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ECONOMIC EVALUATION OF THE SELECTED ECOLOGICALLY SIGNIFICANT ELEMENT IN AGRICULTURE

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Abstract

Ecologically significant elements are essential not only for the development and quality of life in rural areas, but also for agricultural management. Services provided by these ecosystems ensure water retention in the landscape, a protection against erosion and an increase in biodiversity. In the context of current political debates, the importance and necessity of highlighting the value of ecologically significant elements is desirable from the farmer's point of view. This study inquires into costs and benefits while implementing a selected ecologically significant element – landscaping orchard in an agricultural area, taking into account not only the explicit benefits that could be marketed, but also the benefits floating from the ecosystem services. The case study found out that whilst complying with the general conditions to be able to apply for the State subsidies with the value of ecosystem services, the Net Present Value is positive for the given project. The monetary value of ecosystem services provided by the given landscaping orchard is estimated to be, according to Ecosystem Services Valuation Database (2020), 125 thous. CZK.year^{-1} per 1.6 ha. That is a considerable amount which should be noted not only by the farmers but also by the policy makers who should reconsider the subsidies for farmers and pay more attention to their financial needs.

Keywords: agriculture, extensive orchards, ecology, ecosystem services, valuation, cost-benefit, environmental economics

INTRODUCTION

The study and monitoring of economic value of environmental elements and ecosystem services is a crucial topic on a global scale (Bouma and van Beukering, 2015). The agricultural public considers the problematics of a contribution of ecosystem services rather Epositively (Smith and Sullivan, 2014), but in terms of including the ecosystem services' value into the economic considerations of farmers, where the diversification of the production and soil care can be interesting also from the profit point of view (Teixeira *et al.*, 2018), its value is perceived only marginally. From the perspective of a farmer, who classifies him/herself as an entrepreneur, it is necessary to determine whether and why the implementation of ecologically significant elements into the agricultural landscape is beneficial or not. According to Swinton *et al.* (2014), the decisive aspects are not only the awareness of the problem, attitude towards the greening and available sources, but mainly financial incentives. To a certain extent, the current state of agriculture is one of the main factors of the decrease of biodiversity elements in the landscape (European Court of Auditors, 2020). From the authors' perspective, it is necessary to focus on the return of life into the agricultural landscape. Daly (1996) claims that the whole decision making in terms of connecting economics and environment should always take into account the welfare of future generations consisting of, among other, preserving a certain environmental standard.

According to statistics from the Research Institute for Soil and Water Conservation (2021), since 2019, 24.17% of arable land has been moderately or severely erosion prone. Overall, up to 31.5% of agricultural land is at risk. Implementation of ecologically significant elements is one of the important tools for prevention of water and wind erosion, for improving the water retention in the landscape, and they also act as a catalyst of the biodiversity increase in the landscape. According to long-term statistics, carried out by the Ministry of Agriculture of the Czech Republic (Soil, Ministry of Agriculture, 2021), an average of CZK 4.3 billion worth of water and wind erosion damage is caused to agricultural land fund annually, that represents approx. 2.7 $t.ha^{-1}$ of eroded sediment per year.

