SOME RELATIONS OF REMOTE SENSING IN EVERYDAY AGRICULTURE AND IN LIFE OF PEOPLE LIVING ON FARMS

UNELE RELATII DE TELEDETECTIE INTRE AGRICULTURA DE ZI CU ZI SI VIATA OAMENILOR CARE LOCUIESC LA FERMA

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Abstract: *Our life and business are changing day by day. Lack of the permanent harmony between the different spheres of economy, or more exactly, of agribusiness has a negative impact on economic efficiency. Some data and information become very important and good aid for agriculture. I do not forget its social aspects. Modern technology and equipment help us to find the correct ways of processes. I try to point at some interesting details and coherences.*

Keywords: *remote sensing, rural development, agriculture, society, map*

INTRODUCTION

Application of spatial informatics in agriculture brings a lot of novelties, possibilities and also problems for people working in the fields and living on farms. In Hungary, use of modern devices of informatics is not so widespread among people living in farmsteads, they are not aware of the benefits these devices can offer. They are rather averse to systems of spatial informatics, though it can be seen clearly that in certain cases – for example, in case of land-based subsidies or when it is necessary to clear up the ownership – they are of great importance, since objectivity of methods of remote sensing can make a numerous problematic questions decidable quickly. In my study I am aiming to point at certain important interconnections which can make life and work of people living in the outskirts and working in the agriculture easier.

MATERIAL AND METHODS

During my examination I am planning to offer a brief survey of the specialized literature, then to explain the data- and information technological interconnections of remote sensing and spatial informatics. I am showing some problems and tasks to be solved around Hodmezovasarhely to which the systems of spatial informatics and modern solutions of remote sensing can give a solution.

By remote sensing we mean the research methods, on one hand, by means of which we collect data on our environment (most frequently on the surface) so that the data-collecting device (the sensor) is not in a direct physical contact with the examined object or phenomena. The term „remote sensing" also involves processing the obtained data and its technical, professional background, too (Csornai and Dalia, 1991). The expression (remote sensing) has spread with the use of the device fixed on satellites which observe the surface of the earth (scan or photograph it). Remote sensing is one of the most efficient methods of data-collection in spatial informatics.

Sensors placed on different carriers (airplane, helicopter, hang-glider, satellite etc.) collect the data of electromagnetic waves radiated and reflected in different wave-lengths by the surface and its objects. Then, these data give the necessary information about the examined area after the suitable processing (of the image). In processing the reference data measured on the ground are of great importance since they make it possible to analyze the data in connection with the whole field of data. By joining the images to each other, an objective, contiguous image can be formed.

In remote sensing we can collect information about the observed surface in many ways. Shots taken in the visible domain (panchromatic) make spatial structures perceptible by human eyes in an analogue way, in image format or digitally. The orthophotoes or orthophoto-maps, which lack distortions, unite the favorable features of authentic and detailed photos so they can be utilized very well, among others, to survey the state of the soil, surface water and vegetation (Milics, 2006). The aerial and space shots map the surface of the earth in channels of different bandwidths and band number chosen in accordance with the task. Altogether with other technical solutions, continuous spectrums obtained with remote sensing make it possible, by means of the suitable data background, as well, to map

efficiently the current state and composition of the physiological environment and vegetation.

Until recently digital processing and treatment of spatial data were dominated by a technology fixed to the given place. The breakthrough in mobility was brought about by the above mentioned computers, or the so-called PDAs (Nagy, 2001; Jakobi, 2006). As an additional device a handheld GPS-receiver can be attached to the PDAs by means of a suitable card or software, so the momentary position can be displayed on the digital maps which imply a huge development in works on the ground. The different thematic and topography-based data on the handheld computers and the information referring to the place obtained by the attached GPS-receivers, for example, altogether make it possible to carry out tasks of both navigation and data collection easily. The places of sampling marked out in advance can be found, also they can be corrected by comparing the spatial data available in real time to the ground reality. This information makes it possible to examine the expansibility in space, to correct the basic spatial data on the spot and perhaps to mark out monitoring points on the basis of conclusions.

With the expansion of non fixed services, the spatial background information can be obtained through the Internet connection from a suitable Internet server (from an external data service provider or from an internal system of spatial informatics), so it can be used at once on the ground. (Nemeth et al. 2007)

In agricultural consulting a unified system of spatial informatics based on map and descriptive data, which contains data about relief, soil characteristics, cultivation units, ownership even through a map-server on the web, can be applied excellently with integration of a set of tools of spatial informatics usable on the ground (Szabo et al., 2002a, 2002b).

