

New Tools and Processes for Land Consolidation

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ABSTRACT

This paper describes the development of land consolidation activities in Finland.

Demand for land consolidation services in Finland has increased recently. The main reasons for this are:

1. the fragmentation of farms in connection with their rapid growth in size has become a problem, and
2. experience gained in implementing nature-conservation or road-safety programs with new kinds of land rearrangements has been promising.

From the customers' point of view, the main problems in land consolidation projects have been:

3. the long duration of the projects, and
4. the fact that little information about the land consolidation plan is available at the beginning of a project when the decision to carry the project out is made.

The solution to these problems is development of the land consolidation process, and is connected with the implementation of JAKO/VLC, a new application within JAKOcadastre, the Finnish Cadastral Information System. This new application consists of tools for the valuation of land and land consolidation. The main features of this new application are:

5. improved possibilities for using orthophotos and existing topographic and cadastral data in the inventory phase of land consolidation projects,
6. the possibility of handling financial compensations during the planning phase of the projects, and
7. automatic tools for designing new boundaries.

The new tools make it possible to develop the land consolidation process to improve the service offered to customers.

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1. INTRODUCTION

1.1 Historical background

The geographical structure of cadastral parcels in Finland is the product of hundreds of years of development. The first mapping and land rearrangement activities took place in the 17th century. Land consolidation in the way that we recognize it today began in the middle of the 19th century. Prior to this, land rearrangements were regarded as final and the execution of a new land consolidation project on a rearranged area was forbidden.

During the 20th century, land consolidation has developed toward a more comprehensive procedure that has close connections with rural development. The latest step in the development of land consolidation took place in 1997 when Finnish cadastral legislation was completely renewed. The new act on cadastral surveys includes provisions relating to land rearrangements. It is now possible to carry out the land consolidation process in order to promote the use of land for all kinds of purposes – not only for agriculture and forestry.

1.2 Definition of terms

In the interests of clarity, it is necessary to provide a definition of some of the terms used in this paper.

Land rearrangement

This is a general term that describes all types of rearrangements of cadastral parcels. Land rearrangement includes both land consolidation and the reallocation of parcels.

Land consolidation

A comprehensive reallocation process affecting a rural area consisting of fragmented holdings or their parts, usually for the purposes of agriculture or forestry. In this process, it is normal for each holding to be more or less consolidated by exchanging land to form larger plots that are better adapted to their proper use. The area concerned may subsequently be improved in many other ways (Tenkanen 1994).

Reallocation of parcels

This term is used to describe exchanges of land in an area that is affected by a public land-use project such as the building of a new road or the implementation of a nature conservation area. Exchanges of land take place between the authority that is responsible for the land-use project and private landowners. The aim is to assist in the execution of such public projects and to reduce the scale of any negative effects that may result.

2. OVERVIEW ON LAND CONSOLIDATION ACTIVITIES IN FINLAND

The National Land Survey of Finland (NLS) is a government agency responsible for carrying out land consolidation activities in Finland which is answerable to the Ministry of Agriculture and Forestry. The NLS is also responsible for Finland's cadastral system and the execution of general mapping assignments.

In recent decades, the NLS has carried out land consolidation projects in two districts on Finland's western coast. The explanation for the concentration of activities in this area is that land consolidation took place in the southern and south-western parts of the country at the beginning of the previous century, and that in eastern and northern Finland, historical and natural factors mean that the need for land consolidation is smaller.

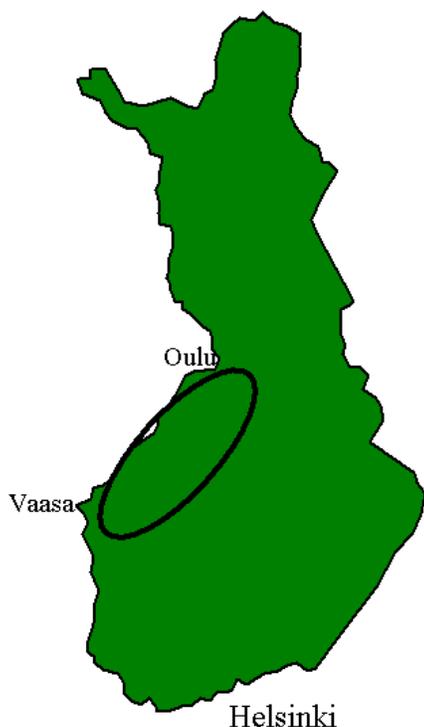


Figure 1 Finland - the circle shows the area of land consolidation activities.

