

Innovation Activities of Small-scale Forest Holdings in Central Europe: Frame Conditions, Attitudes and Policy Implications

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Abstract

In recent years changing technologies, changing consumer markets, decreasing wood prices and other factors have had a dramatic impact on forestry and forest-based manufacturing sectors. The forest sector is under increasing pressure to reform and change. This includes a stronger emphasis on "market-based" incentives for forestry activities and a search for means to enhance productivity and develop new sources of income throughout the forest sector.

Based on the research results of EFI Project Centre Innoforce, the paper presents the innovation landscape in forestry in Central Europe with special focus on small-scale forestry. It aims to provide answers to the following questions: What are the frame conditions for innovation in forestry? Which actors and instruments are important to foster the initiation and implementation of an innovation project? What future challenges does the institutional system face to increase the competitiveness of small-scale forestry? Research results show low innovation activities by small forest holdings in the Central European region. Small forest

holdings rarely offer any other product except industrial wood or wood for bio-energy, if they offer any product at all on the market.

A range of conditions and factors were identified as impediments for small forest holdings to innovate. The strong fragmentation in forest ownership is definitely not supportive of innovations. The most important supporting factor for innovation was co-operations. The empirical results show that co-operation is the most successful approach to increase the competitiveness of small-scale forestry. Just as horizontal co-operations, vertical co-operations are also perceived an important support factor for innovation.

The importance of innovation as such for the future of the sector has been strongly emphasised by policy makers responsible for forestry in all Central European countries. However, the results of the investigation show that explicit innovation policies, strategies and programmes that provide systematically innovation support do not exist for the forestry sector so far.

Keywords: innovation, small-scale forestry, sectoral innovation system, innovation policy

1. Introduction

Forestry is an important source for income for many forest owners and employees in rural areas. In the Central European region, small-scale forest holdings constitute the vast majority of forest owners with a very small average size of private property around 11 ha. However, changes in the social, political and economic systems in Europe demand adaptations of forest management and innovative practises by forest owners and managers, but also by the organisations managing the frame conditions under which innovations can take place. This is important in order to ensure the sector's competitiveness and sustainable development.

In recent years changing technologies, especially information and communication technologies, changing consumer markets, decreasing wood prices and other factors have put the forest sector under increasing pressure to reform and change. This includes a stronger emphasis on

“market-based” incentives for forestry activities and a search for means to enhance productivity and develop new sources of income throughout the forest sector.

2. Material and methods

Innovation in general denotes successful introductions of novelties. The term “innovation” is often traced back to the Latin verb “novare”, meaning “to create something new”. Academic literature contains a number of definitions of innovation, usually emphasizing newness, including anything perceived to be new by the people doing it. In a business context it usually means the first business application of an invention. Schumpeter (1911) defines innovation broadly, as a discontinuously occurring implementation of new combinations of means of production. Nelson and Winter (1977), in their institutional analysis define technological innovation as a non-trivial change in products and processes where there are no previous experiences. For our purposes innovation is defined as the intentional discontinuous change in inputs, processes or outputs of an enterprise. Two main categories of innovation are distinguished: product innovation and process innovation. Product innovation is defined as changes in the output of an enterprise, this might be goods or services. Process innovation is a change in the process of an enterprise that is caused either by technological or organisational novelties or improvements.

To analyze the current situation of innovation in forestry Central Europe and the role of institutional actors, the sectoral innovation system (SIS) approach was applied. In innovation system approaches innovation is seen as an institutional process (see, for example, Lundvall et al. 2002, Edquist 1997), in which it is not only the entrepreneur who is responsible for the innovativeness of his or her firm. Rather entrepreneur and firm are embedded in a system of institutions that build the general framework for the decisions and activities of the entrepreneur. We use the term forestry “innovation system” to refer to the set of distinct actors, institutions and their interactions which contribute to the development and diffusion of innovations in forestry. As such, it is a set of interconnected actors which form a system whose performance is

determined both by the individual performance of each actor, but also by how they interact with each other as elements of a collective system. We speak of an innovation system if the interactions and relations are maintained over time (i.e. not just for one specific innovation project).

Two types of surveys were conducted in order to investigate different stages in the innovation process of firms and their embeddedness in the innovation system (see Figure 1): surveys among forest holdings and among actors of the institutional systems.

