

Current planning practices for implementing Nature-based Solutions in rural development projects in Poland and Ukraine

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Key words: Land management, land consolidation, rural landscapes, mid-field trees, resilience to climate change

SUMMARY

Mid-field trees are one of the critical elements of nature-based solutions (NBSs) in rural areas. NBSs are essential to rural landscapes, determining their resilience to climate change (especially drought). Their role in climate change mitigation was emphasized in the strategies of the European Green Deal, including the Biodiversity Strategy and the New Forest Strategy of the European Union 2030. Mid-field trees planting should be strategically and systematically planned.

The paper aims to show the significance of spatial planning and land management instruments (e.g., land consolidation) for enabling the development of a network of field trees as an element of NBSs in rural areas. The functions of field trees were presented, and the needs in terms of field trees planting in Poland and Ukraine were characterized.

Reference was made to the current planning practices applied with regard to field trees and field shrubs in Poland and Ukraine. The role of surveyors and new possibilities in this respect were discussed. Polish context was related to the intervention entitled "Consolidation of land with post-consolidation management", implemented under the Strategic Plan for the Common Agricultural Policy for the years 2023-2027.

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1. INTRODUCTION

Modern agricultural landscapes are considered systems in which the spatial and ecological structure is systematically simplified while the intensity of use increases (Richling, Solon, 1998, Oberč, Arroyo Schnell, 2020). In areas where agriculture and other productive land uses compete with environmental and biodiversity goals, sustainable land management can be achieved only through the landscape and ecosystem approaches that consider a greater area than the farm proper. Ecosystem and landscape approaches have been adopted in many countries around the world, at various scales, to improve livelihoods, sustain or enhance ecosystem services, ensure the supply of food and other products, and promote efficient and sustainable use of resources (FAO, 2019). Practices falling under a landscape approach include the management of corridors, hedges, field margins, windbreaks, woodland patches, forest clearings, waterways, ponds, and other biodiversity-friendly features of the production environment (FAO, 2019). The above-listed features are the critical elements of Nature-based Solutions (NbSs) that can be introduced in rural areas.

IUCN defines NbSs as actions to protect, sustainably manage and restore natural and modified ecosystems that address societal challenges effectively and adaptively, benefiting people and nature. NbSs respond to societal challenges through protecting, sustainable management, and restoring natural and modified ecosystems (IUCN, 2024). Well-designed NbSs can contribute to tackling climate change and biodiversity loss while supporting many other sustainable development goals, but poorly designed schemes can have adverse impacts. To realize the full potential of NbSs in the rural landscape, they should be part of systemic and strategic planning. Climate and environmentally friendly sustainable farming methods, protecting water, soil, air, and biodiversity, have been identified as a critical theme in new European Union documents (COM/2019/640, COM/2020/380). It envisages the restoration of degraded ecosystems in Europe through various measures, including the enhancement of landscape elements characterized by rich biodiversity on agricultural land. Mid-field trees are essential to rural landscapes, determining their resilience to climate change (especially drought). Their role in climate change mitigation was emphasized in the strategies of the European Green Deal, including the Biodiversity Strategy and the New Forest Strategy of the European Union 2030. The paper aims to show the significance of spatial planning and land management instruments (e.g., land consolidation) for enabling the development of a network of field trees as an element of NBSs in rural areas. Reference was made to the current planning practices applied with regard to field trees and field shrubs in Poland and Ukraine. The role of surveyors and new possibilities in this respect were discussed.

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2. MID-FIELD TREES – FORMS, FUNCTIONS, AND CURRENT NEEDS

With regard to the spatial forms in rural areas, several types of mid-field trees are distinguished (Bałazy et al., 2007; Zajączkowski, 2005; Kujawa et al., 2019): free-standing single trees and shrubs or small groups of them; linear trees, hedgerows, shelterbelts; mid-field coppices; estate greenery. The midland woodlots also include small woodlands of 0.1 to 5 ha (Bałazy et al., 2007).

