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Research paper

## **The perception of abandoned farmland by local people and experts: Landscape value and perspectives on future land use**

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### **Highlights**

- Locals and land use experts are mostly dissatisfied with change to the rural landscape.
- Land abandonment is seen as the most characteristic trend in landscape change.
- The ability of land to be productive is seen as precondition for landscape quality.
- Mosaic pattern of afforestation is higher valued by locals and land use experts.

### **Abstract**

Abandonment of agricultural land is a common feature of areas undergoing a range of urbanisation and marginalisation processes across Europe and beyond. This is also the case in Latvia, particularly in the period since 1990, when after regaining independence from the Soviet Union land was restored to its previous owners or their descendants. Many of these people have moved to cities and lack the interest in or the necessary capital for starting farming enterprises. As a result, large areas of land were abandoned, leading to spontaneous afforestation and with associated changes in landscape structure, ecological function and aesthetic value. While there has been an increase in research interest in the processes associated with abandoned farmland, there are still very few studies on people's perception of such areas. The aim of this study was to extend previous research on the ecological aspects of the afforestation processes by assessing the opinions of rural residents and of land use experts about recent landscape change and potential solutions for the re-use of abandoned agricultural land. The results confirmed earlier research showing that in general attitudes towards abandoned agriculture land are rather negative, it being mainly associated with insufficient use and desolation, while very few respondents perceive it positively for its naturalness. Nevertheless, when asked to evaluate four different forest colonisation patterns, respondents expressed a preference for a mosaic pattern as being better for the appearance of the landscape as well as for biodiversity.

*Keywords: landscape change; rural areas; spontaneous afforestation; survey; Latvia*

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## **1. Introduction**

Rural areas and the lifestyle of rural residents are currently undergoing dramatic changes worldwide, with many impacts on cultural landscapes. Over the last century urbanisation processes in combination with rural development policies that focused on increases in agricultural production led to a polarisation of land uses, resulting in changing settlement structures and reducing population densities, the intensification of agriculture on more productive and accessible areas, while remoter areas underwent marginalisation and abandonment (Antrop, 2004; Mander, Palang, & Ihse, 2004; Palang, Helmfrid, Antrop, & Alumäe, 2005). In many areas the abandonment of agricultural land results in spontaneous afforestation (i.e. colonisation of abandoned fields by forest) and the loss of cultural landscape features ((Baldock, Beaufoy, Brouwer, & Godeschalk, 1996; Gellrich, Baur, Koch, & Zimmermann, 2007; MacDonald et al., 2000). Land abandonment also has significant ecological consequences when the disappearance of a fine-grained mosaic landscape structure leads to its simplification, homogenisation and the loss of many semi-natural habitats and a consequent decrease in biodiversity value (Henle et al., 2008; Nikodemus et al., 2005; Stoate et al., 2009; Uematsu, Koga, Mitsuhashi, & Ushimaru, 2010), although some authors also view it as an opportunity for “re-wilding” the landscape (Bowen, 51 McAlpine, House, & Smith, 2007; Navarro & Pereira, 2012). The social impacts caused by the closure of landscape by forest and the loss of its scenic qualities together with depopulation and the loss of sense of a well-managed landscape can also results in feelings of desolation, isolation, oppression and loss of contact with neighbours other people (Bell, Montarzino, Aspinall, Peneze, & Nikodemus, 2009; Benjamin, Bouchard, & Domon, 2007).

In Central and Eastern Europe the course of landscape change, in addition to the processes described above, was strongly influenced by the periodic political and socio-economic changes of the 20<sup>th</sup> and early 21<sup>st</sup> centuries (Nikodemus et al., 2005; Palang et al., 2006), which was also the case for Latvia. A mosaic structure of landscape developed there following the land reforms of the 1920s when land previously owned by manors was redistributed to peasants to produce farms of a maximum size of 22 ha (Vanwambeke, Meyfroidt, & Nikodemus, 2012). During the period of Soviet occupation (1945-1990) the formation of collective farms, the melioration of land to form large expanses of agriculture and forest re-colonisation of marginal areas led to a simplification and homogenisation of the landscape (Melluma, 1994; Peneze, 2009). With the regaining of independence another land reform took place through the process of restitution of land to the former owners, who in many cases were living in cities and lacking the interest or the necessary capital to establish a farm enterprise (Bell, Nikodemus, Peneze, & Kruze, 2009; Vanwambeke et al., 2012). This has led to extensive land abandonment which, in a country with already extensive forest and abundant seed sources, means it succumbs to colonisation by forest. Rates of land abandonment have slowed since Latvia's accession to the European Union in 2004 and access to financial support, such as single area payments, to mow unused meadows so as to prevent trees taking over. However, the loss of population and the social abandonment of rural areas continue as a result of the out-migration of mostly young people of working age, who might otherwise be future land managers (Bell, Alves, de Oliveira, & Zuin, 2010).

Scenarios of land use change in Europe for the period up to 2030 suggest a continuous decline of productive agricultural land, one of the major factors influencing the European landscape in the future (Stoate et al., 2009). The leading role of economic agriculture in forming the rural landscape is diminishing as farmers, who formed the majority in the past, are becoming a minority, and where the socio-professional structure of the countryside is evolving more towards that found in the urban environment, especially in areas close to

larger urban centres where commuters and “hobby farmers” can be found (Domon, 2011; Palang et al., 2006, Bell et al., 2011).

The development trends found in the countryside of today result from the demands of a changing society (Antrop, 2005; Sayadi, González-Roa, & Calatrava-Requena, 2009; Vos & Meekes, 1999). The concept of a multifunctional landscape is gaining ground in landscape research as well as in land use policy, which tends towards an equal focus between economic, ecological, social and cultural functions. The amenity or recreational quality of the landscape is becoming an important resource for the development of rural areas (Domon, 2011). Reform of the EU Common Agriculture Policy (CAP) has served as major driver for such developments, gradually changing the focus away from intensive farming and production towards more environmentally-friendly farming practices. As a result of various agro-environmental schemes, farmers’ roles have expanded from the production of food to promoting biodiversity and maintaining cultural landscapes (Henle et al., 2008). Multifunctionality has become an essential precondition for sustainable landscape management, which besides conservation of inherent landscape qualities and values, involves also direction towards sustaining rural economies and exploring the long-term possibilities offered by new developments (Antrop, 2006). In this context abandoned land can be viewed as challenge as well as opportunity for future land management (Benjamin et al., 2007).

Within this complex transformation process of the rural lifestyle farmers and other landowners might not be given a clear policy direction or have an understanding of future development trends, although they are in fact the most influential actors in the landscape (Kaur, Palang, & Sooväli, 2004). In order to optimise the development of rural areas, public preferences for land use management options and the associated aesthetic results on the landscape have become an important element of landscape research (e.g. see Hunziker et al., 2008; Sayadi et al., 2009; Zheng, Zhang, & Chen, 2011). Nevertheless, there are still few studies specifically looking at the perception of abandoned land and public preferences for its future management (Bauer, Wallner, & Hunziker, 2009; Benjamin et al., 2007; Höchtl, Lehringer, & Konold, 2005; Hunziker, 1995), although some researchers have addressed the issue in a wider context of landscape change (Bell, Montarzino, et al., 2009; Kaur et al., 2004; Peneze, 2009).

