Linking role-playing games, GIS and MAS to *accompany* governing processes in land use management:

The *SelfCormas experiment* in the Senegal river valley

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CIRAD, Montpellier, France

I. Theoretical grounds

- 1.Complexity of LUCC presents uncertainty and implies a multiplicity of legitimate perspectives.

- 2. Scientific knowledge is only one of the legitimate perspectives taken account to handle complexity.

- 3. Due to this complexity, decision-making process is *imperfect* : incremental, iterative and continuous.

- 4. How can we *help actors to govern themselves* instead of propose pretentious technical solutions ?

   -> The *Accompanying Approach*

The *Accompanying Approach*

- Not produce definitive decisions but improve making-decision process.

- Putting all supports at principals' disposal:
    - to take into account their own perceptions
    - to provide external knowledge on request, into their own framework
    - To be directly controllable by them

- Scientific information summoned up progressively by principals.

II. Help stakeholders to conceive theirs LUCC models:
the SelfCormas experiment
(2 500 km² and 40 000 people)

For "Taking into account the stakeholders' perceptions"

1/GIS self-design

. a/ Stakeholders give spatial information they consider themselves important

Stake hold.		Annual Cycle of « needs », according to participants											
Bree der	Pas ture												
	water												
Agric.	Crop												
	water												
Fisher	Fish												
	water												
Parc	Vegt.												
	water												
Hunt.	Bird												
	water												

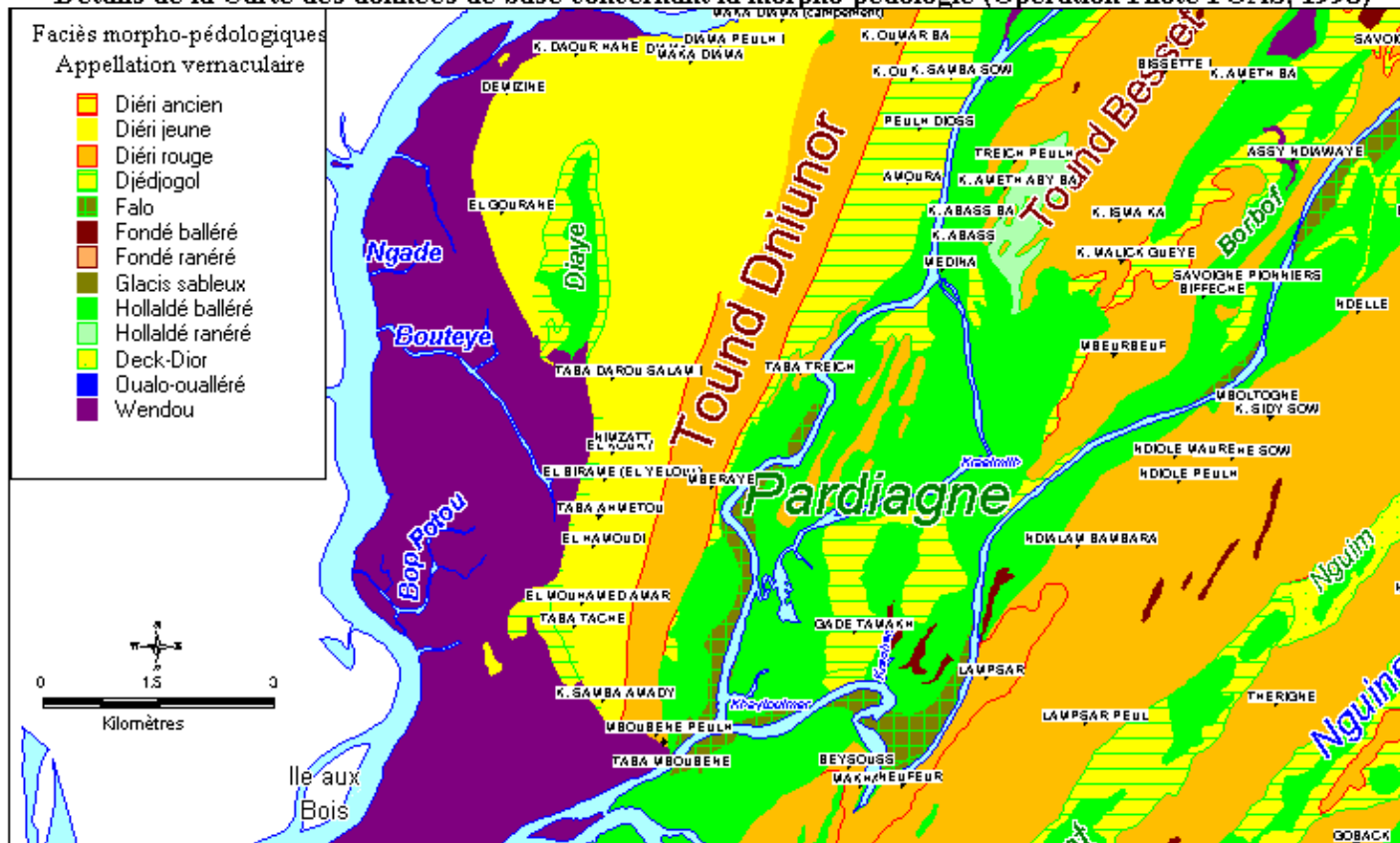|	Légend
	: watering zone until about November
	: watering zone until about February
	: watering zone until about May
	: culture
	: water

