

# SISTEM UPRAVLJANJA KMETIJSKIH PARCEL NA POLJSKEM TER ŠTUDIJA PRIMERA DRŽAV ČLANIC EVROPSKE UNIJE

## LAND PARCEL MANAGEMENT SYSTEM IN POLAND AND A CASE STUDY OF EU MEMBER STATES

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UDK: 528.44:63(438)

Klasifikacija prispevka po COBISS.SI: 1.04

Prispelo: 12. 6. 2018

Sprejeto: 1. 12. 2018

DOI: <https://doi.org/10.15292/geodetski-vestnik.2018.04.630-640>

PROFESSIONAL ARTICLE

Received: 12. 6. 2018

Accepted: 1. 12. 2018

### IZVLEČEK

*Sistem LPIS (angl. land parcel identification system) podpira sistem plačil na površino v državah EU v okviru skupne kmetijske politike. To je koristno orodje, ki omogoča pravilno delovanje mehanizma strukturne podpore kmetijstvu. Glavni cilj članka je analiza in ocena sistema upravljanja kmetijskih parcel na Poljskem v okviru rešitev, ki se uporabljajo v EU za namene skupne kmetijske politike. Predmet analize so bile uvedene rešitve na področju sistema LPIS, izhajajoče iz evropskih pravnih in tehničnih specifikacij, še zlasti tistih, ki se nanašajo na sprejeti tip referenčne parcele (kmetijska parcela, katastrska parcela, kmetijski blok, fizični blok, topografski blok). Na podlagi podatkov, med drugim zbranih s posebnim vprašalnikom, so bile opravljene raziskave, povezane s sprejetimi modeli referenčnih parcel v državah in regijah EU, vključno s Poljsko, za obdobje 2006–2016. Raziskovalni vzorec so bili sistemi LPIS, ki so se uporabljali v EU v obravnavanem obdobju. V članku je predstavljeno, kako so se s časom spreminjali uvedeni modeli referenčnih parcel in kaj so bili najpogostejši vzroki za te spremembe. Poljska je ena redkih držav članic EU, kjer je podlaga LPIS vse od leta 2006 uradni register nepremičnin. Sklepi raziskave so podlaga za pripravo sprememb na tem področju na Poljskem.*

### KLJUČNE BESEDE

LPIS, zemljiški informacijski sistem, skupna kmetijska politika, EU, referenčne parcele

### ABSTRACT

*The LPIS (Land Parcel Identification System) supports area-based payment schemes in EU countries under the Common Agricultural Policy and is a useful tool enabling the proper functioning of the structural agricultural support mechanism. This study analyses the agricultural parcel management system in Poland in the context of solutions applied in the EU within the Common Agricultural Policy. The research concerns solutions applied in the field of the LPIS system, arising from European legal and technical specifications, particularly those referring to the adopted type of a reference parcel (agricultural parcel, cadastral parcel, farmers' block, physical block, topographic block). Based on the data originating from LPIS questionnaire interviews, a study was conducted related to the adopted models of reference parcels in the EU countries and regions, including in Poland in the years 2006–2016. The research sample comprised LPIS systems functioning in the EU in the analytical period. In the paper, it is demonstrated how the implemented models of reference parcels had been changing over time and the most frequent reasons of the changes were indicated. Poland is one of few EU Member States in which the Land and Property Register has been the basis for the LPIS since 2006. The conclusions of the research provide a basis for planning of a change in LPIS in Poland.*

