

The analysis of the spatial layout of land in relation to less favoured areas (LFA) in the Milejów comune, Łęczna district

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Abstract. Rural land in Poland accounts for more than 90% of the area of the country and plays a very significant role. It is inhabited by 38.1% of the population. Unfortunately, these people are largely unemployed. The present status of the agricultural production space is a result of many centuries of human activity closely connected with social and economic, legal and political conditions. The spatial arrangement of land in the rural areas of central, southern, south eastern and eastern Poland, developed by historical processes, is characterized by the frequent occurrence of individual plot patchworks. An incorrect configuration of land owned by farmers considerably affects the profitability and effectiveness of agricultural production. The accession of Poland to the European Union offered many options for development to our country and in particular to the Polish countryside. Reconstruction of the defective spatial structure in Poland is one of the priorities of the EU's agricultural policy. Numerous development programmes (SOP, RDP) are used for financing land consolidation and exchange works which are one of the basic tools for transforming ownership and structural relations in rural areas. With regard to the fact that agricultural land in Poland is greatly differentiated, particular attention should be paid to less favoured areas (LFA). It seems obvious that farmers in LFA are not able to generate the same earnings from crops as those generated by farmers in favoured areas. For the purposes of this publication, detailed surveys were carried out in the Milejów commune, Łęczna district, Lublin voivodship. Five villages in that commune were classified as less favoured areas. The analyses showed that Milejów is one of two communes in the Łęczna district with the smallest average area of plot owned by individual farmers. Based on the analysis of the structure of ownership and use, fragmentation and distribution of plots, as well as identification of less favoured areas, an alternative land development model was proposed, along with the reconstruction of the existing arrangement of land through comprehensive consolidation and exchange of land.

1 Introduction

Lublin voivodship is a region characterized by a high percentage share of the agricultural sector. It has suitable conditions for agricultural activity, which is mostly determined by favourable soil and climate conditions and a large share of cropland. Due to historical and social conditions, for a large group of people agriculture has remained the basic or an additional source of earnings. One of the defects of this region is the occurrence of farms with a small area and the emergence of a number of factors contributing to an increase in the costs of their operation. Such defects can be observed both in the area structure (size of farms) and spatial structure (excessive elongation of plots). It is also believed to be disadvantageous in demographic terms [1]. Another negative aspect is the occurrence of a defective plot patchwork, which is one of the main factors having a negative effect on agricultural production. Chequerboarded land is used for agricultural purposes and generates lower income. In reference literature authors state that plot patchworks (chequerboarding) have a negative effect on the organization and level of agricultural production [2-12]. According to Koncent-Zieliński [13], a plot patchwork is an arrangement of land owned by a single village where

plots (i.e. parcels of land) owned by individual owners are not situated in a single common share of land next to their dwelling but are fragmented into more plots, most often narrow and elongated, distributed over a considerable area and partitioned by plots which the property of other owners.

This paper aims to analyze the spatial arrangement of five villages situated in the Łęczna district classified as less favoured areas (LFA). As a result of analysis of a plot patchwork of private lands, a need for land consolidation and exchange was identified. Within the limits of the analyzed villages a concept of land exchange was developed for bringing the land closer to the farmer's dwelling and increasing the area of individual farms. The chequerboard arrays method developed by Noga [14] was used in order to determine the size of the external plot patchwork and the possibilities of eliminating this phenomenon.

2 Less favoured areas in Poland

Since the accession of Poland to the European Union, multifunctional and sustainable development of rural areas has been advocated [15-17]. Measures to ensure the development of agriculture, rural areas and

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protection of the natural environment are indicated. Integration of our country with the European Union creates many options for development for Polish rural areas. Poland, as well as other member states, has implemented the Common Agricultural Policy (CAP). One of its elements was introducing aid for LFA, that is, supporting management in mountain areas and other less favoured areas (LFA). It is based on financial grants for farms situated in areas where agricultural production is difficult due to unfavourable natural conditions. Such areas are also faced with the problem of excessive depopulation.

