NON-MARKET VALUE OF ESTONIAN SEMINATURAL GRASSLANDS: A CONTINGENT VALUATION STUDY

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Abstract

Seminatural grasslands i.e. the floodplain meadows, seashore meadows, wooded meadows, dry meadows, wooded pastures are the very traditional part of Estonian landscapes, which play an important role in the appearance of the landscape in general and also serve as an important habitat for many plant and animal species.

In order to preserve the seminatural grasslands continuous annual mowing and/or pasturing is needed. This activity is not economically profitable and needs subsidizing.

The authors of the work raise a hypothesis that the Estonian seminatural grasslands could be viewed as a valuable non-market environmental good for which a significant public demand exists. In order to find out the non-market value of the seminatural grasslands a contingent valuation study was carried out among the Estonian working-age population (size of the sample 1061 individuals). The average individual willingness to pay was 11.3 euros. During the study, the authors constructed the total demand function and discovered that the total annual demand for seminatural grasslands was 17.9 million euros.

Keywords: Seminatural grasslands, non-market value, contingent valuation, willingness to pay.

JEL classification numbers: Q1, Q5

1. Introduction

Due to the climate conditions, there are no natural grasslands in Estonia such as prairie in North America, pampas in South America, puszta in Hungary and steppe in southern Russia. This means that without continuous human activities there would be no typical Estonian landscape with open areas as inseparable parts: fields, pastures and meadows. A significant and most valuable part of open landscapes in terms of both nature protection and recreation are seminatural grasslands, the largest of them and most important types of landscape are coastal meadows, floodplain meadows, dry meadows and wooded meadows.

Seminatural grasslands are the oldest anthropogenic biological communities in Estonia, which have developed during a long period by scythe, axe, fire and grazing (Ehrlich, Habicht, 2001; Luhamaa et al., 2001). They require constant management in order to survive: mowing, grazing, brush cutting, etc. The above named seminatural grasslands are called seminatural because unlike cultural grasslands where cultivated hay is seeded and fertilised, species of natural grass plants grow on seminatural grasslands and are not fertilised. Just moderate human activity, which is mainly mowing and grazing, will ensure preservation of seminatural grasslands. Without any human impact, grasslands would start rapidly overgrowing and will lose their species diversity, and their aesthetic and recreational value. The same will happen in the event of excessively intense human impact where grasslands become cultivated and values characteristic of seminatural grasslands disappear.

Seminatural grasslands attained the maximum surface area at the end of the 19th century and early in the 20th century, covering nearly 2 million hectares then. That area started to diminish in the first half of the 20th century in connection with transition from extensive to intensive agriculture (Ehrlich, Habicht, 2001). Seminatural grasslands started to disappear especially fast after World War II, due to the diminishing of cattle breeding and collectivisation, as a result of which households lost interest in manually mowing small pieces of land. Mechanisation of collective agriculture accelerated the disappearance of seminatural grasslands because large plots of cultivated grasslands were more suitable for machine mowing, which, in addition to that they are easier to mow by machines, have also higher yields. The fast decrease in the area of seminatural grasslands as a result of the intensification of agricultural production was typical not only for Estonia but has happened virtually all over the world.

In 1992, the Council Directive on the conservation of natural habitats and of wild fauna and flora was adopted in the European Union (Council Directive 92/43/EEC of 21 May 1992), according to which seminatural grasslands are valuable and endangered habitats. From the point of view of nature conservation, the seminatural grasslands are considered valuable primarily due to the extraordinary diversity of life there (Ehrlich, Habicht, 2001). Many endangered and protected plant, animal and fungi species are associated only with seminatural grasslands (Palo, 1996; Pedmanson et *al.*, 1997; Kukk and Kull, 1997).

The primary reason for the diminishing area of seminatural grasslands is their insufficient management. To preserve seminatural grasslands they need to be maintained annually, which, as a rule, is not cost-effective. Hence, seminatural grasslands cannot without special measures compete with cultivated grasslands, because they have lower hay yields and higher production costs. To preserve seminatural grasslands a support system is required, without which seminatural grasslands would disappear rapidly from the landscape.

In Estonia, support for the management of seminatural grasslands is paid by the Estonian Agricultural Registers and Information Board (ARIB) and the Environmental Board. The support rates vary across types of seminatural grassland and activities planned there (maintenance or restoration). The support payments, however, may cover not all maintenance and restoration costs, and in the latter case, the principle is applied that the cost depends on the period during which the grasslands have not been maintained. Hence, the longer the grassland has not been maintained, the more expensive its restoration is because in that case mowing is preceded by

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brushwood cutting, which has a much higher per hectare cost. Moreover, the maintenance of seminatural grasslands during a couple of years after the restoration is also more expensive than normally.

For example, in 2012, applications for the maintenance support were lodged for 26,576 hectares of seminatural grassland only, which is a very small figure compared to 1.8 million hectares at the beginning of the 20th century. Though it is probably unrealistic to restore all the previous seminatural grasslands, the establishment of the maintenance support rates and the aid eligible area (and hence also maintenance) should take into consideration the actual population demand for seminatural grasslands as a valuable environmental good.

This paper seeks to find out the Estonian adult population's demand for seminatural grasslands as an environmental good and through this the monetary equivalent of their non-market value.

The authors of this paper hypothesise that demand of the Estonian adult population for the maintenance of seminatural grasslands is higher than the area of seminatural grasslands currently maintained and restored under the current support system.

To test the hypothesis, they try to calculate demand of the Estonian adult population for seminatural grasslands. Considering that seminatural grasslands are a non-market environmental good, a contingent valuation method based study was conducted among a representative sample of Estonian adult population to find out the monetary equivalent of their value. A questionnaire was designed, where the respondents were asked to answer how much they are willing to pay annually for the preservation of seminatural grasslands. Based on the answers, a demand curve of Estonian adult population was drafted and with the help of the consumer surplus, an aggregate demand curve for seminatural grasslands was calculated. Additionally, they were asked to answer the questions that show their attitude toward seminatural grasslands, and fill in their gender, age, education and income level to investigate the effect of these indicators on the willingness to pay.

Since the respondents' willingness to pay represents a hypothetical payment made in a fictitious environment, then in order to minimise unrealistic willingness-to-pay amounts, this has been addressed in this questionnaire. The respondents were asked to mark the amount for the maintenance of seminatural grasslands as truthfully as possible, taking into consideration their possibilities, notwithstanding that it is a hypothetical situation and does not presume any direct payment.

The body of the paper comprises two interlinked sections. First, an overview of the distribution, value and protection of Estonian seminatural habitats is provided. The second part is about the survey conducted by the authors to find out the monetary equivalent of the non-market value of Estonian seminatural habitats and aggregate demand of Estonian adult population for seminatural habitats as an environmental good. The paper concludes with a summary and findings.

2. Distribution, value and protection of Estonian seminatural grasslands

2.1. Definitions

Seminatural grasslands are areas of natural biota, which have been continuously mown or used as pasture. These are areas where natural vegetation has been preserved and human activity is mainly limited to mowing or grazing livestock, more seldom burning off dead grass. At the same time, fertilisers, sowing or ploughing are not used. Seminatural grasslands are also called heritage communities, since they have been influenced by our ancestors during a long period and human activity has been carried on from generation to generation. The image and values of heritage communities have developed by considerate management in respect to the nature during a long period. Like the name says, these are seminatural habitats, i.e. natural conditions and human activities both have a significant role. When the latter stops, the previously maintained areas grow into shrubs and woods (Kusmin *et al.*, 2011).

Seminatural grasslands differ from cultivated grasslands primarily by the initial natural diversity and extent of human activity. Contrary to seminatural grasslands, original natural vegetation has not survived in cultivated grasslands; it has been extensively altered by fertilisation, ploughing and land improvement. Though both of the grasslands are anthropogenic, cultivated grasslands have significantly stronger human influence (e.g. tillage). Cultivated communities also start developing toward natural habitats when human activity there stops (Tiina Talvi, Tõnu Talvi 2012, 3).

Seminatural grasslands are grouped according to humidity, soil structure or land use type. We know the following seminatural grasslands: wooded meadows and wooded pastures, floodplain meadows or flooded meadows, coastal meadows, dry meadows or alvars, grasslands on mineral soil and marsh meadows (Kusmin *et al.*, 2011).

2.2. Distribution of seminatural grasslands

There are different estimates of the total area of Estonian seminatural grasslands and their regional distribution. A reason for that may be mainly insufficient source data or variability in different databases, as well as different meadow classifications. Similarly, different databases provide different evaluations of low-value (extensively overgrown) and high-value (maintained or high potential for maintenance) areas of seminatural grasslands. The main sources on the area of distribution of seminatural grasslands are the Estonian Seminatural Community Conservation Association's database, Estonian Fund for Nature's nature conservation projects database, Natura 2000 database, land cadastre, and data of agricultural censuses (Kukk *et al.*, 2004).

The seminatural areas according to the European Council Habitats Directive are estimated to total at 130,000 hectares in Estonia; including 60-70% are of high value. Such figure was received by summing up the results of the Estonian Seminatural Community Conservation Association's database and of the Natura database, since these two databases coincide in the extent of less than 5%. The outcome has been adjusted with an expert assessment. The seminatural habitats were counted the most in Läänemaa and Saaremaa, in each approximately 24,000-26,000 hectares, and the least in Järvamaa, Ida-Virumaa and Põlvamaa, where the area of seminatural habitats is smaller than 2,000 hectares. However, an insufficient inventory has been made of grasslands in these counties and therefore the actual area might be slightly bigger. In the Habitats Directive, the concept of seminatural grassland covers more areas than only coastal meadows, grasslands on mineral soil, floodplain meadows, wooded meadows, marsh meadows and wooded pastures. Speaking only of the latter, their total area is approximately 81,000 hectares, including 60-70% of them valuable (Ibid.).