According to Žalud, Trnka and Hlavinka (2020), since autumn 2014, the water precipitation balance has not been in equilibrium cumulate, and so a long-term decrease of groundwater level occurs. They further state that soil only has a 60% ability to retain water which represents only 5 billion m^3 of water per year. One of many measures, which deals with both the water and wind erosion and retention abilities of the landscape to retain and accumulate water, are the ecologically significant elements. The low biological diversity is another problem since the populations of birds on an agricultural land and butterflies on pastures have decreased by more than 30% within the past thirty years (European Court of Auditors, 2020). Agriculture has always played a historically important role within the Central Europe region for the provision of food. However, according to the European Court of Auditors report (2020), agriculture must become a significant co-creator of healthy nature with respect to an adverse development in connection with the decrease in biodiversity, climate change and degradation of the land fund (Horák, 2020). In the Czech environment, where there were large parts of land blocks created during the communist regime, the soil degrades, previously fertile land becomes less creditworthy (Houška *et al*., 2020; Marada *et al*., 2012; Marada, 2011). The new policy of the European Union, issued in a form of the Green Deal conceptual document, also partly represents the effort of authors to show the integral role of agricultural played in the struggle with a climate change and the decrease in biodiversity (European Commission, 2020). Thus, it is necessary to accentuate the sustainability of agricultural production with respect to returning life into the landscape, biodiversity support, and reducing the impact of water and wind erosion. Therefore, the main goal of this study is to economically evaluate benefits of ecosystem services of a selected ecologically significant element, so that a conventional farmer may implement it in certain localities within his scope of work and by doing so minimalize the erosion threat for arable land and also positively contribute to restoring a diverse landscape (The Strategic Plan of the CAP, 2021). The study is therefore based on literature research of expert articles and monographies. The basic research problem is how to evaluate and rate the value of services of a selected ecologically significant element and how to motivate farmer into realization. Authors of this article are convinced that also (and mainly) thanks to the implementation of ecologically significant elements it is possible to get close to reaching the set of nine goals, as laid down by the new form of the Common Agricultural Policy for 2023–2027 (European Commission, 2020). As Kay *et al.* (2019) and Wetzel *et al.* (2014) agree, ecological approaches based on lower phytosanitary inputs – application of pesticides and higher work inputs, so called ecological agriculture, are increasingly being highlighted as promising agricultural systems for reaching the goal of environmental and social improvement, and for prioritising ecosystem services of given environmental elements. Kay *et al.* (2019) also discusses the new supported measure within the 2023+ period of agroforestry in agriculture as a possible tool for greater sustainability and a biodiversity increase in a form of increasing numbers of wild animals and general improvement of environment. Agroforestry is yet looking for a place in the current legislation but the implementing of ecologically significant elements into nature and the landscape has been playing its role, especially in the domestic environment, for a long time. As Etter (2016) points out, degraded soil is in an urgent need for restoration and rehabilitation not only for socio-ecological reasons, but also for economic reasons.

MATERIALS AND METHODS

The study specifies a selected ecologically significant element which has been implemented in the South Moravian region. The costs of implementing the project, its benefits, and the representation of net present value (NPV), together with a sensitivity analysis, are stated in the Results section. Findings, on which conclusions and recommendations are based on, are discussed within the results in the Conclusion section. The selected system of landscaping was measured for its protection of land against erosion, retention abilities and increasing biodiversity was evaluated within the study, where this ecologically significant element has the nature of permanent measures implemented in the given locality, which were implemented extensively on the area of the original intensive agricultural farming. Terminology related to the ecosystem services was clarified for the purposes of this research. According to Frélichová (Osúchová) *et al.* (2014, p. 114), ecosystem services are divided into these categories: provisioning, regulating and cultural. These categories contain individual services that are relevant and fundamental for the Central European region. By the

Benefit Transfer method, Frélichová (Osúchová) *et al.* (2014) evaluated individual provided services within the three categories: 1) Providing: biomass provision, fish provision, wildlife provision, sources provision, crops provision, wood pulp provision, water supply; 2) regulatory: air quality regulation, climate regulation, disturbances regulation, erosion regulation, nutrients regulation, pest control, water cycle regulation, water quality regulation; 3) cultural: aesthetic value, recreational value (tourism). The summary of the above stated is for demonstrative purposes, it is not definitive thus it is possible to specify other.

Braat and de Groot (2012) interpreted the ecosystem services, which, for instance, provide ecologically significant elements and offer the stated overview of possible definitions within a time frame from individual authors, as they have evolved over time (Braat and de Groot, 2012, p. 5): "Ecosystem Services are conditions and processes through which natural ecosystems, and the species that comprise them, sustain and fulfil human life" Daily (1997). "Ecosystem services are the benefits human populations derive, directly or indirectly, from ecosystem functions." Constanza *et al.* (1997). "Ecosystem Services are components of nature, directly enjoyed, consumed, or used to yield human well-being." Boyd and Banzhaf (2007). "Ecosystem Services are the aspects of ecosystems utilised (actively or passively) to produce human well-being." Fisher *et al.* (2009). „Ecosystem Services are direct and indirect contributions of ecosystems to human well-being." De Groot *et al.*, 2010.

Braat a de Groot (2012, p. 5–6) specify and formulate given findings into a more comprehensive frame: "... Services are therefore actually conceptualizations ("labels") of the "useful things" ecosystems "do" for people, directly and indirectly. It should be realized though that properties of ecological systems that people regard as "useful" may change over time even if the ecological system itself remains in a relatively constant state."

In these examples of ecosystems, we can observe that this is a very wide range of services, which are provided, and they are inherently essential for both agricultural practises and for human well-being in general. Frélichová (Osúchová) *et al.* (2014) states that the value of services provided by ecosystems in total creates an equivalent of 1.5 times the annual gross domestic product (GDP) within the Czech Republic, and Constanza, de Groot, Braat *et al.* (2017) estimate that the annual value of the ecosystem services of the whole biosphere is 33 trillion USD. In the Czech Republic, the estimate of value of services provided by forests made by Jůza and Šišák (2021) are indeed significant, these services are up to 104,812 million CZK. The authors therefore consider it appropriate to include these individual, and often overlooked ecosystem services, into the analysis when considering the implementation of a given ecologically significant element into agricultural landscape.

