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EVALUATION OF THE PLOT SIZE (FARM LAND) OF FAMILY AGRICULTURAL HOLDINGS AND THE NEEDS FOR LAND CONSOLIDATION IN POLAND

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Summary

The current study presents status and the need for improvement of the land distribution of family agricultural holdings in Poland.

The assessment of the distribution of farm lands in the area between 1 and 300 ha has been made according to the 2013 data and provided by the Polish Agency for Restructuring and Modernisation of Agriculture (ARMA). Our analysis included totally app. 750,000 of family agricultural holdings. The evaluation of land consolidation was based on the two regional criteria proposed by the Regional Offices of Geodesy and Agricultural Areas, i.e. the plot size and the number of plots within individual family farms.

The family agricultural holdings, that are included to the Polish system of agricultural support, have an average land area of around 16.0 ha, and this refers to around 6 cadastral plots with an average acreage of app. 3.0 ha. The need of land consolidation was estimated to be at the level of app. 7.1 million ha (this corresponds to 69.14% of total agricultural area land in Poland). The problem occurs in the entire country, but the worst situation is in the southern, south-eastern and central Poland. The implementation of *the land consolidation and farmland exchange* procedures within the Programme RDP (Rural Development Programme) in the period 2007-2013 stood at the level of 13,600 ha annually, thus the area of unfavourable land distribution was not reduced significantly. According to our

evaluations the land consolidation should involve at least 50,000 ha annually to improve in real terms the distribution of agricultural plots in Poland.

Key words: parameters of the land distribution, land consolidation, rural areas development.

INTRODUCTION

The socio-economic development of Poland as well as Polish accession to the European Union have increased the interest of remodelling the spatial structure of rural areas. Currently, it is carried out mainly through land consolidation. By distribution of land we understand the shape of the agricultural holding territory and this determines the system of agricultural land in relation to the homesteads (husbandry – 1997terminology). It is a collection of all lands used directly or indirectly by farms in the process of agricultural production, and can be improved through consolidation, exchange, or purchase and sale transactions of plots (Woch, 2001).

The distribution of land on the territory of Poland is very diverse and generally far from optimum (Woch, 2010). In the northern and western Poland the situation is fairly favourable, whereas in the southern, south-eastern and central Poland (mainly in the mountain and upland areas) the situation is radically different and the shape of land distribution can be considered as catastrophic. This adversely state is the result of a significant aggregation of the settlement units, a large variation of a terrain and soil, and the fragmentation of holdings agricultural land and forest (chessboard) occurring quite commonly.

The land consolidation is a major procedure in the spatial area planning (farm-management operations) influencing the use of an agricultural production area, and its primary goal is to improve the land distribution by formation the shape close to optimum (Regulation on land consolidation, 2003; Regulation amending the Regulation on land consolidation, 2011). For many years now, the divergent information on the needs of land consolidation in Poland can be found. Thus, according to the Ministry of Agriculture and Rural Development these needs are estimated to be at around 2.2 mln ha, but according to the University of Environmental and Life Sciences of Wrocław at the level of 3.4 mln ha (Malina and Tkocz, 1993), and by IUNG-PIB in Puławy to be at least at the level of 4.0 mln ha (Woch, 2001 and 2010).

The data, on the basis of which the needs of land consolidation are given, are heavily outdated because they are based on the results of a survey performed for the entire country in 1988 (Stelmach et al., 1990). Moreover, these data are hardly comparable to the family agricultural holdings according to the current legal standards (area of 1-300 ha), because they were based on a registered units

with an area of more than 0.5 ha (Malina and Tkocz, 1993).

The aim of this study was to assess the distribution of agricultural lands in Poland and the needs of improvement of land configuration, on the basis of current data on family agricultural holdings held by the Agency for Restructuring and Modernisation of Agriculture (ARMA) and regional criteria proposed by the Regional Agencies of Geodesy and Rural Areas.

MATERIALS AND METHODS

The study on the distribution of land in Poland was carried out on the basis of data from 2013 and provided by the Agency for Restructuring and Modernisation of Agriculture (ARMA). The information is collected and used by ARMA for the implementation of various activities under the Rural Development Programme (Rural Development Programme, 2007 and 2010; Regulation 2008). Our evaluations included the data on 750,000 agricultural holdings that fulfilled several criteria, i.e., in accordance with the Regulation from 2003 (Regulation on the agrarian system), had an area between 1 and 300 ha, and had been conducted personally farming activity, and had been established in the same districts as their plot lands.