With the largest area in Estonia are floodplain meadows, which according to the Estonian Seminatural Community Conservation Association's database, Natura database and based on the expert assessment, cover approximately 20,000 hectares, 80% of which are

of high value. Floodplain meadows are followed by coastal meadows with 18,000 hectares, 70% are regarded as high-value meadows. Dry meadows or alvars in Estonia can be found on 15,000 hectares, and 70% of them are considered valuable. Wooded meadows are the best-inventoried habitats, whereas they are found on approximately 8,000 hectares in Estonia (Ibid.). Their value, however, is disputable since probably a large share of this area is quite overgrown in reality. The area of wooded meadows is also suggested to be only 500 hectares, which include only mown and valuable wooded meadows (Paal 1998, 1040).

The area of seminatural grasslands peaked at the end of the 19th century and early in the 20th century, when they covered approximately 40% of the Estonian territory. Especially widespread were wooded meadows, grazed alvars and coastal meadows in West-Estonian coastal areas and islands. With agricultural development, the share of cultivated grasslands increased since new equipment came into use and land improvements were made. This quickened essentially the disappearance of seminatural grasslands in the 20th century. Depending on the application, meadows were turned into cultivated grasslands, arable land or forests. The neglected wooded meadows grew into mixed forests, coastal and floodplain meadows grew into reeds and bushes, alvars turned into dense juniper shrublands, and marsh meadows mostly grew into birch woods. The remaining seminatural grasslands continue overgrowing without management (Tiina Talvi, Tõnu Talvi, 2012, 5-6). The dynamics of seminatural grasslands is described in Figure 1.

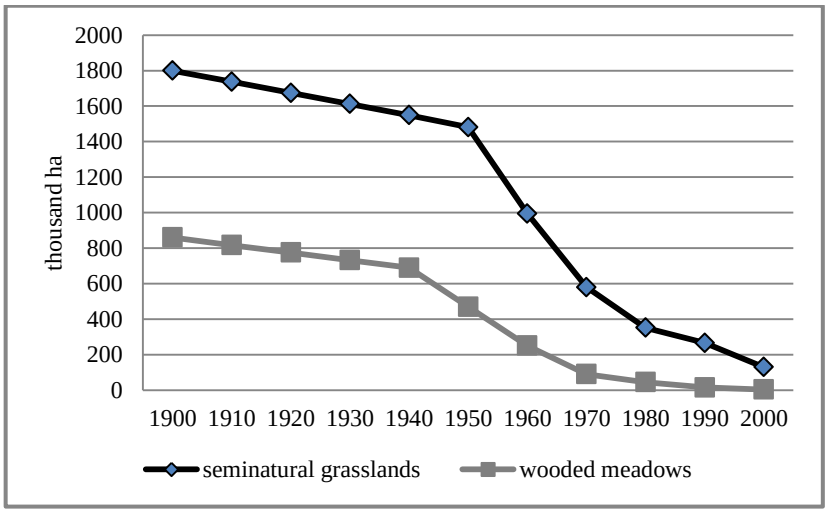

Figure 1. Dynamics of seminatural grasslands and wooded meadows in Estonia in the 20th century (thous. ha)

Source: Sammul *et al.*, 2008, 415

Figure 1 depicts that early in the 20th century, there were 1.8 million hectares of seminatural grasslands, including 0.86 hectares of wooded meadows; but early in the 21st century, there were only 130,000 hectares of seminatural grasslands left, 8,000 hectares of which were wooded meadows.

If to speak only of maintained seminatural grasslands that are in a good condition, then the figures are considerably smaller. According to ARIB, in 2012, applications for support for the maintenance of seminatural grasslands were submitted with regard to 26,576 hectares.

Disappearance of seminatural grasslands can be avoided by their competent management and insufficient amounts of support are available for the restoration and maintenance works.

2.3. Value of seminatural grasslands

Some types of seminatural grasslands have been mentioned as threatened habitats in the European Union Habitat Directive, whereas the main aim of the Directive is to contribute towards biodiversity, conservation of threatened species of fauna and flora, and their natural habitats (Council Directive 92/43/EMÜ).

Seminatural grasslands have a very high diversity of species. 40% (603 species) of all vascular plants growing in Estonia have been found in Estonian wooded meadows and one third of the directory of protected species are growing only on wooded meadows (Kukk *et al.* 2004, 73). In order to value the natural and cultural heritage of wooded meadows, at the initiative of the Estonian Seminatural Community Conservation Association, eight Estonian wooded meadows (Laelatu, Kalli-Nedrema, Mäepea, Allika, Tagamõisa, Loode, Koiva and Halliste) were inscribed on the UNESCO (*United Nations Educational, Scientific and Cultural Organization*) world heritage tentative list (Wooded meadows..., 2004).

The diversity of species is spectacular also in floodplain meadows, where 350 species of vascular plants are growing, and in coastal meadows and alvars, where respectively 290 and 263 species of vascular plants can be found, many of which are rare (Kukk *et al.* 2004, 74-76). In global scales, the small-scale diversity of species of Estonian seminatural habitats is very big: in addition to wooded meadows (76 species per square metre), 49 species per 1 square metre have been counted on alvars, 35 on coastal meadows and 39 on floodplain meadows. Diversity can be seen also in landscapes: in seminatural habitats, natural areas harmonically alternate with anthropogenic ones (Pärtel, 2003, 11).

The Red List of Threatened Species contains many seminatural ecosystem related organisms: 20% of fungi, 49% of lichen, 86% of vascular plants, 42% of invertebrates and 55% of vertebrate animals (Ibid., 8).

Heritage communities are, in addition to their natural diversity, also valuable as ambassadors of culture. There are few examples of how the nature and men are not counterworking but create something new and valuable in harmony. Seminatural grasslands are distinguished, for example, from valuable virgin forests, by connection to humans. The old constructions, cairns and stone fences on

grasslands are also a significant part of cultural heritage (Kukk *et al.* 2004, 179). Aesthetic and recreational values are not less important either. Being a stopover for migratory birds, grasslands attract numerous bird watchers from Estonia as well as from afar (Gren *et al.,* 1997, 12).

Directly economically beneficial values such as, for example, products of animals grazed on seminatural grasslands, cannot be ignored either. Free-range animal products are increasingly more valued in food industry. Owing to that, the situation of seminatural grasslands has started to improve in some regions. For example, in Spain where the well-known Iberian pigs roam freely outdoors and thereby contribute to the maintenance of grasslands (Hopkins, 2009). Seminatural grasslands can be well used in organic production, which today is growing increasingly more popular among both producers and consumers.

The value of seminatural habitats might be revealed also in using them for bioenergy production. Without respect to logical obstacles or alternative uses of biomass, 2% of Estonia's primary energy consumption could be replaced by bioenergy that comes from seminatural habitats. The biomass energy throughput depends on the type of seminatural grassland. With the greatest potential for biomass production among Estonian seminatural grasslands are floodplain meadows where annual average dry biomass yield per hectare is 5.7 tonnes, while the same indicator from wooded meadows is 1.6. The use of biomass for energy production would provide a motive for mowing seminatural grasslands and in that way, for their more extensive management (Heinsoo *et al.,* 2010).

So far, the value of seminatural grasslands has been studied mainly in the context of related biological species. Their use value has been explored less and their non-use value even to a lesser extent.

2.4. Protection of seminatural grasslands

Being a European Union member, protection of Estonian seminatural grasslands is concerned with European Union policies. The first piece of legislation historically which promotes protection of meadows was The Birds Directive of 1979. One aim of the Directive is to protect birds' habitats and hence it quite directly concerns the meadows. The Habitats Directive of 1992 is more concerned with the protection of seminatural grasslands: as a result, the Natura 2000 network of valuable and threatened habitats was established. Thanks to the Habitats Directive, the European Union member states can apply from the common budget of the Union for co-financing for the protection of threatened habitats. Additionally, the European Union requires the member states to work out agricultural environment programmes to make agriculture more protective of the nature. Many such programmes contain also measures for the management of meadows (Kukk *et al.,* 2004). A rural development plan has been developed in Estonia, where one focus is on making the management of seminatural grasslands more effective (Eesti maaelu arengukava... 2012). Protection of seminatural grasslands presumes their restoration and maintenance.

Protection of seminatural grasslands means preservation of human activity favourable to the nature, which would have a positive effect on the diversity and aesthetic value of grasslands. Human activity should be just enough: excessive human activity would spoil seminatural habitats and where human activity is absent, meadows gradually overgrow and disappear. Of primary importance in the protection of grasslands today is to ensure an appropriate mowing and grazing regime (Kukk *et al.,* 2004).

Meadows can be legally protected by establishing protected areas. However, protected areas alone do not ensure that meadows will remain. Meadows need to be restored and maintained as well. Nowadays, the traditional use of meadows is not cost-effective and has to be arranged in both protected areas (e.g. Matsalu National Park) and outside. One of the most usual ways for doing this is applying for support for the maintenance or restoration of seminatural grasslands, which incurs a responsibility of the applicant to restore or maintain the grassland as required. Meadows on the state and nature protection organisations' lands are maintained also for nature protection purposes (Ibid.).

Heritage communities are maintained by mowing and/or grazing, and where necessary, the tree and shrub layers are thinned, branches fallen to the ground are gathered up and rocks are labelled. However, no chemicals are allowed in the heritage communities; they may not be pruned from the top; it is not allowed to plant introduced species, build roads there or in any other way damage the seminatural condition. Heritage communities are mown mostly once a year starting from July when the birds nesting season is over and many flowering plants finished blooming. It is important to use an appropriate method of mowing: to leave birds and animals an escape route (starting in centre or moving from edge to edge), and at the same time, grass may not be mown very short because this might have a negative effect on the diversity of vegetation. It is important not to leave hay lying on the ground too long but rake it together and carry away. As a rule, wooded, floodplain meadows and grassland on mineral soil are mown. On the other hand, wooded pastures, coastal and dry meadows and sometimes also marsh meadows are grazed. More suitable for grazing are small low-maintenance breeds such as Estonian horse, bovine animals and sheep, the first of which are not suitable in habitats that are not tread resistant (Kukk et al. 2004, 103-106).