Ecologically significant elements are listed in Czech legislation within the Government Regulation No. 307/2014 Coll. These are used in determining the details of land use records according to user relationships (LPIS) and within § 5 Article 1 and 2 defining the ecologically significant elements like: a landscaping orchard, a meadow, a terrace, a grassed valley, a group of woody plants, an arboretum, a solitary woody plant, a ditch, a wetland, growing woody plants and a woodland.

Therefore, the main research issue is to find out if it is economically feasible for a farmer to implement a landscaping orchard on a previously intensively farmed land, while taking into account ecosystem services, which are very often neglected among current farmers' balance sheets and, in the vast majority, they are not monetary calculated at all. The Cost-Benefit analysis was adapted on conditions in the context of implementing ecologically significant elements in the country. A procedure according to Verdone (2015) (in Wainaina, 2020, p. 5) was used and it was necessary to undertake those steps with respect to the local ecologically significant element (ESE) properties:

1) The definition of agricultural land to be affected by the introduction of an ESE, identification of the activities to achieve this.
2) To identify involved parties that will be affected by this intervention.
3) To describe impacts and effects of ESE implementing.
4) To evaluate these services monetary and calculate their total value (CZK/ha).
5) To discount yields B_t and costs C_t a. For this purpose, it is necessary to determine a suitable discount rate (r), which will take the circumstances of the ESE implementation into account.
6) To calculate the Net Present Value (NPV) with and without ecosystem services.

Consequently, the necessary inputs (conditions) for a farmer who has to allocate his own land or acquire it as a primary input are also included. The determination of the "r" discount rate will be based on the social discount rate which, by its very nature, should be lower than in the private sector (Atkinson and Mourato, 2008). The discount rate of 5% p.a. is recommended according to the methodology of European Commission (2008) for the CBA evaluation of investment projects.

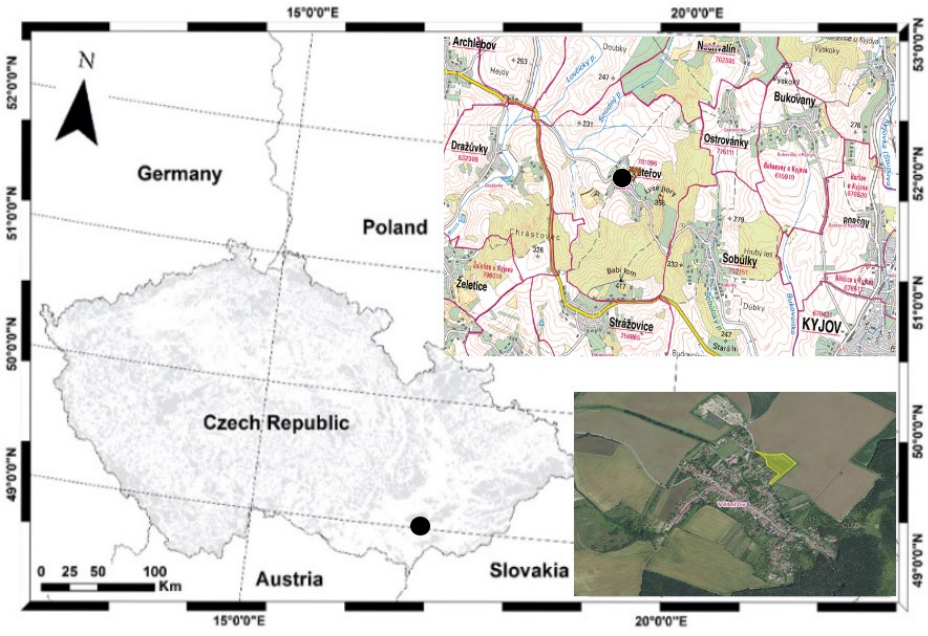
$$Net\ Present\ Value = \sum_{t=0}^{n} \frac{B_t}{(1+r)^t} - \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}. \quad (1)$$