The present concept of identifying less favoured areas is based on the Regulation of the Council of the European Union No. 1257/1999 on support for rural development from the European Agricultural Guidance and Guarantee Fund (EAGGF), the Regulation of the European Commission No. 4445/2002 and regulations of the Councils of Ministers of 14 April 2004, 29 June 2004, 23 September 2004 and 21 March 2005 concerning detailed conditions and mode of granting financial aid for supporting agricultural activity in less favoured areas [18]. The list of LFA in our country is attached as an appendix to the regulation of the Minister of Agriculture and Rural Development of 11 March 2009 concerning detailed terms and conditions and mode of granting financial aid under the measure "Support for farming in mountain areas and other less favoured areas (LFA)".

Every member state of the European Union delimited LFA in its territory according to the adopted specification based on criteria accepted by the European Commission. Three types of LFA are distinguished in Poland: mountain LFA affected by specific handicaps and lowland zones I and lowland zones II. Each of the above-mentioned types has been assigned different qualification criteria. Mountain LFA include communes and precincts where over half the cropland is situated more than 500 m above sea level. The areas affected by specific handicaps included communes and precincts of the foreland identified for the needs of the Agricultural Tax Act of 15 November 1984 [19]; at least 50% of cropland is situated more than 350 m above sea level. Lowlands where the productivity of agriculture is limited in connection with poor soil quality, unfavourable climate, unfavourable water regime, and unfavourable terrain relief and in connection with the demographic index and a considerable share of population connected with agriculture, were classified based on demographic criteria and valorisation of agricultural productive area by means of indices characterizing soil quality, water regime, terrain relief and climate.

LFA aid is provided exclusively to farmers as annual lump sum payments per hectare of cropland situated in mountain areas and other less favoured areas and areas under agricultural use. Rates of payments for farming in mountain areas and other less favoured areas are different for different LFA types. In Poland less favoured areas cover about 9 000 ha of cropland [18].

3 Areas with natural handicaps in the Milejów commune

Detailed surveys were carried out in the Milejów commune (Fig. 1) situated in the central part of Lublin voivodship. The analyzed area is characterized by a high percentage of private land where private owners have 9723.7702 ha split into 20037 registration plots. The average area of a plot in the commune is 0.49 ha. According to the surveys [10], the analyzed area is characterized by the largest fragmentation in the Łęczna district. Figure 1 shows a map of the location of the Milejów commune in the Łęczna district and in Lublin voivodship.

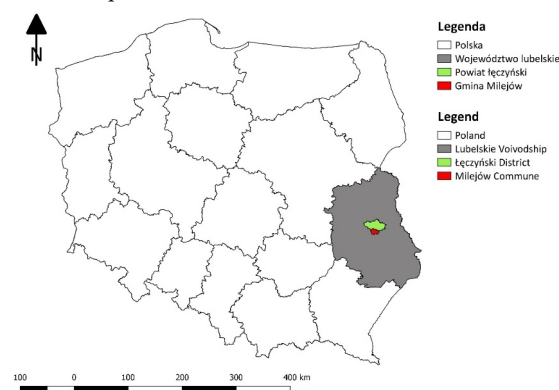


Fig. 1. Geographical location of the analyzed area in Lublin voivodship and the Łęczna district
Source: Own elaboration

Five villages in that commune were classified as less favoured areas. They are presented in Table 1. The villages of Białka Kolonia, Klarów and Maryniów were classified in the lowland zone I, with Dąbrowa and Zgniła Struga in the lowland zone II. For the above-mentioned villages the Institute of Soil Science and Plant Cultivation in Puławy determined the valorisation index describing their production potential. This was determined on the grounds of quantitative analysis of soil and natural conditions covering soil quality, terrain relief as well as water regime and climate. Soils were valued according to a 100-point scale based on soil class data and descriptions of agricultural usefulness of respective soil complexes on the basis of soil and agricultural maps converted to numerical forms. Also, the water regime was evaluated based on the soil profile and water storage capacity of respective soil types. The qualification was performed according to 5 moisture categories scored in a 5-point scale. The terrain relief was valorised according to a 5-point scale based on a map of slopes (Fig. 2) developed based on the numerical 40x40 m terrain model and the height of relative basic fields. Agricultural climate was measured using one index for the whole commune – the climate crop index calculated based on meteorological data for a period of 50 years. The index of valorisation for each village is a sum of weighted averages for partial area indices. The weight for measurement of the quality of the soil class index for the specific precinct is the area covered by

respective soil classes. The weight for the calculation of soil usefulness ratio is the area of respective complexes of agricultural usefulness of soil. On the other hand, the weight for the terrain relief is the area of respective forms of relief (relative slopes and heights) to which a specific score was assigned. Feature valorisation scoring was established based on long-term surveys calibrating the adopted valorisation approach. The valorisation index is an objective measure of settlement conditions and its value is strongly correlated with statistical crops. LFA refer to areas affected by specific handicaps and in which agricultural activity should be continued in order to maintain or improve the status of the environment, maintain the status of the landscape and maintain the tourist potential of such areas.

