Modelagem das Dinâmicas Sócioambientais de uma Frente Pioneira : Uruará, PA

Modelling the Pioneers Fronts of the Transamazon Highway Region

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UnB

Study site


10 0 10 km


BRÉSIL
PARÁ
Brasília

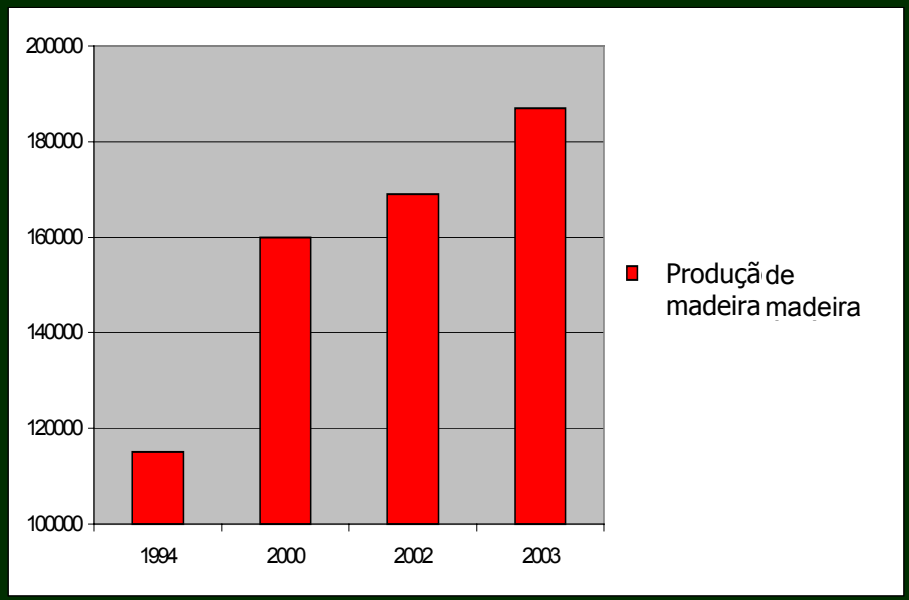

PARÁ
Belém
Transamazonian highway
Main roadsns principales

Contexto Amazônico :
Riquezas, Interesses e Conflitos

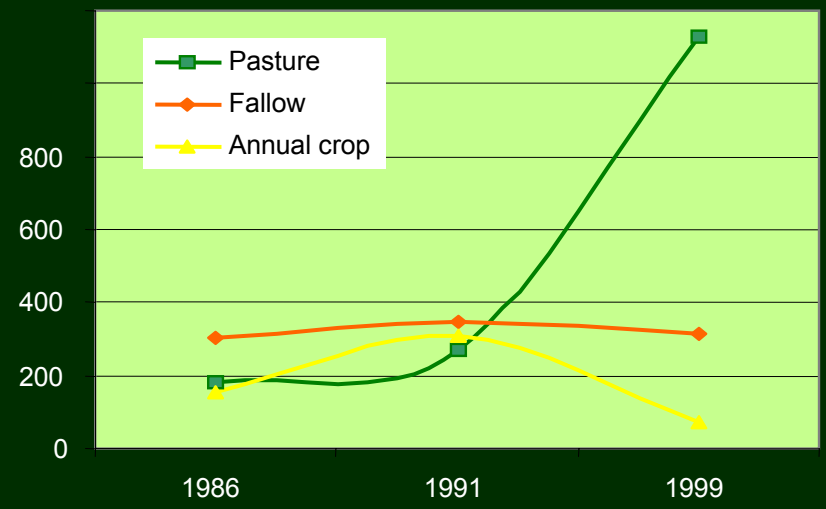
- **Um mosaico de situações diversas**
  - ✓ físicas e humanas
- **Evolução das políticas públicas**
  - ✓ 60 / 85 ⇨ Colonização, ocupação e desenvolvimento
  - ✓ 85 / 00 ⇨ Suspensão programas & abertura ambiental
  - ✓ 00 / … ⇨ Política de planejamento vs política proteção
- **Mudanças rápidas (em 30 anos)**
  - ✓ 5-7 M ⇨ 22 M habitantes
  - ✓ 5-10 M ⇨ 60 M bovinos
  - ✓ ? % ⇨ 15 % de desmatamento
- **Desafios científicos imensos**
  - ✓ Ciclo H_2O, CO_2, fertilidade do solo, biodiversidade

