

Non-urban area ownership structure. Case study of Southern Poland

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Abstract: The study shows a possible way of analyzing the diversity of ownership forms in non-urban areas, with particular focus on land co-ownership. The data in cadastral databases was processed with the use of the relational model which applied information on the geometry of areal spatial objects and descriptive attributes. The paper presents also the results of the analysis of Nowy Sącz District with the area of 1.550 sq.km and containing approximately 200.000 parcels. The area is representative for many countries in Central and Eastern Europe, where unfavorable land fragmentation indices and complex ownership structures complicate investing processes and development of rural areas what results in progressive degradation of agricultural and cultural landscape. The results indicate that the co-ownership phenomenon affects 13% of parcels in the study area. However, it varies greatly depending on the village and ranges from 3 to 67% of total parcels number. Suggested methods of analyzing the ownership structure are of universal character. In spite of this, when used during analyses conducted in other countries, certain modifications are required. It is mainly caused by the differences in cadastral data models used in those countries.

Keywords: land and property register, consolidation, co-ownership, real estate register

1. Introduction

Non-urban areas prevail in the world. Securing their development is now one of the greatest economic and socio-economic challenges (Westhoek et. al., 2006), yet the difficulties and the extent of changes vary significantly, depending especially on the level of development of a given region. In order to plan the development of rural areas it is necessary to identify their current state, approaching it from different angles (Herrmann and Osinski, 1999), among which should be social, economic, and environmental conditions.

The knowledge of spatial structure of a rural area should be the basis for actions, such as spatial planning, taken to provide their further development. Among others, the information should contain the arrangement of parcels, land use, agricultural suitability, and ownership structure (Hoppe, 2006). The usefulness of such data is even more evident when it is analyzed periodically, as it allows to observe trends and provide long-term prognoses. Complex study of land spatial structure can be achieved through the analysis of cadastral data (Navratil and Frank, 2004) usually in GIS software (Hasanzadeh, 2010). Cadastre, a register of land properties and ownership, was essential for the functioning of tax systems in the past. Today, the usefulness of cadastre (and, derived from it, land registry) is much higher: a well-organized cadastre, supported by land and mortgage register allow efficient governing (Enemark, 2010).

Contemporary techniques of relief data acquisition and its further processing, most importantly LIDAR technique, allow to add other information into two-dimensional cadastre data models making them, as a result, three-dimensional (Stoter and Salzmann, 2003; Stoter and van Oosterom, 2006). Furthermore, the commonness of storing data in cadastral systems, their standardization, and computerization allow easy time related analyses, that is their examination in fourth dimension (Döner et al., 2011; Siejka et al., 2014).

This study approaches one possible use of cadastral databases, that is the spatial distribution of land ownership forms. This characteristic of land spatial structure affects their functioning (Cobanoglu, et al, 2011; Vranken, et al., 2004) as well as plays an important role in providing prognoses of their development (Home, 2009; Munton, 2009).

The study focuses on the analysis of the abundance of land co-ownership: a phenomenon unfavorable for planned investments. The results prove that the phenomenon of co-ownership is common, but its intensity depends on the region. Additionally, there are several ways of using the developed method, of which land consolidation works serve as an example (Janus and Taszakowski, 2015).

2. Materials and methods

The method of analyzing ownership forms with the use of the cadastral data relational model used in Poland (Bydłosz, 2015) was proposed for this study. The method differs from the one suggested by Gobin et al. (2001) and has no significant limitation that could be caused by the size of data sets. The suggested solutions were tested on a 1.550 sq. km object located in northern Poland, in Małopolska Voivodeship, Nowy Sącz District (Figure 1). The district consists of 16 communes in which there are approximately 200.000 cadastral parcels. The area is representative for many countries in Central and Eastern Europe, where vast areas are bothered by unfavorable land fragmentation indices and complex ownership structures. Such situation complicate investing processes and impede the development of agriculture.



Fig. 1. Location of the Nowy Sącz District in Poland and the Małopolskie Voivodeship

The input data was obtained from cadastral databases in SWDE files, which is one of the formats used in Poland for this type data (Bydłosz and Parzych, 2007). The format consists of plain text of the relational model, used for exchanging information among different Polish cadastral systems. The data sets store information on the property location, parcel geometry, form of use, as well as information on the owner, including the number of owners, form of co-ownership, and owners' addresses.

