

A study of the benefits of land consolidation processes in selected cadastral precincts in Poland

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Summary

Land consolidation is an agricultural management procedure aimed at creating more favourable conditions for agricultural and forestry production by improving land configuration. This analysis provides a description of the benefits of consolidating land in two adjacent cadastral precincts located in Miechów County, Małopolskie Voivodeship. The study was conducted thanks to reliable and up-to-date documents on the course and results of the consolidation process provided by the Krakow Office of Geodesy and Agricultural Land in Krakow. The study showed that, in addition to individual benefits, the consolidation process in the studied villages also brought significant benefits to the general population. The consolidation process enabled the implementation of a series of modernization projects to the network of access roads to the fields, significantly impacting the working conditions of farmers. Moreover, a tangible result of the land consolidation work was the improvement of cadastral plot boundaries and a reduction in their number. Following the land consolidation survey, post-consolidation development was undertaken, including the repair or construction of municipal roads and improvement of water conditions. The research confirmed existing knowledge about the benefits of land consolidation. It offers real opportunities to improve the well-being of residents in a village, in both social, economic, and legal aspects, through optimising the spatial structure of land and regulating legal and technical ownership relations.

Keywords

land consolidation and exchange • benefits of land consolidation • post-consolidation development

1. Introduction

In Poland, the countryside plays a special role. According to Przegon [2008], employment in agriculture in Poland is several times higher than in other European Union member states. Unfortunately, farms are more fragmented and account for 93.4% of the country's total area. The diversity of agriculture levels across the country is the result of the transformation of the agricultural economy from the period of the Partitions to the present day [Akińcza and Mastalska-Cetera 2017]. Historically, differences in the standard of agriculture were already apparent during the Partitions. While 29% of the population worked in agriculture in Prussia, in Galicia (the Austro-Hungarian partition) it was 77% [Talarowski 2021]. For these reasons, among others, the agricultural plots in southern Poland today are more fragmented, which means that farms in this region have worse conditions for development. For the same reason, production costs are higher there, and production itself cannot be automated [Leń and Mika 2016c, d]. In addition, a characteristic feature of farms in Poland is the so-called checkerboard pattern of land. This term refers to the arrangement of many small agricultural plots of various shapes, which are separated by balks. This type of land use also has a negative impact on the level of agricultural production and its organization. In addition, the spatial structure of land in Poland has the disadvantage of fragmentation, which significantly slows down cadastral reforms. All these factors affect negatively the cadastral data [Leń et al. 2016a]. One way to improve this situation is to exchange land between its owners. The tool for carrying out this process is land consolidation and exchange, regulated by the Act on Land Consolidation and Exchange [Leń and Mika 2016b]. Due to the numerous disadvantages of the spatial structure of land in the country, there is a need for projects that would improve this situation. Such actions would raise the standard of living in the countryside, improve technical infrastructure, and increase the attractiveness of rural areas [Dacko 2006]. Thanks to consolidation works carried out in rural areas, the spatial structure of farms is being corrected, among other things by reducing the number of plots and shortening the access roads to the land [Dudzińska and Prus 2017]. In addition, existing wasteland in agricultural areas (due to its low utility value) should be utilised for purposes other than agriculture. Examples of ways to develop these areas include adapting them to serve other functions: forestry, ecological land use, or growing crops for energy purposes. According to Sajnóg and Wójcik [2013], under special conditions, these lands can also be designated for development. The implementation of such works requires large financial outlays. Currently, in Poland, land consolidation works are mainly financed by the European Union [Janus 2011]. Thanks to these funds, it was possible to execute land consolidation, as a result of which the number of plots on farms decreased by nearly 49% between Poland's accession to the European Union and 2012, while their area increased by 95%. In addition, as a result of the consolidation works, the estimated increase in farm income after consolidation was estimated at 12–43.8% [Woch 2012]. During consolidation works, there is also an opportunity to improve water relations through various technical measures, such as cleaning and clearing ditches, or building micro-retention reservoirs. The

courses of ditches are also altered, which is related to the need to adjust the boundaries of registered plots to their courses. The courses of new ditches, which before consolidation were located within the boundaries of plots belonging to private owners, are also marked out. Therefore, these works should be planned during the elaboration of the land consolidation project guidelines [Taszkowski et al. 2016]. As the literature illustrates, there are many benefits to land consolidation, which should be exploited in a deliberate manner, and public participation provides an opportunity for the local population to participate in the proper (and beneficial) planning of the process. There is no doubt that land consolidation leads to the reorganization of rural areas that are meant for agricultural production. The construction of access roads, improvement of drainage facilities, or changes in the layout of plots, all of which provide an opportunity to increase farm productivity. In addition, consolidation is an opportunity to regulate and improve the quality of cadastral data. These works facilitate the modernization of the EGİB [Mika and Leń 2016].