The assessment of land distribution of the family farms comprised the information on their acreage, and the number and size of individual plots. On the basis of our analysis and using a regional criteria proposed by the Regional Offices of Geodesy and Agricultural Areas, that concern acreage and the number of plots within an agricultural holdings, the needs of land consolidation were evaluated (Table 1). The analysis of data on the land distribution in Poland (see Figures 1-3) allowed to describe 4 groups of regions with diversified parameters of plot configuration, thus different qualifying criteria for consolidation or land exchange were applied for particular group. The eligibility criteria are linked with the economic determinants of farming due to a direct impact of land configuration on the costs and farm income (Woch, 2001 and 2012; Woch et al., 2011). Land consolidation is regarded as required in these rural areas (villages) where farmers due to unfavourable distribution of land lose at least 20% of their income, and the desirable land consolidation occurs if they lose at least 15% of their income (Woch, 2001 and 2012; Woch et al., 2011). Summing up the area of districts within a particular municipalities that were qualified to the land consolidation (necessary or desirable) the ranges of needs within them have been established. The same mechanism is used for the calculations when evaluating the needs of land consolidation in the voivodeships and across the country.

The assessment of the land distribution and the needs for land consolidation in regional and municipal system is shown on the accompanying figures and

tables, additionally the information on individual districts of cadastral registration (villages) is in the possession of the IUNG-PIB in Puławy.

Table 1. The qualification criteria of land consolidation procedures for rural areas (villages) in Poland.*

Group of voivodeships	Urgency of land consolidation	Qualification criteria for agricultural holdings for land consolidation			
		An average size of plots (ha)	An average number of plots per agricultural holding (pc)	The distance between plot field and farm (km)**	Additional criteria
I – Voivodeship: Lubuskie, Pomorskie, Warmińsko-Mazurskie, Zachodniopomorskie,	necessary	< 1.00	> 8.0	> 2.0	The possibility to enlarge the area of family agricultural holdings from Agricultural Property Agency (APA); outdating of the legal status
	recommended	1.00 – 2.00	8.0 – 4.0	2.0 – 1.0	
	not necessary	> 2.00	< 4.0	< 1.0	
II – Voivodeship: Dolnośląskie, Kujawsko-Pomorskie, Opolskie, Podlaskie, Wielkopolskie,	necessary	< 0.70	> 8.0	> 2.0	The possibility to enlarge the area of family agricultural holdings from Agricultural Property Agency (APA); outdating of the legal status us;
	recommended	0.70 – 1.70	8.0 – 4.0	2.0 – 1.0	
	not necessary	> 1.70	< 4.0	< 1.0	
III – Voivodeship: Lubelskie, Łódzkie, Mazowieckie, Świętokrzyskie, Śląskie,	necessary	< 0.50	> 8.0	> 2.0	***calc. by formula of Moszczeński or formula of Van Duin
	recommended	0.50 – 1.50	8.0 – 4.0	2.0 – 1.0	
	not necessary	> 1.50	< 4.0	< 1.0	
IV – Voivodeship: Małopolskie, Podkarpackie	necessary	< 0.30	> 10.0	> 2.0	***calc. by formula of Moszczeński or formula of Van Duin
	recommended	0.30 – 1.00	10.0 – 5.0	2.0 – 1.0	
	not necessary	> 1.00	< 5.0	< 1.0	

* determined according to the criteria suggested by the Regional Agencies of Geodesy and Rural Areas;
** along the public roads, calc. as a part of consolidated area;
*** by formula of Moszczeński (U = S×O/P×1.53: necessary >100, recommended 100 – 50), or by formula of Van Duin

($R = \frac{\sqrt{n}-1}{P}$ – necessary >0.40, recommended 0.40 – 0.25).