Mid-field trees perform many important functions, providing a range of ecosystem services such as (Johnston et al., 2000; Aertsens et al., 2013; Lingxi et al., 2012; Tschardt et al., 2005):

- provisioning services: providing food, raw materials and medicines,
- regulating and supporting services: effects on microclimate (buffering extremes of temperature, precipitation, drought, and flooding), water retention, and carbon sequestration, among others, effects of the presence of hedges on biodiversity growth,
- cultural services: impact on human health and mental well-being, trees are an important component of the landscape heritage.

Rural areas in Poland are diversified in terms of spatial structure and economic conditions. They cover 93% of the country's total area and are inhabited by 39.8% of the country's population. The area of the country is 31.4 million hectares. Arable land constitutes 60.2% of the territory of the country. Half of it constitutes unique habitats disappearing in the European landscape. The average total area of a farm in Poland is 12.65 ha.

In Poland, as early as the 1820s, a regular and dense network of strip tree planting was created by Dezydery Chłapowski on his Turew estate in Greater Poland, which still exists today. Its purpose was, among other things, to protect crops from the wind.

A regionalization of afforestation needs was developed in 2005 in Poland (Zajączkowski, 2005). The basic criterion for this regionalization was the most important functions of afforestation in the agricultural landscape, primarily increasing the water retention of the environment, reducing water and wind erosion of soil, and increasing landscape biodiversity. Seventy regional units were distinguished, representing 12 types of afforestation needs (Fig. 1). Afforestation models have been developed for the distinguished typological units. Regions with the most urgent afforestation needs cover approx. 49.3% of Poland's area.

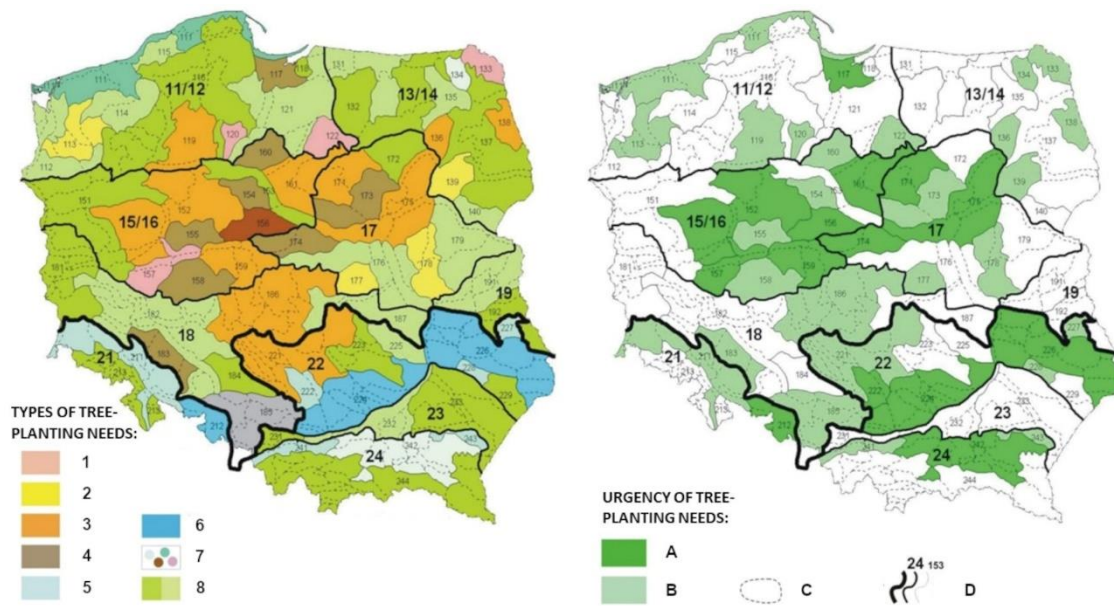


Fig. 1. Regionalisation of afforestation needs in Poland (Source: Zajęczkowski, 2005) 1. Improvement of hydrological conditions, 2. Reduction of wind erosion, 3. Improvement of hydrological conditions and reduction of wind erosion, 4. Improvement of hydrological and biocenosis conditions, 5. Water erosion prevention, 6. Water and wind erosion prevention, 7. Other needs, 8. Low afforestation needs due to increased resilience and low environmental risk; A. Very urgent tree-planting needs, B. Urgent tree-planting needs, C. Physical and geographical regions, D. Boundaries and numbers of lands, and arboreal districts

Ukraine is a large agrarian country. The area of the country is 60.3 million hectares. According to the official data (State Statistics Service of Ukraine, 2017), agricultural lands in Ukraine share 70% of the total country's area. These lands are home to some of the most fertile soils in the world – black earth (chernozem), which range from 15.6 million to 17.4 million hectares, representing around 8% of the world's reserves.