Polish cadastral data model is characterized by the division of the types of ownership into 15 registry groups. This allows to maintain administrative and statistical order and is used for tax purposes. One of the basic registry groups is land belonging to private owner (out of which individual farms can be additionally isolated) The remaining 14 groups are formed by the properties owned by various public administration bodies, their organizational units, institutions, companies, and other organizations. The data was processed in the MkScal software to produce widely accepted formats of data that store the geometry of parcels and their descriptive attributes. It was then implemented into GIS environment.

Using this information, parcels with co-ownership (meaning at least two owners) were selected. Then, using algorithms in GIS software all of the selected parcels were attributed with the number of owners. Finally, marital property (ownership between spouses) was distinguished as a separate category.

3. Result and discussion

With the use of cadastral data from Nowy Sącz District a sequence of analyses was conducted. Their aim was to examine the ownership structure of land. The first one allowed to determine the structure by attributing parcels to different categories that described types of ownership. The majority of parcels belonged to private owners – 86% of the total number of parcels. Their combined area equaled 57% of the total area of all analyzed parcels. Private owners' lands were spread across the Nowy Sącz

District, however, their distribution was noticeably denser in central and northern parts of the district (Figure 2).

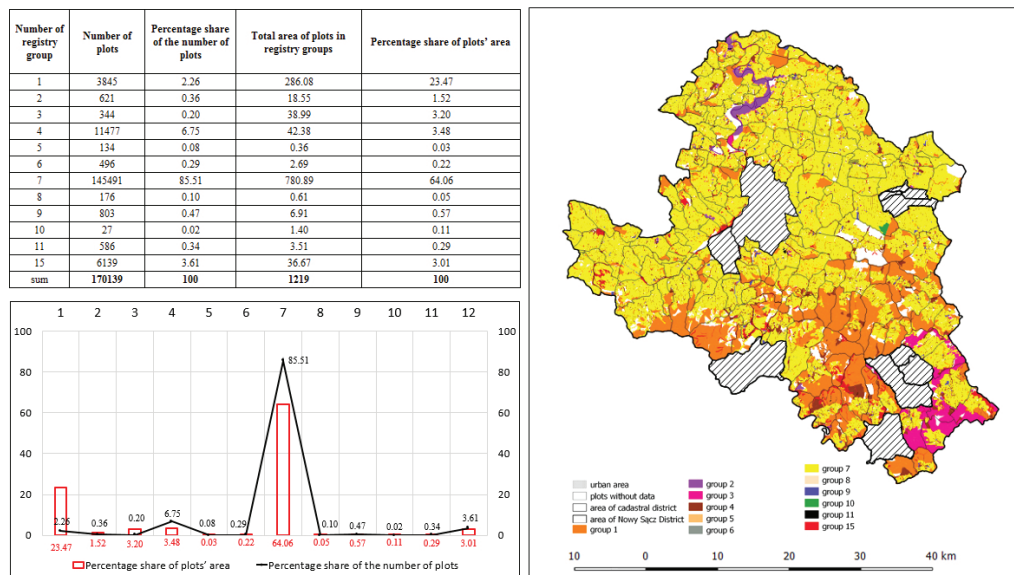


Fig. 2. Structure of land use according to registry groups in Nowosądecki District

Further analysis examined the number of owners of parcels. The previously selected parcels were classified on grounds of the number of people who owned them. Parcels owned by a single person were most common, equaling 87% of the total number of parcels. Second group consisted of parcels owned by two people – 8%. Third group (4%) was owned by more than two but less than five people. The distribution of single owner parcels was uniform. The distribution of parcels with two owners was concentrated in northern and western parts of the Nowy Sącz district (Figure 3). The remaining groups were not characterized by any rule and occurred in different parts of the district.

Determining the structure of the phenomenon relating on the data of parcels was exceptionally problematic. Using spatial tools, the results were generalized to the level of surveying sections. This allowed to define areas in which the percentage of co-ownership in total number of parcels was evident. The average value for all surveying sections was 28%. Parcels with more than one owner were most common in Krzywka section – 52% and the least common in Sowikowa section – 3%.

