

AFFORESTATION IN RURAL DEVELOPMENT PROGRAMME AND ITS ROLE IN CHANGING LAND USE STRUCTURE

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The paper deals with EU financial support mechanisms for agricultural holdings (in terms of spatial differentiation) and includes the issues related to a range of activities within the Rural Development Plan/Programme [Polish: PROW] which were conducted between 2002 and 2004 (Rural Development Plan) and between 2007 and 2010 (Rural Development Programme 2007–2013) and with regard to the organisation and technological development of agriculture, i.e. afforestation. The research demonstrated serious territorial differences in the amount and structure of European funds acquired by agricultural holdings in *poviats* located in the Warmińsko-Mazurskie voivodeship. Two indices were used in the study: *poviat* activity (comparison of the number of applications submitted) and absorption of funds in agricultural holdings (comparison of the number of payments made) which were considered together as a composite index of EU fund utilisation, whereby the funds acquired in the periods of 2004–2006 and 2007–2010 were treated separately. A holistic analysis was also carried out and it included the entirety of European Programme Measures, with special attention paid to the differences between spatial patterns observed between 2004 and 2010 per 1 ha of forest. Additionally, a co-relation between *poviat* activity, payments made and forest land area was analysed. The study included also the relationship between the absorption index and the forest land area.

It has been shown that the Common Agricultural Policy [Polish: WPR] instruments dedicated for pro-ecological agricultural activities in *poviats* of the Warmińsko-Mazurskie voivodship – mostly with regard to afforestation – contribute to spatial changes in the land use structure.

Keywords: Rural Development Programme [PROW], afforestation, Common Agricultural Policy [WPR], Polish agriculture development.

INTRODUCTION

Polish accession to the European Union gave the Polish agriculture new opportunities which had been inaccessible until then. The development of the Polish agriculture is, to a large extent, due to the EU support for agricultural holdings – the support which provided the capital necessary for investment in modernisation. The development can be seen in a number of improved inherent features of agriculture and in reduced spatial disproportions between them (R. Rudnicki, 2013). In order to preserve the valuable agricultural landscape an array of EU-funded activities was implemented, among which there was a programme of agricultural land afforestation (Biczkowski, 2008).

This paper focuses on the presentation of the afforestation programme analysed both in the general (nation-wide) scope and with reference to *poviats* in the Warmińsko-Mazurskie voivodeship. According to Podstawka and Konieczny (2002), Polna (2006), Polna and Szczepański (2010), afforestation contributes not only to the improved environment, what with a more potent ecological potential of forest areas thanks to smaller fragmentation of forest complexes and ecological corridors, but also to people's better recreation and health.

In Biczkowski's opinion (2012) one of the important elements of the programme of agricultural land afforestation is its positive influence on the tree stand structure. Owing to differentiated rates, deciduous species have gained in significance, which should be acknowledged as a favourable phenomenon because of the domination of coniferous trees in Poland.

Global and local changes in the environment are among the reasons for the development of an extensive afforestation plan for Poland. The involvement of marginal soils into area under cultivation essentially results from the environmental functions of the forest. It refers to the following phenomena: positive effects on the national water balance; limitation of soil erosion processes and landscape desertification; elimination of chemical substances from water, air and soil; reduction of the greenhouse effect; ecological associations between ecologically-valuable areas. Those elements of environment protection which were deemed particularly vital were regulated by law in form of European directives. In Poland real territorial co-relations are fostered by Nature 2000 project and ECONET project, the latter of which was

implemented into the planning policy and development strategy of provinces (National Afforestation Programme 2003, Polish: *Krajowy Program Zwiększania Lesistości 2003*).

Previous studies dealt with the Rural Development Plan for 2004–2006, whereas for the purposes of this research data by the Agency for Restructuring and Modernisation of Agriculture (Polish: ARiMR) on the programme continued for 2007–2013 were used (data until 2010 were taken into consideration).

The author of this paper took advantage of the data collected by the Agency for Restructuring and Modernisation of Agriculture, with its 314 *poviat* offices treated as basic units of the spatial analysis.