More than 6 million hectares of land are systematically exposed to wind erosion and as much as 20 million hectares to sandstorms. An important factor in the fight against wind erosion is the creation of a system of protective planting.

Protective afforestation in Ukraine has a long history and a rich tradition. Ukraine has a unique heritage of traditional windbreak systems with a high environmental, economic, and cultural potential (IUAF, 2024; EURAF, 2024)

At the beginning of the 19th century, V. Lomykovskyy developed a system of protective forest plantations within the territory of his estate in Poltava province. He created different types of protective plantations: windbreak systems on arable land, massive afforestation of the land unsuitable for agriculture, linear stands along roads, around gardens, settlements, and other objects. The steppe afforestation became fulfilled at the planning base at a national scale in the second half of the nineteenth century (Gładun, Lokhmatov. 2007). The windbreaks have been carried out on a regular basis by the state, regional, and local projects (Pylypenko et al., 2004).

Today, the total area of windbreaks is about 446,7 thousand ha and covers about 1,5% of arable land. They protect 13 million hectares of arable land and agricultural landscapes. The occurrence of protective planting is spatially differentiated. The average coverage of protective afforestation in Ukraine is 1.3 - 1.5%. The optimal coverage should be 3 - 4.5%, depending on the natural climatic zone. This means that for reliable protection of the agricultural landscape, the area of protective planting should increase 2-3 times (Pylypenko et al., 2004; RULES, 2020; IUAF, 2024; EURAF, 2024).

3. CURRENT PLANNING PRACTICES ENABLING THE DEVELOPMENT OF A NETWORK OF FIELD TREES AND THE NEW ROLE OF SURVEYORS

In spatial planning practices, mid-field trees as NbS elements can be considered at the scale of the municipality or individual villages.

In Poland, the functional and spatial structure of the municipality is defined in the documents developed at this level. However, there is no obligation to develop the NbS concept as a component of this structure in documents defining the spatial policy of municipalities. Local Spatial Development plans are developed only for selected areas of municipalities and villages in Poland. This contributes to increasing the role of Municipalities' Rural Development Plans and Villages' Rural Development Plans - optional, study-like documents developed for rural areas - and Land Consolidation (LC) projects as instruments for shaping and implementing NbS in rural areas.

The Municipality's Rural Development Plan is a planning study elaborated for the municipality area, developing the issues identified as priorities in strategic studies. In particular, it addresses agriculture, environmental protection, tourism, and recreation issues. The plan contains an analysis of the existing state of agricultural production space and the issues that directly or indirectly affect it. At the same time, it points out the need to carry out management and agricultural works, the implementation of which will contribute to increasing the efficiency of agricultural and forestry production. It also indicates possibilities of preserving and protecting natural and cultural values.

The arrangements and land management measures for rural areas in the municipalities included in the plan should be helpful and used by the local government in preparing their programming, planning, and design studies or creating municipal budgets for individual years. The findings should be reflected in Local Spatial Development plans for individual villages (DBGiTR, 2024).

Land consolidation works, by changing the ownership structure of the area, provide a unique opportunity to undertake rural landscape-shaping activities, including the introduction of NbS. Landscape shaping in the process of LC is mainly carried out by creating spatial and legal conditions for the desired forms of land use.