### KEY WORDS

LPIS, land information system, Common agricultural policy, EU, reference parcel

## 1 INTRODUCTION

Introduced in 1962, the Common Agricultural Policy (CAP) is a partnership between agriculture and society, between Europe and its farmers. It is a policy common to all European Union (EU) Member States, managed and financed at the European level using the EU's annual budget. The CAP is the oldest EU policy. Its principal objectives have evolved over the years (European Commission, 2014). Currently, the CAP is focused on supporting farmers' incomes in the form of direct payments arising from its policy associated with multi-directional and sustainable development of rural areas (Zadravec and Žalik, 2009). To this end, EU countries establish and maintain an Integrated Administration and Control System (IACS) which includes the Land Parcel Identification System (LPIS) (Montaghi et al., 2013, Zygmunt et al., 2014). The main functions of the LPIS are localisation, identification and quantification of agricultural land via very detailed geospatial data. In order to receive EU support, farmers have to adhere to environmentally-friendly land management requirements, commonly known as cross-compliance (CC) principles. Furthermore, farmers can carry out additional actions to reduce agricultural pressure on the environment or to improve the countryside biodiversity. These are known as agri-environmental measures (AEM) and incur additional monetary support. Management of information on environmentally-compliant land use and agri-environmental measures is the second most important function of IACS/LPIS (Sagris et al. 2013). To date, LPISs in MSs greatly differ in concepts and models of representations and spatial identifications of an agricultural land use unit (Sangris et al. 2008; European Court of Auditors, 2016). Currently, there are LPISs in EU, which reference databases are based on 5 models of reference land plots (parcels), such as an agricultural parcel, a cadastral parcel, a farmers' block, a physical block and a topographic block (JRC D5 – Mars CAPland, 2017). The issue with these different IACS/LPISs is that there are no standardised structures; rather, each represents a unique design in each MS, both in the case of LAS-based (Land Administration System) or in the case of special systems as described by Inan et al. (2010). Land Administration Systems are a basic tool for the administration of natural resources, physical and economic planning, environmental monitoring and protection and crisis management (Lemmen, 2012). Since May 1, 2004, i.e. since Poland's accession to EU, Polish agriculture and rural areas have been under the Common Agricultural Policy schemes. An area aid scheme has been introduced to include all farmers. The Rural Development Plan and Sectoral Operational Programme have been implemented to support the restructuring and modernisation of the food sector. Aiming to get financial support in agriculture from EU funds, a country needs to ensure appropriate organisational and technical conditions, primarily the establishment of a proper Payment Agency as well as the development and maintenance of an Integrated Administration and Control System (IACS), i.e. an administration and information system enabling efficient distribution and control of financial aid for farmers. The Payment Agency responsible for the management of agricultural grants in Poland is the Agency for Restructuring and Modernisation of Agriculture (ARMA), which is involved in the implementation of instruments co-financed from the EU budget (those concerning direct payments) and is responsible for their proper disbursement. It is also an institution, which maintains the Integrated Administration and Control System, including the LPIS.

The main aim of the research was to analyse and assess the system of management of cadastral parcels and reference areas in Poland in the context of solutions applied in the EU for the purpose of CAP. The research concerned the solutions applied in the field of the LPIS, arising from European legal and

technical specifications, particularly those referring to the adopted type of a reference parcel (agricultural parcel, cadastral parcel, farmers' block, physical block, topographic block).

## 2 MATERIALS AND METHODS

The achievement of the intended goals was based on an analysis of strategic, programme and study documents, which enabled preparing of conclusions about the system for management of the reference layers of the LPIS in Poland in the context of the solutions applied in other EU countries. The main motivation was to provide a basis for changes of LPIS in Poland. Based on the data originating from questionnaire interviews concerning the assessment of the quality of LPIS and on data provided by European bodies responsible for maintaining reference land parcel identification systems, a study was conducted related to the adopted models of reference parcels in the EU countries and regions, including in Poland. The research sample included databases for reference parcels of LPISs declared by the Payment Agencies in 2006, 2008, 2010 and 2016 (Table 1). The lack of data concerning the selected model of a reference parcel within the CAP results from the fact that the EU Member States or regions failed to participate in European research into the LPIS.

Table 1: Reference databases in EU countries and regions.

EU Member State	2006	2008	2010	2016
<b>Austria</b>	-	CP	CP	PB
<b>Belgium – Flanders</b>	AP	AP	AP	AP
<b>Belgium – Wallone</b>	AP	PB	PB	PB
<b>Bulgaria</b>	-	PB	PB	PB
<b>Croatia</b>	-	-	-	FB
<b>Cyprus</b>	CP	CP	CP	CP
<b>Czech Republic</b>	FB	FB	FB	FB
<b>Deutschland – Baden</b>	CP	PB	PB	-
<b>Deutschland – Bavaria</b>	FB	FB	FB	FB
<b>Deutschland – Berlin</b>	-	-	-	PB
<b>Deutschland – Brandenburg</b>	-	-	-	PB
<b>Deutschland – Bremen</b>	-	-	-	PB
<b>Deutschland – Hamburg</b>	-	-	-	PB
<b>Deutschland – Hessen</b>	-	AP	AP	AP
<b>Deutschland – Lower Saxony</b>	-	-	-	PB
<b>Deutschland – North Rhine - Westphalia</b>	-	PB	PB	PB
<b>Deutschland – Rhineland – Palatinate</b>	-	CP	CP	CP
<b>Deutschland – Saarland</b>	-	AP	AP	AP
<b>Deutschland – Rhineland – Saxony - Anhalt</b>	-	PB	PB	PB
<b>Deutschland – Schleswig - Holstein</b>	-	-	-	PB
<b>Deutschland – Thuringia</b>	-	PB	PB	PB
<b>Denmark</b>	PB	PB	PB	PB

