Ecosystem Services of Vegetation Features as the Multifunction Anti-Erosion Measures in the Czech Republic in 2019 and Its 30-Year Prediction

Marie Balková ^{1,*} , Lucie Kubalíková ¹, Marcela Prokopová ², Petr Sedlák ³ and Aleš Bajer ¹

¹ Department of Geology and Soil Science, Faculty of Forestry and Wood Technology, Mendel University in Brno, 613 00 Brno, Czech Republic; lucie.kubalikova@mendelu.cz (L.K.); ales.bajer@mendelu.cz (A.B.)

² Global Change Research Institute of the Czech Academy of Sciences, Lipová 1789, 370 05 České Budějovice, Czech Republic; prokopova.m@czechglobe.cz

³ Department of Forest Protection and Wildlife Management, Faculty of Forestry and Wood Technology, Mendel University in Brno, 613 00 Brno, Czech Republic; petr.sedlak@mendelu.cz

* Correspondence: marie.balkova@mendelu.cz; Tel.: +420-545-134-040

Abstract: The communication presents the pieces of information of the ecosystem services estimation of the four research localities transformed from an arable land to vegetation features—bosks. These bosks should dispose several ecological functions, primarily anti-erosion measures, additionally the local biodiversity increase, unfavorable microclimate mitigation, shelter provision for small game, birds and insects, or wood and fruit production, etc. One of these benefits, the biodiversity increase, can be evaluated using the Habitat Valuation Method (HVM) and expressed by the financial value obtained on the basis of a combination of expert valuation and cost replacement method. The various combinations of local woody plants and bushes within the project Multifunction anti-erosion measures as a part of adaptable landscape were planted or sown at the project localities (South Moravia and Žďárské vrchy, Czech Republic) in March 2019. Ecosystem services evaluation was one of the fundamental outcomes of the project. The most important result was the calculated value increase of the service termed “environment for the species life providing and genetic diversity conserving”. The increase means the difference between the state prior to planting and the expected target state after 30 years as specified in HVM. In total, the increase of this ecosystem service of the four bosks was valued at 2,633,809.64 CZK (97,206.48 EUR/114,399.06 USD).

Keywords: anti-erosion measures; bosks; ecosystem services; erosion; vegetation; woody plants

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1. Introduction

The landscape value increase in the sense of ecosystem services provision is the topical key issue for conserving its natural functions needed, especially in disturbed areas with very intensive human activities [1–4]. Unfortunately, the disturbances which are caused by natural processes and directed in accordance with the principles of nature, are omitted. In this study, the main issue is the disruption of these natural processes, caused by intensive interventions, which have fundamentally influenced and altered the environment into the visual aspect and form that neither visually nor remotely resemble the original state at all.

Specifically, in this case, the problem was caused by original natural habitats transformation into arable land, with contemporary intensive conventional agricultural management [5]. Such management generates lots of problems [6] and complications, including huge decrease in its environmental functions that are limited only to production in fact, other ecological functions are almost completely suppressed. This is a typical example of ecosystem services trade-off where intensification of agriculture and promotion of solely production services cause a significant decrease of the other groups of services including regulating (erosion protection, climate regulation, and water retention), supporting (habitat provision) or cultural ones (land use character and esthetics) [7]. Other resulting problems

are significant suppression in biodiversity [8–11], water retention capacity reduction [12], rise of undesirable elements from agricultural fertilizers in the soil [13,14], etc. Almost all of these facts result in bad coherence of soil particles and thus in easier erodibility and huge organic matter loss from widespread arable land areas [15–17]. This is largely because the arable land is usually managed in areas of several tens of hectares, where the risk arises even in areas smaller than a hectare. The second unfavorable factor is the fact that almost for the entire year, a very large area of arable land is uncovered by crops, especially concerning broad-leaved crops and due to early harvest [18]. This phenomenon (large blocks of monocultures and unsuitable management) is typical for countries in Central Europe (mainly Czech Republic, Slovakia, Poland, or Hungary) as a remain of the intensive agriculture during the 1950–1990 Soviet era [19], compared to Austria with agriculture based on small arable land blocks and diversity of cultivated crops as an example [20].

All the aspects mentioned above lead to unacceptable loose of soil matter [10,21–24]. This can be mitigated by division of arable land blocks by specific anti-erosion measures as an example. The greatest service for both arable land and the surrounding landscape systems can probably be provided by any vegetation feature, incorporated into large blocks of crop monocultures [5,25–30]. In fact, we can talk about the whole farmland also including meadows and pastures, very frequently managed in a monoculture mode.

