Evaluation of Land Parcel Identification Systems

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Key words: Land Parcel Identification System (LPIS), Cadastre, Land tenure, Land administration.

SUMMARY

Countries in EU have been using Integrated Administration and Control System (IACS) in order to administer agricultural subsidies since 1992. In time, IACS experienced some major changes indicating the usage of concrete spatial reference systems. In this context, Land Parcel Identification Systems (LPISs) emerged in order mainly to spatially represent the activities of farmers on their lands. LPIS requires the usage of orthophotos or orthoimagery as a basic guidance and sometimes uses cadastre coverage as an ancillary data source in demarcating agricultural parcels in conjunction with the declarations by farmers. These systems cover only agricultural areas. They mainly records agricultural land use information declared by farmers rather than land tenure information. The main reason for using such a system rather than using land records under land administration authorities is that land records were not readily available for the majority of countries. Another reason for that is the so-called complexity of both these land records and related administrations. The LPISs of this kind are regarded as easy to build, update and manage, and also low cost systems. In this study, the application of building standalone LPISs has been analyzed considering both the current situation and the future prospects. In this context, pros and cons of LPISs were revealed in view of land tenure and land administration.

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1. INTRODUCTION

Countries in EU have been using Integrated Administration and Control System (IACS) in order to administer agricultural subsidies since 1992 (Krugh, 2000; Delince, 2001; van der Molen, 2002). In time, IACS experienced some major changes indicating the usage of concrete spatial reference systems. In this context, Land Parcel Identification Systems (LPISs) emerged in order mainly to spatially represent the activities of farmers on their lands (JRC, 2001). On the other hand, it is scientifically known that cadastre systems are cornerstones of effective land administration and land use management. This notion has clearly been expressed among others by Dale and McLaughlin (1988), Williamson (2001) and Enemark (2005).

In this paper, after introducing the LPIS, it is intended to clarify the similarities and differences between cadastral systems and the LPIS, and to draw attention to future inclinations of these two similar concepts considering the ultimate targets – Land Administration and Land Management.

2. LAND PARCEL IDENTIFICATION SYSTEM (LPIS)

Land Parcel Identification Systems (LPISs) came into being with the introduction of IACS as a tool of implementing a new subsidy regime (de-coupled payments) in the framework of the European reform of Common Agricultural Policy (CAP) in 1992 (Delince, 2001; Krugh, 2000). With the adoption of Agenda 2000 and CAP reform of 2003, in addition to agricultural payments, environmental and rural development regimes were adopted. These reforms caused extra pressure on LPIS systems, which makes them more important.

In the course of time, different member or candidate countries preferred different solutions for the establishment of their LPISs, depending on their current cadastre and land administration systems, availability of large scale topographic maps, ortho imagery/photos etc. In Article 20 of the Regulation (EC) No 1782/2003, it is stated that the identification system for agricultural parcels (LPIS) shall be established on the basis of maps or land registry documents or other cartographic references. This article legalizes the current situation on the LPIS establishment.

2.1 Demarcation Methods Used in LPISs

Demarcation is a very important and time consuming process both for cadastre systems and LPIS because of the fact that disputes may arise between adjacent land owners or users during or after the process. In a report by JRC (2003), it is confessed that, in the creation of reference systems, the consolidation with the farmer is often underestimated both in importance, time and resource needed.

A vast variety of demarcation methods and combinations of these have been used for LPISs in different countries. This section describes these various cases in three main categories considering the main source of reference data.

2.1.1 Based on Cadastral System

The LPIS is an inventory similar to the cadastral records, and it is applied to the administration of agricultural aid (Perez, 2005). For the LPIS, "agricultural parcel" is a continuous piece of land with a single crop cultivated by a single farmer. For the Cadastre, "parcel" is a continuous piece of land belonging to a single owner. Cadastral parcels are divided in "sub-parcels" according to the different types of land uses in the same parcel. So, the concepts "agricultural parcel" and "cadastral sub-parcel" are physically similar. In addition, the LPIS deals with "farmers/users" and the Cadastre deals with "owners". They may not be the same person (Perez, 2003). LPISs which based on cadastre consider both the regulation on the establishment of this kind of reference systems and land administration systems, which based completely on cadastral system. In the few countries the rural cadastre has been used as the basis for construction of the LPIS. One of them is Spain. The majority of countries have adopted alternative solutions that generally exclude cadastral information, which in these countries is used for other purposes (Perez, 2005).

2.1.2 Based on Large Scale Topographic Mapping

Some countries used their conventional large scale topographic mapping for this purpose. In the process of demarcating reference parcels, in this case, current geographic features (hedges, fences etc.) and sometimes land registry information are used as ancillary data sources. This is a similar identification system to the following one. The only difference is the usage of large scale topographic mapping instead of ortho products. This method is used by the countries having a tradition of general boundaries approach in their cadastral systems such as England.