EU Member State	2006	2008	2010	2016
Estonia	PB	PB/FB	FB	FB
Spain	CP	CP	CP	CP
Finland	FB	-	FB	FB
France	FB	FB	FB	FB
Greece	PB	-	PB	PB
Hungary	PB	PB	PB	PB
Ireland	AP	FB	TB	TB
Italy	CP	CP	CP	CP
Latvia	-	PB/FB/CP	PB	PB
Lithuania	PB	PB	PB	PB
Luxemburg	AP	AP	AP	PB
Malta	-	FB/AP	AP	AP
Netherlands	PB	PB	PB	PB
Poland	CP	CP	CP	CP
Portugal	AP	FB	FB	FB
Romania	-	PB	PB	PB
Sweden	PB	FB	FB	FB
Slovenia	FB/GERK	FB/ GERK	FB/GERK	FB
Slovakia	PB	PB	PB	PB
United Kingdom – England	AP	-	TB	TB
United Kingdom – Scotland	AP	-	TB	TB
United Kingdom – Wales	AP	-	TB	TB
United Kingdom – Northern Ireland	AP	-	TB	TB

Source: own elaboration based on the 2006 and 2008 LPIS Questionnaire, European Court of Auditors and JRC.

Legend:

AP – Agricultural parcel

CP – Cadastral parcel

FB – Farmer's block (in Slovenia, Farmer's block used to be divided by land use – GERK; in 2014, the »real« FB was introduced).

named GERK)

PB – Physical block

TB – Topographical block

### 3 RESULTS OF THE RESEARCH

The LPIS is an IT system based on aerial or satellite imagery recording all agricultural parcels in the Member States. It is a key control mechanism under the CAP designed to verify eligibility for area based subsidies, which amounted to approximately 45.5 billion euro in 2015. The Court's Statement of Assurance (SoA) estimated the level of error for the European Agricultural Guarantee Fund (EAGF) at 2.9 % (2.2 % without cross compliance errors) in 2014. Close to half of the errors were area related. The system also plays an increasing role in checking the compliance with various environmental obligations (European Court of Auditors, 2016). In order to ensure proper servicing and granting funds, Poland, as a full EU member, was required to establish the Integrated Administration and Control System, including the maintenance of the LPIS, which aim is to enable:

- unambiguous identification of beneficiaries (register of producers),
- unambiguous identification of a land parcel within the space, and its current area (register of agricultural farms),
- verification as regards the eligibility for a particular aid scheme (registration of claims for payments).

In order to develop the LPIS database, it was necessary to create a vector map of the entire country, containing boundaries of cadastral parcels, outlines of agricultural areas, soil type boundaries and a vector layer of the so-called managed lands and to develop a digital orthophotos of the country to enable the identification of the arable lands. These projects were in line with the requirements arising from Regulation (EU) No 1306/2013 under which the LPIS shall be established based on cadastral maps, land register documentation, or other cartographic sources. The techniques used are based on a computerised system of geographical information including aerial or satellite orthophotos, using a uniform standard ensuring accuracy at least equal to the accuracy of cartographic mapping at a scale of 1 : 10,000 and since 2016 at a scale of 1 : 5,000, considering the contour and state of the parcel (Regulation EU 1306, 2013).

In Poland, the legislator indicated in regulations that a source of data for the establishment of a national system for registration of producers, registration of agricultural farms and registration of payment claims is the Land and Property Register (July, 2011). The Register is defined as an information system ensuring the collection, updating and sharing, in a manner uniform for a country, of information on land, buildings and premises, their owners, and on other entities holding or managing these lands, buildings or premises (Geodetic and Cartographic Law, 1989). The adoption of the Land and Property Register as the basis for the establishment of the LPIS resulted from the following facts:

- the Land and Property Register is a system covering the entire territory of the Republic of Poland, maintained in a uniform manner, constantly updated and supervised by state administration bodies,
- the data extracted from the system is official,
- it contains reference data on parcels, buildings and premises, of which quality and method of acquiring is determined by geodetic and cartographic law,
- it is comprised of a descriptive part and cartographic part (cadastral map) representing the boundaries and numbers of cadastral parcels and the boundaries and attributes of agricultural land,
- the registration data are legal in nature,
- it contains the owner's personal data.

