A GIS SOLUTION TO LAND CONSOLIDATION TECHNICAL PROBLEMS IN MOROCCO

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ABSTRACT

In Morocco, among important agricultural projects, land consolidation constitutes a dynamic mean for the development of the rural world. Unfortunately, land consolidation projects do have a great number of administrative and technical problems.

Our objective in this study is to show the contribution of GIS to find a solution to these technical problems. This solution concerns especially land consolidation in irrigated areas, it is based on five main key points:

- Establish a conceptual data model
- Conceive a prototype database
- Find a solution to computational and overlaying problems
- Examine a solution to land redistribution problems, taking into account the constraints of the project and the landowners' requirements
- Quantify the reallocation process, estimate the precision and analyze the results.

Using CONGOO formalism, a conceptual data model is established. This model illustrates both data before and after land consolidation and their relationships. According to this formalism, the established CDM contains 2 layers of geographical objects, 20 classes, 29 objects, 4 relationships of structure, a constraint and near two thousands of topological relationships.

Then a database is built based on the georelational model of ArcInfo. The spatial information identified in the conceptual level is assigned the corresponding entities in ArcInfo representation. Entities are classified as function of their geometric representation, such as point, line and polygon.

After that, we suggest a methodology to solve computational, overlying and reallocation problems, this methodology tries to find solutions to imposed constraints such that:

- Landowners' requirements
- The reallocation according to the habitat
- The reallocation according to the soil class that occupies the greatest area in a land ownership
- The reallocation on very neighbor soils of the situation before land consolidation
- The reallocation closest to the old position of each land ownership.

The outline of the proposed methodology is subdivided into three parts:

- The first part is a computed redistribution that may be conducted using four different methods depending on the requirements of the farmers, the administration priorities and the constraints imposed by the project. After analysis, the leader of the project may choose the solution that satisfies the most important criteria and the repartition of the redistributed soils.
- The second part is a graphical redistribution based on the results obtained in the first part. It is an iterative procedure, which determines the final position of the new properties taking into account the imposed tolerances on the redistributed values.
- The third part of this methodology concerns the analysis of the results obtained. The parameters used in this analysis are: parcels displacements with respect to old positions, satisfied constraints and the percentage of soil areas before and after redistribution process. A global factor of satisfaction is used to evaluate the performance of the achieved results for the whole project.

The proposed methodology was conducted to three applications. The results show that the graphical redistribution is more time consuming than the computed redistribution, all constraints are satisfied, most of the properties are redistributed near their old positions, most landowners receive equivalent percentage of soil classes, and the redistributed values do meet the allowed tolerance.

This study terminates with the estimation of the precision of overlay operations in land consolidation projects. Results of overlying parcels to soil classes are influenced by three main factors: the coordinates of soil class limits, shape of parcels and intersection angles. The precision of the attributed areas is very influenced by that of soil class limits.

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