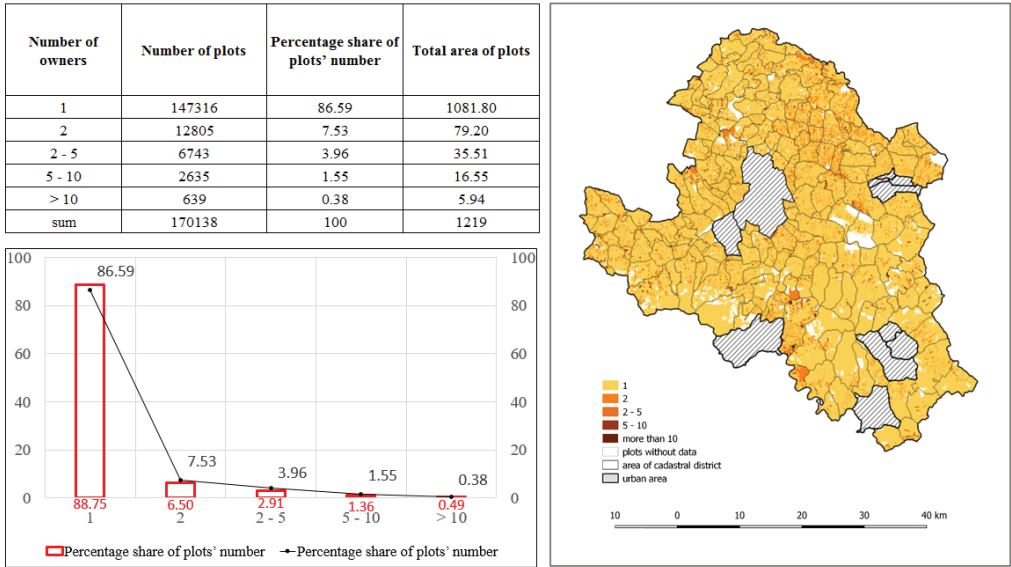


Fig. 3. Spatial diversity of property depending on the number of owners

Further analyses involved the identification of martial properties. The study was completed on a set of parcel for which cadastral data was available. The total number of elements was 170.138 (the dataset contained private owners' lands – used as arable lands, forests, pastures, and built-up areas). Out of all the parcels, 40% were martial properties. Determining the areas with high or low density of such properties was difficult, as their distribution was uniform and not characterized by any particular rule (Figure 4).

With the use of GIS tools, the results were generalized to the surveying sections level. Percentage share of martial properties in the total number of parcels in a section was calculated (Figure 5). It was then possible to provide spatial representation of the phenomenon followed by structural analysis. It became evident that the most common sections (142, that is 75.53%) were characterized by 20–40% share of martial properties. Second most common were sections with less than 20% share. With the number of 35, they equaled to 18.62% of studied surveying sections. The least common were sections in which martial properties exceeded 40%. In Nowy Sącz District there were 11 such sections, that is 5.85% of the total number.

With the use of GIS spatial analysis tools, similarly to the previous analysis, sections in which the phenomenon was most and least common were determined. The average value for the whole Nowy Sącz District was also calculated. The phenomenon was most common in Posadowa Mogilska section (39%), least common in Czynna section (3%), and the average value of martial property in the whole district was 13%.