Why the pioneer front progresses ?

Sawmills



Ranching



Fonte : Salgado, Toni, Bonaudo

Área de Estudo : Frente Pioneira de Uruará

- Uma frente pioneira : o lugar onde o ecossistema natural é transformado em espaço rural

- Por que as frentes pioneiras ?
  - ✓ Elas apresentam todas as características já mencionadas
  - ✓ Dinâmica espaçais, demográficas, econômicas, sociais e ecológicas.
  - ✓ Lugar onde emergem novas sociedades e novas regiões

One more model… what for ?

- To formalize and synthesize the knowledge acquired during the last 10 years (remote sensing, monographs,…)
- To focus on stakeholders, their needs (money and family labour), their rules and their dynamics
- To elaborate prospective scenarios on the pioneer front evolution (according to the actors' needs)
- To discuss possible public policies

The underlying question is: How to control the extension of the pioneers fronts?

The modeler's role

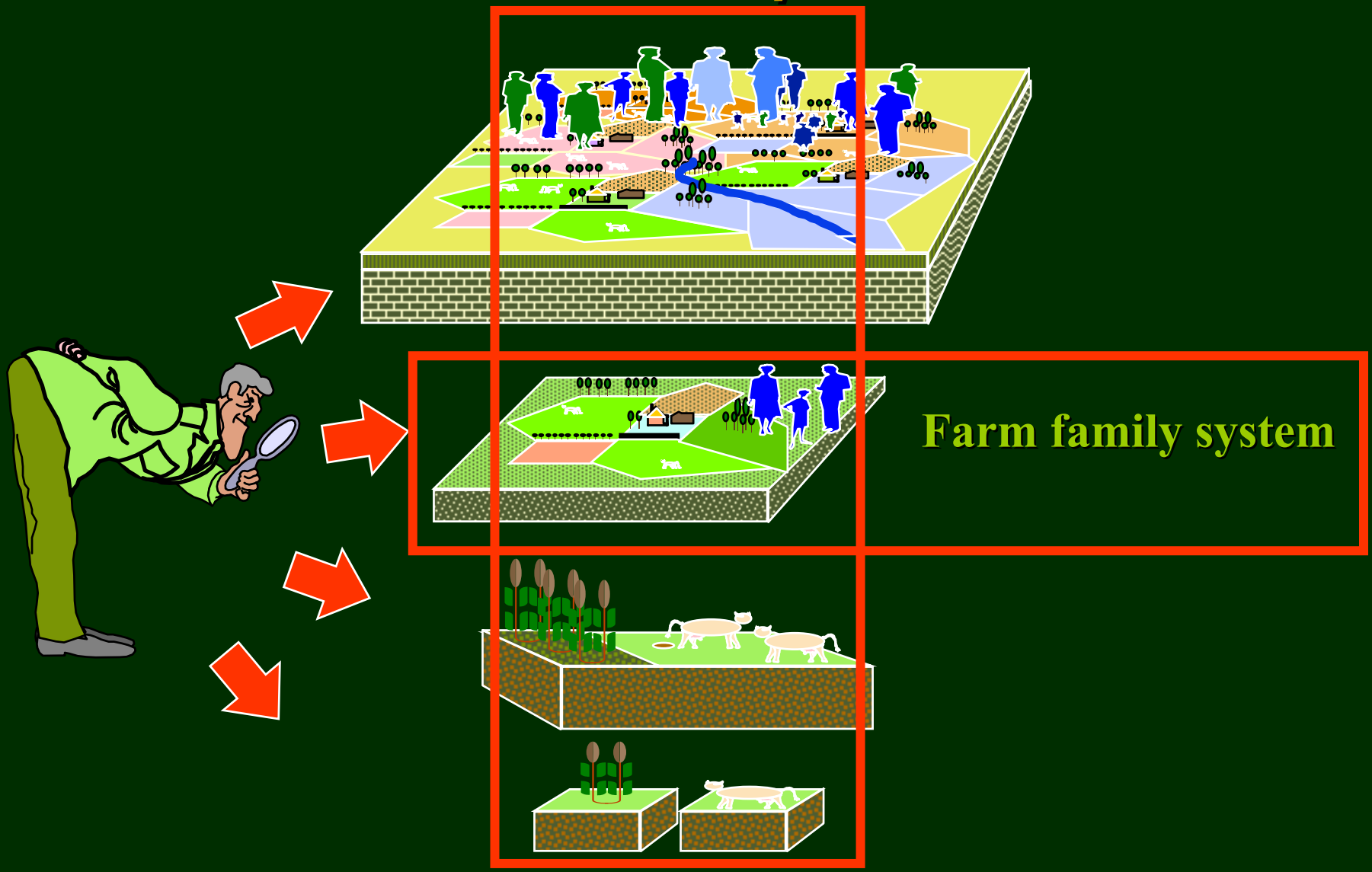
KISS

&

KIDS

How to simplify the knowledge
of the experts and of the stakeholders ?