Restoration and maintenance of heritage communities is a costly process and economically inexpedient. In order to protect heritage communities, support can be applied for their restoration and maintenance. Estonia as a European Union member state is in the scope of the common agricultural policy. Its aim is to ensure stability of the European Union internal market and income to agricultural producers, for the achievement of which many aid grants are paid. Both incomes and expenses of the common agricultural policy go through the general budget of the European Union (EL ühine põllumajanduspoliitika..., 2010). Measures of the common agricultural policy shall be implemented by the Estonian Agricultural Registers and Information Board (ARIB) (Euroopa Liidu ühise... §8).

In order to carry out the common agricultural policies, the Estonian Rural Development Plan 2007-2013 was prepared. The Development Plan seeks to contribute to increasing competitiveness of Estonian agriculture and forestry, improving the quality of life and environment in rural areas. In 2007-2013, Estonia could use 935 million euros to support agriculture, rural life and environmental development under the Development Plan (Eesti maaelu arengukava... 2012). 26.8 million euros from this were available for the maintenance support of seminatural habitats with the aim to preserve areas of high natural value and biological and landscape diversity (Eesti maaelu arengukava... 2012, 161).

Table 1 provides the support payments by ARIB for the maintenance of seminatural grasslands in 2007-2012. A total of 22.9 million euros of support was paid out during these years from 26.8 million euros envisaged in the Estonian Rural Development Plan. The number of approved applicants has been increasing from year to year, which in 2011 and 2012 remained at the previous level. The area of seminatural grassland for the maintenance of which applications have been submitted has also been increasing. The area of

wooded meadows for which maintenance support has been applied for has been steadily around 3% of total area indicated in applications.

Table 1. ARIB support payments for the maintenance of seminatural habitats in 2007–2012

Year of application	Number of approved applicants	Area of wooded meadow for which support has been applied for, ha	Total area applied for, ha	Payment, eur
2007	692	396	15 501	2 846 598
2008	712	508	18 780	3 351 795
2009	803	550	21 427	3 821 774
2010	869	727	23 500	4 089 010
2011	916	587	25 441	4 442 881
2012	913	622	26 576	4 353 613

Source: ARIB

Support for the maintenance of seminatural habitats can be applied for with regard to those habitats in the Natura 2000 area that have high natural value. Support for the maintenance of semi-natural habitats will not be paid for land with regard to which some other agricultural or nature protection support has been applied for. The support rate per hectare of wooded meadow is 238.07 euros a year and per hectare of other seminatural habitat 185.98 euros a year (Poollooduslikukoosluse hooldamise... §2, §3). The support rate for wooded meadows is higher since its maintenance requires a lot of manual labour and hence also the costs are higher.

Starting from the year of application, the applicant commits to maintain the seminatural grassland during five successive years, in compliance with the requirements such as frequency and time of mowing, grazing at sufficient stocking rate, prohibition of fertilisers, etc. Compliance with the requirements will be checked by the Environmental Board, ARIB and the Veterinary and Food Board (Poollooduslikukoosluse hooldamise... §3, §5, §7).

Indirectly related with the maintenance of seminatural grasslands is also support paid for grazing, since it enables to apply for support in areas that are not listed in the Natura 2000 network. Since the problem for Estonia is undergrazing rather than overgrazing, then grazing should be promoted (Eesti maaelu arengukava... 2012, 188-192). Support for grazing can be applied from ARIB in the amount of 51-13 euros per cattle or horse annually, and 9.20 euros per goat or sheep (Loomade karjatamise toetuse... §2).

In addition to ARIB, support for the maintenance of seminatural grasslands is provided by the Environmental Board under the Ministry of the Environment. For the maintenance of wooded meadows that are not among the Natura 2000 areas, a nature conservation subsidy in the amount of 199 euros per hectare can be applied for, for the maintenance of other meadows 147 euros per hectare (Loodushoiutoetuse taotlemise... §2). Table 2 provides an overview of supports paid for the maintenance of seminatural habitats.

Table 2. Subsidies and support for the maintenance of seminatural habitats

Support for the maintenance of seminatural habitats	Paying authority	Habitat location	Type of seminatural habitat	Support rate EUR/ha
Support for the maintenance of seminatural habitats	ARIB	Natura 2000 area	Wooded meadow	238.07
			other	185.98
Nature conservation subsidy	Environmental Board	outside Natura 2000 area	Wooded meadow	199.00
			other	147.00

Source: Poollooduslikukoosluse hooldamise... §3, loodushoiutoetuse taotlemise... §2

Both, support for the maintenance of seminatural habitats and nature conservation subsidy enable to apply for a larger amount of money for the maintenance of wooded meadows because due to more complicated nature conditions and more abundant manual work, their maintenance is more costly compared to other meadows. The support rates for the maintenance of seminatural habitats are higher than the rates of nature conservation subsidy because these are aimed at the Natura 2000 areas and are therefore regarded as more valuable. The share of nature conservation subsidies paid by the Environmental Board however is extremely small: in 2012, nature conservation subsidies were paid out for the maintenance of 108 hectares of seminatural grasslands.

3. Non-market value of Estonian seminatural grasslands

3.1. Economic methods for determining the value of non-market goods

Seminatural grasslands represent an environmental good that is not traded in the market and therefore has no market value. Diversity of seminatural grasslands or wellbeing from enjoying the beauty of grasslands cannot be expressed in market prices. However, it is essential to determine the non-use value of environmental objects because this might be important in policy-making and financing, for example, establishing the support rates. The monetary value of environmental goods can be determined as a result of research where information is gathered regarding population's willingness to pay (*WTP*).

In general, there are three different ways to evaluate what people are willing to pay for non-market goods, including environmental goods (Abelson, 1996, 45):

1) By studying the prices people pay for substitute goods on different markets;
2) By studying expenditures people make on getting the goods, for example, transportation cost, expenditure of time in money terms, etc.;
3) By asking people how much they are willing to pay for a non-market good.

The two first options are based on preferences of how people actually behave; but the third is based on preferences revealed by their contingent behaviour. The environmental goods valuation methods are often grouped into two: the revealed preferences and stated preferences based method of valuation. The revealed preferences methods are based on consumers' willingness to pay or willingness to accept in an artificial environment. The stated preferences methods are based on individuals' actual behaviour in a real environment. The choice of method depends on the type of non-market good for which the monetary value is to be found and the kind of data used for that (Abelson, 1996, 45).

If the good for which monetary value is to be found is not tradable in the market, its value can be derived from the price of a tradable substitute good. For example, the value of well water not connected to the urban water supply system can be found through the tradable water price. Though the prices of substitute goods and services are a good source of information for identifying the willingness to pay, they are not sufficient to determine the value of non-market goods (Ibid.).

The stated preferences method is based on market prices of other goods in order to determine the value of non-market goods. For example, the value of a non-market good can be found through the costs incurred for consumption of this non-market good. These costs are indirect since such goods cannot be bought: for example, travel costs for the consumption of non-market goods. The travel costs method is used to derive the value of a non-market good through the cost of its consumption including, for instance, transport to the destination, entrance fees, opportunity costs of time. The travel costs method is used more frequently for determining the value of recreational areas (e.g. national parks). The method might be based on a survey conducted among actual or potential visitors of the recreational area (Hussen, 2000, 154-156).

There are also other ways to measure the value of non-market goods with the help of costs. One option is through restoration costs. In that case, costs incurred for the restoration of the situation preceding the environmental damage are measured (Abelson, 1996, 72). In this way, the costs incurred for the restoration of an overgrown seminatural grassland enable to find the value of this grassland. Costs incurred for the prevention of environmental damage also help find the value of a non-market good (Ibid., 72). In that case, costs incurred, for instance, for the maintenance of seminatural grasslands to avoid their disappearance and to preserve animal and plant species there are measured.

The seminatural grasslands can be used in alternative ways. If these areas were used, for example, as arable land, market prices of agricultural produce could be used to find the value of seminatural areas through the opportunity cost measurement. Valuation with the help of costs, however, does not take into account the value offered by the seminatural grassland itself, especially as regards its species diversity and aesthetic and historical value.

The vicinity of seminatural grassland might be a significant factor in the real estate price formation. The environmental impact on real estate is studied by the hedonic price method, which helps to calculate the value of non-market goods from their impact on the sale or rental prices of real estate. The location of real estate, the specific aspects of neighbourhood and environmental quality are investigated for that purpose (Abelson, 1996, 61-62).

The stated preferences methods for determining the value of non-market goods are based on the impact of non-market goods, or absence of impact. In either case, the stated preferences based valuation method might not take into consideration all values of non-market goods. Often the actual value of objects is undervalued since this is not only incomes and costs expressed at current prices. The revealed preferences based valuation method is more comprehensive and takes into account, among other things, such values as aesthetic and historical value. Therefore, contingent valuation (CV) is the most appropriate method for determining the value of seminatural grasslands.

3.1.1. Determining the value of environmental goods with the contingent valuation method

The contingent valuation method is based on questionnaires designed to finding out population's willingness to pay for non-market goods. The questionnaire seeks to learn how much consumers are willing to pay for that their wellbeing would not deteriorate or how much should be compensated to consumers for loss in wellbeing (Pearce, Atkinson, 2006, 107). Contingent valuation indicates that payments are hypothetical and the respondents need not donate any real money. Therefore, it is important to explain to the respondents that notwithstanding the contingency of payment, they should state their willingness to pay as truthfully as possible and taking into consideration their possibilities. Since non-market goods have no real market, this will be created artificially, by asking consumers' willingness to pay. The contingent valuation method uses all consumers for measuring the value of a non-market object: willingness to pay can be expressed by both actual and potential consumers of the object (Hanemann, 1994).