Table 1. Villages classified as LFA

Name of precinct	Types of LFA		Valorisation index
	lowland zone I	lowland zone II	
Białka-Kolonia	X		55.62
Dąbrowa		X	48.25
Klarów	X		52.20
Maryniów	X		52.64
Zgniła Struga		X	49.05

Source: Own elaboration based on data from materials of the Ministry of Agriculture and Rural Development

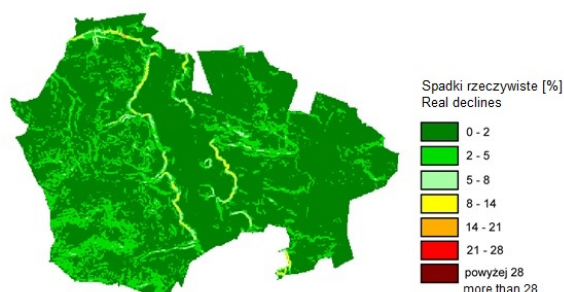


Fig. 2. Real slopes within the Milejów commune
 Source: Own elaboration

4 Detailed surveys concerning selected villages in the Milejów commune

Detailed surveys were carried out in five villages identified as LFA. The analyses made use of descriptive and spatial data from the database of the land and buildings register. The surveys were based on a cartographic and descriptive method. For the purposes of adequate planning and performance of rural management works, the existing status of ownership and use of land, and the fragmentation and distribution of plots were analyzed. According to analyses carried out in selected villages of the Milejów commune, the largest share in

the structure of ownership is allocated to individuals in the villages: Maryniów, Dąbrowa and Zgniła Struga. The area of private land in Maryniów is 341.4267 ha, which corresponds to 94.1% of the total area of the village; Dąbrowa – 262.2353 ha, i.e. 90.3%; Zgniła Struga – 134.2687 ha, which accounts for 83.7% of the total area of the village. In Białka Kolonia the largest area is covered by land owned by the State Treasury – 606.7181 ha, i.e. 50.8% of the total area of the village. It is similar in Klarów, where the State Treasury owns 372.7152 ha, that is, 60.2% of the area of the village. In both villages most of the land owned by the State Treasury is covered by forests owned by the State Forests National Forest Holding. Other registration groups cover a small area of land in the analyzed villages. Studies concerning the structure of use suggest that the analyzed villages in the Milejów commune are typically agricultural areas.

The analysis of fragmentation of land in the analyzed area was carried out for plots owned by private owners only. Surveys were carried out in 8 size ranges because the average area of the plot does not reflect adequate fragmentation in respective villages. This is due to the negative layout of land in the analyzed villages where plots are arranged in a ribbon-like pattern. Detailed surveys showed that most plots fell into the range 0.11-0.30 ha – in Dąbrowa (34.31%), Klarów (26.51%) and in Zgniła Struga (42.61%). On the other hand, in Białka Kolonia most plots fell within the range 0.31-0.60 ha. The same situation occurs in Maryniów (25.04%). The percentage share of plots in respective area ranges for each of the analyzed villages is differentiated. In comparison to other communes in the Łęczna district, land fragmentation in the Milejów commune is considerable. The average area of a plot in the commune is 0.49 ha, compared to 0.65 ha in the district [8,20].

A characteristic feature of Polish agriculture, leading to the necessity for undertaking land consolidation works, is excessive fragmentation of land, that is, scattered small parcels or registration plots. It is one of the major factors inhibiting profitable agricultural production and the occurrence of this phenomenon is one of the conditions for carrying out land consolidation works in a specific area to improve the parameters of the spatial structure of agricultural land.

