



Analysis of the sectoral innovation system for forestry of the Czech Republic. Does it even exist?



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ABSTRACT

The article deals with the implementation of an innovation system (IS) in the forestry sector in the Czech Republic. The aim is to analyse characteristics of selected elements (forest owners, forest policy documents, support measures, related institutions) of that system since 2000 and evaluate all three main functions proposed for IS. The conclusion is that the sectoral IS for Czech forestry is established but the IS does not fulfil all three main functions completely – it provides sufficient supportive functions but the information function fulfils only partially and the conflict management function performs poorly.

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1. Introduction

Forest management practices in a particular country are strongly influenced by the character of the forests being managed and the cultural history of the surrounding area. In Central Europe traditions which value preservation and longevity in particular, are very important. For more than two centuries, this cultural environment has seen the development of approaches which value tradition and longevity and have not changed over time. In this way forestry in the Czech Republic (CZ) became one of the most conservative sectors of the national economy. The conservativeness of forestry could also be documented by unwillingness to integrate programmes from other sectors (Giessen and Krott, 2009). According to Šišák (2007), the traditional (conservative) concept of forest management does not concern forester only; it concerns wider social environment which involves forest management including environmental concept, opinions and activities. However forests can boast of other valuable characteristics, and their multi-function outputs are regarded as the most significant today. The forest is not only perceived as a production environment; it also fulfils a number of social functions and provides many ecosystem services. To maintain such versatility of forest functions at a high level, it is necessary to consider not only the multi-functionality of forests, but also the whole of forest management. As Ingold and Zimmermann (2011) mentioned, in recent years, this sector has had to tackle far-reaching changes taking place in the social, economic and political systems. In many other sectors, implementing diverse methods of innovation is a motor for revival,

and York and Venkataraman (2010) suggest innovative change as an alternative to “returning to a simpler time”.

2. Theoretical background

There are many definitions of innovativeness or innovation in the literature (see Nybakk et al., 2009). According to Nasierowski and Arcelus (2012), a scholarly debate on the definition of innovation has created a dizzying array of differing and sometimes contradicting definitions. For example the World Bank (2006) uses the term innovation to refer to new processes, institutions or ways of working that aim to meet a set of needs or tackle a set of problems. According to OECD (2005), innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. The issue of innovation has been researched for approximately 80 years; the summary of 3 research traditions was performed by Anderson (2006).

The consensus is that innovation in general denotes the successful introduction of novelties. There are different approaches to studying innovation. One is to study innovation as a linear process, while another is to study innovation as a complex phenomenon from a system's perspective (Rametsteiner and Weiss, 2006b). With a growing importance of social science in the forestry sector, the systemic approach has been increasingly utilised. An innovation system was developed as a policy concept in the mid-1980s (Jacobsson and Bergek, 2011) and in literature it supports consensus in the sense that innovation can be an institutional process (Edquist, 2001; Lundvall et al., 2002; Moulaert and Sekia, 2000) and that it is not only entrepreneurs who are responsible for innovation in business.

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An innovation system (IS) is a system of institutional settings and relevant factors which influence the development and implementation of innovation or, in other words (Fischer, 2000), a system that aims to create and diffuse knowledge allowing the production of innovation. The concept of innovation systems is a heuristic attempt, developed to analyse all societal subsystems, actors, and institutions contributing in one way or the other, directly or indirectly, intentionally or not, to the emergence or production of innovation (Hekkert et al., 2007). To define an IS, one must define the elements (actors and institutions) that comprise the system, and the links between these elements. Innovation system approaches are considered to be a conceptual framework rather than a formal theory (Rametsteiner and Weiss, 2006a).

Different approaches exist for analysis of IS according to spatial (National or Regional IS), sectoral (Sectoral IS) or technological (Technological IS) focus. Deep analysis of NIS was performed by Lundvall (2010), and increasing attention is paid to RIS (Doloreaux and Parto, 2004; Gerstlberger, 2004; Štěrbová et al., 2014), though as mentioned by Fischer (2000), geographical proximity can be considered as a necessary precondition, but not sufficient on its own, for the existence of a territorially based IS.

There are three fundamental functions of IS defined by Edquist and Johnson (1997): – the reduction of uncertainties by providing information, conflict management and cooperation, creation of pecuniary and non-pecuniary incentives for creation of innovation. The term function is usually used in relation to particular institutions (Galli and Teubal, 1997; Edquist and Johnson, 1997) or to the system as a whole (Carlsson and Stankiewicz, 1991; Lundvall, 1992). For a historical overview see Hekkert et al. (2007).

Galli and Teubal (1997) state that it is important to make a distinction between organisations and functions, since organisations increasingly have multiple roles. They distinguish between hard and soft functions. Hard functions require hard organisations (i.e., performing R&D), while soft functions may be operated by soft institutions (not performing R&D as for instance regulatory entities) and involve catalytic and interface roles only. Hard functions are: (i) R&D activities (public) and (ii) the supply of scientific and technical services to third parties (business sector and public administration). Soft functions include: (i) diffusion of information, knowledge, and technology; (ii) policy making; (iii) design and implementation of institutions concerning patents, laws, standards, etc.; (iv) diffusion of scientific culture, and (v) professional coordination. Even though Galli and Teubal (1997) stress the importance of distinguishing between organisations and functions, the functions are a relatively straight extrapolation from the classic modules present within IS (knowledge development infrastructure, demand side, intermediate infrastructure, and supportive infrastructure).