The questionnaire helps to identify the respondents' attitudes toward the non-market object and their willingness to pay for preserving or compensation for not preserving that object. It is important how the questionnaire is designed. With open-ended questions no possible answers are suggested but the respondent is expected to write down his/her maximum willingness to pay for maintaining the object or minimum amount of money he/she is willing to accept to abandon it. With open-ended questions the respondent is not influenced by suggested values, however, in that case, unrealistic results should be eliminated (Baarsma, 2000, 53-60). Open-ended questions have been used also to find out the willingness to pay for seminatural grasslands.

"Take-it-or-leave-it" questions can also be asked from respondents. In that case, consumers are asked whether they are willing to pay a certain amount for maintaining the survey object, whereas the price in each questionnaire is different and selected from among previously prepared price ranges. Another option is repeated questions, in the case of which consumers are expected to answer whether they are willing to pay a certain amount for maintaining the object. If a positive answer is given, the same question with a higher value is asked and so on until a negative answer is given (Handbook of.., 2005, 877-878).

In the payment card format, respondents are offered a card with a list of bids and are asked to choose one that they are willing to pay. In that case, the willingness to pay is more credible than with open-ended questions (presumes realistic multiple-choice answers); however, the respondents' choices are limited (Ibid.).

Contingent valuation is used mostly for environmental goods that are public goods. The method has been used for evaluating grasslands and recreational areas worldwide. In Italy, the recreational and nature conservation values of grasslands were investigated by introducing two scenarios: the current grassland and forest landscape, and hypothetical forest landscape without grasslands. The respondents were asked their annual willingness to pay for the project that would preserve grasslands. The results imply that most of the respondents approve of the project implementation and are willing to donate to the wellbeing of future generations (Marzetti *et al.,* 2011). In the Netherlands, the contingent valuation method was used to measure the value of paludified grasslands to decide how it would be most appropriate to finance their maintenance (Brouer *et al.,* 1998).

The contingent valuation method is the most preferred valuation methods of environmental goods, since it enables to measure the value the grassland will acquire due to its active users (people who go there for recreation, live in the vicinity, etc.), as well as passive users (people who are not directly in contact with the grassland but are still willing to pay for its maintenance). Hence, the contingent valuation method enables to more comprehensively determine the value of a grassland since it involves also consumers who are not using it. Additionally, the contingent valuation method takes into consideration the values of a seminatural grassland that other methods ignore. For example, willing to pay for a seminatural grassland are people who are not in any contact with the grassland but who still appreciate the historical value of the grassland. Just for these reasons, the contingent valuation method was used to study the willingness to pay of the Estonian adult population for the maintenance of Estonian seminatural grasslands. Willingness to pay enables to derive demand of the Estonian adult population for the maintenance of seminatural grasslands and to calculate the non-use value of seminatural grasslands.

3.2. Contingent valuation study in Estonia

3.2.1 Methodology

A contingent valuation survey was conducted to find out the willingness to pay of the Estonian adult population for the maintenance of seminatural grasslands and demand for them. For that purpose, a questionnaire was designed, where a random sample was asked to answer the questions that show the respondents' attitudes toward seminatural grasslands and estimate how much they are willing to pay annually for the maintenance of seminatural grasslands. Based on the answers, a demand curve of the Estonian adult population for grasslands was drawn up and total demand was calculated.

In addition to the questionnaire, the respondents had to indicate their sociometric data, which were used in regression analysis to identify which data influence the attitude toward seminatural grasslands and the willingness to pay for their maintenance. The econometric package *Gretl* was used for regression analysis. Indicators at the significance level of 5% were considered statistically significant, meaning that with 95% of probability the effect of the indicator on the answer was not accidental. In tables with results of regression analysis in this subchapter, the statistically significant variables are labelled with two (significance level 5%) or three asterisks (significance level 1%). One asterisk denotes the variables that are statistically significant at the level of 10%.

1078 people answered the questionnaire. The final sample contained all those 1061 respondents who had filled in all sociometric data (gender, education, age, income). Based on the sample, total demand of Estonian adult population for the maintenance of seminatural grasslands was derived.

The answers were analysed according to sociometric indicators of the respondents. The distribution of the respondents by gender, age, education and income is represented in Table 3. Data of Statistics Estonia on the Estonian adult population are also included.

In general, the distribution of the respondents according to sociometric indicators was satisfactory. Men accounted for 41% and women 59% of all respondents, whereas in total adult population men accounted for 45% and women 55%. The biggest difference from total Estonian population was in education, where 40% of the respondents had higher education (28% in the case of total population). Higher education includes professional higher education, bachelor's, master's and doctoral degrees. According to income level, respondents earning 601-770 euros per month accounted for the biggest proportion of the respondents.

The questionnaire contained four questions preceded by a short explanation of the matter of seminatural grasslands and an overview of the floodplain, coastal and wooded meadows. The questionnaire also mentioned the need to maintain grasslands to avoid their overgrowing and disappearance of habitats' species diversity. The following questions were asked:

1. Have you heard over the radio, TV or press anything about seminatural habitats?
2. Do you agree that Estonian seminatural habitats (floodplain meadows, coastal meadows, wooded meadows) are worth maintaining?
3. How do you rank the Estonian seminatural habitats (floodplain meadows, coastal meadows, wooded meadows) in order of importance?
4. If you agree that Estonian seminatural habitats should be maintained, then what is the amount of money you would donate annually for that purpose?

Table 3. Distribution of the respondents and Estonian adult population according to sociometric indicators

Indicator		Share of respondents, %	Share of Estonian adult population, %
Gender	male	40.7	44.9
	female	59.3	55.1
Education	primary (basic)	4.1	30.2
	secondary	27.5	23.4
	Secondary specialised	28.2	18.9
	higher	40.2	27.5
Age	18-23	11.0	10.2
	24-29	10.5	11.5
	30-39	19.5	17.1
	40-49	19.4	16.3
	50-59	20.5	16.6
	60-69	9.9	12.5
	over 70	9.2	15.8
Monthly average disposable income, €	<150	6.3	20.5
	151-300	8.3	
	301-450	17.7	19.9
	451-600	18.3	20.0
	601-750	19.0	20.1
	751-1000	16.8	19.5
	1001-1300	7.3	
	>1300	6.3	

Source: database of the Statistics Estonia, based on answers to author's questionnaire

The second and third questions seek to find out the respondents'' attitude toward seminatural habitats; the fourth question contributes to calculating the respondents' willingness to pay for the maintenance of habitats and deriving a demand curve of Estonian adult population for the habitats.

3.2.2 Estonian adult population's willingness to pay for the maintenance of seminatural grasslands

The fourth or last question asked from the respondents how much they would agree to pay annually for the maintenance of seminatural habitats. They were asked to state their willingness to pay as precisely as possible and considering their possibilities, notwithstanding that it is a hypothetical payment. The questionnaires with unreasonably high willingness to pay were removed from the sample and the missing willingness to pay was replaced by zero since in that case the respondent probably did not want to pay for the maintenance of seminatural grasslands.

72% of the respondents referred to positive willingness to pay, whereas 28% of the respondents were not willing to pay for the maintenance of seminatural grasslands. To examine the impact of sociometric data on the payment decisions, regression analysis was conducted where payment decision was a dependent variable, i.e. whether the respondent was willing to pay a bigger sum than zero for the maintenance of seminatural grasslands, or his/her willingness to pay was zero. The results of regression analysis are described in Table 4.

Table 4. Dependence of payment decision on sociometric data

Dependent variable: Payment decision Method: OLS					
Variable	*Coefficient*	*Std. Error*	*T-ratio*	*P-value*	
Const	1,3430	0,0720	18,6630	<0,00001	***
Gender	0,1387	0,0280	4,9611	<0,00001	***
Education	0,0623	0,0161	3,8711	0,00012	***

Age	-0,0143	0,0078	-1,8251	0,06827	*
Income	0,0048	0,0080	0,5969	0,55071	

Source: Compiled by the author

Table 4 shows that the statistically significant variables (significance level 5%) in the payment decision are gender and education. Surprisingly, income level does no influence the payment decision. When a respondent values seminatural grasslands and earns low income, he/she probably is willing to donate even a very small sum for their maintenance.

78% of women mentioned positive willingness to pay and 22% of female respondents were not willing to pay for the maintenance of seminatural grasslands. 63% of male respondents stated positive willingness to pay and 37% of men said their willingness to pay was zero. Hence, female respondents are more willing to pay for the maintenance of seminatural grasslands.

Respondents' education is another factor that has effect on the decision-making between payment and non-payment for the maintenance of seminatural grasslands. Respondents with low educational level made a positive payment decision more rarely than people with higher educational level. Figure 2 demonstrates that the higher the educational level, the more respondents are willing to pay for the maintenance of seminatural grasslands. Among the respondents with primary or basic education, 53% are willing to donate for the maintenance of seminatural grasslands, among people with higher education this percentage is as high as 80.