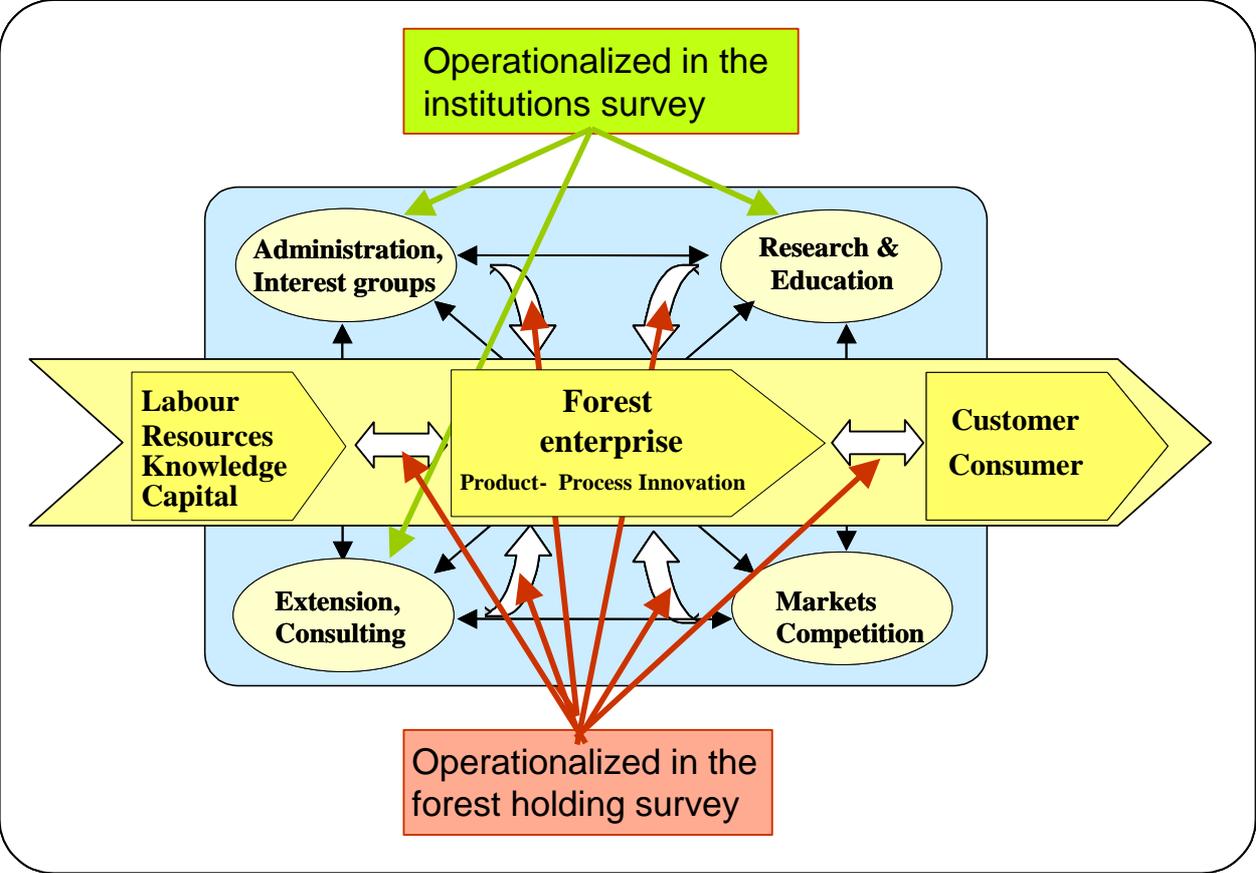


Figure 1: Forestry Innovation System and surveys conducted

The forest holding surveys were conducted in seven Central European countries, Austria, Germany, Czech Republic, Hungary, Italy (Trento Province), Slovakia and Slovenia. Samples were taken randomly or as full samples, except in Italy, where a quota sample was used. The surveys were conducted nationally, based on a common master questionnaire and after national pre-tests. Data collection was undertaken by mail or face-to-face (Slovenia, Italy,

Czech Republic for holdings <100ha) mostly in the first half of 2002. Response rates ranged from 25% (Slovakia, mail) to 100% (Slovenia, face-to-face). The total number of valid responses to the forest holding surveys was 1417. A non-response survey was undertaken in Austria to validate Austrian results (Rametsteiner and Kubeczko 2003). Common formats and categories were developed to allow standardised data analysis, especially for responses from open questions.

In order to determine innovation behaviour and attitudes of forest owners or managers they were asked to state whether they had, in the last three years, introduced a new product or service or whether they have introduced “significant” changes in technological or organizational processes. Data thus refer to the years 1999 to 2001. For “significant”, examples were given that illustrated that “significant” requires a major change on how the forest holding is managed, including e.g. outsourcing of all harvesting or marketing functions. Innovators were then asked to specify their most successful innovation. The further questions were then related to this specific innovation.

The institutional level surveys were undertaken in six countries, Austria, Czech Republic, Hungary, Italy (Trento Province), Slovakia and Slovenia. Main actors from the institutions as outlined in Figure 1 were selected for the interview. If further key actors for innovation were identified during these interviews, these were added to the sample. In total 115 actors were interviewed (74 national level, 41 in Trento Province), mostly in the first half of 2002. The interviews were conducted face-to-face, using standardised and semi standardised questionnaires, except in Slovakia (mail survey).

All surveys were undertaken by national research institutes in the context of the Regional Project Centre Innoforce of the European Forest Institute, hosted by the Institute of Forest, Environment and Natural Resources Policy at BOKU University of Natural Resource and

Applied Life Sciences, Vienna, Austria. Further details on the research results can be found in Rametsteiner, Kubeczko and Weiss (forthcoming).

3. Results

3.1. The frame conditions for innovation and start-up activities in forestry

The context and conditions under which forestry is operating are in many respects not supportive of innovations. In the Central European region (excluding Italy) the average size of forest property is around 22 ha. The average size of private property is even smaller, namely 11 ha. This fragmentation of forest ownership is an important obstacle to innovation.

Practically all properties <100 ha are owned by single persons or families. More or less all work in properties <10 ha is done by family members. In Properties 10-100 ha external workforce is starting to play a role, but still most work is done by the family.