'Sectoral innovation systems' (Breschi and Malerba, 1997; Malerba and Orsenigo, 1990, 1993, 1995) are based on the idea that different sectors or industries operate under different technological regimes which are characterized by particular combinations of opportunity and appropriateness conditions, degrees of cumulativeness of technological knowledge, and characteristics of the relevant knowledge base. These regimes may change over time, making the analysis inherently dynamic, focusing on the competitive relationships amongst firms by explicitly considering the role of the selection environment (Carlsson et al., 2002). How we define the system boundaries i.e. how to delineate the system and identify the actors within a sector? First the term sector needs to be clarified. There are various perspectives how to conceptualize sectors (Giessen and Krott, 2009). Hubo and Krott (2007) defined 'sector' in the context of three elements: (i) actor-related elements (advocacy coalitions, interests or belief systems, etc.); (ii) political programmes and public policy measures; and (iii) institutional and related procedural compounds. Giessen and Krott (2009) identify so-called 'boundary behaviour', meaning that actors are assumed 'to define, to structure, to identify and to distinguish' sector boundaries. Such 'boundary behaviour' may be explained by beliefs and/or interests and in addition

involves ensuring, defending or even maximizing the given degree of autonomy that sectors have. They further hypothesise that sectors tend to show such behaviour in order not to be coordinated by sector-external programmes, with forestry sector being the case (Giessen and Krott, 2009).

Forestry is not an isolated sector and forests are recognised as one of the most significant environmental elements that ensure wider sustainable development. Since 1997, forestry policy has been regarded as an integral component of rural development policy in the European Union (Elands and Wiersum, 2001). Therefore the results of both environmental innovation (Cooke, 2011; Ghisetti and Rennings, 2014; Horbach, 2008) and sustainable development innovation analyses (Colvin et al., 2014; Sol et al., 2013) can be applied to the forestry sector. There are also various analyses of innovative approaches directly related to forestry (e.g. Segura-Bonilla, 2003; Shanley et al., 2012; Song et al., 2004). Increasingly, research attention is being paid towards innovation in the forest sector (Hansen, 2010). Several studies on sectoral and regional innovation systems have been conducted in the wood industry in Europe (e.g. Rametsteiner et al., 2005). While the forest sector innovation research is primarily focused on the primary and secondary wood industry (e.g. Hansen et al., 2011; Stendahl and Roos, 2008; Nybakk, 2012). However, the systemic approach has been used in only a small number of cases (e.g. Buttoud et al., 2011; Ingold and Zimmermann, 2011; Kubeczko et al., 2006; Nybakk and Hansen, 2008; Rametsteiner et al., 2010; Rametsteiner and Weiss, 2006a; Weiss et al., 2011). More frequently the systemic approach appears in papers dealing with sectors closely related to forest management–timber processing (Alfranca et al., 2014), agro-food (Gagliardi et al., 2014) and crop protection (Schut et al., 2014).

3. Background information on Czech forestry sector

CZ is a Central European country and since 2004 an EU member. Forests cover approximately 34% of the total area of the Czech Republic (MA, 2010). Based on their prevailing function, forests in the CZ are classified into three categories – protection forests, special purpose forests and production forests. The development of forestry after social change in the 1980s and 90s had its own characteristics. In particular, the sector was restructured and transformation of the state estates took place. This transformation took the form of different types of privatisation (coupon, direct sale etc.). What was crucial (and did not happen elsewhere in Europe) however was that this privatization did not concern forestry itself (Kupčák, 1998). Only forest enterprises (including machinery, facilities and other technologies, workers and buildings) were privatized leaving out forest stands and forest land which remained in state property. As a result, a number of private companies emerged providing services to forest owners. Thus the transformation of forest ownership was undertaken through a process of restitution (reprivatisation) only, and was terminated in 2000. The process resulted in the following ownership structure: state forests 60%, individuals 19%, municipal forests 17%, legal persons 3%, and forest cooperatives 1% (MA, 2013), which has not changed significantly since 2000. After 20 years of negotiations, the restitution of church property took place in 2013. It is assumed that 6–8% of the current state of forest ownership will be forwarded to the churches in the next years and thus the restitution process in the Czech forestry will be completed.

When the main dimension of interest is a (existence of the) sectoral innovation system, the determination of the relevant boundaries is an important theoretical or at least methodological issue (Carlsson et al., 2002). As stated above, forestry provides various goods and services. As Giessen and Krott (2009) argue, forestry as an economic human activity does not qualify as a sector, although political programmes on forestry exist. But when applying Hubo and Krott's (2007) definition we can conclude that forestry can be regarded as a sector. Forestry sector in the CZ can be regarded as a specific sector as well because all main

components (political programmes, actors and institutions dealing specifically with forestry issues) can be found.

In this article we consider the SIS in forestry in the broader sense, meaning the provision of all forest products and services (wood and non-wood), including the activities linked to rural development (e.g. tourism and recreation). Rural development policy is regarded as a cross-cutting policy incorporating the goals of other policies including forestry (Dobšínská et al., 2013). Moreover, as the public support from national sources to forestry is limited in the CZ (to traditional forest management activities), financial incentives, which may provide an opportunity for innovation implementation for the forestry sector, were potentially accessible from the European funds, especially from those connected with common agricultural policy and rural development policy (EAGGF and EAFRD).

