bearing special characteristics are involved.

Taking into account the specific nature of the sample underlying the SSFN, the adopted approach generally refers to cross-section time series encompassing all recorded entities for the latest ten years. Thus, the greatest possible number of actual data is utilized and the effects of variations of the sample are mitigated within a dynamic framework. It is meant to update all of the models annually. In order to illustrate the significance of this issue, Figure 1 compares the yearly average tractor hours per farm in the SSFN for four alternative levels of aggregation: (1) yearly figures, (2) five year moving averages for panels, (2) five year moving averages for the whole sample and (4) ten year moving averages. Consistent time series being available from 1999 onwards only, the developments can be assessed for a different number of years as dependent on the length of the respective time series to be considered.

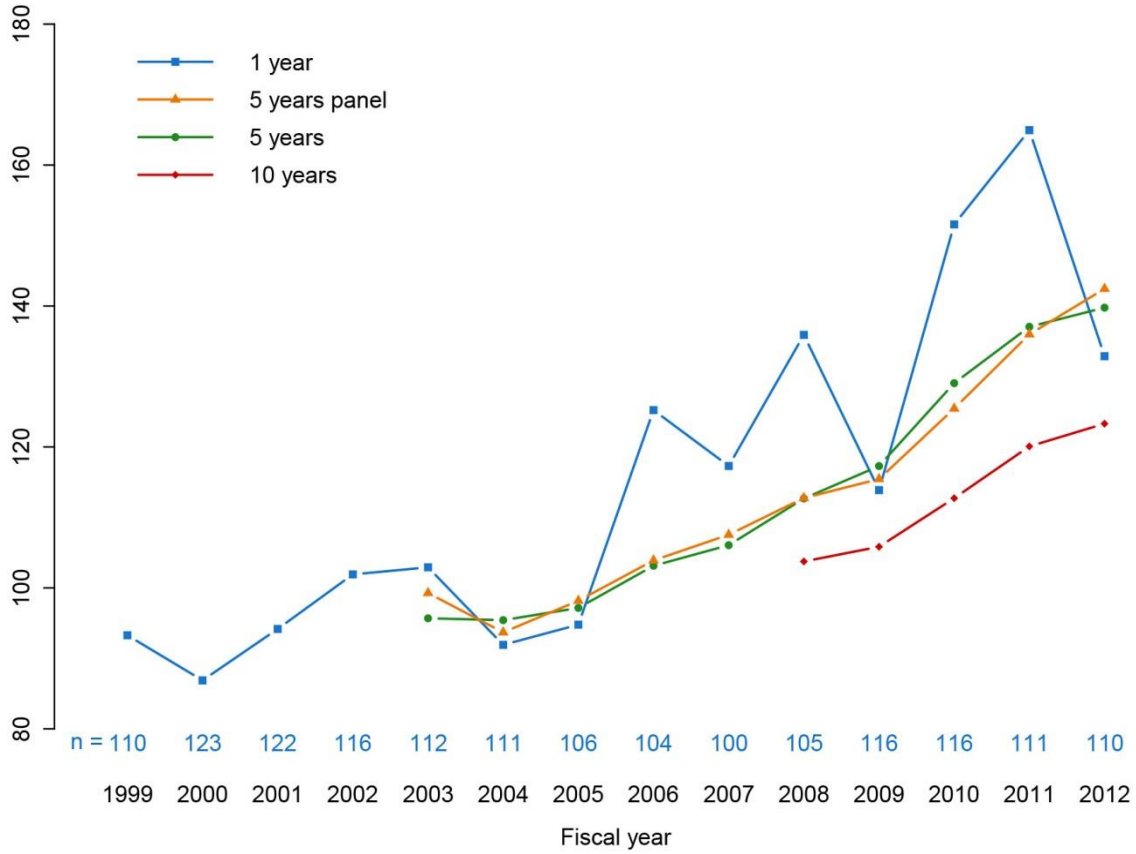

Figure 1. Mean values of total yearly tractor hours per farm in the SSFN as dependent on the mode of aggregation. The number of farms recorded for each fiscal year is printed above the respective year.

The yearly figures clearly show a high volatility. Obviously, no major differences between five years moving averages for a panel or the whole sample can be observed, at least as regards this example. Due to the generally increasing trend, the results derived from pooled data of a ten years period lag behind and show the lowest values.

The tractor hours in forestry estimated for the FADN reflect these differences by way of the different model specifications to some extent and thus underpin the relevance of this issue: The average figure per farm derived for 2012 varies between 61.6 hours (1 year), 58.5 hours (5 year panel), 54.8 hours (5 years) and 51.3 hours (10 years). Thus, the highest result exceeds the one derived in the preferred way by 20.1%. The general difference in magnitude between the SSFN and the FADN is a clear indication for the SSFN being biased towards a higher relevance of forestry, so that a simple transfer of values per farm is by no means justified.

4.2 Models for assessing individual types of cost

The approaches for deriving absolute values for each type of cost as proposed by Brenner (2010) were reconsidered, in several cases modified and ultimately specified for practical application in regard to the data of 2012. The respective framework comprises two steps: In regard to family labour and tractor cost the estimation of monetary values refers to physical inputs which are in turn to be derived by means of specific linear regression models. Where appropriate, the correlation of the assessed value from the FADN with the documented value of the SSFN is specified in terms of Pearson's coefficient of correlation (r).

4.2.1 Inputs in physical terms as preliminaries for the estimation of cost

Family working hours

Family working hours (FWh) are not documented directly, but in the manner of family working days (FWd). According to the documentation of the Austrian Report on the Situation of Agriculture (BMLFUW 2014), FWh are the sum of all FWd of a family member (i) times 8 hours times the age dependent working force reduction factor (RF), which is part of the general accounting framework of the FADN and varies in the range of 0.05 to 1.0 (equation (**1**)).

$$FWh[h] = \sum (FWd_i[d] * RF_i * 8[h]) \quad (1)$$

Coefficient of correlation for equation (1): r = 0.835

The total input of family working hours has to be split up according to cost centers, different wage rates being applied for harvesting and other forest-related activities. The family working hours for logging ($FWh_{logging}$) are estimated by means of a linear regression, fitted with the total FWh of the SSFN. A side condition defines, that in case the result for $FWh_{logging}$ is negative, it is set zero, implying that only family working hours for other activities (FWh_{other}) in the term of fixed cost occur. In equation (2) variable $c = -a / b$ and is the threshold value for the minimal work input to forestry. As equation (3) shows, FWh_{other} is calculated as the difference of FWh and $FWh_{logging}$.

$$FWh_{logging}[h] = \begin{cases} 0[h] & FWh[h] < c \\ a + b * FWh[h] & FWh[h] \geq c \end{cases} \quad (2)$$

Coefficients for equation (2): a = -8.667, b = 0.819, c = 10.579; R^2= 0.896; *r* = 0.794

$$FWh_{other}[h] = FWh[h] - FWh_{logging}[h] \quad (3)$$

Coefficient of correlation for equation (3): *r* = 0.487

Tractor hours

The tractor hours (TRh) are estimated using the productive forest area (PFA), cutting volume (CV), FWh, and employee working hours (EWh) as independent variables (equation (4)). Two side conditions assign TRh a value of zero: (1) in case the result of TRh is negative or (2) in case neither FWh nor EWh exist, implying that the use of machinery is connected to the input of an operator.

$$TRh[h] = \begin{cases} 0[h] & \sum e*PFA + f*CV + g*FWh < -d \;||\; (FWh = 0 \;\&\&\; EWh = 0) \\ d + e*PFA + f*CV + g*FWh[h] + h*EWh[h] & \sum e*PFA + f*CV + g*FWh \geq -d \;\&\&\; (FWh > 0 \,||\, EWh > 0) \end{cases} \quad (4)$$

Coefficients for equation (4): d = –4.119, e = 0.242, f = 0.043, g = 0.198, h = 0.137; R^2= 0.622; *r* = 0.738

4.2.2 Eliciting values for individual types of cost

The estimation of some cost elements refers to the monetary input of family labour and machinery (tractor) which are considered as major cost drivers, so that a stepwise approach is applied to a certain extent also within the monetary sphere. For this reason these two elements are considered in the first place, whereas the sequence of the remaining types of cost corresponds to the scheme of profit accounting as applied in the section presenting the numerical results.

Family labour

The estimation of the imputed value of family labor (FL) is based on the assessed $FWh_{logging}$ and FWh_{other}. The hourly wages for logging and other activities are annually rated for the evaluation instructions for the FADN (LBG 2013). For the fiscal year 2012 following hourly wages are defined: logging € 14.59, other activities € 8.84.

Labour on-cost are respected with a 50% charge to performance linked wages. FL is calculated as the sum of wages and labour on-cost for logging and other activities (equation (5)).

$$FL\ [€] = FWh_{logging}[h] * 14.59[€] * 1.5 + FWh_{other}[h] * 8.84[€] * 1.5 \quad (5)$$

Coefficient of correlation for equation (5): $r = 0.832$

Tractor cost

Assessment of tractor cost (TC) is based on TRh, average tractor power (TP) and the common hourly rates for tractors, according to the evaluation instructions for the FADN (LBG, 2013). In case an enterprise operates more than one tractor, the average TP is calculated as there is no assignment of tractors to forestry available. This imputed hourly rate, derived from the rates provided by the Austrian council for agricultural engineering and rural development (ÖKL, 2013), includes elements of depreciation and interest. Due to the amendments in the enquiry depreciation of capital assets belonging to forestry are documented directly and must be excluded to avoid double counting. In average depreciation of capital assets count 25% of the hourly rate and imputed interest 12%. The rate for tractors for the fiscal year 2012 is 0.47 [€/kWh]. TC are calculated according to equation (6).

$$TC[€] = \frac{1}{n}\sum_{i=1}^{n}\left(TP_i[kW] * 0{,}47\left[\frac{€}{kWh}\right] * 0{,}63\right) * TRh[h] \quad (6)$$

Coefficient of correlation for equation (6): $r = 0.822$

The remaining TC can be subdivided by cost types. In average 51% belong to fuel cost, 23% to cost of repair and maintenance, 13% to cost of lubricants and 13% to cost of accommodation and insurance.

Wages

Cost for wages in forestry (W_F) occurs for dependent employment. They are assessed from the total cost for wages (W_{total}) using the forestry-related share of total working days (d). Working days are recorded for agriculture (WD_A), forestry (WD_F), agricultural auxiliary activity (WD_{AAA}), commercial auxiliary activity (WD_{CAA}) and farm holidays (WD_{FH}). W_F are calculated according to equation (7).

$$W_F[€] = W_{total}[€] * \frac{WD_F[d]}{WD_A[d] + WD_F[d] + WD_{AAA}[d] + WD_{CAA}[d] + WD_{FH}[d]} \quad (7)$$

Coefficient of correlation for equation (7): $r = 0.966$

Energy and material

Cost for energy and material (EMC) consists of the positions energy, material, plant protective, fertilizer and forest plants. Whereas cost for forest plants (CFP) is recorded specifically, the other elements are assessed in terms of a fixed relation to FL and TC, as shown in equation (8).

$$EMC[€] = CFP[€] + (FL[€] + TC[€]) * i \quad (8)$$

Coefficients for equation (8): i = 0.046; $r = 0.835$

Contractors
Starting with the fiscal year 2012, the cost of contractors rendering forest-related services is recorded specifically, so that no additional model is required.

Other contracted services
Cost for other contracted services (OCS) includes maintenance, legal advice, rental and cost for cars. As defined in equation (9) OCS is assessed in relation to FL and TC (j).

$$OCS[€] = (FL[€] + TC[€]) * j \quad (9)$$

Coefficients for equation (9): j = 0.026; *r* = 0.312

Taxes
Cost for taxes (TaC) include taxes and charges dependent on the assessed tax value of forestry (ATV_F) as well as additional taxes and charges. The cost for taxes and charges that is not based on ATV_F is derived as an inflation-adjusted fixed value per ha of PFA (k). TaC based on ATV_F is calculated with an average collection rate of 1875% according to the guidelines for the SSFN. For the first € 3,633.64 of the ATV_F, the collection rate is applied to 1.6 ‰ of the ATV_F and for the remaining value to 2.0 ‰ of the ATV_F (see equation **(10)**).

$$TaC[€] = \begin{cases} ATV_F[€]*0.0016*\frac{1875[\%]}{100}+PFA[ha]*k[\frac{€}{ha}] & ATV_F[€] \leq 3633.64 \\ ATV_F[€]*0.0016*\frac{1875[\%]}{100}+(ATV_F[€]-3633.64[€])*0{,}0004*\frac{1875[\%]}{100}+PFA[ha]*k[\frac{€}{ha}] & ATV_F[€] > 3633.64 \end{cases} \quad (10)$$

Coefficients for equation (10): k = 0.367; *r* = 0.953

Other cost
The item other cost (OC) includes insurance premiums and any kind of other cost. OC is assessed in relation to FL and TC (l) (equation (11)).

$$OC[€] = (FL[€] + TC[€]) * l \quad (11)$$

Coefficients for equation (11): l = 0.020; *r* = 0.290

Depreciation
Due to enhancements in the enquiry starting with the fiscal year 2012 the depreciation of assets (DoA) is documented specifically. DoA is even differentiated according to the four main cost units: logging ($DoA_{logging}$), silviculture ($DoA_{silviculture}$), roads (DoA_{roads}) and administration ($DoA_{administration}$). DoA is therefore calculated as the sum of the cost units' DoA (equation (12)).

$$DoA[€] = DoA_{logging}[€] + DoA_{silviculture}[€] + DoA_{roads}[€] + DoA_{administration}[€] \quad (12)$$

Coefficient of correlation for equation (12): r = 0.943

4.3 Numerical results for 2012

The results obtained for the year 2012 comprise three main categories: structure of the total cost, determination of family income and operating result as well as a set of physical ratios and figures given per m^3 and per family working hour.