The basis for the operation of the LPIS is the reference parcel database. According to the guidelines, a reference parcel includes a spatial unit of land, which is the surface of an agricultural area, i.e. an area occupied by arable land, permanent grassland, and permanent pasture or permanent crops. Each Member State marks out a reference parcel in a manner, which guarantees its measurability, stability over time and the possibility for unique and unambiguous location of each agricultural parcel declared annually. The basis for the establishment of the LPIS in Poland was the system of Land and Property Register, where a cadastral parcel, which is assigned in the system with its unique number, boundaries, determined area, and the marking, land area and boundaries of agricultural land, was adopted as a reference parcel. However, it should be noted that the total area of a cadastral parcel indicated in the Land and Property Register is not an area eligible for the calculation of payments. At the end of 2015, a total of 34,696,000 reference parcels were registered in Poland, including 10,407,689 reference parcels (SAP) and 9,935,315

agricultural parcels eligible for payments. A cadastral parcel is a reference, within which boundaries it is necessary to determine the area of agricultural land eligible for direct payments. It should be noted, however, that the definition of agricultural areas eligible for payments, arising from the provision of Regulation (EU) No 1307/2013, based on which the maximum eligible area is determined, differs from the Polish definition of agricultural areas specified in Regulation of the Minister of Regional Development and Construction on the Land and Property Register, based on which the area of agricultural land is determined in the land and property register system – Table 2.

Table 2: Agricultural areas/land use according to EU and Polish regulations.

Agricultural land classification according to Regulation (EU) No 1307/2013	Agricultural land classification according to Regulation on the Land and Property Register
	- arable land
	- orchards
- arable land	- permanent meadows
- permanent grassland	- permanent pasture
- permanent pasture	- developed agricultural land
- permanent crops	- wooded land and bushland on agricultural land
	- pond bottoms
	- land under ditches

Source: own study based on law.

In accordance with the above-mentioned Regulation, which is also indicated in Table 2, agricultural areas also include developed agricultural land, pond bottoms and ditches. Therefore, the areas of agricultural land specified in the Land and Property Register cannot be directly adopted as reference areas for direct payments within CAP.

During the first year of the operation of the LPIS system in Poland, the reference database was primarily the descriptive part of the Land and Property Register. A claim for payment submitted by a farmer contained numbers and the area of cadastral parcels, the area used for agricultural purposes within the boundaries of a cadastral parcel and the attributes and areas of agricultural parcels situated in cadastral parcels. The role of the LPIS was to verify the information provided in the claim against the data concerning the numbers of cadastral parcels and the area of agricultural land within a parcel, which are eligible for payments and contained in the Land and Property Register. Since 2005, apart from descriptive data originating from the Land and Property Register, the identification of agricultural parcels has been additionally carried out based on graphical data, i.e. maps and orthophotos. This refers to a vector cadastral map, which indicates boundaries and numbers of cadastral parcels as well as boundaries and attributes of land use. On the other hand, by the interpretation of orthophotos it is possible to recognise the land cover, and to distinguish forested areas, settlements, roads, waters, ditches, woodlots and shrubs, i.e. land non-eligible for payment. The possibility for graphical visualisation of the area, on which agricultural parcels declared by a farmer are situated, in connection with particular cadastral parcels, makes it possible to note and explain all discrepancies, which affect the amount of payments. Such situations can be encountered in the event of changes in the boundaries of land in use, which have occurred in the field and have not been entered into the Land and Property Register documentation.

The basis for the proper disbursement of Community funds is an efficiently operating system for land parcel identification, which should contain accurate, reliable and up-to-date data concerning agricultural land, and the eligible area of agricultural land should correspond to the actual area. Therefore, a very important aspect of the proper system operation is served by the timeliness of data contained in the Land and Property Register as regards cadastral parcels (reference parcels) and land in use, and, in particular, those areas which, under the LPIS, are excluded from payments. In practice, it appeared that the data acquired from the Land and Property Register were often out-of-date due to the changes continuously occurring in the spatial arrangements of land resulting from the performed divisions, consolidations, property sale and purchase transactions, or investment processes. For example, a completed process of land consolidation results in a change in the value of land eligible for payment for all parcels within the district. Therefore, it was decided that the best and generally available source for the performance of measurements of the area, and the interpretation as regards land development and use, is a digital orthophoto, which is a basic data source for the performance of measurements and a complex assessment of the eligible area within the reference parcel. The use of an orthophoto to determine the maximum possible area eligible for payment also arises directly from the Community regulations. On the other hand, data from the Land and Property Register will only be used in the field of identification and spatial location of an agricultural parcel (a unique identifier of a cadastral parcel) and the total area of the cadastral parcel.