1.1. Project Introduction

This issue of erosion and problems related were involved within the project of Multi-function anti-erosion measures as a part of adaptable landscape, which deals with planting and seeding vegetation features as the important part of the landscape providing a wide scale of ecological functions. The main goal of the project was testing an alternative way of vegetation features estimation consisting in seeding—the most natural, yet underestimated way of growing plants. Also, seeding can be considered as a unique way in the Central European space (characterized as the area of temperate deciduous forest). The great advantages are little costs for the sowing material and consequent care about such vegetation features as well as healthy and stable stands thanks to the possibility of adaptation to the ecological conditions of the habitat from the seed phase. There were also other secondary project goals, and as one of them, we would like to present the results of habitat benefits evaluation, that was scheduled as one of the project results. Within the research ongoing on the four localities in South Moravia and Žďárské vrchy (Section 2.1), thus vegetation features were planted as the parts of farmland blocks. The conditions for this choice were mainly the following ones: Locality could be incorporated within the large block of arable land and was under erosion threat, cooperation with owners and their will and agreement with the experiment, previous experience with vegetation planting in the region and feasibility of the experiment consisting in sowing and presumption of its positive effect. These features were created by sowing or planting mixture of native forest trees and bushes with flowery meadow added in the places. The woody species were selected so that there are not only species of natural composition of each specific locality, but also honey-bearing or fruiting species as a source of birds' food. More detailed information about particular localities is described in Section 2.1.

1.2. The Aim of the Study

The aim of this study was ecosystem services evaluation as one of the projects outcomes. All four localities (Section 2.1) were evaluated in the state before planting (2019), and their expected economic benefit after 30 years as this period is pre-modeled in HVM [1] as the time presumed to be necessary to reach their full possible stability and complex of ecological functions, services, and benefits. The economic benefits are expressed by value increase calculation of the service environment for the species life providing and genetic diversity conserving. A comparison of the results between the localities is an integral part of the study, as it is discussed and justified, as well as the possible future development and

its impact on possible deviations from the expected state. This method (or its previous versions) has been used in several studies in the Czech Republic [31–34].

1.3. Bosks

Vegetation feature is a quite wide term used for several types of landscape vegetation (or non-forest woody greenery). This report deals with both linear and irregular shapes of woody vegetation planted on arable land specified below. Unfortunately, in English, there is no exact equivalent for this kind of the feature. The authors chose “bosks” as the most appropriate term (other variants are, for instance, bosques, hedgerows, groves, clusters, and niches) [35].

In general, a bosk is a vegetation feature in the open landscape composed of lower woody plants, bushes, and herbs. It could be of a linear shape, because of being a part of field margins, that historically divide particular parcels. Sometimes we can observe any other irregular shapes, like one of the localities in this study. However, this phenomenon has been disrupted on the major area of the Czech Republic as the bosks and field margins were plowed up to become a part of widespread farmland complexes during the Soviet era (1950–1990) [19,36], compared, e.g., to Austria [20], bosks are not a common part of Czech agricultural landscape. This way, we return to the basic of the topic and to the reason for bosks as our choice of suitable anti-erosion measurement. At the same time, the bosk brings other functions and services to the landscape like more favorable microclimate, food for small game and birds, and shelter for game [37]. Other significant functions are represented by filtration of substances entering the air and soil, windbreak, or the aesthetic aspect in the landscape. The bosk should also have a production function as a source of wood, in the case of blooming woody plants and herbs also as a source of pollen and nectar for honey production, as well as the choice to medicinal herbs collection, etc. [38]. In comparison with hedgerows (the name is used mainly in France or Great Britain [39,40]), bosks could be of any shape (as hedgerow is usually linear feature dividing particular parcels), could provide more ecosystem services as they are sometimes planted by gamekeepers primarily to be a refuge for small game and birds or for the reasons described above [37].

