

MID-FIELD WOODLOTS AS A SUBSTITUTE FOR FORESTS IN AGRICULTURAL AREAS - THE IMPACT ON ENVIRONMENT AND TOURISM

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Abstract

In vast agricultural areas, afforestation systems - mid-field, roadside, waterside and others - are a necessary "substitute" for former natural forest complexes. They contributed to preserving the ecological balance in areas intensely anthropogenically transformed centuries ago. Systemically introduced and constantly maintained, they bring many benefits for people and the environment - they fulfil several diverse functions - from biological and technical to aesthetic and social. Afforestation strongly impacts the climate, translating into economic efficiency in agricultural areas; it significantly reduces environmental pollution (phytoremediation); they have a biocenosis function (shaping specific biotopes); they positively affect landscape physiognomy. In Europe, the protection of landscape and natural resources is implemented through several legal acts at the level of EU legislation and individual countries. In 2020, the European Commission published a biodiversity strategy for protecting and restoring nature in the European Union by 2030. The document also refers to mid-field plantings because this issue remains at a different level in individual countries.

Key words: Mid-field afforestation, ecological corridors, environmental impact, rural areas, recreation and tourism values, woodlots

Introduction

A necessary "substitute" for former natural forest complexes in vast agricultural areas are the systems of plantings - mid-field, roadside, waterside and others. Afforestation contributed to preserving the ecological balance in areas heavily transformed by man centuries ago. Systemically introduced and constantly maintained, they bring many benefits for people and the environment - they fulfil several diverse functions, closely related to each other - from biological, technical, aesthetic, and social [e.g. Hejmanowski et al. 1964; Niemirski 1973]. Afforestation strongly impacts the climate and contributes to limiting wind erosion, translating into economic efficiency in agricultural areas (Hejmanowski et al. 1964; Strzelecki, Sobczak 1972; Niemirski 1973; Karg 2003). Afforestation improves the water balance - increasing air and soil humidity (by limiting evaporation and surface runoff) and water storage (increasing soil retention). It is estimated that thanks to a properly shaped network of woodlots, Poland's so-called available water resources increased by approx. 3 km³ (Karg, Karlik 1993), essential in the face of existing deficits. They significantly contribute to reducing environmental pollution (phytoremediation), e.g. by reducing dust concentrations and gaseous air pollutants, e.g. CO, NO₂, NH₃ (Niemirski 1973; Bell, Treshow 2004; Sadowiec, Gawroński 2013). In agricultural areas, the biocenotic function (forming specific biotopes) is marked, contributing to maintaining the ecological balance in a given area (Karg 2003). The fragmentation of the natural environment is one of the greatest threats to many plant and animal species (isolation of plant and animal habitats). Woodlots, planted in a system, play the role of ecological corridors that enable the connection between populations (free migration of animals). Skillfully laid out in the landscape, midfield woodlots significantly affect its physiognomy (Łuczyńska-Bruzda 1995; Bogdanowski et al. 1979; Fortuna-Antoszkiewicz, Łukaszkiwicz 2016, 2017, 2018; Fortuna-Antoszkiewicz et al. 2018). Midfield woodlots' aesthetic (landscape) function becomes particularly important in flat, extensive areas with little forest cover. The monotony of fields is not a pleasant and exciting sight for everyone, which is especially important in developing agritourism. Appropriately shaped trees allow for the formation of clear landscape interiors or for, covering unattractive objects and views or exposing an attractive landscape. The change and variety of planting forms along the roads counteract the monotony and weariness of driving (Graffstein 1989).

In Europe, the protection of landscape and natural resources is implemented through several legal acts at the level of EU legislation (e.g. the European Landscape Convention, Journal of Laws of 2006 No. 14, item 98) and individual countries (e.g. in Poland: Act of April 16, 2004, on nature protection, Journal of Laws 2018, item 1614, as amended). In 2020, the European Commission published a biodiversity strategy for protecting and restoring nature in the European Union by 2030 (EU Biodiversity Strategy 2030: Bringing nature back to our lives [COM(2020)0380], of May 20, 2020). This

document also refers to mid-field plantings, e.g. by introducing and protecting landscape elements characterized by rich biodiversity on agricultural land, stopping and reversing the decline in pollinating insects, and planting 3 billion trees by 2030 (Resolution 2021). As of today, the situation in different countries is different.

Material and methods

In 2015-2022 (in continuation), the authors researched selected agricultural areas in central Poland (main research ground: Mazovia region). Afforestation of various types (including roadside, mid-field, mid-meadow, and waterside) was observed in terms of their distribution, spatial structure, and functioning - as an independent element or part of a more extensive area system. Observation of woodlots in a given area was used to assess their condition and the current structure of overall systems. At the same time, the history and tradition of introducing systemic afforestation in Poland were investigated - achievements, research facilities, and methods of implementation (archival query, literature review). It made it possible to identify the origin of the existing woodlots.