LPIS operates using GIS technology (Sagris et al., 2008; Grandgirard and Zielinski, 2008; Inan et al., 2010; Sagris et al., 2013). An advantage of the GIS is the possibility to verify whether the parcel declared for payment actually exists and is located in the areas eligible for payments, or whether the area of an agricultural parcel located within a particular cadastral parcel exceeds the area eligible for payments. Such an approach enables the identification of the causes of the discrepancies found and the solution of problems related to the verification of the data provided by the beneficiary against the data contained in the system.

In 2016, 44 declared national and regional LPISs operated in 28 Member States. They were based either on one type of a reference parcel (93% of LPISs) or on more than one type of a reference area, which particularly concerns the countries such as Germany or Belgium (7% of LPISs). Reference parcels are agricultural areas, which are identified based on a unique number. European LPIS databases contain over 135 million reference parcels divided into five models, which include an agricultural parcel, a cadastral parcel, a farmers' block, a physical block and a topographical block. The selection of a reference parcel model in individual countries is determined by numerous factors, including historical background and the natural, cultural, social and economic determinants as well as the adopted legal and technological solutions as regards the operation of IACS. The adopted local agricultural practices are also of significance when selecting a parcel model (Figure 1).

Most LPISs are based on models of parcels, which reference area is determined on the basis of either crop boundaries or invariable field elements, e.g. roads or hedges. The LPISs based on the cadastre have specific problems due to the different philosophy of the cadastral parcel (based on ownership) compared to the other LPIS reference parcels (based on land use) (Kay and Milenov, 2006).

In the analysed period of 2006–2016, the dominant type of a reference parcel in the EU Member States and regions was the physical block (Figure 2), regarded as easy-to-update compared to, for example, a cadastral parcel. This is due to the fact that the reference area of the physical block is based on boundary lines represented in the field by land development structures with no account taken of the legal status, restrictions or obligations.


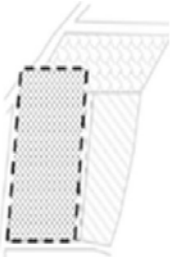
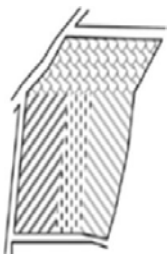
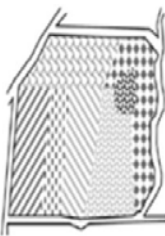
	Agricultural parcel (AP)	Cadastral parcel (CP)	Farmer's Block (FB)	Physical block (PB)/ topographical block (TB)
				
main features	- single crop group - single farmer	- one or more crop groups - one or more farmers - based on ownership	- one or more crop groups - single farmer - no natural boundaries	- one or more crop groups - one or more farmers - area bordered by certain features (ditches, walls, hedges, etc.)
main data source	farmer's application	cadastre, land registers	farmer's application	administrative classification

Figure 1: Characteristics of reference parcel models. Source: own elaboration based on European Court of Auditors and European Commission (JRC) 2016.

