

STUDY ON THE IMPORTANCE OF PROTECTION CURTAINS IN THE SUSTAINABLE DEVELOPMENT OF THE RURAL AREA

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Abstract: *Achieving sustainable development necessitates finding a equilibrium between the imperative for ongoing economic and social progress and the safeguarding and enhancement of the environmental condition. This equilibrium is crucial to guarantee the well-being of both current and future generations. In recent years, Romania has been faced with major disasters that have brought the issue of natural risks to the fore, and we believe that the establishment of forest protection curtains would be a particularly important component of the sustainable development of rural communities. The research aims to make a substantial contribution to knowledge in the field and to alert decision-makers to the role and importance of defences in the sustainable development of rural areas and beyond. Rural development and planning programmes should aim to increase forest cover through afforestation and the establishment of forest protection curtains.*

Key words: *sustainable development, forest protection curtains, rural areas*

INTRODUCTION

To solve the problems of environmental degradation and economic development is recommended transformation of nations' goals and policies to support sustainable development through out the world [3]. The promotion for the concept of **sustainable development** gained prominence during the 1992 United Nations World Conference on Sustainable Development held in Rio de Janeiro.

The concept of sustainable development is defined in the literature as follows: *"Humanity can achieve sustainable development - to ensure that present needs are met without compromising the ability of future generations to meet their own needs"*, Report of the UN World Commission on Environment and Development, known as the Brundtland Report, 1987 [1].

The rise in global average temperature is known as global warming, but climate change includes not only a change in average temperature, but also changes in various aspects of weather, such as wind patterns, amount and type of precipitation, and the type and frequency of extreme weather events. Climate change is the most global process facing mankind this century in terms of environmental protection [8].

With temperatures no longer predictable and controllable, ecosystems are threatened with extinction sooner or later and life becomes almost impossible. In addition to all these negative phenomena in our country, there has been massive uncontrolled deforestation in recent years. By reducing the area of forests, the possibilities of refreshing the air are reduced, ecosystems disappear and soil erosion increases [9,10]. The inequitable distribution of green cover in Romania, together with the need to conserve and retain rainwater and snow, as well as the need to reduce wind intensity, underlines the importance of creating forest protection curtains. This is particularly crucial in certain regions, such as the Bărăganului Plain, the Western Plain of the country and the southern part of Moldova [6].

In Romania, approximately 27% of the total area is covered by the forest fund, which means approximately 6.43 million hectares. Of these, 3% (about 200 thousand hectares) are registered as primary forests, and the remaining 97% consist of secondary forests and lands with forest vegetation. If we consider only ecologically functional forests, the degree of afforestation drops to only 23%. The percentage of afforestation in Romania is significantly lower than in other European countries with similar natural conditions (Slovakia 41%, Austria 47%, Bosnia 53%, Slovenia 57%), standing at approximately half of the proportion considered optimal for Romania (40 -45%) [4]. In the plains, excessive deforestation has generated phenomena such as aridification, excessive expansion of steppe areas and, in some places, even desertification processes, while in mountainous areas, massive soil erosion has become a significant problem. For this reason, we believe that it is absolutely necessary to expand the forests [7].

According to Law no. 289 of 2002, forest protection curtains are classified as follows: for the protection of agricultural land; anti-erosion; for the protection of communication and transport routes; for the protection of dykes and banks; for the protection of localities and various economic and social objectives [13]. In the period 1991-2012 in Romania, a total of 2036 hectares of protection curtains were established, of which 763 hectares on forest land and 1273 hectares on other land. According to Iacob, 2003 was considered a peak year for the installation of forest protection fences in Romania, with 116 ha in the state-owned forest and 498 ha on other land, of which: 186 ha in Vrancea county, 94 ha in Ialomita county, 29 ha in Olt County, 26 ha in Constanța county, 26 ha in Ilfov county, 25 ha in Buzău county, 20 ha in Dolj county, 20 ha in Dâmbovița County, 19 ha in Timiș county and so on [2].

MATERIALS AND METHODS

In terms of research methodology, the study started with scientific documentation. The scientific documentation is combined with direct documentation and consists of the analysis of the practical reality providing information on the field in which the topic under investigation is integrated. The analysis and interpretation of the data that characterise the practice of the field under study have outlined the problem that was the basis for the research. Since documentation is not only a necessary stage of the research but also a very important one for the knowledge of the scientific experience in the field under research, the secondary research was based both on electronic sources (databases available on various specialized websites, institutional websites) and printed sources (books, studies, guides, reference journals). The research itself also focused on the collection and analysis of information on the possibility of extending the protection curtains through European projects for the countryside in our country. The main method used is content analysis. The research was carried out within the Research Centre "Sustainable Rural Development" of the Faculty of Management and Rural Tourism of the University of Life Sciences "Regele Mihai I" in Timisoara. The Research Centre "Sustainable Rural Development" has as its activity/objective to carry out research in the field of economics and sustainable rural development, for teachers and students of all educational cycles: bachelor, master and PhD.