2.1.3 Based on Ortho Imagery/Photos

In this case, to identify agricultural parcels clearly, ortho imagery or ortho photos are used. In the demarcation stage, three methods are used. These are;

- Directly identifying *Agricultural Parcel.*
- Identifying *Ilots (or* farmer block), grouping together a number of neighbouring agricultural parcel cultivated by the same farmer.
- Identifying *Blocks (or* physical block), grouping together a number of neighbouring agricultural parcels cultivated by one or several farmers and delineated by the most stable boundaries (*see* Fig 1) (JRC, 2001).

Many EU-15 countries and all of new EU members have been used ortho products as the main source of information in the establishment and maintenance of their LPISs (JRC, 2003). Some countries used current cadastral maps as a source of ancillary data; on the other hand, in some countries (all of them new members) the cadastre and the LPIS have been built at the same time.

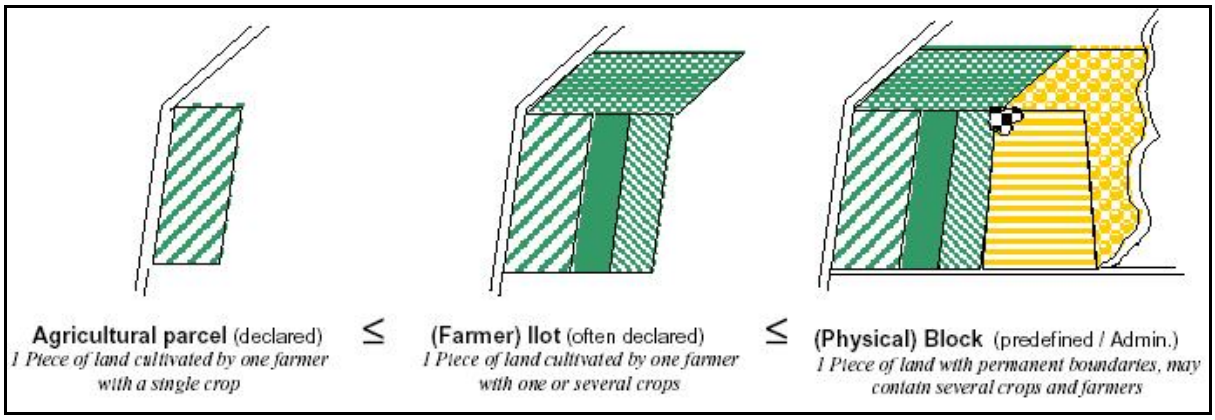

Fig. 1. Methods used for the identification of reference parcels (JRC, 2001).

2.2 Turkey's Current Stance Regarding the Usage of LPIS

In Turkey, the National Registry of Farmer System (NRF) has been implemented throughout the country under the Agricultural Reform Implementation Project (ARIP) supported by the World Bank on the one hand, and a new approach aimed at determining agricultural parcels with the help of ortho products has been initiated with the pilot projects on the other.

The NRF system is based on declarations by farmers. These declarations are largely dependent on the titles of agricultural land. The exception is the regions where cadastral records are not available. The declarations in these regions are dependent on farmer declarations and approval by the special commission governed by the village headman (*in Turkish* Muhtar). So far, within the NRF system, 2.75 million farmers and 16.7 million hectares of land are registered. Currently the NRF system is used for national support schemes, environmental measures, organic farming applications, farm product insurance systems and even for bank credits to farmers (Inan, 2006).

However, it seems to be inevitable the establishment of a new LPIS basically not dependent on cadastre data with the introduction of pilot projects in Agri and Tekirdag provinces. The main reason for such an initiative is no doubt EU's pre-accession procedures. In fact, Turkey's current cadastre system has similar drawbacks stated in the heading (3.1), and re-structuring of the cadastral system seems to be a time consuming and not a cost effective process in view of current agricultural applications. Yet, when considered in a broader context, although it has many technical drawbacks, Turkish cadastral system, which is a modern system, is very convenient for the information infrastructure required by IACS regulation.

3. THE CHALLENGE

Mooney and Grant (1997) states the reality is that in most countries the land administration infrastructure provided by the cadastral and land registration activities, and surveying and mapping activities, is the only available infrastructure which enables the implementation of

integrated national, state or provincial land policies. Unfortunately these land administration infrastructures are often out of date and inadequate to serve a more integrated role, even though they are usually the only option if an integrated national approach is needed. This results in purpose-built infrastructures being created which in turn results in isolated land information "silos" which are jealously guarded, cannot be integrated or combined, and are usually not shared (Williamson, 2001) just as LPISs under IACSs.