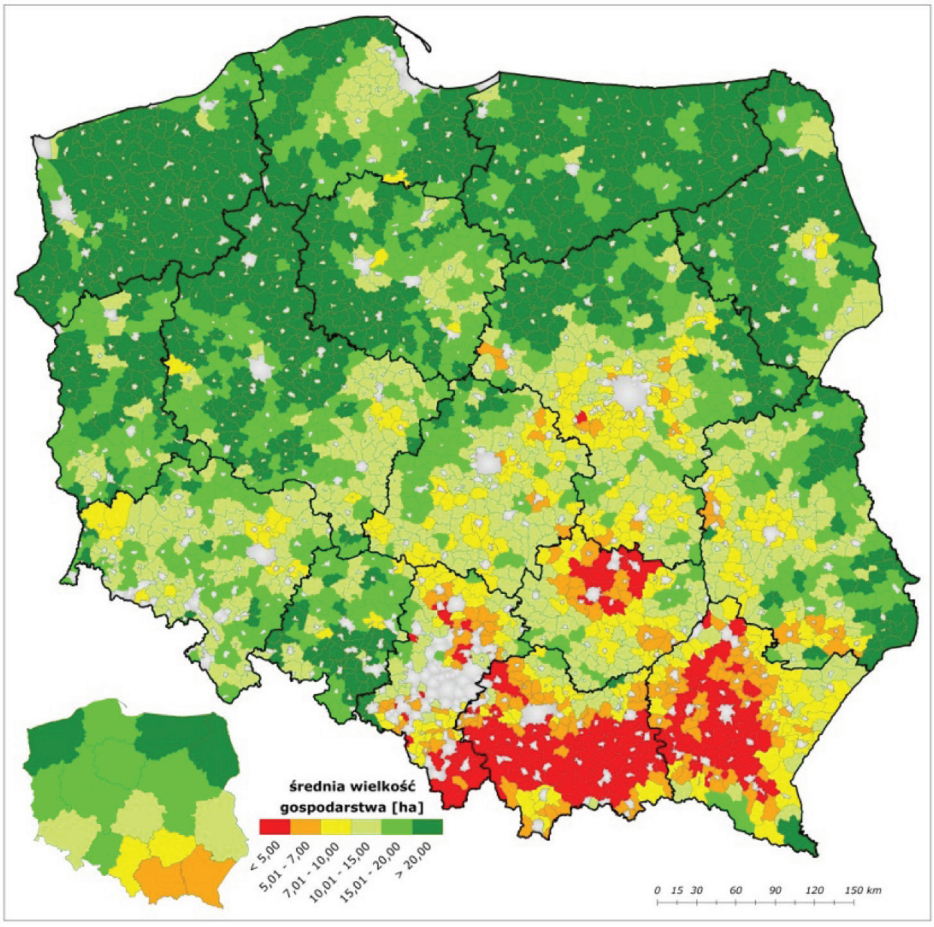

Figure 1. The average area of family agricultural holdings in Poland, ranked by municipalities. Source: Developed at the Institute of Soil Science and Plant Cultivation – State Research Institute in Puławy, and based on the data of ARMA from 2013.

The time necessary to implement the total needs in the area of land consolidation was determined by dividing the total needs by the average annual rate of consolidation work performed within the Programme RDP in the period 2007-2013.

RESULTS

The evaluation of the size of agricultural holdings in a municipality system that is presented in Figure 1 and Table 2 shows a large variation in this area in

Poland. The average farm area stands at the level of app. 16.0 ha and consists of the holdings with an area of over 20.0 ha in the northern part of the country (mainly in the voivodeships: Zachodniopomorskie, Warmińsko-Mazurskie and Podlaskie), as well as the holdings of only about 5.0 ha in the southern part of the country (mainly in the voivodeships: Małopolskie and Podkarpackie). In the central and south-eastern Poland majority of farms have an acreage in the range of 7-15.0 ha.

