



## **EXAMINATION OF THE CONFORMITY OF REGISTRY DATA BEFORE AND AFTER THE MODERNIZATION WITH THE ACTUAL STATE IN THE FIELD**

***Monika Mika, Dorota Świątoniowska, Paweł Kotlarz***  
*University of Agriculture in Krakow*

### ***Abstract***

The legal basis for the modernization of the land and building registry is the Act of 17 May 1989 Geodetic and Cartographic Law, which determines how the procedure of update and modification of data, to the form which is in accordance with applicable regulations, is carried out. Maintaining of the proper degree of timeliness and reliability of the registry data is important because of the prospect of integration with the Databases of Topographic Objects (BDOT) and Geodetic Registry of Infrastructural Network (GESUT), in the project of construction of the Real Estate Integrated Information System (ZSIN). Furthermore, the land and building registry (EGiB) plays a significant role in the implementation of most of the processes of real estate management.

The aim of the publication is to verify the compliance of the registry data regarding the area and the course of the borders of plots before and after modernization, with the real state in the field. The complex survey of plots before and after modernization was performed to assess the effects of modernization, taking into account the reliability of geodetic works and the timeliness of the registry data. The present study involved updating the course of borders and areas of the plots used solely for agricultural purposes. The object of research represented the complex of 31 plots used for agricultural purposes, located far from the village buildings. The study area is located in Małopolskie voivodship, in the district of Myślenice. In order to verify the course of borders of plots the rapid satellite measurement using

the method RTK / RTN with the receiver CHC X900+ was applied. The selected measurement technique is economic and accurate, therefore often used by surveyors for this type of field tasks. The study showed the need for re-modernization of land and buildings registry in the selected area.

**Keywords:** modernization of the land and building registry, registry data, registry plot

## INTRODUCTION

In accordance with applicable regulations (Regulation 2001) the registry is created and carried out in a computer system, which is based on computer databases of the registry data. These databases are an integral part of the national geodetic and cartographic resource. In the context of the modernization of land and building registry (EGiB), the importance of this registry should be emphasized, from the point of view of creation of a national infrastructure for spatial information. Furthermore, EGiB plays a significant role in the realization of most of the real estate management processes (Żróbek 2000). Therefore, it is important to create favorable organizational, technical and financial conditions for the development and smooth functioning of this public registry.

The issue of modernization of the land and building registry was already raised, among others in Siejka *et al.* (2015), Siejka *et al.* (2016), Mika *et al.* (2017) and Taszakowski *et al.* (2016). Modernization of the registry is a set of technical, organizational and administrative measures taken by the district governor in order to: supplement the registry database and creation of full range of registry data sets in accordance with the requirements of the Regulation, modification of existing registry data in accordance with the requirements of the Regulation and improving the functioning of the computer system that supports the registry database. The timeliness and reliability of the land and buildings registry is also important because of the need for its integration with BDOT and GESUT (Maślanka 2016).

In accordance with the Regulation (2001) the land and buildings registry should include information databases and registry documentation. The registry documentation consists of geodetic and legal documentation and descriptive and cartographic documentation. The geodetic and legal documentation is a collection of evidences justifying entries to computer registry databases which is kept for each cadastral precinct. The descriptive and cartographic documentation includes computer printouts of reports, illustrating registry data at the time of registry creation, and copies of the appropriate fragment of the map. The legal basis for the modernization of land and building registry is the Act of 17 May 1989 the geodetic and cartographic law (Act 1989), which describes, how the proce-