4.3.1 Composition of total cost
Table 1 compares the shares of the different types of cost documented by the SSFN for 2012 as well as for the period 2003 to 2012 with the structure of cost derived as a representative, national average on the basis of the FADN and additionally to the subset of forest enterprises within the FADN which are defined by a share of forestry on standard output of at least one third ($FADN_{FE}$).

Table 1. Cost structures as documented by the SSFN and the FADN (figures given in %).

	SSFN 2012	**SSFN** 2003–2012	**FADN** 2012	**FADN$_{FE}$** 2012
Wages	3.9	3.9	1.3	2.5
Energy and material	4.3	4.0	4.5	4.4
Contractors	15.7	11.8	8.0	13.7
Other contracted services	1.9	0.2	1.9	1.7
Tractor cost	18.6	17.5	10.0	9.2
Taxes	1.6	1.8	0.9	1.6
Other cost	2.7	0.3	1.5	1.3
Depreciation	10.2	10.6	8.3	11.1
Family labour	41.1	49.9	63.6	54.5

The results indicate in regard to several items considerable differences between the FADN and the SSFN as well as a high variability within the SSFN when referring to different periods. Only about 18% of the total costs are recorded directly at the level of the FADN, the bulk of it since 2012 only. The cost structure is clearly dominated by imputed items, the value of family labour dominating by far.

4.3.2 Determination of income

In farm forestry, family income is the most significant indicator of profitability, the distinction between earned income and property income hinging on the wage rate for imputing the costs of family labour. Therefore, family income is specified as an intermediate result in *Table 2*. The figures are given as values per hectare of forest land for reasons of comparability. Furthermore, the methodological considerations addressed in section 4.1 are revisited by providing ratios of results derived from two different approaches.

Table 2. Determination of forestry income per ha of forest land for the SSFN, the FADN and the sub-sample of forest enterprises within the FADN (FADNFE), individual items for the FADN being assessed on the empirical basis of a 10-year sample of the SSFN (10a). The results derived from five year panels (5aP) are expressed in terms of percentages.

	SSFN	**FADN**		**FADN$_{FE}$**	
	2012 [€/ha]	2012 [€/ha]	relation 5aP/10a	2012 [€/ha]	relation 5aP/10a
Total revenues	**517.39**	**486.47**	100%	**413.53**	100%
- Wages	14.43	6.82	100%	8.64	100%
- Energy and material	16.06	24.07	107%	15.40	106%
- Contractors	58.67	42.79	100%	47.89	100%
- Other contracted services	7.19	10.12	106%	5.76	106%
- Tractor cost	69.55	53.00	114%	32.21	113%
- Taxes	5.92	4.75	101%	5.61	101%
- Other cost	10.21	7.71	117%	4.39	117%
- Depreciation	38.23	44.35	100%	38.92	100%
Family income	**297.13**	**292.85**	96%	**254.71**	98%
- Imputed value of family labour	153.84	337.83	101%	190.29	101%
Operating income	**143.30**	**–44.97**	133%	**64.42**	87%

Inputs and outputs per ha of forest land are driven mainly by the level of harvest. This is clearly the reason for the family income being lowest for the forest enterprises within the FADN. A methodological impact can be observed for some items and seems significant at least at the level of the operating income. In terms of efficiency, the SSFN exceeds the FADN by far, the $FADN_{FE}$ ranking in between and showing the highest cost efficiency in regard to cost other than family labour only. Relating forestry revenues to total cost, the SSFN shows an average figure of 1.38, the $FADN_{FE}$ reaches 1.18 and the FADN achieves 0.92 only.

The way means are calculated may considerably affect the results as exemplified in *Table 3* where alternative averages for family income and operating income, calculated as income per hectare, income per m³ of total cut and income per family working hour, are compared. The weighted mean approach uses an individual weight based on the number of represented farms and the quota of the sample. This is the standard approach of the FADN for deriving representative results. Conversely, the arithmetic mean is derived as the sum of individual ratios divided by the number of units in the sample. Thus this approach encompasses also units with no income from forestry. The national farm approach considers all single records as branches of one big farm (the national farm). The mean value is then calculated as the sum of all values x (e.g. family income) through the sum of all values y (e.g. productive forest area).

Table 3. Comparison of different approaches for the calculation of mean values for family income and operating income for the entire FADN (fiscal year 2012; PFA: productive forest area; FWh: family working hour).

		Weighted mean	Artihmetic mean	National farm
Family income forestry per ha PFA	[€/ha]	293	340	303
Operating income forestry per ha PFA	[€/ha]	–45	–327	–29
Family income forestry per m³ total cut	[€/m³]	41	20	41
Operating income forestry per m³ total cut	[€/m³]	-6	–67	–4
Family income forestry per FWh	[€/h]	17	26	18
Operating income forestry per FWh	[€/h]	–3	10	–2

The results of the ‚national farm approach' do not differ very much from the ordinary ones. This is an indication for the statistical quality of the quota sample. Conversely, calculating an arithmetic mean out of individual ratios implies the assumption, that all units carry the same weight, irrespective of their size and representativeness. The results of ratios referring to different units may even appear to be inconsistent, confusing and potentially misleading. This is the case in regard to the operating income which carries a negative sign when related to forest area or volume of harvest but has a positive value when depicted as value per family working hour.

4.3.3 Additional ratios

Quite a range of further ratios can be derived from the augmented database. These too, shed some light on the systematic bias which is introduced when results of the SSFN are used as proxies for small scale farm forestry as such. In addition to the values per ha given in *Table 2*, figures per m^3 as well as per family labour working hour are provided in *Table 4*.

Table 4. Comparison of selected physical results as well as total revenues of forestry and family income from forestry for the fiscal year 2012 for the SSFN, the FADN and the forest enterprises within the FADN ($FADN_{FE}$).

		SSFN	FADN	$FADN_{FE}$
Productive forest area per farm	[ha]	54	14	49
Annual allowable cut	[m³/ha]	6.14	6.10	6.03
Total cut	[m³/ha]	7.46	7.17	6.06
Total cut in % of annual allowable cut		121	117	101
Family working hours per hectare	[h/ha]	7.69	16.84	9.43
Productivity of felling	[m³/FWh in harvesting]	1.17	0.54	0.80
Total revenues forestry	[€/m³]	69.35	67.86	68.19
Family income forestry	[€/m³]	39.83	40.74	42.00
Total revenues forestry	[€/FWh]	67.32	28.88	43.83
Family income forestry	[€/FWh]	38.66	17.34	27.00

These items too, show that the SSFN differs considerably from the FADN and is not even a suitable substitute for forest enterprises in all respects. The efficiency of family labour is clearly a key issue of farm forestry. The productivity of felling cannot as yet be assessed properly, as the whole cutting volume has to be related to the family working hours in harvesting, irrespective of selling on the stump and harvesting by contractors. The true figure for productivity is documented for the SSFN only and amounts to 0.78 m³/FWh.

5 DISCUSSION, CONCLUSIONS AND OUTLOOK

The concept for an ex-post delimitation of forestry and agricultural inputs for all of the units of the FADN based on the empirical data of the SSFN as proposed by Brenner (2010) could be applied successfully. Quite a lot of methodological details could be refined or clarified. The exercise benefitted from recent improvements in the scheme of data collection. The original identification of forestry-related contractor cost as well as the specific allocation of depreciation became possible for the data of 2012 only. The framework of models for assessing individual types of cost has been designed in such a way, that annual updates can be performed quite easily. Thus, the implementation of the scheme of profit calculation for the forestry branch of farms sampled within the FADN in terms of a standardized extension would require only marginal organizational, technical and financial input.

Ultimately, the initially stated research questions could be dealt with successfully. Considering the requests for a dynamic and efficient framework and for mitigating the influence of changes in the sample of the SSFN it is proposed to base the models on 10 year moving averages of the SSFN. Specific models have been developed and tested in order to assess the forestry-related amount of each type of cost. For this purpose, reference is made to cost drivers such as volume of harvest and forest land, which are generally available throughout the FADN. The validity of the approaches is indicated by satisfactory levels of R^2 and Pearson's *r*. Eight out of the eleven coefficients of correlation exceed the level of 0.7. The lowest ones are in the range of 0.3 and refer to the minor and very heterogeneous types of cost 'other contracted services' and 'other cost'. Once data for several accounting periods are available, more sophisticated statistical analysis may help to further improve the models.

The statistical quality of information on farm forestry and its profitability can be improved substantially due to the considerable number of farms on the one hand and the representative design of the sample on the other. The statistical framework of the FADN allows deriving representative results for all kind of groupings, as each farm contributes to aggregated results according to its individually assigned weight. Respective results were already computed for the subset of forest enterprises. Revenues, costs as well as family and operating income can be presented as averages per farm, per hectare of forest land, per cubic meter of harvest or per hour of family labour.

There is considerable potential for further progress in terms of empirical results, statistical analysis as well as methodological issues. The implementation of such a framework shall pave the way to significantly improved insights into the economics of small scale farm forestry. In addition to a substantial progress in sector statistics, a respective, standardized extension of the FADN will provide a most valuable, empirical basis for the investigation of the interrelationships between agricultural and forestry activities, of the role of forest resources and forestry in terms of the resilience of farms, of the overall production efficiency and of the total economy of farm (Niskanen - Sekot 2001). Sustainability of timber production can be addressed by referring to regionally defined levels of allowable cut (Sekot 2011) as indicated already in the results section.

Starting with the fiscal year 2013, the FADN is to represent farm forestry up to a size of 500 ha. In principle, this implies closing the statistical gap in the range between 200 ha and 500 ha at least in regard to farm forestry, the Austrian network of bigger forest enterprises representing forestry only above this threshold level (Hyttinen et al. 1997). In practice, however, extending the sample to this size class proves to be quite a challenge. Other types of ownership prevail instead of the classical family farms and there is no tradition and low interest in voluntary book-keeping.

The general significance of the results derived from the SSFN might be improved as well as the impact of changes of the sample mitigated by introducing a weighing procedure. This could enhance also the statistical quality of the regressions applied to the FADN. So far, any aggregated figures are derived from absolute values, so that a single bigger entity may easily outweigh a considerable number of smaller ones, irrespective of any consideration of representativeness. However, the weights assigned within the FADN are not suited for this purpose, as they refer to the quotas underlying the design of the FADN, whereas the SSFN is not based on any statistical scheme and does not cover all of the major categories of farms. As an alternative to a general but more or less ambiguous weighing one may consider and test an n-nearest neighbour approach in order to identify for each unit within the FADN a respective subset of the SSFN for deriving specific coefficients.

Ultimately, the Austrian example may serve as reference or even as template for forestry-specific amendments of the FADN in other countries as well (Sekot 2012). The associated challenges and obstacles must not be underestimated, however. In spite of the very favourable preconditions given in Austria, it took some five years from designing the approach to a first implementation.

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Der Beitrag verschiedener Baumarten zum ökonomischen Erfolg von Forstbetrieben

Stefan WILHELM* – Bernhard MÖHRING

Abteilung für Forstökonomie und Forsteinrichtung, Göttingen, Deutschland

Zusammenfassung – Im Laufe der letzten Jahrzehnte war das gesellschaftliche Verständnis vom Wald einem Wandel unterworfen, dessen verstärkte Hinwendung zum Laubholz zu langfristigen Auswirkungen insbesondere auf die finanzielle Situation von Forstbetrieben führen wird. Da die Holzerlöse die Haupteinnahmequelle der meisten Forstbetriebe darstellen, werden detailliertere Informationen über den Beitrag der einzelnen Baumarten zum Erfolg des Betriebes benötigt. Mit der Verwendung der multiplen Regressionsanalyse zur Untersuchung der empirischen Daten des Privatwald Betriebsvergleiches Westfalen-Lippe kann durch die Erweiterung von vorhandenen durchschnittlichen Werten die ökonomische Bedeutung der einzelnen Baumarten abgeleitet werden. Diese Analysen zeigen die besondere Bedeutung ertragsstarker Nadelbaumarten im Baumartenportfolio von Mischbetrieben, um deren finanziellen Erfolg sicherzustellen.