4. Research questions

Following from the background information, the aim of the paper is to describe and evaluate the implementation of an IS for the forestry sector, analyse selected elements of that system since 2000 to 2010, and evaluate all three main functions of the IS using the example of Czech forestry. Accordingly two hypotheses are stated:

- H1.** Sectoral innovation system of the Czech forestry is established.
- H2.** Sectoral innovation system of the Czech forestry fulfils all three main functions.

5. Methods used

This article presents the compilation of results from different projects on which the author worked since 2000 in the case of the CZ. The concerned projects on international level are as follows: Towards a Sustainable Forest Sector in Europe: Fostering Innovation and Entrepreneurship (INNOFORCE), Integrating Innovation and Development Policies for the Forest Sector (COST Action E51), Innovation and sustainability of forestry in Central-Eastern Europe: challenges and perspectives (SUSI-CEE). Projects on the national level include: Differentiation of intensity and management practices in relation to forest biodiversity and ensure the economic viability of forestry, Social effectiveness of the existence and use of forest services in pecuniary terms in the Czech Republic, and Multifunctional forestry in the marginal socio-economic and natural conditions. Partial results have been published in selected papers (mainly in national language) but there has been no evaluation from the systemic perspective.

The main method was a synthesis of the data acquired from the analyses of innovation system individual features – non-government forest owners, institutional system (represented by political documents) and institutional support.

Background information about the implementation of innovation in Czech forestry was identified using the quantitative research approach: questionnaires via e-mail and face to face interviews. What was evaluated was innovation inclusion in the forest management in the Czech Republic. The evaluation stems from survey carried out twice within 10 years. The first survey was performed from autumn 2001 till spring 2002 (Jarský, 2002; Šišák and Jarský, 2002), the follow-up survey took place from autumn 2009 till spring 2010 (Pudivítrová and Jarský, 2011). In both cases the survey was performed as a questionnaire survey with questionnaires being identical. The questionnaire was composed of six parts: questions related to forest ownership, personal respondents' view of the development of selected markets and forest management in general, questions related to entrepreneurship. The questionnaire stated what is regarded as innovation: products or services that were offered for the first time in relation to forest use, or significant or radical technical or organisational changes in work process which help fulfil company's goals (applied to international comparison

in Rametsteiner et al., 2005). 192 (92 face-to-face interviews and 100 from the e-mail survey, where the rate was 48%) completed questionnaires from the first and 132 (face-to-face interviews) from the second phase of the research were analysed.

In-depth document analysis was utilised for evaluation of innovation in policy documents dealing with forestry in CZ (details in Jarský et al., 2010) as well as for the analysis of cross-sectoral coordination (details in Jarský, 2014). The analysis concerned 14 different documents of seven different policies (forestry, innovation, rural development, regional development, sustainable development, renewable resources, forest based industry) where the evaluation of innovation inclusion in the policies and process and actors' coordination were performed following the methods of Oslo manual (OECD, 2005). The main objective of innovation integration analysis in individual documents was to assess whether the material comprises the selected innovation, methods and support for innovation based on the above mentioned manual and for the evaluation of horizontal relations within IS assess the coordination of the document at a political level. Inter-sectoral coordination is investigated in the following categories; process and documents' coordination, participants' coordination, participating parties, and coordination mechanisms.

In the observed period the most significant institutional change was the CZ accession to the EU in 2004 and consequently the possibility of receiving financial means from European funds. Therefore, as a methodological approach for evaluation of the supportive function of IS the analysis of financial means provided by rural development programmes was utilised. The analysis focused on both a financial side (evaluation of allocated and really drawn means) and factual side (evaluation of measurement and use of individual measures). Details are described in Jarský et al. (2014) and Jarský (2007) for the programming period 2000–2006 and in Sarvašová et al. (2010) and Špičková and Jarský (2013) for the period 2007–2013.

A qualitative research approach (face to face interview) was utilised for the evaluation of the cooperation function and coordination amongst forest owners and other stakeholders (details in FAO, 2012; Weiss et al., 2012).

Besides the respondent's opinions and mentioned face-to-face interviews, the exploration of the important stakeholder's (Ministry of agriculture, Ministry of environment, State agricultural intervention fund, Forest of the Czech Republic, Association of municipal and private forest owners) and basic web pages was utilised to evaluate the information flow dealing with innovations.

The article can be regarded as a pilot study which shows that based on innovative system function evaluation (according to Edquist and Johnson, 1997 herein) the significance of sectoral innovation system of forest management can be identified.

6. Results and discussion

6.1. Input data – forest owners' view

Based on a comparison of questionnaire survey results, conducted in 2001 and 2010, it was found that the percentage of owners who implemented some form of innovation during previous three years, did not significantly change (question: Did you implement any innovation lately?; 31% in 2001 and 28% in 2010).

Such changes however occurred in innovation implementation type. Table 1 presents the shares of implemented innovation types (related to the group of innovating respondents).

Significant changes in the innovation activities taking place in the Czech forestry sector are therefore apparent. While in the beginning of millennium (the first survey) especially organisational and technological changes in the forest management (related to a restitution process and forest management restructuring) were carried out (51% innovating respondents), 10 years later (the second survey) so many grand changes of that type were not in respondents' point of view really

Table 1
The share of implemented innovation.

