INSTITUT AGRONOMIQUE ET VETERINAIRE HASSAN II

Rabat, MOROCCO

NEW APPROCH FOR LAND REALLOCATION USING A GEOGRAPHIC INFORMATION SYSTEM

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Presentation Overview

1. Introduction
2. Problematic and methodology
3. Land reallocation process
4. New approach for land reallocation
5. Development of the prototype
6. Conclusion

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1. Introduction

· Rural Land Consolidation or « Remembrement »

« an operation which has its aim to improve the land cultivation by substituting for the existing scattered division of the land into many parcels, new division characterized by smaller number of parcels, larger in size, easily accessible and suitable for cultivation by machinery »

· Needs years of studies and decision making before seeing its implementation
· L.C. project is based on legal, administrative and technical tasks

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1. Introduction

· Technical operations :

  – Land surveying tasks
  – Social and economic inquiries
  – Soil studies
  – Network studies (water management and network access to fields)
  – Land Reallocation process
  – Implementation

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1. Introduction

· Land Reallocation

  – Most important and decisive technical step
  – Synthesis, analyse and decision making step
  – All the L.C. project is identified in this application

    · Lacks of good approach to process large volume of data

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1. Introduction

· Manipulation of different documents (land surveying plans, soils classes plans, network plans, etc)
· Data treatment
· The preferences (wishes) of farmers for particular spatial location

  – QUALITATIVE DATA
  – QUANTITATIVE DATA

1

1. Introduction

- Objective
  - Development of new methodology approach integrating steps of L.C. in a GIS framework in general, and the step of Land Reallocation in particular, accounting for Moroccan realities

- Methodology
  - Design of Conceptual Data Model for all steps of L.C. project
  - Establishment of landowners list to be reallocated inside a block "Temporary Land Reallocation"
  - Development of a specific GIS prototype for L.C. project
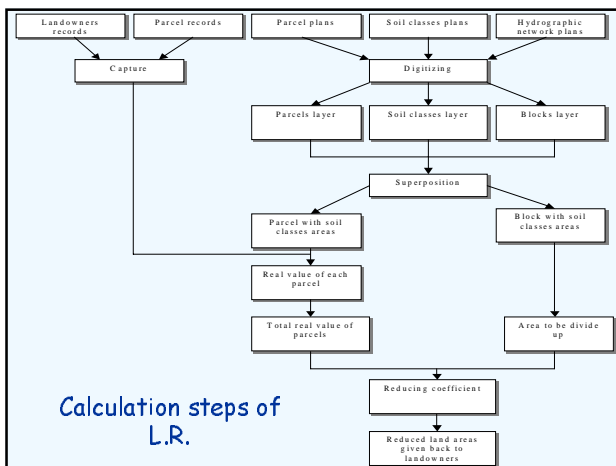
2. Land Reallocation Process

- Conceptual Data Model was developed for L.C. project in irrigated areas with "Merise"

- Four main operations are needed for L.R. :

  - Preliminary calculations
  - Temporary Land Reallocation
  - Definitive Land Reallocation
  - Implementation

2. Land Reallocation Process

- Preliminary calculations

  - Parcels plans before Land Consolidation
  - Social and economic inquiries
  - Soil classes plans
  - Irrigation network plans

2. Land Reallocation Process

- Preliminary calculations

  - Calculation of the parcel areas and their values before L.C. (digitising parcel limits and their soil classes)
  - Calculation of the block areas and their values (digitising block limits and their soil classes)
  - Calculation of the required public use land value (roads, hydrographic network, etc.)

Calculation steps of L.R.

2. Land Reallocation Process

- Temporary Land Reallocation

  - Performed by conventional methods
  - Determine approximate localization of owners inside the irrigation network frame (block), and the landowners list in each block
  - Factors taken in account :

    - Existing "plus value", e.g. house, well, rock mass, etc.
    - Existing parcel within the block
    - Landowners requirements and wishes
    - Existing of a dominant class of soil inside a block
    - Existing of a parcel which its value is higher than the mean of all parcels of a specific area

2. Land Reallocation Process

- Definitive Land Reallocation

  - Determine the exact position and the "definitive" localization of each landowner's parcel in a concerned block
  - More than a geometric problem (several constraints)

    - The value of the block
    - The value of the new parcel
    - The soil classes
    - The "plus value"
    - The types of irrigation network ("trames" in French)

3. New approach for Land Reallocation

- The main problem with L.C. in general, and L.R. in particular, is the manipulation and combination of qualitative and quantitative data

- To overcome this challenge, a new approach has been developed for "Temporary Land Reallocation"

- Question survey was established and sent to different persons involved in L.C. projects (private companies, administrations, state departments, etc.)

