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New land parcel identification system for agricultural subsidies in the Czech Republic

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ABSTRACT: The Land Parcel Identification System (LPIS) in the Czech Republic has been created by Ekotoxa Opava since 2001 as the key component of Integrated Administration and Control System (IACS) for area-based agricultural subsidies. The system holds geographical information about land parcels (blocks and block units). Czech LPIS is based on panchromatic digital orthophoto maps. Direct farmer's input was included during the building of the system. Czech LPIS is a homogenous GIS database covering the whole country and is prepared to be ready for the 2003 national subsidies campaign and since 2004 for area based subsidies within IACS. The future development of the system leads towards the multifunctional use in many different areas.

1 MAIN FUNCTION OF THE LAND PARCEL IDENTIFICATION SYSTEM

The Land Parcel Identification System (LPIS) is the key component of Integrated Administration and Control System (IACS) for area-based subsidies. The legislative and conceptual base for the system is included in several EU regulations and technical specifications. IACS is mainly used for management and control of agricultural subsidies by all EU national administrations. LPIS holds an information about land parcels which are used as a reference for declaration by farmers, for administrative and cross-checks (100% of all declarations), and finally for on the spot inspections (minimum 5% of all declarations). Functional LPIS is also needed for candidate countries by the time of accessing EU (now expected by 2004). There are different approaches concerning LPIS among present member states: some systems are based on cadastre or topographic maps, but an increasing trend in use of aerial orthophoto maps is evident (Léo 2001, Léo, Kay & de Roeck 2002).

2 DESCRIPTION OF THE CZECH LPIS

In the Czech Republic, LPIS has been created for the Ministry of Agriculture by Ekotoxa Opava since January 2001. In 1999, one pilot district was chosen for methodology testing, and over the year 2000 some other preparation work was done. The whole graphical database is to be finished in June 2002.

The system is based on panchromatic digital orthophoto maps (pixel size 0,5 m) covering the whole country (78000 km^2) created from aerial photographs taken between 1999-2001 in the scale 1:23000. About 10% of the territory is covered with orthophotos based on 1998 flights in the scale 1:26000. Orthophoto maps were created by the Czech Office for Surveying, Mapping and Cadastre. Subsequently, Ministry of Agriculture provided Ekotoxa Opava with this data as the source input for the project. Images were orthorectified using digital terrain model (DTM) derived from contours covering the whole country in the scale 1:10000.

According to dominant landscape types, quality and suitability of the cadastral maps available, and the amount and structure of farmers in our country, the approach based on physical blocks was chosen as the main principle for LPIS building. Physical block is defined as a cultivated agricultural area surrounded by permanent boundaries like road, river, forest, hedge, etc. When more farmers or land use types are present on the block, internal block units are registered. This leads to two-level schema, which is the basic concept of LPIS graphical database. The upper level, physical block, is rather fixed object comparing to the internal block unit (farmers block), which must be updated more frequently (Trojáček 2001).

After on-screen digitalization of the block boundaries, the consultations with farmers gave us a valuable information on usage and land use type inside blocks (Fig. 1). Information about stables and farms locations were also registered. During consul-

tations, other important information was collected as well. The information relates to organic farming, irrigation, occurrence of water erosion and more detailed description of grassland.

Fig. 1. Sample graphical output from LPIS database

The draft basic statistics of LPIS database is as follows:

- 290 000 physical blocks
- 490 000 block units (farmers blocks)
- total area of identified agricultural land: 3,7 mil ha
- average size of physical block: 12,8 ha
- average size of block unit: 7,6 ha
- 20 000 farmers involved into consultations
- 30 000 farmers identified

An extract from the graphical database around the capital Prague is shown on fig. 2. Different colours of farmers blocks correspond with different land use types (arable land is dominant, but permanent grassland, hop fields, and orchards are also present in this area).