RESEARCH RESULTS

• **The importance of protection curtains in the sustainable development of rural area**

The protection curtains have a particularly important role in the sustainable development of the rural area by contributing to the protection of the environment, the

protection of agricultural land, protection against snow, extreme frost and wind, and last but not least the reduction of soil water losses.

The role of protection curtains in environmental protection. The environment is a material universe in which man as a human being satisfies his needs. In most cases, through his actions, man influences the environment through various actions: the expansion of cities, the increase in the number of thermal power stations, and gas installations, intensive industrialisation, and the production of vehicles, which pollute the air with carbon dioxide and harmful substances such as soot, hydrocarbons, sulphur and nitrogen compounds, lead and carcinogens.

In the plains areas with small areas of forest, the protection curtains have a particularly favorable influence on the environment, they have a role of *climate protection*.

Trees and shrubs in the **forest curtains attenuate noise**. The literature states that protection curtains can reduce noise by up to 10 decibels. In the US, a 30 m strip of forest along a road has been reported to reduce traffic noise by 8-11%.

The protection curtains have a *depolluting role*. Concerning chemical pollution, it is indicated that a stream of air polluted with sulphur dioxide at a concentration of 0.1 mg/m³ can be completely cleaned up by slowly passing through one hectare of forest. They also carry out microbial purification, particularly in coniferous curtains.

The protection curtains have a *recreational role* for the neighbouring population, provide a favorable environment for development a fauna, provide nesting conditions for useful birds, and create a favourable microclimate during summers with high temperatures [5].

The role of protection curtains in the protection of agricultural land. Trees and shrubs growing on or next to agricultural land are seen in modern agriculture as a hindrance, a loss of land or a factor reducing productivity. This view is narrow: from an agronomic point of view, trees or shrubs, in addition to their aesthetic value, produce many benefits which ultimately contribute to increased production.

The role of curtains against snow, extreme frost and wind. Snow curtains stop the snow from blowing away, which settles relatively evenly around the perimeter of the curtain, and have the following advantages:

- after the snow has melted, the ground is relatively evenly moistened in those areas enclosed by curtains

- the layer of snow deposited protects the plants from frost and thus indirectly contributes to increasing the harvest

- the soil does not freeze over a greater depth, but favours the deep infiltration of water resulting from snow melt, the best effect being provided by narrow semi-enclosable curtains, which allow a more even distribution of approximately 18-20 mm of water (snow equivalent) in the space between the curtains than in the open field. Soil moisture at a depth of 2 m in the space between the curtains is 1.2-4.58% higher than the open field (30 mm rainfall equivalent) through snow retention. The forestry curtains protecting agricultural land are planted perpendicular to the prevailing wind direction in the area. They are listed as main curtains which are geometrically linked together by secondary curtains.

Their role is to weaken the wind strength by about 25-50%, which is more noticeable near the curtain (20 m in front, compared to 50 m behind), but also at a distance of more than 200 m, where the speed is reduced by 25%, thus reducing plant transpiration.

Rigorous measurements have shown that a wind increases plant transpiration by 2-3 times, whereas a strong wind can increase it by almost 20 times.

The role of buffer curtains in reducing soil water losses. Protection curtains reduce the loss of soil water supply by evaporating 25-35% (45%) of the protected land.

They retain about 5-10 % (per ha 100-150 cm) of soil moisture (equivalent to about 300 tonnes of water/hectare) compared to unprotected land. Relative air humidity increases by 10-15% (30%) due to the resulting water vapour that is retained in the space between the curtains.

The presence of protection curtains prevents the spread of erosion caused by water or wind, limiting land degradation and reducing agricultural or horticultural yields. It also keeps water levels within constant limits, and protects communication routes and even rural areas from the imminent flooding that has occurred in recent years.

These represent only a few advantages of protection curtains, to which one may include their role as sources of *industrial and food products* (such as fruit, mushrooms, medicinal and apiculture products). Additionally, they contribute to enhancing living conditions, purifying the air, creating a more pleasant climate, beautifying the landscape, regulating water conditions, and supplying wood for diverse applications through forestry practices [5].

Possibilities for the extension of forest protection fences through EAFRD-funded programmes in Romania

The National Forest Fund, along with forest vegetation outside this fund, spans a combined area of 6,746,906 hectares. This accounts for 28.3% of the total National Forest Fund area, falling below the European average of 37.6% and the recommended optimal level for our country of 35%, as identified by the Institute of Forest Research and Management.