1/GIS self-design

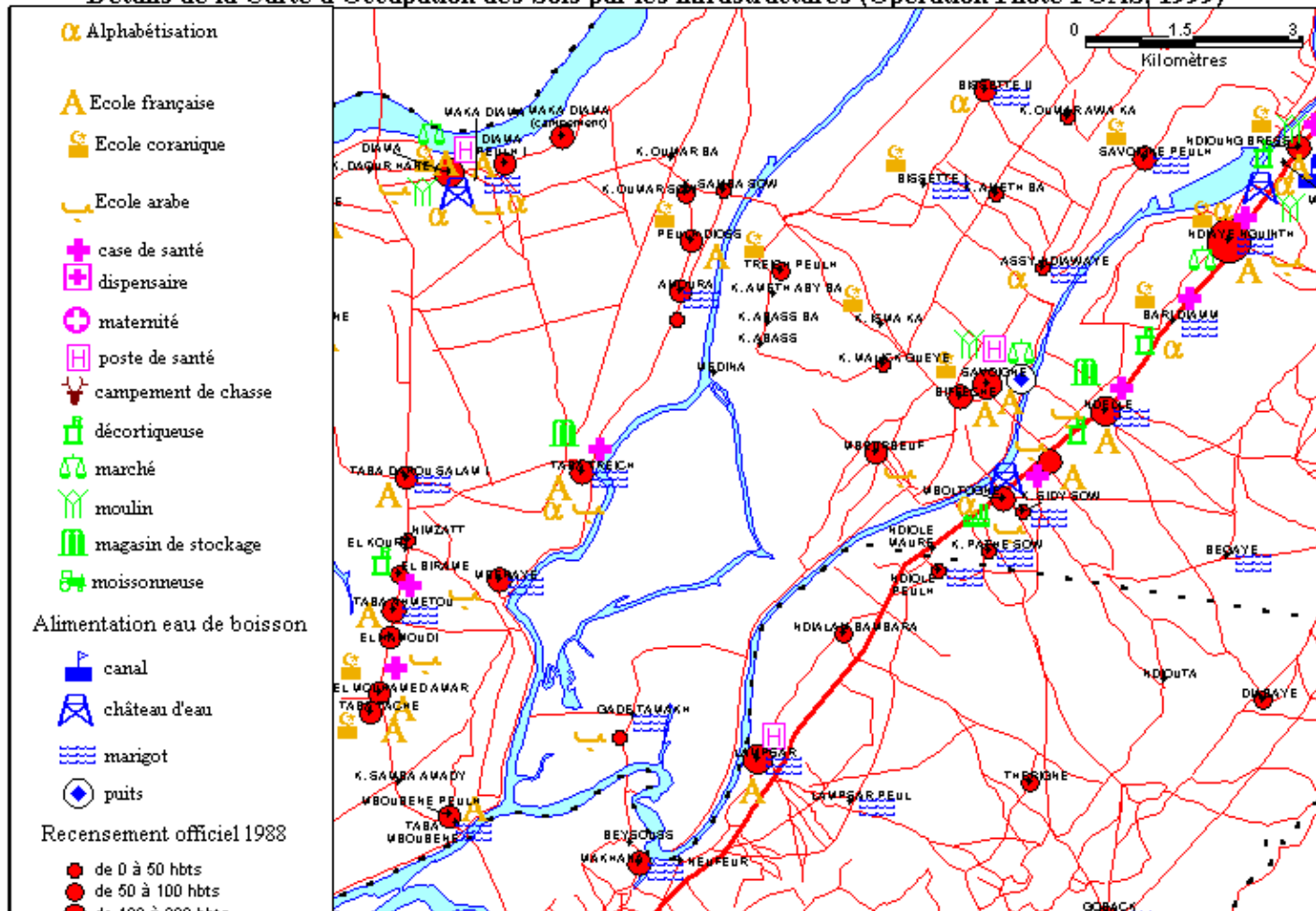. b/ Stakeholders identify lacks of information and control some data collects

For "Putting external knowledge straight at stakeholders' disposal"

. providing data directly from a complex GIS, but through their own framework

. learning-by-doing to analyze maps (correct, valid, debate)