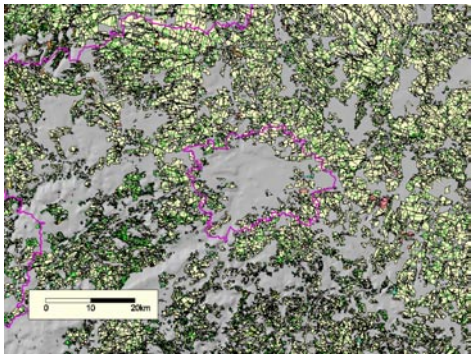

Fig. 2. Extract from LPIS database showing the Central Bohemian region (around Prague)

3 CATEGORIZATION OF BLOCKS

Important feature of the Czech LPIS concerns blocks categorization (Vrubel & Trojáček 2002). This operation is carried out on the physical block level because of the relative stability of this object. Blocks are classified according to natural and limiting management factors using GIS analytical methods. Natural factors are mean height, mean slope angle, exposition and soil typology. To the main limiting factors belongs nitrate vulnerable zones, environmental sensitive areas, water protection areas and contaminated zones. It is important that suitable graphical databases in digital form covering the territory of the country are available. The detailed description of the blocks allows farmers to fit their farming practice in the blocks characteristics and also helps the national administration to perform more detailed administrative control after receiving the farmers declarations.

4 GIS SOLUTION

All final digital data are stored in GIS databases (Fig. 3). That enables the administration to centralize the storage of data, to make an easy maintenance and updating, to print map outputs for farmers, and to distribute the data using easy-to-use and fast Web-GIS application.

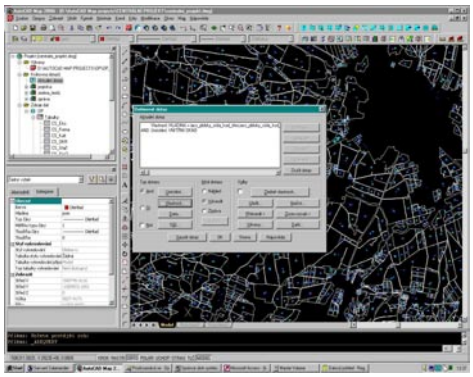

Fig. 3. LPIS data within the environment of GIS project (AutoCad Map 2000i)

The core of the GIS solution is ORACLE 9i database management system. All data – attribute and spatial – are stored in the unique DB platform. For viewing, presentation and managing data the Autodesk MapGuide web-map server solution has been chosen. Map server is joined with the database using Oracle Data Extension for Autodesk Map Guide. This solution allows viewing of geodata in the standard web browser environment. On-line changing of attribute data directly from the web-browser inter-

face as well as spatial data editing in redlining mode is allowed.

5 CONCLUSIONS

During the building of the system, the requirements of EC legislation were respected (Reg. 2419/2001, Reg. 3508/92, Reg. 1593/2000). Detailed technical specifications of the system were set up according to the results of the pilot project with special regards to relevant technical documents mainly by DG-JRC Ispra (Discussion Paper 2001).

The testing of procedures concerning the area-based subsidies is now in progress in two chosen districts. It consists of the LPIS updating, farmers declarations, software and cross checks, and on-the-spot controls including control with remote sensing. Printed outputs from the LPIS database were prepared for the farmers because of the indication of changes (LPIS updating) and declaration of agricultural parcels for the 2002 season.

The system is prepared to be ready for the 2003 national subsidies campaign and since 2004 for area based subsidies within IACS.

Since the LPIS completion, the database must be constantly updated. The continuous updating based on information given by farmers and the updating based on a new set of orthophoto maps are both necessary. Colour ortophoto maps in three year period are recommended for the actualization process.

The future development of the system leads towards the multifunctional use in several areas (Léo, Kay & de Roeck 2002, Vrubel & Trojáček 2002):
- Rural development,
- Agri-environment,
- Landscape management,
- Permanent crops registers (vineyards, hop-fields, intensive orchards),
- Environmental sensitive areas including Natura 2000, etc.

To reach this vision assumes to enhance the whole system and to split the present non-agricultural background into the polygons with defined land use categories.

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