From the legislative point of view [38], planting and caring for bosks is a part of hunting grounds users’ duties (Paragraph 11, Section 1 of Act No. 449/2001 Coll./§) [41]. If the bosk is defined only according to valid legislative, it is impossible to describe its whole principle, because the legislative definition is too narrow [38]. The best definition is anchored in the Government Regulation No. 307/2014 Coll. [42], where the bosk is included in field margins as “a continuous line-type formation, used mainly to reduce the risk of water or wind erosion, usually delimiting the boundary of arable land blocks; woody vegetation, a stone wall or a grassy area can be a part of such a field margin” (Paragraph 5, Section 4 of Government Decree No. 307/2014 Coll. [43]). In other laws, this feature is mentioned quite marginally, e.g., as one of the forms of an Important Landscape Element, or as a part of Territorial System of Landscape Ecological Stability or anti-erosion measure [38,43]. The bosk planting has been financially supported by European funding, namely European Structural and Investment Funds [44,45] or national funding, e.g., Landscape Care Program [46] or The Landscape Natural Function Restoration Program [47].

1.4. Conceptual Background of Ecosystem Services and their Evaluation

Ecosystem services are the benefits (goods and services) that society obtains from nature [48]. Costanza et al. [49] define ecosystem services (ES) as “the ecological characteristics, functions, or processes that directly or indirectly contribute to human wellbeing”. The concept of ecosystem services gradually developed in the second half of the 20th century [49–51], for an overview of the development of the concept, see Braat and de Groot [52] or Costanza et al. [49], but the Millennium Ecosystem Assessment (MEA) [48] is considered to be a basic document where the definitions and approaches were presented together with justifications why further developing of the concept of ecosystem services was necessary.

These days, this concept has already been fully accepted as an important base for nature conservation, landscape planning, responsible, and sustainable use of resources within different types of ecosystems as proven by numerous papers and monographies [49,53–55]. The assessment of ecosystem services is considered as a base for their quantification and environmental accounting [56,57] and references herein and as an important issue in land-use policy [58,59]. There are numerous classifications of ecosystem services for various purposes. Primarily, the classifications come from the MEA classification [48]. Several authors discussed these topics and problems of classification [60–62], numerous authors proposed classification for scientific analysis, economic valuation, and policymaking [56,63,64], for overview see an editorial of Burkhardt et al. [65]. Recently, Common International Classification of Ecosystem Services (CICES) has been developed, and it includes both biotic and abiotic ecosystem services. This classification was established by European Environmental Agency (EEA) to unify the ecosystem services for environmental accounting [66]. In the Czech Republic, the classification and methodology by Frélichová et al. [67] is used (respectively Vačkář et al. [68]—methodology in Czech).

Ecosystem services are traditionally divided into four groups: Provisioning, regulating, cultural, and supporting [48].

- Supporting services are represented by basic ecosystem processes, such as soil formation, primary productivity, nutrient cycling, biogeochemistry, and provisioning of habitat (or according to Costanza et al. [63] refugia service). They contribute to the human wellbeing indirectly via affecting other types of services—provisioning, regulating and cultural ones [48,63].
- Provisioning services are the products obtained from ecosystems, including, for example, genetic resources, food and fiber, and fresh water [48]. De Groot et al. [69] distinguish the use of biotic resources (i.e., products from living plants and animals) and abiotic resources (mainly sub-surface minerals). The biotic resources have always been considered and rather emphasized, but in the recent years, the importance of abiotic resources is also recognized [70–72].
- Regulating services are the benefits obtained from the regulation of ecosystem processes, e.g., climate regulation, water regulation, pests and disease regulation [48]. According to de Groot et al. [69] these services are essential to human existence on the Earth. However, as they customarily have indirect benefits, they are not frequently recognized until they are lost or disturbed [69].
- Cultural values of ecosystems are as important as other services for many local communities [48]. People have benefited in many ways from cultural ecosystem services, including aesthetic enjoyment, recreation, artistic and spiritual fulfillment, and intellectual development [73]. Generally, the cultural ecosystem services can be defined as nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences [48]. The conceptual and methodological aspects of cultural ecosystem services were discussed in numerous papers [69–80].

2. Materials and Methods

The four evaluated localities are placed at the exposed habitats predominantly from the point of view of erosion soil loss and all the related problems as this issue is widespread all over the climatic conditions as a consequence of unsuitable management. The three localities were chosen in South Moravia, Czech Republic, where the vegetation is exposed to unfavorable climatic conditions, relative to the rest of the Czech Republic in sense of drought (very low average annual precipitation causing long-term soil moisture deficit) as well as increased soil loss as the consequence of intensive cultivating and overloading not only arable, but all the farmland. In the Czech Republic, the drought caused by temperature rise, precipitation reduction and unsuitable arable land and forest management is monitored by Intersucho program of the Global Change Institute, Czech Academy of Sciences [81] presenting drought intensity, water deficit, soil moisture saturation, impacts

on the vegetation, agriculture, and forests [82]. All these localities are founded in exposed areas according to Intersucho models (the actual situation maps are regularly loaded on the program website during the vegetation season) and to real experience of the authors. The average climatic conditions are summarized in Table 1.