The focal point



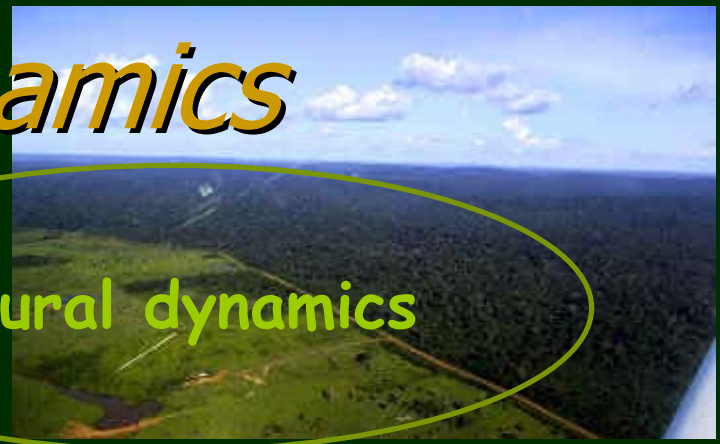
Adapted from: Mercedes Figari

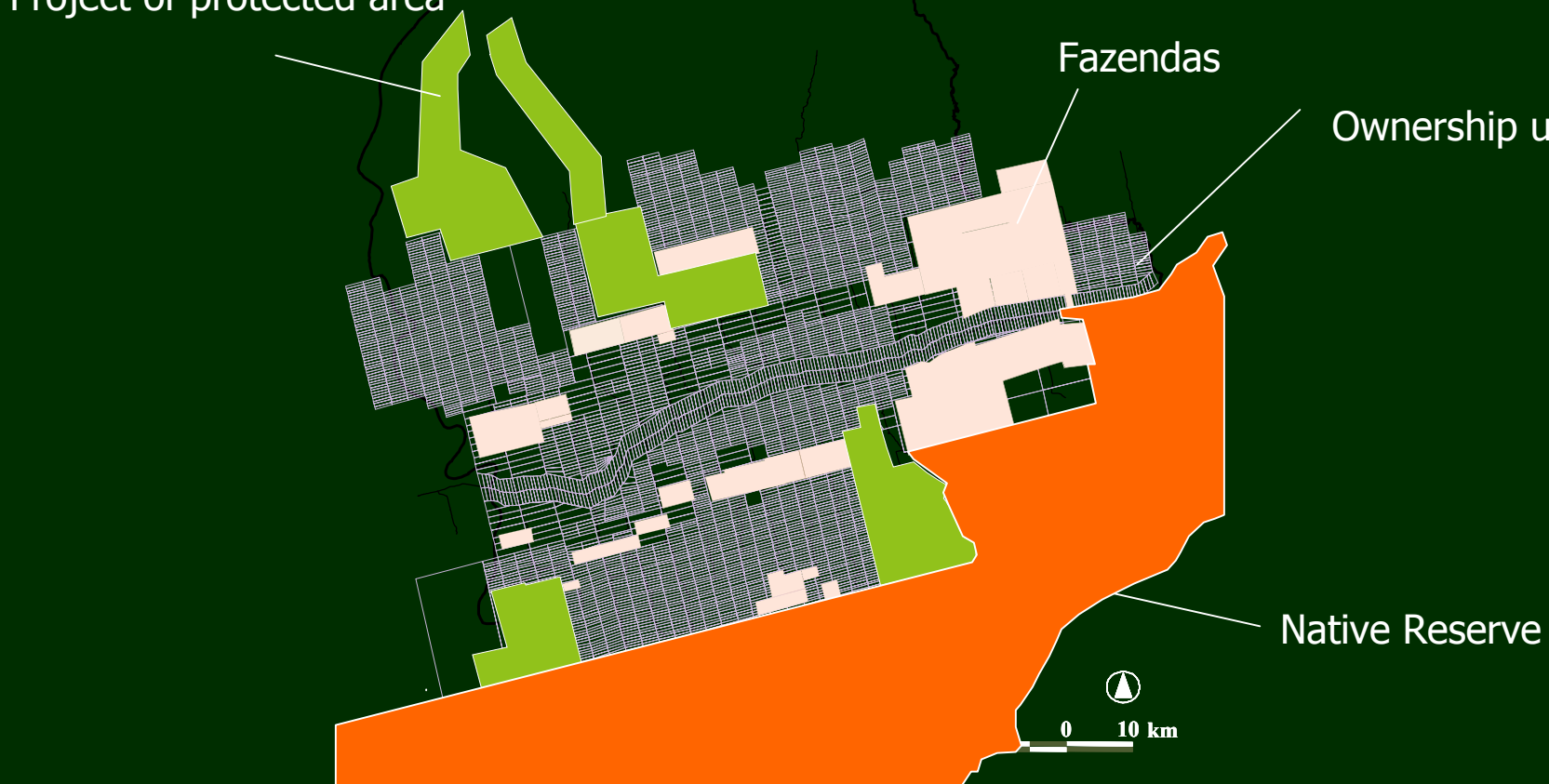