LC has a long tradition in Poland. In 2023, the 100th anniversary of the passing of the Act on Land Consolidation and Exchange by the Polish Parliament was celebrated. The need for LC

works is estimated at 7.1 mln ha, constituting approximately 69% of the area of arable land of family farms in the country (Pijanowski (ed.), 2019). Depending on the region, they are respectively larger or smaller. The greatest needs concern the country's southern, south-eastern, and central parts due to the small surface area of plots and their high dispersal. In 2022, LC works were implemented in Poland on 30 228 ha, comprising 39 LC areas and 19 737 LC participants (source: Polish Ministry of Agriculture and Rural Development).

An essential role of LC in preparing rural areas for climate change is the possibility of adapting land to create windbreaks (Pijanowski (ed.), 2021). However, so far, the possibility of implementing design concepts, included in the assumptions of LC projects, related to the introduction of mid-field trees and shrubs meant that surveyors-designers of LC could propose the location of new plantings, mainly along existing and designed roads (Fig. 2 and Fig. 3).

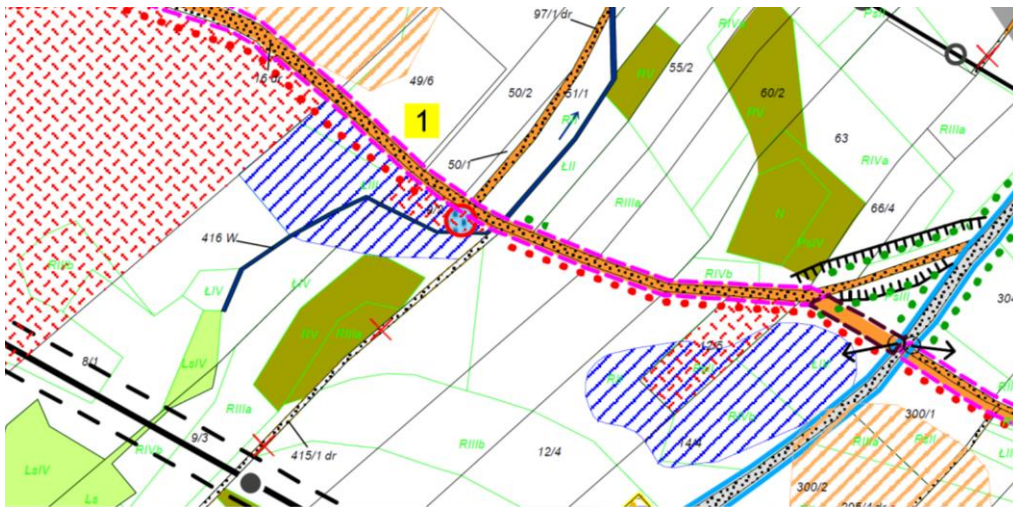


Fig. 2. Example of the location of newly designed tree planting along an access road to agricultural and forest land in the Assumptions of the LC Project for the village of Prusice in the Lower Silesian voivodeship in Poland (Source: Lower Silesian Office of Geodesy and Agricultural Areas (DBGiTR) in Wrocław, after Czarnecka, Rędzińska, 2022) (an excerpt from the map is shown, the newly designed trees are highlighted in red)



Fig. 3. Example of planting newly designed tree as part of post LC development in the village of Prusice in the Lower Silesian voivodship in Poland (Source: Lower Silesian Office of Geodesy and Agricultural Areas (DBGiTR) in Wrocław, after Czarnecka, Rędzińska, 2022)

In Poland, new opportunities for the introduction of NbS are provided by the Strategic Plan for the Common Agricultural Policy 2023-2027, which, under intervention I.10.8 "Land consolidation with post-consolidation development", provides project selection criteria concerning, in particular:

1. Investments contributing to water retention on agricultural land increase, such as small-scale water retention, including creating or restoring mid-field ponds, wetlands, or small water reservoirs. One or two points can be awarded for the presence of each of the listed solutions in the assumptions of the LC project.
2. Investments containing nature conservation and environmental protection measures, such as preserving vegetated slopes, preserving or delimiting shrubbery or mid-field shelterbelts, and delimiting buffer zones or field-forest borders. One point can be awarded for the presence of each of the listed solutions in the assumptions of the LC project.

