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Towards an Integrated Cadastral System Fulfilling LPIS Requirements

Efi DIMOPOULOU
National Technical University of Athens,
Greece



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Rural Development in Greece – Main Statistical Findings

- In Greece, the agriculture sector contributes almost 3.4% to the GDP and absorbs 12.4% of the country's work force.
- Greek agriculture is based on small-sized, family-owned dispersed units.
- In 2007, 65 % of the agricultural area was farmed by its owners. The family labour force represents 82 % of the total labour force.
- The 2007 FSS recorded 860,200 agricultural holdings in Greece, with an average size of 5.6 ha.
- 29 % of Greek farms specialized in olives, 12 % in mixed cropping, 10 % of the holdings specialized in various crops and livestock combined and 10 % in cereals, oil seed and protein crops.

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Size of the farms	Agricultural area (ha)				All farms	Livestock (LSU)			
	<20	20-50	50-100	>=100		0	>0-50	50-100	>=100
Area (1000 ha)									
Total area of agricultural holdings	2731.6	929.8	403.1	238.3	4300.8	1672.0	2342.4	206.1	81.6
- H. Other area	206.1	37.5	18.5	43.3	305.4	103.4	169.9	17.7	14.4
Wooded area	41.0	15.4	1.2	0.0	58.4	25.5	31.6	0.4	0.9
- Agricultural area	2525.5	892.3	384.6	193.1	3995.5	1568.6	2172.5	187.3	67.1
- D. Arable land	1316.8	554.0	154.5	54.1	2079.4	963.2	1049.8	45.1	21.2
Cereals	703.1	316.5	98.0	33.2	1150.7	540.8	560.8	25.3	11.8
Common wheat and spelt	107.7	43.3	12.6	5.9	169.5	81.9	82.8	3.4	1.4
Durum wheat	291.7	153.4	38.6	14.9	498.6	289.9	220.4	8.8	2.7
Rye	11.7	6.6	1.8	1.2	21.0	6.8	12.7	1.0	0.8
Barley	79.3	36.1	12.1	5.5	132.9	43.2	81.4	5.8	2.5
Oats	43.6	19.8	6.8	1.5	71.5	10.3	56.7	3.3	1.2
Grain maize	149.8	49.3	11.5	2.5	208.1	85.2	114.4	5.6	2.9
Dried pulses	11.1	6.0	2.4	0.8	20.3	10.7	8.9	0.5	0.2
Root crops	23.9	10.9	2.2	0.4	37.4	17.0	20.0	0.5	0.1
Potatoes	16.7	5.3	1.2	0.3	23.5	9.7	13.5	0.2	0.1
Sugar beet	7.1	5.6	1.0	0.1	13.9	7.2	6.5	0.1	0.0
Fodder root	0.1	0	0	0	0.1	0	0	0	0
Industrial crops	234.4	96.1	21.4	3.3	357.2	190.2	165.4	1.1	0.6
Tobacco	17.6	1.3	0.2	0	19.1	9.4	9.6	0.1	0
Hops	0	0	0	0	0	0	0	0	0
Cotton	207.2	92.3	19.6	2.6	321.7	172.4	148.0	0.8	0.5
Rape and turnip	0.2	0.2	0.3	0	0.6	0.4	0.3	0	0
Sunflower	7.1	3.4	1.3	0.5	12.3	5.7	6.4	0.1	0
Soya	0.1	0	0	0	0.2	0.1	0.1	0	0
Fresh vegetables, melons, strawberry	47.3	12.1	2.2	0.5	62.2	33.6	28.3	0.2	0.1
outside	42.9	11.7	2.2	0.5	57.3	30.8	26.3	0.1	0.1
under glass	4.4	0.4	0	0	4.8	2.8	2.0	0	0
Flower and ornamental plants	1.0	0.1	0	0	1.1	0.9	0.2	0	0
outside	0.5	0	0	0	0.6	0.5	0.1	0	0
under glass	0.5	0	0	0	0.5	0.4	0.1	0	0
Forage plants	196.5	67.3	28.6	9.2	258.6	71.6	185.1	14.7	7.2
Fallow land	137.9	41.7	14.3	6.5	200.3	96.3	99.7	3.0	1.3
- E. Kitchen garden	10.8	0.5	0.1	0	11.4	2.9	8.4	0.1	0
- F. Permanent pasture and meadows	193.6	274.9	214.0	132.7	815.2	2.0	637.2	133.0	43.1
- G. Permanent crops	1094.3	62.9	16.0	6.3	1089.5	600.6	477.1	8.1	2.7
Fruit and berry plantation	119.6	7.3	1.1	0.2	127.2	62.0	44.4	0.5	0.3
Citrus plantation	49.4	1.7	0.3	0	51.4	30.2	20.9	0.1	0.1
Olive trees	733.5	47.1	12.7	4.5	797.7	424.2	363.9	7.5	2.1
Vineyard	97.6	6.2	1.8	1.2	107.0	60.1	46.1	0.6	0.2
Ratios									
Agricultural area per holding (ha)	3.7	29.5	66.6	155.0	5.6	4.2	6.6	28.0	28.5
Agricultural area... (%)									
... own farmed	77.2	46.1	41.6	29.4	64.5	66.5	63.7	46.2	47.1
... in less favoured or mountain area	65.0	77.9	87.8	99.1	71.2	61.0	76.5	90.8	94.4
... organic farmed	4.0	4.3	7.2	12.8	4.8	6.0	3.7	7.6	8.1
... irrigated	37.9	28.9	14.7	6.1	31.7	40.6	27.7	9.8	13.6



