

CAN AGROFORESTRY SYSTEMS BE ORDINARY PRACTICES IN ROMANIA?

SISTEMELE AGROSILVICE POT FI PRACTICI OBIȘNUITE ÎN ROMÂNIA?

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Abstract. Agroforestry system seems to be necessary in Romania because the climate has undergone important changes and some of ecosystems are degraded; agroforestry systems ensuring the long-term enhancement of environmental quality. There are some types of agro-forestry that can be applied in Romania, some have been applied to certain extent, others can be implemented for the first time. In the first category enters forestry shelterbelts for crops protection, pastures with trees, forestry shelterbelts for the protection of watercourses, the second includes other types of agroforestry systems among which it is presented a case study "agroforestry hunting system" which have been developed by smallholders farmers.

Key words: agroforestry, forest shelterbelts, "agroforestry hunting", support measures

Rezumat. Agro-silvicultura este necesară în România deoarece climatul a suferit schimbări importante și unele ecosisteme sunt degradate; sistemele agro-silvice asigurând îmbunătățirea pe termen lung a calității mediului. Există câteva tipuri de agro-silvicultură care pot fi aplicate în România, unele au fost aplicate într-o anumită măsură, altele pot fi implementate pentru prima dată. În prima categorie intră perdelele forestiere pentru protecția culturilor, pășuni cu arbori, perdele forestiere de protecție a cursurilor de apă, în categoria următoare se includ alte tipuri de sisteme agro-silvice printre care este prezentat un studiu de caz privind "sistem agro-silvic pentru vânătoare" care a fost dezvoltat de către mici fermieri.

Cuvinte cheie: agrosilvicultură, perdele forestiere, "sisteme agrosilvice pentru vânătoare", măsuri de sprijin

INTRODUCTION

According to the European Agroforestry Federation (EURAF), the main institution from Europe dealing with agroforestry, agroforestry means "the integration of woody vegetation, crops and/or livestock in the same area of land. Woody vegetation can be inside parcels or on the boundaries (hedges)". In Romania, agroforestry systems are an old practice (the combining the trees with crop and/or animals have been practiced over time, in various forms) and, in the same time, are a new concept (not fully understood and not perceived as independent science like in many countries in the world). The main types of

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agroforestry systems find in Romania with ecological, economic and social impact are: forestry shelterbelts for crops protection, forestry shelterbelts for the protection of the main rivers, pastures with trees, taungya system. There are some other forms of association forestry vegetation and crops and/or animals such as: specialized farms on non-timber products (e.g. the harvesting of seeds, flowers from trees, honey by bee-keeping, mushrooms) or agroforestry hunting which have been developed through the initiative of some farmers and particularly smallholders. They have not yet a regional or national character but could be relevant for implementation of agroforestry system. (Mosquera-Losada *et al*, 2018).

MATERIAL AND METHODS

In order to present a summary of the main types of agroforestry systems in Romania was based on the consultation of relevant works and on the results of its own researches.

For the majority of localities in the south of the country it has designed the forestry shelterbelts for crop protection. The forestry shelterbelts were placed using GIS-specific techniques. For practical reasons, the network of forestry shelterbelts was designed on the contour of the agricultural land, at average distances of approximately 600 m between the main forestry shelterbelts and 1200 m between the secondary forestry shelterbelts, with a width of 10 m.

Forest belts for protection of the water courses (riparian buffer strips) were designed by analysing of the main watercourses to show the area occupied with forest vegetation in a corridor of 1,5 km width of one side and another using the GIS method. After that we delimited the alluvial soils from the waterside (haplic fluvisols, dystric fluvisols, eutric cambisols). Within the area occupied by alluvial soils, they were divided the land areas without forest vegetation and those with forest vegetation were.

In the area of Nămolosa, Galati County, the territory at the confluence of the Lower Siret Plain in the north-eastern extremity of Romanian Plain and Siret Valley, a private entrepreneur has applied the following agroforestry system adapted to the requirements of hunting, namely, for the growth, spreading and "exploitation" of the pheasants, partridges and rabbits. They were chosen marginal land and / or marking the ditches and irrigation channels. The form of ownership has been agreed with owners or land exchange was used.

The structure and form of the combined crops have been established according to three functional criteria in relation to the requirements for the growth, development and harvesting of game (hunting) stock, and are presented below.

Type 1: The recovery by the chase of the stocks of hunting, grown and fed into agro-forestry strip areas. The system for capitalizing the game hunting is given the example of 1 year agro-forestry culture installed in November, 2017 (fig. 1).

Scheme black pine planting rows is 2.0 x 1.0 m. By turn, 3 pieces of black pine are interwoven with 5 specimens of shrubs of the species: rosehip, turkey cork, cherry-plum. The same interlacing system: 3 specimens of the main species with 5 seedlings of shrubs were also used on the black and honey locust for planting device where the planting pattern is 1.5 x 1.0 m. A corn harvest (unrecorded) was added to the forest culture and an alfalfa crop with red clover of the same width. The band created has a width of 31-32 m and a length of 600 m. Routine maintenance was performed with the manually trailed tillers. For the main species, the 4.0 x 1.0 m scheme was also chosen.