2. Formal and legal basis for the land consolidation process

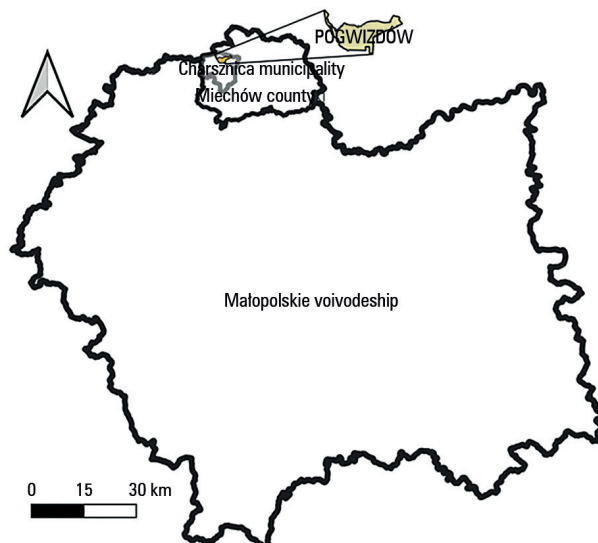
The basic law regulating the rules and procedure for land consolidation and exchange is the Act on Land Consolidation and Exchange of 26 March 1982, as amended by the Journal of Laws of 2023, item 1197. Further provisions are contained in the Act of 21 August 1997 on real estate management and the Act of 17 May 1989 on geodetic and cartographic law.

Land consolidation is an agricultural procedure that aims to create more favourable conditions for agricultural and forestry production by improving land distribution. Land distribution refers to the location of agricultural land in relation to the buildings on the farm [Act of 1982]. The benefits of this process also include improved functionality of access roads, improved water relations, reduced soil erosion, and enhanced aesthetic value of the village after consolidation. The consolidation procedure is strictly defined by the Act on Land Consolidation and Exchange of 26 March 1982. According to this legal provision, consolidation proceedings may be initiated at the request of the majority of owners of agricultural holdings located in the consolidation area, or at the request of owners whose total area exceeds half of the consolidation area. The request is submitted to the district administrator. The consolidation procedure is initiated by a decision of the starost and contains: the definition of the boundaries and area of the consolidation area; a list of participants; the expected date of completion of the works. The decision to begin consolidation proceedings is announced for 14 days on the municipal office notice board and published in the Public Information Bulletin on the County Office website. The next step in the consolidation process is to determine the external boundaries of the consolidation area. Landowners whose land borders the land subject to consolidation shall be notified of the place and date of the proceedings on the notice board at the municipal office and in the village within the consolidation area, as well as in the Public Information Bulletin of the County Office [Act of 1982]. If the number of consolidation participants exceeds 10, a council of consolidation partic-

ipants is appointed, consisting of 3–12 persons selected from among the consolidation participants. The council of consolidation participants is elected at a meeting of consolidation participants convened by the district administrator. The council acts in an advisory capacity to the surveyor-designer of the consolidation. The consolidation participants define the rules for land valuation. If the rules are not defined by them, the land is valued on the basis of the prices applicable to the sale of state-owned agricultural real estate. The results of the land valuation are announced at a meeting of the consolidation participants and additionally made available for public inspection for a period of 7 days in the villages subject to consolidation. At the meeting of the consolidation participants (during the vote), the decision to accept the land valuation is approved in the form of a resolution. Resolutions shall be adopted by a three-quarters majority in the presence of at least half of the participants in the consolidation [Act of 1982].