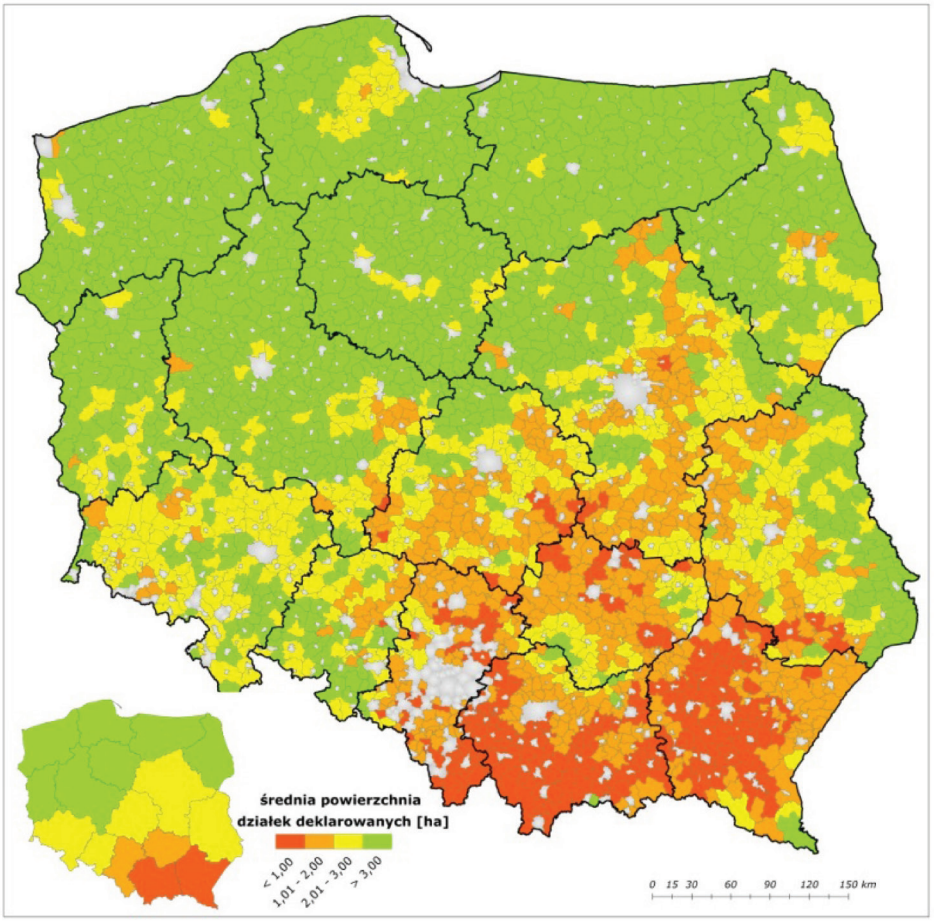

Figure 2. The average size of plots per family agricultural holding in Poland, ranked by municipalities. Source: Developed at the Institute of Soil Science and Plant Cultivation – State Research Institute in Puławy, and based on the data of ARMA from 2013.

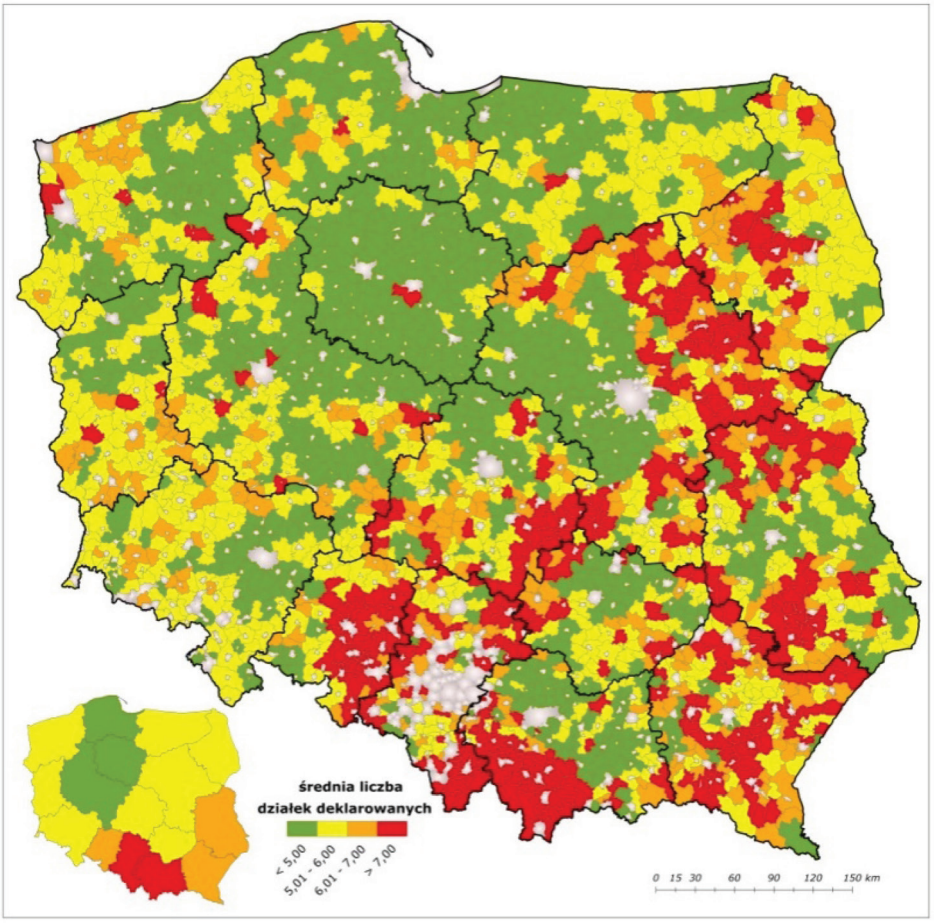

Figure 3. The average number of parcels per family agricultural holding in Poland, ranked by municipalities. Source: Developed at the Institute of Soil Science and Plant Cultivation – State Research Institute in Puławy, and based on the data of ARMA from 2013.