Deckungsbeitrag / multiple Regressionsanalyse / Privatwald Betriebsvergleich / Betriebserfolg / Baumarten

Abstract – The Contribution of Different Tree Species to the Economic Success of Mixed Forest Enterprises in a Continuously Changing Environment. In the course of the last decades, society's understanding of forestry has changed causing long lasting effects on the forest sector, particularly on the financial situation of forest enterprises. As timber sales account for the main source of income in most forest enterprises, more detailed information regarding the contribution of the different tree species to the net income is required. Using the multiple regression analysis to examine empirical data, the economic relevance of different tree species can be derived by expanding the given data basis of mean values from a long-term intercompany comparison study of private owned forest enterprises in North Rhine-Westphalia. These analyses show the importance of high yield conifers in the portfolio of mixed forest enterprises as they ensure their financial success.

EINFÜHRUNG

Seit einigen Jahren berichten private Forstbetriebe verstärkt über steigende Ansprüche verschiedenster gesellschaftlicher Gruppen an die Wälder in Deutschland. Das Verständnis der Gesellschaft von Wald und damit auch der Forstwirtschaft war in den letzten Jahrzehnten einem starken Wandel unterworfen. Die Wünsche und Forderungen an die Betriebe haben in vielfältiger Weise Auswirkungen auf die Bewirtschaftung von Wäldern und damit auch Folgen auf den wirtschaftlichen Erfolg der Betriebe.

Trotz der steigenden Erlöse insbesondere der ertragsstarken Nadelbaumarten Fichte und Douglasie bleibt die Frage Wirtschaftlichkeit der einzelnen Baumarten aktuell. Neben den

* Korrespondierender Autor: stefan.wilhelm@forst.uni-goettingen.de; Büsgenweg 3, D-37077 Göttingen

Erlösen der jeweiligen Baumart stellt sich die Frage nach den baumartenspezifischen Produktionskosten und zu welchem Anteil die einzelnen Baumarten zur Deckung der Ausgaben außerhalb der Holzproduktion beitragen können (vgl. Möhring – Wilhelm 2012).

Jedoch werden in den meisten mitteleuropäischen Forstbetrieben die Produktionskosten nur in Summe und nicht baumartenweise erhoben und in den Betriebsergebnissen dokumentiert. Für die Analyse des Beitrags der einzelnen Baumart zum Erfolg des Betriebes ist dieses Wissen jedoch eine notwendige Grundlage. Daher soll anhand der Daten des Betriebsvergleiches Westfalen-Lippe gezeigt werden, wie es möglich ist, aus durchschnittlichen, summarisch erfassten Kosten baumartengruppenspezifische Kennzahlen zu ermitteln. Mit den Methoden der mehrstufigen Deckungsbeitragsrechnung und der multiplen Regressionsanalyse wird die langfristige Entwicklung der Kennziffern und ihr Beitrag zum Erfolg des Betriebes innerhalb des Zeitraumes von 1970 bis 2012 analysiert. Diese Ergebnisse werden den Kosten für Schutz gegenübergestellt, um aufzuzeigen, mit welchem Beitrag die einzelnen Baumarten zum Tragen dieser Kosten beitragen.

DATEN

Die Forstbetriebe

Betriebsvergleichsdaten sind eine wichtige Basis im Forstbereich, um Aussagen über Betriebe zu bestimmten Zeitpunkten treffen zu können, aber auch insbesondere zur Erfassung von Entwicklungen über längere Zeiträume. Auf Grund der Standardisierung der Erhebungsdaten und klaren Definitionen der Tätigkeitsbereiche wird eine systematische Erfassung der einzelbetrieblichen Daten und eine betriebsübergreifende Datenauswertung möglich.

Zum Wirtschaftszweig der Forstwirtschaft zählen Forstbetriebe der unterschiedlichsten Art und Ausprägung, die durch eine Vielzahl verschiedenster Eigenschaften charakterisiert sind. In Abhängigkeit der gewählten Fragestellung ist eine gemeinsame Vergleichbarkeit dieser verschiedenen Betriebe jedoch nur eingeschränkt möglich (Brabänder 1967). Für einen Betriebsvergleich ist es daher notwendig, störende Einflüsse auf die Vergleichbarkeit zu verringern, um annähernd vergleichbare Gegebenheiten zu ermöglichen. Für die Entwicklung von Kennzahlen und deren Verwendung für den zwischenbetrieblichen Vergleich bietet sich daher eine Differenzierung in unterschiedliche Betriebstypen an. Diese Betriebstypen sollen eine klare Unterscheidung von Forstbetrieben ermöglichen und damit zu einer Verbesserung der Aussagekraft der Datenanalyse beitragen. Diese Art der Betrachtung hat aber auch zur Folge, dass individuelle Werte einzelner Betriebe durch die Bildung von Durchschnittswerten überdeckt werden.

Brabänder (1967) empfiehlt Betriebe anhand weniger typischer Eigenschaften zu charakterisieren und entsprechend zu gruppieren. Basierend auf diesen Empfehlungen werden die Forstbetriebe meist anhand der Eigentumsart, der Betriebsgröße und der Hauptbaumart klassifiziert. Die Eigentumsart beeinflusst die Betriebsziele und hat damit direkte Auswirkungen auf die Art der Bewirtschaftung des Betriebes. Die Betriebsgröße hat Auswirkungen auf die Bewirtschaftungsintensität, Organisationsform und die Höhe der Fixkosten der Betriebe. Die Art der Hauptbaumart und die damit verbundenen Produktionsprogramme sind in großen Teilen durch Standortseigenschaften und die geographische Lage des Betriebes geprägt. Darüber hinaus haben die Baumarten einen direkten Einfluss auf die Bewirtschaftungskosten und die Holzerlöse. Vergleichbare Bewirtschaftungsmethoden und Standortseigenschaften sind eine geeignete Grundlage für den zwischenbetrieblichen Vergleich (Speidel 1967). Daher werden im Betriebsvergleich Westfalen-Lippe die Betriebe mit dem gleichen Baumartenschwerpunkt traditionell zu den sogenannten Beratungsringen zusammengefasst (Möhring – Wilhelm 2012). Diese Beratungsringe repräsentieren weitgehend die unterschiedlichen Regionen, in denen sich die Betriebe befinden. Mit diesen

Klassifizierungen wurde ein brauchbarer Kompromiss zwischen einem nicht zu detaillierten und noch nicht zu groben Vergleich der betrieblichen Daten gewählt.

Der Betriebsvergleich Westfalen-Lippe

Die verwendeten Daten des Betriebsvergleichs Westfalen-Lippe stammen von ca. 40 privaten Forstbetrieben mit einer jeweiligen Fläche von über 40 ha in Nordrhein-Westfalen und direkt angrenzender Bereiche Hessens und Niedersachsens. Die durchschnittliche Betriebsfläche lag 2012 bei 1750 ha. Dieser Betriebsvergleich ist deutschlandweit einer der ältesten seiner Art im größeren Privatwald und steht für insgesamt rund 60.000 ha. Seit 1969 werden die wichtigsten naturalen und finanziellen Kennziffern kontinuierlich erhoben. Diese Informationen werden zusammengefasst und ermöglichen Aussagen über die Situation und die Entwicklungen der Forstbetriebe und bilden hierdurch eine wichtige Datengrundlage für die Betrachtung langfristiger Entwicklungen (Möhring – Wilhelm 2012).

Die Daten des Betriebsvergleichs sind insbesondere auch dazu geeignet, mit der Hilfe von mathematisch-statistischen Methoden Einblicke in die Zusammenhänge zu erhalten und Schlussfolgerungen zu ziehen. Der Vorteil dieser Daten, die unter festgelegten methodischen Rahmenbedingungen erhoben wurden, liegt in der Tiefe der Differenziertheit, die einen Vergleich der statistischen Ergebnisse zwischen den einzelnen Betrieben und zwischen den Beratungsringen ermöglicht, über die Tiefe hinausgehend, die die Daten des statistischen Bundesamtes z.B. ermöglichen (Wense 1990).

Bestandteile der Kennzahlen

Ein breites Spektrum verschiedenster Zahlen werden im Betriebsvergleich von jedem einzelnen Betrieb erhoben und anschließend zu aussagekräftigen Kennzahlen weiter für den zwischenbetrieblichen Vergleich verdichtet. Einige Forstbetriebe weisen enge Verflechtungen mit anderen nicht forstlichen Betriebsteilen oder landwirtschaftlichen Flächen auf. Daher ist eine klare Abgrenzung zur bewirtschafteten forstlichen Fläche notwendig und die Grundlage für eine vergleichbare Bezugsgröße. Hierfür wurde die reine Holzbodenfläche gewählt. Diese enthält sowohl Hochwald, Dauerwald, Mittelwald und Kurzumtriebsplantagen.

Die Holzerlöse stellen für die meisten Forstbetriebe die Haupteinnahmequelle dar und bestimmen entsprechend das Betriebsergebnis zu einem hohen Anteil. Die Erlöse werden jährlich von den Betrieben separat für jede Baumart erfasst und dokumentiert. Eine Zuordnung der Erlöse zu den jeweiligen Sortimenten unterbleibt jedoch bei der Datenerfassung im Betriebsvergleich. Der betriebsinterne Verbrauch von eingeschlagenem Holz spielt nur eine sehr untergeordnete Rolle und kann auf Grund der geringen Menge vernachlässigt werden. Dagegen hat die Selbstwerbung in den letzten Jahren deutlich an Bedeutung gewonnen. Daher werden auch deren Erlöse separat erfasst und bei der Berechnung mitberücksichtigt.

Neben der Holzernte gehören die Bestandesbegründung und Bestandespflege zu den größten Kosten im forstlichen Produktionsprozess. Zu den Kosten der Bestandesbegründung zählen die Kosten der Flächenvorbereitung, sofern diese nicht während der Holzernte berücksichtigt wurden, die Kosten, die durch die Saat, Pflanzung oder natürliche Verjüngung anfallen, und die Kosten für alle weiteren Maßnahmen, bis zum Erreichen der gesicherten Kultur. Des Weiteren werden hierzu auch die Kosten für den Voranbau und Unterbau hinzugerechnet.

Zu den nicht baumartenspezifisch erfassten Kosten für die Bestandespflege werden alle Kosten für Maßnahmen ab dem Zeitpunkt der gesicherten Kultur bis hin zum Zeitpunkt, zu dem die ersten verkaufsfähigen Sortimente anfallen, gerechnet. Auch Astungskosten sowie Kosten für Be- und Entwässerung werden hier miteinbezogen.

Neben den waldbaulichen Kosten müssen auch die Kosten für die Erschließung und Verwaltung auf Betriebsebene mit einbezogen werden. In die Erschließungskosten werden Kosten für Wege, Brücken und Lagerplätze einbezogen. Die Verwaltungskosten mit ihrem hohen Anteil an den Gesamtkosten der Holzproduktion enthalten die Gehälter der Angestellten, die Nebenkosten und Pensionen. Darüber hinaus werden auch Ausgaben für den Bürobedarf und Ausstattung sowie Steuern, Beiträge und Versicherungen miteinbezogen. Abschreibungen für Gebäude, Miete und andere Kosten sind hier auch enthalten. Nicht hierher gehören die Kosten für Naturschutz und Erholungsleistungen der Forstbetriebe.

METHODIK

Deckungsbeitragsrechnung

Als eine Methode zur Bestimmung des Erfolgs unterschiedlicher Produkte empfiehlt Speidel (1967) die Kostenträgerrechnung. Mit der Kostenträgerrechnung könnte eine direkte Aussage über den erreichten Gewinn oder Verlust eines Produkts getroffen werden und sie wäre daher eine ideale Grundlage für den Vergleich verschiedener Produktionsmethoden oder Produkte (Speidel 1967). Eine Kostenträgerrechnung in der von Speidel beschriebenen Tiefe wird jedoch nur von sehr wenigen Forstbetrieben für den kompletten Holzproduktionsprozess durchgeführt (vgl. Moog 1995). Insbesondere die verursachungsgerechte Berücksichtigung der Gemeinkosten stellt Betriebe vor einige Herausforderungen und wird daher meist nicht durchgeführt (Moog 1995). Im Forst ist die Vollkostenrechnung auf Grund des hohen Anteils an Kuppelprodukten mit einem hohen Anteil an Gemeinkosten und sehr langen Produktionszeiten äußerst komplex (Keuffel 1980). Entsprechend scheint der Bewertungsansatz der Vollkostenrechnung mit der direkten Einbeziehung der fixen Kosten ungeeignete für den hier zu verwendenden Bewertungsansatz zu sein (Speidel 1967).

Der Hauptunterschied zwischen der Vollkosten- und Teilkostenrechnung besteht in der Aufteilung der fixen und variablen Kosten. Der wesentliche Vorteil der Teilkostenrechnung im Vergleich zur Vollkostenrechnung ist in der vereinfachten und klareren Analyse des Produktionsprozesses und des Erfolgsbeitrages von einzelnen Baumarten ohne die Betrachtung von fixen Kosten zu sehen. Ein genaueres Bild der Realität und insbesondere die Verbindungen zum Erfolg einzelner Produkte lassen sich durch die Trennung in fixe und variable Bestandteile klarer herausarbeiten (Keuffel 1980). Hierdurch ist die Methode geeignet, den finanziellen Beitrag der einzelnen Baumart bzw. Baumartengruppen zum Erfolg des Betriebes zu bestimmen (Moog 1995), wie er hier untersucht werden soll.