It is important for farmers that, when drawing up a consolidation project, each participant is allocated land of the same type and quality as the land they owned before consolidation. If it is not possible to allocate land with the same characteristics (value), cash subsidies are granted. The difference in the area of land allocated to a given participant in the consolidation may not exceed 20% of the land covered by the consolidation or 10% of the land previously owned with particularly high agricultural suitability [Act of 1982]. The consolidation project is drawn up by a surveyor-designer with the assistance of a commission appointed by the starost (district administrator), as specified in the Act of 26 March 1982 on land consolidation and exchange: The project takes into account the provisions of the local spatial development plan. It also specifies the proposed boundaries of the allocated land and the rules for its transfer to new owners, as set out in the Act. Participants in the consolidation (within 14 days of the presentation of the plan) may submit written objections, which are considered by the starost with the support of the commission. The validity of objections shall be assessed in the presence of the interested parties and at least half of the members of the commission. If necessary, an inspection may be carried out, the date and place of which shall be announced 3 days in advance. Any change to the consolidation plan after it has been marked out on the land and presented to the participants requires it to be re-designed and presented again [Act of 1982]. The land consolidation plan is approved if, after it has been presented, the majority of the consolidation participants do not raise any objections. It is approved by the starost in the form of a decision. This decision is made public (for a period of 14 days) on the notice board of the municipal office, the information board in the village and in the Public Information Bulletin of the county office. The decision approving the project constitutes the basis for disclosing changes in the land and mortgage registers and in the land and building register [Act of 1982]. The participants in the consolidation take possession of the newly allocated land during a meeting convened by the starost.

3. Characteristics of the research area



Source: Author's own study

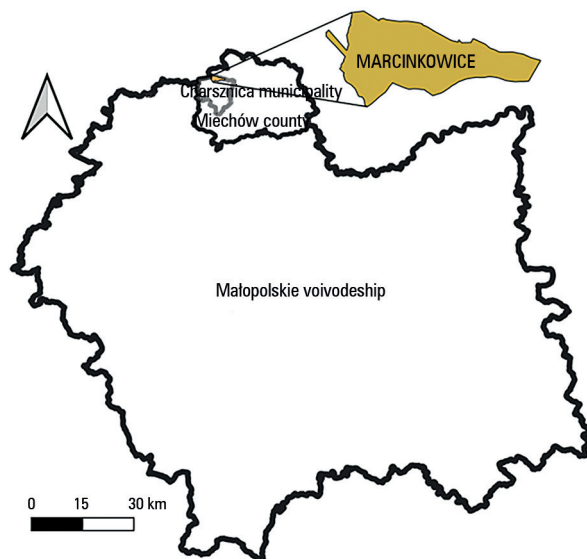
Fig. 1. Location of the Pogwizdów cadastral precinct

The first area of study was the Pogwizdów cadastral precinct. It is located in the Małopolskie voivodeship, Miechów county, Charsznica municipality (Fig. 1). It covers an area of 485.4771 ha. The village is located in an area dominated by agricultural production, which means that most of the inhabitants of the area have farms. It is worth noting that not every farm owner makes a living exclusively from agricultural production, as they work outside agriculture alongside running their farms. The village is a post-state farm village, which means that during the communist era most of the land was cultivated by the State Agricultural Farm. The village has a very well-documented history, as the first mentions of it date back to the 15th century, when it was owned by Piotr Myszkowski, the starost of Chęciny [Wikipedia 14.05.2025]. Subsequent owners are documented, thanks to which we know how the history of this village unfolded. Hence, there is a 17th-century noble manor house in Pogwizdów, along with a park, which currently houses a primary school. In the days of the gentry, land in Pogwizdów was owned only by a small group of residents who now live in the part known as the 'old village', which is located next to the manor house. The rest resided in farm living quarters, i.e. buildings intended for manor workers and seasonal agricultural labourers [Wikipedia 14.05.2025]. After the Second World War, the manor lands were divided among the residents. Thanks to this, there is no significant fragmentation of registered plots in the village, and in most cases they are not far from farm buildings. However, the lack of functional access roads to agricultural land was disadvantageous, resulting

in the creation of dirt roads in places where, according to documents, no roads existed. The construction of the LHS (Linie Hutnicze Szerokotorowe) railway line in the 1970s, which runs through the northern part of the village, had an impact on the fragmentation of registered plots. Some of the plots separated during the division for the construction of the railway line did not have access roads indicated in the documents. During the construction of the line, a retention reservoir was dug to lower the groundwater level that could seep under the track bed. In order to discharge the excess water, a ditch was also dug in the place of the old manor road connecting Pogwizdów with Marcinkowice.