Currently, some 30 land consolidation projects involving a total area of 130,000 hectares are being executed. The amount of work carried out each year totals 65 man-years and has a value of €2.5 million. A total of approximately 7,000 hectares of land consolidation is completed each year.

It is a legal requirement that land consolidation projects be profitable. The objective in these projects is twofold - to diminish fragmentation and to promote the use of properties. Land consolidation projects are subsidized by the Finnish state and EU funding is also possible.

In addition to the land consolidation projects, several projects involving the reallocation of parcels are being executed. These projects are connected with the implementation of nature conservation programs and the improvement of road safety.

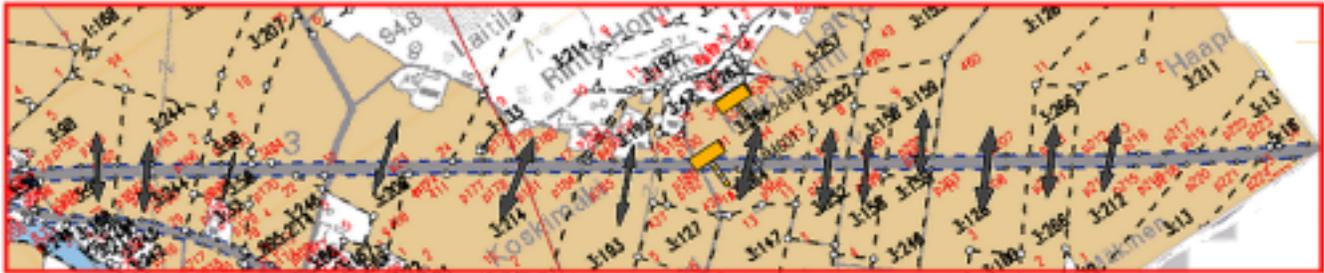


Figure 2 An example of an area in which road safety should be improved: local farm traffic is a danger to long-distance traffic.

Land consolidation and the reallocation of parcels is carried out by a surveyor and two trustees elected by the municipal council. Even though these three executors have the power to make legally-binding decisions in connection with a project, the aim is to achieve voluntary agreements rather than to impose compulsory decisions.

3. FORMER TOOLS FOR USE IN LAND CONSOLIDATION PROJECTS

Until last February, land consolidation projects were carried out using a first-generation GIS application (FINGIS) developed by the NLS in the 1980s.

The main problems with this application are:

1. As many separate application programs are used in the land consolidation process, managing them is difficult. Work processes are therefore divided between different employees with the result that land consolidation projects take a long time to complete.
2. Using digital geographic data in the inventory phase of the projects is difficult.
3. As the FINGIS GIS database is based on map sheets, the map sheet borders cause problems - the objects on the map are split in an unnecessary manner.
4. The application being employed does not run on the same hardware platform as JAKOcadastre.

A new application program for land consolidation in the NLS was completed in February 2002. Most of the on-going projects will be completed using the old application. Projects which are in the inventory or planning phase can be moved to the new application.

4. THE NEW TOOLS – PART OF THE GROWING JAKO FAMILY

4.1 JAKOcadastre

The NLS developed JAKOcadastre, a new GIS-based cadastral information system, in 1995-1998. This object-orientated system stores attribute data and map data in the same database. Development was carried out using Smallworld GIS as the development tool.

JAKOcadastre consists of applications for providing a cadastral information service and conducting legal land surveys. More than 1,000 users working in the 37 sub-units of the 13 District Survey Offices of the NLS are updating the data.

JAKOcadastre supports multiple 'alternatives' of the same database in an economical manner, and this feature enables the system to provide a long transaction-concurrency model. This means that several users are able to update the database simultaneously over long periods, with each user working on their own stable and self-consistent alternative without locking out other users who are carrying out the same operations.

Experience with JAKOcadastre has been very good. The efficiency of conducting legal land surveys (measured in terms of the time spent) has improved by about 30%. The new system also allows an efficient information service with versatile attribute predicates (name, date, area, owner etc.) and spatial predicates on a map.

Following the introduction of JAKOcadastre, the NLS developed new applications using the same platform – giving birth to the JAKO FAMILY.

The new members of the JAKO FAMILY are:

1. JAKO Topographic Data System (JAKO/TDS) (introduced in 2000)
2. JAKO Market Price Register on Cadastral Units (JAKO/KHR) (introduced in spring 2001)
3. JAKO Valuation and Land Consolidation (JAKO/VLC) (completed last February)
4. JAKO/Map Site (under construction) This will replace NLS Map Site and serve internet users by distributing topographic and cadastral data.