Type of innovation	2001 [%]	2010 [%]
New product	21	39
New service	27	29
New technological/organisational innovation	51	32

necessary (decrease by 32%). Instead interest has been redirected to business development through the supply of new products (increase from 21 to 39%). The most important survey questions related to factors that bore both significant positive and negative impacts on the implementation of innovation. The results are presented in Table 2 (in a descending order).

It is apparent that, cooperation with customers, suppliers and service providers had a very significant positive impact in both observed periods. Moreover, there has been growing influence from public support, especially as a result of the Czech Republic becoming an EU member in 2004. In the 2010 questionnaire survey European subsidies are considered by far the most important positive factor. As regards negative factors, financial problems are obviously still of great importance although, in respondents' opinion, access to finances is improving. Both surveys found that legislation was a negative influence (in particular, legislation concerning the environment and the Forest Act, as well as Acts related to labour law) which prevents certain business activities. A positive finding of the survey was that the cooperation with authorities has improved and is no longer considered an obstacle to innovation.

The outputs from these surveys are a basic source of information for the analysis of the whole innovation system. As described above, the basic purpose of the IS is to introduce new innovation to particular sectors, disseminate it and ensure it is applied. In the analysis of questionnaire surveys there appear to be at least three areas – European funds, legal regulations and functioning of the authorities – which are all mentioned by respondents as factors of significant influence in implementing innovation in the Czech forestry sector. One of the questions in the survey concerned information sources of possible innovations. Based on response analysis a large opportunity was also identified for improving the implementation of new innovation through seminars, workshops, training events or by orienting consultancy firms towards this sector. Respondents still lack sufficient awareness of the various possibilities for implementing innovation in forestry. Although in the CZ a general innovation system is already functional (based on the Czech Innovation policy), which is proven by the existence of two individual operation programmes, Operational programme Enterprise and innovation (MPO, 2010) or operation programme Research and development for innovation (MŠMT, 2008), the same cannot be said about the forestry. Neither of the mentioned programmes focuses on forestry and forestry (and forest) is not even mentioned.

Table 2
Factors affecting the implementation of innovation.

Year 2001	Year 2010
<i>The most significant positive factors</i>	
Cooperation with customers, suppliers, services	EU programmes' support
Cooperation with other forest owners	Cooperation with customers, suppliers, services
Public support supply	Financial services supply
<i>The most significant negative factors</i>	
Cooperation with authorities and chambers	Access to finance
Access to finance	High deployment costs
Legislation	Lack of info on new products and services
High deployment costs	Nature conservation and environmental legislation

The results of the questionnaires showed that implementing innovation has a positive impact on corporate management by forest owners. And since financial support for forest management is one of the public interests proclaimed in Forest Act no. 289/1995 Coll., it is necessary to support the implementation of innovation as well. Innovation activities in the Czech forestry sector are to a large extent dependent on the size of forest area. Almost 1/3 respondents reported implementing at least one type of innovation in the previous three years. However, in the case of owners of more than 500 ha, more than 50% of respondents introduced innovation. Because of this it appears that it would be effective to focus innovation support on the different groups separately, as in Slovakia (Šálka et al., 2006). In supporting the implementation of innovation for small-scale forest owners it would therefore be effective to focus support on forest owners associations. In particular support could be targeted at the development and marketing of new products, which would in general, corresponds with the EU's prioritised support for small and medium-sized enterprises.

6.2. Innovation in policies relating to forestry and the coordination process

One of the essential features of an IS is its tendency to encourage institutional security. This is encouraged by the system of institutions on the one hand and the system of institutional rules on the other. Institutional rules in CZ tend to originate from democratic political agreements which are, ideally, created cross-sectorally. Public administration then seeks to translate these into documents generally defined as policies (sectoral, branch, regional and so on). Forest-related policy is, unusually for the European Union, still created at the national level (with European agreements).

The analysis of individual documents showed that forest-related policy of the CZ is represented by the national forestry programme (NFP). The first NFP was approved in 2003. The current version (NFP II) was approved by the Government in 2008. Forest policy has a wide coverage and impacts on many sectors, it overlaps with other strategic documents in the Czech Republic such as the Strategy for regional development of the Czech Republic, Rural development programme for the Czech Republic, Strategy for sustainable development and others. At the regional level, forest policy is often included as part of the programme for regional development. Over the years the government of the Czech Republic has issued several concepts which guide forest policy; the last one was issued in 2012. Originally the analysed NFP II was to be valid till 2013; however, its validity has been extended for an indefinite period of time. Compared to NFP I, which said very little about the concept of innovation, NFP II represents a significant shift which is apparent in the focus on individual types of support and especially overcoming resistance to innovation, with reference to RDP. Innovation is mentioned in the objectives of the NFP II, in the economic pillar – in two points of the key action 2 (1 Establishing a platform for forestry and related industrial sectors in order to support innovation. 2 Creating economic, or legislative conditions for more intense cooperation between research, businesses and the third parties) and in the social pillar – in one point of the key action 13 (supporting the establishment and development of micro-businesses in the country including the creation of an informational and consultancy system). As regards “historical” documents – *Essential principles of forest-related policy* (issued in 1994) and the *Concept of sectoral policy of the Ministry of Agriculture for the period before joining the EU* (issued in 2000), – they indicate support for forest-related policy in the Czech Republic. Both documents were written generally but in some sections of the documents reference to innovation features can be found. The innovation mentioned is mainly of an institutional nature. An essential change was expected in the document *Principles of state forest-related policy* from November 2012, which is a more modern document compared to previous political documents including NFPII. In practice, however, the document did not introduce any new approach related to innovation. Innovation is mentioned as part of one long-term goal – to reinforce the importance