The purpose of this analysis is to demonstrate, using a given example, whether the project is sustainable without indirect yields of the ecosystem services, which are not being considered upon

decision making, and to decide if to implement the ecologically significant element or not. Important aspects for the calculation are also other above-mentioned facts whether a farmer has investment sources so he/she can implement, create, control, and administrate the given environmental measure him/herself, and ensure its sustainability for at least 10 years. For an environmental measure, it was also necessary to identify its ecosystem services which are provided by this measure. For the research purposes, an agri-environmental and climate measurement of "Landscaping orchard", when both authors took part in implementing it, was selected as the ecologically significant element. The ecosystem services from the *Ecosystem Services Valuation Database* (ESVD), where the values are stated in USD/ha/year, and for the needs of our analysis will be converted into CZK, according to the current exchange rate of the Czech National Bank will be evaluated for the landscaping orchard within the analysis. These will be mainly services providing protection against erosion, for water retention, regulation of microclimate, increasing biodiversity, soil fertility, waste management, air quality, raw materials, and also aesthetic. These are average values which are based on studies carried out around the world, which are continuously updated. Above all, an emphasis on these "invisible" services is necessary because values, which are stated in the ESVD database, are accepted by the academia as reference values of services provided by the ecosystems.

Landscaping Orchard

The landscaping orchard was established in two phases, namely in November 2020 and March 2021. In total, 139 trees, semi-dwarfs and hard-growings, indigenous regional varieties were planted. It is an area of 1.61 ha, from which 1.47 ha is moderately (MEP) or severely erosion prone (SEP) land. The average altitude of the area is 250.86 m, average slope is 5.63°, and the distance from water is 103.53 m. In the first phase, 98 fruit trees were planted in accordance with the approved project of Ministry of the Environment (Methodological standard, NCA CR, 2016). In the second phase (in March 2021), 41 deciduous trees were planted, also in accordance with the approved standard. The orchard lies in the cadastre of the Věteřov municipality located in the geomorphological unit of Kyjovská pahorkatina and subunit Věteřovská pahorkatina. This rugged upland consists mainly of Paleogene sandstones and claystones of Ždánice unit, Sarmatian and Pannonian clays, sands, partly grits and Pleistocene loess. The area has a slightly undulating hilly and upland relief with flat watersheds, wide, generally hollow, valleys. In the areas where the afforestation was carried out, the predominantly chernozem on gentle slopes with a main exposure to the north-west and a total skeletal content of up to 10% are represented. Soil is deep and in a very warm, dry-climate region and is less productive. The considered locality – agricultural land – used to be ploughed, surrounding lands were covered in intensively farmed arable



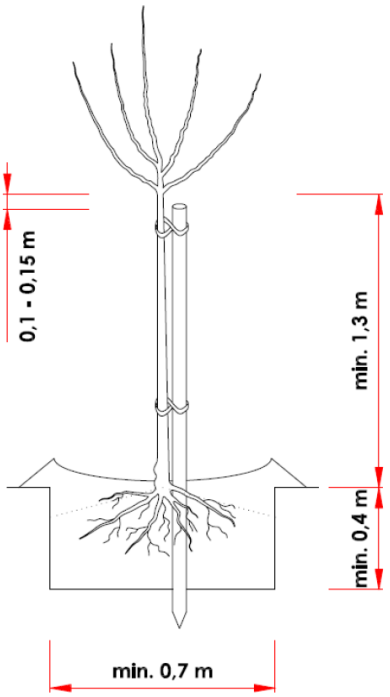
1: *Location of the landscaping orchard (symbol •) in the cadastral area of Věteřov in the South-Eastern part of Moravia, the Czech Republic*
The yellow area shows the exact location of the landscaping orchard in Věteřov. The grey layer on the map shows the forested areas.

land, and this locality was free of woody plants. As a condition of the implementation, the boundaries of the land had to be demarcated by a geodetic company, which had to be ensured by the project implementer.

In the past, the given locality used to be an intensively farmed agrarian landscape with a low ecological value, low biodiversity and has no non-forest foliage, when there are occasionally small bosques. Ploughing of the stated area is disproportional and brings a whole range of ecologic, hygienic and economic problems. The subject rugged and diversified area has been transformed to the form of extended fields with a minimum portion of natural greenery by radical economic and technical modifications. Extensive fields exceed the size of the habitat conditions which (together with the absence of elements allowing slowdown and absorption of surface water) causes considerable damage of soil due to water and partly also wind erosion. Due to the area's condition, it was necessary to restore the land structure, to improve the water regime of the land, to restore native tree species to its habitat and to generally increase the biodiversity of the area and to regulate the microclimate (Houška *et al*., 2020).