Asked for their goals for forest management, around two thirds of small-scale forest owners and managers state that their primarily goal is to maintain capital. Increasing profit is very rarely an explicit goal for forest owners of very small forest holdings (<10 ha). It becomes more important for larger forest holdings but even for property sizes larger than 500 ha the goal of maintaining capital prevails as the most important goal. Correspondingly, the dominating strategy for forest holdings in all size classes up to 500 ha is "business as usual". On average, only around 20% of forest holdings <10 ha have sold round wood and around 15% have sold fuel wood over the last five years. This means, forest holdings <10 ha are, as a whole, hardly active in the market. Many of them are using wood from their forests only for their own consumption. The amount of forest holdings selling products on the market increases dramatically in property sizes 10-100 ha, where around 80% of forest holdings have sold wood over the last five years. The range of products sold is small, only rather few offer services for other forest holdings or rent out use

rights. Services for other forest holdings, the second most important income earner, contributes on average only 15% to income of Central European forest holdings.

It seems that both human and technical capacity and input for forest management are often weak. A large majority of main decision makers in forest holdings <10 ha has a primary education, while in property sizes 10-100 ha quite many more persons own a high school or technical degree.

The forest holding surveys results show that nowadays very few decision makers in forest holdings (forest owners or managers) actually work full-time in forest management, even in larger properties. In Austria, decision makers on forest holdings <100 ha state to spend only around 10% of their personal time on forest management (see figure 2).

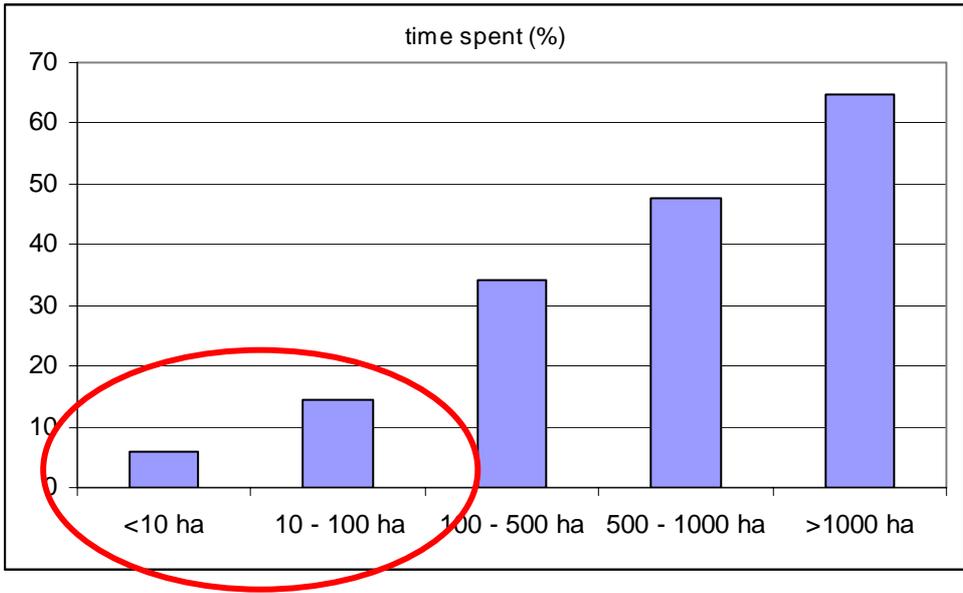


Figure 2: Austrian forest holding decision makers: personal time spent in forest management

This low work input is mainly due to the fact that in these property sizes people cannot live from forest income alone. Traditionally, many forested properties were and are part of agricultural holdings. However, also here the share of occupation in the primary sector is quite small. In Austria, where around 80% of forests are in private ownership, a substantial majority of around

70% of all forest holdings <10ha has its main occupation outside agriculture (figure 3). Recent studies show that this share is further growing (see also Hogl, Pregernig and Weiss 2003).

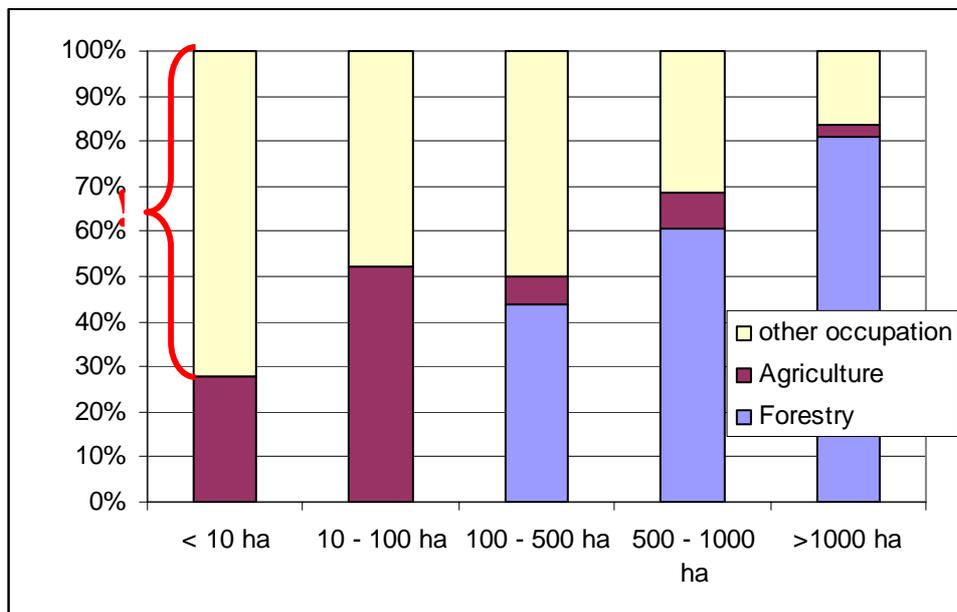


Figure 3: Main occupation of forest holding decision makers in Austria

3.2. Innovation behaviour

On average, around 9% of the forest owners/managers in Central European countries have introduced one or more products or process innovations (selling a new product or service or having introduced a new technological or organizational innovation) in the surveyed period. The difference between small forest holdings (<500 ha) and large holdings (>500 ha) is significant. Of the forest holdings larger than 500 ha about 56% have introduced some innovations during this period while the innovation rate of small forest holdings lies much below in all countries (see figure 4). This clearly shows the difficulties that small forest holdings face in their innovation efforts.