Die Verwendung von Deckungsbeiträgen kommt ohne die zum Teil schwierige Zuordnung der Gemeinkosten und ohne die Proportionalisierung der Fixkosten aus. Im Vergleich zur Vollkostenrechnung wird mit der Deckungsbeitragsrechnung eine realitätsnähere und klarere Darstellung der tatsächlichen Gegebenheiten und Zusammenhänge und damit der erfolgsbeinflussenden Faktoren des Betriebes möglich (Keuffel 1980). Die Deckungsbeitragsrechnung ermöglicht entsprechend die Antwort auf die Frage nach der verursachungsgerechten Höhe des Erfolgsbeitrags (Moog 1995) für jede Baumartengruppe innerhalb einer definierten Periode, insbesondere, da Nadel- und Laubholz unterschiedlich mit ihren Produktionskosten und der Bandbreite an Erlösen zum Erfolg des Betriebes beitragen.

Die mehrstufige Deckungsbeitragsrechnung stellt ein System der Erfolgsdifferenz-rechnung dar, das, beginnend von den verkauften Holzmengen, die jeweiligen Erlös- und Kostenkomponenten gegenüberstellt. Mit dieser mehrstufigen Deckungsbeitragsrechnung wurde ein Kompromiss entwickelt, durch dessen mehrstufige Gliederung eine mehrstufige Fixkostendeckungsrechnung entsteht (Moog 1995), ohne auf die detaillierte Sicht der variablen Bestandteile im Produktionsprozess zu verzichten (Keuffel 1980).

Als Deckungsbeitrag I der mehrstufigen Deckungsbeitragsrechnung wird die Differenz zwischen den Erlösen aus dem Holzverkauf und den Holzerntekosten bezeichnet (Speidel 1967). Von diesem Wert werden schrittweise die Kosten für die Bestandesbegründung und Bestandespflege abgezogen, was zum Deckungsbeitrag II führt. Durch den Abzug der Kosten für Erschließung und abschließend den Verwaltungskosten wird der Deckungsbeitrag III bzw. IV gebildet (Keuffel 1980). Der Deckungsbeitrag IV stellt in diesem Zusammenhang den Waldreinertrag ohne die Berücksichtigung der sonstigen Kosten dar, die hier nicht mit in die Berechnung einbezogen werden. Des Weiteren sind hier die Kosten für Schutz und Erholung nicht enthalten. Diese zusätzlichen Kosten außerhalb der klassischen Holzproduktion werden hier aus Gründen einer differenzierteren Betrachtungsmöglichkeit am Beispiel der Kosten für Schutz getrennt betrachtet.

Die mehrstufige Deckungsbeitragsrechnung ermöglicht eine umfassendere Betrachtung zu welchem Anteil die Erlöse jeder Baumartengruppe zur Deckung der Fixkosten und damit zum Erfolg des Betriebes beitragen. Die Deckungsbeiträge sind hierdurch für eine direkte Beurteilung des Erfolgsbeitrages der einzelnen Baumartengruppen zum Betriebserfolg geeignet. Wegen der einfachen Interpretierbarkeit bildet die mehrstufige Deckungsbeitragsrechnung mit ihren einzelnen Deckungsbeiträgen der verschiedenen Baumartengruppen die Grundlage für diese Untersuchung.

Wie bereits ausgeführt, werden die Kosten nicht baumartenspezifisch, sondern nur in Summe erfasst und dementsprechend nicht den einzelnen Baumarten zugeordnet. Einzig die Erlöse liegen getrennt nach den jeweiligen Baumarten(-gruppen) vor. Daher wird eine Methode benötigt, die die Kosten verursachungsgerecht den einzelnen Baumartengruppen und den jeweiligen Deckungsbeiträgen zuweist. Für den Deckungsbeitrag I werden die Kosten entsprechend des geernteten Holzvolumens jeder Baumart zugeteilt. Bei den Deckungsbeiträgen II, III und IV, die nicht direkt vom geernteten Volumen abhängig sind, wird der Bezug zur Fläche der jeweiligen Baumart unterstellt (Möhring – Wilhelm 2013a).

Multiple Regressionsanalyse

Die multiple Regressionsanalyse ist eine flexible und häufig verwendete statistische Analysemethode. Sie ermöglicht die Beziehung zwischen mehreren unabhängigen und einer abhängigen Variable zu untersuchen, wie zum Beispiel den Zusammenhang zwischen der Einschlagsmenge der einzelnen Baumarten innerhalb einer Periode und den dazugehörenden Holzerntekosten. Der primäre Anwendungszweck der multiplen Regressionsanalyse ist die Analyse des kausalen Zusammenhangs und hierdurch eine geeignete Methode, um die Gesamtkosten den einzelnen Baumartengruppen zuzuteilen. Die Anwendung dieser Technik als statistische Methode zur Bestimmung von Kostenfunktionen auf der Grundlage empirischer Daten aus vorangegangenen Perioden ist eine etablierte Technik in der Kostenrechnung (Friedel 2013).

Die grundlegende Vorgehensweise der regressionsmathematischen Analyse kann in verschiedene Unterkategorien wie folgt unterteilt werden: Zu Beginn steht die Aufstellung des zu analysierenden Regressionsmodells und die Formulierung der Hypothese. Hierfür sind die inhaltlichen Ursache-Wirkungs-Beziehungen zu formulieren. Entsprechend muss hierbei ein Untersuchungsansatz entwickelt werden, der die angenommene Beziehung so umfassend wie möglich beschreibt (Backhaus et al. 2010).

Hypothesen

Für die Zuteilung der verschiedenen Kosten zu den Baumartengruppen wurden jeweils eigene Hypothesen aufgestellt. Es wurde angenommen, dass jeder Festmeter geerntetes Holz der jeweiligen Baumartengruppe direkt zu entsprechenden Holzerntekosten führt. Die Hypothese hierfür lautet, dass die Holzerntekosten einzig von der geernteten Menge abhängig sind und hierdurch auf die Einbeziehung eines konstanten Gliedes in der Regressionsgleichung

verzichtet werden kann. Für die nächsten Hypothesen wird unterstellt, dass die Holzbodenfläche der jeweiligen Baumart die Höhe der Kosten für die Bestandesbegründung und -pflege bestimmt. Ebenso wurde auch bei den letzten beiden Hypothesen die Abhängigkeit zwischen der Holzbodenfläche der jeweiligen Baumart und den Erschließungs- bzw. Verwaltungskosten angenommen. Zu Beginn der Analyse wird ein linearer Zusammenhang unterstellt, der später überprüft wird.

Anhand des Beispiels der Abhängigkeit der Summe der Holzerntekosten 2012 von dem Einschlag der jeweiligen Baumartengruppe wird die Berechnung des Regressionsmodells vollzogen. Die drei Baumartengruppen Laubholz, Fichte und Kiefer stellen hierbei die unabhängigen Variablen dar, während die Holzerntekosten entsprechend die abhängige Variable bilden.

Der Zusammenhang zwischen Kosten und Kostentreibern ist langfristig nicht fixiert (Hongreen et al. 2001). Insbesondere im forstlichen Produktionsprozess erfolgten in den letzten Jahrzehnten, bedingt durch technische Innovationen, dem verstärkten Maschineneinsatz, den steigenden Kosten (Möhring – Wilhelm 2012) deutliche Veränderungen. Um diesen Zusammenhang mit abzubilden und Einflüsse von technischen Entwicklungen auf das Ergebnis zu vermeiden, wurde die Analyse der Holzerntekosten auf einer jährlichen Basis durchgeführt. Abweichend hiervon stellt sich die Situation für die Bestandesbegründung und Bestandespflege dar. Der Arbeitsaufwand dieser Maßnahmen schwankt stark zwischen den einzelnen Jahren in den Betrieben. Um dies auszugleichen, wurden hier 10-jährige Perioden anstelle der jährlichen Daten verwendet.

Die Zielfunktion der Regressionsanalyse für die Holzerntekosten wird durch die folgende Formel beschrieben:

$$Holzerntekosten = b_1 * Menge\ Laubholz + b_2 * Menge\ Fichte + b_3 * Menge\ Kiefer$$

mit b_j ($_j$ = 1, 2, 3), dem jeweiligen Regressionskoeffizienten und den eingeschlagenen und verkauften Mengen der einzelnen Baumartengruppen in den jeweiligen Jahren.

Mit der Hilfe der Methode der kleinsten Quadrate, einer Methode zur Bestimmung der unbekannten Parameter im Regressionsmodell, ist die folgende Regressionsfunktion für den aufgezeigten Zusammenhang vollständig beschrieben.

$$Holzerntekosten = 21{,}67 * Menge\ Laubholz + 19{,}99 * Menge\ Fichte + 27{,}29 * Menge\ Kiefer$$

Für das Jahr 2012 setzen sich entsprechend der dargestellten Regressionsgleichung die summierten Holzerntekosten, die durch Arbeiten in Eigenregie oder Unternehmerleistungen angefallen sind, aus 21,67 € für jeden geernteten Festmeter Laubholz, 19,99 € für jeden geernteten Festmeter Fichte und 27,29 € pro Festmeter für Holzernte der Kiefer zusammen. Die Regressionskoeffizienten bestimmen den Kostensatz, mit dem ein weiterer geernteter Festmeter der jeweiligen Baumartengruppe zu den Holzerntekosten pro Hektar beiträgt.

Überprüfung des Modells

Die Modellevaluation ist ein wesentlicher Schritt im Rahmen der multiplen Regressionsanalyse. Nach der eigentlichen Berechnung des Regressionsmodells ist die Güte der geschätzten Parameter zu bestimmen und zu überprüfen, wie diese und damit auch die aufgestellten Hypothesen geeignet sind, die Realität zu beschreiben. Hierbei wird grundsätzlich in die globale Prüfung der Regressionsfunktion als Ganzes und in die Prüfung der einzelnen Regressionskoeffizienten unterschieden, um zu klären, wie diese zur Erklärung der abhängigen Variablen beitragen (Backhaus et. al. 2010).

Um die Erklärungskraft des Regressionsmodells zu beurteilen, wird die Güte der Anpassung analysiert, die durch das Bestimmtheitsmaß (R^2) beschrieben wird. Das Bestimmtheitsmaß eines linearen Modells, wie es hier verwendet wurde, ist der Quotient aus der Varianz der durch die Regressionsgleichung geschätzten und der Varianz der

beobachteten Werte bzw. dem Anteil der Varianz der abhängigen Variablen, der auf Grundlage der Regressionsgleichung beschrieben wird. (Wense, 1990). Das Bestimmtheitsmaß für das Beispiel der Holzerntekosten im Jahr 2012 beträgt 0,99. Dies bedeutet, dass 99 % der Holzerntekosten durch die geernteten Mengen der einzelnen Baumartengruppen beschrieben werden können.

Zur Signifikanzprüfung des geschätzten Modells in seiner Gesamtheit wurde der F-Test verwendet. Dieser ermöglicht die Analyse der gemeinsamen Erklärungskraft und damit den Einfluss der unabhängigen Variablen auf die abhängige Variable. Dieser kausale Zusammenhang, wie er hypothetisch postuliert wurde, wurde mit einer Irrtum-wahrscheinlichkeit von 5% für das Beispiel der Holzerntekosten bestätigt.

Nach der Bestätigung der Signifikanz des kompletten Regressionsmodells erfolgt im nächsten Schritt die Überprüfung der jeweiligen unabhängigen Variable und ihres Einflusses auf die abhängige Variable. Hierfür wurde für jeden Regressionskoeffizienten der entsprechende Standardfehler und t-Wert berechnet. Der t-Wert gibt dabei Auskunft über das Größenverhältnis zwischen dem geschätzten Koeffizienten und dem entsprechenden Standardfehler. Die Ergebnisse des Beispiels der Holzerntekosten weisen dabei deutlich höhere Werte als die Schwellenwerte auf, wie in der folgenden *Tabelle 1* dargestellt, und bestätigen damit die Beziehung zwischen der abhängigen Variable und den unabhängigen Variablen, die nicht nur dem Zufall zugeschrieben werden kann (Hongren et al. 2001).

Tabelle 1. Testergebnisse der Regressionsanalyse

		Estimate Std. Error	t value	Pr(>|t|)	
Laubholz	21.673	1.892	11.456	7.37e-13	***
Fichte	19.989	2.013	9.930	2.69e-11	***
Kiefer	27.289	4.844	5.633	3.14e-06	***

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Für die Aufstellung des Regressionsmodells und die Anwendbarkeit der Testverfahren wurden einige Annahmen getroffen, die im Folgenden überprüft werden. In der Realität ist die Regressionsfunktion nicht immer linear, wie es hier angenommen wurde.

Skaleneffekte sind in der Forstwirtschaft ein fester Bestandteil, und dies insbesondere in der Holzernte. Jedoch können diese zu nicht linearen Zusammenhängen in den Kostenfunktionen führen. Durch die Wahl der zu analysierenden Daten der Betriebe des Betriebsvergleiches, die sowohl ähnliche Eigenschaften aufweisen als auch durch deren Mindestgröße von 200 ha, mit der ein regelmäßiger Holzeinschlag unterstellt werden kann, wurde versucht, die Skaleneffekte einzugrenzen. Entsprechend wurde die Linearität durch das Aufzeichnen der Regressionsgeraden und der Residuen überprüft. Zugrunde liegt hierfür die Annahme der Homogenität der Varianz, diese impliziert, dass die Residuen durch den Wert der unabhängigen Variablen nicht beeinflusst werden und dass die Werte gleichmäßig um die Regressionsgerade streuen, was für die untersuchten Daten zutrifft und entsprechend die linearen Zusammenhänge bestätigt.

