

# GI Support for Land Consolidation

Bela MARKUS, Hungary

**Key words:** land consolidation, spatial information management

## SUMMARY

In the 90's in parallel with the political changes, the transformation of the Hungarian agriculture has also been started. After the collapse of the command economy structures and state socialism, a returning to private ownership and farming through a third agricultural land reform was pursued as a potential remedy of the problems. The land reform has caused a significant change in the agricultural structure. The outcomes of the land privatisation affected more than half of the total area of the country and over 2,5 million new ownerships were created. Compensation and land privatisation resulted in inadequate land size and shape and a very fragmented distribution of plots belonging to one owner, failing to support viable family farming and competitiveness. As a result of the land privatisation, the previous farming-on-large-scale was replaced by the farming based on inadequate field size for sustainable and competitive family farming.

The introduction of a complex land consolidation procedure, together with the rural development could significantly contribute to a better quality of life in rural areas. The EU accession and the agricultural and environmental policy of the Hungarian Government will generate major changes in land-use. Geoinformation systems should be developed for supporting planning work and decisions on political, managerial, technical and operational level. This involves design and implementation of land tenure databases, land market and land use analysis, user needs analysis and building mathematical and information models, creation of new visualisation techniques etc.

The first part of the presentation is dealing with land consolidation issues in Hungary. The author gives a brief historical overview then outlines the present status and ongoing projects. The second part of the paper is giving an overview of the GI infrastructure available in Hungary. Finally, in the last part the author introduces the present situation of the computer-supported land consolidation projects in Hungary. The paper is based on the initial results of a research project (OTKA T 43384) supported by the Hungarian Academy of Science.

# GI Support for Land Consolidation

Bela MARKUS, Hungary

## 1. INTRODUCTION

The first part of the presentation provides an overview of the history and current issues of land consolidation in Hungary. Agriculture has always played an important role in Hungarian history, and accordingly the development and application of land consolidation policies. The knowledge of historical processes is an inevitable part of professional intelligence, and a significant condition for the new generation to eliminate the mistakes of our predecessors.

The substantial changes in national and international conditions took an effect on land issues, too. Agrarian structures of European countries have changed perceptibly by the beginning of the 20<sup>th</sup> century. Transformations were mostly characterized by evolution, and involved the decrease in the proportion of rural population. The “left-over population” found livelihood in other sectors or started labor-intensive agricultural (husbandry, gardening) jobs, though even if they changed residence or possibly emigrated, they calculated that upon return several years’ income will be sufficient to buy land.

Following the First World War and the disintegration of the Austro-Hungarian Monarchy, the former economy – in which Hungarian agriculture topped 40% of the national income – became unbalanced, leaving behind one-sided land structure (latifundia), out-of-date farming and the negligence of soil conservation. The 1920 state controlled land reform utilized about 10% of the large estate area, resulting in no basic changes in land structures. This consolidation concerned too few land and too many people, so fundamentally unviable smallholdings appeared.

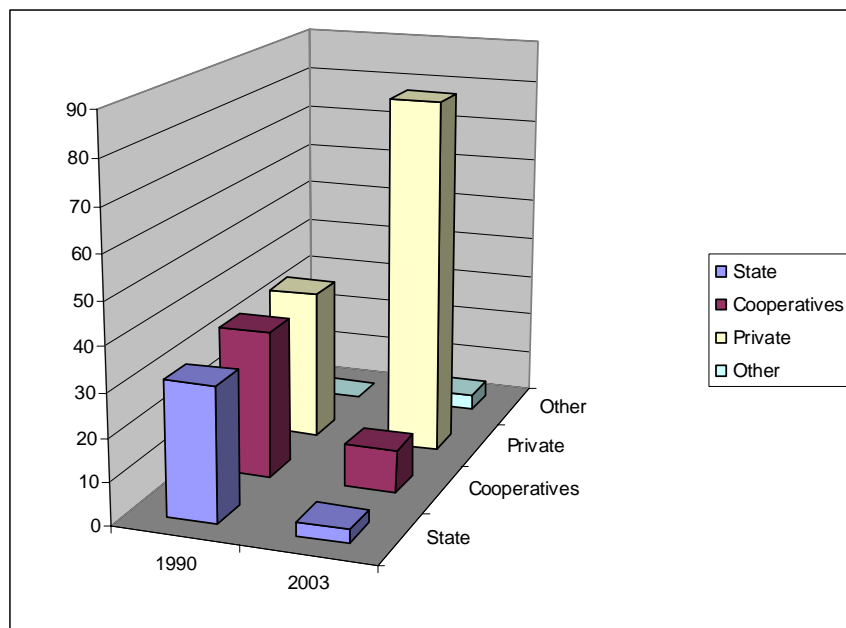
Following the Second World War, Hungarian agriculture went into collectivization. In 1945 expropriation started, in which one third of the land area changed ownership. As a consequence of redistribution, a large number of people became new owners, who themselves did not have any land before (but were mostly working in the agriculture). These people were lacking both professional experience and equipment, and were unable to cultivate without state support. This land reform was primarily backed by political and social considerations, for the most part without weighing economical aspects. The unhealthy system of large estates came to an end, although on the other hand the number of unviable parcels (typically below 3 ha) increased.