3.1 Interrelation between Cadastral Systems and the LPIS

When conventional cadastral systems are examined, it is seen that until today most countries (or states or provinces) have developed their own cadastral system because there are supposed to be huge differences between the systems. The one operates deeds registration, the other title registration, some systems are centralized, and others decentralized. Some systems are based on general boundaries approach, others on fixed boundaries. Some cadastres have a fiscal background, others a legal one. On the other hand, looking at it from a little distance one can observe that the cadastral systems are in principle mainly the same: they are all based on the relationship between persons and land, via (property) rights and are in most countries influenced by developments in the Information and Communication Technology (ICT) (van Oosterom et al., 2006).

When LPIS is considered all over the EU, basically the cadastral registers and maps could not serve as data source for the System (van der Molen, 2002). The reasons behind using different data sources other then cadastre for identification systems are analyzed and, in this context, the advantages and disadvantages of using cadastral data for this purpose are revealed by JRC (2001). These are:

Advantages (Presented by Cadastral Systems):

- they are available and familiar to the farmers,
- they are very detailed (scale 1:2000 – 1:5000) and accurate (if modern),
- they provide reference parcels with a unique reference number,
- they provide readily available gross area and sometimes official land use, almost always in digital format, allowing administrative cross check,
- they allow possible cross-checks with ownership information.

Drawbacks:

- they may have variable geometric accuracy, use local and/or various projection systems,
- they may suffer from heterogeneous quality and date of updating,
- they may not constitute a regular map-sheets coverage (format, irregular shape, scale, north orientation),
- they are generally not available as digital maps in rural areas,
- and more fundamentally, due to the fact that the cadastre is most often concerned with "property rights", cadastral parcels may not correspond directly to "agricultural parcels", which are the one required by the LPIS/IACS regulations.

In the light of the above analysis by JRC (2001), it is obvious that the majority of disadvantages of cadastre systems in this respect are related to the technical considerations and maintenance of current cadastral systems. Beyond that, the most important issue, which

was seen as a fundamental drawback, is that cadastre systems basically deals with property rights (ownership and land tenure), not agricultural activities.

With this issue in mind, not considering conventional differences, when we would like to draw an image of general purposes of modern cadastral systems, the definition – these systems or infrastructures include the interaction between the identification of land parcels, the registration of land rights, the valuation and taxation of land and property, and the present and possible future use of land (Fig. 2) – by Enemark (2005) is very useful. In this regard cadastral systems form the basis for effective land administration systems, and thus effective land-use management.