RESEARCH AIM, SCOPE AND METHODS

The main aim of the research was to present, in spatial terms, the directions in which the European funds for the afforestation of agricultural land were absorbed within the already completed Rural Development Plan 2004 – 2006 and the ongoing Rural Development Programme 2007–2013 and to juxtapose them with the real needs for increased afforestation in Poland. The paper deals with the analysis of the factors affecting the amount of payments by beneficiaries of particular provinces for forms of pro-ecological land development (afforestation, natural land use, and support for protective measures). In order to determine the level of absorption of funds within the agricultural land afforestation in particular provinces in Poland, spatial co-relations were analysed on the basis of natural, urban and historical factors. Further, detailed analysis subjected the Warmińsko-Mazurskie voivodship, as the absorption levels were high here. For evaluative purposes, a comparative analysis was conducted, which was to investigate the project of agricultural land afforestation within the Rural Development Plan/Programme (2004–2006 and 2007–2010) in *poviats* of the Warmińsko-Mazurskie voivodship and to establish the afforestation increase rates with particular attention paid to those *poviats*, which are classified as having the best absorption of EU funds in Poland. Additionally, in the analysis of *poviats*, spatial co-relations were studied on the basis of natural, urban and historical factors. The associations of *poviat* activity, payments and forest land area were also examined. The relation between the absorption index and the forest land area was another subject of study.

The article presents the results of the analysis in form of choropleth maps and diagram maps performed by means of ArcGIS 10.1 software.

Characteristics of agricultural land afforestation programme

Land afforestation refers to enlargement of forest areas through afforestation of agricultural land; it was part of the Rural Development Plan 2004–2006 (afforestation of agricultural land of poor agricultural quality) and the Rural Development Programme 2007–2013 (the scope of land to be afforested included lands other than agricultural acreage). Altogether, within the programme under analysis, 15.3 thousand applications were made and 734 mln PLN were paid (Ogryzek and Rudnicki, 2013).

Financial aid covered the establishment of forest plantation, purchase and installation of wire mesh (support for afforestation), cultivation of a new forest plantation for the first five (5) years following planting (annual allowance to cover maintenance costs) and exclusion of land from agricultural cultivation (annual premium per hectare to cover loss of income resulting from afforestation).

Two afforestation strategies may be differentiated: (i) agricultural land afforestation and (ii) non-agricultural land afforestation. Strategy (i) involves afforestation of lands under agricultural cultivation – man-created forest areas (plantations). Aid within this area was dedicated for afforestation, cultivation of a new forest plantation and compensation for the loss of income due to afforestation (annual premium per hectare to cover loss of income resulting from afforestation). Strategy (ii) regards (support for afforestation and annual allowance to cover maintenance costs) exclusively the afforestation of abandoned agricultural land or other lands which should be afforested as that is a reasonably justified method of their management (e.g. protection against erosion). This strategy assumes the possibility of taking advantage of natural succession of the lands mentioned above. In the case of afforestation with indigenous dominant forest tree species in the course of natural succession, it was commonly agreed that the maximum age of the trees couldn't exceed twenty (20) years (class 1 of tree stand age) and the area occupied by trees and bushes should be over 50 %. If the area covered by tree crowns is smaller, it is admissible to adopt trees in the course of land preparation for afforestation (Rural Development Plan 2004–2006, Rural Development Programme 2007–2013).

- aid for afforestation of agricultural land: support for afforestation, in other words a one-off lump sum paid in compensation for the costs of afforestation and, in some cases, for forest plantation fencing, in the first year of plantation. Additionally, payments may be received for erection of two-metre high wire-mesh fencing for a new plantation as recommended by a forest manager. Farmer may also claim an annual allowance to cover maintenance costs, which is a lump sum paid per hectare of afforested land, but it is paid every year throughout the period of five (5) years. It is paid in such an amount that it covers the maintenance costs defined in the afforestation plan, including first and foremost: weeding, early cleaning and protection of seedlings against animals. Moreover, valid throughout a year, there is also a payment for implementation of individual measures recommended by a forest manager aiming at protection of a forest plantation against animals. Besides the annual allowance to cover maintenance costs, farmer is also entitled for the annual premium per hectare to cover loss of income resulting from afforestation, which is similarly in form of a lump sum. The latter is paid for a longer period than the former, as it is available for fifteen (15) years as of the establishment of a forest plantation. Only farmers who were able to submit documents proving that at least 25 % of their income is from agricultural activities could benefit from that premium.
- aid for afforestation of non-agricultural land consists of two tranches: support for afforestation and annual allowance to cover maintenance costs. This mechanism does not include the annual premium per hectare to cover loss of income

resulting from afforestation, because the land designated for forest plantation is not used for agricultural production, therefore there is no need to make any compensation for loss of income resulting from abandoning agricultural activity on particular land, as is the case in agricultural land afforestation.