The restoration of planting the native fruit and deciduous trees is a significant landscaping requirement (Marada *et al*., 2010). In the cadastral area of Věteřov, fruit trees create an unrepeatable character of the original agricultural land. Therefore, the implementation of the project was (and still is) expected to bring significant benefits to strengthening the biodiversity within the locality and increasing ecosystem diversity on a larger scale. It is already showing that the location for this project has been chosen very appropriately, which is clear from the increasing the wildlife numbers, mainly deer, rabbits or pheasants that have a stable presence here. The choice of clover-grass mixture for grassing the land has proven to be also right because the presence of birds, butterflies, bees, and other species of insects has increased from the estimate given by the farmer who takes care of the landscaping orchard regularly. The farmer also installed a CCTV system which helps him to inspect the overall movement in the area. However, the expectations were primarily that the landscape structure would be restored, the erosion hazard of the area would be reduced and that the natural retention capacity of the landscape would be increased – especially in the runoff lines and paths of concentrated runoff leading through the parcels, the ecological stability of the area would increase, the species diversity of flora and fauna would increase and the resulting ecosystem would enable the permanent or temporary existence of animals and plants, and last but not least, the aesthetics of the area would increase. Therefore, the plot was prepared by undermining to a depth of 27 cm to aerate the compacted soil as much as possible and to increase its absorption ability, the area was then grassed (spring 2020). In the first phase, only fruit trees, namely semi-dwarfs, has been planted on the plot so as not to hinder the management of neighbouring plots. Trees were placed evenly in a line about 490 m long. In total, 98 trees were planted, namely 20 apple trees, 20 pear trees, 20 cherry trees, 8 sour cherry trees, 20 plum trees and 20 apricot trees. In the second phase (March 2021), fruit trees and deciduous forest tree species, high-growings, were planted, and the circumference of the trunk was about 10–12 cm (4 trees) and above 12 cm (37 trees) in 1 meter above ground. These trees were planted evenly as so not to hinder farming on neighbouring plots. In total, 41 trees were planted among which belongs large-leaved linden *Tilia platyphylos* 5 pcs, small-leaved linden *Tilia cordata* 4 pcs, common oak *Quercus robur* 8 pcs, rowan *Sorbus aucuparia* 4 pcs, Cornelian cherry *Cornus mas* 4 pcs, bird cherry *Prunus padus* 4 pcs, Persian walnut *Juglans regia* 3 pcs, silver birch *Betula pendula* 3 pcs, field maple *Acer Campestre* 2 pcs, European ash *Fraxinus excelsior* 2 pcs and Rubinola apple tree 2 pcs. The preparation of the plot, grassing and subsequent tree planting and their maintenance were performed in accordance with the arborist standard of SPPK C02 003:2016 (NCA CR, 2016). Plotting the distribution of individual trees on the defined plot was performed in accordance with the elaborated planting plan; the plot was free of self-seeded trees and undesirable herbal vegetation like perennial weeds – chickweed, pyrethrum, burdock, wormwood, or honeysuckle. Prior to the actual planting, the pits were excavated by machine, where for fruit trees the minimum permissible diameter of the pit is 0.7 m and the depth 0.4 m, according to the quoted arborist standard. The planting of trees was done in a line, always 3 m from the border of the plot and within the distance of 10 m from each other. After subsidence of soil, a watering area with a minimum volume of 10 litres of water was created. No substrates and similar substances, which are intended to improve the habitat for tree planting purposes, were used during the planting. Trees were planted so the trunk and the exposed root collar are at least 1.3 m above the ground. For the obvious reason of the possibility of total destruction of the planting, measures protecting a tree against wildlife were taken immediately after planting (Marada *et al*., 2019). These measures were based on anchoring and mesh protection placed on every single tree in order to avoid the destruction of a tree immediately after planting. Used data concerning the financial aspects were obtained from a farmer who decided to restore the landscape structure and it is estimated for the period of sustainability of the project realised from the calls of Ministry of the Environment, meaning for 10 years.

2: *Landscaping orchard*
Source: Authorial documentation



3: *According to the arborist standard*
Source: Arboristic standard SPPK C02 003:2016

RESULTS AND DISCUSSION

A farmer, who could intensively farm on the given arable land, will have a relatively high opportunity cost. This will mainly represent lost profits which would have resulted from conventional agricultural farming within the given locality. The expenses of the farmer consist of several significant items necessary for implementing a landscaping orchard. Prior the actual realisation of the project, it was necessary to grass the given area and so it was important to consider these expenses within the analysis. Within the subsidised project, trees, both semi-dwarfs and high-growings, were bought from an external company selected in accordance with legal requirements. The company prepared soil for planting, planted the trees, and then protected them against wildlife and performed the first pruning. Another significant item in the budget was the acquisition of a plot of land where the ecologically significant element was implemented. In our case, the farmer had to buy the land for this intension.