Shortly after the division of lands, a governmental regulation presented the state’s right of preemption for landed property. The proportion of state property increased, and because of major produce delivery charges and harassment most of the owners offered their land to the state. Meanwhile private farms were organized into co-operatives (with force). At the end of the 1950s a strong “co-operative” campaign started, and though it did not consider proprietary rights of the land, still the disposal power of joined members were practically suspended.

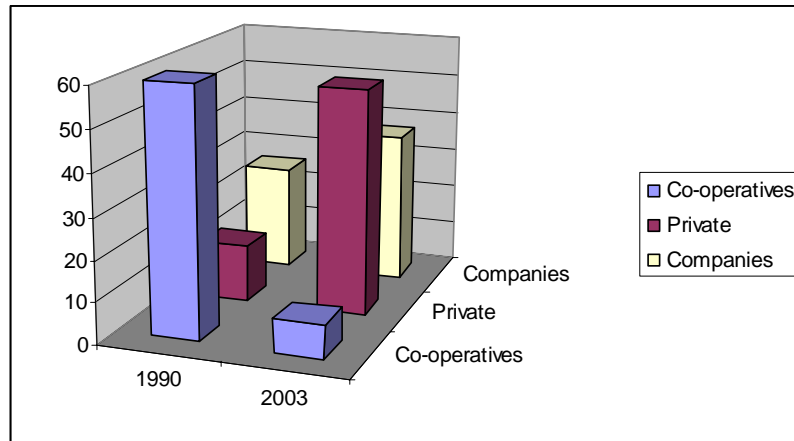
The socio-economic changes of the 1990s brought a significant turn to the consolidated land politics of the last 2-3 decades, in which the agricultural sector achieved internationally recognized results. The radical reorganization in properties and land use aimed to restore the leading role of private ownership, to gain ground for individual farming, and to compensate complaints of former owners. These objectives notably widened the group of potential owners, regardless of their previous linkage to agriculture and whether they plan to cultivate their new possessions or not. A particular consequence of land privatization is the most deeply cut-up land structure ever, and the separation of property and land use. The structure based upon the land size is cut-up, for which the land tenure system offers some solution, though in its current form does not provide the grounds for long term effective land use.

The average parcel size used by private farmers has grown in the last decade, but it is still only about 3 hectares. Because of the low profitability of agriculture, farm rent costs are significant factors. Beyond this the eminent administrative costs lay a burden upon the tenants. Agricultural organizations with 1000-1200 hectare land are contracted with several hundred hirers, because of the average plot size of 3 ha. The future developments of the two main components of the land market (purchase and tenure) are cause and effect dependent on land consolidation.

Therefore land structures need to be changed in order to form viable, modern enterprises.



Property structure changes in the last years in Hungary (Source: KSH)



Change of land user categories in the last years in Hungary (Source: KSH)

## 2. DATA

The second part of the paper is giving an overview of the GI infrastructure available in Hungary.

### 2.1 Cadastral Maps

Approximately 60 000 cadastral map sheets cover the area of Hungary at scales from 1:1000 to 1:4000. A large part of the sheets are in different projections, mapping systems and datum.