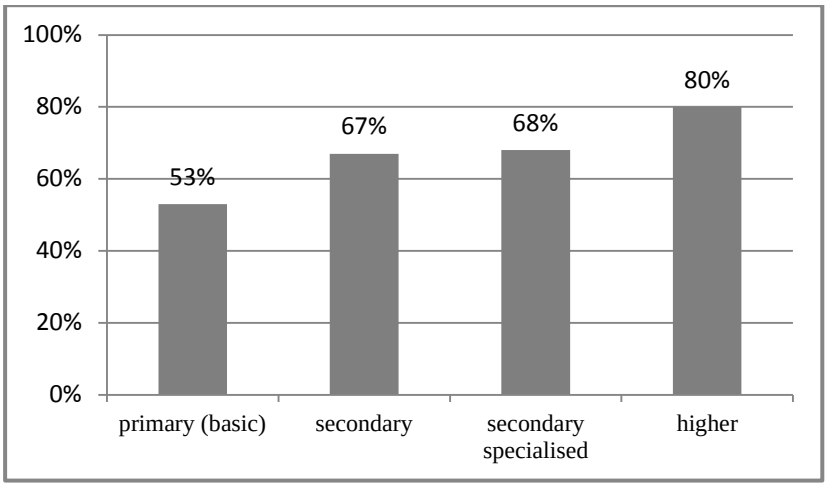

Figure 2. Proportion of positive payment decisions according to education (%)

Source: Compiled by the author

Next, the authors studied the dependence of the payment decision on the first question of the questionnaire. The first question inquired whether people have heard over the radio, TV or press anything about seminatural habitats. 56% of the respondents had heard about seminatural grasslands in the media. As given in Table 5, this is not a statistically significant variable in the payment decision making (significance level 5%). Hence, it is of no significance for the payment decision whether person has heard anything about grasslands and their condition in the media.

Table 5. Dependence of payment decision on questions 1 and 2

Dependent variable: Payment decision Method: OLS					
Variable	*Coefficient*	*Std. Error*	*T-ratio*	*P-value*	
Const	0,7860	0,0694	11,3325	<0,00001	***
Question 1	0,0486	0,0266	1,8292	0,06765	*
Question 2	0,3109	0,0240	12,9701	<0,00001	***

Source: Compiled by the author

The second question in the questionnaire inquired whether people agree that seminatural grasslands are worth maintaining. 81% of the respondents agreed. The regression analysis results in Table 5 demonstrate that answer to the second question is a significant variable in the payment decision making. 80% of those who agreed were also willing to pay for the maintenance of seminatural grasslands. Surprisingly, 18% of those who believed grasslands are not worth preservation were also willing to pay, mostly a very small sum indeed.

While the payment decision means choosing between two options (to pay or not to pay), the willingness to pay means whether and how much to pay. Hence, the results of investigating the impact of sociometric data on willingness to pay may be different. Average willingness to pay according to sociometric indicators is presented in Table 6.

Average willingness to pay for the maintenance of seminatural grasslands is 17.3 euros per respondent. Table 6 shows that female respondents have higher willingness to pay; according to education, people with higher education are more willing to pay; and according to age, 40-59 year old people are willing to pay the most. Additionally, the higher the income, the higher the willingness to pay.

The following regression model was built to test the impact of respondents' gender, education, age and income on willingness to pay:

$$\ln(WTP) = \alpha + \beta_1 G + \beta_2 \ln(age) + \beta_3 \ln(edu) + \beta_4 \ln(inc) + \varepsilon \qquad (1)$$

where:

G – gender (fictive variable, 1= male, 2= female)

age – age (7 age groups starting from youngest)

edu – educational level (4 levels starting from lower)

inc – income (8 levels starting from lower)

ε – error term

Table 6. Respondents' annual average willingness to pay for the maintenance of seminatural grasslands according to sociometric indicators

Indicator		Average willingness to pay, €	Share in overall average, %
Gender	male	16.5	95.4
	female	17.9	103.5
Education	primary (basic)	8.9	51.4
	secondary	15.9	91.9
	secondary specialised	14.5	83.8
	higher	21.1	122.0
Age	18-23	14.8	85.5
	24-29	10.8	62.4
	30-39	18.4	106.4
	40-49	20.4	117.9
	50-59	20.3	117.3
	60-69	16.3	94.2
	over 70	13.2	76.3
Average monthly disposable income, €	<150	11.1	64.2
	151-300	12.8	74.0
	301-450	12.3	71.1
	451-600	15.6	90.2
	601-750	19.0	109.8
	751-1000	21.3	123.1
	1001-1300	21.3	123.1
	>1300	28.1	162.4
Average		17.3	100.0

Source: Compiled by the author

The results of regression analysis are presented in Table 7, according to which the statistically significant variables at the significance level of 5% are income, gender and education.

Table 7. Dependence of willingness to pay on sociometric indicators

Dependent variable: willingness to pay Method: TOBIT					
Variable	*Coefficient*	*Std. Error*	*Z*	*P-value*	
Const	-22,7574	6,7019	-3,3957	0,00068	***

Gender	6,7428	2,5672	2,6265	0,00863	***
Education	3,3550	1,4791	2,2684	0,02331	**
Age	-0,0893	0,7110	-0,1256	0,90005	
Income	2,5904	0,7387	3,5067	0,00045	***

Source: Compiled by the author

Women's average willingness to pay is 8.5% higher than the average willingness to pay of men. Respondents' monthly disposable income has a strong impact on the willingness to pay. This is demonstrated in Figure 3. People earning less than 150 euros are willing to pay for the maintenance of seminatural grasslands on average 11 euros, people earning 601-705 euros would pay on average 19 euros and people earning more than 1300 euros even 28 euros on average.

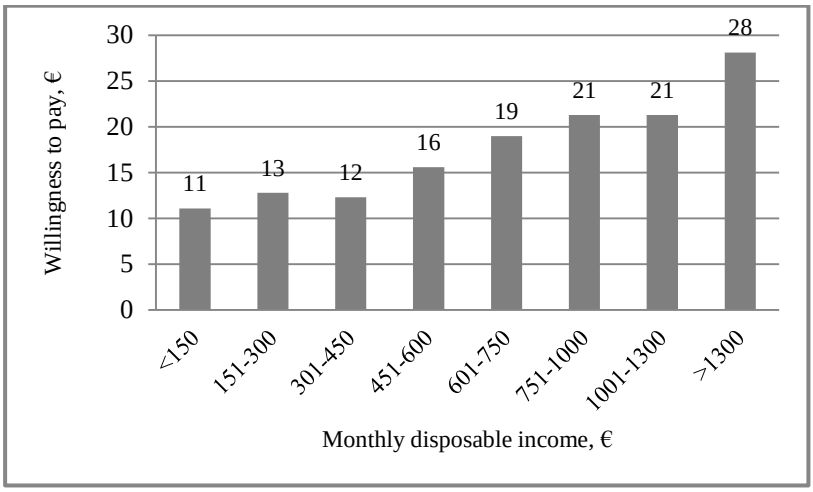

Figure 3. Dependence of willingness to pay (€) on monthly disposable income (€)

Source: Compiled by the author

Contrary to the payment decision, influence of the media on willingness to pay is considerable. The average willingness to pay of those respondents who had heard something about grasslands from the media is 21.5 euros, which is 24% higher than the average willingness to pay of all respondents. Those respondents who had not heard anything about grasslands through the media were willing to pay 11.9 euros for the maintenance of seminatural grasslands, which is 31% smaller than the average willingness to pay of all respondents.

Table 8. Willingness-to-pay dependence on questions 1 and 2

Dependent variable: Willingness to pay Method: TOBIT					
Variable	*Coefficient*	*Std. Error*	*Z*	*P-value*	
Const	-70,6068	8,1423	-8,6716	<0,00001	***
Question 1	9,4226	2,5467	3,7000	0,00022	***
Question 2	23,3597	2,7782	8,4083	<0,00001	***

Source: Compiled by the author

Table 8 demonstrates that the answer given to question two is also statistically significant, or those who answered that seminatural grasslands are worth maintaining are also willing to pay more for them. The average willingness to pay is 19.9 euros a year, which is 15% higher than the average willingness to pay of all respondents. Those who think the seminatural grasslands are not worth preservation are still willing to

donate annually an average of 2.5 euros, which is 86% smaller than the average willingness to pay of all respondents. Those respondents who could not say whether seminatural grasslands are worth preserving or not are willing to support their maintenance with an average of 8 euros per year.

The willingness to pay for the maintenance of seminatural grasslands survey revealed that 72% of the respondents stated positive willingness to pay in the questionnaire. The average willingness to pay for the maintenance of seminatural grasslands is 17.3 euros per respondent. The sociometric indicators of the respondents that most influence the willingness to pay are income, gender and education.

3.2.3. Demand of Estonian adult population for seminatural grasslands

The aggregate demand curve of Estonian adult population has been derived from the respondents' willingness to pay, which has been extrapolated to the Estonian adult population. The easiest way to find overall demand is to multiply the respondents' average willingness to pay, which is 17.3 euros, by the number of Estonian adult population. Such approach, however, is not the most perfect and might under- or overvalue overall demand. To get credible results, the aggregate demand curve is derived.

An exponential model with the following equation is used to find the aggregate willingness to pay:

$$WTP = \alpha e^{-\beta x} \qquad (2)$$

where

WTP – willingness to pay,

x – number of people who are willing to pay at least that sum of money

α and β – parameters valued.

The model's determination coefficient is R^2=0.92, according to which the model has a high descriptiveness rating. The parameters α= 89.54 and β=0.005, and both parameters are statistically significant. Hence, we can write the demand curve as follows:

$$WTP = 89{,}544e^{-0{,}005x} \qquad (3)$$

The demand curve received using the above equation is presented in Figure 4 where the vertical axis represents the willingness to pay (WTP) in euro, and the horizontal axis the Estonian adult population (thousands) who are willing to pay that much.