Explicit benefits are based mainly on selling agricultural commodities, hay, and fruit which will be produced in the landscaping orchard within estimated five-year interval. Other visible sources of incomes arise from the one-off orchard establishment grant provided under Call 4/2019 issued by the Ministry of the Environment, where the funds are also earmarked for aftercare, and ongoing annual SAPS grants, subject to compliance with all cross-compliance standards. The basic one-off grant for planting has covered the initial costs, the subsequent annual grant, however, may differ depending on the discussed form of the new Common Agricultural Policy for 2023-2027 (European Commission, the new CAP, 2021).

An important aspect that is not sufficiently emphasised is ecosystem services which are provided by ecologically significant elements, a landscaping orchard in our case. These services were monetarily quantified in the global ESVD database, where data for values of individual ecosystem services, which can one hectare produce annual in USD, is collected. The exchange rate set by the CNB was used – 21.9 CZK/1USD.

For an intensively farming farmer, the initial costs consist mainly of acquiring the land, material and work needed for implementation and aftercare and maintenance of a landscaping orchard. However, the value of opportunity cost, which this farmer would have to bear, is relatively high since it would be possible to generate yields form conventional crops within the given land block intended for the purposes of the landscaping orchard. Values of benefits are the same for a conventional farmer also with respect to the ecosystem services that can be provided by the landscaping orchard. We shall not overlook biomass consisting in the harvesting of wood from these trees, which can be cut down by the project implementer after the project's sustainability period expires and this raw material can be further used or sold.

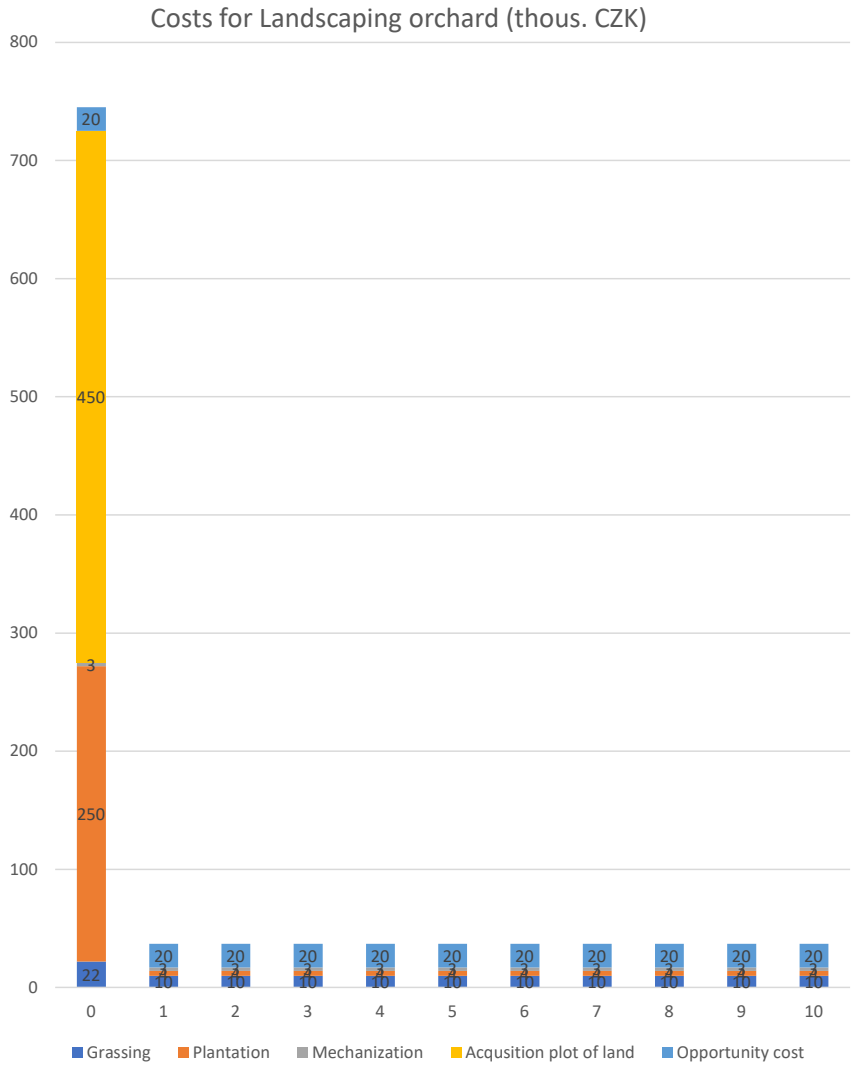
For an intensively farming farmer, the NPV values together with the sensitivity analysis were calculated, where the values for the discount rate of 3%, 5%, and 7% were used in order to assess the impact of the