After the political and economical changes the land privatisation affected more than half part of the country (5.6 out of 9.3 million hectares). All efforts have been made to keep the old cadastral maps up-to-date during the land privatisation process. From the other side, a nationwide map renewal (data capture) programme was worked out to realise the unification and updating the existing systems within framework of the National Cadastral Programme (NCP). Recently, the digital cadastral survey in standardised form is carried out on 500 thousand hectares (6% of Hungary), as well as 2300 thousand hectares of rural areas (25% of Hungary) are digitised in near-standardised form. During 2002 and 2003 NCP has successfully performed digitisation of cadastre maps of rural areas in a pilot project over 1.9 million hectares to support the Integrated Administration and Control System (IACS) to be introduced at the time of the EU-accession of Hungary. The results of large amount of digital cadastral maps are expected to be integrated with land registry data in the database of the Land Office IT-systems called TAKAROS to make the cadastral system alive in computerised form.

The technical and financial documents of the NCP have been elaborated focusing on the following items:

- Accelerating the data entry of the land registration records,
- Continuing the cadastral mapping project,
- Providing geometric template for land registration and for a wide range of applications,
- Education, training and management,

- The implementation of additional planned actions, having impact on the NCP is scheduled using a priority scenario,
- In 2003 a revised program a NCP has been ordered by government: all the analogue cadastral maps of Hungary must be vectorised during 2 years for the rural areas and during 4 years for the built-in areas. A governmental credit of 9.8. Billion HUF are available for this purpose.

## 2.2 Topographic Maps

The Act on Surveying and Mapping and the respective Decree to it coming into force on 1<sup>st</sup> March, 1997 distinguish the topographical maps produced till 1997 in EOTR and the state topographic maps. Respectively, the responsibility for topographic maps is divided between the National Mapping Agency (DLM/MARD) and Military Survey (MS HDF) as follows:

- Topographic maps produced till 1996 in EOTR – Department of Lands and Mapping/MARD,
- State topographic maps of large scales (equal to or larger than 1:10 000) – Department of Lands and Mapping/MARD,
- State topographic maps of medium and small scales (smaller than 1:10 000 and up to 1:250 000) – Mapping Service of HDF.

Before this Act, the topographic maps were produced for civil and military use. Both the civil Lands and Mapping Administration and the Defence Force have their analogue and digital maps at several scales.

## 2.3 Land Use

In Hungary, the political reform has resulted a great increase in the number of properties and parcels. From the previously homogeneous large estates, hundreds of thousands of small parcels were created. For that reason, the most important provision of the amendment to the Act on Arable Land was the introduction of the land use registration on 1st January 2000. The main principles of the land use registration and the land registration are different. In land registration, the property is the basic item – it means that all additional data are gathered into groups around these items. The land use registration is managed in each District Land Office for its territorial competence. The land use sheet contains all the parcels of a land user on the territory of the given Land Office. No registration of land use is required for a land property with a size less than 1 hectare. The land use registration system called FÖNYIR has been installed at the District Land Offices by FÖMI in 2000. From this year on, the land users have been registered at the District Land Offices.

## 2.4 Land Value

In Hungary, the land value system introduced in the second half of the 19th century called Golden Crown system is still in power. At the time of its introduction, this system had served for its original purpose. Recently, the system and its method became old fashioned, however, it is still in power and use. The land parcels are registered by District Land Offices, using the Golden Crown system. Its survival might contribute to the fact that the arrangement of the land ownership conditions, the compensation by land, the re-allotment of the land to the co-op-members on basis of the original property value and, in general, the privatisation needed the value of lands in old Golden Crown system, since it is operating as a connecting tie between the past and present times. The Golden Crown system indicating the quality of the land highly promotes the rearrangement of the property conditions. Consequently, at least till completion of that rearrangement, the validity of the Golden Crown system should be maintained.

Several attempts have been made to improve the land valuation systems in the last five decades. Currently a research project (D-e-METER) is in progress, aiming to develop an information system which on the one hand consists of an online GIS based land valuation visualization module and on the other hand tries to support obligatory information supply connected to land use and to assure direct communication with the sectoral management. The project is co-ordinated by University of Veszprem. The information system is based on a land valuation system which also considers environmental aspects

- Determines production potential quantitatively
- Provides possibility for evaluation pursuant to main crops or plant groups
- Includes climatic, pedological, geological fertility valuation and productivity risks (drought, inland waters)
- Distinguishes production relations on different cultivation intensity levels.