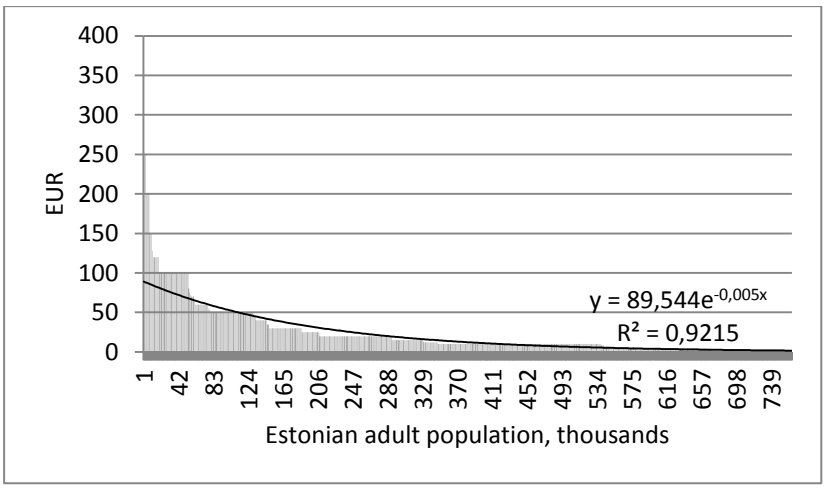

Figure 4. Demand curve of Estonian adult population for the maintenance of Estonian seminatural grasslands

Source: Compiled by the author

The demand curve in Figure 4 shows the price the respondents are willing to pay for the maintenance of seminatural grasslands. Demand of Estonian adult population for the maintenance of seminatural grasslands

has been calculated through the consumer surplus, which in the figure is depicted by the area under the demand curve. This area represents the wellbeing of Estonian adult population they get when „consuming" seminatural grasslands.

The definite integral equation was used to calculate the consumer surplus (CS):

$$CS = WTP_T \int_{x_1}^{x_2} \alpha e^{-\beta x} = -\frac{\alpha}{\beta}(e^{-\beta x_2} - e^{-\beta x_1}) \cong \frac{\alpha}{\beta} \qquad (4)$$

where x_1=0 and x_2 denote the number of population with positive willingness to pay.

Replacing parameter values α and β in the equation, we can calculate the consumer surplus of Estonian adult population:

$$WTP_T = \frac{\alpha}{\beta} = \frac{89{,}544}{0{,}005} \approx 17.9 \ million \ \ euros \qquad (5)$$

Annual demand of Estonian adult population for seminatural grasslands as environmental goods is 17.9 million euros. Consequently, the non-use value of seminatural grasslands in money terms is 17.9 million euros a year.

4. Conclusions

The contingent valuation survey conducted among Estonian adult population with the aim to identify demand for seminatural grasslands received 1,078 responses. The final sample contained 1,061 people, those who had filled in their sociometric data.

72% of the respondents reported positive willingness to pay, i.e. they were willing to donate a larger sum than zero, whereas 28% of the respondents were not willing to donate for the maintenance of seminatural grasslands. The statistically significant variables in the payment decision making (to pay or not to pay) were gender and education. Surprisingly, income does not affect the payment decision.

The average willingness to pay for the maintenance of seminatural grasslands is 17.3 euros per respondent. The willingness to pay is influenced most by respondents' income, gender and education. The higher the income, the higher the willingness to pay: people earning less than 150 euros (disposable income) are willing to donate for the maintenance of seminatural grasslands on average 11 euros, people earning 601-705 euros are ready to pay on average 19 euros, and those earning more than 1300 euros on average as much as 28 euros. Females have higher willingness to pay: it is 3.5 percent higher than average and 8.5 percent (or 3.8 euros) higher than that of males. According to the educational level, people with higher education are willing to pay more: even 22% or 3.8 euros more than average.

An interesting fact is the effect of media on payment decisions and willingness to pay rate. 56% of the respondents had heard something about seminatural grasslands from media, whereas this has no particular effect of their payment decision. However, the media has notably influenced the size of donations. The average willingness to pay of such respondents who had heard something about grasslands from media is 21.5 euros, whereas the willingness to pay of other respondents was nearly two times smaller (11.9 euros). Hence, it is important to discuss the topic of seminatural grasslands in the media since this would increase awareness of people about the value of grasslands. This is evidenced by the higher willingness to pay of those respondents who had heard something about seminatural grasslands from media.

Demand of Estonian adult population for seminatural grasslands is derived based on the aggregate demand curve. The demand curve enables to calculate consumer surplus, which shows wellbeing of Estonian adult population they receive when „consuming" seminatural grasslands. By calculating the consumer surplus, annual demand of Estonian adult population for the maintenance of seminatural grasslands was figured out, which is 17.9 million euros. This can be interpreted as the non-use value of seminatural grasslands.

Based on the average maintenance cost of a grassland on mineral soil, floodplain, coastal and wooded meadow, which is 131 euros per hectare, for 17.9 million euros annually we can maintain approximately 136,640 hectares of seminatural grasslands. This would satisfy demand of Estonian adult population. According to ARIB, support for the maintenance of seminatural grasslands was applied for with regard to

26,579 hectares in 2012; additionally, support for the maintenance of another 108 hectares was applied from the Environmental Board. Demand of the Estonian adult population, however, would be maintenance of a four times larger area.

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EESTI POOLLOODUSLIKU ROHUMAA TURUVÄLINE VÄÄRTUS: TINGLIKU HINDAMISE UURING [1]

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Tallinna Tehnikaülikool

Sissejuhatus

Lähtuvalt klimaatilistest tingimustest ei ole Eestis looduslikke rohumaid, nagu seda on preeria Põhja-Ameerikas, pampa Lõuna-Ameerikas, pusta Ungaris ja stepp Lõuna - Venemaal. See tähendab, et ilma pideva inimtegevuseta ei oleks olemas Eestile tüüpilist maastikku, mille lahutamatuks osaks on avatud alad: põllud, karjamaad ja heinamaad. Nii looduskaitseliselt kui rekreatsiooni seisukohalt kõige väärtuslikuma osa avatud maastikust moodustavad poollooduslikud rohumaad, milledest suurima pindalaga on rannaniidud, luhaniidud, puisniidud ja aruniidud. Poollooduslikud rohumaad on Eesti vanimad inimtekkelised bioloogilised kooslused, mis on pika aja jooksul kujunenud peamiselt niitmise ja karjatamise tulemusena (Ehrlich, Habicht, 2001; Luhamaa et al., 2001). Eelpoolnimetatud poollooduslikke rohumaid nimetatakse poollooduslikeks sellepärast, et erinevalt kultuurrohumaadest, kuhu külvatakse kultuurheina seemet ja mida väetatakse, kasvavad poollooduslikel rohumaadel loodulikud heintaimede liigid ja neid ei väetata. Küll aga vajavad kõik Eestis esinevad poollooduslike rohumaade tüübid regulaarset majandamist niitmise, karjatamise ja võsa lõikamise näol, sest vastasel juhul asenduksid need kooslused sõltuvalt tingimustest kas võsa või metsaga.

Poollooduslike rohumaade pindala saavutas oma maksimumi 19.sajandi lõpul ja 20. sajandi algul, ulatudes peaaegu 2 miljoni hektarini. Pindala hakkas vähenema 20. sajandi esimesel poolel seose üleminekuga ekstensiivselt põllumajanduselt intensiivsele (Ehrlich; Habicht, 2001). Eriti kiiresti hakkasid poollooduslikud rohumaad kaduma pärast Teist Maailmasõda, kui põllumajanduse mehhaniseerimise tulemusena kadus majapidamistel huvi väikeste maalappide käsitsi niitmise vastu. Poolloodusulike rohumaade pindala kiire vähenemine seoses põllumajandusliku tootmise intensiivistumisega ei ole iseloomulik ainult Eestile vaid on toimunud praktiliselt kõikjal Euroopas. 1992. aastal võeti Euroopa Liidus vastu Loodusdirektiiv (Council Directive 92/43/EEC of 21 May 1992), mille kohaselt on poollooduslikud rohumaad väärtuslikud ja ohustatud elupaigad.

Tänaseks on poollooduslike rohumaade pindala kahanemise põhjuseks eelkõige nende vähene majandamine. Poollooduslike rohumaade säilitamiseks on vajalik nende igaaastane hooldamine, mis aga üldjuhul ei ole majanduslikult kasumlik. Nii ei suuda poollooduslikud rohumaad ilma spetsiaalsete meetmeteta kultuurrohumaadega konkureerida, olles nii madalama heina tootlikkusega kui ka suuremate tootmiskuludega.

[1] Fulltext article „Non-market Value of Estonian Seminatural Grasslands: A Contingent Valuation Study“ can be found on the CD attached.

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Poollooduslike rohumaade säilitamiseks on vajalik toetussüsteem, ilma milleta poollooduslikud rohumaad kaoksid maastikupildist kiiresti. Eestis maksavad poollooduslike rohumaade majandamiseks toetusi Põllumajanduse Registrite ja Informatsiooni Amet (PRIA) ning Keskkonnaamet. Toetuse määrad erinevad poollooduslike rohumaa liikide ning planeeritavate tegevuste (hooldamine või taastamine) lõikes. Näiteks 2012. aastal taotleti poollooduslike rohumaade hooldamise toetust kõigest 26 576 hektari poollooduslikku rohumaa hooldamiseks, mis on väga väike osa võrreldes 20. sajandi alguse 1,8 miljoni hektariga.

Kuigi poollooduslike rohumaade kunagise pindala taastamine on ilmselt ebarealistlik eesmärk, tuleks nii majandamise toetusmäärade kehtestamisel kui toetatava (ja seega ka majandatava!) pindala valikul arvestada elanike tegeliku nõudlusega poollooduslike rohumaade kui väärtusliku keskkonnakauba järele. Käesoleva uuringu eesmärk ongi välja selgitada Eesti täisealise elanikkonna nõudlus Eesti poollooduslike rohumaade kui keskkonnakauba järele ning leida seeläbi poollooduslike rohumaade turuvälise väärtuse rahaline ekvivalent. Arvestades, et poollooduslike rohumaade puhul on tegemist turuvälise keskkonnakaubaga, siis viidi nende väärtuse rahalise ekvivalendi väljaselgitamiseks läbi tingliku hindamise (*contingent valuation*) meetodil põhinev uuring eesti täisealise elanikkonna suhtes representatiivse valimi hulgas ja saadud tulemused ekstrapoleeriti eesti täisealisele elanikkonnale.