Type 2: The system for the growth and development of the stocks of hunting, providing protection areas for food and nesting, the way of realizing the agro-forestry

belts is the same (fig. 2). The changes occur in the arrangement of adjacent crops. Next to the belt, two strips with a width of 5 m are created with a biannual plant seed variety: in, mustard, coriander, poppy, hemp, millet chicory, sunflower, Calle cabbage, etc. After these two strips, continue with 2 strips of "big" crops: sunflower or maize (rotation at 2 years). In such areas, hunting is only allowed selectively for mature pheasants. These areas have also been created around the lofts of growth where pheasant chickens are raised intensively, until a certain age, after which these lofts are dismantled and their location moves.

Type 3: Special system for breeding and development of partridges

The agricultural part of the system is similar to Case 2, only the forestry component changes structurally (fig. 3). The rows with the main species in this case, the black and honey locust to which it was proposed mulberry tree, become central rows with planting scheme of 2.0 x 1.0 m, and on each side of this axis are planted 5 rows of shrubs with the scheme of 1.10 x 1.0 m.

RESULTS AND DISCUSSION

The forestry shelterbelts for crops protection are the most visible type of agroforestry system promoted by government institutions (central public authorities, research institutes), without being supported by appropriate financial measures. Their achievement is done by both owners and administrators of agricultural land, pastures, farms, either individuals or companies.

The south (The Romanian Plain and Dobrogea), but also agricultural areas in the western and eastern parts of the country are affected by climate change. The analyzed areas are characterized by average annual temperatures of about 11°C, average annual precipitation below 500 mm and de Martonne aridity index between 20 and 23, thus the shelterbelts were designed to improve the conditions for the growth of crops, to increase fertility and soil conservation. In the southern area of the country, the network of forestry shelterbelts would cover about 87,200 ha, which will protect about 3,500,000 ha of agricultural lands (crops and pastures). This result in an approximate percentage of occupancy of agricultural land with forest vegetation of 2-3%. Different forest species were used such as *Quercus* sp. *Ulmus pumila*, *Fraxinus ornus*, *Pyrus pyraster*, *Tilia tomentosa*, *Eleagnus angustifolia*, *Acer platanoides*, *Prunus cerasifera*, shrubs have been used to ensure biodiversity. The forestry plantations to be installed within this agroforestry system will store an appreciable amount of carbon solution which comes in the context of efforts to reduce greenhouse gas content.

First researches and recommendations on the establishment of **forest belts for protection of the watercourses (riparian buffer strips)** (Siret, Ialomita, Arges, Olt, Jiu, Mures) have been made since the 50s of the last century.

The analysis of the main watercourses showed that the area occupied with forest vegetation in a corridor of 1.5 km width of one side and another is relatively small (ranging from 10.21% for the Siret River to 26.77 % in the case of the Jiu River). The small percentage of forest vegetation was due to its systematic removal and use of land for the extension of agricultural land or, recently for the development of living areas close to river. The lack of forest vegetation have a great ecological impact, increasing the share of agricultural land

near the watercourse. For instance, the areas where forest belts for water-protection are required vary from 124,054 ha (19.39%) for Mures River, to 3,702 ha (0.58%) for Tisa River (fig. 4).

The first stage in the realization of forest belts for water protection consists in the particular analysis of each water course in terms of climatic and site conditions, the presence or absence of forest vegetation and the main functions of these forest protective belts (bank stabilization, filtering pollutants etc.).

Pastures with trees, the most representative type of silvopastoral systems have a long tradition in our country as in many other countries. During the period between the 50s and 80s of the last century, they developed in an organized manner, and the silvopastoral management followed to harmonize the economic, social and environmental requirements. Currently, many of them are degraded.

Agroforestry Hunting System: Case Study

Type 1: Replenishments will be done with black pine because this species through its low form ensures pheasant shelter against predators: jackal and fox. In the plantation executed in autumn 2016, in an intensive hunt with chase, were shot in the winter of 2017, 200 samples / day. At present, 3500 samples currently has on 150 ha, in which 20 ha of such crops have already been created. Harvest on this hunting fund was 1000 samples of pheasant in the conditions in which only 1100 samples were collected in the whole Galați County, in year 2017.

Type 2 an 3. Areas of feeding with biannual herbaceous plants and large crops remain unchanged as position and structure. Given that the current fund has a yield of 60-100 samples / year, is expected to reach the end, at a production of 15,000 - 20,000 samples./year, at the time of closure of the entire network.