Similarly decomposes an average area of land plots (see Figure 2). In the northern and north-western Poland, i.e. in the voivodeships: Zachodniopomorskie, Warmińsko-Mazurskie, Pomorskie, Kujawsko-Pomorskie, Wielkopolskie, Podlaskie and Lubuskie, the average size of plots exceeds 3.0 ha, in the south-eastern and central parts it is in the range of 1-2.0 ha (voivodeships: Śląskie, Świętokrzyskie, Łódzkie, Lubelskie, Mazowieckie, Dolnośląskie, Opolskie), and in the south part (voivodeships: Małopolskie and Podkarpackie) the average is less than 1.0 ha.

The situation is different regarding the distribution of the number of declared plots per holding (see Figure 3). There is a lack of clear division of Polish territory on the northern part with the lower number of plots in the farm, and the southern part with a large number of plots. However, the area of the country can be divided into a three regions but in another arrangement, i.e., north-central, western, and south-eastern. North-central region is characterized by the smallest average number of plots in the holding (up to 5), and in the western region (voivodeships: Dolnośląskie, Lubuskie and Zachodniopomorskie) slightly larger number of parcels (5-6) can be observed. While in all southern and eastern voivodeships (from Opolskie voivodeship to the Lubelskie voivodeship) the average number of plots in the farm exceeds 6.0. The worst situation is in the Małopolskie voivodeship, where the average number of parcels per holding increases to about 8.4.

The results presented in Figures 1-3 and Table 2 clearly demonstrate the diversity of Polish territory in terms of the distribution of agricultural land. Northern and western parts of Poland have the most preferred distribution of land. There are mainly large-area family agricultural holdings, consisting of large size plots, but their number per holding is also large. This is due to the fact that many farms expanded their area land by purchasing of the parcels from the resources of the Agricultural Property Agency (APA) not situated near of their own land. The second group consists of the voivodeships neighbouring to the above: from Opolskie to Podlaskie voivodeship. Generally, there is a fairly favourable distribution of land, nevertheless in some specific areas this composition is not as advantageous. This applies particularly to the southern parts of the Wielkopolskie, Kujawsko-pomorskie and Podlaskie voivodeships. The third group is composed by the regions of central and south-eastern Poland. The distribution of land is unfavourable there in almost all municipalities. There are mainly small scale holdings (up to 10 ha), with small, numerous and dispersed area plots. Slightly more favourable situation occurs only in the northern part of the Mazowieckie voivodeship and the border territories of lubelskie voivodeship. The fourth group consists of areas with an extremely unfavourable distribution of the land, and this concerns two voivodeships: Małopolskie and Podkarpackie. The average 5-ha farm is composed of over 8 parcels of the acreage less than 1.0 ha. This unfavourable land distribution is enhanced by the substantial and diverse topography, with typical agro-forestry chessboard (large fragmentation of holdings).

The above information allow us to conclude that the problem of the land distribution in Poland must be addressed regionally.

By comparing the data in Table 2 with the data of Central Statistical Office (Woch, 2010), it can be concluded that the farms included to the system of agricultural support have more favourable structure of the land area in comparison to the total number of agricultural holdings. This is due to the fact that small registration entities, not representing the holding and having the land in small

plots, had not been included in the area of measures of ARMA. Their land can be optionally incorporated when the existing holdings increase their acreage.

Table 2. The parameters of land distribution of family agricultural holdings in Poland, ranked by voivodeships.

Group of voivodeships	Voivodeship	The average assessments			
		Area of holdings (ha)	Plot size (ha)	Number of parcels per holding (pc)	Additional information
I – favourable distribution of land	Zachodniopomorskie	27.30	5.27	5.18	Less favourable distribution in the central part of the Pomorskie voivodeship
	Pomorskie	19.92	4.24	4.70	
	Warmińsko-Mazurskie	24.89	4.93	5.05	
	Lubuskie	19.90	3.75	5.31	
An average		**23.00**	**4.55**	**5.06**	
II – rather favourable distribution of land	Opolskie	18.33	2.75	6.67	Less favourable distribution in the south-western part of the Wielkopolskie voivodeship
	Dolnośląskie	14.22	2.72	5.18	
	Wielkopolskie	18.44	3.69	5.00	
	Kujawsko-Pomorskie	19.23	5.05	3.80	
	Podlaskie	23.56	3.96	5.95	
An average		**18.76**	**3.63**	**5.12**	
III – unfavourable distribution of land	Łódzkie	12.45	2.12	5.88	More favourable distribution in the northern part of the Mazowieckie voivodeship and in the border area of Lubelskie voivodeship
	Mazowieckie	15.20	2.68	5.67	
	Świętokrzyskie	9.47	1.69	5.60	
	Śląskie	8.86	1.17	7.58	
	Lubelskie	14.35	2.36	6.07	
An average		**12.07**	**2.00**	**6.16**	
IV – extremely unfavourable distribution of land	Małopolskie	5.32	0.63	8.42	Less unfavourable distribution in the border area of Podkarpackie voivodeship
	Podkarpackie	6.21	0.90	6.91	
An average		**5.76**	**0.76**	**7.66**	
An average for the country		**16.10**	**2.99**	**5.81**	