The fourth locality was situated in the low mountain area in Žďárské vrchy with milder climatic conditions than in South Moravia but was included due to its real erosion threat and with an effort to test an irregular shape of the bosk. At each locality, the bosk was planted or seeded and the shape and species composition were designed as suitable as possible in the harmony with the surrounding environment. In the close neighborhood, so-called “comparative feature” was fixed. This vegetation feature has already existed for a longer time, is similar to the new bosks and serves for the soil analyses comparison and as the possible model of these conditions of new bosks after some years, in order of decades.

At the localities, erosion and hydrological conditions analyses were conducted as well as the soil survey and estimation of the soil unit, which are the basis for the bosk space location and its design. Also, the weather stations and sensors for global soil radiation, soil humidity and temperature measurement were installed at the localities. In the first two years after plantation, it was necessary to protect the bosks against the game damage by wire or electric fence and prevent the storm spreading. In the second year, other woody species were planted and seeded. The continuous monitoring of the conditions and development was important, especially in the case of the seeded plants. This case report targets on the ecosystem services evaluation in these four localities, the evaluation was performed in July 2020, approximately one year and a half after the plantation of bosks (spring 2019) and the predicted value after 30 years (state in 2049) was calculated as the HAV methods enables. However, the method does not work with the alternative scenarios—only the default and fully functional habitat.

2.1. Research Localities

2.1.1. Blížkovice

Vegetation anti-erosion feature is located in the Blížkovice cadastral territory (Znojmo district, South Moravian region, GPS 48.9981883 N, 15.8249519 E). The basic ecological characteristics are described in Table 1. The bosk consists of two belts with an area of 871 m², seeded by woody plant mix in the amount of 50%, 100%, or 200% of the recommended seed dosage (e.g., the recommended amount for oak is 35 seeds per one seeding row, etc.) [83]. Sowing is completed by seedlings providing the protective shade. As the comparative feature, the elm alley (The Ent’s Path) with grassy herb floor was chosen (Figures 1 and 2c).

Table 1. Basic habitat ecological characteristics applied within Habitat Valuation Method (HAM) [84–86].

Locality	Altitude [masl]	Vegetation Stage	Average Temperature in January [°]	Average Temperature in July [°]	Average Precipitation during Vegetation Season (April–October) [mm]
Blížkovice	400–420	3rd oak-beech	−3–(−4)	17–18	400–500
Třebelovice	445–470	3rd–4th oak-beech, beech	−4–(−5)	16–17	350–450
Kyjovice	235–240	1st oak	−2–(−3)	19–20	300–350
Kamenický	667–673	5th fir-beech	−3–(−4)	15–16	500–600

2.1.2. Třebelovice

This anti-erosion vegetation feature is located in the Třebelovice cadastral territory (Třebíč district, Vysočina region, GPS 49.0137489 N, 15.6559956 E). The basic ecological characteristics are described in Table 1. The bosk sowing was performed on the borderline of grassy rocky hillock and arable land and its current area is 558 m². The hillocks are usually drying out habitats (due to the very thin soil cover and protruding rock); however, it is surrounded by less favorable monocultures of agricultural crops, so it provides refuge for animals like small mammals or birds. Amending the grassland of woody species

generates milder microclimatic conditions (e.g., cooler, and more humid air than in the direct sunlight, shade, or soil moisture evaporation protection) and rises the protective function of this locality. As the comparative feature, the grassy country lane with bird cherries was chosen (Figures 1 and 2a,c).

Figure 1. Localization of the four bosks within the Czech Republic.

2.1.3. Kyjovice

This anti-erosion vegetation feature is located in the Kyjovice cadastral territory (Znojmo district, South Moravian region, GPS 48.9157114 N, 16.1611172 E). The basic ecological characteristics are described in Table 1. This bork was implemented like the belts sown with 50%, 100%, or 200% of the recommended seed dosing completed by the seedlings providing shade protection with the total area of 2600 m². The grassland with woody species on the borderline between arable field and road was chosen as the comparative feature (Figures 1 and 2b).