The consolidation proceedings in Pogwizdy were completed with the entry into force of the decision of the Miechów County Administrator of 5 October 2022 approving the land consolidation project in this area. As a result of the proceedings, the number of plots decreased slightly from 968 to 961, a difference of 7 plots. Before the consolidation proceedings, the average area of a registered plot in the Pogwizdów precinct was 0.5015 ha. After the entire process, the average area increased by 0.0037 ha and is now 0.5052 ha. This is a small difference in area, but in the case of the Pogwizdów precinct, the reduction of plot dispersion and the improvement of access roads were significant benefits from the consolidation process.

The second examined area is the village of Marcinkowice. The Marcinkowice cadastral precinct is located in the Małopolskie voivodeship, Miechów county, Charsznica municipality (Fig. 2). The village covers an area of 427.8701 ha. Similarly to the Pogwizdów precinct, the Marcinkowice precinct is situated in an area dominated by agricultural production. In the case of Marcinkowice, not all farm owners rely on their own farms for their livelihood.



Source: Authors' own study

Fig. 2. Location of the Marcinkowice cadastral precinct

The first mentions of Marcinkowice date back to the 14th century and appear in church documents related to the granting of land to the nearby parish in Uniejów. The village was also owned by Piotr Myszkowski, the starost of Chęciny [Wikipedia 24.05.2025]. Unlike Pogwizdów, though the village of Marcinkowice belonged to the manor, it was mostly owned and farmed by the people. The village had more individual farmers, which resulted in a high degree of fragmentation of plots. The plots are narrow but long. This was caused by the division of land between children, of whom there were usually several. Due to such divisions, the plots took the shape of very narrow rectangles, as can be seen in Figure 3. This shape of the plots creates difficulties in cultivation and increases the costs of cultivation due to the inability to use modern agricultural equipment, which is becoming larger year by year.



Source: <https://kbgitr.com.pl>

Fig. 3. Spatial structure of plots illustrating their elongation

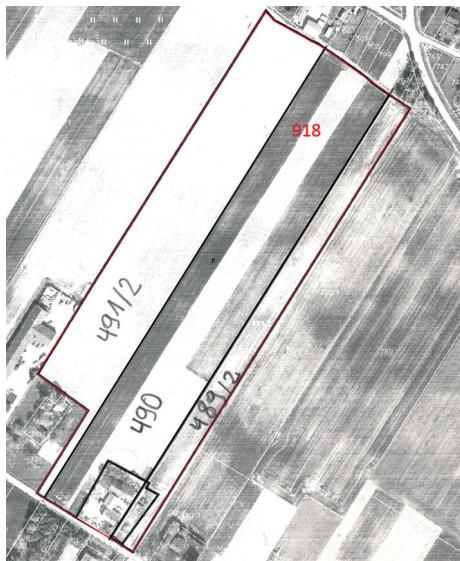
The LHS railway line also runs through this village, but it had less of an impact on the fragmentation of plots than in Pogwizdów. However, it significantly increased the travel time to farmland.

The consolidation procedure for the Marcinkowice precinct was approved on the date of the entry into force of the decision of the Miechów Starost dated 5 October 2022. As a result of the completed works, the number of registered plots in this area decreased by 302 from the initial number of 1,087 to 785 plots. This is a significantly greater difference than in Pogwizdów, which may be explained by the high fragmentation of plots in this precinct. Moreover, when analysing the subject, one can notice that a greater number of consolidation participants agreed to exchange land in Marcinkowice in order to improve their land layout.

The average area of a registered plot in the Marcinkowice precinct before consolidation was 0.3703 ha, and after consolidation it increased to 0.3939 ha. This is an increase of 6.35% compared to the state before the consolidation. This increase is greater than in Pogwizdów, as described earlier. The benefits of the consolidation will be presented in the following examples, which concern both individual and general interests.