The aid predicted in the measure ‘Afforestation of agricultural and non-agricultural land’ is dedicated for farmers cultivating land of a very poor soil quality which does not guarantee crops bringing decent profits. Afforestation of such land is, therefore, an opportunity for those farmers to have higher incomes than from purely agricultural production. The principles governing the allocation of funds within this measure, which were put in force by the amendment to the Regulation of Minister of Agriculture and Rural Development, underwent a few changes to farmers’ benefit. The most important of them relies in enlarging the maximum area of land designed for afforestation. According to the new legal provisions, one beneficiary, within the whole period covered by the Rural Development Programme 2007–2013, may plant forest over the area of up to 100 ha. Previous legal provisions allowed for afforestation of 20 ha at the most. Another significant change made it possible to afforest land of less than 0.5 ha if this land is adjacent to forest, whereby the minimal area of afforested land is 0.1 ha. Other changes introduced by the said amendment to the Regulation of Minister of Agriculture and Rural Development are connected with the method of measuring the inclination of land to be afforested and they make more precise the provisions related to application for support in case of legal succession.

The support for afforestation, the annual allowance to cover maintenance costs and the annual premium per hectare to cover loss of income resulting from afforestation are totally covered by the European Union (80 %) and country’s (20 %) public funds.

SPATIAL ANALYSES

On average, every hundredth agricultural holding took advantage of the aid for afforestation (1.17 %). That index oscillates from 0.35 % in the Małopolskie voivodeship, through 0.54 % in the Śląskie voivodeship, to 3.32 % in the Warmińsko-Mazurskie voivodeship. Bearing in mind different sizes of provinces and areas with the poorest soil, indices were worked out to demonstrate the number of applications submitted per 1,000 ha of class V and VI land. Farmers from the Podkarpackie voivodeship (7.9 applications per 1,000 ha of class V and VI land), the Świętokrzyskie voivodeship (6.4), the Warmińsko-Mazurskie voivodeship (4.4) and the Lubelskie voivodeship (4.0) contributed to the highest indices in Poland. Characteristically, all of those regions have rather small share of the poorest soils (below the national average). Therefore, there is no significant co-relation between the presence of the lowest quality soils and an increase in farmers’ interest in the analysed programme, which should be considered an unfavourable factor for development. In all the provinces where the share of class V and VI lands exceed 40 % of the total agricultural acreage, the number of applications made was between 1.3 and 2.6, while the average for Poland amounts to 2.7 per 1000 ha of the poorest land. Altogether 137.5 mln EUR (as of the end of 2010) were granted to the farmers who applied for the aid for afforestation, 35 % of which was paid to farmers from the two voivodships: Warmińsko-Mazurskie (EUR 25 mln or 18.2 % of the total of payments made in Poland) and Mazowieckie (23 mln EUR or 16.9 %) (Biczkowski and Rudnicki, 2013].