With the help of D-e-METER system

- We will be able analyze the relation between the result of agricultural land use (vegetal product) and the environmental sources
- Up-to-date administration of cultivation and environmental management information, easing and boosting information exchange between farmers and management
- The results of this R+D project contributes to the realization of European Union agricultural and rural development objectives, to increase competitiveness and promotes the development of the rural information society.

## 2.5 Land Protection and Land Utilisation for Sustainable Development

Arable land is one of Hungarian nation's natural resources, which cannot be substituted, but should be improved from time to time. Important economic interest is involved in its protection and its adequate utilisation. One prominent field among the activities of Land Offices is to perform tasks connected with the protection of arable land and with its proper use.

*Land Protection* - Arable lands can be used for purposes different from that of agriculture only by leave of authority. To the utilisation of arable lands for industry, mining, water conservancy, transport, community development and/or other purposes, a permission has to be granted by the Land Offices. However, the utilisation of arable land under permission does not provide preventing force all by itself and further, the areas should be compensated which inevitably have to be used to investments. Therefore, in case of non-agricultural utilisation of arable land, besides the permission, a land protection fee should be paid by the user, too.

*Land Utilisation* - As an undesired by-product of land privatisation carried out in the last decade, scattered property patterns have been formed in our country, e.g. properties of arable lands belonging to a single landowner dispersed at 5-10 different field units, far from each other. This fact is very disadvantageous from the point of view of economical production. To overcome this situation, the present legislation offers one possibility: spontaneous land exchange. Arrangement of such exchanges, especially in case of several property owners, needs much skill and proficiency. Therefore, since the possibility is legally given, those intending to exchange their lands would rather do request the assistance of the competent land office. In connection with land utilisation, Land Offices have a dual task. One of them is checking the obligations of farming the land, the other is promoting land consolidation by means of spontaneous land exchanges.

### **3. LAND CONSOLIDATION**

Land Consolidation is very important factor in the sustainable development procedures in Hungary: After the compensation period a lot of small parcels in rural area exist now. Voluntary land consolidation activities started in Hungary, for that reason. There have been pilot projects to formulate the technical, organisational, social and legislative approach. On this base a land consolidation act is under preparation. All the IT developments and the cadastre system are suitable to handle this procedure.

#### **3.1 TAMA**

TAMA is a computer-aided land consolidation project started in 1993 and finished in 2000. The project was carried out in a Hungarian-German co-operation between the Federal Ministry for Agriculture, Bonn (BML) and the Ministry of Agriculture and Regional Development, Hungary (MoARD). The project aim was to develop a method for computer-aided land consolidation. At the beginning the object of the project seemed to be the exchange, concentration of parcels to ensure more economical agricultural production. In the second phase of the project involved more problems in the project, e.g. village development, a new system of land division and ecological planning, village melioration projects etc. The final goal was to improve the living conditions in the rural areas. The project piloted on 16 settlements.

The TAMA project contributed largely to the awareness of the possibilities of land consolidation. The need of land consolidation was recognised but its outcome was not the expected. Some of the most important experiences are:

- Although the size and shape of the parcels was not suitable for viable and marketable farming, the schedule of land consolidation was untimely. After 50 years of collectivisation the new land owners did not show interest for the project, were not able to carry out the exchange of their own parcels. Fulfilment of a land consolidation process needs the interest of the owners.
- One of the main problems was the lack of the land consolidation law. The citizens have seen difficulties to make arrangement with each other without an existing law. The parcel exchange on voluntary base is unsuitable for regulation of comprehensive, concentrated for more owners and/or more parcels land consolidation. The progress in this field could be accelerated by the Law on Land Consolidation and the Law on the National Land Fund.
- The determination of the exchange-value is very important. Neither the market price nor the Golden Crown values are suitable for exchange-value. The farmers wanted to enlarge this value by taking into account other values, for instance the distance of the parcel from the settlement, from roads, the state of melioration etc.
- The method is expensive, the citizens could not pay the costs and the state has to take upon itself all or a part of the costs.
- To help a successful land consolidation the establishment of a land fund in each municipality is required.
- The method proved that in frame of land consolidation the exchange of parcels is not enough, it needs to solve the complex task of landscape development, village renewal, and rural development.
- Technical tools, infrastructure, technology, knowledge for fulfilment of the land consolidation process is ready.
- The process is lengthy; it needs continuous and efficient reconciliation for preparing and agreeing the planned land consolidation.
- The bottom up initiative can lead to a simpler and quicker implementation. The close cooperation between the land consolidation authority and the civil inhabitants is very important. Interactive planning of land consolidation is a precondition for a good solution.

