



Considering the level of socio-economic development of rural areas in the context of infrastructural and traditional consolidations in Poland



Małgorzata Dudzińska^a, Stanisław Bacior^b, Barbara Prus^{c,*}

^a Institute of Geography and Land Management, Faculty of Geodesy, Geospatial and Civil Engineering, University of Warmia and Mazury in Olsztyn, Poland, Prawocheńskiego str. 15, 10-719, Olsztyn, Poland

^b Department of Geodesy, Cadastre and Photogrammetry, Faculty of Environmental Engineering and Land Surveying, University of Agriculture in Kraków, Balicka str. 253a, 30-149, Kraków, Poland

^c Department of Land Management and Landscape Architecture, Faculty of Environmental Engineering and Land Surveying, University Agriculture in Kraków, Poland, Balicka str. 253c, 30-149, Kraków, Poland

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ABSTRACT

Agricultural land consolidations help solve structural problems caused by land fragmentation. The FAO classifies the impacts of land consolidation at three levels: firstly, there is the micro-level, where land consolidation aims at changing the farm structure. Secondly, there is the meso-level where land consolidation has broader aims of changing rural communities by improving the infrastructure, the natural environment, and the management of natural resources, landscape and, consequently, the spatial distribution of economic activities. Finally, there is the macro-level where the focus is on changes which can positively affect the whole country by reducing the disparities between rural and urban areas. Therefore, one of the advantages arising from the implementation of consolidations should be positive socio-economic changes in rural areas, resulting from the implementation of agricultural land consolidations. In this study, the Authors took on an assessment of the effects of consolidations at the meso-level. Another aim of the study was to identify the effects of consolidations on changes in socio-economic development of rural areas. A question was raised as to whether there is a correlation between the rate of changes in socio-economic development of rural areas and the implementation of agricultural land consolidations in this area.

The level of socio-economic development was assessed based on an indicator of the rate of changes, calculated as the difference between the levels of commune development indicator for the years 2004 and 2016. In order to determine the synthetic indicator, one of the taxonomic methods, namely Helliwig's synthetic measure of development, was applied. The study concerned communes of Lubelskie and Małopolskie Voivodeships in which both traditional and infrastructural consolidations had been implemented over an area of at least 15% of the commune's area.

The study indicates an increase in the level of socio-economic development of the communes in which traditional consolidations were implemented. The study results indicate that the implementation of traditional consolidations of agricultural land is one of the factors contributing to an increase in the level of socio-economic development of rural areas.

At the same time, it was found that infrastructural consolidations understood as a corrective tool, implemented at the time of the construction of linear infrastructure projects, do not always serve their function of an improvement in the land layout in rural areas. The conducted study indicates that in the communes in which infrastructural land consolidations have been implemented, no improvement in the conditions of socio-economic development has taken place.

1. Introduction

Land consolidation (LC) is a commonly-known and widely-performed measure that has been applied for centuries (Vitikainen, 2004).

LC may be described as a planned re-adjustment and re-arrangement of land parcels and their ownership. Thanks to land consolidation, the land quality and agricultural infrastructures such as irrigation systems and roads are improved, and land fragmentation is reduced. At the

* Corresponding author.

E-mail addresses: gosiadudzi@uwm.edu.pl (M. Dudzińska), rmbacior@cyf-kr.edu.pl (S. Bacior), b.prus@ur.krakow.pl (B. Prus).

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same time, land use patterns are significantly transformed (Wang and Zhang, 2004; Yun et al., 2008; Pašakarnis and Maliene, 2010). The benefits that arise from LC works have a positive influence on a number of the aspects, because it not only increases the economic efficiency of a farm but is also a vital tool for supporting the multifunctional development of a rural area (Sklenicka, 2006; van Dijk, 2003; Pasakarnis and Maliene, 2010; Lisec et al., 2014; Haldrup, 2015; Janus and Markuszewska, 2017).

LC is a specific type of a project which also has a significant impact on socio-economic progress. However, as confirmed by, *inter alia*, Jin et al. (2016) or Crecente et al. (2002), it is difficult to analyse the impact, especially the socio-economic one, of an LC programme due to its diversified, far-reaching and inter-correlated influencing factors.

The FAO (2008) classifies the impacts of LC at three levels: firstly, the micro-level where LC aims at changing the structure of farms and their immediate environment so as to enable farmers to become more competitive. Secondly, there is the meso-level where LC has broader aims of changing rural communities by improving the infrastructure (roads, irrigation and drainage systems, water and disposal installations, etc.), the natural environment, and the management of natural resources, landscape and, consequently, the spatial distribution of economic activities. At the macro-level, the focus is on changes which can positively affect the entire country by reducing the disparities between rural and urban areas, by ensuring a more efficient and varied use of the rural space, by improving the overall competitiveness of the agricultural and rural sector, and finally, by building trust between the government and inhabitants of rural areas, and by enhancing the land market (Demetriou, 2013).