At these three localities, the sessile oak (*Quercus petraea* (Matt.) Liebl.) and bird cherry (*Prunus avium* L.) were chosen as the target wood species. Also, auxiliary species were planted—hedge maple (*Acer campestre* L.) and European birch (*Betula pendula* Roth.) completed with bush trees like common hawthorn (*Crataegus monogyna* Jacq.), common dogwood (*Cornus sanguinea* L.), wild privet (*Ligustrum vulgare* L.) or way-faring tree (*Viburnum lantana* L.). As the shade providing trees, these species were planted: White mulberry (*Morus alba* L.), mahaleb cherry (*Prunus mahaleb* L.), European aspen (*Populus tremula* L.), hedge maple (*Acer campestre* L.), and European chestnut (*Castanea sativa* Mill.).

Figure 2. The localities and bosks during the time: (a) Třebelovice—locality before planting, April 2018, (b) Kyjovice—sowing row, March 2019; (c) Blížkovice—sessile oak (*Quercus petraea* (Matt.) Liebl.) seedling, August 2020; (d) Kamenický—lower part of the bosks with blooming meadows, July 2020.

2.1.4. Kamenický

This vegetation feature is situated in the Kamenický cadastral territory (Chrudim district, Pardubice region, 49.7547869 N, 15.9782261 E). The basic ecological characteristics are described in Table 1. The locality in different climatic conditions was included because the erosion is not only an issue within warm areas, but is also related to any farmland, especially the wind erosion is a problem of this region. This bosk was planted thanks to a local farmer, who provided his parcel for this experiment, as the own activity of farmers and education are also some of the project goals. This bosk was planted by pre-grown forest woody species with the combination of useful species, e.g., melliferous mespilus. In some parts, the rich florid meadow mixture of unbred herb and grass species was seeded. In some places the dead wood was left to help rise the organic matter in the soil. This bosk consists of the three particular parts and the total area is 1820 m². On the surrounding arable land, both common and uncommon crops are grown alternately, for instance barley, buckwheat, bundle, etc. (Figures 1 and 2d).

Woody species there are as follows: Silver fir (*Abies alba* Mill.), European birch (*Betula pendula* Roth.), European mountain ash (*Sorbus aucuparia* L.), black alder (*Alnus glutinosa* (L.) Gaertn.), green alder (*Alnus alnobetula* (Ehrh.) C. Koch), European hazel (*Corylus avellana* L.), midland hawthorn (*Crataegus laevigata* (Poir.) DC.), wild privet (*Ligustrum vulgare* L.), European aspen (*Populus tremula* L.), bird cherry (*Prunus padus* L.), European beech (*Fagus sylvatica* L.), European crabapple (*Malus sylvestris* Mill.), sycamore maple (*Acer pseudoplatanus* L.), alder buckthorn (*Frangula alnus* Mill.), alpine currant (*Ribes alpinum* L.), snowy mespilus (*Amelanchier alnifolia* (Nutt.) Nutt. ex M. Roem.), and Scotch elm (*Ulmus glabra* Huds.).

2.2. Ecosystem Services Evaluation—Methods

At the research plots, the ecosystem services evaluation targeted to habitat provision and biodiversity was performed. The Habitat Valuation Method (HVM) [1] which is based on biodiversity assessment was used. It evaluates Habitat services—habitat for species, maintenance of genetic diversity according to TEEB [56,87].

2.2.1. Description of the Method

The principle of the HVM origins in the method of ecological harm on habitats assessment used in Hesse (Germany) and was further developed in the Czech Republic. The method is based on the national list of habitat types and their expert valuation using eight biodiversity-related ecological criteria with assigned point value ranging from 1 to 6 points (Table 2). The relative point value has been calculated for each habitat type of the Czech Republic (related to 1 m² of the habitat area) representing its relative ecological value in comparison to other habitats. According to this, the first step consisted in choosing a habitat type from the list of typical habitats, its evaluation by 1 to 6 points per 1 square meter for each characteristic and the total calculation of points for all 8 characteristics altogether.

Table 2. Basic habitat ecological characteristics used within Habitat Valuation Method (HVM).