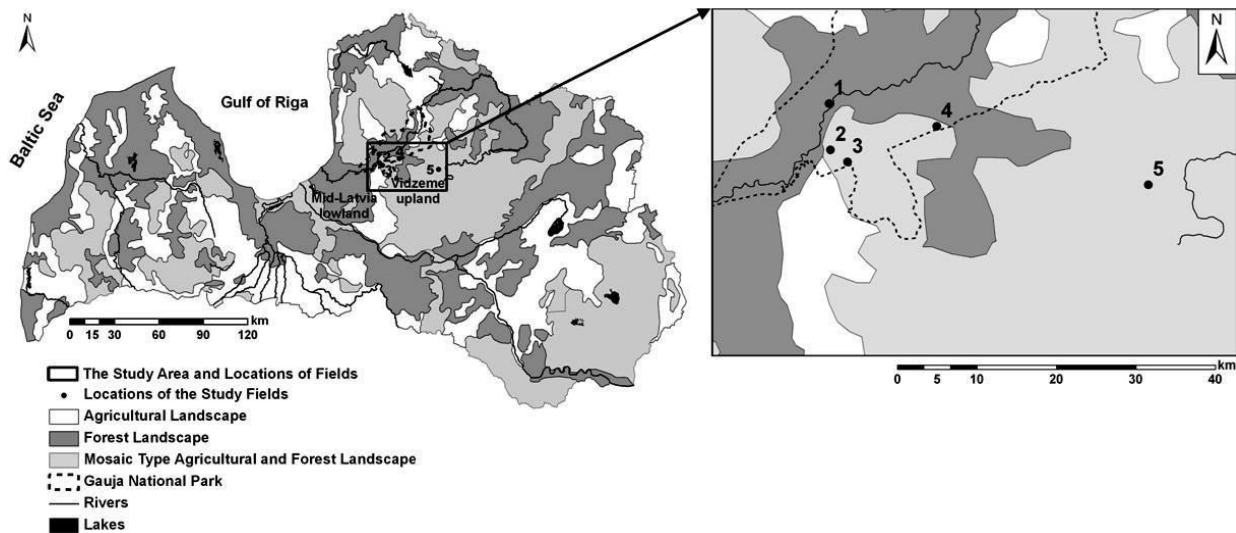
In a previous study on the course of the secondary succession to forest in abandoned fields in Latvia four patterns of spontaneous afforestation were identified (Ruskule, Nikodemus, Kasparinska, Kasparinskis, & Brumelis, 2012). The aim of the study reported here was to extend the research from the ecological aspects to the social impacts of the afforestation process in the same study area, by exploring the perceptions and opinions of rural residents and land use experts such as planners from local authorities and experts in forestry, agriculture, ecology and landscape about the recent landscape change and potential options for the future use of abandoned agricultural land. It was also hoped that interviews with local people and experts would help to interpret the on-going natural afforestation process as well as providing a picture of the social impact of land abandonment.

We hypothesised that local communities in general tend to have negative perceptions about natural forest colonisation of abandoned areas since the managed landscape has been shown to have a higher value in the minds of the Latvian people (Bell et al., 2007); however, the different spatial patterns of afforestation might be perceived differently from an aesthetic and ecological perspective.

## **2. Materials and methods**

## 2.1. Study area

The study was conducted in the central part of Latvia, encompassing part of the Vidzeme upland (Fig. 1), which has undulating topography (ca. 200-300 m above the sea level), and part of the Mid-Latvia lowland, which is generally a flat plain. The population density in this region in 2009 was estimated to be some 15.5 people per 1 km<sup>2</sup> (Central Statistical Bureau, 2012), although in the deeper rural areas the density is considerably lower, as a result of the scattered settlement structure of individual farmsteads. This area represents the typical rural landscape of Latvia formed by a mosaic of forest patches, fields and farmsteads, although affected significantly by collectivisation in Soviet times (Bell, Nikodemus, et al., 2009). About half of the area is classified as agricultural land, of which 25-35 % is abandoned (Peneze, 2009). The high proportion of unused agricultural land in the Vidzeme upland has been caused by marginalisation processes and unfavourable natural conditions for agricultural development such as poor soils. In the part of the study area located within the Mid-Latvia lowland the afforestation process is driven more by suburbanisation and a consequent transformation of agriculture land into built-up areas, which due to the economic crisis were left abandoned.



**Fig. 1.** Location of the study area: 1– Inciems; 2 – Sigulda-Nurmiži; 3 – Gobas; 4 – Līgatne-Ieriķi; 5 – Taurene.

The previous study examining the secondary succession to forest on former agriculture land focused on seven abandoned sites within the study area representing four different spatial patterns of afforestation (Ruskule et al., 2012). This survey was carried out in the same study area and included the seven abandoned fields with their surroundings (reaching ca. 5 km radius from the sites). Since few of the sites were located near each other this resulted in five localities where interviews were conducted – four in the Mid-Latvia lowland (Inciems, Sigulda – Nurmiži, Gobas and Līgatne – Ieriķi) and one in the Vidzeme upland (Taurene). The four Mid-Latvia lowland localities are situated within the Gauja National Park, established for the protection of outstanding natural and landscape assets of the primaeval valley of the river Gauja and its surroundings.

## 2.2. The survey

The survey was based on semi-structured face-to-face interviews with residents of the study area and experts from fields related to land management – agriculture, forestry, ecology, landscape research and spatial planning. This approach was chosen since it allows an interviewer to be responsive to the way the interviewee reacts to questions and to understand their reasoning when answering to the questions, while also allowing the comparison of the responses between the different groups (Calvo-Iglesias, Crecente-Masada, & Fra-Paleo, 2006; Marshall & Rossman, 2006).

Since the aim of our research was to study attitudes towards land abandonment among the people experiencing this process in their everyday life and taking into account the tendency for local residents to be mainly concerned about their immediate surroundings (Palang et al., 2011), we chose to target the survey at the rural population of the five localities described above as well as people living in the nearby suburban areas. Thus this survey is not representative to the rural population of the country as a whole, but has a local (site-based) character.

For the selection of the interviewees the theoretical sampling approach was applied (Hunziker (1995) and Hunziker et al. (2008)) which allows the researcher to obtain the maximum variety among the respondents according to sample-selection criteria relevant to the particular objectives of the study. The first set of criteria we applied was to cover all the abandoned fields – their owners or direct inhabitants, neighbours and residents of the surrounding area including rural dwellers and people from nearby villages or towns. The next set of criteria included covering all age groups (from 15 years and older), levels of education, both sexes and those with different levels of engagement in agriculture (i.e. farmers; those who own agricultural land but do not practice farming and locals who do not own agricultural land). Experts were selected so as to represent land use planners from each of the five localities, as well as to cover the different fields of expertise as already described above.

All interviews were conducted by two researchers either at the homes of local residents or at the workplace of experts over a period of two years from summer 2010 to summer 2012. Each interview lasted 30 min on average (although in some cases up to 2 h, including walking around the abandoned fields included in the study). Since population density in the study areas is rather low, as already noted, almost every farmstead was approached. The study areas included 205 farmsteads, although many were abandoned or used as holiday homes. Interviews were conducted at 59 active and occupied farms making 28.8 % as the total response rate, which is sufficient sample size according Atinaya and Paraskevas (2008), while active response rate (total sample subtracting not contacted farmsteads) has been ca. 90%. 35 sub-urban dwellers from areas next to five study sites and 23 experts were also interviewed. This gave a total sample size of 117 people. The distribution of respondents by each locality and the categories of socio-economic variables used for data analysis are presented in Table 1.

The total sample of local residents included 7 owners or direct inhabitants of the study sites, 15 direct neighbours and 72 inhabitants of the surrounding areas. Despite the high proportion of rural dwellers in the sample, only 15 were actively engaged in farming, although 63 respondents owned agricultural or forest land. Most of the landowners are only managing their land by mowing the grass and receiving single area payments for keeping it maintained in an acceptable state. The size of properties owned by the local people were mostly small – 55% of respondents stated that their property is smaller than 10 to 30 ha of land, 11% – 30–50 ha, 5% – 50–100 ha and 10% owned more than 100 ha.