The needs of land consolidation in Poland are presented in Figures 4 and 5, and Table 3. It is clearly showed that these needs occur in the entire country. The biggest problems of unfavourable arrangement of agricultural land exist in the southern, south-eastern and central parts of Poland. In the northern and western parts the needs of land consolidation are smaller and the scope of work should

be also different. The consolidation should be conducted there in parallel with the parcelling out of some areas being at the disposal of the State Treasury to increase the acreage of existing family agricultural holdings.

The total needs of land reparcelling procedures were established at the level of 7,077,571.05 ha, which represents 69.14% of Polish agricultural land. This value significantly exceeds previously estimated figures in this area, i.e. 2.0 mln ha determined by Zalewska-Urbańczyk (1991), 3.4 mln ha determined by Malina and Tkocz (1993), 2.2 mln ha estimated by the Ministry of Agriculture and Rural Development (Woch, 2001), and 4.0 mln ha found by IUNG-PIB in Puławy (Woch, 2010). Such significant differences in the evaluation of the needs of land consolidation between those established over 20 years ago and determined in this study are the result of the following circumstances:

- Different, more stringent and unitary for the whole country criteria used by Malina and Tkocz for eligibility of objects for land consolidation and farmland exchange procedures (farms with more than 8 plots, which are smaller than 0.6 ha, and also the parcels having elongated sides above the ratio 1:10, and parcels distant over 3 km from the registration entities – villages).
- The rate of consolidation procedures in the last 20 years was very low (symbolic), and amounted to 10-15 thousand ha per year. This refers to only about 5% of the rate of reparcelling work by the political changes in the 90s of the last century, and even then those actions were behind the needs in the field of land configuration.
- A considerable part of the land owned previously by the state and cooperative farms, mainly in the northern and western parts of the country have been purchased by the family agricultural holdings, but a large portion of those plots was not adjacent to land held by the farmers. Thus, farmers expending their farm acreage made also worse the land configuration, and as a result appeared the need of land consolidation in the areas with no previous demand for this. In those areas it is recommended a procedure of comprehensive land consolidation or even wider formula – improvement and rearrangement of rural areas based on land consolidation (Pijanowski et al., 2013; Weiss and Pijanowski, 2005; Woch, 2001).

The analysis of data in Table 3 allows to draw the following conclusions. The smallest needs of necessary land consolidation occur in the voivodeships of first and second group (7.6 and 10.4% of the area, respectively), and in the rest of the country are about twice as large (19.7 and 14.4% of the area in group 3 and 4, respectively). While the share of the land area with recommended reparcelling is only slightly differentiated in the listed groups of voivodeships. Our results refute the general view of the lack of consolidation needs in the northern and western Poland.

The reparcelling work should be conducted there simultaneously with parcelling out of some large-scale land areas to establish a new or enlarge existing family agricultural holdings. In contrast, the area of southern and central part of the country can be still regarded as a "region of the backwardness of the agrarian landscape" (Malina and Tkocz, 1993), and it largely overlaps with the area of the former Russian and Austrian annexation.