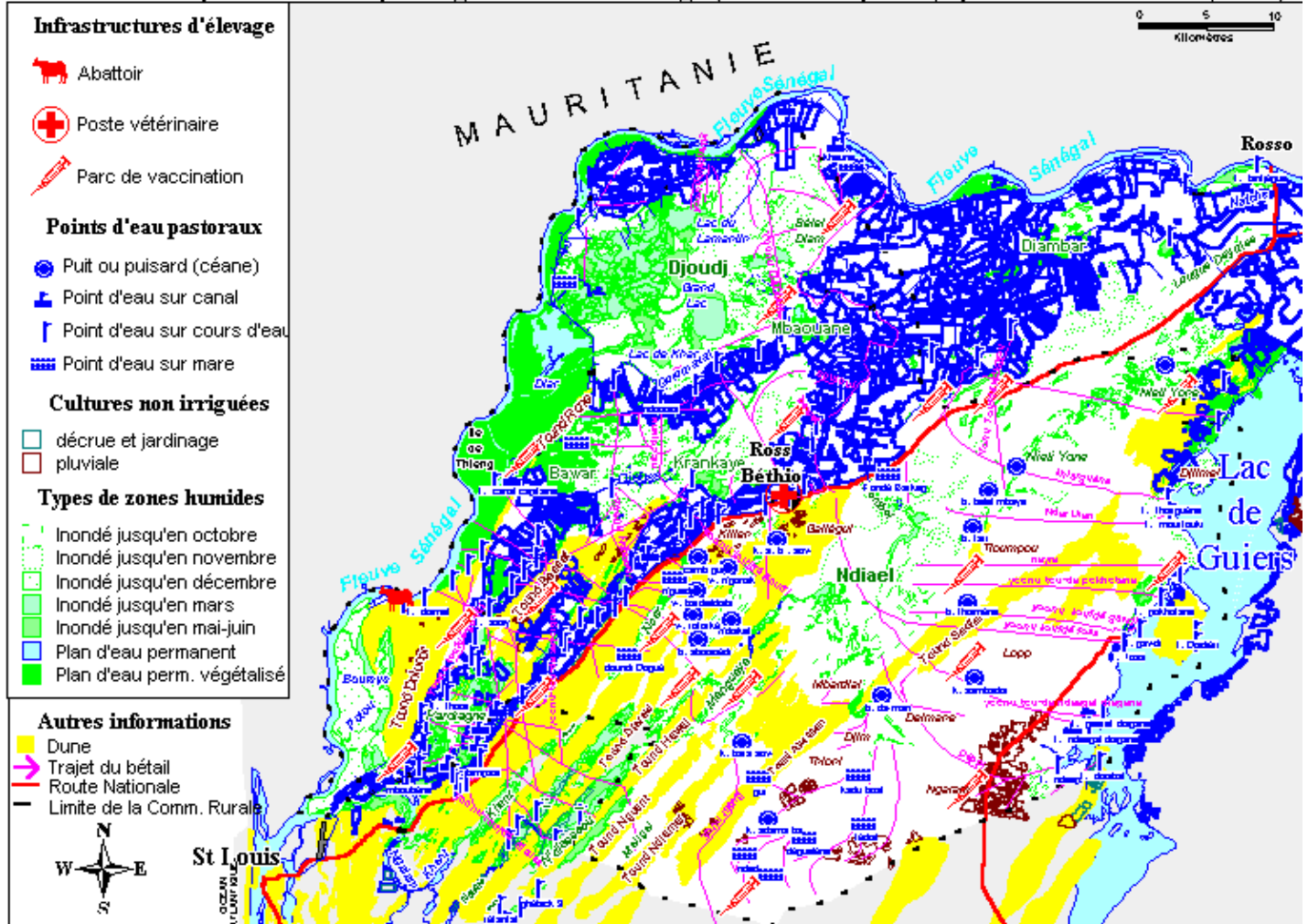## Détails de la Carte des données de base concernant la morpho-pédologie (Opération Pilote POAS, 1998)

Faciès morpho-pédologiques
Appellation vernaculaire

- Diéri ancien
- Diéri jeune
- Diéri rouge
- Djédjogol
- Falo
- Fondé balléré
- Fondé ranéré
- Glacis sableux
- Hollaldé balléré
- Hollaldé ranéré
- Deck-Dior
- Oualo-oualléré
- Wendou

0   1.5   3
Kilomètres

Ngade
Diaye
Bouteye
Bop.Potou
Ile aux Bois

Tound Driunor
Tound Besset
Borbof
Pardiagne
Nguim
Nguine

MAKA DIAMA (campement)
K. DAOUR HANE   DIAMA PEULH I   K. OUMAR BA   BISSETTE I   K. AMETH BA   SAVOIG
MAKA DIAMA
DEMZINE   K.Ou K. SAMBA SOW
PEULH DIOSS
EL GOURANE   TREICH PEULH   ASSY NDIAWAYE
AMOURA   K. AMETH ABY BA   K. ISMA KA
K. ABASS BA
K. ABASS   K. MALICK GUEYE
MEDINA   SAVOIGNE PIONNIERS   BIFFECHE   NDELLE
TABA DAROU SALAM   TABA TREICH   MBEURBEUF
HIMZATT EL KOURY   M.BOLTOGNE K. SIDY SOW
EL BIRAME (EL YELOUY)   MBERAYE   NDIOLE MAURE HE SOW
TABA AHMETOU   Kreuroulli   NDIOLE PEULH
EL HAMOUDI   NDIALAM BAMBARA
EL MOUHAMEDAMAR   GADE TAMAKH
TABA TACHE   Korrhoulli
K. SAMBA AMADY   Khoutoulleur   LAMPSAR   THERIGHE
MBOUBENE PEULH   LAMPSAR PEUL
TABA MBOUBENE   BEYSOUSS   GOBACK
MAKHAHEUFEUR

Détails de la Carte d'Occupation des Sols par les infrastructures (Opération Pilote POAS, 1999)

α Alphabétisation
A Ecole française
Ecole coranique
Ecole arabe
✚ case de santé
⊞ dispensaire
⊕ maternité
Ⓗ poste de santé
campement de chasse
décortiqueuse
⚖ marché
moulin
magasin de stockage
moissonneuse

Alimentation eau de boisson
canal
château d'eau
marigot
◆ puits

Recensement officiel 1988
- de 0 à 50 hbts
- de 50 à 100 hbts

0   1.5   3
Kilomètres

MAKA DIAMA   MAKA DIAMA (campement)
DIAMA PEULH   BISSETTE II   K. OUMAR AWA KA
DIAMA   K. OUMAR BA   SAVOIGNE PEULH   NDIOUNG BRESSE
K. DAOUR HANE
K. OUMAR SOW K. SAMBA SOW   BISSETTE I K. AMETH BA
PEULH DIOSS   NDIAYE NGUITH
AMOURA   TREICH PEULH   ASSY NDIAWAYE
K. AMETH ABY BA
K. ABASS BA   K. ISMA KA   BARLODIAMU
K. ABASS
MEDINA   K. MALICK GUEYE   SAVOIGNE
BIFFECHE
K. SAMBA AMADY   MBEURBEUF
TABA DAROU SALAM I   TABA TREICH   M.BOLTOGNE   SIDY SOW
HIMZATT   NDIOLE MAURE   K. PAYNE SOW
EL KOURY   NDIOLE PEULH   BEDAYE
EL BIRAME   MBERAYE
TABA AHMETOU   NDIALAM BAMBARA   NDIOUTA
EL HAMOUDI
EL MOUHAMEDAMAR   DIAYE
TABA TACHE   GADE TAMAKH
K. SAMBA AMADY   LAMPSAR   THERIGHE
MBOUBENE PEULH   LAMPSAR PEUL
TABA MBOUBENE   BEYSOUSS
MAKHAN HEUFEUR   GOBACK