**Table 1**

Descriptive summaries of the local residents, grouped by the localities of the study.

Area	No. of interviewees	Engagement in agriculture	Age	Education	Gender
<b>1. Inciems</b> Suburban/rural Distance from capital: ca. 59 km	18	No agriculture land: 6 Land, but not farming: 7 Farming: 5	15–29: 3 30–44: 0 45–59: 6 ≥ 60: 9	Primary: 1 Secondary: 11 Higher: 6	Female: 13 Male: 5
<b>2. Sigulda-Nurmiži</b> Urban/suburban/ rural Distance from capital: ca. 55 km	26	No agriculture land: 9 Land, but not farming: 12 Farming: 5	15–29: 3 30–44: 12 45–59: 6 ≥ 60: 5	Primary: 2 Secondary: 11 Higher: 9	Female: 20 Male: 6
<b>3. Gobas</b> Rural/suburban Distance from capital: ca. 57 km	17	No agriculture land: 3 Land, but not farming: 12 Farming: 2	15–29: 1 30–44: 7 45–59: 4 ≥ 60: 5	Primary: 3 Secondary: 8 Higher: 6	Female: 11 Male: 6
<b>4. Līgatne-Ieriķi</b> Rural Distance from capital: ca. 70 km	16	No agriculture land: 6 Land, but not farming: 10 Farming: 0	15–29: 2 30–44: 5 45–59: 4 ≥ 60: 5	Primary: 0 Secondary: 8 Higher: 8	Female: 12 Male: 4
<b>5. Taurene</b> Rural Distance from capital: ca. 110 km	17	No agriculture land: 7 Land, but not farming: 7 Farming: 3	15–29: 2 30–44: 2 45–59: 4 ≥ 60: 9	Primary: 2 Secondary: 9 Higher: 6	Female: 9 Male: 8

The content of the questionnaire emerged from the objectives of the study, which were twofold: (1) to obtain information on the land use history of the particular abandoned fields where the character of the secondary succession to forest was studied and (2) to inquire about the attitudes of local residents and experts towards the visible landscape change over recent decades and associated patterns of afforestation. In the design of the questionnaire we consulted other research on this issue (eg. Benjamin et al., 2007, Hunziker, 1995, Hunziker et al., 2008) as well as experts in landscape research and sociology. To ensure that the content of the questionnaire was understandable it was piloted by conducting five test interviews after which it was adjusted.

Two different questionnaires were designed, one for local residents and one for experts. Many of the questions were the same so as to be able to compare the views of the two groups. The content structure of both questionnaires consisted of five blocks, each having a different purpose within the study (see Table 2). The questionnaire included qualitative open-ended questions as well as questions for quantitative analysis, including predefined options of answers or a preference rating along a 5 point Likert scale.

Before answering the fourth block of questions each respondent was shown the photos and maps of four fields, representing the four afforestation patterns found in the study area (see. Fig. 2): *afforestation from the forest edge* – woody patches formed by tree species present in the surrounding forest, gradually invading the field starting from the forest edge (in the 20 years since abandonment only some 8% of field has become overgrown); *continuous afforestation* – a dense, closed canopy stand, mostly dominated by birch (*Betula pendula*) has formed over a relatively short period of time since abandonment (7–10 years); *mosaic afforestation* – woody patches of very diverse species composition, density and age are scattered over the entire area; *linear afforestation* – formed by linear shaped narrow woody patches of simple species composition (mainly *Salix spp.* or *B. pendula*), that followed the former ploughing directions.

**Table 2**  
Content of the questionnaire.

Block	Type of information obtained	Respondents addressed	Questions
1.	Engagement of respondent in agriculture	Local residents owning agriculture or forest land	Questions with predefined answer options on the size of property, how the land is used and if subsidies for agriculture or afforestation are obtained
2.	Previous land use of the study fields (to provide input to the study on secondary succession in the abandoned fields)	Land owners; direct inhabitants or neighbours of the study fields; spatial planners or agriculture experts from local authority.	Open-ended questions on previous land use, year since abandoned, possible disturbances of succession process.
3.	Opinion about the landscape change and land abandonment in general.	All respondents	Open-ended questions on observed landscape change in the study area since the beginning of the 1990s and rating the observed change on a 5 point Likert scale; multiple-choice options on emotions or concepts associated with abandoned agricultural land; open-ended question on how the availability of agricultural subsidies have influenced landscape in their neighbourhood.
4.	Assessment of four afforestation patterns	All respondents	Rating of the four afforestation on a 5 point Likert scale with regard their impact on landscape appearance and biodiversity; question on optimal further land use of each afforestation pattern.
5.	Socio-economic profile of the respondents	Local residents	Questions with predefined answer options on sex, age, employment sector, and educational achievement level as well as how long the respondents have lived in the study area.

### 2.3. Data analysis

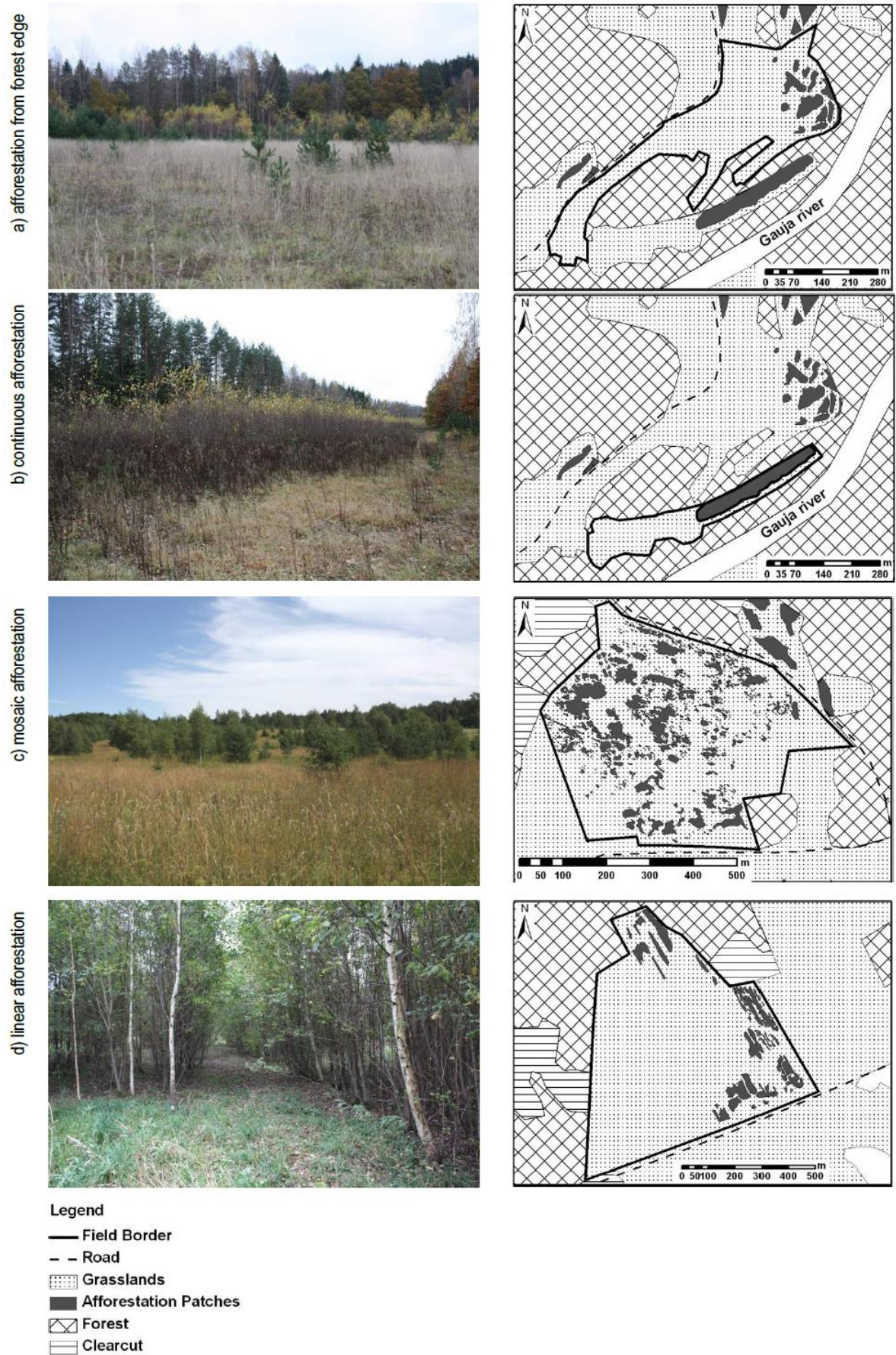
The interview results were entered into an Excel database, coded and transformed into a binary system (where 1= a positive answer and 0 = a negative answer). We analysed the answers on perceived landscape change, emotions or concepts associated with abandoned agriculture land and the assessment of the four afforestation patterns (the 3rd and 4<sup>th</sup> block of the questionnaire) using the answers from the 1<sup>st</sup> and 5<sup>th</sup> blocks as explanatory socio-economic variables.