Although the distribution of landforms is relatively balanced within the National Land Fund, as far as the National Forest Fund is concerned, there is an uneven distribution of landforms, as follows: 52% of the areas owned by forests are in mountain areas, 37% in hilly areas and only 11% in lowland areas. Thus, there are counties where the forest area is less than 16%, and these counties are recognized as having a deficit of forests.

A crucial goal outlined in Romania's National Strategy for Sustainable Development - Horizons 2013-2020-2030 and its National Strategy on Climate Change is to increase the area covered by forests, which is also a national obligation and priority under the Forestry Code.

A crucial goal outlined in Romania's National Strategy for Sustainable Development - Horizons 2013-2020-2030 and its National Strategy on Climate Change is the expansion of forested areas. This objective is not only a national commitment but also a priority outlined in the Forestry Code.

This initiative, involving afforestation of both agricultural and non-agricultural land, aims to:

- Mitigate the concentration of Greenhouse Gases (GHG) in the atmosphere by sequestering carbon dioxide (CO₂),
- Diminish soil erosion,
- Enhance water retention in the soil,
- Strengthen the resilience of Romanian agriculture to climate change, marked by rising average annual temperatures and reduced rainfall.

Consequently, the establishment of forests, protection belts, or forest curtains on lowland agricultural or non-agricultural land is anticipated to yield positive impacts on the local climate. This will contribute to addressing the effects of excessive drought, improving the local climate, and regulating water and soil conditions by minimizing evaporation and transpiration processes in plants.

The forested areas to be created in mountain and hill areas will contribute to: reducing soil erosion, improving the soil's water retention capacity, and mitigating the risk of flooding and the negative effects of floods. The creation or expansion of woodland, in

addition to its positive influence on climatic conditions, also contributes to increasing local biological diversity by restoring habitats and ecosystems and creating transition zones for the development of insect, bird and mammal populations.

In addition to the positive influence on climatic conditions, newly created forests also contribute to increasing biological diversity at the local level by restoring habitats and ecosystems and creating transition zones favourable to the development of insect, bird and mammal populations.

In addition to their ecological function, forests also fulfil economic and social functions, providing goods and services for society, such as wood and non-wood products, recreation and landscape beautification, which complement the rationale of the afforestation measure [12].

In the financial year 2007-2013, the objective was to augment Romania's forested area through the implementation of *Measure 221*, which focused on the initial afforestation of agricultural land. This measure was executed under the National Rural Development Programme - NRDP 2007-2013.

The potential beneficiaries of Measure 221 from the PNDR 2007-2013 could obtain non-refundable financing for the establishment of protection forest curtains.

Investments of this type could be applied on agricultural land of at least 0.5 hectares, on which the forest plantation could be established. The established forest had to be maintained until it reached the age of exploitability, which could be up to 40 years.

Table 1.
The fund allocated for rural development through NRDP 2007-2013, in Euros

Measure	Public	Private	Total
	expenditure		
M 221	3,226,656	482,144	3,708,800
TOTAL NRDP	932,4804,232	2,635,436,614	11,960,240,846

Source: own processing after NRDP 2007-2013, September 2014 version

Table 2.
Situation of projects under the NRDP, 06.10.2016, in Euros

Measure	PROJECTS SUBMITTED		SELECTED PROJECTS		CONCLUDED CONTRACTS		PAYMENTS MADE	
	Number	published values	Number	published values	Number	published values	published values	
221	NRDP	52	4354839	40	3775661	16	1253365	510288
	Transferred from SAPARD	-	-	-	-	3	13796	11452
TOTAL NRDP		150944	18533168276	98249	7363836852	84507	5658386655	7830993770

Source: own processing according to [11]

Under Measure 221 "First afforestation of agricultural land" of the NDPDR 2007-2013, 52 projects were submitted, of which 40 were selected and only 16 contracted. Thus, until 06.10.2016, the payments made were in the amount of 510288 Euro, of which 11452 thousand Euro were payments that were made for projects transferred from the SAPARD Programme.

The financial allocation for the 2014-2020 National Rural Development Programme (RDP). Romania was allocated €8,015.6 million through the European Fund for Rural Development (EAFRD) for the execution of the 2014-2020 NRDP.

The suggestions for intervention measures and approximate EAFRD allocations pertained to **three categories of investment measures**, the first set concerned investments in **farms** and rural enterprises, the second set of investment measures concerned **climate and environment** and the third set concerned **knowledge transfer and information measures**.

The climate and environment measures, with a total allocated value of 2.387 billion euros, are the first set of measures. The overall sum of €2.387 billion, designated for climate and environmental measures, encompasses the subsequent initiatives: afforestation, creating forested areas and protection curtains- €105 million, agri-environmental and climate measures - €850 million, organic farming - €200 million, etc.