Autokorrelation tritt primär bei Daten aus Zeitreihen auf (Backhaus et al. 2010). Daher wurde neben der Analyse von Streudiagrammen mit dem Durbin-Watson-Test die Autokorrelation der untersuchten Werte geprüft. Die Ergebnisse des Durbin-Watson-Tests können sich dabei zwischen 0 und 4 bewegen. Werte in der Nähe von 0 oder 4 weisen auf eine hohe Autokorrelation zwischen den Residuen hin, während Werte um 2 die Abwesenheit einer solchen Autokorrelation bestätigen (Wense 1990). Insbesondere für die Ergebnisse der Bestandesbegründung und Bestandespflege, in denen 10-jährige Perioden untersucht wurden, besteht möglicherweise das Risiko einer Autokorrelation. Die Ergebnisse des Durbin-Watson-Tests sind für diese Kostenarten in *Tabelle 2* dargestellt. Sie liegen nahe 2 und bestätigen daher die Abwesenheit der Autorkorrelation.

Tabelle 2. Testergebnisse des Durbin-Watson-Tests

Periode	1970-1979	1980-1989	1990-1999	2000-2009
Testergebnis	1,91	2,01	2,12	1,90

Abschließend wurde die Annahme des linearen Regressionsmodells, und zwar die Normalverteilung der Residuen für die einzelnen Regressionsanalysen bestätigt.

ERGEBNISSE

Das Testen der Ergebnisse aus der multiplen Regressionsanalyse hat die getroffenen Annahmen, die durch die Formulierung der Hypothesen aufgestellt wurden, für jedes einzelne betrachtete Jahr des analysierten Zeitraums mit der Ausnahme der Erschließungskosten bestätigt. Der unterstellte Zusammenhang zwischen der bestockten Fläche der jeweiligen Baumartengruppe und den Erschließungskosten konnte nicht bestätigt werden. Augenscheinlich ist die Höhe der Erschließungskosten nicht abhängig von der Baumartengruppe, sondern von einem nicht betrachteten Faktor, der auf Grund der Themenstellung hier nicht weiter untersucht wurde. Entsprechend werden im Weiteren die durchschnittlichen baumartengruppenunspezifischen Erschließungskosten der Betriebe verwendet.

Für die mengenabhängigen Holzerntekosten werden im Folgenden die ermittelten baumartengruppenspezifischen Kosten verwendet, während für die Bestandesbegründung, Bestandespflege und die Verwaltungskosten die flächenabhängigen holzartengruppen-spezifischen Kostenarten in die Berechnung einfließen. Diese Werte entsprechen den Koeffizienten der multiplen Regressionsanalyse. Aus Gründen der Übersichtlichkeit werden die Elemente der mehrstufigen Deckungsbeitragsrechnung im Folgenden entsprechend der drei Baumartengruppen Laubholz, Fichte und Kiefer gegliedert und mit Daten aus dem Betriebsvergleich vervollständigt.

Die Höhe der Holzerlöse pro Hektar, die erste Eingangsgröße der mehrstufigen Deckungsbeitragsrechnung, ist in hohem Maße abhängig von der geernteten Menge der jeweiligen Baumart. Während die geerntete Menge im Laubholz über den Betrachtungszeitraum relativ stabil bei ungefähr 5 Festmetern pro Jahr und Hektar lag, schwankte die Einschlagsmenge der Kiefer stärker zwischen den einzelnen Jahren. Größere Schwankungen traten jedoch nur in den von den Stürmen Wiebke (1990) und Kyrill (2007) beeinflussten Jahren aus, während sich die Einschlagsmenge über lange Zeiträume auf Grund der geringeren Produktivität der Standorte deutlich unter der Einschlagsmenge des Laubholzes befand, wie in *Abbildung 1* dargestellt.

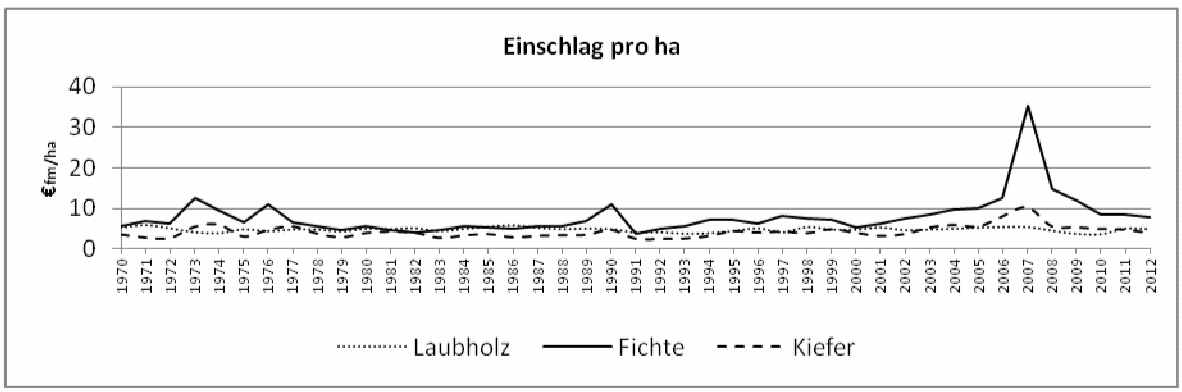

Abbildung 2. Einschlag pro ha

Der in der Forsteinrichtung geplante Hiebssatz kann langfristig auch als ein Indikator für die Produktivität der Standorte und den unterschiedlichen Zuwachs der verschiedenen Baumarten gesehen werden. Während der geplante Hiebssatz der Kiefer relativ konstant bei ungefähr 3 Festmetern pro Hektar und Jahr während des gesamten Betrachtungszeitraums lag, stieg der Hiebssatz der Fichte um mehr als das Doppelte der Kiefer auf bis zu 7 Festmetern im letzten Jahrzehnt an. Darüber hinaus war der Einschlag der Fichte deutlich durch die diversen Sturmereignisse der letzten Jahrzehnte geprägt, wie in *Abbildung 1* dargestellt. Die Stürme führten zu einem deutlichen Anstieg der geernteten Mengen in den Jahren des Ereignisses und den Folgejahren, wie 1972 durch Quimburga, 1976 durch Capella, 1990 durch Vivian und Wiebke, 2007 durch Kyrill und Emma 2008. Die Folgejahre nach den Stürmen waren dagegen meist durch einen zurückhaltenden Einschlag geprägt. Aber auch Sturmereignisse anderer Regionen, wie zum Beispiel Lothar, der im Beratungsring zu keinen hohen Schäden führte, zeigten direkte Auswirkungen in der Höhe der Erlöse und damit im Deckungsbeitrag I.

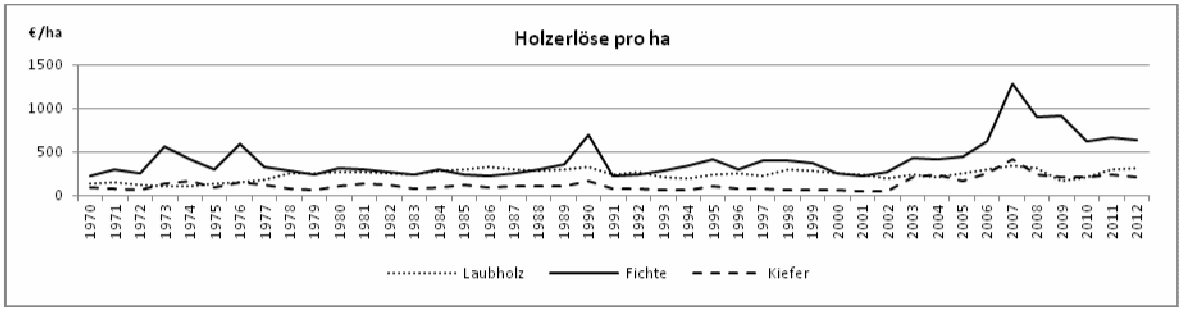

Abbildung 4. Holzerlöse pro ha

Neben diesen verschiedenen Einschlagsmengen pro Hektar bestimmen die Erlöse pro Festmeter der jeweiligen Baumart die Höhe der Erlöse pro Hektar, wie in *Abbildung 2* dargestellt. Nach dem Abzug der baumartenspezifischen Holzerntekosten von den Erlösen wurde der Deckungsbeitrag I berechnet *(Abbildung 3)*.

Es ist offensichtlich, dass der Deckungsbeitrag I *(Abbildung 3)* großteils einer Parallelverschiebung der Erlöse pro Hektar entspricht und damit stark von den Erlösen und Einschlagsmengen abhängig ist, mit der Ausnahme in den durch Stürmen beeinflussten Jahren. Die Holzerntekosten haben im Vergleich zu den Erlösen nur einen geringen Einfluss auf den Deckungsbeitrag I, was auf die geringen Schwankungen in ihrer Entwicklung zurückgeführt werden kann. Während die Holzerntekosten der Fichte 1970 bei ca. 11 € lagen und ihr Maximum mit 29 € pro Festmeter 1991 erreichten, und die Erntekosten der Baumart Kiefer eine ähnliche Entwicklung aufwiesen, entwickelten sich die Holzerntekosten des Laubholzes deutlich zurückhaltender. Seit 1970 steigen diese von 6 € pro Festmeter auf ca. 22 € 2012.

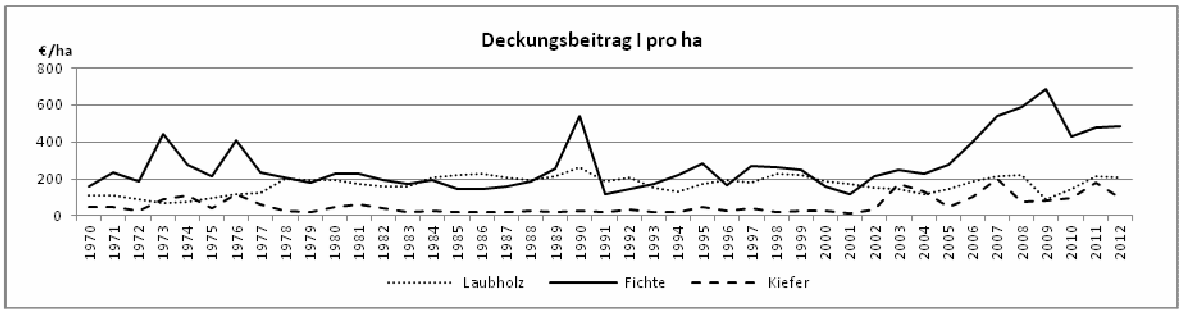

Abbildung 6. Deckungsbeitrag I pro ha

Bei der langfristigen Betrachtung des Deckungsbeitrags I der Kiefer wird der relativ konstante Verlauf des Wertes bei rund 20 € mit nur leichten Schwankungen bis 2003 deutlich. Mit dieser Höhe knapp über Null liegt der Wert deutlich hinter den anderen Baumartengruppen zurück. Erst seit 2003 hat sich dieses Bild geändert und der Deckungsbeitrag stieg auf Grund der hohen Holzerlöse für die Kiefer.

Auf Grund der hohen Einschlagsmengen der Fichte pro ha wird in *Abbildung 2* nicht deutlich, dass der durchschnittliche Erlös des Laubholzes pro Festmeter zwischen 1983 und 2008 deutlich über dem für die Fichte lag. Seitdem hat sich jedoch das Bild deutlich gewandelt. Während die Erlöse für die Fichte ständig stiegen, fielen die für das Laubholz unter die für die Fichte zurück, und entsprechend entwickelten sich auch die Deckungsbeiträge.

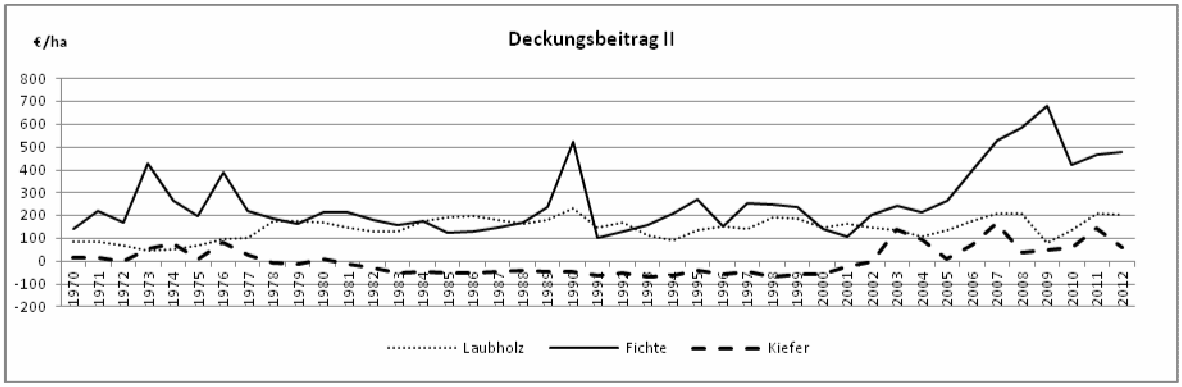

Abbildung 8. Deckungsbeitrag II

Nach dem Abzug der holzartengruppenspezifischen Kosten der Bestandesbegründung und Bestandespflege wird der Deckungsbeitrag II berechnet. Aus Gründen der relativ hohen Kosten für die Kiefer im Vergleich zu den anderen Baumartengruppen fiel der Deckungsbeitrag II 1981 ins Negative, und erst die steigenden Holzerlöse 2003 führten wieder zu einem positiven Deckungsbeitrag, wie in Abbildung 4 ersichtlich. Diese niedrigen Erlöse für Kiefer waren entsprechend über eine lange Zeit hinweg kaum in der Lage, die Kosten für die Bestandesbegründung und Bestandespflege zu tragen.