The answers to the qualitative open-ended questions on perception of the landscape change were transcribed into full text and later analysed by content analysis, mainly using the Keywords in Context (KWIC) technique (Ryan and Bernard, 2003) to identify the most frequent key-words /phrases, which were listed in separate columns within the Excel data base while noting in the binary system if respondents had mentioned them. Thus we obtained quantitative data on the main tendencies of landscape change and the characteristics of the present day landscape. In this paper we reflect on the 12 most frequent key words (Fig.3).

For statistical processing of the quantitative data we used both parametric and non-parametric methods, since the verification of data conformity for certain distribution types according to the Fisher criteria of dispersion revealed that the data did not always correspond to the normal.

In the case of rating the landscape change using the 5 point Likert scale the data had a normal distribution, so we used the average value and standard deviation (Fig.5) as well as parametric methods. The *Tukey* and *Scheffe* tests in the one-way analysis of variance





**Fig. 2.** Pictures of the four afforestation patterns used in the interviews.

(ANOVA) were applied to assess differences among responses of the key respondent groups, using *SPSS PASW Statistics 18* software. Taking into account the possibility that the selected data could have unequal dispersions in gradation classes, Dunnett's T3 adjustment method was used for the assessment of the average differences of responses.

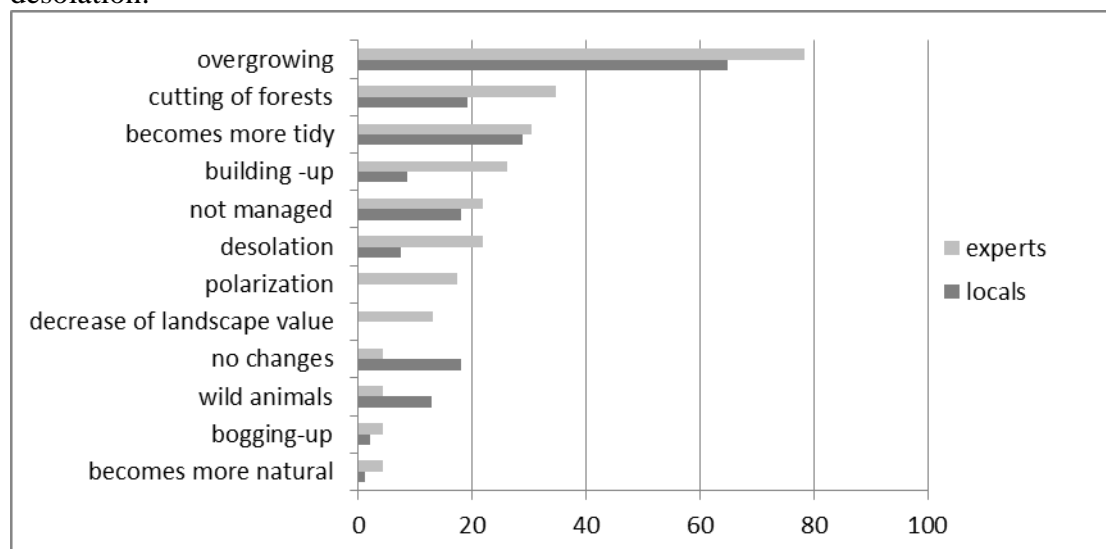
In the case of the assessment of the four afforestation patterns the data had non-normal distribution among the 5 grades, therefore the median values and non-parametrical methods (i.e. *Mann-Whitney* test) were applied to compare differences in the assessment values among the four afforestation patterns (Table 4) as well as between experts and locals.

To test the correlation between the response variables with the explanatory socio-economic variables (age, educational level, ownership of agriculture land and engagement in farming) we applied principal component analysis (PCA), using the software *PC ORD 5.10*. A *Monte Carlo* test was used to test the significance of PCA axes. Pearson correlation coefficients were determined between response and explanatory variables. This approach was applied to extract the characteristic response variables on perception of abandoned farmland (i.e. *inefficient use, desolation, shame, naturalness* and *enjoying the revival of nature*) as well as for comparing assessments of the four afforestation patterns (Fig.4 and Table 5).

### 3. Results

#### 3.1. Perceived landscape change within the study area

Land abandonment and the resulting process of secondary forest succession was seen by both locals and experts as the most characteristic trend in landscape change since the beginning of the 1990s (Fig.3). Around 78% of the experts and 65% of the locals noted "overgrowing of agricultural land" when answering the open-ended question about perceived landscape changes within the study area. Other trends which were also frequently noted were an increase in forest cutting as well as land becoming more built-up near the largest towns. Around one third of both groups of respondents felt that their neighbourhood has become tidier, although this is mainly associated with the period starting from 2004, when Latvia joined EU and agricultural support schemes became available. A significant proportion of respondents also felt that the land is not managed enough, thus also giving an impression of desolation.



**Fig. 3.** Perceived landscape change in study area since beginning of 1990ies (% of respondents that have indicated particular feature).

The experts also noted trends such as polarisation, meaning intensification of land use in some areas in parallel to land abandonment in others, while some locals thought that nothing much has changed in the surrounding landscape. Several respondents had observed more frequent appearances of wild animals (e.g. wild boar, roe deer, beaver etc.) and traces of their activities in the landscape. A few respondents also noted that the land was becoming more water-logged, as a result of the collapse of melioration systems (land drainage ditches and pipes) and the naturalisation process of landscape.

Attitudes towards abandoned agricultural land among the people living within the study area were mainly negative (Table 3). From the multiple choice options in the questionnaire for locals, most of respondents selected *inefficient use* and *desolation* as concepts associated with abandoned land, followed by *apathy*, *depression* and *shame*. A positive association with abandoned land such as *naturalness* and *enjoying the revival of nature* were noted less frequently. Slight differences can be observed when comparing the results between different socio-economic variable such as engagement in agriculture, age and educational level (Table 3). Active farmers and the older generation were more critical about land abandonment (around one third of farmers and people older than 60 years consider it to be a *shame*), while positive associations such as *naturalness* and *enjoying a revival of nature* were mainly stated by younger people and people with a higher education. Those residents of the study area who do not own agriculture land were also mainly negative about what they saw – a majority of this group (72%) noted feeling of *desolation* mentioned *depression* more than other groups. The *inefficient use*, although being dominant in the answers of all groups, was mostly selected by farmers as well as the younger people.