5 Detailed surveys concerning the plot patchwork

Despite the problem of fragmentation of land owned by private owners, detailed surveys also showed defects of internal and external plot patchwork. A significant obstacle in the analyzed area is a high percentage share of land owned by out-of-village non-resident owners, which is illustrated in Table 2. Except in Zgniła Struga, out-of-village non-resident owners own considerable areas of land in each of the villages. Studies concerning the distribution of private land were based on chequerboard arrays covering the overall area and the layout of plots of non-resident owners in the analyzed area. To this extent, the analysis was performed for residents of the villages who own land outside their

place of residence (local non-resident owners) and for owners who did not live in the villages but owned land in them (out-of-village non-resident owners). The highest share of out-of-village non-resident owners was recorded in Dąbrowa where they own 150.1100 ha, which corresponds to 56.2% of the total area of the village. A high share of the area of land owned by non-resident owners was found in Białka Kolonia – 53.36% and in Klarów – 49% of the area of the village. The area owned by out-of-village non-resident owners in Zgniła Struga is quite small. Their share in land accounts for only 28.05% of the area of the village.

Table 2. Area of land owned by out-of-village non-resident owners in the analyzed villages

Name of village in which out-of-village non-resident owners live	Białka Kolonia	Dąbrowa	Klarów	Maryniów	Zgniła Struga
Białka Kolonia	x	7.51	-	0.71	7.83
Dąbrowa	-	x	-	-	1.02
Klarów	0.20	0.27	x	-	-
Maryniów	32.55	0.57	-	x	1.83
Zgniła Struga	15.46	22.02	-	-	x
Town of Łęczna	14.25	3.32	12.20	19.93	1.04
Others in the Milejów communes	145.65	31.98	35.84	100.17	6.77
Others in the district	10.43	9.88	4.40	7.84	5.75
Others from towns and cities	49.93	37.24	33.19	17.97	3.40
Other outside the district	41.17	37.32	32.41	10.80	10.55
In total land owned by out-of-village non-resident owners	309.63	150.11	118.05	157.42	38.20
Percentage of land owned by out-of-village non-resident owners in relation to the area of private land in the village	53.36	56.24	49.00	44.93	28.05

Source: Own elaboration based on the land and buildings register (EGiB)

The presented area of land owned by non-resident owners is the result of inheritance, land turnover or marriages. In addition to land owned by non-resident owners from the analyzed area there is also land owned by non-resident owners living outside the analyzed area, e.g. from towns and cities. Emigration of people from the analyzed villages is observed throughout and even

outside Poland. It was noted that some out-of-village non-resident owners come from Łęczna, that is, the town which is the seat of the district. Residents of that town own land in each of the analyzed villages. Non-resident owners living in towns and cities left the countryside looking for a better job or they inherited land from their parents. Another possibility is that such people own building plots or leisure property. With regard to the considerable area of land owned by out-of-village non-resident owners who do not live in the Łęczna district, it can be supposed that the land they own is not used at all or is informally leased out to residents of these villages.

6 Consolidation and exchange of land as the first stage of reconstruction of the existing spatial layout

Land consolidation process is a surveying instrument which comprehensively improves the spatial structure of rural land. The main legislative act governing the land consolidation and exchange process in Poland is the Act of 26 March 1982 on Land Consolidation and Exchange. This procedure aims to improve the spatial structure of fragmented or checkerboarded plots. During land consolidation a new arrangement is designed which facilitates access to plots and reduces the distance between the owner's dwelling and cropland. The consolidation is a strictly economic process. It makes it possible to increase the effectiveness of management, and cut down on the costs of production and labour expenditure, which improves the farmer's standard of living [22].

However, it must be remembered that land consolidation and exchange works, due to financial limitations, should be carried out in land with the most defective spatial structure [23, 24]. The role of the process of land consolidation and its legal consequences in the context of surveying tasks for the needs of updating cadastral data was discussed in detail by Mika and Leń [25]. Consolidation of land can have a positive effect on the spatial order in the commune taking the development of investment grounds into account [26].

Financial support under LFA is provided for ensuring the continuity of agricultural use of land, which contributes to maintaining the landscape values, promoting environment-friendly agriculture and preventing depopulation. These measures should be deemed sustainable and contributing to the maintenance of permanent plant cover and reinforcement of non-productive functions of meadows and pastures [18]. In the analyzed area land was classified as lowland zones I and II, where payments per hectare of cropland is respectively PLN 179 and PLN 264. The farmer can receive payments if he/she owns at least 1.0 ha and uses the land for agricultural production purposes. Agricultural parcels reported in the application must be used as cropland, orchards or permanent grassland. In the case of LFA payments agricultural activity must be carried out for at least 5 years from the date of the first payment within an area not smaller than that for which support was granted in the first year. It is a certain

limitation to farmers who plan to reduce the area of their farms within such a time period. It would, rather, be advisable to increase the area of farms and improve the configuration of land.