3. New approach for Land Reallocation

- Results of the question survey

  - Model was developed by assigning weights for each criterion and constraint for a specific block
  - The grant of these weights is based on the synthesis of survey results
  - Two methods

    - Closed method or by default (weights are fixed)
    - Open method or by choice of the user (to work according to the specificity of every region)

3. New approach for Land Reallocation

- To put in a conspicuous position the importance of the "plus value", a highest weight was affected to this criterion

- With this condition it's sure that the landowner who has a "plus value" will be selected and reallocated in the concerning block

1st Method

Criterions and constraints	Weight
« Plus values »	50
Possession a parcel inside a block	20
Landowner wishes	15
Dominant soil class	10
Existence of a parcel which its value is higher than the mean of all parcels of a specific area	7
Existence of a parcel which its value is lower than the mean of all parcels of a specific area	4
Closness to the village	3

2nd Method

Criterions and constraints	Weight
« Plus value »	?
Possession a parcel inside a block	?
Landowner wishes	?
Dominant soil class	?
Existence of a parcel which its value is higher than the mean of all parcels of a specific area	?
Existence of a parcel which its value is lower than the mean of all parcels of a specific area	?
Closness to the village	?

3. New approach for Land Reallocation

- Post-destination algorithm for landowners

  - Calculate the numerical value for each landowner, in basis of criterion priorities inside of each block

  - Calculate the sum of numerical values of the landowners in each block

  - Classify blocks in ascendant order according to the sum of numerical values

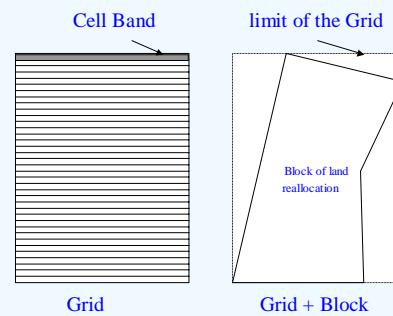 - Determine the landowners to reallocate, starting by the block which has the maximum points of landowners

3. New approach for Land Reallocation

- Reallocate the landowners possessing the "plus value" in the specified block

- Determine the landowner lists to be reallocated by priority order, and by comparing the sum of reduced value landowners with the value of the block

- Proceed on the same way for other blocks, by eliminating each time the reallocated landowner.

3. New approach for Land Reallocation

1. The landowners possessing the maximum of points will be the first selected inside a specific block

2. The operation is repeated by iteration until the L.C. operator is satisfied

3. The adjustment of the block value with the total value of landowners will be achieved interactively, if it seems necessary