ture is carried out in order to update and modify data, to the form in accordance with applicable regulations. The research described by Kwartnik-Pruc (2013) and Hanus *et al.* (2014) indicate the need to introduce digital registry maps, in order to improve the legal status of the borders of the registry plots. Proceeding of modernization is the responsibility of the district governor who by tendering procedure selects the surveying company, which has adequate technical facilities to carry out such a complex order. The initial stage of work of the surveying company is to collect all possible data from the state geodetic and cartographic resource and assessment of their suitability. At this stage of work, it is necessary to download from the Surveying and Cartographic Documentation Centre base maps and registry maps, cadastral maps, archival documentation on determining the course of borders of plots and any descriptive data contained in the database of the land and buildings registry. After planning the order of field works, notices should be send to the land owners and holders, and then the determination the course of the plots borders should be carried out. This operation, depending on the size of the precinct may take a few months. After completion of the field work and completion of documents, the documentation is made available for public inspection, where each party to proceedings may bring comments to the work done. Finally, after taking into account all requests, documentation is completed and reviewed, and then approved by the district governor and entered into the District Office database.

The aim of the publication is to verify the compliance of the registry data relating to the area and the course of borders of the plots, before and after the modernization with the real state on the ground. Land Registry is modified on an ongoing basis, by a single party applications and surveying documentation of the works carried out in given area. The inventory of databases before and after the modernization will make possible to assess the effects of modernization, in terms of the reliability of geodetic works and timeliness of data. The present researches include the problem of updating the course of borders and areas of the plots used solely for agricultural purposes.

## **MATERIALS AND METHODS**

In order to verify the course of borders of plots the rapid satellite measurement using the method RTK/RTN with the receiver CHC X900+ was applied. The selected measurement technique is economic and accurate, therefore often used by surveyors for this type of field tasks.

The object of research represented the complex of 31 plots used for agricultural purposes, located far from the village buildings. The study area is located in Małopolskie voivodship, in the district of Myślenice. The selected area

extends from the top of the mountain in the south to the foothills in the north and is bounded by unpaved dirt roads. The complex of plots is divided by a dirt road, running from north to south. The field inspection confirmed the right choice of the test object, used to study the course of borders and the status of the peaceful use, because balks were clear and easy to identify and direct measurement. Analysis of the planning documents revealed, that the western part of the object has in the local development plan is intended for industrial application, even though the use of selected plots is typically agricultural. So it can be said that this area has the development potential. From the point of view of possibility of carrying on investments there – clearly defined course of borders is very important. In turn, the geodetic documentation showed, that the area was covered by the modernization of the land and buildings registry in 2010, which consisted mainly on vectorization of EGiB maps for agricultural and forests land. In this way, the digital map of the poor quality was created. While each plot within the precinct has the numerical description of borders its parameters indicate a low accuracy.

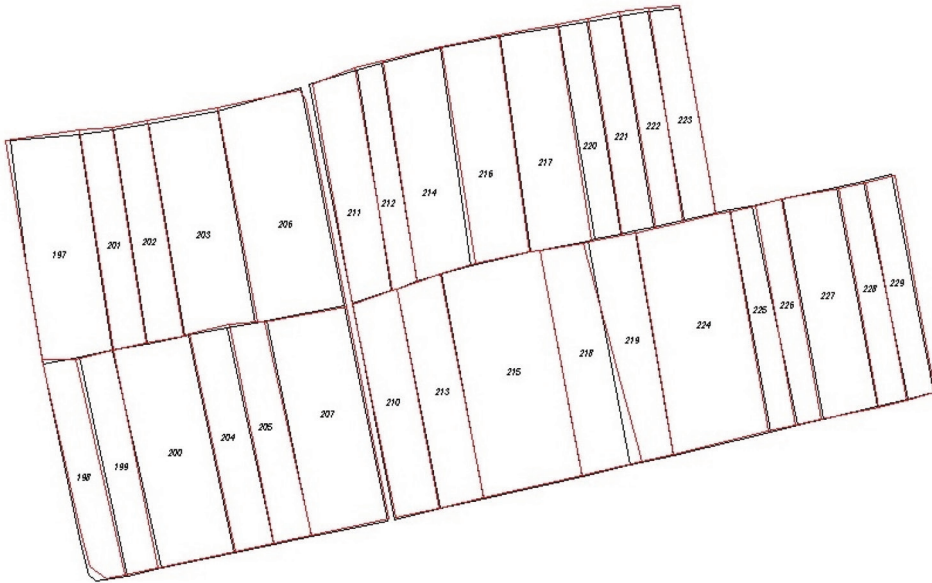
In agricultural areas very useful to assess the condition of use are field balks, which separate the different properties. The problem arises when two adjacent parcels have the same owner and are equally used, because then there is no balk. However, such a case was not found on the selected object.