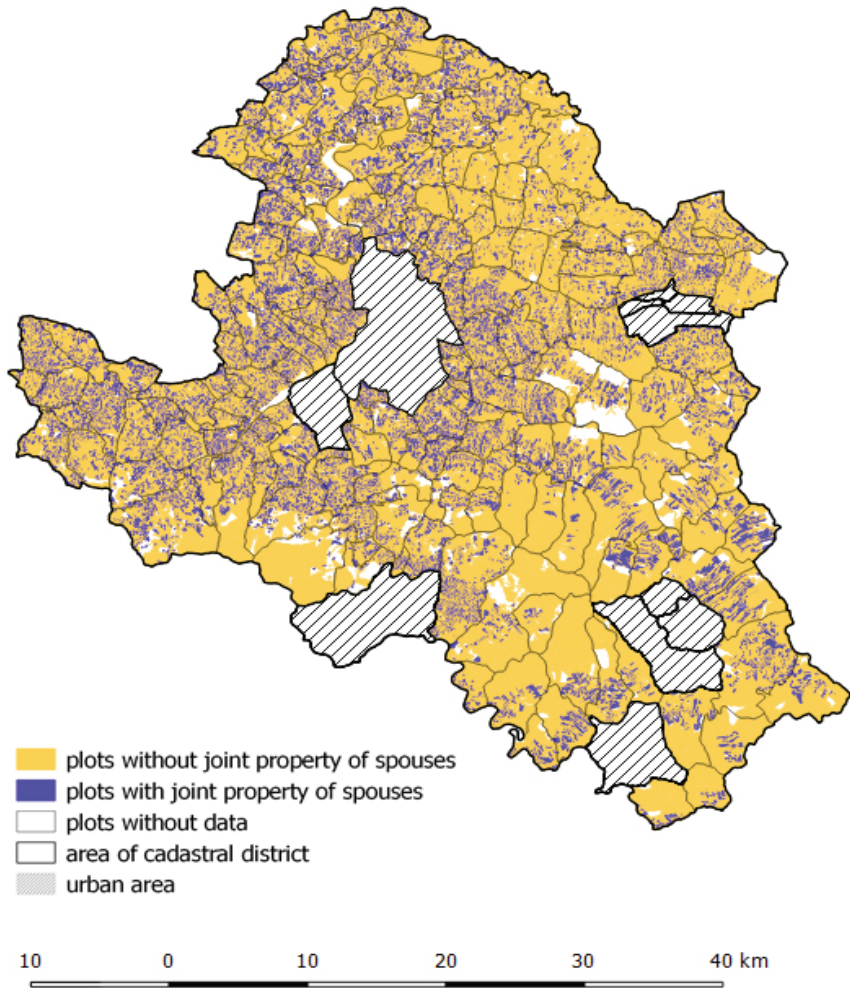


Fig. 4. Spatial diversity of property depending on the number of owners

Percentage share of plots with joint property of spouses in a surveying section	Number of surveying sections	Percentage share
0 - 20 %	35	18.62
20 - 40 %	142	75.53
40 - 100 %	11	5.85
sum	188	100

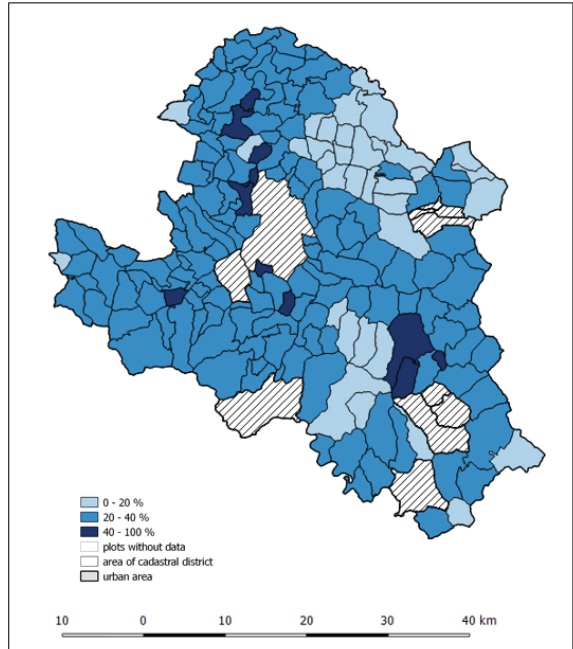
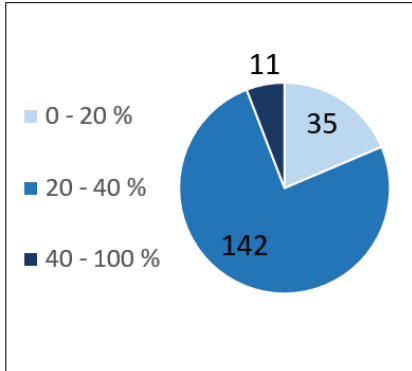


Fig. 5. Share of plots which are the subject of standard joint property of spouses for individual surveying sections in communes of Nowy Sacz District

The use of O_m index was suggested, what allowed to describe parcels ownership structure. The closer the value of the index is to 100%, the more common are the marital properties in a surveying section. The results were divided into a three-degree scale. This allowed to determine areas with unfavorable property structure, with particular consideration of marital properties. In sections where the phenomenon is the most common it would be advisable to eliminate it.

$$O_m = \frac{m}{o} \cdot 100 [\%]$$

Where:

- m – number of parcels with spousal ownership in surveying section
- o – Total number of parcels in analyzed surveying section.

Conclusions

The results prove the commonness of land co-ownership in the study area, with wide spread of 3–67% of the total parcel number in a given village. Also diversified is the number of parcels co-owned by spouses, equaling 3–52%. Only around 2% of

the total number of parcels belong to at least 5 people. Their distribution also varies. This lack of order should raise a question of the causes of such situation, and this should be a matter of further studies on a larger area with additional consideration of historical, cultural, and socio-economic background.

Knowledge of the commonness of co-owned lands can be one of the elements incorporated in multi-criteria analyses used for the identification of areas where land consolidation works could be applied. It should also be an element of evaluation during the applications for such works, which require thorough analysis of numerous characteristics. Reducing the number of parcels with many co-owners is a positive effect that supplement consolidation works.

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