Land use by size of the farms – Greece 2007








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* National capital
• Populated place

Forest
Grazing land
Cereal farming
Orchards and vineyards

0 50 100 Kilometers
0 50 100 Miles

In a country area of 131,960 km² the total crops area comes up to 37,324 km² (prov. statistical results 2009):

- 53.1% of the total crops area is covered by arable crops and other crops
- 30.8% is covered by permanent crops
- 2.8% is covered by garden crops and
- the fallow land represents 12.4% of the total crops area.
- Permanent meadows and pastures 46,000 km²






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European Union's (EU) Common Agricultural Policy (CAP)

- 1992 CAP Reform: introduced direct aid to farmers, necessitating the setting-up of an Integrated Administration and Control System (IACS), to manage and control community expenditure, comprising:
 - a computerized dB of holdings and aid applications
 - an administrative system for processing aid applications
 - a Land Parcel Identification System (LPIS) (1997)
 - a system to select the farmers for on-the-spot inspection
- The European CAP changed from:
 - aids linked to production, to area-based subsidies, and later,
 - alpha-numerical identification of the agricultural land parcel to a more accurate identification based on a GIS (*obligatory since 2005*).

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Land Parcel Identification System

- The LPIS is the key-element of the IACS.
- As of 2005, the new LPIS is a GIS inventory, similar to the Cadastre, for administering agricultural aid. Basis for constructing the LPIS:
 - (rural) cadastre/ LAS, or
 - alternative solutions, that generally exclude cadastral information.
- The IACS for agricultural parcels, operates at reference level such as cadastral parcel, or production block which ensures unique identification of each reference parcel (*EC Reg. 178/2003*).

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Reference parcels in the LPISs - definitions

- **(Physical) block:** continuous piece of land delimited by permanent boundaries (geographical irregularities, roads, etc), that can accommodate different agricultural uses, exploited by several farmers.
- **Plot or farmer block:** continuous piece of land, farmed by one farmer with several crops of the same or different land use type. In both ilots and blocks, IACS must verify that total area of parcels declared does not exceed the reference parcel's area.
- **Agricultural parcel:** continuous piece of land with a single crop cultivated by a single farmer.
- **Cadastral parcels:** can be subdivided to sub-parcels of different types of land use in the same parcel.



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Implementation of IACS in Greece

- Greek agriculture is heavily subsidized by the Common Agricultural Policy (CAP)
- Rural development in Greece is managed by the Hellenic Ministry of Rural Development and Food (HMRD&F)
- OPEKEPE, a private legal entity operating since 2001 supervised by the HMRD&F, is the paying authority of CAP in Greece
- Greece developed a new LPIS-GIS, using recent orthoimagery and complying with the technical standards required, first used in the 2009 claim year. From claim year 2010, only parcels with changes need to be annually digitized.

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Technical characteristics of the LPIS