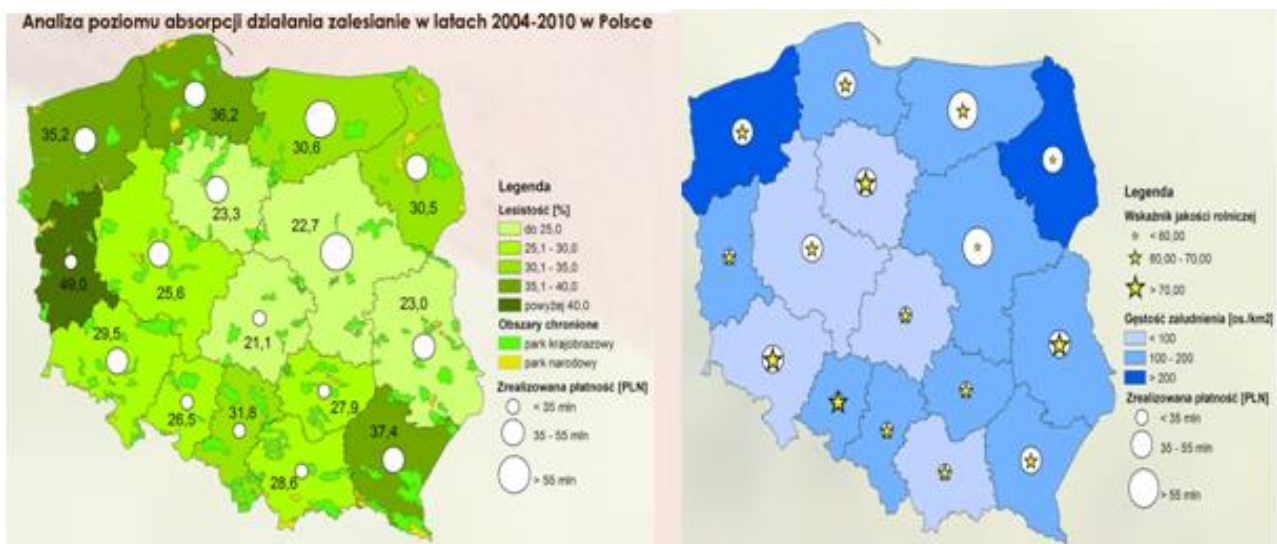


Figure 1. Analysis of absorption of aid for afforestation in Poland and major indices. Source: own study on the basis of data collected by Agency for Restructuring and Modernisation of Agriculture (Unpublished data from ARiMR)

Key (green):

Wood cover [%]: up to 25.0; 25.1 – 30.0; 30.1 – 35.0; 35.1 – 40.0; over 40.0

Protected areas: landscape park; national park

Payments made [PLN]: <35 mln; 35 – 55 mln; +55 mln

Key (blue):

agricultural production area quality index: <60.00; 60.00 – 70.00; >70.00

density [person/km²]: <100; 100 – 200; >200

payments made [PLN]: <35 mln; 35 – 55 mln; +55 mln

The largest subsidies within the afforestation programme were received by farmers in the Mazowieckie and Warmińsko-Mazurskie provinces, as in the diagram map in Fig. 1. The amount of subsidy within this measure is highly dependent on the share (%) of forest land in the total area and on the presence of areas under legal protection which cannot be afforested. A low agricultural production area quality index in a voivodeship translated into higher payments for afforestation. The quality of agricultural soils was also of importance. As a result of afforestation of land with a low soil quality class, the quality of that land improves. The payments are independent of urban conditions.

Between 2004 and 2010 Poland received 733,942,770 PLN for afforestation, with 18.69 % of the amount for the Warmińsko-Mazurskie voivodeship. There were 52 PLN per ha in Poland, but 144 PLN per ha in the Warmińsko-Mazurskie voivodeship. The afforestation programme, when compared with other programmes, did not enjoy high popularity in Poland, because the funds obtained within this measure did not exceed 3% of the total funds available within the Rural Development Programme. The lower average for Poland means a higher absorption of European subsidies. It is due to the fact that farmers from the Warmińsko-Mazurskie voivodeship met the formal requirements imposed on the applicants for large subsidies. But it could also result from stricter subsidy award conditions that had to be satisfied.

The Warmińsko-Mazurskie voivodeship is located in north-east Poland. It is the fourth largest region in Poland, with over 24 thousand km². The voivodeship was established in 1999 in consequence of countries' regionalisation and its borders included the areas of the former Olsztyn voivodeship, larger parts of the Elbląg and Suwałki provinces and fragments of the Toruń, Ciechanów and Ostrołęka provinces. According to the data collected by the Central Statistical Office [Polish: GUS] as of 1 January 2011, the area of the voivodeship was 24,173.47 km², which accounted for 7.7 % of the total area of Poland. It includes historical lands of Warmia, Mazury, Upper Prussia, Land of Lubawa, southern parts of Natangia and Barcja, parts of Powiśle and Żuławy Wiślane [delta area of the Vistula], as well as minor parts of the Region of Suwałki. The southern and eastern border of the Warmińsko-Mazurskie voivodeship almost entirely overlaps with historical borders of East Prussia, Duchy of Prussia and Royal Prussia. The highest number of applicants were noted in the *poviats* of Elbląg and Braniewo, the lowest number was recorded in the *poviat* of Mrągowo. However, upon the study of the number of decisions to grant subsidies, it can be observed that the highest number of positive decisions was in the case of the *poviat* of Elbląg (123 positive decisions per 633 applications submitted). Whereas the *poviat* of Mrągowo was the only *poviat* without any positive decision awarding a subsidy for afforestation. The highest application effectivity was in the *poviat* of Nidzica – nearly 30 % of all applications failed. On the other hand, the fewest correctly completed application forms were submitted in the *poviat* of Węgorzewo. Still, the most significant indices relate to the amounts granted (see Fig. 2).