Spatial informatics, as a data content, can be divided into two components: geometrical and descriptive data, data bases. As a general feature, descriptive data are organized in relational data bases. Although, they do not coincide with the strictly meant (normal) relational data base in each case as in their structure other viewpoints can have a part, too. Since, from the aspect of storage, it is rather the geometrical data which cause most of the problems, it can be permitted more or less. Geometrical data create a unit together with their descriptive data so it is not necessary to talk about their linkage separately, since they cannot be separated.

Relation between descriptive and geometrical data is the basis of spatial informatics modeling. Objects having spatial (geographical) features can be described both with the necessary geometrical data model and their original physical characteristics. Geometrical data create a unit together with their descriptive data so it is not necessary to talk about their linkage separately, since they cannot be separated. The data carry their 'pair' due to the formalized tabular links which can hinder formation of certain relations a bit, since it can happen that the attached data makes meaningless a certain operation. Links between geometrical elements are essentially based on their topolologic features, like neighborhood, inclusion, contact/intersection etc. Co-ordination between objects is carried out on the basis of how the chosen topological feature is realized. It is a frequent task to identify neighborhood in case of analysis of spatial correlation or inclusion-examinations etc. (Nemeth et al. 2007)

Knowledge of the geographical position makes it possible to execute map or geometrical analysis, queries, too. These are for example, intersection or combination of objects of identical (e.g. spot-spot) and different (eg. spot-line) type, marking out zones determined in a complex way by distance and/or place and/or attribute feature, analysis of relations of neighborhood, carrying out operations of algebra or logic type between maps, spatial expansion (co-ordinate point with a spot, interpolation etc.), calculation of isolinear maps, analysis based on a ground model (slope, exposition, conditions of calculability, volumetric, calculations of hydrology and flowage etc.)

It could be continued, mainly after considering the possibility to enlarge the spatial representation, as most of the above mentioned processes are applied in case of the most frequent vector and raster ad types.

In order to let the user get in touch with processing, it is necessary to have a system element which shows the data in the suitable form both for the user and processing. This element is the (user's) interface. It is necessary to have a (professional) interface between processing and the stored data because data generally are not stored in the data base in the form as processes demand or provide it. The user gets in touch with the other system elements by means of so-called tools (hardware and software). By means of these tools it is possible to realize the data base, to carry out processing and to get interfaces to operate (Bana, 1994). The system can be analyzed. Though it is impossible to plan them, their forming is possible; it is

advisable to acquire the knowledge on the use of the system and other information in connection with the informatics system..

RESULTS: EXAMPLES FROM THE PRACTICE AND SOME INTERCONNECTIONS IN REALIZATION

It was possible to face with the fact in the environs of Hodmezovasarhely that due to the changes in properties, the different speed in functions of the administrations which register properties, farmers or tenants had enlarged gardens around their houses, or utilized lands not used by anybody in the neighborhood for cultivation or as pastures, so a situation hard to follow was formed. After a while properties were sold or changed owners which had not meant a significant value before, so registration about them was not accurate. Boundaries changed several times because the farmer placed the boundary pole farther on when he started to plough so that he could have a bit bigger field. In our town it was typical, too, that in the world of isolated farms of huge area a family could cultivate lands on small plots in several places even far from their living place, based on the memories and customs. After joining to the European Union subsidies, applications, tenders set a new challenge for the farmers to whom even town-dwellers joined who wanting to purchase farmhouses wanted to know the accurate boundaries of their properties, so it became necessary to establish a state which is based on more accurate maps and which is clear in the sense of ownership rights. Remote sensing gave and still gives help to realize it, since the most important elements of the thematic modules of the multi-level informatics system which supports regional development and agrarian-environmental management are the systems of registration and topography of the land sector, the system of monitoring cultivated plants and surface cover based on remote sensing, systems of spatial soil informatics of wide-scale, the digital system of map development based on aerial shots and system of management and control of agrarian subsidies. Systems of land sector and agrarian-sector registration are joint to each other tightly and also to the registration systems of environment and systems of settlement management and planning. Nowadays, we can witness establishment of a unified land systems. An open system based on standard, spatial informatics which has an institutional background regulated by the

law can help to establish the forms of agrarian-environment protection subsidies of the EU, that of consulting and farmers' data base.