I: *Costs and Benefits for a 10-year project*

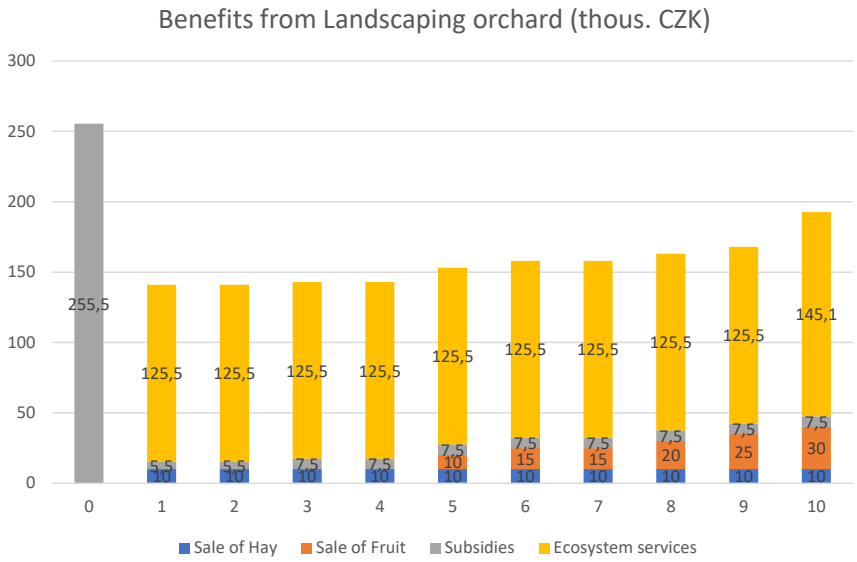
COSTS (thous.CZK) 1.6 ha/year	0	1	2	3	4	5	6	7	8	9	10
					Type of cost						
Grassing	22										
- labour	12										
- material	10										
- maintenance		10	10	10	10	10	10	10	10	10	10
Plantation	250										
- trees	200										
- labour	45										
- watering	5	5	5	5	5	5	5	5	5	5	5
- maintenance		4	4	4	4	4	4	4	4	4	4
Mechanization											
- maintenance	3	3	3	3	3	3	3	3	3	3	3
Plot of land (acquisition)	450										
Opportunity cost	20	20	20	20	20	20	20	20	20	20	20
Total initial costs	745										
Periodic costs		42	42	42	42	42	42	42	42	42	42
BENEFITS (thous.CZK) 1.6 ha/year	0	1	2	3	4	5	6	7	8	9	10
					Type of benefit						
Sale of hay	x	10	10	10	10	10	10	10	10	10	10
Sale of fruit	x	x	x	x	x	10	15	15	20	25	30
Subsidies											
- nonrecurring	250										
- annual	5.5	5.5	5.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Ecosystem services											
- anti-erosion		2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
- water retention		24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7	24.7
- climate regulation		48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5	48.5
- biodiversity		3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
- fertility of soil		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
- waste treatment		0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
- air quality		36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2	36.2
- raw materials (biomass)											19.6
- aesthetics		8	8	8	8	8	8	8	8	8	8
Ecosystem serv. value		125.5	125.5	125.5	125.5	125.5	125.5	125.5	125.5	125.5	145.1
TOTAL periodic benefits		141	141	143	143	153	158	158	163	168	173

Source: Data collected from an intensively farming farmer, his prediction of development for 10 years and the value of ecosystem services, source: the ESVD database from 2020.

given rate on the result with 5% being the key rate. As stated in the literature (see the EC above, 2008), this is the most common method for assessing public projects. The values of ecosystem services were also taken into account and included in the financial scheme. It follows from the data that the acquisition of the plot of land, on which a farmer wants to establish a landscaping orchard, is a significant item



4: *Costs for Landscaping orchard*
Source: Authors' own elaboration



5: *Benefits from Landscaping orchard*
Source: Authors' own elaboration

II: *Net Present Values in 10 years*

(in thous.CZK)	$NPV_{ES\ 3\ \%}$	$NPV_{nES\ 3\ \%}$	$NPV_{ES\ 5\ \%}$	$NPV_{nES\ 5\ \%}$	$NPV_{ES\ 7\ \%}$	$NPV_{nES\ 7\ \%}$
	458.88	-611.66	364.43	-604.64	283.22	-598.24

Source: Authors' own elaboration NPVES = net present value with values of ecosystem services; NPVnES = net present value without values of ecosystem services – and the discount rate %

in the beginning of the project implementation. In our study, a farmer had to buy the given area. However, consideration can also be given to the fact that the farmer would already own the land and, without the initial input of land acquisition, would decide to establish a landscaping orchard.