Coupling dynamics

Economic and social dynamics

=

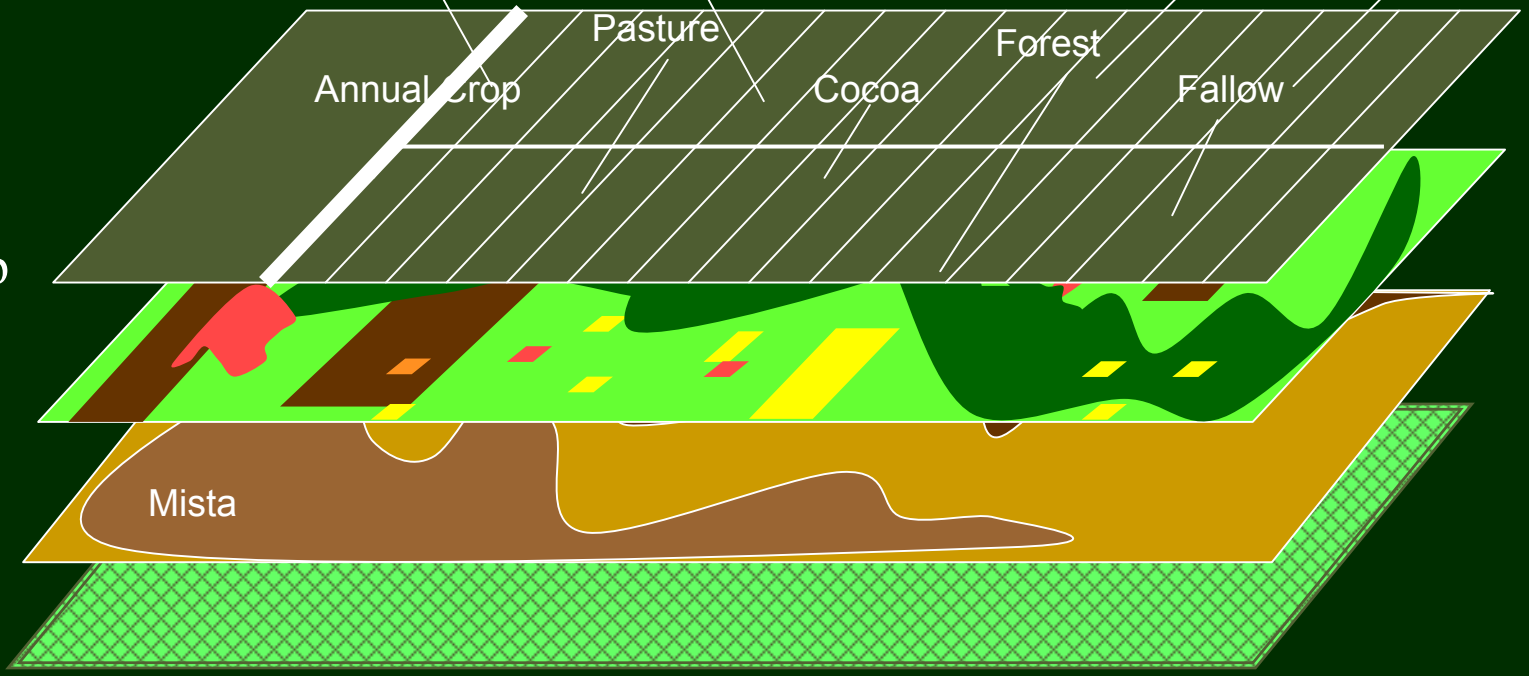