The LC project shall be awarded funding if the operation scores a minimum of 13 points, of which at least 3 points are under the criteria set out above (WYTYCZNE, 2023).

The new regulations mean that surveyors - designers of the assumptions of the LC projects, will develop guidelines for the location, form, and function of mid-field trees, as NbS elements, in the LC area. It should be noted that LC projects are usually carried out by surveyors in Poland. The representatives of other disciplines are rarely part of the project teams.

Before the assumptions of the LC project are made, a mid-field trees study should be developed to complement the standard pre-project studies. The starting point for developing a mid-field trees study should be a municipality-wide analysis of afforestation needs. General principles for shaping mid-field trees in terms of location, form, and function as an element of NbS in such a study are presented by Czarnecka and Rędzińska (2022).

Since 1991, land reform has been going on in Ukraine. The state form of land ownership has been demonopolized. The lands of almost 12,000 socialist collective farms were reformed, and 6.77 million peasants acquired land rights (Martyn et al., 2022). As a result of privatization, each former collective farm worker or pensioner received four land plots of different types and functions. Martyn et al. (2022) indicate that landowners usually do not have long-term plans to use their land plots independently. Their economic interests are limited to the transfer of land for use on leaseholds. As a result of the reform, effective land management became difficult. The fields, which used to be a single technological array, are today a collection of several dozen separate land plots whose owners have different interests and, therefore, are almost never able to reach a consensus on the issue of sharing the entire land array. The mass privatization of land and the reorganization of state-owned agricultural entities have also resulted in the problem of land fragmentation - more than six million owners of plots of 1-4 ha have emerged (STRATEGY, 2017).

There is a current need to introduce a modern and effective land consolidation mechanism in Ukraine. Ukraine's land legislation does not contain a sufficiently effective mechanism to ensure land consolidation. It needs to be advanced in order to improve the spatial conditions to achieve more efficient multifunctional use of rural areas (Martyn et al., 2022). New legal solutions should enable the achievement of the goals of sustainable development of rural areas as well as environmental policies. They should ensure the adaptation of the land use system to climate change and provide the opportunity to undertake rural landscape-shaping activities, including the replenishment of shelterbelts as NbS elements.

Ukrainian experts agree that existing shelterbelts are in poor condition. The main reason for this was the lack of legal regulation of the status of protective afforestation in Ukraine after 1990. There have been no conservation and maintenance activities in these areas. The shelterbelts often became a habitat for weeds, a place for grazing livestock, and dumping grounds for rubbish.

In July 2020, a resolution of the Cabinet of Ministers of Ukraine approved the 'Principles of Maintenance and Preservation of Shelterbelts on Rural Land.' (RULES, 2020). It is planned to digitize those spatial structures in order to monitor their condition. Active work on the registration of protective afforestation in the State Land Cadastre is underway.

4. SUMMARY AND CONCLUSIONS

The process of land consolidation became an essential tool for the introduction of NbS in Poland. New opportunities in this respect are related to the "Land consolidation with post-consolidation development" intervention implemented within the Strategic Plan for the Common Agricultural Policy 2023-2027 framework.

Strategic planning of mid-field afforestation, as an element of the NbS, should include the development of a mid-field trees study as a component of the Municipality's Rural Development Plan. Such a study should be the initial material for the surveyor during his work on the assumptions of the land consolidation project. When such a study does not exist, the surveyor – the designer of the LC project - may independently develop general guidelines for shaping mid-field afforestation in terms of their location, form, and function. Such a study may be developed as part of the pre-project studies prepared to develop assumptions for the land consolidation project.

In Ukraine, new possibilities for shelterbelt network replenishment occurred in 2020 when the new legal solutions entitled the 'Principles of Maintenance and Preservation of Shelterbelts on Rural Land' were approved. The digitalization and registration of protective afforestation in Land Cadastre have started.

The introduction of a modern and effective land consolidation mechanism in Ukraine should ensure the adaptation of the land use system to climate change and provide the opportunity to undertake rural landscape-shaping activities, including the replenishment of shelterbelts as NbS elements. The surveyors' role in this process could be crucial.

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BIOGRAPHICAL NOTES

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