Inventory works were carried out in the second half of August 2016 after the harvest, and thus balks and traces of the borders were clearly visible. Unfortunately, any geodesic boundary markers or border stones were not found on the test object. Field inspection showed that on the selected object the most of fields are plowed every year and well kept. Field roads are unpaved and quite narrow, designed for tractors and other agricultural machinery. They are, however, visible and well preserved. The condition of use was therefore not difficult to determine.

In the agricultural area there were no trees or other objects constricting GNSS receiver measurements, therefore the measurements were fast and accurate. The checking procedure could be performed on the basis of 2 points of geodetic control network, which were located in the immediate vicinity of the object (one of them inside the research area). It should be noted that the state network fulfills only the control role, and not necessary to carry out GNSS RTK measurements. However, the regulations governing surveying require this control. The fieldworks lasted one day. The surface amendments in VRS technology (measured by the RTN method) were used. First of all field balks, ditches, tops and bottoms of the slopes and balks between dirt roads and used cultivated fields and other border marks found on the ground were measured.

## RESULTS AND DISCUSSION

In order to compare the course of borders on maps and from the field measurement the MIKROMAP program was used. The status before modernization was illustrated by registry map and base map that existed in analog form and were calibrated in this program. The status after upgrading was acquired directly in digital form. As a base for analyses, a digital map in the „dgn” format obtained from the district office was used. The factual state on the ground was reconstructed basing on the coordinates of the points from direct measurement, imported from a file in text format. Borders of plots in vector form were received as a result of connection of these points with a line. Each set of data was recorded on a separate layer. The results of the comparative analysis of the course of borders for the complex of plots are shown in Figure 1.



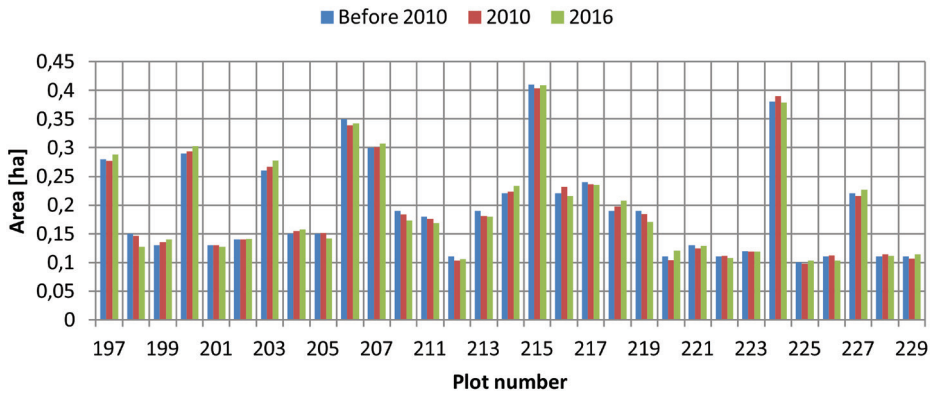
**Figure 1.** Comparison of the course of border lines of plots on registry map (black lines) and in the field (purple lines – direct measurement)

The result of research, presented in the figure 1, shows the large number of discrepancies in the course of the boundary line of the registry plots between the data from the registry map (as a result of modernization in 2010) and the measurements performed by authors (direct measurement in 2016).

The results of the measurements from the 2010 and 2016 in relation to the area of plots before the modernization are presented in Table 1 and Figure 2.