Natural dynamics





Simplify the model components

Located Elements: farmers, cattle, valuable timber



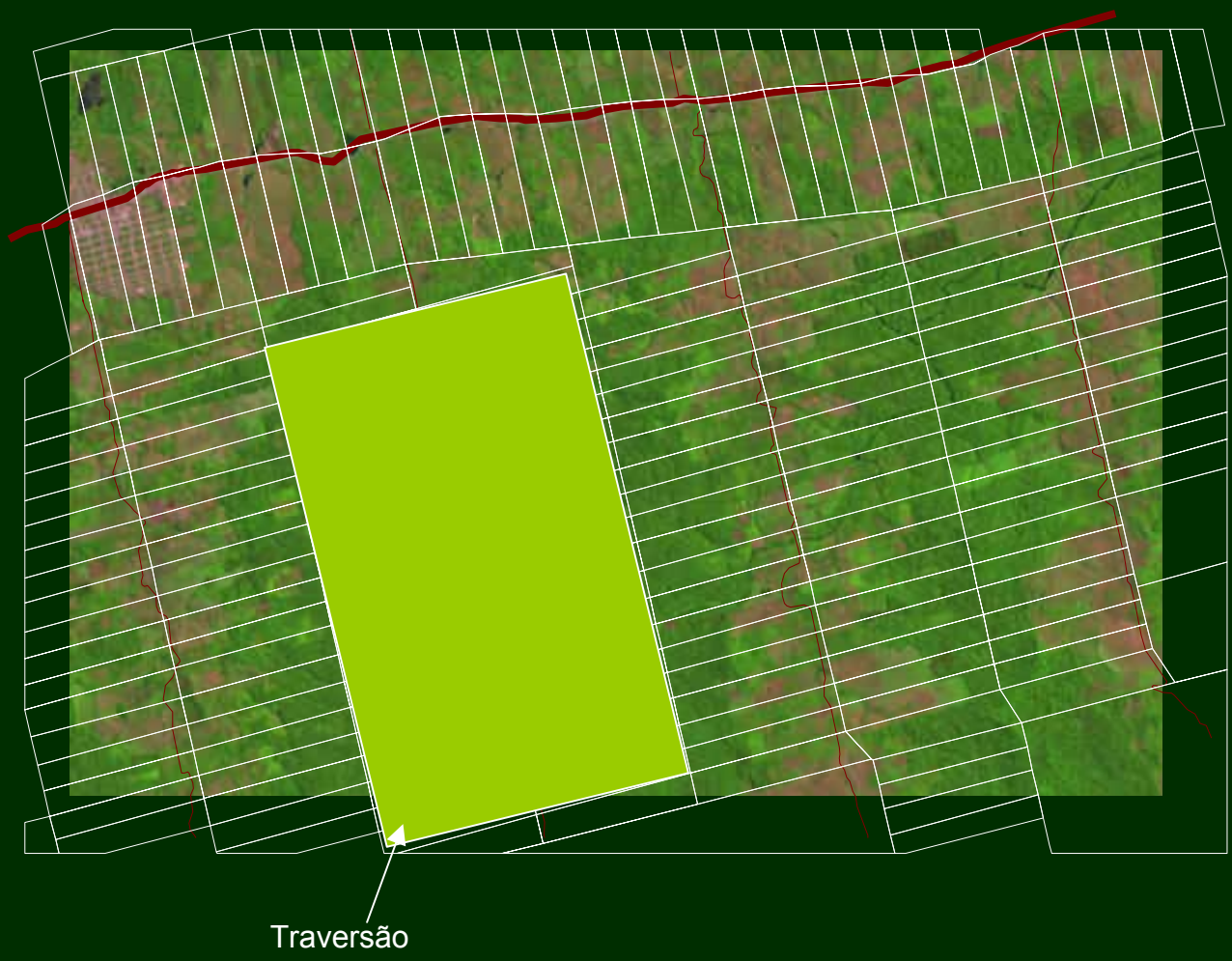
Land ownership strips

Vegetation

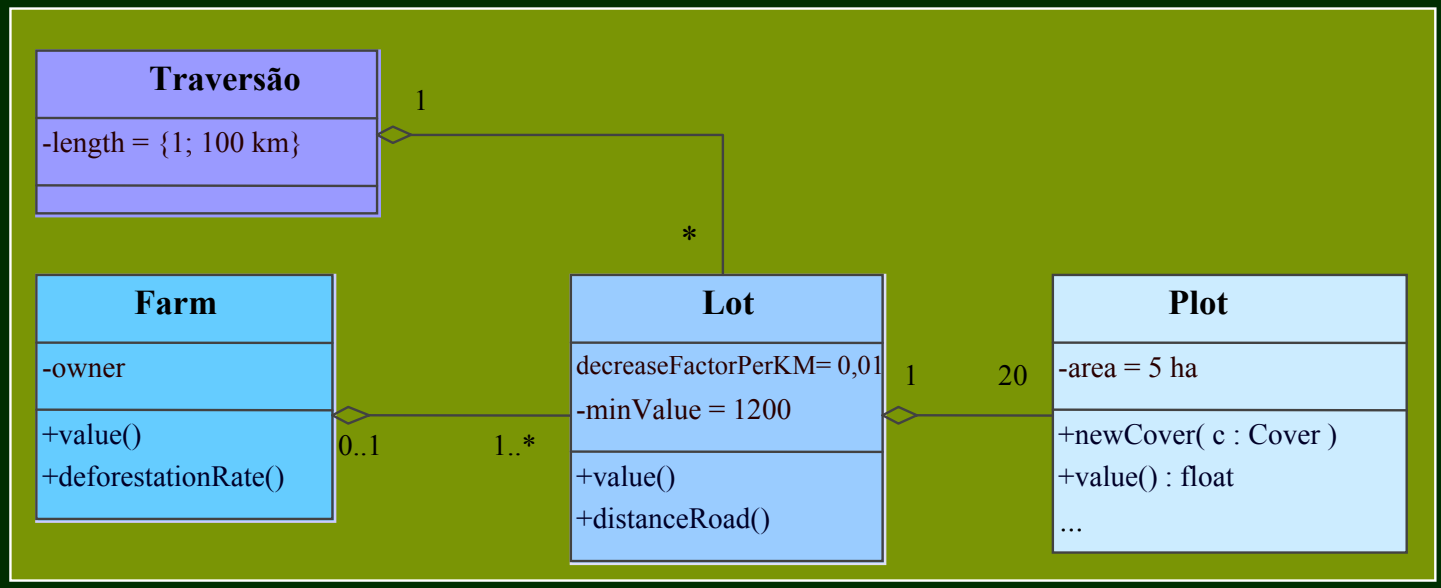