4. Examples of the benefits of consolidation proceedings in Pogwizdów precinct

The case of individual benefits within Pogwizdów will be illustrated by the example of the farm described below. Before consolidation, FARMER 1 owned 8 agricultural plots with a total area of 11.1219 ha. The outline of the registered plot boundaries (491/2, 490, 489/2, 632/1, 632/2, 763/2) before consolidation is shown in Figure 4 and Figure 5. The boundaries before consolidation are marked in black, while the area of these plots after consolidation and their new numbers are marked in red. After the consolidation process, the total area of this farmer's land was 10.9806 ha, consisting of two registered plots, 918 (Fig. 6) and 1304 (Fig. 7). The reduction in area was caused by the sale of two plots (numbers 110/1 and 111/1) with a total area of 0.1940 ha, which were permanent grassland. In addition, FARMER 1 purchased a small registered plot of land from the county authorities, which had been separated from his land during the design of the LHS railway line, and which he had been working on until then (despite the fact that it was not his property). This plot is shown in Figure 5, marked



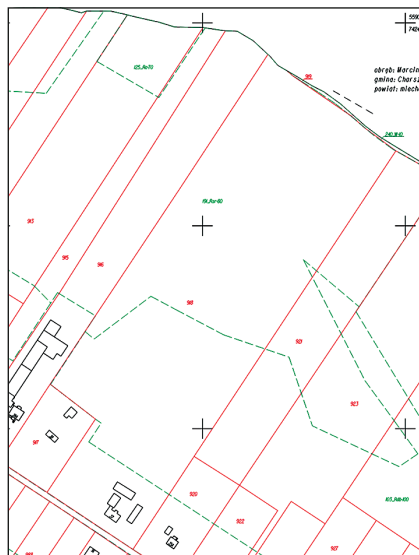
Source: provided by the landowner

Fig. 4. Boundaries of registered plots nos. 489/2, 490, 491/2 prior to consolidation



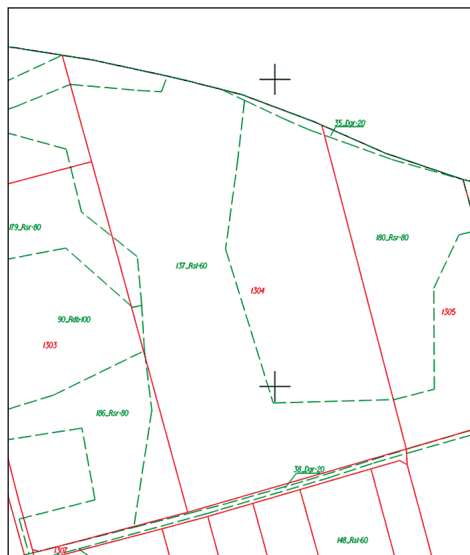
Source: provided by the landowner

Fig. 5. Boundaries of registered plots nos. 632/1, 632/2, 763/2



Source: Appendix 1 to the decision of the Miechów Starost No. GG.611.16.2019

Fig. 6. Plot 918 after consolidation



Source: Appendix 1 to the decision of the Miechów
Starost No. GG.611.16.2019

Fig. 7. Plot 918 after consolidation

with the number 763/2. As a result of the consolidation process, the average plot size on the farm increased significantly from 1.3883 ha before the works to 5.4903 ha after the consolidation works. In this case, an increase of approximately 75% was recorded. Thanks to this, FARMER 1 can actually save time, e.g. when filling in the application for direct payments, he no longer has to describe each of the 8 plots he owned before the consolidation, but only two.

The second example of individual benefits is the case of FARMER 2, who owned 35 plots with a total area of 11.9368 ha before the consolidation works were undertaken. After the process, the number of plots was reduced to 8, and the total area increased to 15.7727 ha. The increase in the total area stems from the fact that FARMER 2, who was engaged in animal production, purchased permanent grassland from other farmers who were not engaged in such production. The average plot size on FARMER 2's farm changed from 0.3411 ha before consolidation to 1.6251 ha after consolidation.