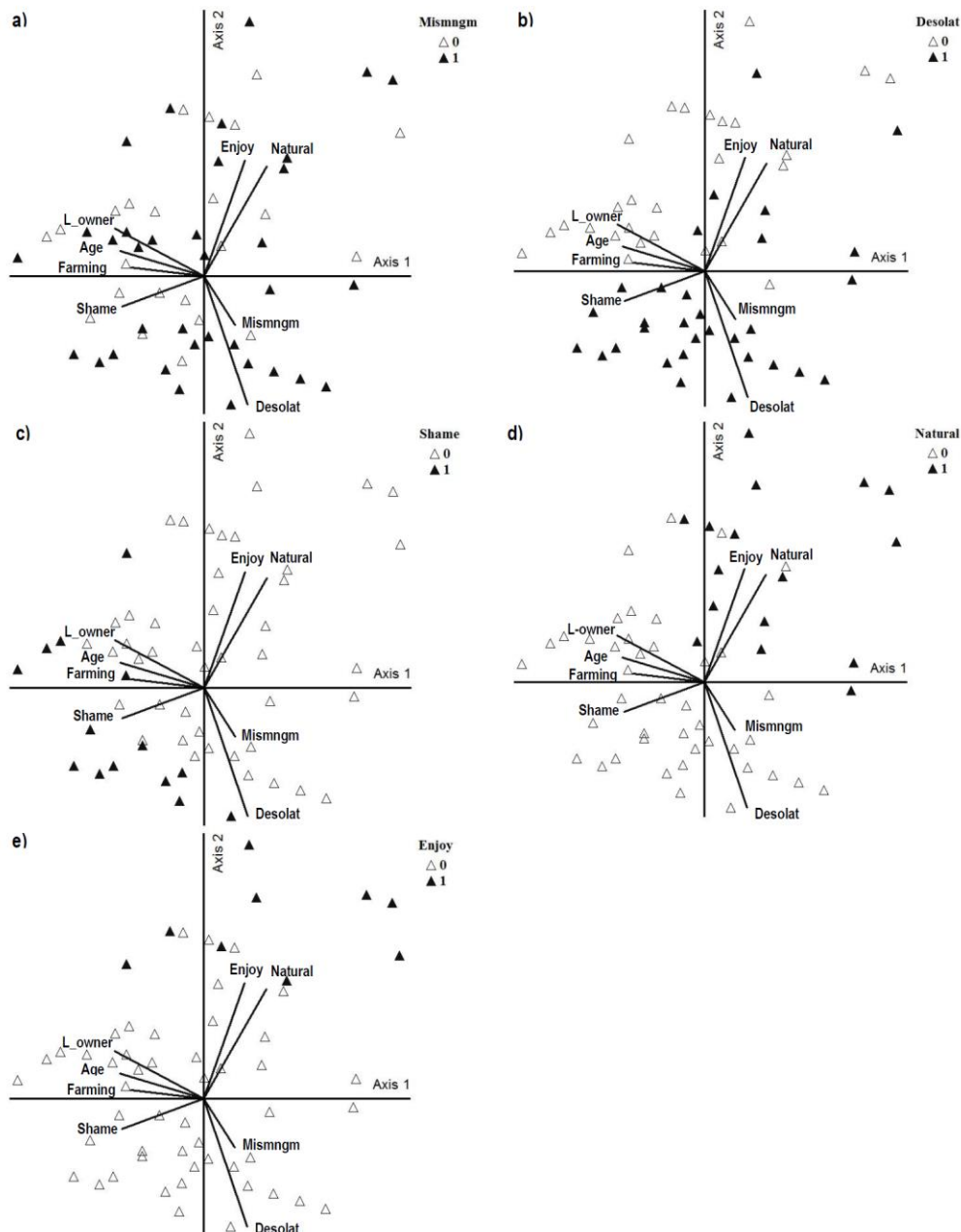
**Table 3**

Emotions/concepts associated with abandoned agriculture land indicated by the residents of the study area (% from all locals and from particular groups).

	All locals	Engagement in agriculture		Farming	Age				Education		
		No agri-cultural land	Land, but not farming		15–29	30–44	45–59	≥ 60	Primary	Secondary	Higher
Inefficient use	68.1	69.0	64.0	80.0	81.8	76.9	66.7	57.6	75.0	61.2	75.7
Desolation	59.6	72.4	58.0	40.0	63.6	69.2	66.7	45.5	62.5	57.1	62.2
Apathy	35.1	20.7	42.0	40.0	18.2	34.6	37.5	39.4	12.5	38.8	35.1
Depression	21.3	34.5	12.0	26.7	45.5	11.5	25.0	18.2	12.5	24.5	18.9
Shame	19.1	13.8	18.0	33.3	0.0	23.1	8.3	30.3	37.5	16.3	18.9
Naturalness	18.1	17.2	20.0	13.3	54.5	15.4	12.5	12.1	12.5	12.2	27.0
Enjoying revival of nature	10.6	13.8	12.0	0.0	18.2	3.8	12.5	12.1	0.0	8.2	16.2
Loneliness	9.6	10.3	10.0	6.7	9.1	11.5	12.5	9.1	0.0	14.3	5.4
Diversity	2.1	0.0	4.0	0.0	0.0	0.0	0.0	6.1	12.5	2.0	0.0
Fear	1.1	0.0	2.0	0.0	0.0	0.0	4.2	0.0	0.0	2.0	0.0

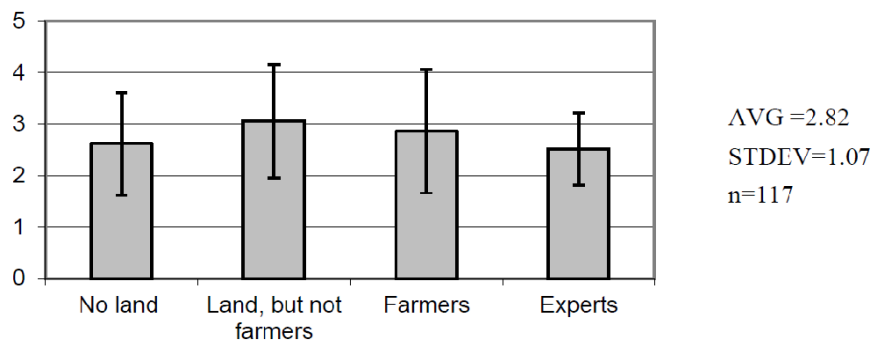
The PCA ordination of selected characteristic response variables on perception of abandoned farmland (*inefficient use*, *desolation*, *shame*, *naturalness* and *enjoying the revival of nature*) with the explanatory socio-economic variables (age, ownership of agriculture land and engagement in farming) showed three principal components (first three axes were statistically significant ( $p < 0.05$ )) in total explaining 56.25% of dispersion (Fig. 4; Table 3). Axis 1 revealed a positive correlation between *shame* ( $r = -0.57$ ) and all three selected socio-economic variables – age ( $r = -0.58$ ), ownership of agriculture land ( $r = -0.62$ ) and engagement in farming ( $r = -0.50$ ), thus confirming that the older generation as well as active farmers have the most negative attitude towards land abandonment and the forest succession process. The same axis indicates that there might be a negative correlation between the same

socio-economic variables and *naturalness* ( $r = 0.43$ ). Axis 2 indicated a positive correlation between *naturalness* ( $r = 0.63$ ) and *enjoying a revival of nature* ( $r = 0.66$ ), while at the same time showing a negative correlation between these variables and *desolation* ( $r = -0.73$ ), although not having statistically significant correlation with any of the socio-economic variables. Axis 3 indicated a positive correlation between *inefficient use* ( $r = 0.59$ ) and engagement in farming ( $r = 0.68$ ) as well as close to negative correlation with age ( $r = -0.48$ ), confirming that younger people and farmers consider abandoned farmland to be the result of inefficient use.