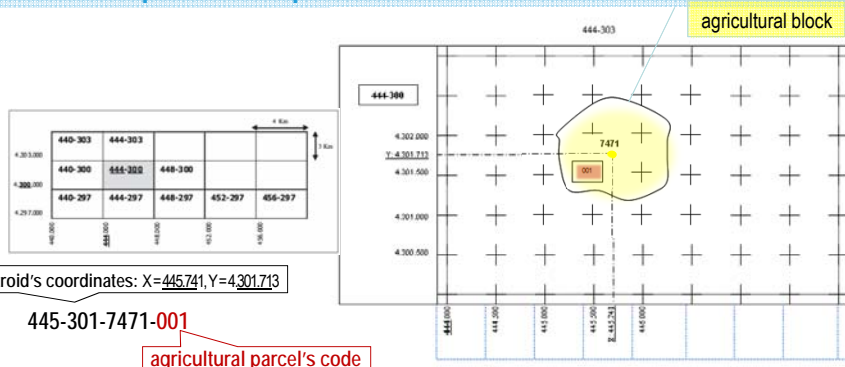
- In Greece, the new LPIS for the Integrated System covers the total agricultural country area (appr. 60% of the country), with 1.54 million ilots/ agricultural blocks (areas ranging from 5 to 50 ha, depending on the land use codes, with constant boundaries) and 9.8 million sub-lots (for eligible land use).
- The new LPIS, is based on 9,670 orthophotomaps at a scale of 1: 5,000 (pixel size 1m), produced by recent VHR satellite imagery (2006 - 2007), while for the rest of the country, high accuracy orthophotomaps, already developed for the Hellenic Cadastre project were used.

The use of orthoimagery is not compulsory but strongly recommended in the EU regulation. However, all the EU Member States decided to use orthoimagery in a way or another in their LPIS.

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Reference parcel unique identification code



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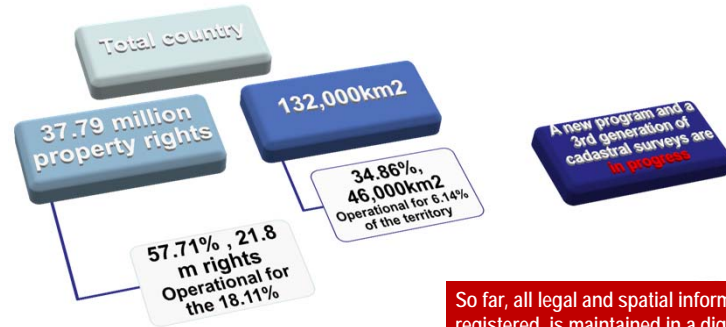
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ONGOING HELLENIC CADASTRE PROJECT



So far, all legal and spatial information registered, is maintained in a digital database, the Hellenic Cadastre IT System (SPEK), where 95 cadastral offices are connected through the Internet.

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HCP infrastructure data



Mapping infrastructure for the entire country, comprising digital orthophotomaps of high accuracy with a pixel size 50 cm (20 cm pixel for urban areas)

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GIS – Data Base Systems for the Greek Territory

Hellenic Cadastre (HC)

- Registers cadastral parcels as polygons
- Cadastral parcels are related to registrable real estate property rights
- Each land parcel is identified by a 12-digit unique code, assigned in accordance with the administrative division of the country
- The HC covers areas included in the program of cadastral surveys
- The HC deals with owners
- The HC is administered by the Ministry of Environment and Climate Change

Land Parcel Identification System (LPIS)

- Registers agricultural parcels as polygons
- Agricultural parcels are related to crop cultivated by a farmer
- Each agricultural parcel is identified by a unique 13-digit cartographical code, according to the 1: 5,000 HMGS distribution grid in EGSA '87 geodetic system
- LPIS covers all agricultural land
- The LPIS deals with farmers/users
- The LPIS is administered by the Hellenic Ministry of Rural Development and Food

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CADASTRAL PARCEL

A single area of land or more particularly a volume of space, under homogeneous real property rights and unique ownership (*WPLA, "Guidelines on Real Property Units and Identifiers" WG-CPI, 2006*),

Remark: By unique ownership is meant that the ownership is held by one or several owners for the whole parcel. By homogeneous property rights is meant that rights of ownership, leases and mortgages affect the whole parcel. This does not apply to specific rights as servitudes which may only affect part of the parcel.

..while an agricultural parcel is a continuous piece of land with a single crop cultivated by a single farmer.



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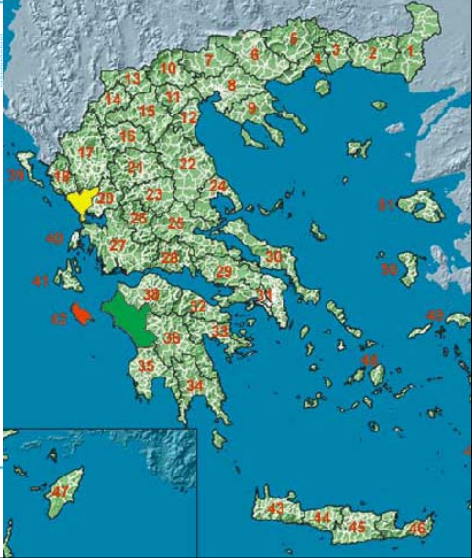
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CASE STUDY

Focused in 3 areas with different characteristics (geographical location, land fragmentation and topography):
a flat low-lying area,
a seaside area of intense relief and
an island agricultural area






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Data collected

From OPEKEPE:

- Orthophotomaps from VHR imagery (pixel size 1m) (2006-2007).
- Diagrams depicting LPIS's agricultural parcels in EGSA '87 geodetic reference system (dxf format).