### 3.2 TALC

The Hungarian Ministry of Agriculture and Rural Development (MARD) and the Dutch Ministry of Agriculture, Nature management and Fisheries, represented by the Government Service for Rural Areas (DLG) have expressed the mutual wish of implementing the TALC-project in 2003 and 2004. Implementing the project called Technical Assistance in Land Consolidation (TALC) has three phases: Inception phase which has started on 2003 January 1st and was finalised on March 31st; Implementation phase and Completion Phase. The objectives and results of TALC will be: formulate building stones for the Hungarian land consolidation strategy, scenarios for the institutional framework, trainings and a draft communication strategy between organisations and towards farmers.



### 3.3 Vásárhelyi Plan

The Hungarian Government has approved the Governmental Decree No. 1107/2003(5<sup>th</sup> November) on the program serving the increase of flood prevention safety in Tisza Valley, also regional and rural development of the said area “Further Development of the Vásárhelyi Plan” (VTT). The Vásárhelyi Plan is complex, as it serves not only the flood prevention in Tisza Valley and in the country in general, but also contains the integrated rural development program of that region. The most critical part of this program aiming at flood management is the *utilisation of the arable lands in an alternative way and also the compensation of landowners/users*. When changing the area utilisation, it is necessary to stress the principle saying that arable land – being a basic tool of production – should be preserved, and the value of this natural resource should be protected; farming should go on economically.

A vital element in evaluating the prevailing conditions is the survey of property structure in the area of the spillway/emergency reservoirs. These areas were affected – of course – also in the compensation and the re-allotment of co-operative shares. Exact information can be derived from the land registration data of the land offices on the current property structure of the reservoirs, and from the land use registry on the land use scheme. It should be underlined that when planning, selecting and implementing the spillway/emergency reservoirs, it is *obligatory* to use the land management, land registration and land surveying basic governmental data kept by the MARD and its institutions, including the GIS and remotely sensed data as well.

The future use of the area of the reservoirs, through applying methods of landscape management and ecological utilisation should serve the sustainable development of the region. Instead of passive procedure/implementation, the aim should be the formation of a real owner/user attitude, as a result of which the reservoir-area would be utilised in an *environment-friendly and efficient way*.

The timely implementation of the Vásárhelyi Plan and the solution of serious unemployment problems can mostly be assured by reaching an agreement with the affected landowners and users. Stress must be laid upon the communication with the stakeholders and affected persons, distribution of information and strengthening of awareness/receptivity in all phases of the procedure.

### 3.4 BIME

The aim of the research project (started in 2003 at University of West-Hungary) is to develop GIS supported multi-functional, multi-dimensional decision model, which integrates heterogeneous data sources for fulfilling the various needs and aspects of land consolidation. The model will support the decision making procedure, will monitor and visualize the spatial-temporal processes.

#### 1.) Development of a GIS-based model for decision support

Exploring informational needs, integrated data analysis, monitoring of changes.

#### 2.) Integration heterogeneous data sources

Exploring map, surveying remote sensing, statistical needs, development of data acquisition processes, integrated data management.