**Fig.4.** PCA ordination of response variables on perception of abandoned farmland (inefficient use (a); desolation (b); shame (c); naturalness (d); enjoying revival of nature (e)) and explanatory socio-economic variables (age, ownership of agriculture land and involvement in farming).

Both groups – the residents of the study area and the experts – assessed the observed changes in landscape over the period since the beginning of the 1990s, rating them on a scale of 1–5, where 1 means maximum dissatisfaction with the observed landscape change, 3 a neutral opinion and 5 maximum satisfaction (observing positive improvements in landscape). The average value of the whole data set was 2.82, indicating that the overall perception was slightly more towards the negative. The most critical attitude towards observed changes in landscape was among those who live in the study area but do not own agricultural land (average (AVG) = 2.62) as well as experts (AVG = 2.52) while those who own agricultural land but do not practice farming, were slightly more satisfied (AVG = 3.06) (Fig.5). However, no statistically significant differences among responses of those groups ( $p>0.05$ ) were shown up by the *Tukey* and *Scheffe* tests in One-way analysis of variance (ANOVA).



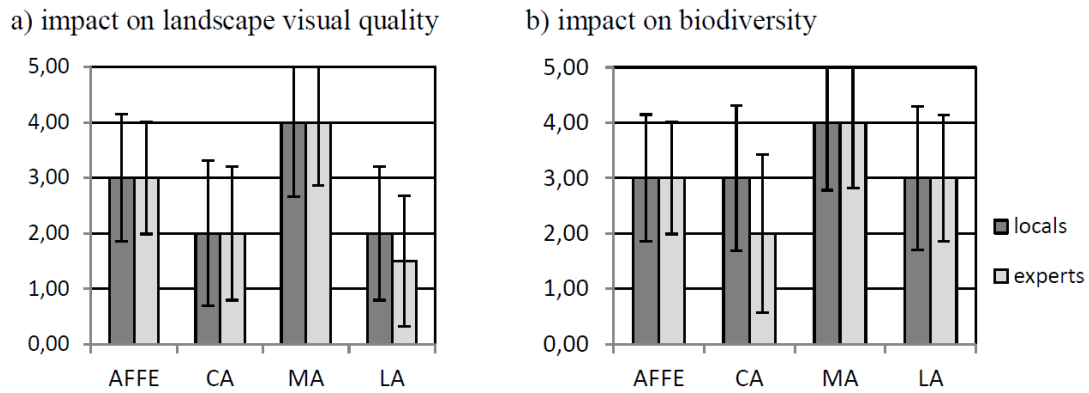
**Fig. 5.** Average values and standard deviation of assessment of perceived landscape change since the beginning of the 1990s by four socio-economic groups on a scale of 1-5, where 1 – the most negative grade and 5 – the most positive grade.

### 3.2. Assessment of afforestation patterns in abandoned agriculture land

The four patterns of spontaneous afforestation in abandoned agriculture land (afforestation from forest edge (AFFE), continuous afforestation (CA), mosaic afforestation (MA) and linear afforestation (LA)) were assessed from the perspective of its impacts on the visual appearance of the landscape and biodiversity. Each pattern was rated on a scale of 1–5, where 1 means the most negative impact and 5 the most positive impact. Response values had normal distribution only in the case of the first pattern, therefore for comparing the assessment values between the four patterns median values and standard deviations were used (see Fig. 6).

The *Mann–Whitney* test revealed statistically significant differences between the patterns in the assessment of their impact on landscape both by locals (Table 4a) and experts (Table 4b), with the exception when comparing the mosaic pattern with afforestation from the edge as well as the continuous pattern with the linear, where differences were not statistically significant. The situation was somewhat different when comparing the assessments of impact on biodiversity – in this case a statistically significant difference was found only between the continuous and mosaic patterns for both groups of respondents as well as between the mosaic and linear pattern for locals. The median values of the assessments show that the mosaic pattern of afforestation was more preferred by both locals and experts (median = 4), from both a visual landscape as well as a biodiversity perspective, while continuous and linear colonisation was rated lower, especially for the impact on the visual landscape value (median value ranges from 1.5 till 2). The rating of the afforestation from the forest edge (median = 3)

was not significantly different from the mosaic pattern, although there was a significant difference from both continuous and linear patterns.



**Fig. 6.** Median values and standard deviation of assessment of landscape and biodiversity value of four afforestation patterns by residents of the study area and experts: AFFE – afforestation from forest edge; CA – continuous afforestation; MA – mosaic afforestation; LA – linear afforestation; scale from 1 to 5, where 1 – the most negative impact and 5 – the most positive impact.

**Table 4**

Differences between assessment of landscape value (ls) and biodiversity value (bd) of four afforestation patterns (according *Mann–Whitney* test).

	AFFE_ls	CA_ls	MA_ls	LA_ls
<b>(a) Assessment by locals</b>				
AFFE_ls		*	n.s.	*
CA_ls	*		*	n.s.
MA_ls	n.s.	*		*
LA_ls	*	n.s.	*	
<hr/>				
	AFFE_bd	CA_bd	MA_bd	LA_bd
AFFE_bd		n.s.	n.s.	n.s.
CA_bd	n.s.		*	*
MA_bd	n.s.	*		*
LA_bd	n.s.	n.s.	*	
<hr/>				
	AFFE_ls	CA_ls	MA_ls	LA_ls
<b>(b) Assessment by experts</b>				
AFFE_ls		*	n.s.	*
CA_ls	*		*	n.s.
MA_ls	n.s.	*		*
LA_ls	*	n.s.	*	
<hr/>				
	AFFE_bd	CA_bd	MA_bd	LA_bd
AFFE_bd		n.s.	n.s.	n.s.
CA_bd	n.s.		*	n.s.
MA_bd	n.s.	*		n.s.
LA_bd	n.s.	n.s.	n.s.	

n.s., not significant difference

\* Significant difference ( $p < 0.05$ )

When comparing the assessment values of the each afforestation pattern between the two groups – locals and experts – using the *Mann–Whitney* test no statistically significant difference was found ( $p > 0.10$ ). Thus we can conclude that in general there is a consensus

among locals and experts about the impacts of the four patterns on visual landscape and biodiversity values.

In the PCA ordination of the response variables on landscape and biodiversity value of the four afforestation patterns and the explanatory socio-economic variables (age, ownership of agriculture land, involvement in farming and education) axis 1 and 2 were statistically significant, explaining around 50% of the variation for afforestation from the forest edge and continuous afforestation, around 51% – for mosaic afforestation and 56% – for linear afforestation (Fig. 6 and Table 5).

Axis 1 of the PCA ordination show a strong positive correlation between the ratings of the impacts on landscape and the impact on biodiversity for all four patterns assessed (Table 5) which partly corresponds to the results shown in Fig. 6, where median values of impact for two of the patterns on landscape and biodiversity (AFFE and MA) were identical. This leads to the conclusion that those afforestation patterns that are rated higher from a landscape perspective are also considered to be more valuable for biodiversity and *vice versa*.

**Table 5**

Results of PCA on correlation between perception of landscape and biodiversity value of four afforestation patterns with socio-economic variables (age, ownership of agriculture land, involvement in farming and education).