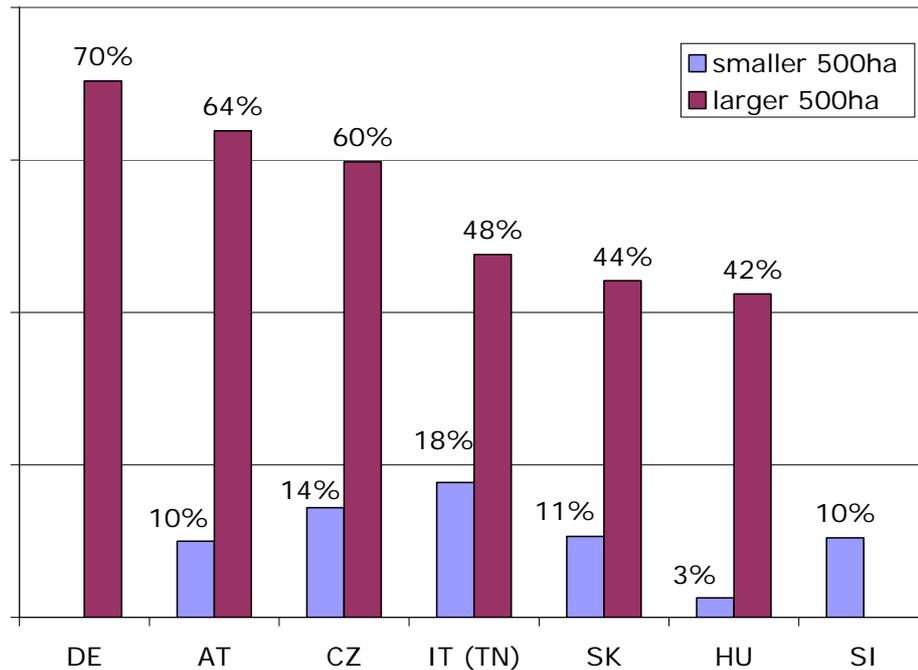


Figure 4: Percentage of innovative forest holdings by forest holding size in Central Europe (SI – only holdings <100 ha; while the German survey excluded forest holdings <200 ha)

The innovation activity in Central European countries in the surveyed period clearly correlates with the size of the forest holding. In many countries the rate of innovation over company size follows an exponential-type curve where innovation frequency increases considerably in the size categories 50 – 500 ha and grows more slowly from 500 ha onwards.

To analyse the distribution of the innovations, the three main types of product, service and process innovation are distinguished. Economic theory predicts that the primary sectors with mature production industries score low in product and service innovations and high in process innovations, as businesses try to improve their productivity and cost advantage over their competitors (see Breschi and Malerba 1997). The following figure 5 shows the distribution of innovations according to the three main categories of product, service and process innovation for forest holding sizes < 500ha. One can see that the multiple benefits from forests leave ample room for innovations in many areas outside process innovation, and that these areas can be exploited much easier by larger businesses.

The most important difference in the level of innovation across countries in forest holdings <500 ha is the difference in the rate of introduction of forest services, with about 9% of Czech forest holdings having introduced a forest service recently, compared to Austria or Slovenia, where forest services are not yet a marked innovation area.

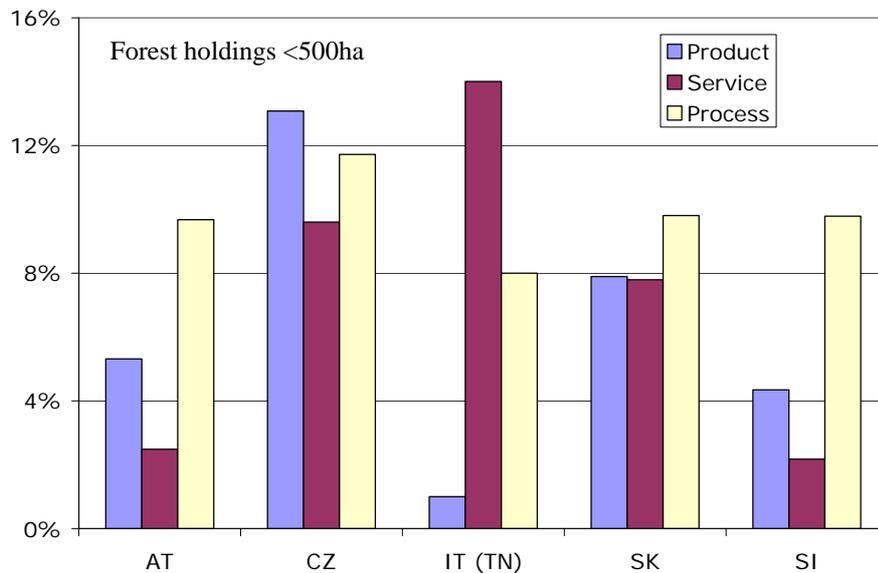


Figure 5: Percentage of forest holdings <500 ha that introduced one or more innovations in three innovation categories

To measure the outcome of innovations to the forest holding, the success of innovations was asked for in terms of whether the innovations introduced resulted in a positive, neutral or negative outcome on company success. The results show that a large majority of innovation projects resulted in a “very positive” or “positive” outcome for the forest holdings.