No.	Name of Characteristics	Points According to:
1	Habitat type maturity	Phylogenetic age of formation and species
2	Habitat type nature	6 pts for natural, 1 pt for anthropogenic habitat type
3	Habitat type structures diversity	6 pts for all vegetation floors
4	Habitat type species diversity	Number of all naturally present species
5	Habitat type rarity	Geographic and climatic uniqueness, frequency, and area
6	Habitat type species rarity	Number of rare and endangered species
7	Habitat type vulnerability	Vulnerability caused by the habitat conditions change
8	Habitat type threat	Dependence on the human activities change

The second step is the individual valuation of particular habitats using the coefficient reducing or increasing the point value from the first step according to the state of that particular habitat (how it differs from a typical habitat type from the list). For natural and seminatural habitats, the six criteria were used to correct the habitat type value, for unnatural habitats (which are at our specific plots), the scale is created for each habitat type and describes three to four levels of the habitat state and their corresponding coefficient values regarding the following criteria:

- The presence and proportion of potential natural vegetation species,
- the presence and proportion of ubiquitous species,
- the presence and proportion of synantropic species,
- the presence and proportion of invasive and expansive species,
- the number of vegetation layers and floors,
- the vegetation cover,
- method and regime of habitat use, and
- intentional application of chemicals or other substances from the activity in the vicinity of the habitat.

The corresponding coefficient can be lower than 1 (means that the real situation is worse than the chosen habitat type), can equal 1 (means that the real situation corresponds to the chosen habitat type) or can be higher than 1 (means that the real situation is better than chosen habitat type). After this adjustment, the total points were gained by multiplying the corrected point amount for 1 m² by the area of the locality. The more detailed description of the point correction process is included in the HVM [1].

The advantage of this method is the possibility to evaluate the future state of habitats using estimation of vegetation development based on development curves and time necessary to reach the state of full functionality which was estimated for various habitat groups. Thanks to this it was possible to evaluate the hypothetical target state of bosks after 30 years of planting as the third step of the evaluation.

2.2.2. Habitat Financial Evaluation

The financial value of one point has been determined based on economic analysis made for 182 realized restoration projects [1] where an increase in ecological value of habitats in the restored area was calculated by comparison of the state before restoration and the target state after restoration. The value of one point was obtained as a ratio of the total expenses on the project and the total long-term expected point increase. The final monetary value of one point for the Czech Republic was approximately 1.11 EUR in 2018 [1]. This price is based on actual budget investments which were spent by Czech society on specific projects of ecological restoration [1].

2.2.3. The Use of HVM at the Project Localities

At each locality, for the state before planting (2019) and their expected economic benefits after 30 years (2049), the habitat type was determined with the corresponding point value from the methodology. After that, the individual valuation was performed. For the state before planting it was determined based on the surrounding area survey (mostly arable land, where the individual value was 1 because the habitat type value did not differ from the typical one). For the target state, it was based on the field survey in the localities with the emphasis on the woody plants species composition: Are there native species corresponding to natural conditions (potential vegetation)? Is there functional differentiation of species (target species and pioneer species)? Are there species of the different growth rate promising development of various vegetation layers? What is the species richness? Are there any non-native trees planted and any unsuitable species chosen? Based on these parameters, the coefficient of the individual valuation, which can range between 1.15 and 1.3 and multiplies the habitat type point value, was determined according to HVM.

The difference between point values for the state before planting and the target state, multiplied by the area, represents a gain of the point value brought by this restoration activity. This gain can be expressed in the monetary term when multiplied by the economic value of one point which has been determined based on analyses of restoration costs and gains as described above.

3. Results

In the paragraphs below, the situations of each locality are explained and commented with the emphasis on the comparison of the state after restoration (2020) and the expected state after 30 years, which primarily means the financial benefit of the measurements brought into the land during this period.

3.1. Habitat Point and Financial Evaluations Results

3.1.1. Blížkovice

This bosk has too small area (871 m²) and does not keep the requirements for natural habitat development. It can be included in close to nature habitats class according to HVM, as the most suitable class is “woody vegetation on agricultural and other land” with the point value of 20 pts/m². In frames of individual terrain point evaluation, this value was increased by 1.15 correcting coefficient and finally reached 23 pts/m². The reason and background for this coefficient choice is providing the development of planted wood species into the stand of suitable species composition with target species (oak, cherry), pioneer species (aspen) and fruit trees (chestnut, walnut). Concurrently, the proportion of such species does not exceed 10%. The original unsown area was included among “weed vegetation of annual and biennial agricultures” habitat with the point value of 9 pts/m².