Eesti poollooduslike rohumaade levik, väärtus ja kaitse

Euroopa Liidu Loodusdirektiivi järgseid poollooduslikke alasid on Eestis kokku hinnanguliselt 130 000 hektarit. Kõige rohkem on pärandkooslusi loendatud Läänemaal ja Saaremaal, mõlemas maakonnas umbes 24000-26000 hektarit. Kõige vähem on neid alasid Järvamaal, Ida-Virumaal ja Põlvamaal, kus pärandkoosluste pindala jääb alla 2000 hektari. Kõige suurema pindalaga on Eestis lamminiidud, mida on pärandkoosluste kaitse ühingu andmebaasi, Natura andmebaasi ja eksperthinnangu alusel kokku umbes 20 000 hektarit, millest kõrget väärtust omavad 80%. Lamminiitudele järgnevad levikult rannaniidud 18 000 hektariga, millest 70% loetakse kõrge väärtusega niitudeks. 15 000 hektarit leidub Eestis looniite ehk alvareid ning neist väärtuslikeks loetakse 70%. Kõige paremini arvele võetud kooslused on puisniidud, samas leidub neid Eestis umbes 8 000 hektarit (Kukk *et al.,* 2003). Nende väärtus on aga vaieldav, kuna arvatavasti on suur osa pakutud pindalast tegelikkuses üsna kinnikasvanud (Paal, 1998, 1040). Heas seisundis olevate ja regulaarselt majandatavate poollooduslike rohumaade pindala on aga märksa väiksem. PRIA andmetel taotleti 2012. aastal poollooduslike rohumaade hooldamise toetust 26 576 hektari poollooduslike rohumaade hooldamiseks. Poollooduslike rohumaade kadumise aitab ära hoida nende oskuslik majandamine ning taastamis- ja hooldustöödeks ettenähtud piisavas suuruses toetused.

Poollooduslike rohumaade erinevad liigid on nimetatud ohustatud elupaigatüübina Euroopa Liidu Loodusdirektiivis, mille ülesanne on säilitada looduse mitmekesisust, kaitstes ohustatud looma- ja taimeliike ning nende elupaigatüüpe (Nõukogu Direktiiv 92/43/EMÜ). Poollooduslikud rohumaad on liigiliselt väga mitmekesised. Eesti puisniitudelt on leitud 40% (603 liiki) kõigist Eestist kasvavatest soontaimedest ning kolmandik kogu kaitstavate liikide loendist kasvab just puisniitudel (Kukk *et al.,* 2004, 73). Tähelepanuväärne on liigirikkus ka lamminiitudel, kus kasvab 350 liiki soontaimi,

ning rannaniitudel ja loopealsetel, kus leidub vastavalt 290 ja 263 liiki soontaimi, millest paljud on haruldased (Kukk *et al.,* 2004, 74-76). Punane raamat, kuhu kantakse haruldased ja ohustatud liigid, sisaldab hulgaliselt poollooduslike ökosüsteemidega seotud organisme: 20% seentest, 49% samblikest, 86% soontaimedest, 42% selgrootutest loomadest ja 55% selgroogsetest loomadest. Seni ongi poollooduslike rohumaade väärtust uuritud peamiselt nendega seotud bioloogiliste liikide kontekstis ja vaid üksikud tööd on pühendatud Eesti poollooduslike rohumaade sotsiaalsele ja majanduslikule väärtusele (näit Ehrlich, Habicht, 2001). Seni ebapiisav uuritus ei tähenda aga, et poollooduslike rohumaade sotsiaalsed ja majanduslikud väärtused oleksid bioloogiliste väärtustega võrreldes ebaolulised, sest poollooduslikud kooslused on lisaks looduslikule mitmekesisusele väärtuslikud ka kultuurikandjate poolest, olles heaks näiteks sellest, kuidas loodus ja inimene ei tööta teineteise vastu, vaid loovad kooskõlas midagi uut ja väärtuslikku. Eesti poollooduslike rohumaade kaitset reguleerib Euroopa Liidu poliitika. Ajalooliselt esimene õigusakt, mis soodustab niitude kaitset, on linnudirektiiv 1979. aastast. Rohkem on poollooduslike rohumaade kaitsega seotud loodusdirektiiv 1992. aastast, mille tulemusel loodi Natura 2000 väärtuslike ja ohustatud elupaikade võrgustik. Tänu loodusdirektiivile on võimalik Euroopa Liidu liikmesriikidel taotleda liidu ühisest eelarvest ohustatud elupaikade kaitseks kaasrahastamist. Lisaks kohustab Euroopa Liit liikmesmaid välja töötama põllumajanduse keskkonnaprogramme, mille abil muuta põllumajandus loodushoidlikumaks. Poollooduslike rohumaade kaitse kujutab endast loodusele soodsa inimtegevuse alalhoidmist, mis mõjub positiivselt nii rohumaade mitmekesisusele kui esteetilisele väärtusele. Inimtegevust peab olema täpselt parasjagu: liigne inimtegevus rikub poollooduslikud kooslused ning olematu inimtegevuseta kasvavad need ajapikku kinni ja kaovad sootuks. Tänapäeval on rohumaade kaitse puhul esmatähtsaks sobiva niitmis- ja karjatamisrežiimi tagamine (Kukk *et al.,* 2004). Pärandkoosluste taastamine ja hooldamine on kulukas protsess ning majanduslikult ebaotstarbekas. Et aga pärandkooslusi kaitsta, on võimalik nende taastamiseks ja hooldamiseks taotleda toetusi. Euroopa Liidu liikmesriigina kuulub Eesti ühise põllumajanduspoliitika rakendusalasse. Selle eesmärk on tagada Euroopa Liidu siseturu stabiilsus ja põllumajandustootja sissetulek, mille saavutamiseks makstakse mitmeid toetusi. Nii ühise põllumajanduspoliitika tulud kui ka kulud liiguvad läbi Euroopa Liidu ühise eelarve (Ühise põllumajanduspoliitika... 2010). Ühise põllumajanduspoliitika abinõusid rakendab Eestis Põllumajanduse Registrite ja Informatsiooni Amet (PRIA) (Euroopa Liidu ühise... §8). Lisaks PRIA-le jagab poollooduslike rohumaade hooldamiseks toetusi ka Keskkonnaministeeriumi haldusalas tegutsev Keskkonnaamet.

Eesti elanikkonna maksevalmidus poollooduslike rohumaades säilitamiseks

Poollooduslike rohumaade näol on tegemist keskkonnakaubaga, millega turul ei kaubelda ning millel seega puudub ka turuväärtus. Poollooduslike rohumaade liigirikkust või heaolu, mida saadakse rohumaade ilu nautides, ei saa turuhindades väljendada. Keskkonnakaupadele on rahalist väärtust võimalik leida läbi uuringute, mille kaudu kogutakse andmed inimeste maksevalmiduse (*WTP – willingness to pay*) väljaselgitamiseks. Sellist lähenemist nimetatakse tingliku hindamise meetodiks (ingl. K. *contingent valuation method*). hindamise meetod kasutab küsimustikku, mille abil selgitatakse välja inimeste maksevalmidus turuvälise kauba eest. Küsitluse eesmärk on teada saada, palju tarbijad on valmis maksma, et nende heaolu ei halveneks või palju

peaks tarbijatele kompenseerima heaolukahju eest. (Pearce, Atkinson, 2006, 107) Tinglik hindamine viitab sellele, et maksed on hüpoteetilised ning reaalselt vastajad rahast loobuma ei pea. Tingliku hindamise meetod on teiste keskkonnakaupade hindamismeetodite kõrval eelistatum, kuna selle abil saab hinnata väärtust, mida omandab rohumaa nii selle aktiivsete kasutajate tõttu (inimesed, kes käivad seal lõõgastumas, elavad läheduses jne), kui ka passiivsete kasutajate tõttu (inimesed, kes rohumaaga otseselt kokku ei puutu, kuid on siiski selle olemasolu eest valmis maksma). Seetõttu võimaldab tingliku hindamise meetod mitmekülgsemalt rohumaa väärtust hinnata, kuna hõlmab ka seda mittekasutavaid tarbijaid. Lisaks arvestab tingliku hindamise meetod poollooduslikku rohumaa selliseid väärtusi, mille teised meetodid kõrvale jätavad. Näiteks on poollooduslikku rohumaa eest valmis maksma inimesed, kellel ei ole rohumaaga mingit kokkupuudet, kuid kes hindavad sellegipoolest rohumaa ajaloolist väärtust. Just nimetatud põhjustel kasutati tingliku hindamise meetodit uurimaks Eesti täisealise elanikkonna maksevalmidust Eesti poollooduslike rohumaade säilitamise eest.

Selgitamaks välja Eesti täisealise elanikkonna maksevalmidust poollooduslike rohumaade säilitamise eest ning nõudlust nende järele, viidi läbi tingliku hindamise meetodil põhinev uuring. Selleks koostati küsimustik, milles paluti juhuslikult moodustatud valimil vastata küsimustele, mis näitavad vastajate suhtumist poollooduslikesse rohumaadesse ning määratleda, kui palju nad oleksid nõus aastas maksma poollooduslike rohumaade säilitamise eest. Vastuste põhjal moodustati Eesti täisealise elanikkonna nõudluskõver rohumaade järele ning arvutati kogunõudlus.

Küsitlusele vastas 1078 elanikku. Lõplikusse valimisse jäi 1061 vastajat, kelle ankeedid olid korrektselt täidetud. Küsitlusankeet koosnes neljast küsimusest, millele eelnes lühike selgitus poollooduslike rohumaade olemusest ning ülevaade luha-, ranna- ja puisniitudest. Ankeedis toodi välja ka rohumaade hooldamise vajadus, et hoida ära niitude kinnikasvamine ning liigirikaste koosluste kadumine.