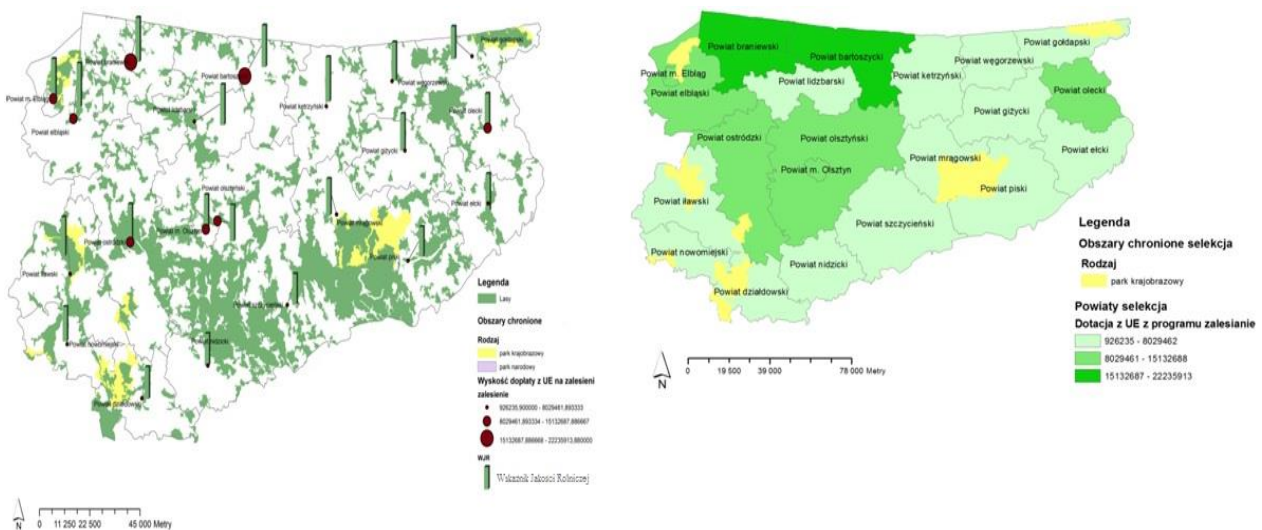


Figure 2. Spatial pattern of subsidies for afforestation granted between 2004 – 2010 (in total, PLN/ha) – spatial analysis. Source: own study on the basis of data collected by Agency for Restructuring and Modernisation of Agriculture (Unpublished data from ARiMR)

[Key (on the left):

Forests

Protected areas (kind): landscape park; national park

Amount of EU payment for afforestation

Agricultural production area quality index

Key (on the right):

Selected protected areas: landscape park

Selected *poviats*

EU subsidies within afforestation programme]

According to Wójcik (2013) out of the meeting of the traditional, local and the agrarian structures which emerge from the past but have already been modernised, on the one hand, and of what is new, created to cater for the needs of life in the countryside, on the other hand, a new valuable feature important for the social life in the countryside and in its cultural landscape will evolve. It seems that the studies conducted corroborate the thesis. The geographical location of the region, its history and farmers' new needs make the rural landscape undergo transformation. The increased wood cover is tantamount to a better quality of air. Numerous ecological corridors have been created to help animals migrate. Predictably, the characteristics of the countryside are changing in terms of its structure – it includes afforested plots. The programme under

analysis has also contributed to an increased number of people working in the sectors of agriculture, forestry and fisheries, which mitigated public dissatisfaction caused by a high unemployment rate and by the outflow of people at an economically productive age to towns, cities and abroad. In the Warmińsko-Mazurskie voivodeship the programme could have stimulated an increased functionality of the forest complex as a base of indigenous raw materials inevitable for industrial development.