Results

The History. The establishment of protective midfield woodlots within the present borders of Poland dates back to the 16th century, when they appeared, for example, in Żuławy Wiślane (northern Poland) together with Dutch immigrants (Olędrzy) who settled there. Windbreak belts in the form of rows of willows by the ditches and among the fields, planted by the Olęders and their successors, were an inseparable element of the landscape of Żuławy until World War II. In other areas, documented tree planting on wastelands has been carried out since the 18th century, e.g. in 1768, the Gdańsk Nature Society announced a competition for the afforestation of shifting dunes that covered the Vistula estuary near Gdańsk and the surrounding settlements and forests. Intensive work was carried out in this area at the end of the 18th century. Inland dunes in Galicia (southern Poland) were afforested at a similar time. In Mazovia, the fixation of volatile sands was carried out throughout the 19th century (Strzelecki, Sobczak 1972). In Poland, the establishment of mid-field shelterbelts - as a panacea for stepping down deforested lowland areas and the low efficiency of agricultural crops - began at the beginning of the 19th century. It was initiated by General Dezydery Chłapowski, a Napoleonic officer, a pioneer of modern agriculture in Wielkopolska region - he developed and implemented in practice the principles of shaping the agricultural landscape. The general, after he practised in England (1818-1819), became a promoter of mid-field plantings, which contributed to the economic success of his estate in Turew and, this day, conducive to agriculture in this area (1954 - a research station of the Polish Academy of Sciences was established in Turew, where the focus was on issues concerning the role of midfield woodlots in the agricultural landscape and the assessment of their impact on the adjacent areas, 1992 - the Gen. D. Chłapowski Landscape Park was established in order to preserve the agricultural and natural heritage, including the system of mid-field woodlots).

Many publications on this subject were published in the 19th century and at the beginning of the 20th century. Appropriate species of trees and shrubs, including valuable fruit trees for roadside plantings, were widely promoted (Fortuna-Antoszkiewicz, Łukaszewicz 2012, 2017). The 20th century is a time of extensive actions to plant protective midfield woodlots (in the wasteland) and mid-field (agricultural areas) nationwide. In the 1920s, public space was regulated and beautified, including planting trees in cities, towns, villages and agricultural areas. In the 1930s, Prof. Adam Wodiczko, chairman of the State Council for Nature Conservation branch in Poznań, postulated the so-called "landscape cultivation" with woodlots as the ultimate goal of practical nature conservation. In the interwar period, one of Poland's most significant actions was organized in 1920-1930, "Days of the forest and afforestation" - about 5.5 million trees were planted at that time, i.e. about 1/3 of today's afforestation resources (excluding poplars). The years after World War II saw massive planting of agricultural land and urbanized areas (e.g. industrial zones and housing estates). In Poland, from 1945-1966, afforestation and artificial regeneration were carried out on an area of 2,860.5 ha (Statistical Yearbook of Forestry and Wood Industry 1966). In the first period, the works were carried out without adequate support (material, equipment and financial), resulting in losses in plantings or poor quality. From the 1960s to the 1980s, woodlots were established methodically throughout the country, based on developed research and material facilities (fig 1, fig. 2) (e.g. Industry standard (BN-76) 9212-02; Strzelecki, Sobczak 1972; Hejmanowski 1975; Zajączkowski, Górka 1979).



Fig. 1: A plantation of trees intended for roadside, mid-field and other afforestation Fig. 2: An example of a young tree stand: a regular, 1-row, 1-storey form

(source: Album on the occasion of the National Tree Arrangement Meeting, Kielce, September 14-15, 1964)

Field research. The following were identified at the research grounds (agricultural areas of Mazowsze): various types of afforestation - waterside, mid-field, roadside, mid-meadow-pasture, homestead; various forms of afforestation - single, group, row, strip and surface. In general, gradual degradation of the existing resources of mid-field woodlots is observed - these are mainly projects from the 1960s and 1970s, occasionally older (age: 100 years and more). Particular structures (so-called afforestation complex) in many locations are characterized by ageing plant material (trees and shrubs in the mature and senile stages, e.g. *Populus xcanadensis* 'Marilandica' *Populus xeuroamericana* Guiner, *Populus xberolinensis* (K. Koch) Dippel 'Berlin', *Malus* sp., *Pyrus* sp.) and apparent defects in plantings (loss of continuity) and lack of additions. In the first place, trees built of short-lived species and varieties (e.g. *Populus nigra* L. 'Italica', *Populus simonii* Carrière 'Fastigiata', *Populus xcanadensis* Moench, fruit trees) disappear. There is an evident fragmentation of the tree system, often by cutting/removing subsequent sections (the most common reason: lack of maintenance, change of land function, new investments). In larger areas, there is a lack of continuation of systemic afforestation. New plantings are introduced sporadically, mainly in sectional roadside plantings. In the case of this form, additions are made (e.g. with *Tilia* sp.), but only locally and object-wise (e.g. selected historic alleys). A similar problem appears in other regions of the country.