Afforestation pattern	Factors	Axis 1 ( <i>p</i> =0.002)	Axis 2 ( <i>p</i> =0.006)
Afforestation from forest edge (AFFE)	Impact on landscape	<b>0.7287*</b>	-0.0649
	Impact on biodiversity	<b>0.7049*</b>	-0.2797
	Age	0.0240	<b>-0.7956*</b>
	Land ownership	<b>-0.4476*</b>	<b>-0.4799*</b>
	Farming	<b>-0.6543*</b>	0.0660
	Education	0.1497	<b>0.6142*</b>
		Axis 1 ( <i>p</i> =0.0012)	Axis 2 ( <i>p</i> =0.009)
Continuous afforestation (CA)	Impact on landscape	<b>-0.7950*</b>	0.1123
	Impact on biodiversity	<b>-0.7423*</b>	0.2653
	Age	<b>-0.4494*</b>	-0.3263
	Land ownership	-0.1785	<b>-0.8191*</b>
	Farming	0.0906	<b>-0.6816*</b>
	Education	<b>0.5056*</b>	0.1091
		Axis 1 ( <i>p</i> =0.0012)	Axis 2 ( <i>p</i> =0.009)
Mosaic afforestation (MA)	Impact on landscape	<b>0.9186*</b>	-0.0803
	Impact on biodiversity	<b>0.8729*</b>	-0.0415
	Age	-0.1029	-0.5647
	Land ownership	-0.0012	<b>-0.8067*</b>
	Farming	0.1056	<b>-0.4997*</b>
	Education	0.2817	0.3678
		Axis 1 ( <i>p</i> =0.001)	Axis 2 ( <i>p</i> =0.004)
Linear afforestation (LA)	Impact on landscape	<b>-0.8577*</b>	0.0245
	Impact on biodiversity	<b>-0.8707*</b>	0.0365
	Age	-0.3766	<b>-0.5397*</b>
	Land ownership	0.1591	<b>-0.8174*</b>
	Farming	0.3444	<b>-0.5232*</b>
	Education	0.4477	0.3570

\* Statistically significant correlation (*r*>0.5) in bold

Axis 1 also indicated statistically significant correlations to socio-economic factors for afforestation from the forest edge as well as for continuous and linear afforestation patterns, while for the mosaic pattern, which was generally assessed as the most acceptable, socio-economic factors did not have much impact on variations in response. In the case of afforestation from the forest edge a negative correlation between the impact on landscape and biodiversity values and the level of engagement in agriculture was observed (for land

ownership  $r = 0.45$ ; for farming  $r = 0.65$ ), from which we can conclude that farmers are the most negative among the respondents about this pattern. For the continuous afforestation pattern Axis 1 indicates a positive correlation to age ( $r = 0.45$ ) and a negative correlation to educational level ( $r = 0.51$ ) – younger people are more critical of this pattern as well as people with higher education. For linear afforestation pattern statistically significant negative correlation was found with education ( $r = 0.45$ ) – this pattern being more negatively perceived by people with higher education. Axis 2 showed interrelations between the socio-economic variables. However, since this is not directly related to the focus of this study, it has not been further analysed.

### 3.3 Possible future uses for abandoned land

To assess opportunities for the future use of abandoned farmland, respondents were asked about their opinion of the most suitable management solutions for the four natural afforestation patterns (Table 6). Responses revealed a surprising unanimity between locals and experts. For the presented case of afforestation from the forest edge the most commonly suggested use option was the renewal of agricultural use, where possible, or the formation of forest stands by additional planting of commercially valuable tree species and thinning of the existing woody patches. Some 30% of experts also considered this pattern suitable for natural succession. The continuous afforestation pattern, characterised by a fast rate of overgrowth and low species diversity, was seen as the most appropriate option for management towards a commercial forest or for leaving it to natural process to develop into a mature forest. The mosaic pattern, which was the most preferred from the landscape aesthetic point of view, was recommended to be kept as it is or used for more extensive farming, leaving the largest woody patches and thus preserving suitable conditions for biodiversity. It can also, to some extent, be seen as restoring something of the smaller-scale landscape diversity lost during collectivisation. A wider range of options were suggested for the linear pattern, including its transformation back to agricultural land, artificial afforestation or using it to produce wood for energy.

**Table 6**

Management solutions for different patterns of afforestation suggested by local people and experts: AFFE, afforestation from forest edge; CA, continuous afforestation; MA, mosaic afforestation; LA, linear afforestation.

Use options	AFFE		CA		MA		LA	
	Locals	Experts	Locals	Experts	Locals	Experts	Locals	Experts
Artificial afforestation	28.7	34.8	<b>42.6</b>	<b>43.5</b>	11.7	8.7	<b>34.0</b>	26.1
Agriculture	<b>47.9</b>	<b>47.8</b>	18.1	17.4	24.5	47.8	<b>34.0</b>	<b>56.5</b>
Landscape maintenance	12.8	8.7	5.3	13.0	<b>43.6</b>	<b>69.6</b>	4.3	4.3
Cultivation of energy wood	4.3	8.7	28.7	17.4	4.3	4.3	29.8	34.8
Natural afforestation	16.0	30.4	11.7	34.8	21.3	13.0	4.3	21.7

The highlighted cells indicate the most preferred options by the both groups of respondents

## 4. Discussion

### 4.1. Attitude towards landscape change and abandoned land

Land abandonment and the related afforestation process was seen by the respondents of the survey as being the main trend in landscape change over the last twenty years, along with such developments as increasing areas of forest cutting and building construction. These perceptions are corroborated by the official statistics which show that forest area has increased from approximately 43% in 1983 to 52% in 2010 (Ministry of Agriculture, 2011),



mostly due to the expansion of scrub areas and young forest stands, while the proportion of older forest is decreasing as a result of timber harvesting.

The study shows that changes in the landscape as a result of land abandonment are generally perceived rather negatively, which supports the results of other studies from Latvia (Bell, Nikodemus, et al., 2009; Peneze, 2009) as well as findings of researchers from Western countries (Benjamin et al., 2007; Höchtl et al., 2005; Hunziker, 1995; Sayadi et al., 2009). Nevertheless, besides the dominant critical views, some of the respondents saw some positive recent developments in the landscape, such as an increasing level of tidiness. Around 20% of respondents rated landscape change in general as positive and 9% as very positive. Acceptance of landscape change has also been demonstrated in other regions, for example by Hunziker et al. (2008) in the Swiss mountains, where the share of positive ratings was much higher than in the present study.

As noted by Palang et al. (2011) accepting change as an integral part of landscape is difficult, though the individual attitude towards it very much depends on the cultural context, variety of associations and childhood memories (Kaur et al., 2004). This has been demonstrated by Kaur et al. (2004) in a study from Estonia, showing that the most concerned about rural decline are farmers and older people who remember the former prosperity of rural life, while younger people only know the current state and consider it normal.

A study in Canada by Benjamin et al. (2007) showed that people owning abandoned land perceived it as untidy, useless, ugly and even stressful, generating feelings of shame about its condition. A feeling of shame was also noted by the local people of our study area, particularly those who practice farming or belong to the older generation, corresponding to findings by Kaur et al. (2004). However, the most frequently noted association with abandoned land in our study is *inefficient use*. The extended answers of the respondents in the qualitative part of the interviews indicate a concept associating good management and productive use of land with being a key precondition for landscape quality – for example one respondent even pointed out that “landscape is formed through production”. Such opinions are also reflected by the critique of agriculture subsidies that are targeted on landscape maintenance but not on stimulating agricultural production. As one farmer noted “I would much prefer to receive an adequate payment for the milk I produce instead of the single area payments”. Probably the same motivation makes some landowners, who do not practice farming, accept the current forest colonisation trends, admitting “it is better to let it be a forest than an unmanaged field”.