In addition to the individual benefits of the consolidation process in the studied village, there are significant benefits for the general population. Post-consolidation development in Pogwizdów was a key element in improving the quality of life for the local community. Thanks to the consolidation process, it was possible to carry out a series of works to modernise the road network and improve the living conditions of the inhabitants, as listed in Table 1. Table 1 shows that 2.609 km of new roads were built and nearly 12 km were rebuilt. Water conditions were also upgraded by adjusting the course and improving the technical parameters of drainage ditches. Over 3 ha of land was reclaimed to enable its acquisition. Tree and shrub planting was planned along

a 380 m stretch. Figures 8-18 illustrate examples of the benefits of post-consolidation development in the village of Pogwizdów.

Table 1. Summary of works as part of the post-consolidation development of the Pogwizdów precinct [Appendix 5 to the decision of the Miechów Starost No. GG.611.16.2019]

No.	Scope of proceedings	Unit	Quantity [approx.]
1	Construction of new roads (TOTAL)	km	2,609
2	Road reconstruction (TOTAL)	km	11,802
2.1	Road reconstruction	km	11,344
2.2	Road reconstruction with drainage	km	0,458
3	Adjustment of the course and improvement of the technical parameters of drainage ditches	km	3,029
4	Construction of culverts (TOTAL)	piece	16
4.1	Construction of new culverts	piece	13
4.2	Reconstruction of existing culverts	piece	3
5	Land reclamation related to the conditions of taking possession	ha	3,217
5.1	Removal of trees, shrubs, and roots, mowing of grass, plowing	ha	0,220
5.2	Plowing the balks	ha	2,997
6	Planned tree and shrub planting (designed tree rows)	km	0,380



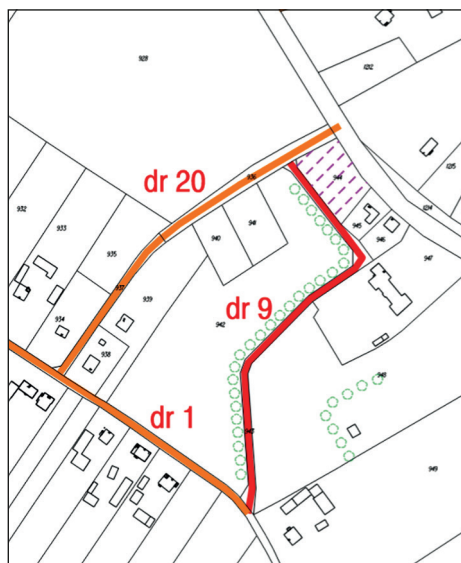
Source: Appendix 5 to the decision of the Miechów Starost No. GG.611.16.2019

Fig. 8. The route of the new road dr 14



Source: Authors' own study

Fig. 9. Newly constructed road dr 14



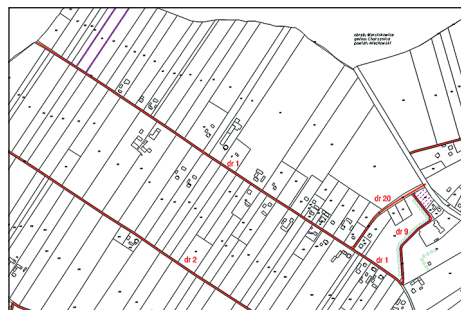
Source: Appendix 5 to the decision of the Miechów Starost No. GG.611.16.2019

Fig. 10. Route of the new road dr 9



Source: Authors' own study

Fig. 11. Newly constructed road dr 9



Source: Appendix 5 to the decision of the Miechów Starost No.

Fig. 12. Route of the new road dr 1



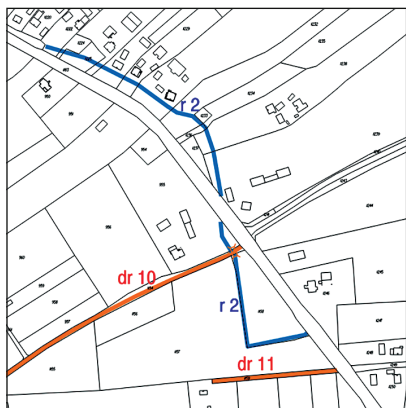
Source: <https://www.google.com/maps>

Fig. 13. Condition of the surface of road dr 1 before renovation



Source: Authors' own study

Fig. 14. Condition of the road surface of road dr 1 after renovation



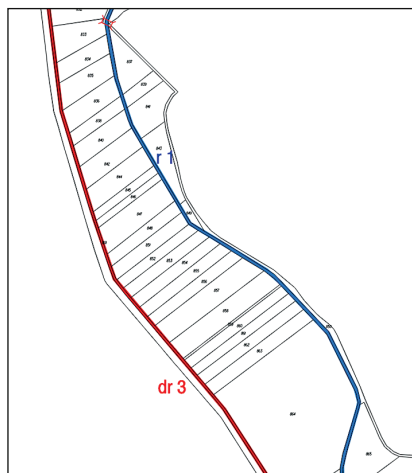
Source: Appendix 5 to the decision of the Miechów Starost No. GG.611.16.2019