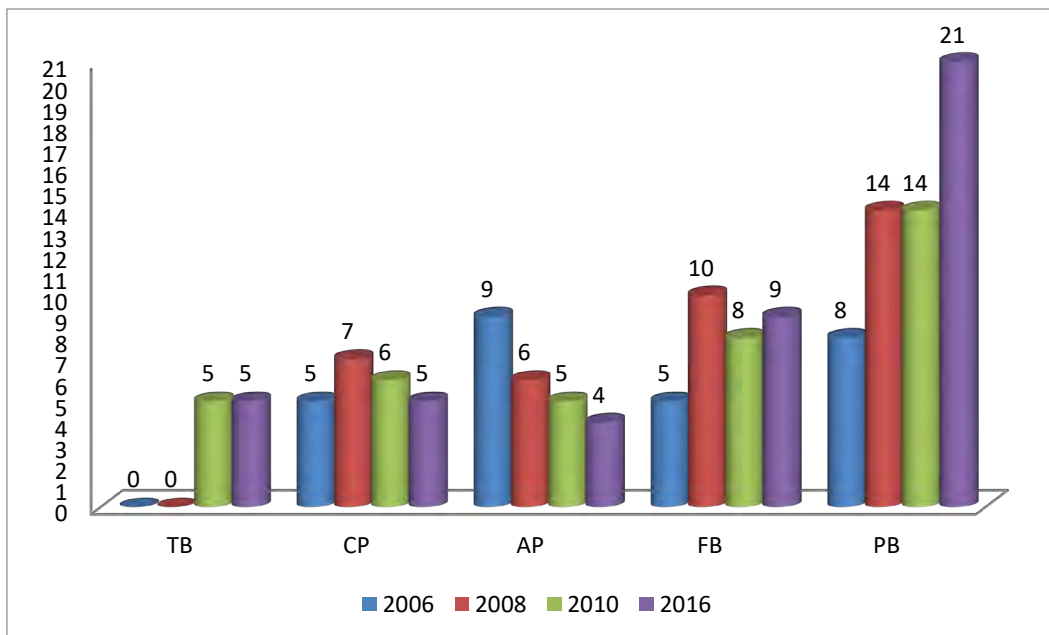


Figure 2: The number of particular reference parcels selected by EU Member States and regions in the year 2006–2016 (Source: own elaboration).

Figure 3 presents the average percentage of particular models of reference parcels declared by the Member States and regions in the years 2006–2016.



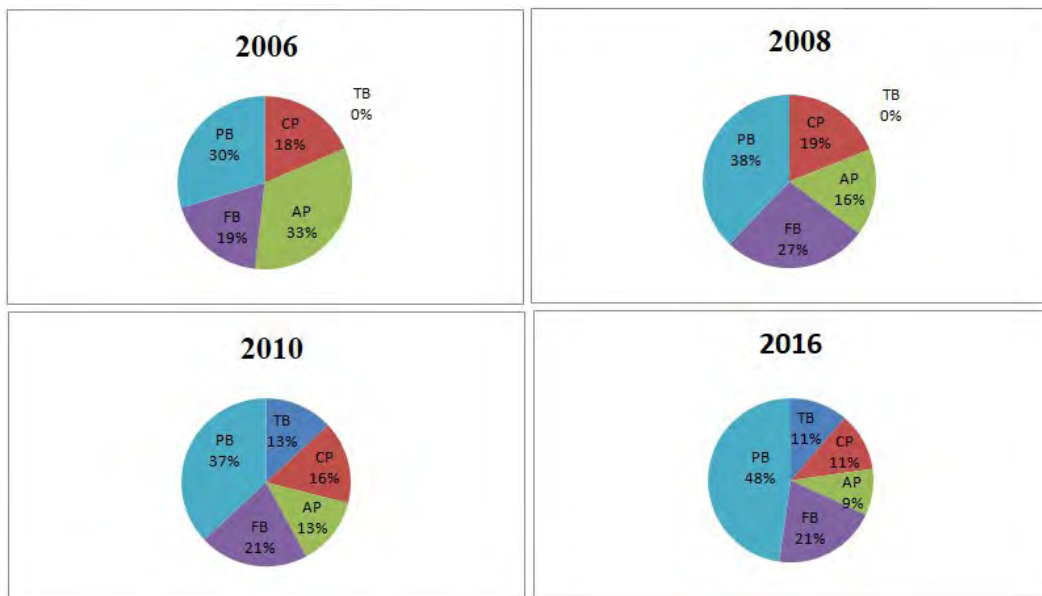


Figure 3: The number of particular reference parcels selected by EU Member States and regions in the year 2006–2016. Source: own elaboration

In 2006, 22 Member States declared 27 LPISs based on four models of reference parcels. Due to regional divisions in Belgium, Germany or Great Britain, at least one type of reference parcel is used in these countries. The dominant models of a reference parcel in the study period were an agricultural parcel and a physical block. In 2008, 24 Member States recognised the physical block and the farmers’ block as the most suitable type of a reference parcel in the 32 declared LPISs. Mixed-type systems of reference parcels can be found in six Member States, these are Belgium, Germany, Estonia, Latvia and Malta. In Slovenia, the LPIS system used to be based on a farmer’s block divided by land use (GERK). In 2008, changes were noted in the types of reference parcels declared in 2006. Countries and regions, including Belgium – Wallonia, Germany – Baden, Estonia, Ireland, Portugal and Sweden, decided to change the type of a reference parcel and introduced the most frequently used farmers’ block (57% of EU Member States and regions) and the physical block (29% of EU Member States and regions) under the LPISs (Figure 4). The most frequently changed type of a reference parcel was the agricultural parcel and the physical block.