Towards Map Self-Designing

Carte d'occupation des sols par l'agriculture et l'élevage (Version simplifiée, Opération Pilote POAS, 1999)

2/The use of GIS:
Self-Designed Simulations

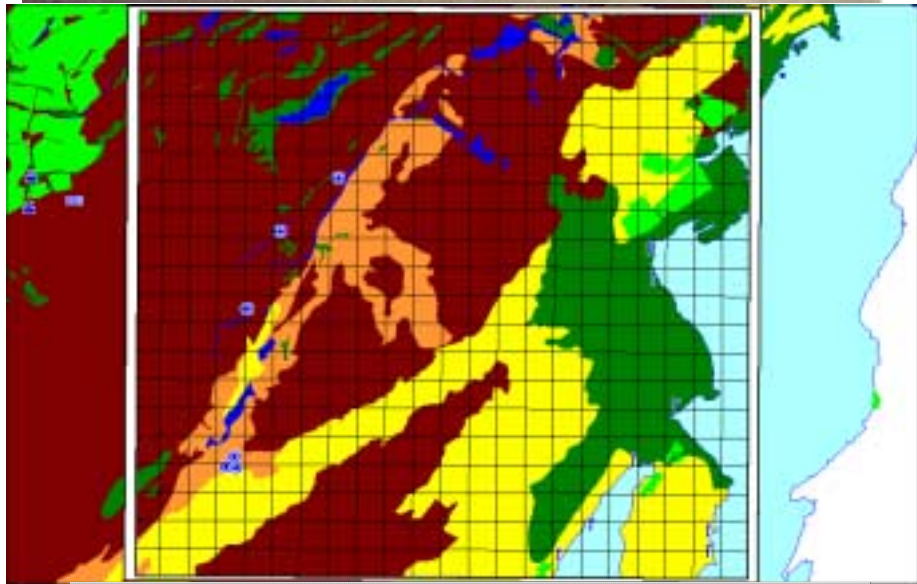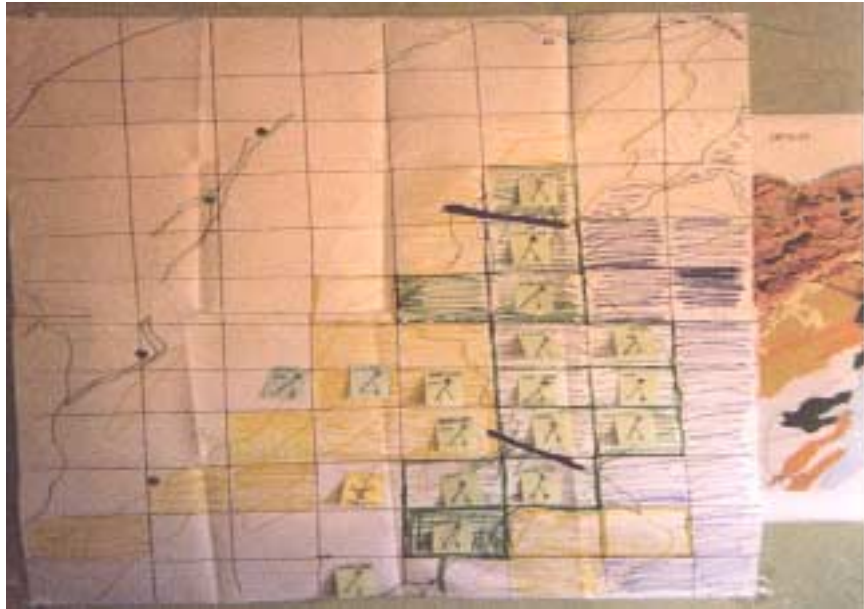- stakeholders identify space and time
- stakeholders identify usages