Discussion

The situation is different in other European countries. England, which has been a leader in this field since the 17th century (Fortuna-Antoszkiewicz, Łukasziewicz 2016), represents a model level of development and permanent maintenance of comprehensive, coherent systems of mid-field woodlots (Fig. 3). Looking at the resources of other countries, such as the Czech Republic, Denmark, Germany, it can be concluded that the maintenance of mid-field, roadside and other woodlots is a standard for shaping and using rural areas. There is a constant presence of mature and older woodlots, which are controlled and protected, as well as activities consisting of their supplementation and renewal and the successive introduction of new plantings (Fig. 4) (Fortuna-Antoszkiewicz et al. 2019).

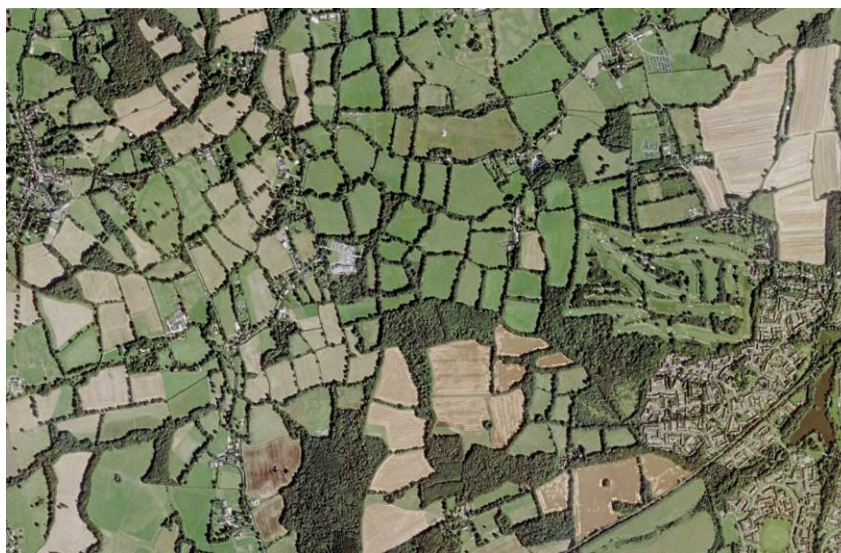


Fig. 3: A developed system of mid-field shelterbelts, southern England, county Surrey - west from Crawley, 2012 (source: GoogleEarth, height: 4,0 km)



Fig. 4: Renewal and establishment of new mid-field shelterbelts, Moravia (photo B. Fortuna-Antoszkiewicz, 2019)

Conclusion

- Historically - agricultural areas in Poland are characterized by a high level of implementation of mid-field planting systems. Documented origins date back to the 16th century; the first major comprehensive implementations took place in the first half of the 19th century; The 19th/20th century and the first decades of the 20th century were a time of intensification of activities; the period after World War II until the 1980s - planned planting of trees in the country.
- The end of the 20th century (economic crisis, political changes) and the beginning of the 21st century brought an evident slowdown in activities in this area.
- Author's research has shown that in selected areas (agricultural areas of Mazovia), gradual degradation of the existing resources of mid-field woodlots is observed (ageing of trees and shrubs, planting losses and lack of supplementation; cutting/removal of individual structures), and above all, the lack of systemic continuation (no new plantings). A similar problem appears in other regions of the country.
- Meanwhile, the lack of action may lead to the **disappearance of systemic midfield woodlots** in a given area, which results in an imbalance in ecological balance and a reduction in biodiversity (environmental aspect) and a decrease in agricultural production efficiency (economic aspect).
- **Disappearance of systemic midfield woodlots** also leads to the deformation of cultural landscapes, i.e., lowering their physiognomic value and, thus, the tourist attractiveness of a given region (social and economic aspects).

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Souhrn

V rozsáhlých zemědělských oblastech jsou systémy zalesnění - středoplošné, silniční, vodní a další - nezbytnou "náhradou" za bývalé přirozené lesní komplexy. Přispěly k zachování ekologické rovnováhy v oblastech intenzivně antropogenně přeměněných před staletími. Systematicky zaváděné a trvale udržované přinášejí lidem a životnímu prostředí řadu výhod - plní několik rozmanitých funkcí - od biologických a technických až po estetické a sociální. Zalesňování silně ovlivňuje klima, což se promítá do ekonomické efektivity zemědělských oblastí; významně snižuje znečištění životního prostředí (fytoremediací); plní funkci biocenózy (utváření specifických biotopů); pozitivně ovlivňuje

fyzionomii krajiny. V Evropě je ochrana krajiny a přírodních zdrojů realizována prostřednictvím několika právních předpisů na úrovni legislativy EU i jednotlivých zemí. V roce 2020 zveřejnila Evropská komise strategii ochrany a obnovy biodiverzity v Evropské unii do roku 2030. V dokumentu se hovoří i o střednědobých výsadbách, protože tato problematika zůstává v jednotlivých zemích na různé úrovni.

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