3.3. Which factors support innovation – and what are the barriers?

This section focuses on the factors that are considered to be barriers or supporting factors for innovation. Impediments for innovations are slowing down innovation projects or force forest owners and managers to try different and often more difficult ways of reaching an objective. Even more seriously, obstacles to innovation may constitute reasons for not starting innovation

activities at all, or for projects to be seriously delayed or aborted. Figure 6 shows the reasons given by non-innovators in Austria with holding sizes <500 ha. The results are quite clear: the by far dominating barrier for innovation in smaller properties is the size of the property. All other factors pale in comparison. Subsistence use and the secondary importance of income from forestry are considered important aspects. Personal factors, such as motivation, age, time together play a quite important role. Taxes, red tape and regulations including environmental regulations play no or only a marginal role.

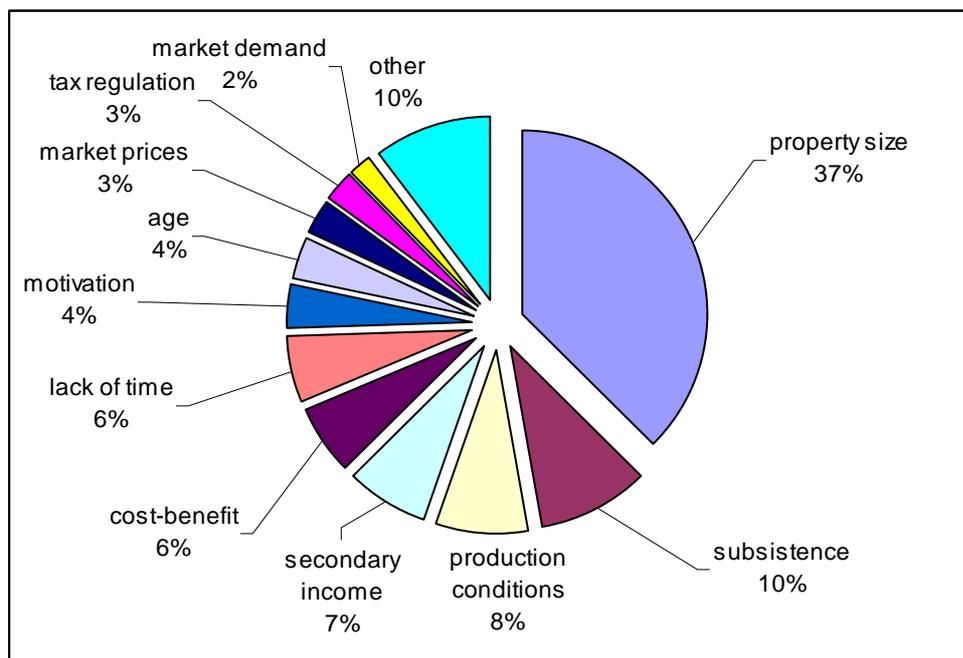


Figure 6: Non-innovators: Impeding factors for innovations in forest holdings <500 ha in Austria

While the majority of forest holdings <500 ha in Austria has not undertaken an innovation in the surveyed period, several of them have. When they were asked what the most supporting factors were for their – usually successfully implemented – innovation, the answer is again very clear: Most supportive to innovation is co-operation with other forest holdings (horizontal co-operation) and co-operation along the value added production chains (vertical co-operation) (see Figure 7). All in all, the business-to-business related factors comprised about one third of all answers regarding supporting factors to forest holdings' innovations. The second most important set of success factors refers to personal characteristics: own motivation, experience, and initiative.

Taken together, such personal factors are almost as important as business-to-business co-operation.

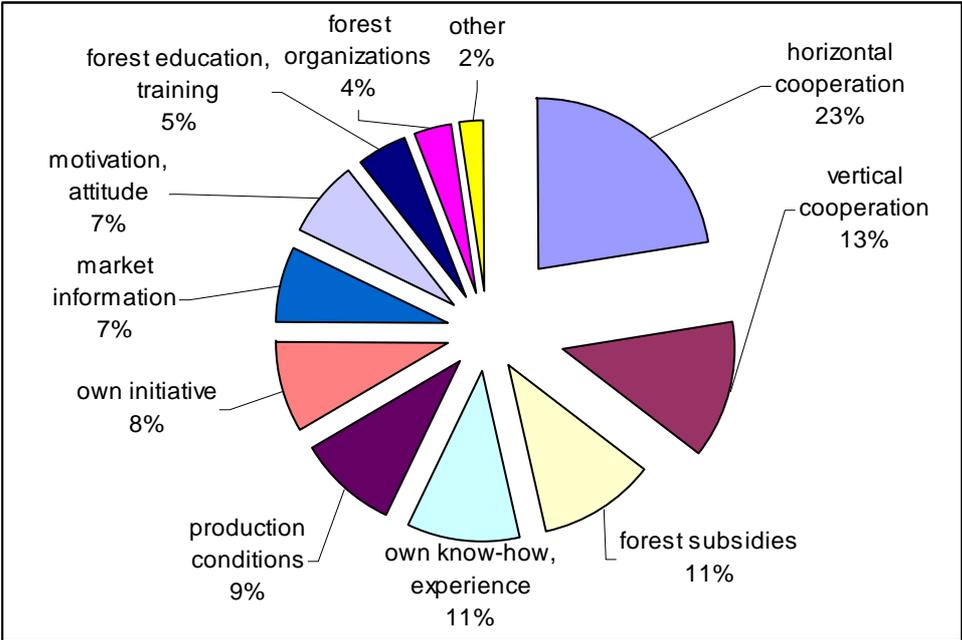


Figure 7: Innovators: supporting factors for innovations in forest holdings <500 ha in Austria