Soils

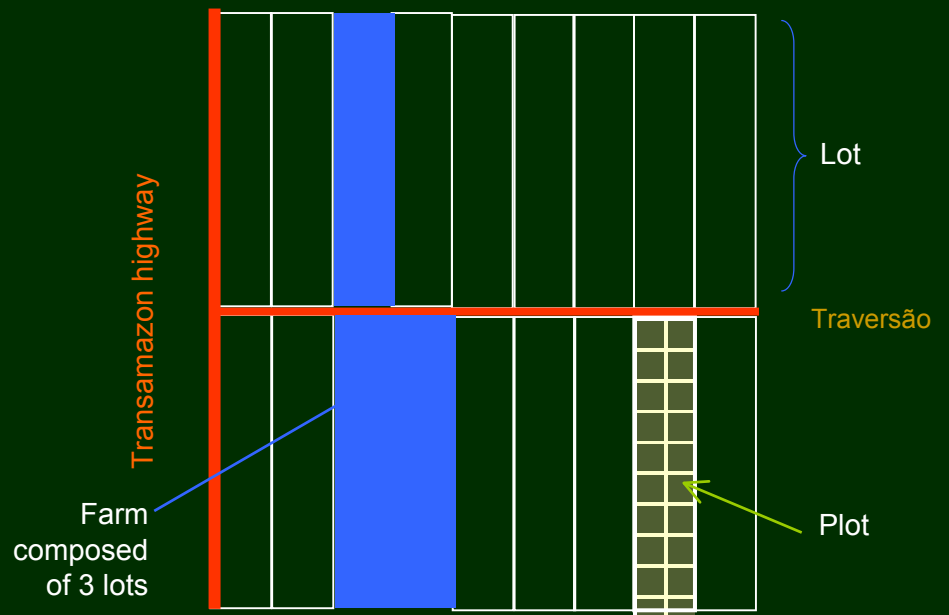
Elementary spatial units

The spatial structure