The process of realization starts with surveying the demand in this case, too, then it is followed with planning. When planning, it is necessary to determine the field of elements and areas involved in the survey in a model by selecting the important features from the aspect of the given purpose. Digital equivalents of the features, objects and the relation between them are determined in a connecting logical model. The following step is to carry out the tools which assure realization, thus formation of the appropriate technical environment where it is possible to give parameters of the data base on the basis of the suitable physical model. The solution here is giving information to the user by means of processing (queries), and system elements which transform the data since it is necessary to analyze the data in space (and in time) in the digital environment, to model them, to integrate the different spatial data referring to the given place and to make the new information appear on the basis of a suitable mapping model.

Besides questions of ownership, there is a great need for information about cultivation, too. It is a frequently debated question that in case of a given natural disaster- like for example, flooding in several counties of Hungary- what grade it has, what loss in production it causes and what insurance burden it brings about from the viewpoint of insurance companies. Nowadays the accurate determination of crop lands covered with water (Figure 1) can give some preliminary information for crop prognostic and thus changes in consumer price, too. As I have mentioned earlier, quick and correct management of claims for damages can mean a great help for farmers since it is necessary to reduce the burden of this kind in an agriculture which struggles with a constant lack of resources.



Figure 1 Area covered with water between Bekessamson and Hodmezovasarhely
www.origo.hu/i/0903/20090309belviz1.jpg

Agricultural patches are located in bigger units, blocks. It is a constant position, from the viewpoint of agricultural cultivation, which are surrounded by well-determined elements (e.g. roads, railways, channels, banks, forests etc.). During the year several operations (e.g. aerial vaporization with chemicals) can be carried out efficiently only in the form of big patches, so it is necessary to mark out the accurate and possibly, the economical farm size. It gives the basis of the settling of accounts with the subcontractor, at the same time.

If we think of the living space and life style of the population in the outskirts, on the farms, it is inevitable to map the space of their everyday life and work. The motorway M43 passing by Hodmezovasarhely divides this earlier unified area, mentioned above. It is very important to build passages for vehicles and games in the most suitable places. Modern spatial informatics and remote sensing can help us with it, too.

CONCLUSIONS

Agriculture is realized by farming organizations and private farmers. The agricultural activities of private farms are primarily based on leasehold, so that is why the problem of accurate definition of land and ownership is so important. Around half of the country's cultivable lands are used by agricultural organizations, however, about one third of them do not have

their own land. The expectation is the same in this situation, too. The basic unit of farming is the agricultural plot, patch which was characterized earlier with homogeneous, though in certain cases heterogeneous, conditions of soil.

It can be generally stated that the plot is not unified since it is usually composed by more cadastral units and often has more owners. It will be the owner or the tenant (farmer) to cultivate it. Remote sensing can give an objective solution in this sometimes chaotic situation.

Remote sensing and the connecting other applications in the field can be useful together for the cost-efficient economic operation and for solving certain social problems of the population living there. Spatial informatics can give a huge help with administration connected to the land and with other fields too, both in the present and future.

REFERENCES

1. **BANA I.** (1994): Az SSADM rendszertervezési modszertan, LSI Oktatokozpont, Budapest, p. 146.
2. **CSORNAI G. – DALIA O.** (1991): Taverzekeles, kezirat, Erdeszeti és Faipari Egyetem Foldmeresi es Foldrendezoi Foiskolai Kar, Szekesfehervar
3. **JAKOBI A.** (2006): A helyfuggetlenseg helyei az informacios tarsadalomban, In: Kertesz A.; Dovenyi Z.; Kocsis K. (szerk.). III. Magyar Foldrajzi Konferencia, MTA, FKI, cd-rom
4. **NAGY G.** (2001): CADvilág, 4, 46.
5. **NEMETH T. – NEMENYI M. – HARNOS ZS.** (2007): A precizios mezogazdasag modszertana, JATEPress – MTA TAKI, Szeged
6. **SZABO J. – BAKOS L. – PASZTOR L. – CSERVENAK R. – POGRANYI K.** (2002a): GPS es terinformatikai alapu alkalmazas a mezogazdasagi szaktanacsadas szamara. Acta Agraria Kaposvariensis, 6(39), pp. 3-13.
7. **SZABO J. – PASZTOR L. – BAKACSI ZS.** (2002b): Compilation of farm level soil information systems in Hungary, In: Proceedings of the 17th World Congress of Soil Science, Bangkok, 14-22/8/02, cd-rom