The results in Austria for forest holdings <500 ha are quite comparable with the overall results for Central Europe. Here forest owners and managers were asked to state, for a list of systematically selected factors, whether each of the factors played a role in the introduction of the specific innovation that the respondent had specified. The by far most important supporting factor was co-operation, primarily with suppliers, customers and other services, identified by more than two thirds of the respondents across countries. This is followed by co-operation with other forest owners as well as the availability of information on innovations and new developments in the sector. On average more than half of the respondents in each country only named these three factors. In a second group, one can find important support services such as innovation support programmes and further information and education services. Interestingly, advisory services by chamber organisations were not ranked as highly supportive in those countries where they exist.

The responses to the closed question on impeding factors in the different Central European countries are also comparable with the more detailed results from Austria. Factors related to the enterprise level were ranked highest. However, financing related issues and a lack of information rank highest as barriers to innovation. On average across countries more than two thirds of non-innovators see low funds as the main factor for their behaviour. More than half of non-innovators identify high introduction cost, lack of information on markets and innovation support schemes as a main factor. However, results vary considerably between countries. In Hungary, a lack of information was the most often named factor, while cost and risk related factors dominated in the Czech Republic. In the Trento Province or the Czech Republic, information is not seen to be as important as it is in other countries.

3.4. Where is the future?

In four of the countries participating in the institutional level survey, namely Austria, the Czech Republic, Slovakia and the Trento province in Italy, respondents were asked to assess the importance of specific markets as a source of income for forest owners for a range of forest products and services. Respondents were asked to assess these in two points in time: over the medium term and over the long term (see figure 8). Note that not all of the products were asked in all of the countries.

Overall, experts expect quite different market developments in the three countries. Only one feature is constant in all of the countries, namely that respondents see non-traditional forest products (i.e. other than traditional uses of wood) to raise in importance from the medium to the long term. Only the Austrian survey contained wood as a reference income source. It was rated highest in terms of importance over the medium term. However, it was the only forest product in the survey that was seen to lose in importance in the long term. In 30 years the Austrian respondents saw bio-energy as more of an important source of income than wood.

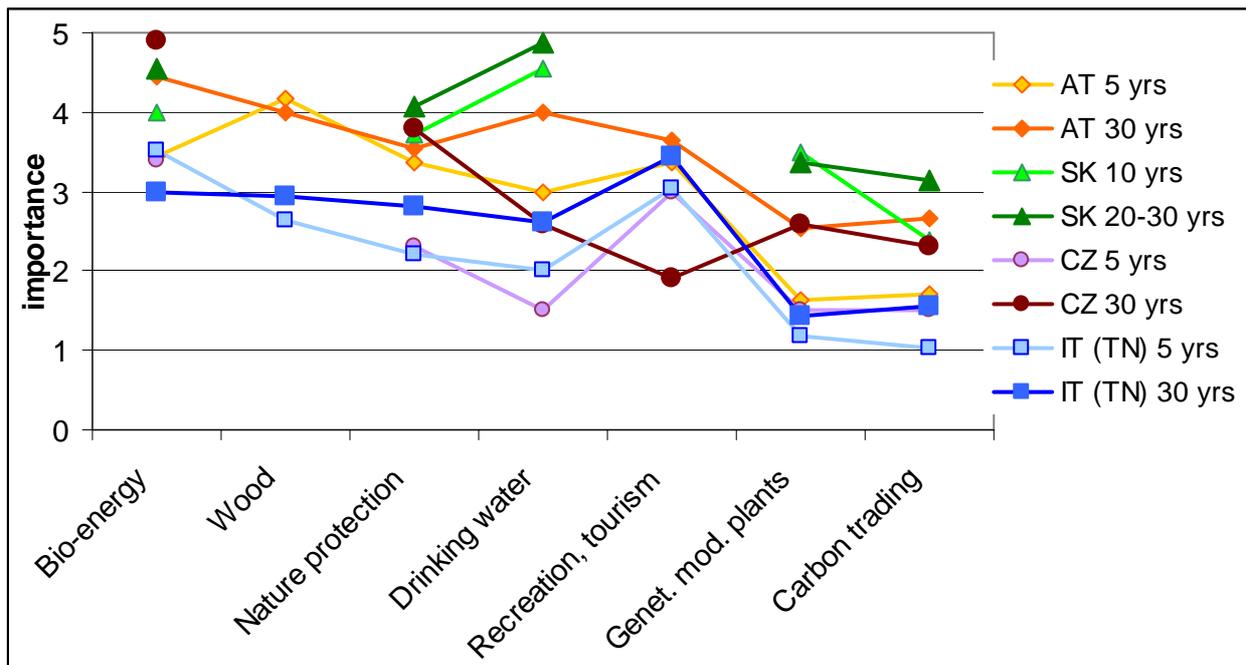


Figure 8: Market expectations for forest products and services over the medium and long term by institutional system actors in Austria, Czech Republic, Slovakia and Trento province in Italy (5=very important source of income for forest owners)

Bio-energy was ranked highly in all three countries and in Trento province in Italy. In the Czech Republic this product was seen as the most important “non-traditional” or new product in the medium and the long term, with the highest increase overall in importance. In Austria and the Trento province bio-energy even overtook wood as the most important income source. In Slovakia bio-energy is seen as the second-most important non-traditional product after drinking water, both over the medium and long term. Its increase in importance (otherwise said market growth) is seen as higher than drinking water.