-> role-playing game :
the own perception of participants,
with their own simplification choices
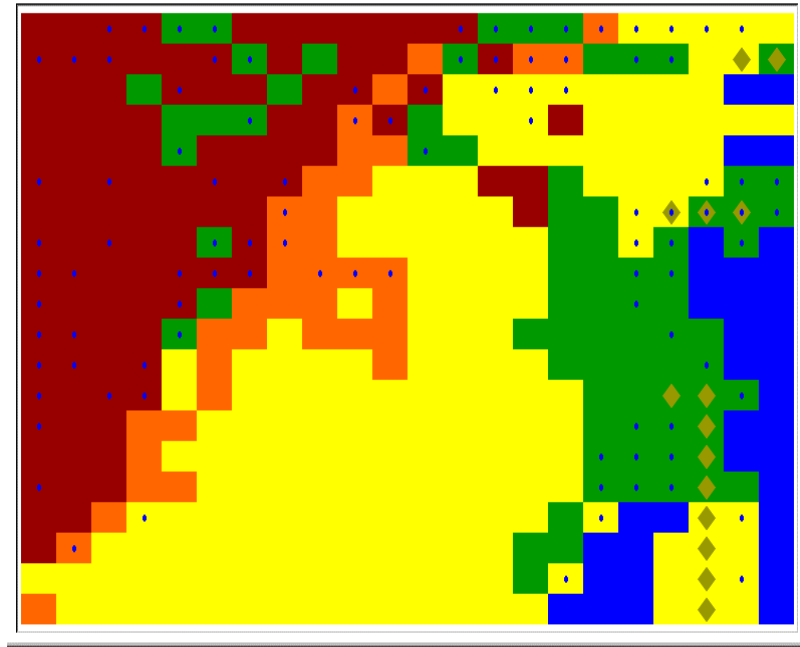
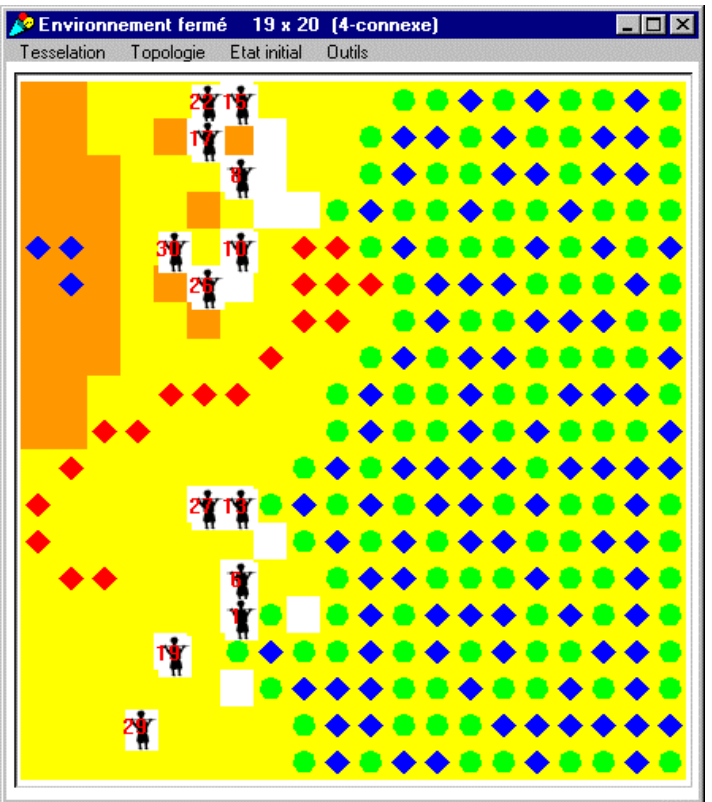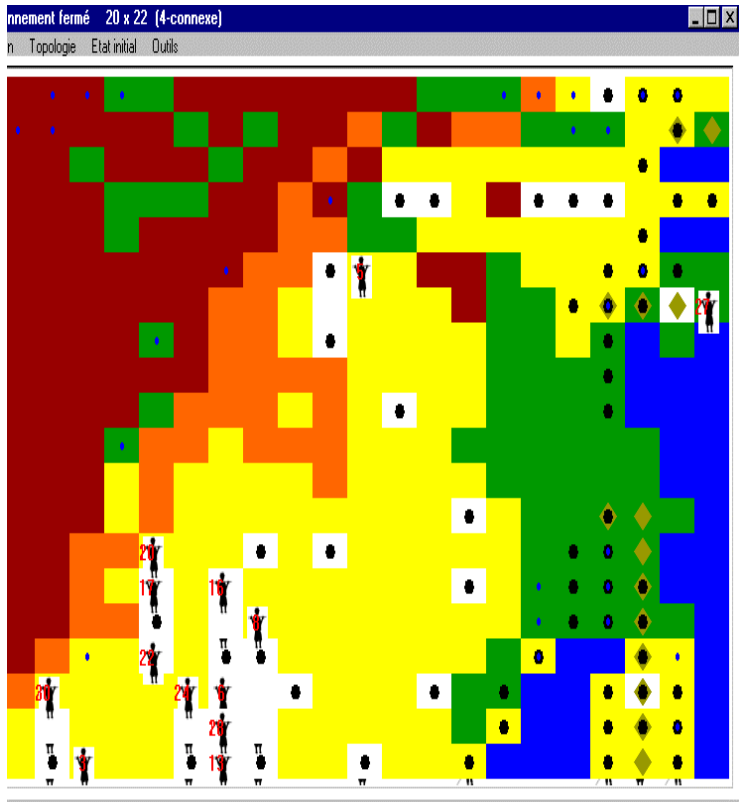# 3/From playing model to computer model:

MAS self-design

-> GIS x RpG x CORMAS

Tesselation   Topologie   Etat initial   Outils

Towards "tools directly handled by stakeholders“

. A self-incremental modeling process, supplied by an accurate information system (GIS)

. More insights in the results of the simulations

. Better to take into account distance between model and reality

II. CORMAS, a flexible platform for accompanying

- Elementary spatial entity (ESE), in regular grids or irregular tessellation

- Compound Spatial Entity (CSE) collection of ESE sharing same properties

- "Spatial point of view" (PoV), simple method implemented combining values of some ESE attributes

II. CORMAS, a flexible platform for accompanying

- PoV defined from biophysical and appropriation features of ESE.

- All PoV showed in a same simulation

- ESE or location

- Shifting/creating/destructing spatial features with a simple click

- static (raster or vector) and dynamic (ArcView) links GIS/MAS

CORMAS Organization

Object

Entity

Msg

SpatialEntity

Agent

ObjectLocated

...