After the procedure described above, the supposed financial benefit in the sense of the ecosystem service “environment for the species life providing and genetic diversity conserving” is determined. The value of this ecosystem service within the bosk in Blížkovice reaches the amount of 356,796.00 CZK (13,168.35 EUR/15,497.39 USD) (Figures 3 and 4).

Figure 3. Absolute expected ecosystem services increase within research localities.

Figure 4. Expected ecosystem services increase per 1 m² within research localities.

3.1.2. Třebelovice

Because of the similar features, this bosk evaluation is equal to the previous one (the area of 558 m²). It can also be included into close to nature habitats class “woody vegetation on agricultural and other land” with the point value of 20 pts/m². During the individual terrain evaluation, the same correcting coefficient of 1.15 was used, so finally the point value reached 23 pts/m². This can be justified by the woody vegetation floor development with the suitable wood species composition, where the target species are included (oak, cherry) as well as the pioneer species (aspen) and fruit trees (chestnut, walnut, mahaleb, and mulberry). The amount of these species does not exceed 10%. The original area in the upper part was included in “nature-distant dry lawns, hems, and heaths” habitat class with the point value of 23 pts/m², whereas the lower part belongs to “nature-distant mesophilic meadows, pastures, and fallows” with the point value of 13 pts/m².

According to the aforementioned method, the amount of 78,417.00 CZK (13,168.35 EUR/15,497.39 USD) expresses the benefit in the sense of the ecosystem service ‘environment for the species life providing and genetic diversity conserving’ (Figures 3 and 4).

3.1.3. Kyjovice

This bosk is also included into “woody vegetation on agricultural and other land” habitat class with the point value of 20 pts/m² (the area of 2600 m²). The 1.30-correcting coefficient value was chosen, and the point value increased to 26 pts/m². The reason for such a rise is the wood vegetation floor development in the suitable species composition with long-age (oak) and pioneer (ash) species, that can ensure the growth of many woody vegetation age grades and floors. The original unsown area was included among “weed vegetation of annual and biennial agricultures” habitat with the value of 9 pts/m².

After the same numeric process as in the case of the previous localities, the amount of 1,296,292.00 CZK (47,731.76 EUR/56,173.90 USD) expresses the benefit in the sense of the ecosystem service “environment for the species life providing and genetic diversity conserving” (Figures 3 and 4).

3.1.4. Kamenický

This locality with an area of 1820 m² also does not meet the conditions for the natural habitat development, so it is included in “weed vegetation of annual and biennial agricultures”. The 1.30-correcting coefficient value was chosen, and the point value increased to 26 pts/m². Justification for this fact is that the suitable wood species composition was chosen as it contains the target species (elm, maple, alder) and pioneer wood (aspen, ash) and bush (hazel, hawthorn) species. The original unsown area was also included in “weed vegetation of annual and biennial agricultures” habitat with the value of 9 pts/m². According to the methodology, the amount of 905,304.00 CZK (33,412.23 EUR/39,321.74 USD) benefit was calculated in the sense of the ecosystem service “environment for the species life providing and genetic diversity conserving” (Figures 3 and 4).

The total default value of the habitats of the four localities in 2019 was calculated at 1,555,841.92 CZK (57,421.74 EUR/65,571.86 USD) and the target expected value after 30 years was calculated at 4,189,651.62 CZK (154,628.22 EUR/181,960.98 USD). In terms of ecosystem services provision per 1 m², Třebelovice is the most valuable locality (453.94 CZK), other localities are significantly less valuable (263.34 CZK). The highest target state value is expected in Kyjovice and Kamenický (760.76 CZK) as well as the highest value increase (by 497.42 CZK). The rather lowest target value is expected in Blížkovice and Třebelovice (497.42 CZK), whereas the increase is 409.64 CZK, resp. 219.04 CZK. In the instance of Třebelovice, distinctly lowest increase is caused by its highest default state value and quite low target state value. Overall, total increase at all project localities is expected to be 2,633,080.64 CZK (97,206.48 EUR/114,399.06 USD), the average increase per 1 m² is 405.88 CZK (14.98 EUR/17.63 USD) (Table 3, Figures 3 and 4).

Table 3. The summary of total and average values of financial habitat evaluation.