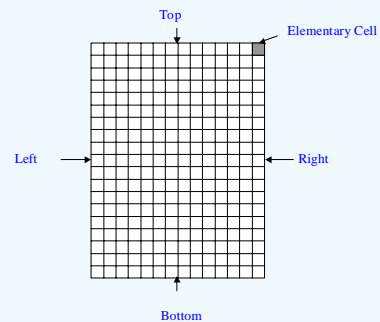4. The tolerance shouldn't exceed 1%, between the block value and the landowners reduced value
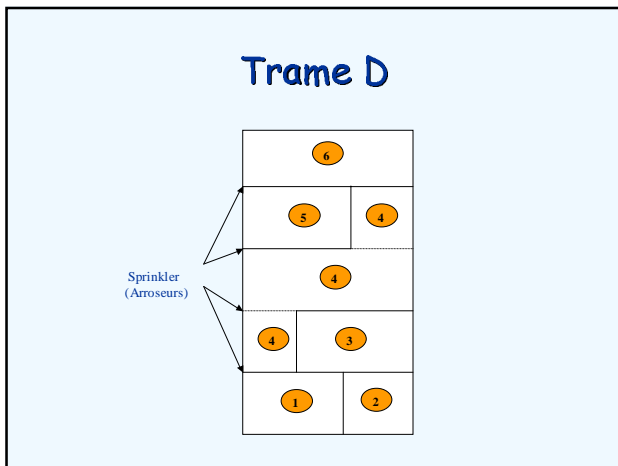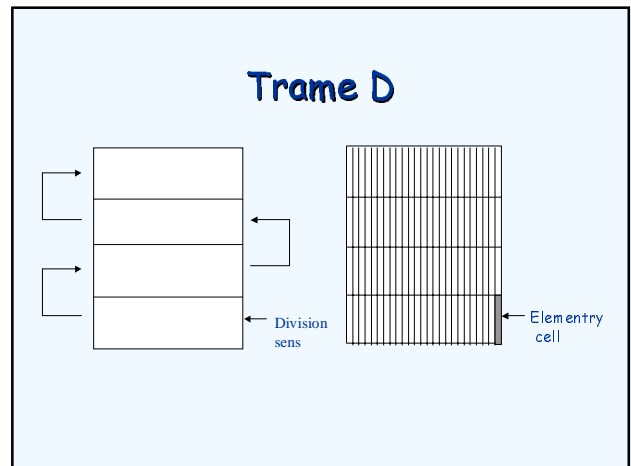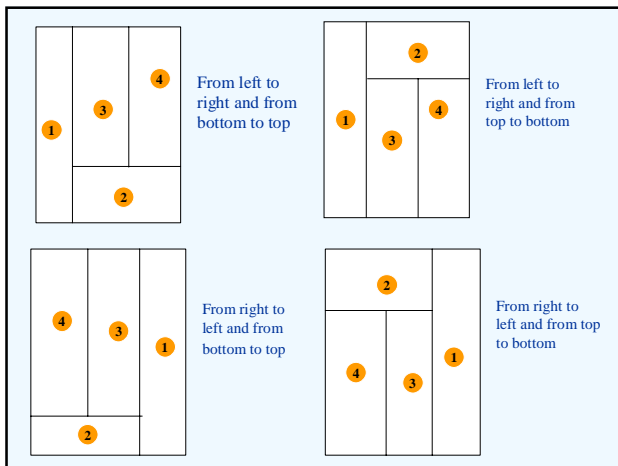
Trame A

Cell Band   limit of the Grid

Block of land reallocation

Grid   Grid + Block

Trame B

Cell Band   limit of the Grid

Block of land reallocation

Grid   Grid + Block

Trame C

Top

Elementary Cell

Left   Right

Bottom

From left to right and from bottom to top

From left to right and from top to bottom

From right to left and from bottom to top

From right to left and from top to bottom

Trame D

Division sens

Elementry cell

Trame D

Sprinkler (Arroseurs)

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4. Development of the prototype

- A prototype was developed within PC Arc/Info GIS software to deal with complex tasks in the:

  - Acquisition
  - Processing
  - Queering
  - Analysing
  - Displaying
  - Archiving

« Temporary Land Reallocation » Menu

PROJET	TRAITEMENT	RECASEMENT	REQUETES	AFFICHAGE	M.A.J	QUITTER
Nouveau	Superposition	Calcul des poids	Techniques Administratives	Couches Couvertures	Données alphanumériques	Arc Recasement Définitif
Saisie Données Alphanumériques	Calcul avant projet	Recasement Provisoire	Socio-économiques	Fermer	Données Graphiques	Fermer
Saisie Données Graphiques	Fermer	Recasement Définitif	Fermer		Fermer	
Données sur le projet		Fermer				
Ouvrir						
Le Projet						
Données alphanumériques						
Données Graphiques						
Fermer						

« Definitive Land Reallocation » Menu

| SELECTION	ORDRE	PARTAGE	VISUALISATION	FINITION	CONSULTATION	QUITTER
Espace de travail	Ordre par défaut	Provisoire	Partage Prov. Propriété	Couv. finale	Aperçu Propriétaire	Arc Recasement Provisoire
Choix du Bloc	Ordre prédéfini	Définitif	Partage Déf. Propriété	Affichage	Bloc Couverture	Quitter
Choix de la trame	Fermer	Fermer	Autre Bloc Autre Propriété Couvertures	Fermer	Fermer	Fermer
Fermer			Quitter		Quitter	
			Fermer			

4. Development of the prototype

- Test was carried out with a real project with this application

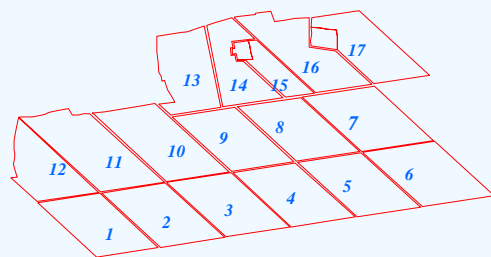- The accomplishment of this task passed from weeks to a few days only
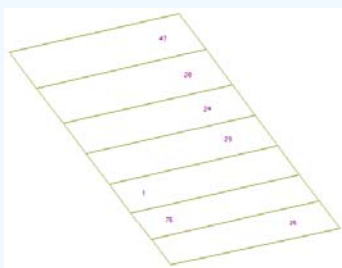