Für die Berechnung des Deckungsbeitrags III, dargestellt in *Abbildung 5*, werden die Kosten für die Erschließung vom Deckungsbeitrag II abgezogen, da mit der multiplen Regressionsanalyse kein direkter Zusammenhang zwischen der bestockten Fläche der jeweiligen Baumartengruppe und den Erschließungskosten für die Datengrundlage des Betriebsvergleichs Westfalen-Lippe nachgewiesen werden.

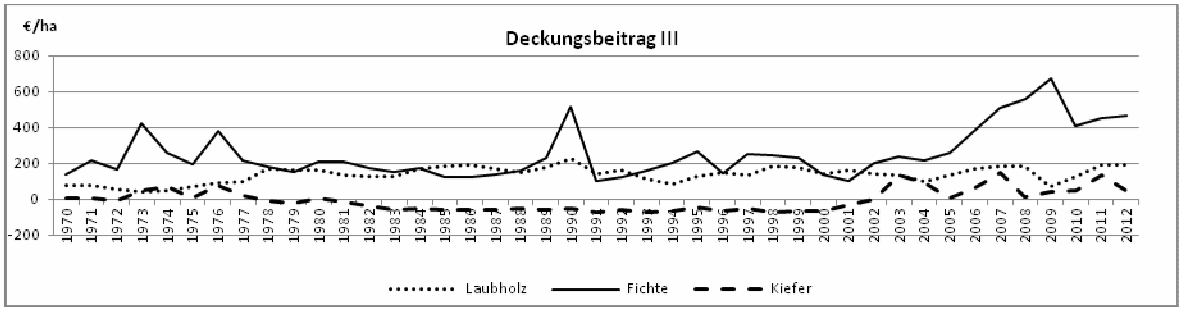

Abbildung 5. Deckungsbeitrag III

Durch den Abzug der Verwaltungskosten wird der Deckungsbeitrag IV berechnet, wie in *Abbildung 6* dargestellt. Die Ergebnisse der multiplen Regressionsanalyse für die Verteilung der Verwaltungskosten führen zu einer klaren Unterscheidung in der Höhe zwischen den

verschiedenen Baumartengruppen. Während in den ersten Jahren des Betrachtungszeitraumes bis 1977, die stark durch Sturmereignisse geprägt waren, die Verwaltungskosten für das Laubholz bei rund 40 € pro Hektar lagen, überstiegen diese danach die anderen Baumartengruppen und steigen bis auf 180 € 2007. Die Verwaltungskosten der anderen Baumartengruppen stiegen auch, jedoch mehr zurückhaltend. Es ist offensichtlich, dass die Bewirtschaftung mit Laubholz zu deutlich höheren Verwaltungskosten geführt hat, insbesondere im letzten Jahrzehnt, während sich die Verwaltungskosten für die beiden Nadelholzgruppen Fichte und Kiefer sehr ähnlich entwickelt haben *(Abbildung 6).*

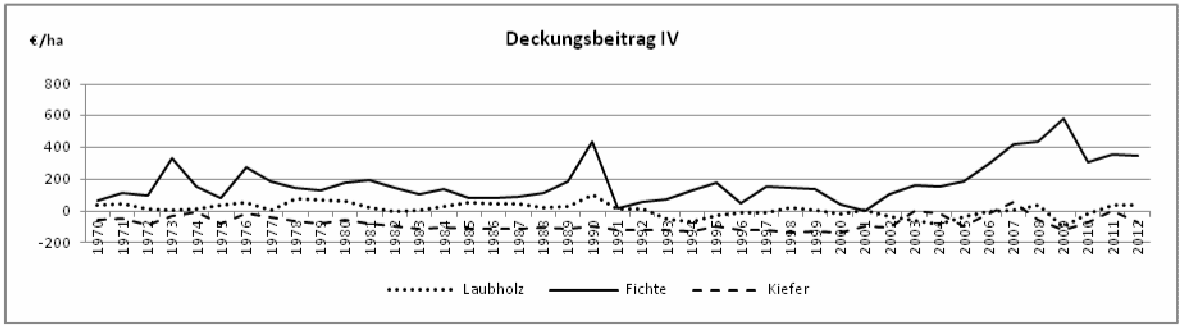

Abbildung 6. Deckungsbeitrag IV

Darüber hinaus wird deutlich, dass für die Kiefer, mit nur wenigen Ausnahmen, die durch einen hohen Massenanfall durch Stürme in Verbindung mit relativ hohen Holzerlösen verursacht wurden, kein positiver Deckungsbeitrag IV während des gesamten Betrachtungszeitraums erzielt wurde. Selbst der Deckungsbeitrag des Laubholzes schwankt langfristig nur um die Nulllinie. Lediglich die Baumartengruppe der Fichte ermöglichte einen dauerhaften positiven Deckungsbeitrag IV.

In diesem Deckungsbeitrag IV sind jedoch nur die Kosten für den klassischen forstlichen Bereich der Holzproduktion enthalten und nicht die zusätzlichen Kosten für Schutz. Lagen die Kosten für Schutz noch 1970 bei rund 0,16 € pro Hektar, sind sie bis 2009 auf 24 € pro Hektar gestiegen. Die Höhe dieser jährlichen Kosten ist jedoch stark von den einzelnen Maßnahmen der Betriebe abhängig und schwankt hierdurch stark zwischen den einzelnen Jahren. Aber der Aufwärtstrend innerhalb der Betrachtungsperiode wird deutlich.

Werden vom Deckungsbeitrag IV noch die Kosten für Schutz abgezogen, wird deutlich, dass insbesondere in den letzten Jahrzehnten die steigenden Kosten lediglich von der Baumartengruppe Fichte getragen werden konnten *(Abbildung 7)*. Ersichtlich wird aber auch, dass das Laubholz in den 1980er Jahren, die noch durch geringe Kosten für Schutz geprägt waren, diese Kosten gedeckt hat. Erst durch die sinkenden Holzerlöse zu Beginn der 1990er Jahre war dies nicht mehr gegeben.

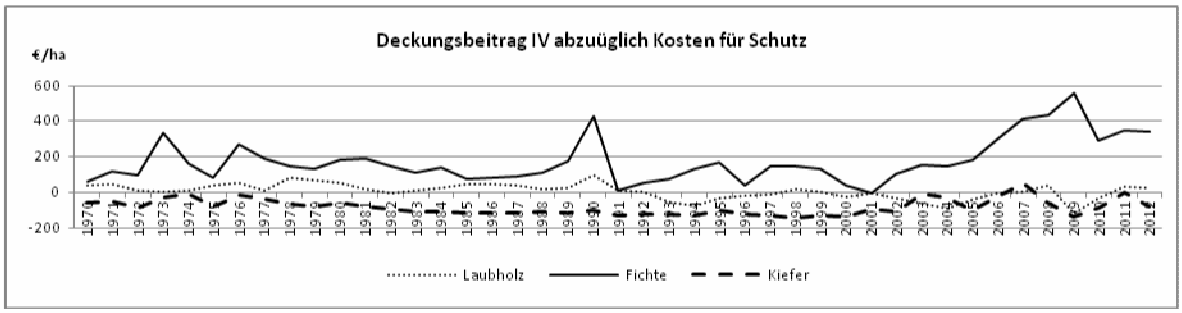

Abbildung 7. Deckungsbeitrag IV abzüglich Kosten für Schutz

Werden vom Deckungsbeitrag IV noch die Kosten für Schutz abgezogen, wird deutlich, dass insbesondere in den letzten Jahrzehnten die steigenden Kosten lediglich von der Baumartengruppe Fichte getragen werden konnten *(Abbildung 7)*. Ersichtlich wird aber auch, dass das Laubholz in den 1980er Jahren, die noch durch geringe Kosten für Schutz geprägt waren, diese Kosten gedeckt hat. Erst durch die sinkenden Holzerlöse zu Beginn der 1990er Jahre war dies nicht mehr gegeben.

DISKUSSION UND AUSBLICK

Angesichts der Langfristigkeit des forstlichen Produktionsprozesses wurde mit dem analysierten Zeitraum von 1970 bis 2012 nur ein vergleichsweise kurzer Zeitabschnitt betrachtet. Jedoch wurde gezeigt, dass sich mit der multiplen Regressionsanalyse unspezifische durchschnittliche Werte der Kosten den einzelnen Baumartengruppen verursachungsgerecht zuteilen lassen und diese zur ökonomischen Beurteilung der Baumartengruppen in die mehrstufige Deckungsbeitragsrechnung einfließen können. Hierbei wurde zunächst für die jeweiligen Jahre ein Statusvergleich der einzelnen Baumartengruppen erstellt. Erst aus der Entwicklung dieser Kennzahlen im Zeitverlauf ließen sich Trends erkennen, auch wenn durch die Verwendung der direkten betrieblichen jährlichen Daten Geldwertänderungen nicht miteinbezogen wurden.

Während die den einzelnen Baumartengruppen zugeteilten Holzerntekosten für die jeweilige Baumart in relativ ähnlicher Höhe ausfielen, mögen die vergleichsweise hohen Kosten der Bestandesbegründung der Kiefer im ersten Moment etwas überraschend wirken. Diese lassen sich jedoch großteils durch den Waldumbau von Kiefer hin zu ertragsstärkeren Baumarten erklären. Aber auch der zum Teil auf Grund der Förderpolitik vollzogene Umbau zu Laubholz dürfte hierzu seinen Beitrag leisten, insbesondere bei den hohen Bestandesbegründungskosten der Eiche.

Die Anwendung der Methode der multiplen Regressionsanalyse erreicht jedoch dann ihre Grenzen, wenn zugrunde liegende Modellannahmen durch die Formulierung unvollständiger Modellannahmen nicht bestätigt werden können. Die angenommene Abhängigkeit der Erschließungskosten lediglich von den Flächen der Baumartengruppen konnte nicht bestätigt werden. Die fehlende Bestätigung ist dabei auf die unvollständige Formulierung der Regressionsgleichung zurückzuführen, da weitere Einflussfaktoren wie bspw. die Topographie, die hier nicht mit aufgenommen wurden, die Kosten für die Erschließung bestimmen. Da für den Zusammenhang der baumartenspezifischen Betrachtung und der Deckungsbeitragsrechnung lediglich die Abhängigkeit der Kosten von der Baumart von Bedeutung waren, wurden die nicht betrachteten Einflussfaktoren der Erschließungskosten nicht weiter analysiert.

Trotz ihrer unterschiedlichen geographischen Lage weisen die Betriebe des Betriebsvergleiches Westfalen-Lippe eine breite Palette unterschiedlichster Baumarten in ihrem Portfolio auf. Jedoch selbst im Beratungsring Laubholz mit seiner Hauptbaumart Buche tragen die Nadelholzbaumarten, insbesondere die Fichte in wesentlichen Teilen zum Betriebserfolg bei (Möhring – Wilhelm 2013a). Ein wesentlicher Anteil von ertragsstarken Baumarten im Portfolio eines Betriebes, den nahezu alle Betriebe des Betriebsvergleiches Westfalen-Lippe aufweisen, sichert den finanzielle Erfolg der Betriebe. Dieser Fokus auf die Nadelholzbaumarten sollte nicht im Gegensatz zu dem empfohlen Waldumbau und der damit häufig verbundenen Verringerung des Nadelholzanteils im Kontext des Klimawandels stehen. Aber dort, wo möglich, sollten die ertragsstarken Nadelbaumarten mit in die Überlegungen einbezogen werden, um diese so im Baumartenportfolio des Betriebes zu halten, denn das Laubholz war im letzten Jahrzehnt kaum in der Lage, die steigenden Mehraufwendungen aus den Bereichen außerhalb der klassischen Holzproduktion zu tragen. Darüber hinaus darf nicht

außer Acht gelassen werden, dass verlängerte Umtriebszeiten oder Flächenstilllegungen aus Gründen des Naturschutzes hier nicht mit in die Berechnungen einbezogen wurden, die aus ökonomischer Sicht aber von den restlichen Betriebsflächen mitgetragen werden müssen, sofern diese nicht im Rahmen des Vertragsnaturschutzes kompensiert werden. Die tatsächlichen Kosten für Schutz dürften daher deutlich über den erfassten Kosten liegen. Insbesondere bei der Zuweisung des Zeitaufwands in diesem Bereich besteht noch Entwicklungspotential für die Betriebe des Betriebsvergleichs Westfalen-Lippe (Möhring – Wilhelm 2013b).