	Blížkovice	Třebelovice	Kyjovice	Kamenický	
Area (m ²)	871	358	2600	1820	Total
Default value (2019) (CZK)	229,369.14	162,510.04	684,684.00	479,278.80	1,555,841.98
Target value (2049) (CZK)	586,165.58	240,926.84	1,977,976.00	1,384,583.20	4,189,651.62
Increase (CZK)	356,796.44	78,416.80	1,293,292.00	905,304.40	2,633,809.64
(EUR ¹)	13,168.35	2894.14	47,731.76	33,412.23	97,206.48
(USD ²)	15,497.39	3406.02	56,173.91	39,321.74	114,399.06
					Average
Default value/1 m ²	263.34	453.94	263.34	263.34	310.99
Target value/1 m ²	672.98	672.98	760.76	760.76	716.87
Increase/1 m ² (CZK)	409.64	219.04	497.42	497.42	405.88
(EUR ¹)	15.12	8.08	18.36	18.36	14.98
(USD ²)	17.79	9.51	21.61	21.61	17.63

¹ Exchange rate: 27.095 CZK/1 EUR; ² Exchange rate: 23.025 CZK/1 USD (5 October 2020, Czech National Bank).

4. Discussion

All the values mentioned as “target” represent medium- or long-term estimation according to the contemporary state and possible development due to the usual generally known evolution of the similar vegetation features. Expected development of the bosks could be potentially threatened by external factors, which can negatively influence seedlings vitality, e.g., unfavorable weather (ground freezers, drought) [88–90], game damage (browsing by ungulates or hares) [91–94] vole damage on the root system, weeding by reed grass or thistles [95,96]. In case of secure failure, the bosks against the damage, the expected value increase could continuously decrease. However, to a certain extent, such damage is a natural process, and it is necessary to count with partial canopy loosening (this fact is taken into account within the evaluation). On the other hand, the ecosystem service value could be maintained or increased by natural reproduction of some species. The value should also be increased by conceiving favorable conditions for other plant species which can appear and the higher concentration of insects, birds (e.g., quail nesting), small game (hare, pheasant) or ungulates (roe deer) is expected. The most important aspect of the project solved within these localities is increasing of anti-erosion endurance of given farmland blocks. This should be reached by gradual improvement of soil particles cohesion or organic matter increase, etc. After the 30-year period, it will be highly suitable to make new evaluation and compare the expectations with future reality. The alternative scenarios are not included because the HVM does not work with them and applying a different method could be the research issue of another study.

Considering the cost-effectiveness of the planted bosks, including protection against game damage, the average final monetary value of one point (approximately 29.60 CZK—1.11 EUR for the Czech Republic in 2018 [1]—described in Section 2.2.2) can be compared to our real costs needed for 1-point increase of the locality. If all four localities are counted and without human labor cost, this value equals approximately 1 CZK (0.03 EUR/0.04 USD). When human labor is included, the value rises to 1.4 CZK (0.05 EUR/0.06 USD). And if we double this cost, the value remains very low at the value of 2.8 CZK (0.10 EUR/0.12 USD). All the values are far from the average point monetary value based on specific projects of ecological restoration costs. According to this comparison, we can declare very high cost-effectiveness of such vegetation landscape features, despite the possible reduction of their expected value.

5. Conclusions

The goal of this paper was to evaluate the value of the seeded and planted bosks using HVM in the sense of the ecosystem service environment for the species life providing and genetic diversity conserving. The evaluation was performed prior to planting and the expected value was also calculated after the 30-year period. Threats as well as future positive benefits were discussed. The total value of all the localities before planting was calculated at 1,555,841.92 CZK (57,421.74 EUR/65,571.86 USD) and the expected value 4,189,651.62 CZK (154,628.22 EUR/181,960.98 USD). This means that the benefits gained during 30 years were calculated to be 2,633,809.64 CZK (97,206.48 EUR/114,399.06 USD). Converted to 1 m², the average value increase for all the localities is 405.88 CZK (14.98 EUR/17.63 USD) and the highest increase is expected in Kyjovice and Kamenický. This evaluation should be made after 30 years with the aim to compare expected and real situations and to gain new knowledge about this specific vegetation landscape feature. It can be stated that such bosks are a very valuable contribution to the ecosystem services provision, by which human can contribute to the development of soil erosion protection and the diversity of the landscape as a whole.

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