The evaluation of LC has attracted the attention of many researchers who try to devise concepts and methods to measure and understand the LC performance. The effect of agricultural land consolidations on the development of rural areas at the micro-level is assessed *inter alia* through the use of parameters of land fragmentation (LF) (Janus and Markuszewska, 2017; Sklenicka, 2006), through yield monitoring (Du et al., 2018), or through the assessment of economic efficiency of a farm (Hiironen and Riekkinen, 2016).

Hiironen and Riekkinen (2016) analyze how land consolidations improve the property structure, and to what extent they reduce the costs of farming. The study calculates whether the ensuing benefits exceed the incurred costs. The average production costs were discovered to decrease by 15% due to the significant improvement in the property structure.

An assessment of the effect of agricultural land consolidations at the meso-level is most frequently performed through, *inter alia*, an assessment of farmers' satisfaction with LC (Allahyari et al., 2018; Luo and Timothy, 2017; Lisec et al., 2014; Aslan et al., 2007).

Lisec et al. (2014), based on a field survey conducted on a sample of private land owners involved in selected land consolidation projects, tried to identify the advantages and disadvantages of the current practice. The main finding was that the active participation of land owners contributes to both their comprehension of the aims and to their satisfaction with the results of the LC. It has been shown that the active participation of land owners in the LC is the basis for developing good practices; moreover, it affects the land owners' perception of LC.

In a study of Allahyari et al. (2018), the farmers' satisfaction with an LC project in paddy fields of the Masal County in Guilan Province of northern Iran was measured by four factors, namely: (1) economic efficiency (related to production costs and income); (2) working conditions (related to physical conditions and working schedules); (3) technical efficiency (related to a better use of resources and inputs); and (4) land productivity (related to the intensification of land use), which all together explained 54.9% of the total variance of effective factors in the farmers' satisfaction.

Jin et al. (2016) presented the system dynamics model which can function as a novel method to effectively evaluate the socio-economic impacts of LC. The developed system dynamics model is comprised of (1)

four subsystems, two forms of input and seven critical output variables regarding the socio-economic impacts of LC are identified; (2) a stock-flow diagram effectively depicting the feedbacks and dynamic nature of LC is established; and (3) a scenario simulation comparing nine indicators with and without an LC project is conducted (Jin et al., 2016).

At the meso-level, the effects of land consolidations on the environment and ecological processes (Moravcová et al., 2017; Zhang et al., 2014; Wang et al., 2015; Liu et al., 2013), on the protection of landscape values (Gu et al., 2008; Kupidura et al., 2014), on the climate effect of forest land consolidation (Kolís et al., 2017), or on the multifunctional development of areas (Crecente et al., 2002; Coelho et al., 2001) are also evaluated.

Wang et al. (2015) found that land consolidation had certain negative effects on ecosystem services, and the total ecosystem service value decreases by almost 30% at the late stage of consolidation. This decrease is caused by the loss of ecosystem service of the wetland and grassland, despite a sensible increase in cultivated land.

Moravcová et al., 2017 confirm the importance of LC processes not only for the organization and recovery of ownership and cadastral records but also for the improvement of agricultural use of landscape, and the protection of natural resources such as soil, water, and plant and animal communities.

A study by Kolís et al. (2017) identifies a number of possible climate effects of forest LC. To specify these, the increased carbon storage in the Pahkakoski LC project (Finland) due to increased forest growth is valued through substitution costs. The results show that the value of the increased carbon storage in the project area amounts to approx. € 750,000, or € 153/ha.

The effect of agricultural land consolidations at the macro-level can be found in publications by Guo et al. (2015) and by Jin et al. (2017).

A study by Guo et al. (2015) concludes that the wide range of LC implementation has comprehensively influenced the multi-functionality of agriculture. For example, LCs have significantly improved the production function of cropland, driven investments in agriculture, promoted development of rural agricultural economy, maintained food security and stability in the rural area, and increased crop supply in most provinces. However, it also slightly impaired rural ecological benefits in some voivodeships.

On the other hand, Jin et al. (2017) found that the overall effectiveness of LC in improving agricultural productivity is low, which is in contrast to optimistic estimates based on regional statistical analyses and theoretical approaches.

This article aims at analyzing and evaluating the effects of two types of land consolidations, traditional and infrastructural, on the change in the level of socio-economic development of rural areas. The study is carried out at the commune level (NUTS 5 level in the statistical nomenclature). The article attempts to provide an answer to the question as to whether there is a correlation between the rate of changes in socio-economic development of rural areas and the implementation of agricultural land consolidations in this area. This correlation is studied for two types of land consolidations: traditional and infrastructural. According to the FAO classification, this is a study at the meso-level.

Infrastructural consolidations differ from the traditional (structural) ones. The main aim of infrastructural consolidations is to organize the space in the areas adjacent to a linear infrastructure project, and to minimize the consequences of this project.

Linear development projects such as motorways or expressways usually occupy small areas in relation to the whole area of the village, but they irreversibly affect the spatial structure of the land, crossing complexes of plots and separating plots belonging to a single farm, which, after construction of a motorway, are located on the opposite side of the village (Harasimowicz and Janus, 2009).

Two main reasons can be indicated, which make it necessary to carry out infrastructural consolidation works in a particular area (Harasimowicz and Janus, 2009). The first one is a disturbance to the transport network system within the area concerned, which involves

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