The high value associated with managed landscape also appears in several other studies which assessed landscape quality (Kaur et al., 2004; Rogge, Nevens, & Gulinck, 2007; Zheng et al., 2011). Also Nassauer (2011) suggests that visible evidences of care and stewardship in landscape evoke aesthetic response that makes us feel good. At the same time several studies highlight *naturalness* or *wilderness* to be major concepts affecting landscape quality (Arriaza, Cañas-Ortega, Cañas-Madueño, & Ruiz-Aviles, 2004; Nassauer, 1995; Nijnik & Mather, 2008, Rogge et al., 2007). Hunziker et al. (2008) found a positive attitude among the Swiss public towards spontaneous forest succession scenarios when testing different options for future landscapes in the Swiss mountains. However, as noted by Bauer et al. (2009) there might be differences in valuation of “re-wilding” between rural and urban people – results of the survey carried out in Switzerland suggests that negative attitude is more likely among people who grew up in the countryside and are being affected by “re-wilding”. This is also corroborated by the results of our study focussing on rural residents, where only about 10 % considered naturalisation of landscape to be a positive trend. Also a study from the south-western Alps in Italy by Höchtl et al, (2005) showed that local people regard the effects of land abandonment very negatively, while visitors are more positive towards increasing wilderness.

The evaluation of the landscape from its productivity perspective is somewhat contradictory to the observed transition from 'productivism' to 'post-productivism' and multifunctional development of rural landscape frequently referred to in the recent scientific literature (Domon, 2011; Kristensen, Thenail, & Kristensen, 2004; Naveh, 2001; Sayadi et al., 2009; Sutherland, Barnes, McCrum, Blackstock, & Toma, 2011). Such a transition implies a shift away from intensification, specialisation and concentration of agriculture (which in the case of Latvia was a characteristic to the Soviet period) to extensification and a diversification of farming practice (Kristensen et al., 2004). Management of land no longer has the sole purpose of producing economic benefits – it serves the multifunctional needs of society, including non-market benefits such as recreation and quality of life as well as securing biodiversity and ecosystem services. As noted by Domon (2011), if before it was the ability to produce goods that formed the basis of landscape appreciation, then now aesthetic, environmental and heritage qualities are decisive factors of appreciation amongst rural society. However, since Latvia along with other CEE countries was out of the mainstream of such evolving policies and societal shifts during the Soviet Era and also the fact that the rapid post-Soviet development was driven by different priorities of rural policy until the country joined the EU, the concept of post-productivism is not yet accepted by local residents.

#### *4.2. Attitude towards patterns of spontaneous afforestation*

While the general attitude towards abandoned land in our study was driven to a large extent by the concept of productivism, when assessing the particular afforestation patterns, the opinion of respondents was obviously influenced by a combination of aesthetic and ecological values. There was a striking unanimity in responses among both local people and experts (no statistical differences were found between the answers of each respondent category).

The mosaic pattern was the most valued from a visual landscape perspective, while the continuous and linear patterns, which according to a previous study (Ruskule et al., 2012) could be the most suitable for generating quick revenues from timber or energy wood production, were the least preferred. Preference for the mosaic pattern is probably affected by associations with the pre-Soviet landscape, which had a typical mosaic structure formed by dispersed agriculture and forest patches (Vanwambeke et al., 2012). This period is still held in the minds of people, especially the older generations as a golden era, representing the 'ideal' landscape (Bell, Montarzino, et al., 2009; Palang et al., 2006), which was replaced by an 'ideological' landscape of the collectivisation period in the Soviet Era, when the small-scale pre-war mosaic pattern was simplified in favour of big, easily worked fields (Bell, Nikodemus, et al., 2009). Preferences for the mosaic pattern can also be related with much deeper evolutionary associations linking structural heterogeneity of landscape, which would have provided survival benefits to our ancestors, with feeling of well-being and aesthetic satisfaction (Val, Aauri, & Lucio, 2006).

At the same time respondents valued this pattern also as being the most beneficial for biodiversity. The opinion of the respondents in this study also corresponds to ecological research into the impact of mosaic patterns on biodiversity – at the initial stage of succession, woodland patches in abandoned fields create diverse shading conditions and thus increase the species diversity in the herbaceous layer, while at the later stages after canopy closure forest stands of complex age structure and species composition are forming (Gutko, Brumelis, Liepins, Nikodemus, & Tabors, 2001; Oliver & Larson, 1996; Ruskule et al., 2012).

#### *4.3. Solutions for use and management of abandoned farmland*

Abandoned farmland has become a typical element of the post-modern or post-productivist landscape, thus it must be viewed from a multifunctional perspective, bearing in mind the social, economic and ecological aspects and benefits it can offer. Use options suggested by respondents indicates that the three patterns – afforestation from the forest edge as well as continuous and linear patterns were judged more by their potential economic benefits, while the mosaic pattern was seen as having more potential for the maintenance of its aesthetic and biodiversity value, thus supporting social as well as ecological functions of the landscape. This corresponds to the findings of the research on patterns of secondary succession in abandoned land, which suggests that the mosaic pattern (in contrast to the continuous and linear patterns) would be less appropriate for obtaining faster revenues from timber production, since the development of a closed canopy can be delayed for 15–20 years, while it has a higher potential for enhancing biodiversity and ‘re-wilding’ of the landscape in places where it is not in contradiction with objectives to preserve open grassland habitats or cultural landscapes (Ruskule et al., 2012).

The results of the study have shown that local residents and farmers are concerned about the current trends of landscape development and have a good understanding of the economic use potential as well as the visual aesthetic and ecological qualities of abandoned land that should be taken into account in shaping land use policy. For example, opinions of local residents and experts should be respected when developing support schemes for the management of abandoned land under the Rural Development programme, by providing more specific measures depending on local ecological and landscape features (e.g. supporting maintenance of biodiversity and landscapes with a mosaic pattern). Understanding public preferences would help in balancing landscape management with social and ecological objectives (Zheng et al., 2011) and enhance public involvement in policy making on landscape management, as enshrined in the European Landscape Convention (Council of Europe, 2000).

## **5. Conclusions**

The aim of this paper was to test the hypothesis that local residents would tend to perceive the landscape changes arising from land abandonment processes as generally negative. This was found to be the case. Respondents of the survey were generally dissatisfied with the observed changes, although some also perceived positive developments, noting that rural areas are becoming tidier. The abandoned agricultural land is mostly associated with inefficient use and desolation, with the older generation and farmers considering it to be a shame, while very few respondents, mostly from the younger generation or with higher education, perceive it as natural or enjoying it as a revival of nature. The low appreciation of nature values in our study marks some cultural differences from the public opinions expressed in some Western countries, where naturalness is perceived as one of leading concepts defining landscape quality and where spontaneous forest colonisation of former agriculture fields in some cases is perceived rather positively (Hunziker et al., 2008). Rural people in Latvia still seem to judge the value of land on its ability to produce crops, which partly contradicts the observed transition from ‘productivism’ to ‘post-productivism’ and multifunctional development of rural landscape.

Nevertheless, when assessing four natural afforestation patterns, respondents valued the mosaic pattern most highly from both a landscape visual aesthetic and a biodiversity perspective. Different management solutions offered by locals and experts for each pattern could promote a multifunctional role of landscape in relation to social, economic and ecological outputs. The consensus between local residents and experts in the assessment of

the visual and biodiversity qualities of the afforestation patterns as well as their potential for use suggests that there could be also agreement on the selection of certain management strategies and the results should provide valuable input for the adjustment of land use policies.

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