of education, research and innovation in forestry, but it is the only area where the document does not mention any measures that would fulfil the goal! From a systemic point of view, not even this most recent document breaks away from the old concepts and innovation is still perceived in a traditional way, as part of science and research support. Although many measures with a long-term goal of increasing competitiveness of forestry can be considered to represent innovation, the document does not treat them as innovation. Another relevant document for forest-related policy is the Concept of the Ministry of Agriculture for economic policy for the Forests of the Czech Republic, State Enterprise, since 2012. The concept does not deal with innovation, although any significant change in the behaviour or orientation of the company (it manages more than 50% Czech forest area) is essentially innovation (either for the company itself or for other business entities in the sector).

As regards the coordination of documents and following processes it is necessary to mention the relationship between the NFPII and the rural development policy (in practice presented as RDP 2007–2013). Their complementary nature must be observed from the perspective that both documents originated at about the same time. It would be logical for the “implementing” RDP to follow requirements of the forest policy (NFPII), in other words clearly formulated goals should be realized by consequent programme documents, in this case RDP. However, both Czech documents are so inter-linked that the approved NFPII even directly refers to passages in RDP 2007–2013. For instance, the economic pillar states: “Financial support of investment areas with the aim to increase economic forest value and implement forest-friendly mechanisation (using RDP Measure I.1.2 Investments in forests)”. As regards the use of forest biomass for energy production, it suggests: “Use support opportunities in particular areas, e.g. measures of rural development programme focused on technical equipment of workshops”. And the social pillar states for instance: “Improving awareness of the Leader programme in order to engage more rural forestry entities in local action groups, local development strategies etc.” An annex to NFPII presents a tentative survey of financial support for the period since 2013. From this point of view it is hard to conclude that NFP II coordinates the RDP because their mutual connectedness far exceeds the concept of coordination. In principle, the policy document (NFP II) should be superior to any implementing document and not cross referencing the detail of the implementing document.

Although there is a sectoral forestry policy (represented by the NFP) which mentions innovation, it cannot be claimed that the Czech Republic has formally implemented a sectoral innovation system for forestry. Instead, forestry is incorporated into a broader system of rural development which incorporates a number of other sectors.

Cross-sectoral coordination is a current issue for research (e.g. Ramcilovic-Suominen and Epstein, 2012; Sarvašová et al., 2013; Söderberg and Eckerberg, 2013) and cross-sectoral coordination could be described as policy innovation. Howlett (2014) tried to identify why policy innovations are rare and often negative. In doing so he described policymakers in democracies as highly risk-averse and therefore unlikely to take policy action unless the circumstances and the nature of the problem they face are propitious. New ideas or technologies are often advocated because of their purported improvements on existing methods. However, what is new is usually less well-known and less widely tested than what is old. The policymaker who must choose between innovation and convention faces an innovation dilemma (Ben-Haim et al., 2013).

And a similar situation can be seen also in the Czech Republic. The cross-sectoral coordination at different levels does formally exist; its practical implementation is constrained at the highest level by competences distributed amongst different ministries or at lower-levels amongst different divisions of public administration. This manifests itself in mismatched decrees from eligible ministries. Besides (forest) political documents it is also necessary to respect valid legislation. The forest management in the CZ is guided by two main acts – Act on forests

(289/1995 Coll.) and act on nature and landscape protection (114/1992 Coll.), which in most cases divide competences in terms of the above-mentioned forest categorisation. Such a situation is potentially conflicting, especially in relation to innovation in forestry versus game management and forestry versus nature protection (Jarský, 2014).

6.3. Financial support for innovation implementation

According to respondents, innovation implementation is significantly influenced by a sufficient number of financial means. Financial support from public sources is assessed as a very significant aid. Similarly, as was discussed in the previous chapter, even principal forest-political documents give public support (especially from European funds) an important role. To what extent innovation is accentuated within such support is described in this chapter.

Government financial support for forestry has a long tradition in the Czech Republic and existed in a different form even before the end of communism – as the support for publicly beneficial forest functions after 1990 was implemented by the supporting the small-scale owners who benefitted from land restitution. The change occurred in 1996/1997 when provisions of the Act on Forests from 1995, concerning forestry support, were being fulfilled. Contributions under the act were provided by particular ministries. A significant systemic change occurred in 2005 when responsibility for providing significant contributions was transferred from the Ministry of Agriculture to regional authorities, which resulted in the diversification of contributions and approaches to forestry support (Jarský, 2004; Šišák and Chytrý, 2004). A completely new situation occurred after joining the EU.

CZ joined EU in 2004 – in the middle of the Rural Development programming period 2000–2006. Up until the end of 2013 CZ was able to utilise financial support from rural development policy programmes in two periods.

In a curtailed programming period 2004–2006, the support for innovation implementation was available in Sub-measure 1.3.3 (association support). This sub-measure provided funding for the formation of new owners' associations (which itself is a significant innovation). However this sub-measure did not receive any applications and the only other relevant sub-measure was forest investments (1.3.2), and in particular part d – acquisition of machinery and equipment.