AgentLocated

AgentComm

AgentCommLocated

Group

Spatial Entity

Elementary SE (L_0)
Cell

Compound SE
SpatialEntitySet

Topological CSE (L_1)
SpatialEntitySetConnex

non-Topological CSE

Partition

Aggregate

CSEnT single-value (L_2)
Category

CSEnT pluri-values (L_3)
Landscape
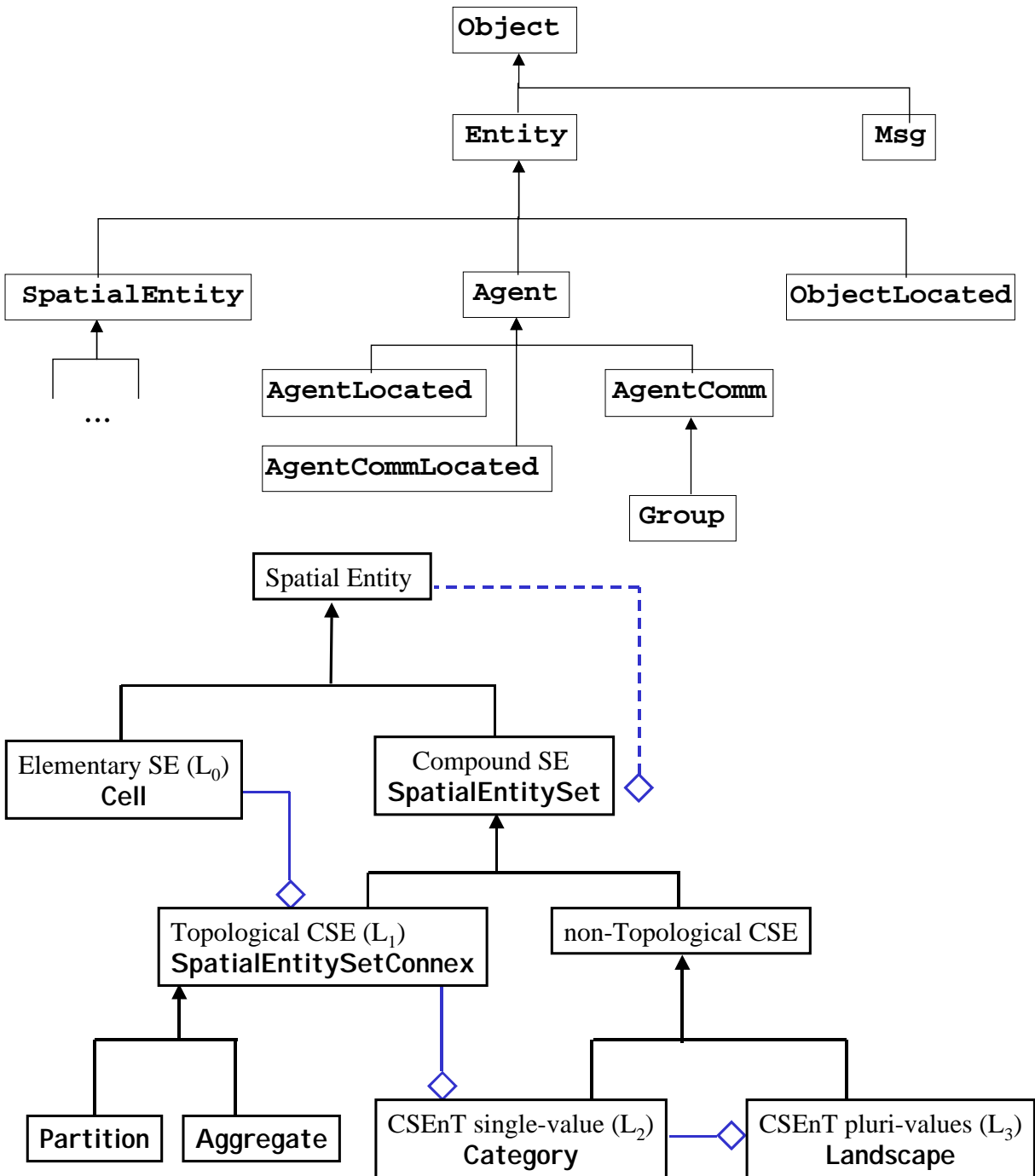
CORMAS Screen
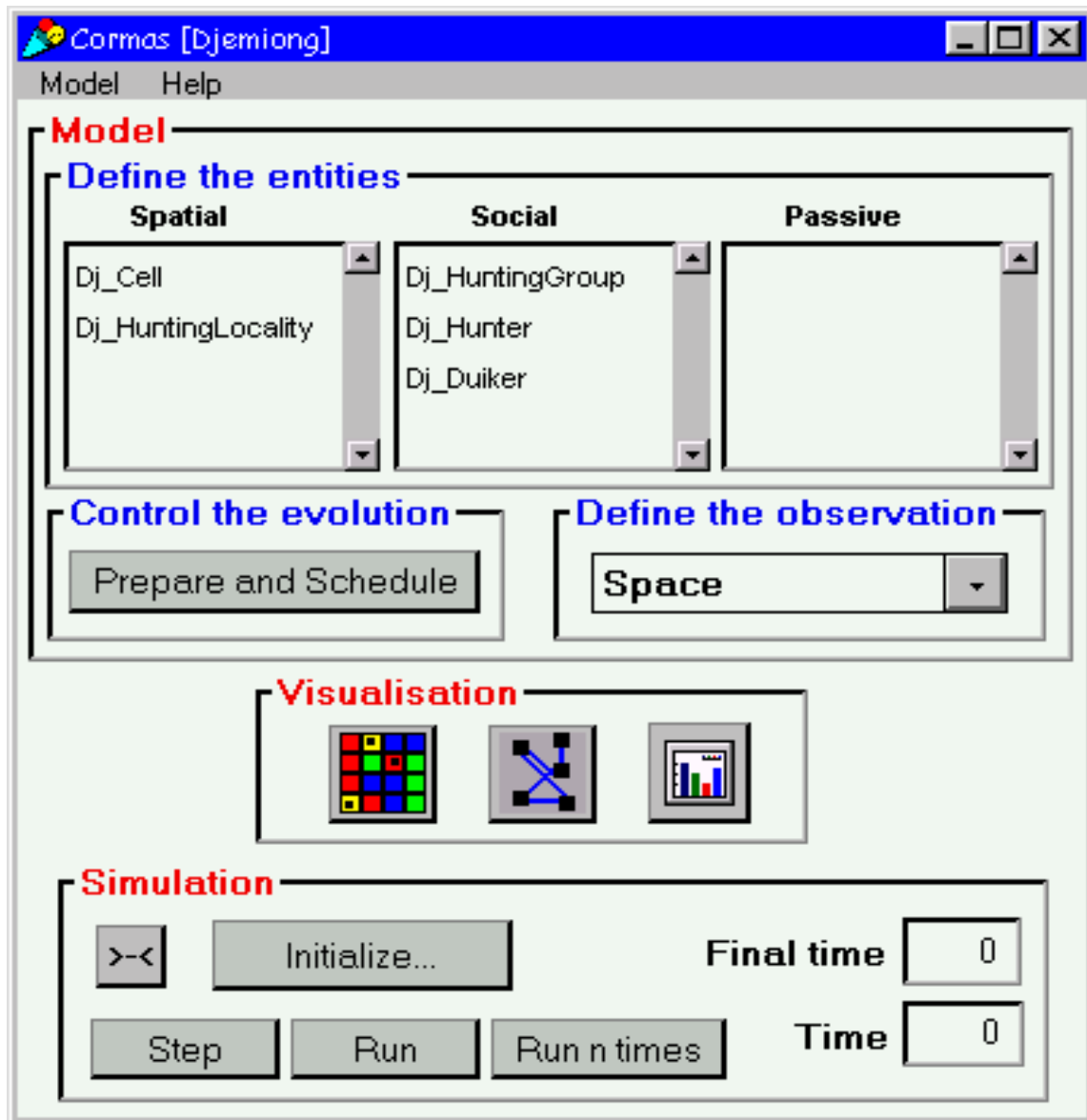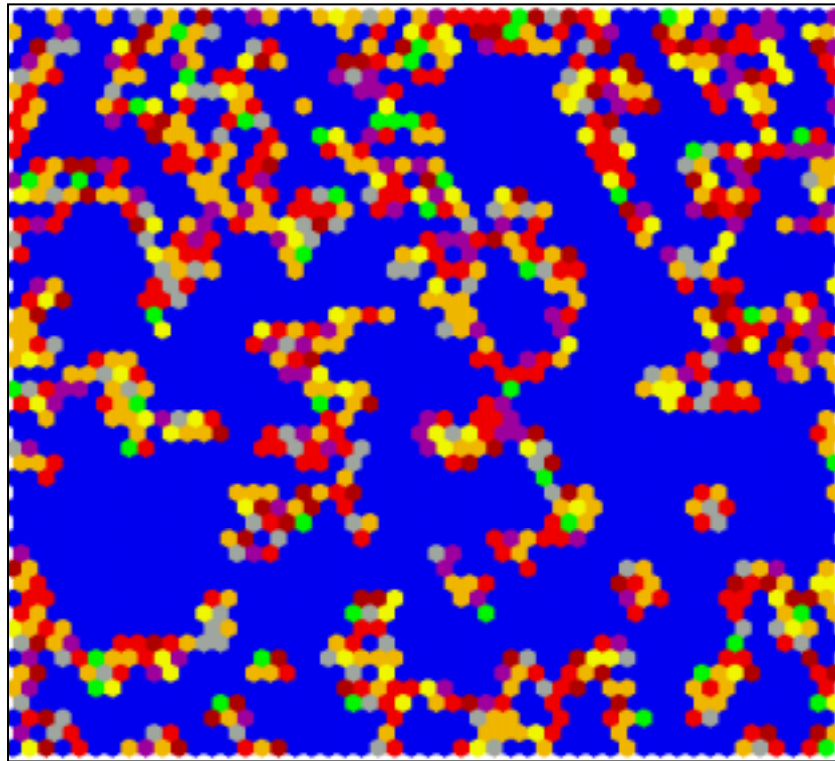
Some Spatial Representations in CORMAS
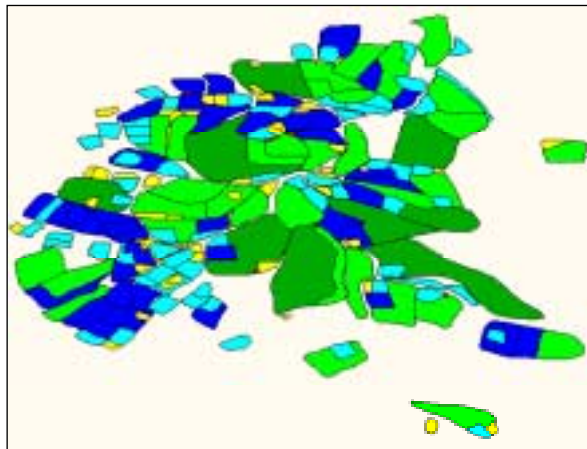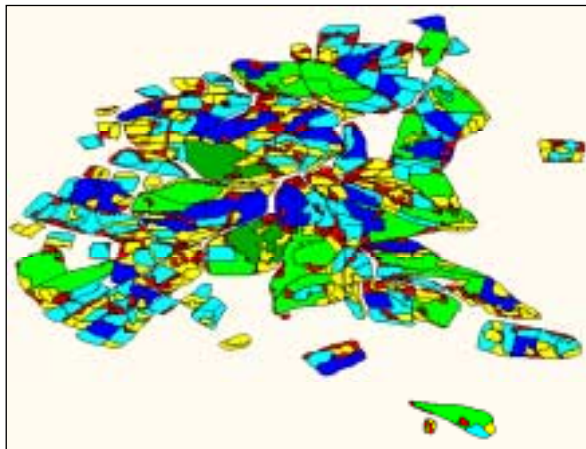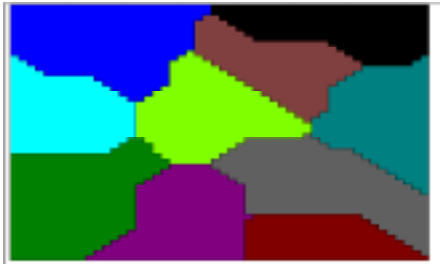