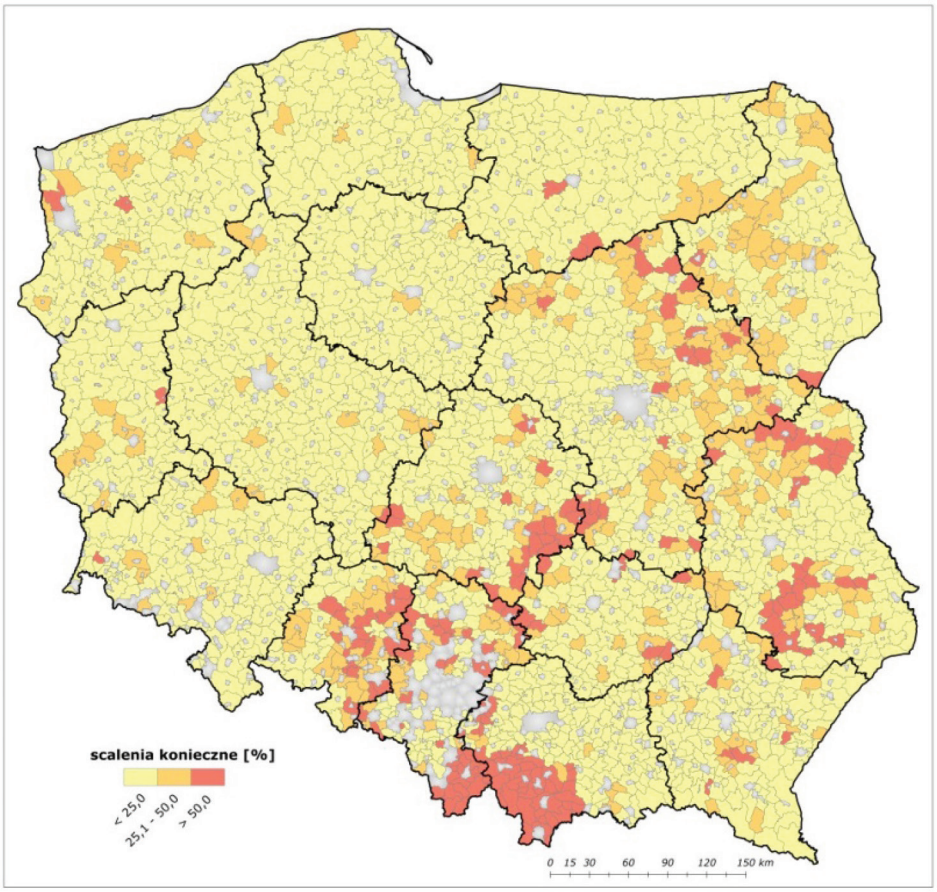

Figure 4. The needs of land consolidation procedures in Poland, ranked by municipalities – necessary land consolidation.

Taking into account the average rate of land consolidation and farmland exchange procedures in the period 2007-2013, i.e. around 13,600 ha per year (according to data from the Ministry of Agriculture and Rural Development), we can conclude that there is no realistic prospect of a significant reduction of this

problem – even the most unfavourable agro-forestry chessboard (large fragmentation of holdings agro-forestry) in the next programming periods.

Over 100 year period of land consolidation and farmland exchange works can be calculated to solve the most necessary needs, and another calculation of around 500 year period for the whole problem seems to be rather a theoretical calculation. With this annual implementation range the needs for land rearrangement will grow rather than diminish, and the only realistic way to reduce the unfavourable land fragmentation of holdings will become a process carried out directly by farmers of purchase and sale transactions or exchange of agricultural plots.