Fig. 15. Course of ditch r 2



Source: Authors' own study

Fig. 16. Course of ditch r 2 in the terrain



Source: Appendix 5 to the decision of the Miechów Starost No. GG.611.16.2019

Fig. 17. Course of ditch r 1



Source: Authors' own study

Fig. 18. Course of ditch r 1 in the terrain

5. Examples of the benefits of consolidation in the Marcinkowice precinct

The example of individual benefits concerns the improvement of land distribution in the Marcinkowice precinct. It involves a farmer who owned a farm that, prior to consolidation, covered an area of 6.6166 ha consisting of 19 registered plots. After the consolidation process, the number of plots on this farm was reduced to 12. As a result, the average plot size on the farm increased by 60% compared to the state before the consolidation (from 0.3482 ha to 0.5585 ha).

The second example of individual benefits for another farmer concerns the increase in the average plot size on his farm. Before consolidation, this farmer owned 15 registered plots with a total area of 3.9210 ha. After consolidation, the number of his plots was reduced to 8. As a result, the average plot size increased significantly, from 0.2614 ha to 0.4921 ha, i.e. by 88%.

Increasing the average plot size on a farm has a positive impact on economics and cultivation. With fewer plots, farmers do not waste time traveling between their fields, reducing fuel costs. In addition, by increasing the size of the plot, cultivation becomes easier, as larger agricultural machinery can be used, which, thanks to the smaller number of trips required and (from a technical point of view) wider tires, causes less soil compaction, which reduces crop yields.

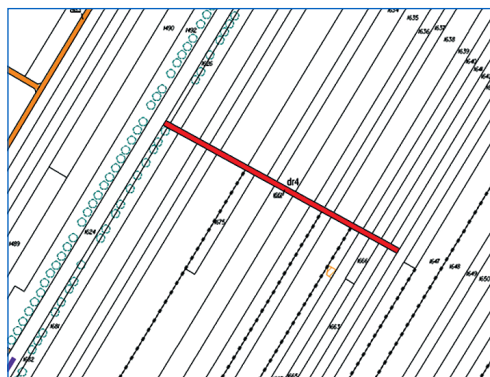
Apart from the individual benefits of the consolidation process in the studied village, significant gains for the entire community can be observed. Table 2 shows the scope of the works carried out as part of the post-consolidation process. It shows that 341 m of new roads were built and 15.436 km were reconstructed. Water management was upgraded by adjusting the course and improving the technical parameters of drainage

ditches over a length of 5.177 km. Reclamation works were also conducted on an area of 1.980 ha, and afforestation of an area of 2.500 ha was planned.

Table 2. Summary of works as part of post-consolidation development in the Marcinkowice precinct [Appendix 5 to the decision of the Miechów Starost No. GG.611.57.2018]

No.	Scope of proceedings	Unit	Quantity [approx.]
1	Construction of new roads (TOTAL)	km	0,431
1.1	Construction of new roads	km	0,313
1.2	Construction of new roads with drainage	km	0,118
2	Road reconstruction (TOTAL)	km	15,436
2.1	Road reconstruction	km	11,627
2.2	Road reconstruction through roadside improvements	km	0,721
2.3	Road reconstruction with drainage	km	0,585
2.4	Road reconstruction by improving the technical parameters of the drainage ditch	km	0,491
2.5	Road reconstruction by improving roadside and drainage ditch	km	2,012
3	Adjustment of the course and improving the technical parameters of drainage ditches (TOTAL)	km	5,177
3.1	Improvement of technical parameters of drainage ditches	km	5,075
3.2	Correction of drainage ditches	km	0,102
4	Construction of culverts (TOTAL)	sztuka	53
4.1	Construction of new culverts	sztuka	22
4.2	Reconstruction of existing culverts	sztuka	31
5	Reclamation works (TOTAL)	ha	1,980
5.1	Land reclamation related to the conditions of taking possession	ha	1,980
6	Planned length of tree planting (TOTAL)	ha	2,500

Figures 19–28 show examples of the benefits of post-consolidation development in Pogwizdów.