During the programming period 2007–2013 EU policy for rural development emphasised the support of innovation in agriculture and forestry. However the extent to which this was prioritised in each National Programme depended mainly on national political representation. According to Sarvašová et al. (2010), improvement in competitiveness in several member states was a priority issue (particularly in new EU member states). Bulgaria, Czech Republic and Slovakia in their political documents stressed the importance of competitiveness and innovation in the context of strengthening their position in a European economy. Innovation aspects (new technologies, knowledge, processes and products) are included in the RDP CZ (especially in Axis 1 measures, and to a lesser extent in Axis II). In particular Measures 122 and 123 were very important; Measure 122 was focused on the purchase of various forestry machines, which businesses may regard as a significant motivation factor for implementing innovation. However, in some countries (e.g. Czech Republic and Slovakia), real support was constrained by the funding principle of “de minimis”, i.e. a maximum total value of the support per one applicant during one period is defined, which significantly limited the size of contribution to investments.

Axis II contains traditional forestry measures with an environmental focus and very little opportunity for economic innovation activities which benefit individual businesses. Although Measure 224, and partially Measure 225, are new to the whole forestry-agricultural sector, they are important for the improvement of environment and rural communities (from a social perspective), but not for private forest owners themselves. They help finance positive externalities – for example protection of Natura 2000 areas in forests, though financial support is paid

to forest owners they do not present business opportunities as such but have an incidental benefit e.g. where nature and landscape protection will stimulate new tourist spending in the local economy. Similarly, various other innovation opportunities exist in Measure 227 (non-productive investments). From the perspective of rural development, building new biking trails and other tourism infrastructure can be very important. Increasing an area's attractiveness for tourism can bring new innovation opportunities for rural entrepreneurs.

Table 3 presents the comparison of individual titles listed to support rural development in the forestry sector in programming periods 2004–2006 and 2007–2013 in the Czech Republic. As regards the support for innovation implementation, measures are evaluated as important, potentially important and not important. In both programming periods investments into forests can be considered important while payments related to forest protection are considered not important.

6.4. Communication and cooperation

For the function of support provision nonsufficient coordination of processes and methods was identified. In the duration of the programming period 2007–2013 there existed more than 20 different operational programmes in the Czech Republic. Forestry entities could access support not only from a primary programme determined for them but also from several others (mainly from the Operational Programme environment). A greater number of potential funding sources could theoretically mean more opportunities for the forestry sector; however due to lack of clarity concerning eligibility for individual funding sources this potential synergy was lost. On the other hand the lack of policy coherence, especially at the local level, may also have an innovation-triggering influence if it forces actors to consider unconventional solutions (Huttunen et al., 2014).

In general, ensuring communication and information flows amongst participants is a vital factor in achieving coherence and sufficient coordination. In addition to this horizontal flow, a vertical flow of information is also very significant for forestry entities. In CZ providing information to entities engaged in the forestry sector is a task performed by particular levels of public administration. The process operates in two ways; State administration can provide information either directly – on web pages, issuing information leaflets and magazines or advertising in media, or it can provide subsidies (see e.g. RDP Measure 111 and 114) to entities which specialize in consultancy and knowledge transfer. Both means are widely used in CZ, however neither of the two a priori deals with information on innovation. There is no “innovation” section featured on web pages of competent authorities or in sectoral press. It depends on readers themselves whether they realize that they are reading about innovation (meaning a novelty for a firm or different subject according to Oslo Manual, OECD, 2005). Communication about innovation in forestry can be thus regarded as information which is appended to primary communications.

Communication of information down to the lowest level, e.g. small-scale and inactive forest owners, is also a persistent problem. Here (also as based on the respondents' opinions) different forestry organisations, and in particular owners' associations, serve as an important information channel. The collaborative working of forest owners is often

regarded as one of the opportunities how to tackle the problem of stimulating more small-scale forest management. Collaboration, through formal associations, does not have to relate to small-scale owners only; the creation of different forms of associations can be initiated for many reasons (Sarvašová et al., 2011). After 1989, following the social changes, the Czech Republic saw a return to a traditional collaboration on the level of estates' organisations or owners' associations (e.g. historical cooperatives of municipalities) and new associations emerged driven by the ongoing restitution and privatisation processes (Sarvašová et al., 2015). The associations related to forest ownership are purpose associations belonging to forest estate owners. There are a number of associations in the CZ; amongst the most significant associations (Weiss et al., 2012) operating at a national level is The Association of Municipal and Private Forest Owners (SVOL). A vertical structure can also be identified where the lowest level is formed by local associations of owners or small-scale entrepreneurs in forestry, the medium level is formed by regional associations (not very significant in the CZ) and the highest level is represented by associations operating on a national level. It is quite common that small-scale owners form local associations and at the same time they are members (either as individuals or through affiliation of local associations) of a national association. Contrary to the Finnish model (Mattila and Roos, 2014) membership in these associations is voluntary. In CZ two types of associations can be distinguished according to the motivation of their formation (FAO, 2012): Primarily economic reasons: for typical associations of small forest owners and mainly of local character aiming at more effective management of associated properties. These are local associations mainly. Primarily forest-political reasons (interest representation): for several major associations active at national level in order to promote their interests in the state forestry policy in Czech Republic.