Through the National Rural Development Programme 2014-2020, the forestry sector benefits from an allocation of more than 105 million Euro under Measure M08 "Investments in the development of forest areas and improvement of forest viability".

This measure has the capacity to fund the afforestation of both agricultural and non-agricultural land, along with the establishment of forest protection fences. **This measure had the capacity to finance the afforestation of both agricultural and non-agricultural land, along with the establishment of protection forest curtains.**

Table 3.

Public allocation NRDP 2014-2020

Submeasure	Public allocation NRDP 2014-2020
Submeasure 8.1 ' <i>Afforestation and woodland creation</i> '.	21,786,653
TOTAL	12,698,518,374

Source: own processing after [14,15]

Table 4.

Status of implementation of NDPR 2014-2020 as of 09.06.2022, Submeasure 8.1 "Afforestation and woodland creation", Euro

Specify	Submeasure 8.1		TOTAL	
	No.	Value	No.	Value
Funding applications submitted	139	27,003,008	103,833	12,295,242,663
Selected funding applications	114	21,437,450	65,856	6,423,918,286
Contracts/Funding Decisions (ongoing and completed)	100	17,015,287	58,635	5,554,996,518
Contracts/Funding Decisions transferred through the transitional procedure*				
- Contracts/ Financing decisions (ongoing and finalised)	10	540,311	18,663	416,054,006
-Finalised Financing Contracts/Decisions	1	5,942	18,523	357,523,372
-Financing contracts/decisions terminated	1	30,878	7,229	42,141,461
Payments made	-	3,118,493	-	260,688
Payments made (transition)	-	7,838,982,489	-	889,930,951

Source: own processing after own processing after [14,15]

According to the **Status of implementation of RDP 2014-2020 on 09.06.2022**, on **Submeasure 8.1. "Afforestation and creation of wooded areas"** 139 applications for funding were submitted, of which 114 were selected, 100 were contracted and the payments made amounted to 3,118,493 Euro (Table 4).

The analysis of the implementation of the NRDP shows that European funding through the NRDP had a low impact on afforestation in Romania in both financial years analysed. In 2022, through the National Recovery and Resilience Plan, the funding guidelines for afforestation and reforestation were launched for public consultation, with the help of which 56,000 hectares (mandatory national target for the implementation period 2022–2026) will be afforested by 2026.

CONCLUSIONS

In the framework of sustainable agricultural development systems, new guidelines are emerging on: the planting of forestry hedgerows, which have numerous protective effects for crops: biodiversity, stability, limitation of insecticide use and biocenotic balance; cultivation and tillage on terraces to avoid the destructive effects of erosion, leaching and soil deterioration; minimum conservation tillage and no-tillage to avoid the destructive effects of drought and aridification; organic, unpolluted agriculture; ecological reconstruction on degraded agricultural land, etc., in the context of current climate change.

We believe that the need and opportunity to establish protective forestry barriers in Romania are particularly important factors in the sustainable development of rural communities, for the following reasons:

in the southern part of the country, aridisation is increasing, which is linked to the small area occupied by forests and to climate changes;

- in the southern part of the country, aridisation is increasing, which is linked to the small area occupied by forests and to climate changes;

- studies indicate the historical existence of a network of forest protection curtains that was destroyed due to deforestation. Therefore, the establishment of new forest protection curtains is imperative to protect agricultural crops. Considering the crucial role they play in growing crops, their positive impact on environmental, erosion control and the protection of infrastructure, roads and settlements, it becomes obvious that having forest protection curtains are not only very advantageous, but indispensable.

The installation of the protective forest curtains in Romania has the following main effects:

- help to reduce the diurnal and annual air temperature range, reduce wind speed, combat blizzards by retaining snow, reduce evapotranspiration and increase air humidity;

- the diurnal air temperature range is reduced by 1-4 degrees Celsius and the annual air temperature range by 1-2 degrees Celsius;

- the circumstances fostering the growth and development of agricultural crops are enhanced;

- enhance fertility, preserve soil, and mitigate soil erosion,

- reduce defoliation to a standstill, increase soil moisture, enrich soil humus, change soil pH due to surplus of organic matter in leaves and roots;

- contributes to an increase in the production of wood mass and forest by-products

- contributes to an increase in the area of woodland at local and national levels;

- play an important role in protecting economic and social objectives, as well as communication routes;

- create favourable conditions for the development of local fauna

- contribute to the enhancement of biodiversity in the region

- enhances the carbon stock and mitigates atmospheric carbon levels

- **contribute to reconstruction and improving the rural landscape, etc.**

Considering the uneven distribution of green cover in Romania against the backdrop of existing climate changes, it is imperative to create protective forest curtains.

European funding through the NRDP has had little impact on afforestation in Romania.

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