**Parcels before
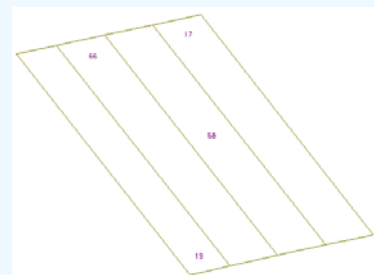Land Consolidation**
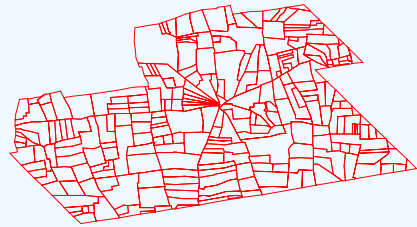
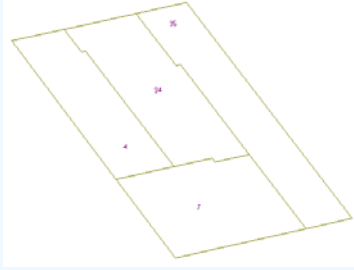**Soil Classes**
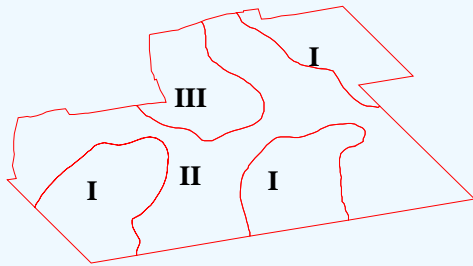
Irrigation Network
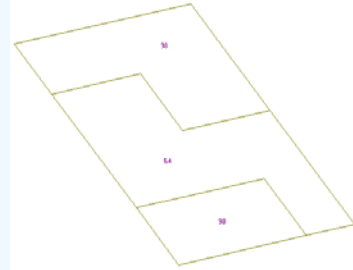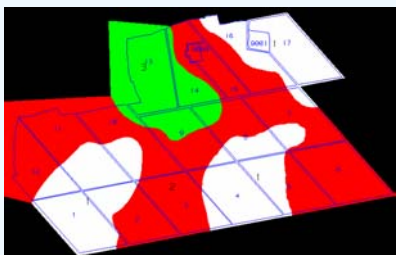
Trame A

Trame B

Trame C

Trame D

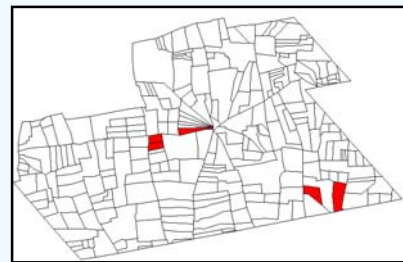Superposition of irrigation network and parcels before L.C.

Superposition of parcels and soil classes

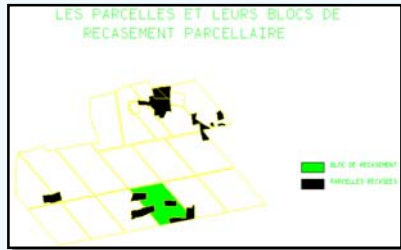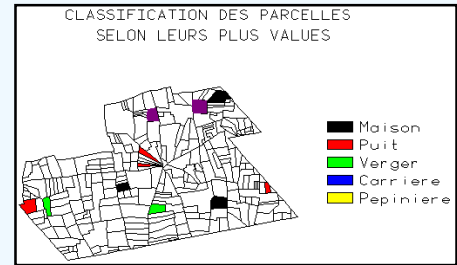Superposition irrigation network and soil classes

Parcels of landowner N° 50

Parcels reallocated in Block N° 4

LES PARCELLES ET LEURS BLOCS DE
RECASEMENT PARCELLAIRE

Parcels with "plus values"

CLASSIFICATION DES PARCELLES
SELON LEURS PLUS VALUES

- Maison
- Puit
- Verger
- Carriere
- Pepiniere

5. Conclusion

- Land Consolidation has several positive impact on rural land development, which is the most discussed subject by different institution (government agencies, Moroccan companies and scientific researchers

- The new method developed for "Temporary Land Reallocation" step will help planners and decision makers during the L.C. procedures

- The use of GIS is very essential for such projects, especially where we deal with multi criteria data analysis

Thank you