The association process for forest small-scale owners is a phenomenon dealt with also by the NFP II and the Rural Development Programme for CZ. NFP II, economic pillar, key action 5 mentions the goal “Support cooperation amongst forest owners” where besides making the system of state and private consultancy more efficient, a requirement for the legislative, financial and informational support of owners associations is presented. The support for association formation is also declared in the Act on Forests, where §46 says that the state supports forest management by providing services and financial contributions while these financial contributions can also be used for the support of forest owners' associations and management in associated small-scale forests. However, the declaration of the support is one thing, an actual provision of support is quite another.

Table 4 presents actual support for forest owners' associations in 1996–2013.

The support of association was first carried out in 1996 and was as high as 1.1 mil CZK (in 2014 an average exchange rate was 27.5 CZK/€), which is reflected in Table 4 as 100%. Despite the declaration in state forest policy, it is obvious that there is actually no financial support for forest owners' associations in the Czech Republic at present. Nowadays, when forestry is of relatively low importance in government policies, the Czech Republic realizes that broader associations, like SVOL, could operate as important lobbyists influencing policy development and decision-makers. In this context, the decision to establish regional

Table 3

Comparison of forestry support in the Czech Republic, and its relevance to innovation implementation, in individual rural development programming periods.

RDP Measure	Innovation	Previous inclusion	Innovation
Forest investments (122, 123)	I	1.3 Forestry (OP)	I
Use of advisory services (114)	P	Measure is new	–
Vocational training and information action (111)	P	2.2 Professional training (OP)	P
Natura 2000 Payments (224)	P	Measure is new	–
Forest-environmental payments (225)	P	Measure is new	–
Restoring forestry potential and support for non-productive investments (226, 227)	N, P	1.3 Forestry (OP)	N, P
Afforestation of agricultural land (221)	P	Forestry (HRDP)	P

I – Important, P – Potentially important, N – Not important.

Table 4
Actual support for forest owners associations in 1996–2013.

Year	Compared with 1996	Year	Compared with 1996
1996	100%	2005	245%
1997	109%	2006	273%
1998	200%	2007	118%
1999	282%	2008	118%
2000	309%	2009	127%
2001	336%	2010	127%
2002	345%	2011	0%
2003	345%	2012	0%
2004	364%	2013	0%

organisations is seen as a very positive development. Forest owners are involved and appear to be more interested in the wider forestry sector if they can discuss their problems and hot issues, first at sub-national level and then have the opportunity to present them at national level as consensus. It seems to be a practical way of involving not only big forest owners but also small forest owners in discussions. This results in an effective transfer of information as well as reduced conflict because member participation in discussions leads, through iterations, to an agreed position reflecting a range of stakeholder views. Sufficient information and the bottom-up approach can much more easily lead to agreement. To an extent, providing an informational function within the innovation system, SVOL takes on a role which some might see as a function of the state.

On the other hand, the associations of small forest owners, whose establishment was driven by economic considerations, are important especially in the safeguarding of sustainable forest management. Fragmentation and the extremely small size of holdings do not favour profitable forest management. As Seeland et al. (2011) mentioned in a Swiss example, there are significant differences between the economic positions of forest owners who join associations of small owners and those who chose not to. Many small forest owners associations in the CZ were established thanks to the existing financial support for an association process. The importance of such support is illustrated by the absence of any new small owners' association registrations since 2011.

7. Conclusions and suggestions

In this paper features of an innovation-institutional system in the Czech Republic forestry sector are described and analysed. According to a general principle, the IS should encourage and support cooperation (in order to reduce conflicts) and provide support for implementing innovation. The analysis has revealed the following findings:

Providing support: This function of the system has been significantly, but not completely, fulfilled in CZ. Support for forestry has a long tradition; however, in 2004 a new opportunity to obtain the support occurred, thanks to CZ joining the EU, together with opportunities to draw resources from European funds. As described above, many subsidies can be understood as requiring innovation in exchange for financial payments. The function of providing support is considered to be “not complete” because the support for implementing innovation is not explicitly identified as such, and can be regarded as innovation support only. This reflects in some missing elements such as non-existence of assessment criteria for evaluating the significance of innovation implementation. Indicators are used for innovation assessment in international comparisons, e.g. within European Innovation Scoreboard (EIS) (EC, 2009) or Innovation Union Scoreboard (IUS) (EU, 2014), however, only the publication from 2005 (EIS, 2005) presents an indicator with some, marginal, relevance to the forestry sector. In analysing those indexes, Nasierowski and Arcelus (2012) pointed out that each composite index consists of sub-indexes, where all items are equally weighted: thus, the specificity of the context of operations in countries is not taken into account. If this function of an innovation system was to be effectively fulfilled, it would be necessary to identify the support of

innovation implementation expressly and define indicators which would use to assess the support. The analysis of innovation implementation, carried out by forest owners in the CZ, showed that support from public expenditure programmes presented a positive factor for innovators, which influenced the innovation implementation. From this point of view the function of providing support can be defined as significant.