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Data collected

From Ktimatologio SA and HCMO:

- Orthophotomaps with a pixel size 0.5m (2007)
- Cadastral diagrams (1st pilot program) in EGSA '87 geodetic reference system (in dxf format)
- updated cadastral diagrams, provided by the Hellenic Mapping and Cadastral Organization, presenting the current situation of land parcellation for the study areas






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Case study 1 – Lehena – geometry overlap

Data
Orthophotomap
Agricultural parcels
Areas not included in the LPIS (yellow: 8%)
AP with a single crop (green dot) (visual control)
AP (black)/ CP (red)/ AP (blue)

Results
Only 3 AP can be compared to relevant CP
1 coincides (2), 2 with differences 4.8-8.8% in land area. Average AP area 2 ha.






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Case study 2 - Filippiada

Data

Orthophotomap
Agricultural parcels
Areas not included in the LPIS (yellow: 68%)
AP with a single crop (green dot)
AP (black)/ CP (red)/ AP (blue)

Results

Only 2 AP can be compared to relevant CP
with differences 5-20% in land area. Heavily
fragmented land, average AP area < 1 ha.

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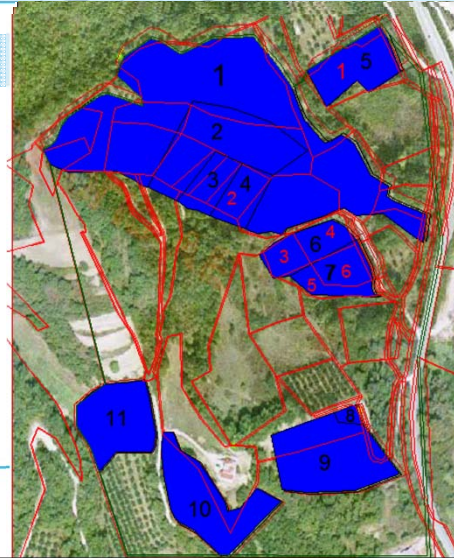


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Case study 3 - Vassiliko

Data

Orthophotomap
Agricultural parcels
Areas not included in the LPIS (yellow: 25.6%)
AP with a single crop (green dot)
AP (black)/ CP (red)/ AP (blue)

Results

Only 2 AP can be compared to relevant CP,
with differences 2-7% in their land area.
Fragmented land, average AP area 1ha.

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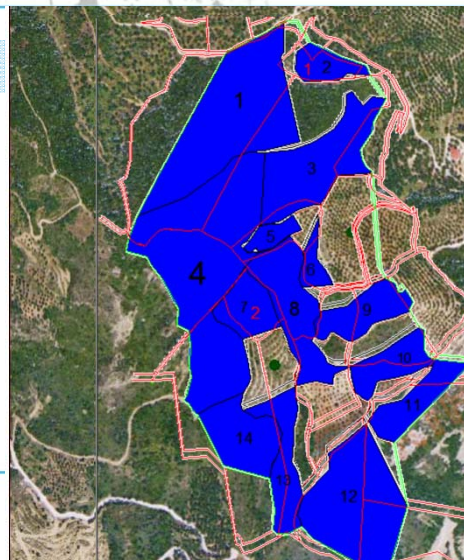




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Results

- Boundaries of CP do not coincide with the boundaries of AP
- Degree of boundary overlap < 10%
- Interpretation of results, taking into account the systems' tolerance
- Gaps in AP declared
- Different crops in the same AP, or containing areas of non eligible land uses (rocky areas, buildings..)
- Total AP surface equals to CP area
- The more fragmented the land is, the less AP are registered into the LPIS (farmers are less interested in subsidy)

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Proposals

- Digitalizing only the eligible areas, stricter control on AP declarations
- Reduction of declaration fees, for motivating farmers to declare even smaller areas
- Obligatory inclusion of the owners' name in declarations, which would act as a link with the HC
- HC & LPIS towards interoperability:
 - The new LPIS and the new generation of HC are built in similar ways, using orthophotos as basic cartography. Both AP & CP are drawn on orthophotos and after on-the-spot and/or remote sensing checks, their boundaries are vectorized and the parcel areas are calculated.
 - LPIS (up to date and accurate) could form a LU mapping tool for rural land, to support development projects and actions in Greek rural economy!

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