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SWOT and Group AHP Approach in Assessing Scenarios for Increased Use of Forest Biomass for Energy in Slovenia

Lidija ZADNIK STIRN* – Špela PEZDEVŠEK MALOVRH – Petra GROŠELJ – Vasja LEBAN – Janez KRČ

Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenija

The implementation of EU 2020 strategy depends to some extend on sustainable and inclusive forest sector, respecting the limits of what forests can supply while increasing the use of forest biomass for energy. Different forest management approaches (integrative, segregative) will be studied and assessed regarding essential future demands, especially on bio-energy, of different stakeholders and interest groups. The study is based on EU WoodWisdom ERA NET project COOL. SWOT analysis regarding forest management and societal demands, and group analytic hierarchy process are employed in a multicriteria decision support model for evaluating the national FM approaches and future scenarios. Data for presented decision model are obtained by Slovenian COOL research group from questionnaires filled by stakeholders and experts. Thus, the results of the generated model will expose the future national (Slovenian) FM policies that will stimulate, regulate or limit the balanced use of wood-based energy. A balanced use of forest biomass for energy reflects on different economic, ecological and social demands, and conflicting stakeholders' and different groups' interests.

forest management scenarios / biomass for energy / stakeholders / experts / SWOT analysis / group AHP / Slovenia

* Corresponding author: lidija.zadnik@bf.uni-lj.si; Jamnikarjeva 101, 1000 LJUBLJANA, Slovenija

Fuzzy Methods for Evaluation of Environmental, Social and Economic Indicators in Natura 2000 Forestlands

Lidija ZADNIK STIRN* – Petra GROŠELJ

Biotechnical Faculty, University of Ljubljana, Ljubljana, Slovenija

It is widely recognized that sustainable forest management (SFM) is a dynamic concept which needs to be regularly updated due to changing demands and competing uses of forests. Further, there are also some new issues/regulations, as for example Natura 2000, that need to be accommodated and call for improved coordination and knowledge, based on interdisciplinary research. Natura 2000 sites are specific, not only by their environmental/conservation characters, but also by their social and economic context. In this view, the paper tackles the problem of how to support SFM of Natura 2000 sites through proper evaluation of their SFM scenarios. These scenarios are assessed by specific indicators measuring environmental, social and economic impact. The indicators are qualitative and quantitative and are difficult to define. To undertake such a difficult valuation process we suggest fuzzy methods. The concept of membership function and fuzzy operators that combine the SFM scenarios and indicators are presented. Finally, these methodologies are illustrated on a SFM of Natura 2000 forestland in Slovenia.

forest management / indicators / fuzzy methods / Natura 2000 forestland / Slovenia

* Corresponding author: lidija.zadnik@bf.uni-lj.si; Jamnikarjeva 101, 1000 LJUBLJANA, Slovenija

Forest Carbon Income Opportunities and Effects on Optimal Rotation Ages for Southern Hardwood Forests: a Tennessee Case Study

Chenli ZHANG – Donald G. HODGES*

Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN, USA

A number of analysts have assessed the effect that carbon markets can play in determining the optimal economic rotation of even-aged pine stands in the southern U.S. Recently, researchers have begun to assess how carbon may influence hardwood management as well, albeit with hypothetical volumes and for even-aged management regimes. Little information exists, however, regarding how carbon can influence uneven-aged management alternatives for southern US hardwoods. We estimated future carbon sequestration opportunities for the two primary hardwood forest types in Tennessee and assessed how various carbon values could affect management returns for even-aged and uneven-aged stands. This was accomplished by first estimating future timber volume and carbon yields with initial stand values based on state forest inventory averages. These values were used to calculate economic returns to three distinct objectives timber production only, carbon only, and carbon and timber. Sensitivity analysis was conducted based on a range on product prices (timber and carbon), discount rates, and product mixes.

forest carbon / optimum economic rotation / ecosystem services

* Corresponding author: dhodges2@utk.edu; 274 Ellington Plant Sciences Bldg, Knoxville, TN 37996, USA

Fostering Adaptation by Changing Landowners' Knowledge Framework – Responses to Extension Education in Northwest Washington State, USA

Kevin W. ZOBRIST[a*] – Lauren A. GRAND[a] – Mary A. ROZANCE[b]

[a] Extension Forestry, Washington State University, Everett, WA, USA
[b] Institute for Sustainable Solutions, Portland State University, Portland, OR, USA

Abstract – Landscape urbanization and fragmentation, spread of invasive pests, biodiversity loss, social value changes, and loss of manufacturing infrastructure are some of the changing ecological, economic, and environmental framework conditions facing small-scale forest owners in northwest Washington State, USA. To successfully adapt to these changes, landowners' knowledge framework must change. Washington State University Extension has been offering comprehensive, multi-week training courses for small-scale forest owners. From 2008 – 2013, we surveyed participants at the conclusion of the training, one year following the training, and again at three years following the training. These follow-up surveys demonstrate a progression from knowledge change to behavior (management) change and, ultimately, to condition change. Condition changes included increased wildlife diversity, decreased invasive species cover, and increased economic sustainability. The results demonstrate that changing a landowner's knowledge framework through education is a highly-effective approach for helping them successfully adapt to changing external framework conditions,

forestry / Extension / evaluation

1 INTRODUCTION

Small-scale forest owners in northwest Washington State, USA face a variety of changing ecological, economic, and social framework conditions. Expanding urbanization is resulting in the loss and fragmentation of the forest land base (Bradley et al. 2009). A changing regulatory framework, in response to concerns about water quality and salmon habitat, increases the complexity and decreases the profitability of forest management on small ownerships (Zobrist – Lippke 2003). Changing log markets and manufacturing infrastructure are resulting in changing management trends (e.g. Mason 2003). Other issues such as invasive species and available wildlife habitat are cited by landowners as additional areas of concern (Zobrist – Rozance in press(a)).

Changing landowners' knowledge framework through education can help them adapt to these changing conditions. Landowners identify education and technical assistance as preferred methods for helping them implement good forest management practices (Jones et al. 1995, Kilgore et al. 2007). This study examines whether a forest landowner education

[*] Corresponding author: kevin.zobrist@wsu.edu; 600 128th St SE Everett, WA, USA 98208

program effectively changes landowners' knowledge framework in a way that subsequently leads to behavior and condition changes (i.e. adaptation to changing framework conditions).

2 BACKGROUND

Forest Stewardship Coached Planning is one of the flagship landowner education and outreach programs offered by Washington State University (WSU) Extension. The program is done in partnership with the Washington Department of Natural Resources (DNR), the United States Forest Service (USFS), and other state and local partners. The program is offered several times per year at different locations around the state, reaching thousands of family forest owners since its inception in 1992 (Baumgartner et al. 2007). Coached planning is typically seven to nine weeks in length and includes class sessions one evening per week, a Saturday field day, and a site visit to each participant's property by a state service forester, usually from the DNR.

Coached Planning is a comprehensive education course that covers a broad spectrum of topics including species identification, stand dynamics, soils, forest health, wildlife, invasive species, silviculture, regulations, water quality, forest inventory, wildfire, and special forest products. The course is focused on coaching landowners in the writing of their own forest stewardship plans (also called management plans) that encompass all of these topics and provide a roadmap for successful management and adaptation. The writing of stewardship plans, coupled with site visits from state service foresters, helps participants synthesize class information and apply it to their individual properties. Downing and Finley (2005) found that learning information that applies to an individual's personal situation is important to landowners. In Washington, management plans have additional benefits, as qualifying landowners can use their plans to meet eligibility requirements for cost share assistance, preferential property tax treatment, and forest certification (Zobrist 2011).

Washington's Forest Stewardship Coached Planning program, along with the corresponding technical assistance from DNR foresters, has been supported in part by the USFS Forest Stewardship Program, a nationwide initiative launched in 1991 to promote written stewardship plans for small-scale forest owners. In many states, funding from this program has been used to provide landowners with professionally-prepared plans. A few states, like Washington, offer the coaching option for landowners to self-prepare plans (Esseks – Moulton 2000).

In the period from 2008 – 2013, 12 coached planning classes were offered in various locations across four northwest Washington counties: King, Snohomish, Skagit, and Island. Two additional classes were offered online in a webinar format. This region, which includes most of the Seattle metropolitan area, has over 50,000 small forest landowners managing over 167,000 hectares of forest (Rogers – Cooke 2009). The total attendance for these classes was 507 people representing 333 families or organizations. Most attendees were family forest owners, but there were several attendees representing municipalities and non-profit organizations related to land stewardship.

3 METHODS

Evaluations were done at four different times: midway through the course, at the end of the course, one year after the course, and three years after the course. The evaluations midway through and at the end of the course collected feedback about the first and second halves of the class, respectively. These evaluations were done for each of the 14 classes, though data for one class in 2011 is missing and not included in this study. In addition to gathering feedback

to improve future classes, the purpose of these evaluations was to assess short-term impacts of knowledge change due to the course. This was done as a retrospective pre-test (also called a then-test), coupled with a post-test, asking participants to rank their before and after knowledge of different course topic areas using a five-point Likert scale, with one being not knowledgeable and five being very knowledgeable. We used a two-sample t-test to test for significant differences between the results of the retrospective pre-test and the post-test.

A retrospective pre-test was chosen because of an expectation of a strong response-shift bias with a true pre-test. This bias is introduced when participants recalibrate their perception of their knowledge based on what they learned. This can result in an underestimate of gains, and in some cases the post-test scores may even be lower than the pre-test scores, as participants find there is much more they do not know about a topic than they realized before the education event. We observed this phenomenon when evaluating a past program, and program participants have commonly expressed things like "I did not know what I did not know."

The one-year and three-year post-class evaluations were done as mail surveys. One-year evaluations were done for 11 classes from 2008 through 2012. Three-year evaluations were done for five classes from 2008 through 2010. The survey method was roughly based on the Tailored Design Method proposed by Dillman (2007). A pre-notice was sent a few days in advance by email. The survey was then sent by mail along with a cover letter and postage-paid return envelope. A thank you and reminder letter was sent by mail, along with a new copy of the survey and a new postage-paid return envelope, two weeks after the first mailing. A second reminder letter was sent two weeks after the first reminder, also with a new copy of the survey and a new postage-paid return envelope. Thank you and reminder emails were also sent one week after the first survey mailing and one week after the first reminder letter mailing. Only those participants who agreed at the beginning of the course to participate in follow-up surveys and who provided a valid mailing address were surveyed. Only one survey was sent per household.

The focus of the one-year survey was on behavior change due to taking the course. The survey included questions about whether participants used new knowledge from the course to complete a stewardship plan, implement stewardship practices, and/or share information with others. We used a chi-squared test to compare the behavior change between those who completed a written stewardship plan and those who did not. The one-year survey also included questions about whether the course increased participants' enjoyment of their forest land, their understanding of the ecological importance of their forest land, and their likelihood of utilizing the services of a professional forester if harvesting timber.

The focus of the three-year survey was on condition change. Participants were asked if they had a stewardship plan and, if so, how often they referred to it. Participants were asked if they observed increased wildlife use or decreased invasive species cover after implementing practices using knowledge gained from the course. Participants were asked if they used course knowledge and/or their stewardship plan to sell any timber or non-timber products, enroll in a cost share program, or enroll in a preferential property tax program. Participants were also asked if their comfort and confidence as landowners and their overall quality of life as landowners had improved due to taking the course.

4 RESULTS

4.1 Knowledge self-assessment results

Table 1 summarizes the mean self-assessment responses for topic knowledge before and after the course. Not every topic was covered in every class, and knowledge of how to write a stewardship plan was not surveyed before 2011, so some n values are noticeably lower than others. All topics showed a mean knowledge gain of at least 1 point (on a scale of 1 to 5), and

all gains were significant at $\alpha = 0.01$. How to write a stewardship plan showed the greatest knowledge gain, followed by forest inventory and timber sale management. Native trees, wildlife, and invasive species showed the smallest gains, but these topics also had the highest levels of pre-class knowledge.

Table 1. Mean topic knowledge rating before and after the course, on a scale of 1 (not knowledgeable) to 5 (very knowledgeable).