4.2 JAKO Valuation and Land Consolidation (JAKO/VLC)

JAKO/VLC has opened up a new era in the process of land consolidation in Finland.

The most important features of JAKO/VLC are:

1. JAKO/VLC is integrated with JAKOcadastre. This means that all the tools in JAKOcadastre are also available in land consolidation projects. Once a land consolidation project has been completed, it is easy to update the data in JAKOcadastre.
2. The seamless database employed by JAKOcadastre means that the problems caused by map sheet borders are now history.
3. It is possible to use available digital data in both the valuation and planning phases of land consolidation projects. Valuation can be based on the existing cadastral boundaries in JAKOcadastre. The NLS topographic database can be used in both raster and vector format. Digital orthophotos (even those with a resolution of 50 cm) can be loaded into the system. It is also possible to load data from digital forestry plans that contain information about soil quality and the quantity of timber in forest areas.
4. It is possible to handle financial compensations during the planning phase of the projects.
5. JAKO/VLC consists of automatic tools for the planning of new boundaries in land consolidation. The application positions the boundary line automatically according to the value of the parcel concerned.

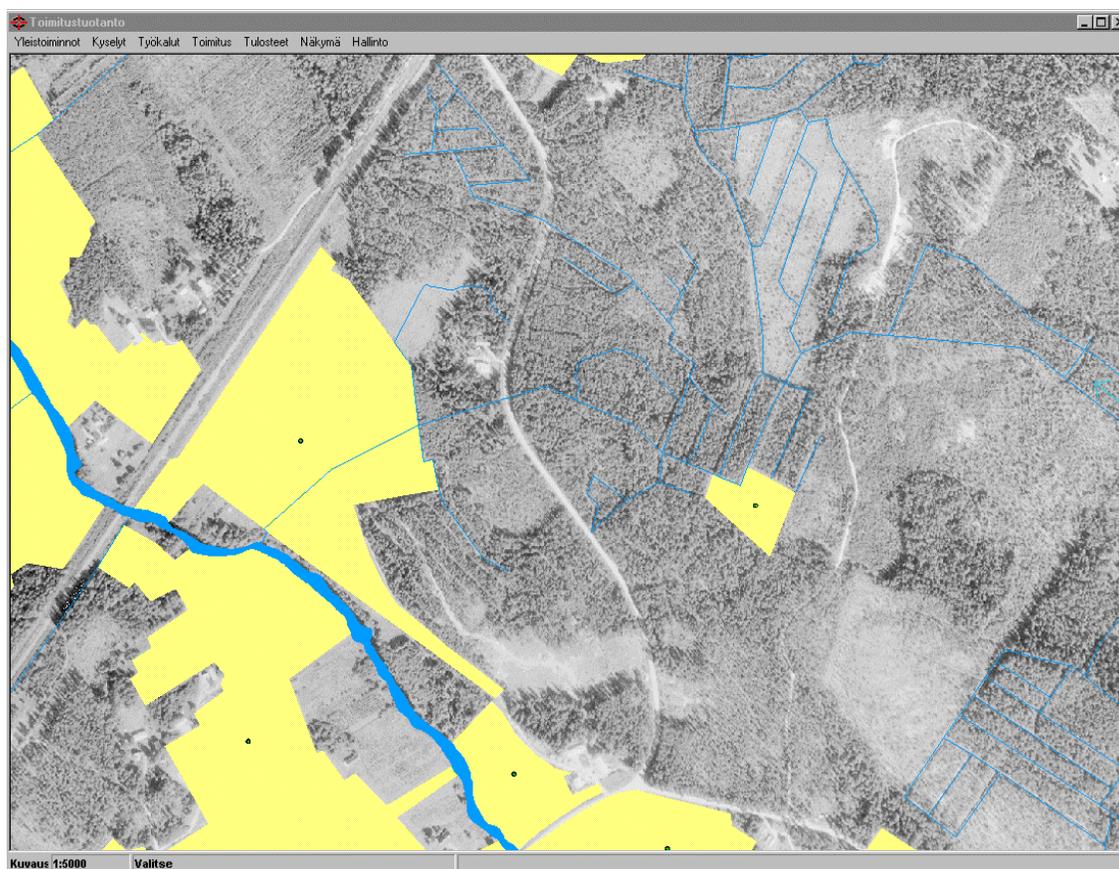


Figure 3 Digital orthophoto combined with arable land and water features from the Topographic Database. This is an example of the digital data that can be employed in the process of land consolidation when using JAKO/VLC.