Source: Appendix 6 to the decision of the Miechów Starost No. GG.611.57.2018

Fig. 19. Newly designed road dr 4



Source: Authors' own study

Fig. 20. Newly designed road dr 4 in the field



Source: Appendix 6 to the decision of the Miechów Starost No. GG.611.57.2018

Fig. 21. Course of sections of drainage ditches subject to parameter improvement as a result of consolidation



Source: Authors' own study

Fig. 22. Course of sections of drainage ditches subject to parameter improvement in the field



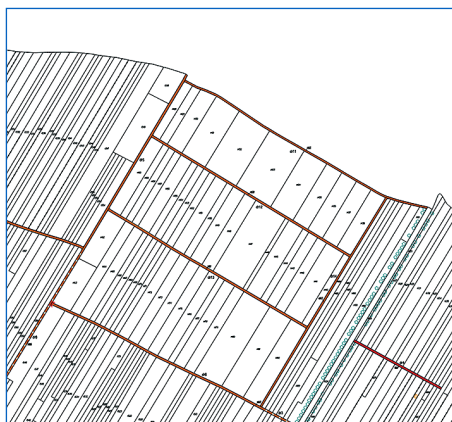
Source: Appendix 6 to the decision of the Miechów Starost No. GG.611.57.2018

Fig. 23. Course of a section of road



Source: Authors' own study

Fig. 24. Course of a section of road in the field



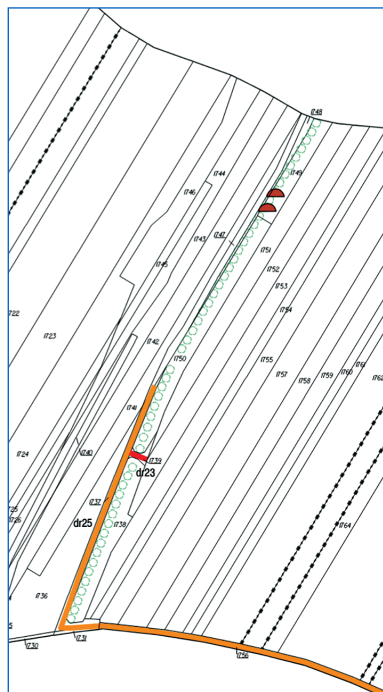
Source: Appendix 6 to the decision of the Miechów Starost No. GG.611.57.2018

Fig. 25. Course of roads in the 'Toborowie' area



Source: Authors' own study

Fig. 26. Course of roads in the "Toborowie" area in the field



Source: Appendix 6 to the decision of the Miechów Starost No. GG.611.57.2018

Fig. 27. Planned tree avenue along the railway line



Source: Authors' own study

Fig. 28. Planned tree avenue along the railway line in the field

6. Conclusions

An analysis of relevant literature, legal regulations, and exemplary technical documentation from the consolidation process in selected precincts has revealed that consolidation plays a crucial role in improving the spatial structure of rural areas and significantly contributes to enhancing the quality of life of their residents. It brings considerable individual and general benefits to the inhabitants of areas undergoing consolidation. A measurable individual benefit is the correction of the boundaries of registered plots and a reduction in their number per farm. Moreover, after the completion of the geodetic land consolidation process, post-consolidation development is undertaken, including, among other things, the improvement of road surfaces or the construction of new access roads, which have a great impact on the quality of life and work of rural residents. In addition, as a result of deliberate and discussed with the farmers concerned plan of the consolidation works, there is also a possibility of improving water relations in these precincts. It is realised through various technical measures, such as cleaning, unclogging ditches, or building micro-retention reservoirs.

In summary, the consolidation proceedings performed in the villages under study created real opportunities to improve the lives of residents in social, economic and legal terms by optimising the spatial structure of land, and regulating the legal and technical aspects of often neglected property relations.

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