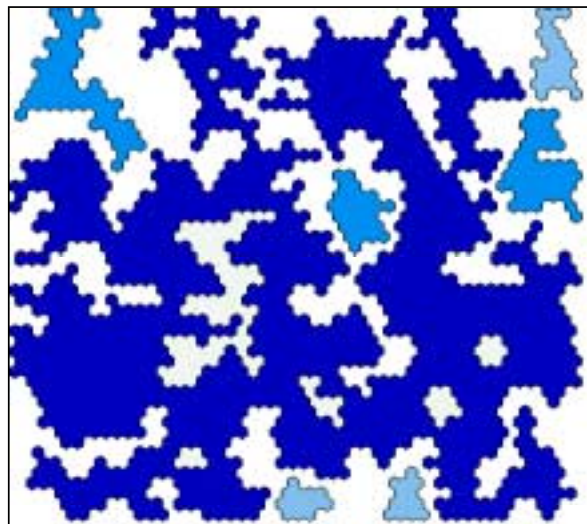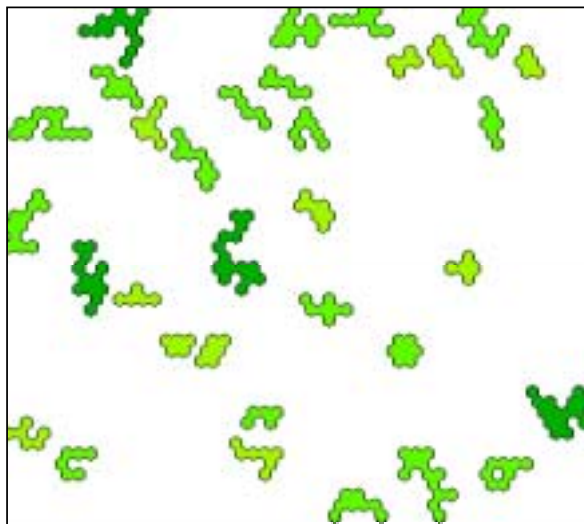**Crops Dynamics**
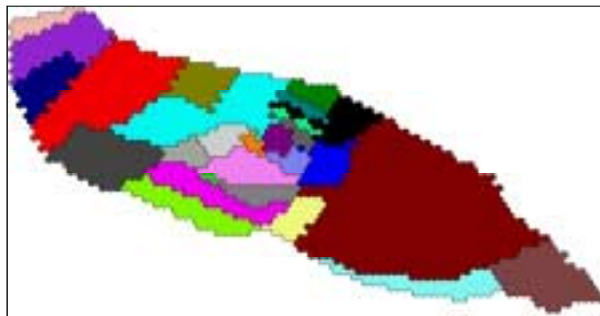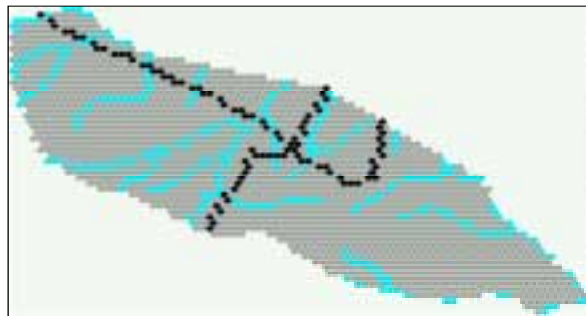
Animals Movements and Territories
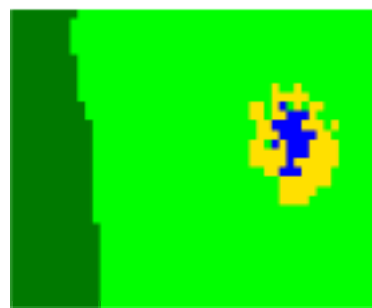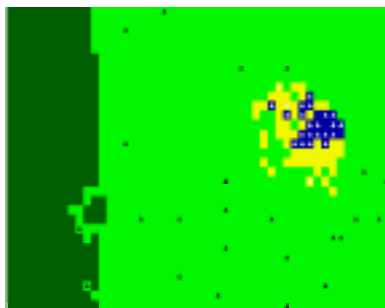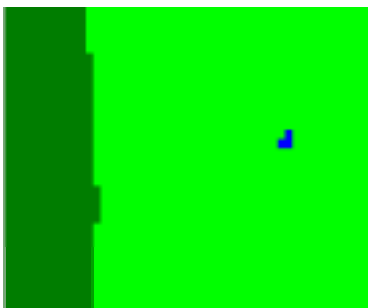
Aggregates Dynamics (village/crops/pasture/forest)

CORMAS: Dealing Spatial Points of View

⬡ Herb
⬡ Shrub
⬡ Tree
⬡ Rock

Two Points of View on this Spatial Environment

III. Conclusions and perspectives

- producing an environment enabling stakeholders to design their model

- practical use in real conditions

- GIS provides data on request and MAS supports local perceptions

- a collective learning-by-doing process combining role-playing games, GIS and MAS

- **towards two directions:**
  - **technologic improvements for a better self-use**
  - **investigations for a *self-interconnecting* between scales of collective decision**