5. THE MEETING POINT: CUSTOMERS NEEDS, NEW TOOLS AND NEW PROCESSES

5.1 Customers' opinions of land consolidation projects

Farmers and other land owners are the customers for land consolidation services. The National Land Survey of Finland has been monitoring the opinions of these customers on a regular basis. From the customers' point of view, the biggest problems have been:

1. the long duration of the projects, and
2. the fact that little information about the land consolidation plan is available at the beginning of the project when the decision to carry out the project is made.

Demand for land consolidation services in Finland has increased recently. The reasons for this are:

1. the fragmentation of farms in connection with their rapid growth in size has become a problem,
2. the minimum size of an arable parcel required for economically-sound farming has become larger, and
3. experience gained in implementing nature-conservation or road-safety programs using new kinds of land rearrangements has been promising.

The requirements of its customers have obliged the NLS to develop its land consolidation services.

5.2 Developing the processes

The National Land Survey of Finland is systematically improving the quality of its services and products. Quality management is based on ISO9000:2000 standard and the EFQM quality model. The main effort is directed to development of the core processes. Self-assessment using the EFQM model is used for finding the improvement areas. Process personnel are working in teams. Strategic goals are defined with Balanced Scorecard (BSC) and critical success factors are transformed to measures and goals. These objectives are then used to guide our processes and teams.

The land consolidation process is a sub-process of the Cadastral core process in the NLS.

New tools for land consolidation such as JAKO/VLC make it possible to develop the land consolidation process in ways which meet the requirements of customers.

JAKO/VLC makes it possible to draw up an inventory of the structure of parcels in a specific area in a very efficient manner. It is even possible to visualize the possible ways of improving the structure of the parcels before the legal procedure of land consolidation is initiated. Finally, the work processes involved take much less time. The primary reason for this is the possibility of using already-available geographical data in digital form rather than having to collect all the required information in the field.

Education of the personnel is very important now. The new tools are introduced at the same time when traditional ways of working have to be changed.

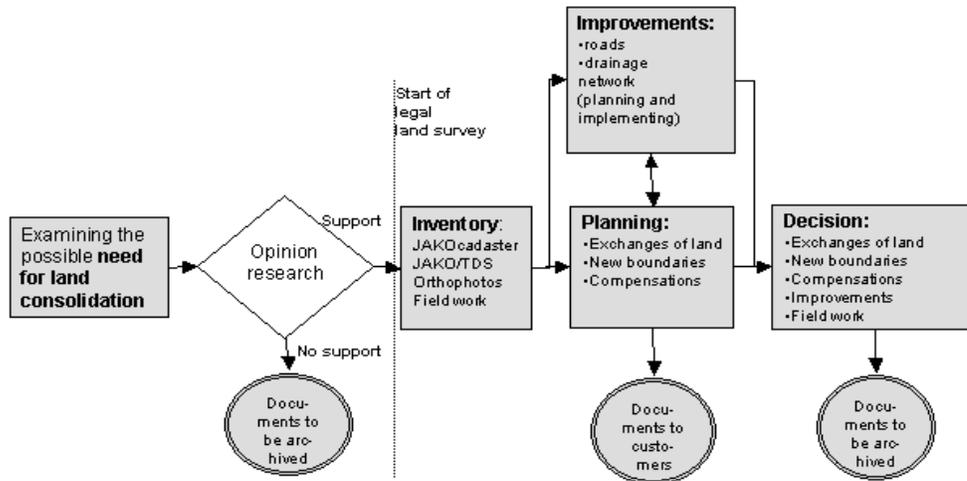


Figure 4 The new land consolidation process employed in the NLS

6. CONCLUSION

Development of the new application for land consolidation (JAKO/VLC) took place at an opportune moment. To meet the requirements set by customers, it was necessary for the National Land Survey of Finland to improve both the quality and the form of its work processes. Without new tools such as JAKO/VLC, this would have been a very difficult task.

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BIOGRAPHICAL NOTES

Mr. Mikko Uimonen, MSc (Engineering), 1977, Department of Surveying at Helsinki University of Technology. President of the Finnish Association of Surveyors (MIL). Since 1993 has worked in the National Land Survey of Finland being now head of Land Consolidation Team. Main task is the developing of new processes for land consolidation and supporting the District Survey Offices in land consolidation. Previous experience includes: Surveying Engineer at the National Board of Agriculture, District of Helsinki 1984-93. Developing the structure of agriculture and land consolidation in forest areas. Surveying Engineer at the National Land Survey of Finland, District Survey office of Oulu 1977-83. Legal land surveys, community planning. He is also Finnish Delegate to FIG commission 7 and a member of WG 7.1 of FIG "Reforming the Cadastre".