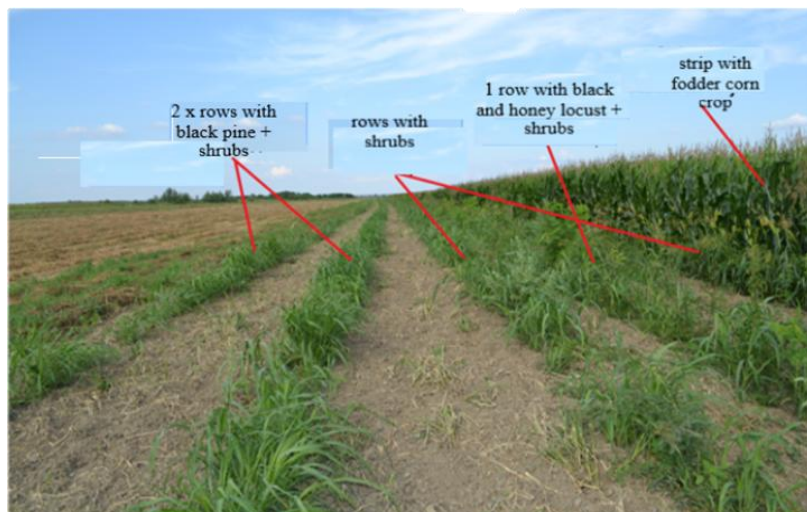


Fig. 1 Type of forest shelter-belt with crops to grown, feed and stock the pheasants for hunting



Fig. 2 The agro-forest system to growth and development the flocks of pheasants

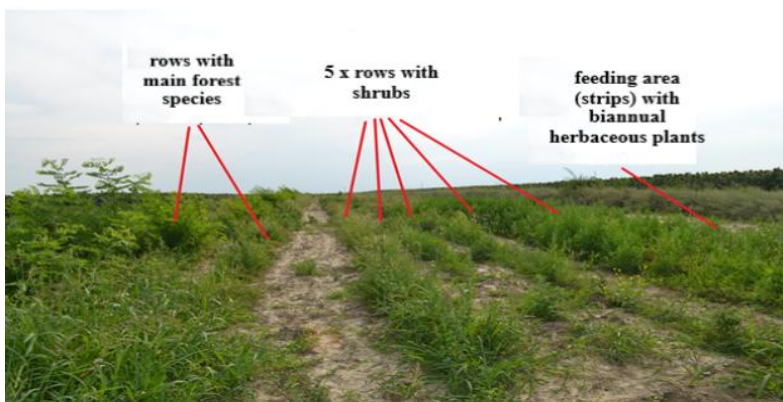


Fig. 3 The special agro-forest system for breeding and development of partridges

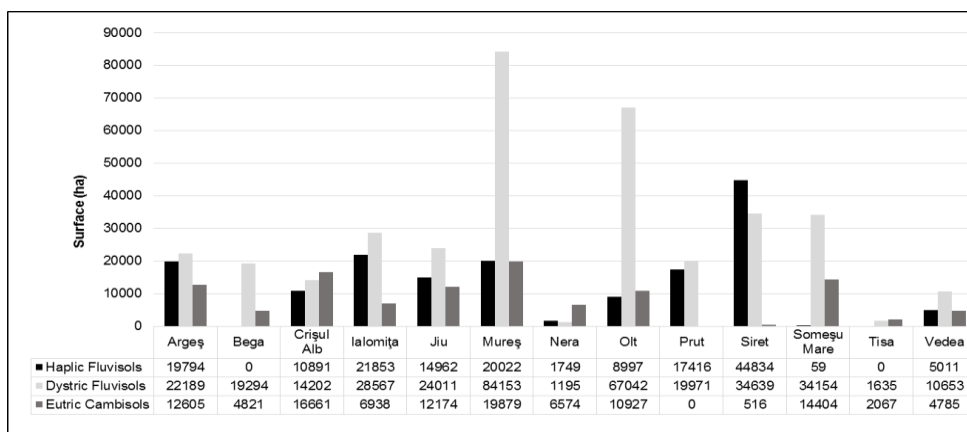


Fig. 4 Areas that need to be forested on a 1.5 km corridor both sides of main rivers (Costăchescu *et al.* 2010, Blujdea *et al.* 2012, Mihăilă *et al.* 2010, Ionescu *et al.* 1960, Sabău and Pană 1955, Motcă *et al.* 1994).

CONCLUSION

At EU level there are measures to support agroforestry systems. Instead, in our country only some institutions (central public authorities, research institutes) and some people promote the agroforestry systems such as forestry shelterbelts for crop and water protection. There was a national project for studying agroforestry systems and there is another project on agroforestry systems in which there are intention to create certain models of agroforestry systems as a means of mitigate the effects of climate change. Higher education institutions with the forestry specialty also included agroforestry systems discipline in the curriculum. Very important is that some farmers and especially smallholders realised their own agroforestry systems.

But little has happened to support AGROFORESTRY from policy point of view. There are only one measure in our *National Rural Development Programme* which support the afforestation in agricultural land. In this case copses and forestry shelterbelts could get supports.

For the promotion of agroforestry systems it is necessary to implement some specific and clear financing support measures, followed by good practice manuals for their application. Landowners must be convinced that agroforestry systems are not supposed to replace stable, specialized and productive systems, but only to improve those that are less productive and located in drought areas.

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