It follows from the analysis that the net present value (NPV) of the project is positive if we also include the benefits of ecosystem services which were specified with respect to the characteristic of the landscaping orchard. Without including this significant NPV item, the value is negative under any discount rate. A conventionally farming farmer still generates negative values of NPV_{nES}, which is why the project is not interesting for him/her in terms of finances. However, the added value in the form of ecosystem services, which are beneficial not only to a farmer but also for the whole society, remains concealed and thus should be thoroughly considered. This case study dealing with establishing a landscaping orchard demonstrates the need for quantification and consideration of benefits of ecosystem services of ecologically significant elements, especially for future creation of policies supporting the establishment of landscaping orchards which, among other things, promote and protect biodiversity (Marada, 2011), reduce the risk of wind and water erosion and increase retention abilities of soil. Beside explicit benefits which can be seen by a farmer mainly in selling fruit, hay or biomass (e.g., harvested wood), it is the ecosystem services that can be of great value not only for the agricultural business but also for the society as a whole (over the long term). Regardless the explicit benefits, which will be produced by this landscaping orchard, the implementor of the project counts with the cultural service that the landscape orchard will perform and will contribute significantly to the aesthetic and cultural function in a long term.

CONCLUSION

The goal of the study was to calculate a complex stream of benefits of the ecosystem services for an intensively farming farmer who can offer an ecologically significant element in the form of a landscaping orchard. The evaluation of these services was executed based on evaluation of the ecosystem services from the global database monetising these services (ESVD) when especially anti-erosion services, retention of water in the landscape, increasing biodiversity, improving microclimate and other cultural and aesthetic contribution were taken into account.

An intensively farming farmer is an entrepreneur generating a profit. However, he/she is also a supplier of ecosystem services for which he/she should be rewarded. The results of the study have clearly shown that from the information provided based on an interview with a farmer, who has established a landscaping orchard, and data collected from the ESVD database, yields exceed costs thanks to the mentioned benefits of the ecosystem services. The value of ecosystem services provided by the monitored landscaping orchard is annually around 125 thousand CZK on a farmed area of 1.6 ha. The limitation that these values represent is primarily the fact that they are values from studies conducted worldwide and therefore may differ in some respects. Nevertheless, the fact remains that ecosystem services are provided by the monitored landscaping orchard. However, this value may not always be included in the farmer's economic thinking about whether to establish a landscaping orchard within an intensively farmed agricultural land because the existence of an orchard itself does not present explicit profits which can be monitored by a farmer within his revenues. The opportunity cost, which is based on “non-production” of conventional crops is high, at the mentioned area, the annual cost is somewhere around 20 thousand CZK.year^{-1}. This opportunity cost is currently not covered by a current European agricultural subsidy policy, except subsidies for establishing a landscaping orchard. It is therefore necessary to recommend that public agricultural policy makers pay higher annual financial support to intensive farmers for the management and maintenance of these ecologically significant elements in the landscape. The authors are of the opinion that an ecologically aware attitude of a farmer to establishing landscaping orchards is crucial for the actual implementation regardless the financial benefits that he/she is getting out of it. The answer on the question whether it is worthy for a farmer to establish ecologically significant elements (in our case a landscaping orchard) is difficult. From the authors' point of view and a general interpretation of the value of ecosystem services, the answer is positive, and this investment is worthwhile regarding the benefits of ecosystem services. It is necessary to impress and convince a broader spectrum

of intensively farming farmers to implement landscaping elements on their plots of lands and to motivate them financially for improving the condition in which the land is in (not only within the monitored area). The landscape then becomes more resistant against water and wind erosion, its ability to retain water will be higher, and the growth of biodiversity in the landscape will be promoted. If we return life back to the landscape, it will be more attractive for current and future generations. Based on the results of this study, it is possible to recommend the evaluation of other socio-economically important ecosystem services of landscape elements within other agroecosystems and thus obtain the necessary materials for defining the objectives of agricultural management in the Czech Republic.

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