Küsitlus koosnes järgmistest küsimustest:
1. Kas olete kuulnud raadio, televisiooni või ajakirjanduse vahendusel midagi poollooduslikest kooslustest?
2. Kas olete nõus, et Eesti poollooduslikud kõlvikud (jõeluhad, rannaniidud, puisniidud) vääriksid säilitamist?
3. Kuidas reastaksite Eesti poollooduslikud kõlvikud (jõeluhad, rannaniidud, puisniidud) tähtsuse järjekorras?
4. Kui Te nõustute, et Eesti poollooduslikke kõlvikuid tuleks säilitada, siis millise summa Te aastas selle heaks annetaksite?

Neljanda ehk viimase küsimusena taheti vastajatelt teada, kui palju nad oleksid aastas nõus maksma poollooduslike kõlvikute säilitamise eest. Küsitlusankeedis paluti maksevalmidus määrata võimalikult täpselt ja vastavalt võimalustele, olenemata sellest, et tegemist on hüpoteetilise maksega. Küsitlusele vastajatest 72% märkisid ankeeti positiivse maksevalmiduse, samal ajal kui 28% vastanutest ei olnud nõus poollooduslike rohumaade säilitamise eest makset tegema. Uurimaks sotsiomeetriliste andmete mõju makseotsusele, koostati regressioonanalüüs, kus sõltuvaks muutujaks on makseotsus ehk kas vastaja on poollooduslike rohumaade säilitamise eest nõus maksma nullist suurema summa või on tema maksevalmidus null. Makseotsuse kujunemisel on

statistiliselt olulisteks muutujateks (olulisusnivool 5%) sugu ja haridustase. Üllatuslikult ei mõjuta sissetulekutase makseotsuse tegemist.

Küsitlusankeedi teises küsimuses uuriti, kas inimesed on nõus, et poollooduslikud rohumaad vääriksid säilitamist. 81% vastajatest olid sellega nõus. Regressioonanalüüsi tulemustest nähtub, et teise küsimuse vastus on oluline makseotsuse tegemisel.

Kui makseotsus tähendab valimist kahe võimaluse vahel (kas maksta või mitte maksta), siis maksevalmidus tähendab otsustamist kas ja kui palju maksta. Keskmine maksevalmidus poollooduslike rohumaade säilitamise eest on 17,3 eurot vastaja kohta. Kõrgem maksevalmidus on naissoost isikutel, haridustaseme poolest on nõus rohkem maksma kõrgharidusega isikud ning vanusegruppidest on kõige rohkem nõus maksma 40-59 aastased isikud. Lisaks selgub, et mida kõrgem sissetulek, seda suurem maksevalmidus.

Koostati järgmine regressioonmudel kontrollimaks vastajate soo, hariduse, vanuse ja sissetuleku mõju maksevalmiduse suurusele:

$$\ln(WTP) = \alpha + \beta_1 G + \beta_2 \ln(age) + \beta_3 \ln(edu) + \beta_4 \ln(inc) + \varepsilon \quad (1)$$

kus:

G – sugu (fiktiivne muutuja, 1= mees, 2= naine)
age – vanus (7 erinevat vanusegruppi alustades nooremast)
edu – haridustase (4 erinevat taset alustades madalamast)
inc – sissetulek (8 erinevat taset alustades madalamast)
ε – vealiige

Regressioonanalüüs näitab, et olulisusnivool 5% on makse valmiduse suuruse suhtes statistiliselt olulisteks muutujateks vastajate sissetulek, sugu ja haridustase.

Eesti täisealise elanikkonna kogunõudluse väljaselgitamiseks konstrueeriti kogunõudluskõver, mis on tuletatud küsitlusele vastanute maksevalmidusest ja mida on üldistatud Eesti täisealisele elanikkonnale.

Kogumaksevalmiduse leidmiseks on kasutatud eksponentsiaalset mudelit, mille võrrand on järgmine:

$$WTP = \alpha e^{-\beta x} \quad (2)$$

kus:

WTP – maksevalmiduse suurus,
x – inimeste arv, kes on nõus vähemalt selle summa maksma
α ja β – hinnatavad parameetrid.

Mudeli determinatsioonikoefitsient R^2 = 0,92, mille järgi on mudelil kõrge kirjeldusvõime. Parameeter α = 89,54 ja β = 0,005 ning mõlemad parameetrid on statistiliselt olulised. Seega saame nõudluskõvera kirjutada järgmisel kujul:

$$WTP = 89{,}544 e^{-0{,}005x} \quad (3)$$

Eeltoodud valemi põhjal saadi nõudluskõver, mis näitab hinda, mida küsitlusele vastajad on poollooduslike rohumaade säilitamise eest nõus maksma. Eesti täisealise elanikkonna nõudlus poollooduslike rohumaade säilitamise järele on leitud läbi tarbijate hinnavaru, mida joonisel tähistab nõudluskõvera alla jääv ala. See ala näitab Eesti täisealise elanikkonna heaolu, mida nad saavad „tarbides" poollooduslikke rohumaid.

Tarbija hinnavaru (CS- *consumer surplus*) arvutamiseks on kasutatud määratud integraali valemit:

$$CS = WTP_T \int_{x_1}^{x_2} \alpha e^{-\beta x} = -\frac{\alpha}{\beta}(e^{-\beta x_2} - e^{-\beta x_1}) \cong \frac{\alpha}{\beta} \quad (4)$$

kus $x_1 = 0$ ja x_2 tähistab positiivse maksevalmidusega elanike arvu.

Asendades valemisse parameetrite α ja β väärtused saame arvutada Eesti täisealise elanikkonna hinnavaru:

$$WTP_T = \frac{\alpha}{\beta} = \frac{89{,}544}{0{,}005} \approx 17{,}9 \ \textit{miljonit eurot} \quad (5)$$

Eesti täisealise elanikkonna aastane nõudlus poolloodusliku rohumaa kui keskkonnakauba järele on 17,9 miljonit eurot. Sellest tulenevalt on poollooduslike rohumaade mitteutilitaarne väärtus rahaliselt väljendatuna 17,9 miljonit eurot aastas.

Kokkuvõte

Töö eesmärgiks oli välja selgitada Eesti poollooduslike rohumaade (peamiselt luhaniidud, rannaniidud, puisniidud, alvarid) kui turuvälise keskkonnakauba rahaline ekvivalent. Selleks viidi läbi tingimusliku hindamise (*contingent valuation*) uuring, mille sihtrühmaks oli Eesti tööealine elanikkond.

Keskmine maksevalmidus poollooduslike rohumaade säilitamise eest on 17,3 eurot vastaja kohta. Maksevalmiduse suurust mõjutavad kõige rohkem vastajate sissetulek, sugu ja haridustase. Mida kõrgem sissetulek, seda suurem maksevalmidus: kui alla 150 eurot (neto) teenivad inimesed on poollooduslike rohumaade säilitamise eest nõus maksma keskmiselt 11 eurot, siis vahemikus 601-705 eurot teenivad isikud maksavad keskmiselt 19 eurot ning üle 1300 euro teenivad isikud juba keskmiselt koguni 28 eurot. Kõrgem maksevalmidus on naissoost isikutel, kes ületavad keskmise maksevalmiduse 3,5 protsendiga ning meeste maksevalmiduse 8,5 protsendi ehk 1,4 euroga. Haridustaseme poolest on nõus rohkem maksma kõrgharidusega isikud, kes maksavad keskmisest koguni 22% ehk 3,8 eurot rohkem.

Huvitava asjaoluna võib välja tuua meedia mõju makseotsusele ja maksevalmiduse suurusele. Küsitlusele vastanutest 56% olid poollooduslikest rohumaadest meedia vahendusel kuulnud, samas ei avalda see erilist mõju makseotsuse tegemisele. Samas aga mõjutab meediast poollooduslike rohumaade kohta kuulmine oluliselt vastajate maksevalmiduse suurust. Selliste vastajate, kes olid meedia vahendusel rohumaadest midagi kuulnud, keskmine maksevalmidus on 21,5 eurot, samas kui teiste vastajate maksevalmidus oli peaaegu poole väiksem (11,9 eurot). Seega on meedias poollooduslike rohumaade temaatika kajastamine oluline, kuna tänu sellele teadvustavad

inimesed paremini rohumaade väärtust. Seda näitab ilmekalt selliste vastajate kõrgem maksevalmidus, kes on meediast midagi poollooduslike rohumaade kohta kuulnud.

Eesti täisealise elanikkonna nõudlus poollooduslike rohumaade järele saadakse tuletades kogunõudluskõver. Nõudluskõvera abil on võimalik arvutada tarbijate hinnavaru, mis näitab Eesti täisealise elanikkonna heaolu, mida nad saavad „tarbides" poollooduslikke rohumaid. Arvutades tarbija hinnavaru, saadakse Eesti täisealise elanikkonna aastane nõudlus poollooduslike rohumaade säilitamise järele, milleks on 17,9 miljonit eurot. Seda saab tõlgendada kui poollooduslike rohumaade turuvälise väärtuse rahalist ekvivalenti. Kui võtta aluseks aru-, lammi-, ranna- ja puisniidu keskmine hooldamise maksumus, milleks on 131 eurot hektari kohta, siis saaks 17,9 miljoni euro eest hooldada ligikaudu 136 640 hektarit poollooduslikke rohumaid aastas. See vastaks Eesti täisealise elanikkonna nõudlusele. PRIA andmete kohaselt taotleti 2012. aastal toetust 26 579 hektarit poollooduslike rohumaade hooldamiseks, millele lisandub Keskkonnaametilt taotletud 108 hektari hooldamine. Eesti täisealise elanikkonna nõudlus oleks aga neli korda suurema ala hooldamine.