RESULTS AND DISCUSSION

In the Warmińsko-Mazurskie voivodeship the number of applications for funds from the afforestation programme depended on the size of the *poviat* and, what was also true for Poland as a whole, on the number of forest areas. Additionally, in order to obtain more information on the absorption of EU funds, the funds granted were interpolated into pro-ecological measures. The results show that when farmers received funds from the programme for less-favoured areas or from the environmental management scheme, they did not receive support from the afforestation programme. The *poviat* of Braniewo was on the 11th position and the *poviat* of Bartoszyce was on the 17th position in the ranking of *poviats* most benefiting from measures related to pro-ecological activities. The co-relation coefficient between the difference of the forest area and the funds allocated to a particular *poviat* amounts to 0.50664 PLN/ha. It is a very high value, which demonstrates that funds dedicated to a particular area considerably contributed to changes in the forest area. The presence of various habitats and extensive forest complexes are favourable to preservation of many animal species. Numerous ecological corridors have been created to help animals migrate. The programme also led to an increased workforce in the sectors of agriculture, forestry and fisheries. In the Warmińsko-Mazurskie voivodeship the programme could have stimulated a higher functionality of the forest complex as a base of indigenous raw materials inevitable for industrial development. Afforestation is a proven form of CO₂ storage. Moreover, forests have mitigatory effects on the climate as they are part of the water cycle and they constitute biofilters acting against pollution. Forest soils in private forests in 2002 captured 9.7 mln tons of CO₂ – 6.3 ton/ha. The ecological functions of the afforested areas may be strengthened by re-creation of old and creation of new bonds between the existing forest complexes to maintain animal migration routes and ecological corridors. For example as a countermeasure to the greenhouse effect, afforestation in arid areas has been proposed and tested in an arid area of Western Australia (Suganuma, 2012). Similar conclusions have Tabakovic-Tosic and etc (2011) on the subject recultivation by reforestation in central Serbia. Thanks to the 'Afforestation of agricultural land' programme the agricultural structure, apart from agricultural acreage, includes also afforested plots. According to the Danes, who are the largest producers of coniferous trees, forest plantation on the poorest soils is more profitable than food production. A surge in the number of agritourism and ecological farms in the voivodship would stimulate full utilisation of the existing natural resources and natural assets. A dense network of rivers and lakes with uncontaminated water as well as large wood cover constitute a kind of natural capital. The income from tourism and compensatory aids may effectively make up for poor earning power of the land. What can help such areas are: multifunctional agriculture, multifunctional rural areas and sustainable development practised in many aspects of life. The programmes studied prevent depopulation of these areas. A common feature of the European Programmes is prevention of depopulation of rural areas. *Poviats* located close to the border are characterised by a high unemployment rate due to a lack of industrial activity there. Through afforestation of agricultural land the afforested areas play an important role in enhancing the ecological function by re-creation of old and creation of new bonds between the existing forest complexes with a view to maintaining animal migration routes and ecological corridors; they also provide new work places.

SUMMARY AND CONCLUSIONS

Poland has an excess of land with low soil quality which is used as agricultural land. Afforestation of these areas has positive effects on their economic value and leads to a substantial improvement in statistical indices related to the size of forest areas in Poland. From statistical point of view, the same areas, when not under cultivation, are treated as excess agricultural acreage with a negligible value for agriculture. On the basis of the facts compiled it can be concluded that farmers with such land were granted support within one of the measures of the Rural Development Programme, which was mostly for enlargement of afforested areas in compliance with the National Afforestation Programme and afforestation of agricultural land with poor agricultural value and at risk of degradation (erosion, soil depletion, penetration of pollutants to water).

Additionally, ecological functions of afforested areas are strengthened by re-creation of old and creation of new bonds between the existing forest complexes for maintenance of animal migration routes and ecological corridors. The share of forests in the total balance of carbon is larger because there are more possibilities for CO₂ absorption by trees in Poland. Taking into account the body of literature related to the subject and the research conducted by the author of this paper, the following conclusion may be made: the main aims of agricultural land afforestation within the Rural Development Programme in the Warmińsko-Mazurskie voivodeship which have been reached are as below:

1. Enlargement of afforested areas in compliance with the National Afforestation Programme;
2. Afforestation of agricultural land with poor agricultural value and at risk of degradation (erosion, soil depletion, penetration of pollutants to water);
3. Increase in the workforce in the sectors of agriculture, forestry and fisheries;
4. Strengthening of the ecological functions of afforested areas by re-creation of old and creation of new bonds between the existing forest complexes for maintenance of animal migration routes and ecological corridors;
5. Increase in forest share in the global carbon balance through higher absorption of CO₂ by trees in Poland.

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