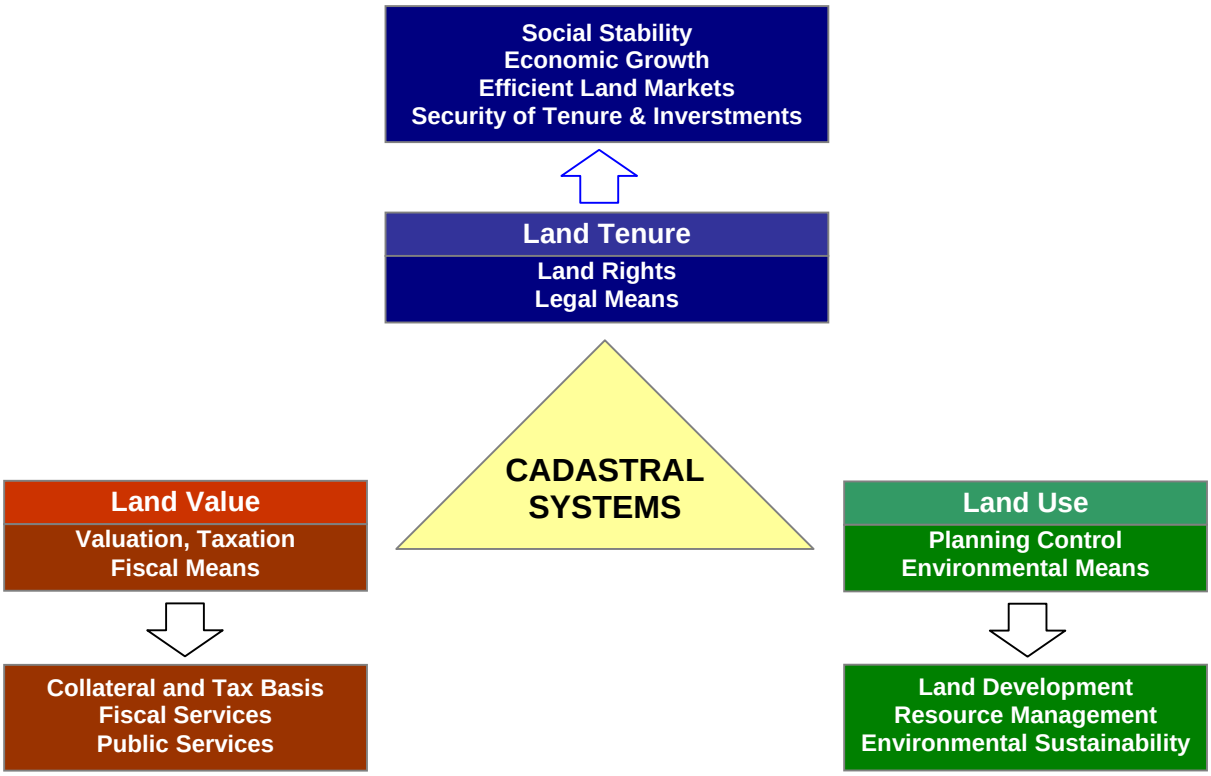

Fig. 2. Cadastral systems facilitate administration of three main areas: Land Tenure, Land Value and Land Use (Enemark, 2005).

In addition to considering the Cadastral System concept as the cornerstone of effective land administration and land-use control, the vision of Cadastre 2014 developed by (Kaufmann and Steudler (1998) should also be considered for further betterment of this concept. This vision suggests the registration of all private and public rights and restrictions relating to land in the form of "land objects" under the cadastral systems. In this context, Oosterom et al. (2006) developed The Core Cadastral Domain Model (CCDM). In the CCDM, in addition to the main concept structured among Register Object (objects subject to registration), Person and RRR (Right, Restriction, Responsibility), several boundaries such as reference system, ortho products, topography, geology, soil information, address registration, building registration,

fishing/hunting/grazing right registration etc. are included. This model is also intended to be proposed as basis for the cadastral data specification within INSPIRE (Oosterom et al., 2006).

3.2 Different Reference Systems

It is a fact that different countries opted different reference systems for their LPISs, may be, to the detriment of their land administration system. Because, even most of the member states having a long tradition of cadastral mapping decided not to use the rural cadastre for this purpose. They defined ideal systems and acted accordingly regardless of land ownership, land tenure, cadastre and thus land administration system of their country. The ideal systems, in this context, should provide one-to-one relation between the agricultural field and the identification system. This definition was the indication of current LPISs not based on cadastral systems and at the same time different demarcation and referencing systems, which were introduced previously under the heading (2.1). Referencing systems vary country by country and even sometimes region by region in a country, making impossible to compare the data sets throughout the EU and even sometimes throughout a specific country. This situation is also the product of the notions “cheap to build”, “easy to manage” and “easy to maintain”. These notions are responsible for today’s purpose-build isolated information silos (LPISs).

3.3 Future Trends

Inclusion of IACS like data within cadastral systems in the future is most likely considering current trends in cadastral systems. However, in the current situation, using different reference systems disconnect the two data sets, namely the data set related to land administration (land ownership, land tenure, cadastre data) and the IACS data including LPIS, up-to-date land use information declared by farmers, yield information, soil information etc. In fact, the information managed under the IACS is directly related to a multipurpose cadastre. Because, the information in these systems have been extended from just an agricultural subsidy infrastructure to a broader land management context with the introduction of second pillar of the CAP – Rural Development. This trend has caused to the usage of several environmental tools to assist in sustainable development of rural landscapes. The usage of these tools has been completely dependent upon the LPIS under the IACS. The future needs, in this context, will be more complex to an extent that the Land Administration System may not be neglected any further.

4. CONCLUSIONS

With the introduction of the CAP regime in 1992, LPISs were emerged under IACSs mainly in support of agricultural subsidies. They were disengaged from cadastral systems and land administration systems, and focused on the farmer, which means the exclusion of land ownership, land tenure and many more land administration functions from agricultural applications. New farmer-centric LPIS systems are cheap and easy to build and maintain. In addition, they are in constant development as the requirements imposed by the CAP are developed. The system has been heading for the management of rural land-use without land administration systems.

On the other hand, cadastral systems are regarded as cornerstones of effective land administration systems and accordingly land administration systems regarded as basic cornerstones of land management. In this context, land ownership, land tenure, cadastre, land administration and land management concepts are closely interrelated. Current and future trends in cadastral systems show the sign of development according to this interrelationship. However, the LPIS system under the IACS conflicts with this trend.

The LPIS system under the IACS is responsible for purpose-build isolated information "silos". It is not intended to support integrated systems. Moreover, the records under LPISs are not statistically comparable throughout the EU or even throughout some countries due to different reference systems. Even though they include invaluable data related to the value and land use, they could not be integrated to cadastral system. In the context of cost effectiveness, the challenge is that considerable investments are needed for the maintenance of these systems and cadastral systems as well. An integrated approach including both cadastral systems and agricultural applications might have been a great opportunity in view of overall functionality and cost effectiveness. Are we late for this?

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BIOGRAPHICAL NOTES

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