7 Proposal regarding exchange of land in external plot patchworks

In three villages in the analyzed area, land for which LFA payments are granted covers a large area. In Dąbrowa, cropland and permanent grassland covers an area of 210.5599 ha, which accounts for 72.5% of the village area. In Maryniów it is 362.6667 ha, which corresponds to 53.5% and in Zgniła Struga – 104.6004 ha, that is, 65.2%. In Białka Kolonia and in Klarów such areas occupy a decidedly smaller area, respectively 37.1% and 29.7%. It is due to the existence of extensive forestland in this region. In the analyzed villages measures must be taken to improve the spatial structure of farms by increasing the area of plots and improving the configuration of land as well as eliminating defective ribbon-like plot patchwork occurring in this area. It is also recommended to improve the transport system, ensuring access to every plot. It should be noted that roads can have a dual role: landscape and transport. It would be advisable to design roads offering access to landscape, which at the same time could be used as agricultural transport and regular transport roads [27].

The defective external plot patchwork of private land occurring in the analyzed area can be eliminated only by exchange since it is difficult to consolidate land in the entire commune. Therefore, in a theoretical approach supported by practical reasons, it is proposed that land in the observed defective external plot patchwork should be exchanged, which is illustrated in Table 3

Table 3. Proposal of exchange of land owned by local and out-of-village non-resident owners from the analyzed villages

Village	Area of the village [ha]	Land of local non-resident owners [ha]	Land of out-of-village non-resident owners [ha]	Area of the village after exchange of land [ha]	Change in area [ha]	%
Białka Kolonia	1193.92	16.1	48.29	1161.69	-32.23	-2.7
Dąbrowa	290.47	1.0	30.37	261.12	29.35	10.1
Klarów	619.17	0.5	0	619.64	0.47	0.1
Maryniów	362.67	35.0	0.71	396.90	34.23	9.4
Zgniła Struga	160.41	37.5	10.68	187.21	26.80	16.7

Source: Own elaboration

The proposed exchange covers only land owned by local and out-of-village non-resident owners in the five villages subject to detailed surveys. Such a solution was proposed due to the fact that in the case of LFA payments, the area of the farm must not be reduced. According to data from Table 3, if land is exchanged between non-resident owners, the area of each village will increase. The only case when the area can be reduced is in Białka Kolonia. The analysis of the structure of ownership revealed that in that village 50.8% of the area is owned by the State Treasury. In the case of land consolidation and exchange, plots owned by the National Support Centre for Agriculture (until 01.09.2017 the Agricultural Property Agency) can be allocated towards increasing the areas of farms.

8 Conclusions

Upon accession of Poland to the structures of the European Union, Polish agriculture became subject to mechanisms of the Common Agricultural Policy and support for the development of rural areas under EU budget funds. This increased the interest of farmers in consolidation works aiming at improving spatial conditions of farms, in particular considering that legal provisions related to land consolidation apart from preparation of surveying and legal documentation providing for investments covered by the so-called post-consolidation management. Both under previous programmes, i.e. in 2004-2006, 2007-2013 and in the current programme 2014-2020, consolidation works are supported by funds from the EU budget – at present from the European Agricultural Fund for Rural Development.

Due to the fact that agricultural land in Poland is greatly differentiated, particular attention should be paid to less favoured areas (LFA). It seems clear that farmers in LFA are not able to generate earnings from crops to the same degree as those generated by farmers in favoured areas.

Detailed surveys carried out in five villages in the Milejów commune revealed numerous defects in the spatial structure of the analyzed area. A large fragmentation and distribution of private land was confirmed. With regard to classification of the villages as less favoured areas and LFA payments received by farmers, the only solution worth trying is consolidation and exchange of land. This process will contribute to the improvement and development of agricultural production as well as to improving the farmer's standard of living and work. A possible solution to the aforementioned problem is the exchange of land between local and out-of-village non-resident owners.

The proposals of exchanging land prior to consolidation, although theoretical but based on specific data, should be studied further in order to refine the technology of land exchange and then its consolidation.

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