	Before the course			After the course					
Topic	Mean	SD	n	Mean	SD	n	change	t	p
Native trees	2.64	1.15	257	3.89	0.81	255	1.25	14.23	<.001*
Wildlife	2.67	0.97	254	4.08	0.71	252	1.41	18.68	<.001*
Invasive species	2.40	1.05	200	3.97	0.73	201	1.57	17.38	<.001*
Forest taxes	1.98	1.11	170	3.56	0.93	168	1.59	14.16	<.001*
Stand dynamics	2.21	1.07	277	3.80	0.72	272	1.59	20.32	<.001*
Forest soils	1.89	0.97	289	3.52	0.74	283	1.63	21.49	<.001*
Silviculture	1.94	0.92	258	3.64	0.96	253	1.70	20.47	<.001*
Importance of plans	2.39	1.24	269	4.13	0.80	268	1.74	19.34	<.001*
Regulations	1.78	0.94	220	3.53	0.77	220	1.75	21.31	<.001*
Non-timber products	1.99	0.93	247	3.75	0.77	247	1.75	22.83	<.001*
Forest health	2.07	0.91	258	3.86	0.70	255	1.79	25.01	<.001*
Timber sale	1.44	0.81	108	3.36	0.86	107	1.93	16.89	<.001*
Forest inventory	1.88	0.94	120	3.82	0.74	119	1.94	17.73	<.001*
Plan writing	1.45	0.84	131	4.08	0.74	131	2.63	26.79	<.001*

* Significant at $\alpha = 0.01$

4.2 One-year follow-up results

The one-year follow-up surveys, were sent to 234 households who agreed to participate and provided valid contact information (87.3% of 268 originally participating households). We received 209 responses (89.3% response rate). Table 2 summarizes participant responses. Approximately 65% completed a written plan, and over 90% used course knowledge to implement stewardship practices. Practices implemented are summarized in Table 3 and Table 4. Wildlife habitat enhancement, invasive weed control, and fire risk reduction practices were applied to the greatest total area, and trail building was applied to the greatest total distance. Wildlife habitat enhancement, invasive species control, and tree planting were applied by the greatest number of respondents.

Table 2. Summary of participant responses in the one-year follow-up evaluation.

	No	Yes	Yes (%)
Completed a stewardship plan	71	131	64.9
Implemented practices using course knowledge	20	184	90.2
Shared course knowledge with others	8	199	96.1
Increased enjoyment of property	21	187	89.9
Increased understanding of ecological importance of property*	15	124	89.2
Increased likelihood of using a professional forester when harvesting timber**	9	92	91.1

*Asked of 2009 and later classes

**Asked of 2010 and later classes

Table 3. Stewardship practices applied within one year using course knowledge

Practice	Participants implementing	Area treated (ha)
Regeneration harvest	26	30.6
Commercial thin	7	63.5
Animal damage protection	44	101.1
Pre-Commercial thin	40	138.8
Pruning	64	137.3
Other vegetation control	87	159.8
Tree planting	92	162.8
Fire risk reduction	71	238.1
Invasive weed control	126	288.1
Wildlife habitat enhancement	100	491.2
Total		1811.8

Table 4. Kilometers of stewardship practices applied within one year of the course

Practice	Participants implementing	Distance treated (km)
Streamside habitat improvement	31	22.8
Road improvement	30	33.1
Trail building	63	84.3

Of those who completed a stewardship plan, 94% implemented stewardship practices using course knowledge compared to 86% of those who did not complete a stewardship plan *(Table 5)*. The results of our chi-squared test indicate that this difference is significant at $\alpha = 0.10$, but just barely insignificant at $\alpha = 0.05$ (χ^2=3.81; p=0.051).

Table 5. Comparison of practices implemented between those who did and did not complete plans

	Completed a plan	
	Yes	No
Implemented practices	122 (94%)	59 (86%)
Did not implement practices	8 (6%)	10 (14%)

Approximately 96% of respondents reported sharing course information with others in the year following the course. The total number of people that respondents reported sharing with was 2,212, which is an average of approximately 11 people per participant who shared. Approximately 90% of participants reported that the course resulted in a greater enjoyment of their property, a greater understanding of its ecological importance, and a greater likelihood of utilizing a professional forester if harvesting timber.

4.3 Three-year follow-up results

For the three-year follow-up surveys, we sent surveys to 123 households who agreed to participate and provided valid contact information (86.0% of 143 originally participating households). We received 101 responses (82.1% response rate). Table 6 summarizes participant responses. The percent of respondents with completed plans increased to 85.9% at the three-year mark. Those who completed a plan reviewed it an average of 1.4 times per

year. Over half of the participants observed increased wildlife use and decreased invasive species cover due to practices implemented using course knowledge. Almost all respondents reported that the course increased their comfort and confidence as a forest owner and decision maker, and that the combination of course impacts increased their overall quality of life.

Table 6. Summary of participant responses in the three-year follow-up evaluation

	No	Yes	Yes (%)
Completed a stewardship plan	14	85	85.9
Increased wildlife use observed	37	49	57.0
Decreased invasive species cover	30	57	65.5
Sold products using course knowledge	69	17	19.8
Enrolled in a cost share program	65	12	15.6
Enrolled in preferential tax program	34	47	58.0
Increased comfort/confidence as forest owner	0	95	100
Increased quality of life	3	87	96.7

Over half of the respondents used their stewardship plan to enroll in a preferential property tax program for forestry. Those who did reduced their property tax liability by an average of $1,489 USD per year. Fewer than 20% of respondents reported using course knowledge to sell timber or non-timber products or enroll in a cost share program. Those who sold products generated a combined total of $516,243 USD in income. Those who enrolled in a cost share program received a combined total of $42,710 USD in cost share funds. When asked to rank their likelihood of converting their property to non-forest use before and after taking the course (highly unlikely, unlikely, neither likely or unlikely, likely, very likely), 30.8% reported a lower likelihood, 3.3% reported an increased likelihood, and 65.9% reported no change. Of those who reported no change, all were either unlikely or highly unlikely.

5 DISCUSSION

5.1 Knowledge change

The results of this study suggest that education through the Forest Stewardship Coached Planning course successfully changes the knowledge framework of small-scale forest owners in northwest Washington State. Knowledge gains were significant across all 14 topics. The extent of these gains should be viewed with some caution. Although a retrospective pre-test can be used to counter response-shift bias, it introduces different biases that can result in overestimating the effect of a program, especially when measuring a socially-desirable outcome like knowledge gain (Hill – Betz 2005). Thus, these results should be viewed with an understanding that they represent participants' subjective views of how they have changed. Future studies may warrant different methods to reduce or better understand potential biases. Our results show that the greatest knowledge increase is in how to write a forest stewardship plan, which reflects the overall emphasis of the course. Our one-year follow-up results show that participants share their new knowledge with an average of 11 people per person in the first year after taking the course, which represents a multiplying of the knowledge change. Further study to investigate the impact of this indirect influence of the course would be beneficial.

5.2 Behavior change

Our one-year evaluation results indicate a progression from knowledge change to behavior change, with 90.2% of respondents reporting using knowledge gained from the course to implement stewardship practices on their property. This is higher than the 73% reported in a 14-year statewide retrospective study of the program done by Baumgartner et al. (2007). However, that study asked the question differently, asking about practices that the landowner would not have done otherwise. Our study asked in more general terms about practices implemented using course knowledge. There may have been practices that the landowner would still have done if not for the course, but that the practice was done differently through the application of course knowledge. Both cases indicate a behavior change for the vast majority of participants.

Our results of plan completion rates, especially after three years, are higher than the 61% reported by Baumgartner et al. (2007). It is unknown why our 2008-2012 results are higher than those from 1992-2005. This could reflect improvements to the course, changes in instructors, or region-specific differences between northwest Washington and the rest of the state. Respondents in our study on average reviewed their plans at least once per year. This is similar to a study by Elwood et al. (2003) in the neighboring state of Oregon that found that all participants used their plans at least annually. In contrast, the results of our study are quite different than a study in West Virginia that found that less than 20% of participants in a forest stewardship program referred to their plans regularly (Jennings – McGill 2005). The reason for this stark difference is unknown. In West Virginia, stewardship plans are written for landowners by professionals, whereas in our program the landowners write the plans themselves. This could indicate that self-prepared plans get greater use, or that management plans done in conjunction with education get more use. This is an area for future study.

Interestingly, the groups of respondents who did and did not complete a stewardship plan both had high rates of implantation of stewardship practices after one year (94% and 86%, respectively). The difference in practice implementation rate between the two groups is significant at $\alpha = 0.10$, but insignificant (albeit barely) at $\alpha = 0.05$. That both groups have implementation rates greater than 85% is perhaps more notable than any difference between them, though, especially since our finding of a higher rate of implementation for those who completed plans does not establish a cause and effect relationship. These results suggests that the education and assistance aspects of the Coached Planning program drive behavior change more than writing a stewardship plan. This calls into question whether the production of management plans is the best policy focus when it comes to landowner outreach and assistance, especially when plans are done by professionals and not coupled with landowner education. Further study is needed to understand the most effective drivers of change.

5.3 Condition change

Our three-year evaluation results suggest a progression from knowledge and behavior change to condition change. Over half of the respondents reported increased wildlife use and decreased invasive species cover on their property after implementing practices using knowledge gained from the course. The wildlife observations should be treated with some caution, as participants may simply be more aware or observant of wildlife use based on what they learned in the class. The decrease in invasive species cover, however, is likely to stem from practices implemented to control these species. This represents an important adaptation to one of the changing ecological framework conditions (the spread of invasive species) facing small-scale forest owners.

Unlike the one-year follow-up survey, the three-year survey did not ask respondents if they implemented specific practices like wildlife habitat improvement or invasive species

control. Thus, these results do not connect specific practices with outcomes. As such, these results are not indicative of the effectiveness of specific practices, but rather are indicative of the impact of the program as a whole relative to these specific areas of interest.

Another adaptation seen in the three-year results is economic adaptation. Over half the participants used course knowledge to get their property enrolled in a preferential property tax program for forestry, saving $1,489 USD per year on average. Forest land that is taxed based on highest and best use rather than forestry use can be a significant impediment to economic sustainability (D'Amato et al. 2010). Forest landowners have cited property tax burdens as a key factor influencing them to parcelized or sell their property (Butler et al. 2010, Stone – Tyrrell 2012). Studies in the U.S. have found that many landowners are not aware of preferential property tax programs for forestry (Rathke – Baughman 1996, Williams et al. 2004, Fortney et al. 2011, Van Fleet et al. 2012). Education about these opportunities, coupled with education about how to write the management plan that is often required for enrollment, can play a significant role in getting landowners enrolled.

Our study revealed another economic adaptation, which is using course knowledge to generate income from the sale of timber and non-timber forest products. Fewer participants (approximately 20%) pursued this compared to those pursuing preferential tax treatment. This is not unexpected, since generating income is not a high ownership value for landowners in northwest Washington (Zobrist – Rozance 2014). These participants generated over a half a million USD of new income using course knowledge, though, which is important for economic sustainability and rural economic development.

5.4 Potential impact on forest conversion rates

Getting more landowners enrolled in preferential property tax programs may not achieve the policy goals of good land stewardship and reduced forest conversion. While landowners consistently claim that property taxes are one of their top concerns and a driving factor for parcelization and conversion (e.g. Butler et al. 2010, Stone – Tyrrell 2012), empirical results from studies of actual landowner behavior are mixed. A 1999 study in the state of Tennessee found no difference in intention to change land use within ten years between those who were enrolled in a preferential property tax program and those who were not (Brockett – Gerhard 1999). While property taxes have been linked empirically to parcelization and conversion, these land use changes are inelastic relative to property taxes, such that lowering property taxes has a disproportionately small impact on slowing parcelization and conversion (Polyakov – Zhang 2007, Poudyal – Hodges 2009). This suggests that, when it comes to conversion and parcelization choices, property taxes are not as great of an influence as landowner testimonials would indicate. Interestingly, Butler et al. (2010) observed that focus group participants, when unprompted, did not cite property taxes as a key problem nearly as much as they did after they were informed that the study was about tax policies.

Almost all respondents in our study (89.9%) reported an increased understanding of the ecological importance of their property due to taking the course. This may be important, as Wadsworth (1999) found that landowners who believe their forest land has an impact on the larger landscape were less associated with an intention to sell or subdivide their property due to financial reasons. That study does not demonstrate cause and effect, though, so increasing ecological understanding does not necessarily lead to a lower likelihood of property sale or conversion. When asked directly to rank their likelihood of converting their land to development before and after the course, 30.8% reported a lower likelihood while 65.9% reported no change. Those who reported no change were already unlikely or very unlikely. This brings up another important issue, which is that participants self-selected into the Coached Planning program and thus may represent a biased sample that is more inherently concerned with ecosystem services and land preservation.

Almost all respondents reported greater enjoyment of their property; greater comfort and confidence as forest owners; and greater overall quality of life. These factors may lead to participants maintaining ownership of their property longer or taking additional steps to protect their forest land from development (e.g. conservation easements). Such outcomes are currently unknown, though, and offer opportunities for further study.

6 CONCLUSIONS

Overall, our study suggests that education is a successful strategy for changing landowners' knowledge framework in a way that fosters adaptation to a variety of changing conditions. Our study finds that the Forest Stewardship Coached Planning program in northwest Washington State, USA, significantly increases landowner knowledge across 14 topic areas. This leads to subsequent behavior change, which ultimately results in condition changes that represent successful economic and ecological adaptations that improve landowner quality of life. The Forest Stewardship Coached planning program, which combines classroom and field-based education with stewardship plan writing and direct technical assistance, appears to be a highly effective landowner education and outreach model. Education and assistance may be more important factors than management plan writing when it comes to behavior change, and there are opportunities for further study to explore this as well as gain a better understanding of cause and effect relationships when assessing the impacts of education and outreach programs.

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