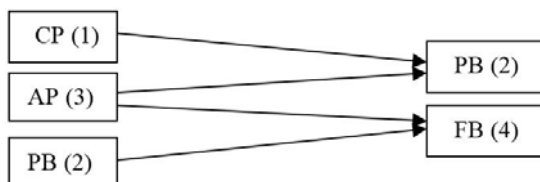


Figure 4: Changes in the types of reference parcels in LPIS systems in 2008. Source: own elaboration.

In 2010, bodies coordinating direct payments for the Member States indicated the physical block and the farmers’ block as the dominant type of a reference parcel in 38 declared LPISs based on 5 parcel models.

It must be added, however, that interest in the physical block has been systematically increasing since 2006 and the farmers' block enjoys a permanent, approx. 20% popularity index in relation to the other types of a reference parcel. In the study period, countries such as Estonia, Ireland, Latvia and Malta, decided to further change the type of reference parcel. The most frequently changed type of a reference parcel was the farmers' block (Figure 5).

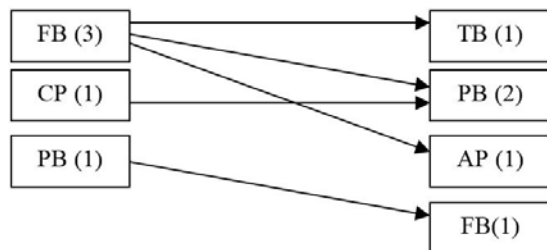


Figure 5: Changes in types of reference parcels in LPIS systems in 2010. Source: own elaboration.

In the period 2010–2016, Austria, Luxembourg and Slovenia declared a change regarding the type of reference parcel within LPIS. Austrian LPIS had previously been based on the cadastre, and Luxembourg used to have agricultural parcel. Both countries decided to switch to the physical block model. The reference database of the LPIS in Slovenia had been based on the farmer's block divided by land use (GERK) since 2005. Some changes were introduced in October 2014, when Slovenia decided to change the existing reference parcel type into to a farmer's block. The other EU Member States and regions have not changed their decisions regarding the previously declared model of a reference parcel within LPISs.

#### 4 CONCLUSIONS

Since 2006, the most commonly used reference parcel within LPISs in the EU Member States has been the physical block. In 2016, almost 50% of European LPISs operated on databases based on the physical block. It is the most generalised reference object to be used, but it is rather stable in time and simple to update. MS also used farmers' blocks as reference parcels. Their choice might be more appropriate, from the point of view of facilitating the administrative cross-check, but it is more complex and time-consuming regarding the LPIS update as found by Kay and Milenov (2006).

In the countries such as Poland, Cyprus, Germany (state of Rhineland-Palatinate), Spain, Italy and Malta, LPIS databases have invariably been based on the Land and Property Register (a cadastral parcel) since 2006. This concept account for 11% of the total number of all LPIS databases in Europe. None of the EU Member States or regions, which changed the declared model of a reference parcel in the study period, selected a cadastral parcel model as a new type of a LPIS reference layer. The current predominance of LPISs based on the physical block is a premise for a transition from the current reference models operating in the EU, including in Poland, to the dominant models. Future studies should primarily focus on the analysis of the statistical data that would illustrate:

- the number of new reference parcels following the change of the model,
- the difference between the numbers of reference parcels prior to, and following, the change of the model,

- the number of agricultural producers affected by a particular change, including the producers, whose number of reference parcels would change.

Furthermore, research should also focus on the analysis of the impact, when changing the reference parcel models, on the form of claims for funding in a particular Member State. The potential re-definition of the reference layers of the LPISs should consider also the number of changes required in the national legislation and as regards the number of organisational and technical measures (inter alia the effect of the change on geospatial data, including their update) and procedures implemented by bodies responsible for the development and maintenance of the reference layers of the LPISs. The results of the proposed research are important when making decisions related to the reasonableness of a LPIS change in a country, including in Poland.

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