### 3.) Analysis of multi-criteria, multi-function decision models

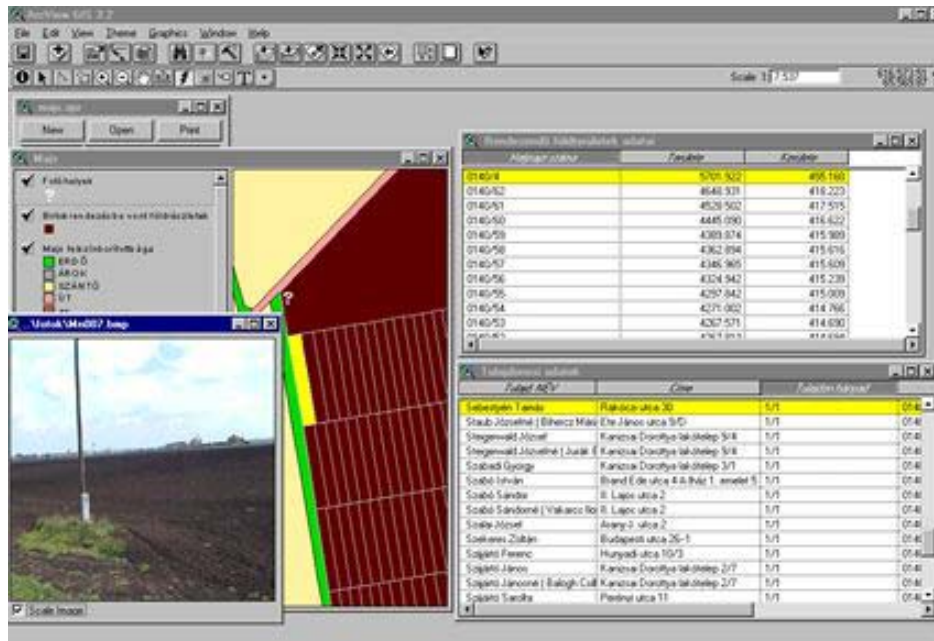
Researches on handling the complex needs, spatial conflicts by multi-criteria, multi-function decision models.

### 4.) Investigations on visualization techniques

Development of data analysis tools and user-friendly forms of visualization.

### 5.) Modelling land valuation processes

There are many data should be taken into account within land reorganisation, land management, land consolidation.



GIS as a tool for presentation of the concepts (© Barnabas Gitta)

The research project (OTKA T 43384) is supported by the Hungarian Academy of Science.

## 4. CONCLUSIONS

Land consolidation is an important, existing problem of the Hungarian society, which could be solved only within a longer period of time. There are many aspects of the topic (agricultural, societal, political, regional etc.). There have been pilot projects to formulate the technical, organisational, social and legislative issues. On the base of the experiences a land consolidation act is under preparation.

In the process stress must be laid upon the communication with the stakeholders and affected persons, distribution of information and strengthening of awareness/receptivity in all phases of the procedure.

The computer-aided approach will be more and more important. All the IT and data infrastructure developments should support this procedure. Using other researches and strategic documents, from the mentioned aspects the current BIME research will focus on the technical-informational side of the problem.

## REFERENCES

- Apagyí, G., 2004: Recent Developments in Hungarian Land Administration, COST G9 workshop, Sopron, Hungary.
- Gaál Z. et al., 2003: A D-e-Meter környezeti földminősítő rendszer, AVA, Debrecen, Hungary.
- Kovács, E., 2003: Is Land Consolidation Just a Dream in Hungary? 2nd FIG Regional Conference, Marrakech, Morocco.
- Markus, B., 2003: Land use planning for rural development in Hungary, EFITE Conference, Debrecen, Hungary.

## BIOGRAPHICAL NOTES

**Bela Markus** is a land surveyor, M.Sc., Ph.D., professor of Geoinformatics, and director of the College of Geoinformatics, University of West Hungary. He has 30 years teaching experience in surveying, 15 years in teaching GIS and 10 years in development and organization of open, distance learning professional courses for land administration. Prof. Markus has over seventy published papers on various aspects of using GIS.

He is actively involved in many national and international academic programmes, is chairman of the National Committee, Association of Hungarian Surveyors and Cartographers, chairman of the Hungarian UNIGIS Course Board. He is member of Board of Directors of FIG Foundation. From 2002 he is chairing the FIG Working Group 2.4 – Knowledge in Spatial Information Management and the Chair Elect of FIG Commission 2. Prof. Markus is member of AGILE Council and EUROPACE Executive Committee. In 2003-2004 he is advising Central European Land Knowledge Center (Budapest, Hungary) as an International Expert on Knowledge Transfer.

## CONTACTS

Prof. Dr. Bela Markus  
College of Geoinformatics, University of West Hungary  
Pirosalma u. 1-3.  
Szekesfehervar  
HUNGARY  
Tel. + 36 22 516 523  
Fax + 36 22 516 521  
Email: mb@geo.info.hu  
Web site: www.geo.info.hu