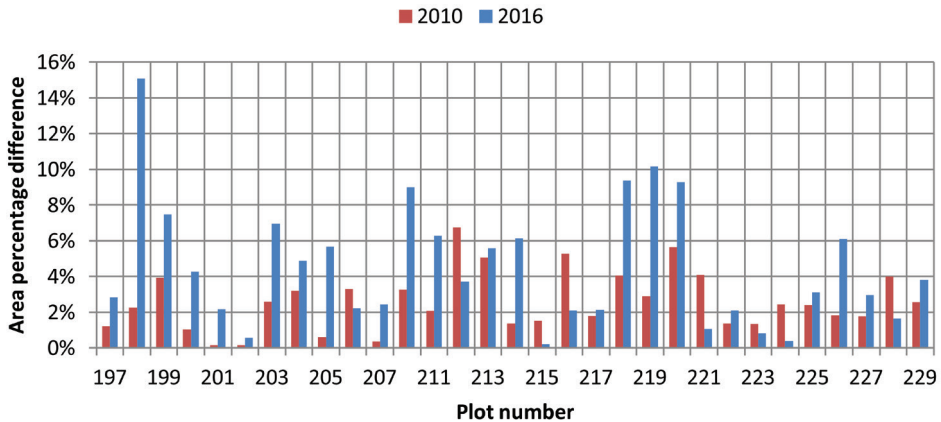
**Table 1.** The list of areas of registry plots

| Plot number | Area by documentation EGiB [ha]<br>Status before the modernization | The area calculated analytically from the vector map [ha]<br>The result of modernisation (2010r.) | The area from the direct measurement [ha]<br>Status after the modernization (2016r.) |
|-------------|--|---|--|
| 197         | 0.28   | 0.2766  | 0.2879   |
| 198         | 0.15   | 0.1466  | 0.1274   |
| 199         | 0.13   | 0.1351  | 0.1397   |
| 200         | 0.29   | 0.2930  | 0.3024   |
| 201         | 0.13   | 0.1298  | 0.1272   |
| 202         | 0.14   | 0.1398  | 0.1408   |
| 203         | 0.26   | 0.2667  | 0.2781   |
| 204         | 0.15   | 0.1548  | 0.1573   |
| 205         | 0.15   | 0.1509  | 0.1415   |
| 206         | 0.35   | 0.3385  | 0.3422   |
| 207         | 0.30   | 0.3011  | 0.3073   |
| 210         | 0.19   | 0.1838  | 0.1729   |
| 211         | 0.18   | 0.1763  | 0.1687   |
| 212         | 0.11   | 0.1026  | 0.1059   |
| 213         | 0.19   | 0.1804  | 0.1794   |
| 214         | 0.22   | 0.2230  | 0.2335   |
| 215         | 0.41   | 0.4038  | 0.4092   |
| 216         | 0.22   | 0.2316  | 0.2154   |
| 217         | 0.24   | 0.2357  | 0.2349   |
| 218         | 0.19   | 0.1977  | 0.2078   |
| 219         | 0.19   | 0.1845  | 0.1707   |
| 220         | 0.11   | 0.1038  | 0.1202   |
| 221         | 0.13   | 0.1247  | 0.1286   |
| 222         | 0.11   | 0.1115  | 0.1077   |
| 223         | 0.12   | 0.1184  | 0.1190   |
| 224         | 0.38   | 0.3893  | 0.3785   |
| 225         | 0.10   | 0.0976  | 0.1031   |
| 226         | 0.11   | 0.1120  | 0.1033   |
| 227         | 0.22   | 0.2161  | 0.2265   |
| 228         | 0.11   | 0.1144  | 0.1118   |
| 229         | 0.11   | 0.1072  | 0.1142   |