Nature protection was seen as quite important in the medium term, and gaining in importance over the long term. In the Czech Republic experts gave the most pronounced assessment for a change in their country, with little importance today, but a quite high prominence in about 30 years. In Slovakia absolute importance was also seen as growing over the years, but not in relative importance compared to other services.

Drinking water, despite the existing legislative arrangements today, was seen as increasing in importance in all countries. In Austria and the Czech Republic it was ranked third, in Slovakia the first most important income source over the long term. As Figure 8 above shows, expectations on the future development of the water market were the by far most varied.

Recreation and tourism was seen as quite important today, but the experts interviewed do not expect a surge of new services here. In the Czech Republic they expect a considerable decrease in importance over the next decades. In Trento province in Italy recreation was seen as the most important service in the long term.

Genetically modified plants, a bio-technological innovation, was seen as an area with little potential to become an important area for income of forest owners/managers. In Slovakia its rankings are considerably higher than in Austria, the Czech Republic or Trento province. In the Czech Republic, however, it was seen as overtaking other fields such as tourism or carbon in the next decades.

Carbon trading was identified as being of comparatively little importance over the medium and long-term in all countries. In all three countries and in Trento province its relative weight is seen as remaining unchanged compared to the other products and services. An additional service that figured quite prominently in Austria was consulting by forest owners to other forest owners.

All these market fields imply quite a large number of possible innovations that could unlock the potential for new sources of income in forestry.

4. Discussion: How to increase the competitiveness of small-scale forestry?

4.1. Design innovation policies around expressed needs

Research results have shown that a small average size of forest holdings constitutes one of the most important impeding factors for innovations in forestry in Central Europe. Entrepreneurial orientation towards their forest property as well as the motivation to innovate is missing for small-scale forest owners because income is mainly earned outside forestry and only little time is invested in forestry work. In addition, small forest holdings face much more difficulties in implementing an innovation project than larger forest holdings. While large forest holdings may develop and implement innovations much easier on their own, small forest holdings strongly depend on institutional support. Consequently, offering incentives and support for small forest holdings to engage in forestry and innovation seems to be one of the most important functions to be provided by institutions in forestry.

However, in regard to the supporting factors for innovation, institutional level actors seem to underestimate two aspects. One is the importance of personal and firm level factors, especially the motivation, experience and knowledge of persons, and the other is the importance of information as an essential factor.

Concerning impeding factors, respondents identified more impeding factors that relate to factors within the forest holding than impeding external factors of the institutional system. Comparing responses from innovative forest owners with those from actors in the institutional system one can observe that the latter again fail in identifying those factors that impede forest owners' innovation efforts most. Respondents in the institutional system tend to overestimate the difficulties forest owners face with administrative and legislative obstacles. These certainly exist and are also pointed out by forest owners to be important. However, institutional actors seem to miss the point that financing and know-how are much more a concern for forest owners, both of those who have been innovative and those who have not. This finding has quite important implications on the design of innovation policies. In regard to impeding factors one can summarise that administrative and legislative obstacles exist, but financing difficulties and

information problems as well as structural weaknesses are more impeding for innovation in forestry.

Looking at different types of forest owners at least three different groups with different needs for innovation support can be distinguished:

- Large forest holdings need support in new and very specific innovations. Support should focus on pilot projects with accompanying research and investment in the development and testing of new ideas and high-risk projects.
- For small farm forest holdings the support of diffusion of innovations is also important. In order to reach small forest owners a service is necessary that raises awareness for new opportunities in forest management. This service may be privately or publicly organised.
- Owners of small forest holdings that are absent from their property require a specific service package that conducts professional work, yet does not require much time input by the forest owner.

4.2. Create appropriate incentives to co-operate to compete

The most appropriate mean to overcome size-related problems of small-scale forestry is co-operation. Co-operation, both horizontal and vertical, was also the by far most important supportive factor for innovative forest owners and managers.

Institutional actors in forestry are quite aware of the importance of co-ordination among forest owners and do well in supporting these in some countries, such as Austria. The advantages of horizontal co-operations are clear: costs for e.g. new machines are reduced for the single forest owner, the market position becomes improved and knowledge and information are distributed more easily. However, for non-farm forest owners the classical forest owners' co-operations are not attractive as they are usually designed for farm forest owners. Absentee forest owners may be interested in keeping their forests maintained but do not have the time and knowledge to manage their forests by themselves. Here, new forms of support and services are required.

Inter-sectoral co-ordination with the timber and paper industry or other further processing industries has been of key importance for the well-being of the forest sector as a whole. While in some countries co-operations with sectors in the wood chain has already been institutionalised, in others mechanisms and opportunities for structured interaction and management have not yet been established. The quality of co-ordination and conflict management in this crucial area will be a key competitive factor for the future of the forest sector, also given the fact that in several of the Central European countries large quantities of raw material are imported by the wood processing industry.