The functions of providing information and management and supporting of cooperation are interdependent and it is therefore not easy to evaluate them separately. With regard to the respondents' opinions, both opinions linked to sufficient information on new innovative approaches occurred. Some of the respondents admit that the existence of such information positively influenced implementation but respondents which did not implement innovation lacked information about new innovation opportunities. Even in this case the evaluation of information function is such that this function is only partially fulfilled. Institutions with competency in matters relating to innovation in the forestry sector, in particular the Ministry of Agriculture and regional authorities, should lead information campaigns, support consultancy and other education opportunities in the forestry sector. Innovation and its implementation are part of information flow only, not primary information. To establish an efficient information flow it is necessary to find partners who can transfer information to a lower level. It is illusionary to assume that the information provided from central sources will reach particular forest owners without sustained and targeted communication initiatives. That is why the significance of different forms of associations operating in forestry is emphasised. From this perspective, it is indisputable that SVOL, as an umbrella association, has become an important partner for public administrators. Thanks to a broad member base and functioning vertical structure, the transfer of information to lower levels is reliable; seminars are held and communication materials made available (sometimes directly customised for a particular audience). Information also flows to non-members who are active in the field of forestry. However, the problem of communicating with “inactive” forest owners is persistent. These small-scale owners, with estates up to 3 ha forest, represent the largest share of private owners and are estimated to number around 100 thousand individual ownerships.

Within its activities, SVOL is also important for the performance of the cooperation support function. The formation of any association is in principle carried out thanks to cooperation, during either particular forestry input activities, shared interest in output performance, or other activities. Cooperation is generally regarded as the most significant means of implementing the third function of the IS – conflict management, i.e. the management of existing conflicts and avoidance of potential new conflicts. Aside from various forms of associations, this function should be secured by other features of the IS, in particular by state (public) institutions and institutes. An essential role here should be played by administrative and legal instruments, including (forestry) policy documents. Those, however, are not directly concerned with the issue of conflict management; they only indirectly solve some situations ex post. As a negative factor for innovation implementation respondents regarded legal provisions (Forest Act, Act on Protection of Nature and Landscape, Hunting Act, law related to employment), as a negative influence on innovation because they are generally perceived as inflexible and do not take account of situations where innovation would be desirable; often they are blamed for impeding the majority of attempts at more substantial innovation. An important reason for this is a strict division of competences amongst administrators despite the fact that all substantial legal and administrative documents must pass through a consultation procedure with individual sectors and other concerned participants. Although the multi-functionality of forestry (and thus the wide variety of forest functions) is generally accepted, in reality there is a strict division of administrative territory, depending on the perceived importance of individual functions. This traditional view should however be superseded because all forests are multi-functional. Today, innovation implementation in protection forests and forests of special purpose is more difficult than in economic forests, even if the

innovation is related to functions other than timber production. From the point of view of the IS it can be stated that the present distribution of competences is more often a potential source of conflict than creating an environment for overcoming conflict. One of few examples where the system strives to overcome conflict is the use of financial aid for the support of nature and landscape in the forest (e.g. payments under NATURA 2000 in forests). A more innovative and correct approach would be to implement these activities as services which the public sector (the state) buys from forest owners (the applicant for the service is the state). The result is that the function of the conflict management is performed insufficiently only.

Generally speaking, for successful innovation implementation it is necessary that all functions of the IS are fulfilled. From this point of view, however, IS functions in the CZ forestry sector are only partially fulfilled. The function of innovation implementation support is accomplished most frequently and the informative function is fulfilled with but with reservations concerning its completeness. The conflict management function (related not only to innovation implementation) is fulfilled insufficiently. On a theoretical level there is a question if all functions of the IS are similarly significant. The author is convinced that the function of conflict management is “superior” to the other two, and the performance of this function is the main reason for the very existence of the modern institutional system of the forestry administration in the CZ. It is necessary to add, however, that the distinction of the functions to the abovementioned three on reflects the system concept. In reality such function can hardly be assessed altogether individually because they are very closely interconnected, it would be more suitable to view these functions as one function only (conflict management – and the other two as tools for its implementing (e.g. by supporting innovation conflict in relation to forest management and nature protection are restricted, or supporting competition and thus restrict conflicts cause by structural or regional economic diversity).

Another perspective concerns the degree to which formalisation of the IS is desirable and already in place. From the analysis described above, it is possible to conclude that the innovation system of the CZ forestry sector (despite its described deficiencies) is established. However, it is not a formal existence of the system as such that would be formally institutionalised (as opposed to the National innovation system). Functions of this system are performed while carrying out other activities, although in effect they can be viewed as an IS. The question remains whether a formal establishment of the sectoral IS for forestry would in reality represent a change.

Based on the submitted information, the stated hypotheses can be assessed. If they were “open” hypotheses, the answer in both cases would be “YES, BUT...” However, if the hypotheses were stated as “enclosed” (i.e. with a requirement to answer yes/no only), it appears that the following is most accurate:

H1. A sectoral innovation system for Czech forestry is established: YES

H2. The SIS for Czech forestry fulfils all three main IS functions: NO.

As was mentioned at the beginning of this paper, the forestry sector is regarded as one of the most conservative in the CZ economy. However, a modern view of sustainable development requires that no sector is isolated. Therefore forestry must be regarded as a substantial part of a wider rural space which in turn links to the wider economy of CZ. Rural development is hardly imaginable without innovation of various types, although, the first requirement is for innovation in thinking; admitting that innovation is essential. The CZ style of forestry policy, whose birthplace is in Central Europe (Krott, 2003), draws information from both natural and social science. The contribution from the former is rich and ever-growing; therefore it is possible to agree with Diedrich et al. (2011) that it is the importance of social science which needs greater enforcement in innovative research.

In conclusion: Does the Czech Republic have a sectoral innovation system for forestry? Yes, it does, but it is not easy to find it.

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