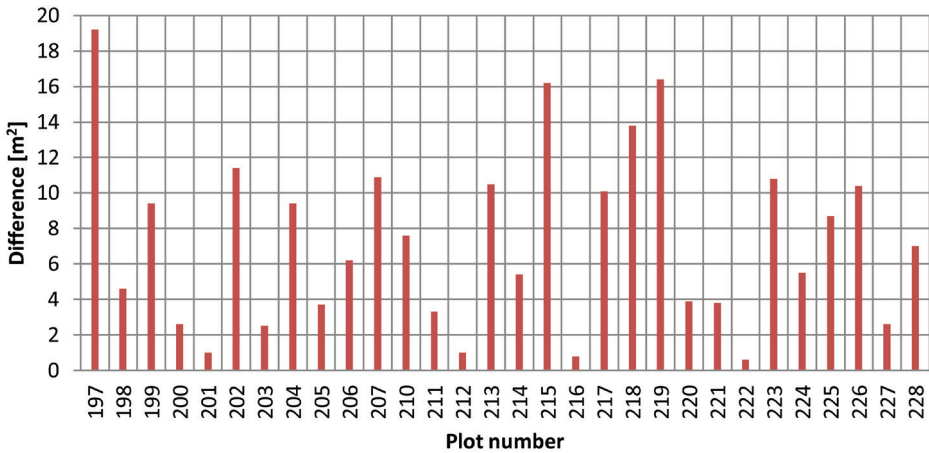
**Figure 2.** The juxtaposition of measurement results of the plot areas before the modernization and after the next modernization of EGiB in 2010 and 2016

In the turns in the Figure 3 the percentage differences between the plot areas before modernization and the measurements in 2010 and 2016 is shown. The average variation in the measurements is 4.53% with the maximum at 15.07%.



**Figure 3.** The percentage difference in plot areas before modernization and measurements in 2010 and 2016

Another perspective is presented in figure 4, where the difference in plot areas measured in 2010 and 2016 is examined. The difference varieties from 0.6 to 19.2 m<sup>2</sup> with the average value of 7.4 m<sup>2</sup>.



**Figure 4.** The differences in plot areas for the measurements in 2010 and 2016

The important stage of the analyses was to verify the plots areas before and after modernization. Research has shown that 12 of 31 studied plots had incompatible area in the descriptive part of the land registry with the graphical part. The registry map has here the vector form, so the reasons for these differences are not due to the calculations of the area from the map. The real reason for the discrepancy is the lack of the areas of plots updating in the descriptive part of EGiB in reference to the graphical part, which was created during modernization works (in 2010). While the comparison results of the plots areas obtained on the basis of the descriptive part of EGiB and areas calculated by measuring the factual status on the ground, show for 20 cases out of 31 examined plots significant discrepancies. Therefore, the data from the descriptive part of EGiB provide the basis for calculation of property tax and valuation of the property – this situation causes the incorrect calculation of tax and falsifies value for 70% of the properties.

## CONCLUSION

Inventory of the registry plots complex before and after modernization in the agricultural area revealed, that financial restrictions in the case of modernization works do not go hand in hand with the quality of obtained data. The research has shown that quick and inexpensive processing of maps from analog to vector form has not been completed with updating of the descriptive part of EGiB. In addition, it turned out that the borders of the plots, on vector map (created on the basis of the analogue map) is not consistent with the actual land use. Areas of



the plots in the descriptive section of land registry, calculated on the basis of the vector map and calculated from the field measurement in many cases are different. This situation can lead to an incorrect calculation of the amount of property tax and the false real estate appraisal. In the case of investment planning, in the study area probably the land valuation will be carried out, on the basis of the area shown in the descriptive part of the land and buildings registry. As a result of the reported discrepancies many owners will be disadvantaged.

The study area requires a re-modernization of the land and buildings registry, with carrying out direct measurement in the field, involving owners and holders of land.

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Corresponding author: Paweł Kotlarz PhD, Eng.  
Monika Mika PhD Eng.  
Dorota Świątoniowska, PhD, Eng.

Department of Geodesy  
University of Agriculture in Krakow  
Balicka 253a  
PL 30-198 Krakow  
e-mail: p.kotlarz@ur.krakow.pl  
phone: +48-12-662-45-39

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