Intersectoral co-ordination with services sectors is still very underdeveloped although many new market opportunities for forest holdings may arise from these sectors. One of the major weaknesses of the forestry innovation systems is the poor ability of the sector's actors to co-operate or co-ordinate on innovations with actors from sectors where a considerable part of innovations are actually currently occurring and are expected to occur in the future, namely forest services, including tourism. Forestry institutional systems have strong sectoral boundaries, even to closely related policy fields such as the wood and agricultural sectors, and even more to other sectors such as energy, tourism, nature conservation, etc. Forestry actors see strong societal demands in these fields however they are experiencing difficulties in establishing systematic and stable relationships with other sectors and promote the co-operation of forest owners with actors from these sectors.

4.3. Create appropriate incentives to explore and test new approaches

Besides improving the frame conditions for innovations in forestry through co-operation, it is also important to develop appropriate instruments to support innovation projects. As the surveys have shown, practically all innovations successfully introduced were innovations that were new to the firm but not new for the market. Equally, sectoral innovation policies and instruments

focus on the diffusion of certain production, services or procedural innovations. Survey results showed that, overall, the actors in the forestry sectoral innovation system are active in the fields of technological and organisational process innovations, and in supporting the adoption/diffusion of certain pre-selected innovations. Except for some selected topics – such as bio-energy or forest education – product and service innovations are rather disregarded.

Comprehensive innovation policies oriented at developing new products and processes practically do not exist for the forestry sector in the Central European countries. Support programmes that are relevant for innovation in forestry are usually neither designed from an explicit innovation support standpoint nor do they consider principles of innovation policy. Principles of innovation policy such as to systematically support new and risky projects or to limit support to the starting phase are hardly regarded. Incentives are provided for the diffusion of already known and pre-selected technologies or organisational rearrangements, but only little incentives are provided for the development and pilot-testing of new ones.

Both financial and non-monetary incentives could be better oriented towards fostering new ideas and innovations that are new to the sector. This implies a stronger risk-orientation of funds and prizes. Specific innovation funds would be oriented towards new and risky ideas and would only provide initial support for a certain period.

4.4. Improve knowledge and information exchange between different actors

Know-how, market information and education services were further crucial factors for innovative forest owners. Forest owners do not develop new ideas in isolation but need interaction and knowledge exchange with other actors. In order to implement innovations successfully forest owners specifically need more information on market issues. This concerns new market opportunities, market research and marketing knowledge. A further important area is information on available support opportunities and information on juridical issues.

Generally, institutional actors provide good information on traditional forestry topics but information severely lacks for new market fields such as tourism, nature conservation, etc. This is a critical issue, especially given the low marketing orientation and the lack of related competencies in forest holdings. Only in exemptions, institutional actors have built up new knowledge on new areas, e.g. on bioenergy.

Again, the design of information services of forestry agencies should take into account that large and small forest holdings require different forms of information transfer. While large forest holdings are interested in specific information, small forest holdings need to be addressed more actively. The information service for larger holdings may be more centralised but should be more flexible. Information service for small holdings should actively approach forest owners as these usually do not ask actively for information on their own. Here, direct methods of knowledge transfer such as personal talks, excursions, field demonstration, workshops, are most effective to pass on information. Again, reaching absentee forest owners poses new challenges for extension services.

A second field to develop further is the information flow between research, education and training, forest extension services and forest owners and managers. Often, as in Italy or Austria, forestry interest groups dominate the policy field regarding innovation and public administration or research and education institutions are hardly mentioned. In fact, the role and importance of knowledge creation and transfer through specialized organizations seems somewhat neglected by institutional actors. Only Slovakian universities and research institutions are regarded as central actors in innovation, however, forest owners' organisations have no significant role there. Stronger and more frequent interaction between these institutions should enable better and faster information flow and knowledge creation. Efforts should also be taken to improve the transfer of new knowledge from emerging research to education and further education systems.

5. Conclusions

The large number of small-scale forest holdings in Central Europe poses a particular challenge for sectoral innovation policy. While large forest holdings are regarded as an independent business, a large part of owners of small forest holdings focus their business activities either on the agricultural part or do not regard their forest land as a business at all. Accordingly, innovation activities in small forest holdings are much lower than in larger forest holdings. Research results confirmed that co-operation with other forest-owners and along the value added chain is an important strategy to overcome size-related problems.

The importance of innovation as such for the future of the sector was strongly emphasised by policy makers responsible for forestry in all Central European countries. However, the results of the investigation show that explicit innovation policies, strategies and programmes that provide systematically innovation support do not exist for the forestry sector. Current innovation support is piecemeal, fractioned and often not co-ordinated. This issue-by-issue approach foregoes the benefits of a more coherent and comprehensive approach, including the benefits of communicating a single message to forest owners and managers in the sector: there is support for new approaches and ideas.

For the purpose of strengthening innovation and entrepreneurship in the forestry sector it is therefore recommended to develop an explicit innovation policy, strategy or programme that take account the specifics of different types of forest owners. Large forest holdings need specific information and flexible support that primarily focuses on the developing and testing of new ideas. Small-scale farm forestry requires decentralised support and infrastructure to co-operate while absentee forest owners need to be addressed separately by new models of services.

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