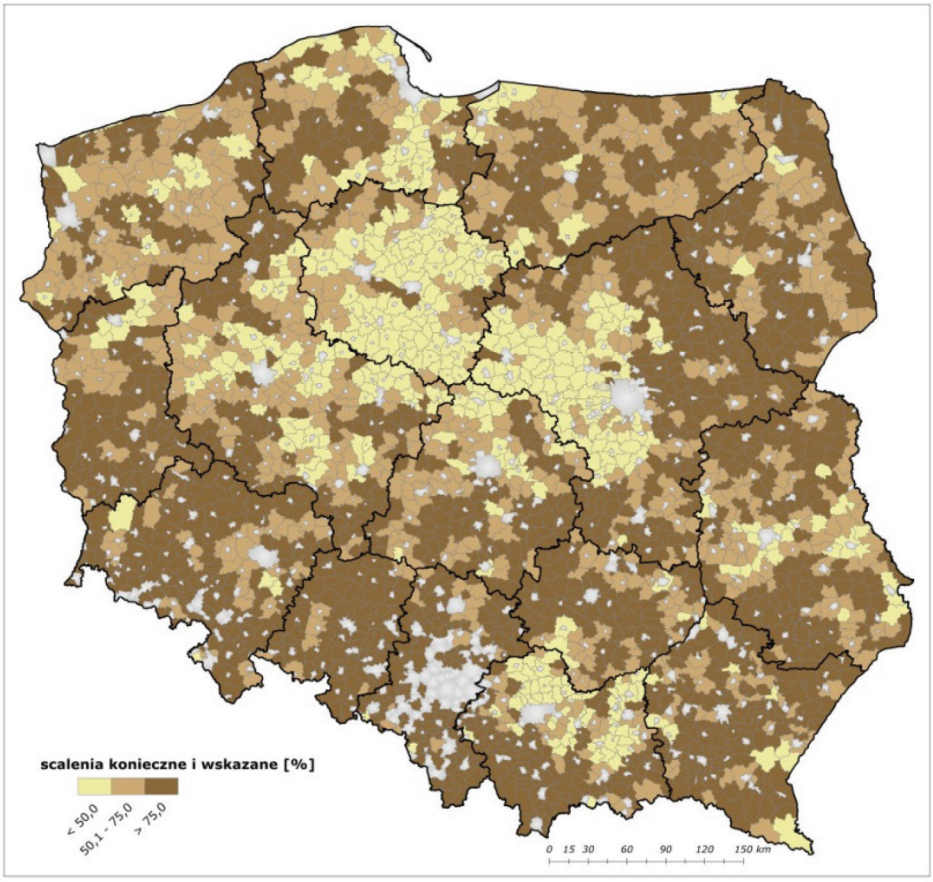

Figure 5. The needs of land consolidation procedures in Poland, ranked by municipalities – together necessary and recommended land consolidation.

Table 3. The Assessment of the needs of land consolidation in Poland, ranked by voivodeships.

Group of voivodeships	Voivodeship	The assessment of the needs of land consolidation					
		necessary		recommended		not necessary	
		Ha	%	ha	%	ha	%
I – favourable distribution of land	Zachodniopomorskie	49 428.58	9.8	290 260.18	57.5	165 260.59	32.7
	Pomorskie	20 931.52	4.3	294 072.44	59.9	175 555.55	35.8
	Warmińsko-Mazurskie	53 410.23	7.5	468 986.60	65.9	189 443.95	26.6
	Lubuskie	26 011.19	9.8	180 634.38	67.7	60 090.85	22.5
Together		**149 781.52**	**7.6**	**1 233 953.60**	**62.5**	**590 350.94**	**29.9**
II – rather favourable distribution of land	Opolskie	83 518.89	29.1	171 185.63	59.6	32 558.79	11.3
	Dolnośląskie	42 659.81	7.7	406 616.65	73.4	104 796.07	18.9
	Wielkopolskie	86 861.37	7.6	640 684.38	56.2	411 959.52	36.2
	Kujawsko-Pomorskie	14 041.70	1.9	288 784.27	38.4	448 109.28	59.7
	Podlaskie	137 120.67	17.5	470 908.82	59.9	177 710.03	22.6
Together		**364 202.44**	**10.4**	**1 978 179.75**	**56.2**	**1 175 133.69**	**33.4**
III – unfavourable distribution of land	Łódzkie	147 276.41	18.9	381 599.21	49.1	249 022.79	32.0
	Mazowieckie	279 248.42	19.2	677 745.19	45.9	499 157.16	34.3
	Świętokrzyskie	63 123.47	15.4	243 190.78	59.4	103 326.84	25.2
	Śląskie	68 972.13	33.7	112 342.52	54.8	23 619.35	11.5
	Lubelskie	215 986.97	20.1	580 255.77	53.9	279 910.37	26.0
Together		**774 607.40**	**19.7**	**1 995 133.47**	**50.9**	**1 155 036.51**	**29.4**
IV – very unfavourable distribution of land	Małopolskie	69 594.83	17.4	173 587.91	43.4	156 825.88	39.2
	Podkarpackie	48 455.17	11.6	290 074.96	69.1	81 074.00	19.3
Together		**118 050.00**	**14.4**	**463 662.87**	**56.6**	**237 899.88**	**29.0**
Total in the country		**1 406 641.36**	**13.7**	**5 670 929.69**	**55.4**	**3 158 421.02**	**30.9**

CONCLUSIONS

Family agricultural holdings that are included to the Polish system of an agricultural support have more favourable, than the whole number of farms, configuration of land, i.e., an average area land of 16.0 ha, which comprises of about 6 cadastral plots of app. 3.0-ha acreage. This is due to the fact that small registration entities, not representing the holdings and having the land in small plots, were not included in the operations of ARMA. Nevertheless, the needs for consolidation procedures are huge, because according to our calculations are found at around 7.1 million ha, which represents 69.14% of total agricultural land, including the areas of very poor distribution of land (the need of necessary reparcelling) which are app. 1.4 million ha (equivalent of about 14% of agricultural land). These needs occur throughout the country, and the largest are in the southern, south-eastern and central parts of Poland. In the voivodeships of northern and western Poland, where the land configuration is seemingly good, the consolidation procedures are also recommended. The rate of land consolidation and farmland exchange procedures executed in the period 2007-2013, and amounting to app. 13,600 ha per year, is just a drop in the bucket, and it did not contribute to the overall improvement of the distribution of lands. According to our evaluations, the land consolidation should involve at least 50,000 ha annually to improve, in the real terms, the configuration of agricultural plots in Poland.

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