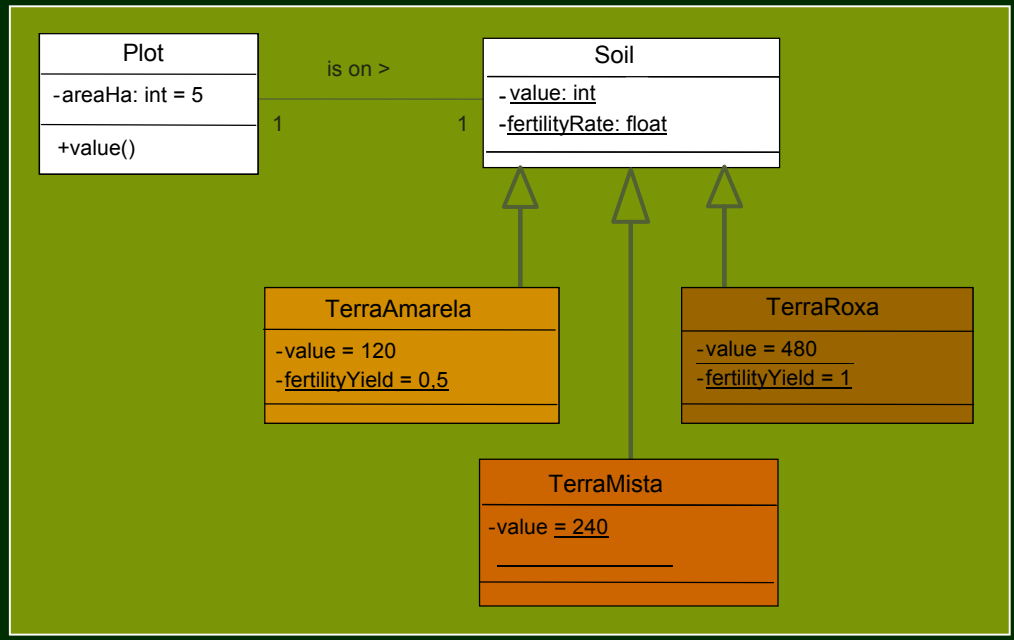


Hierarchy of spatial entities





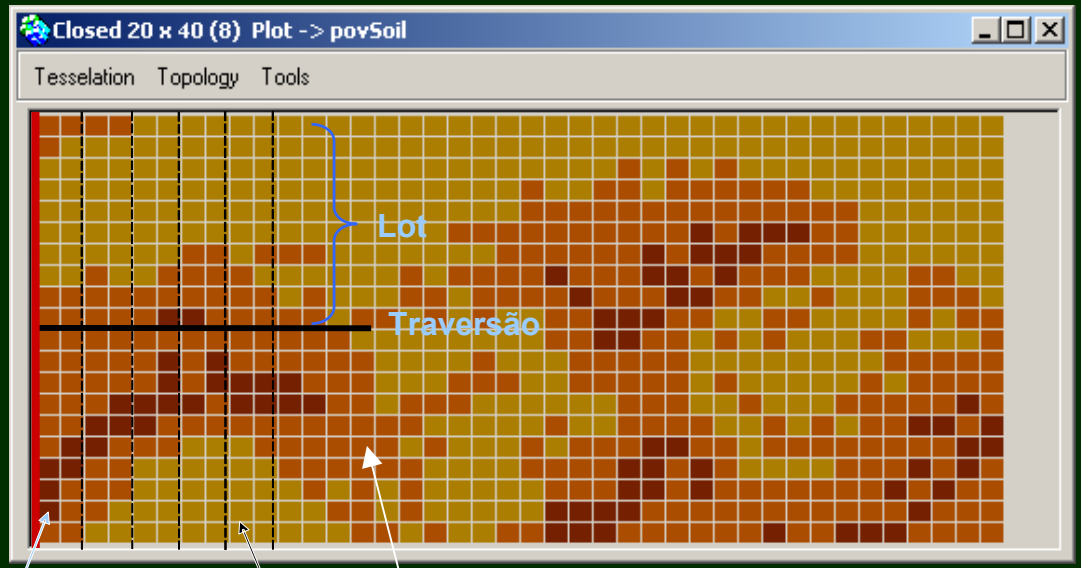
Soil

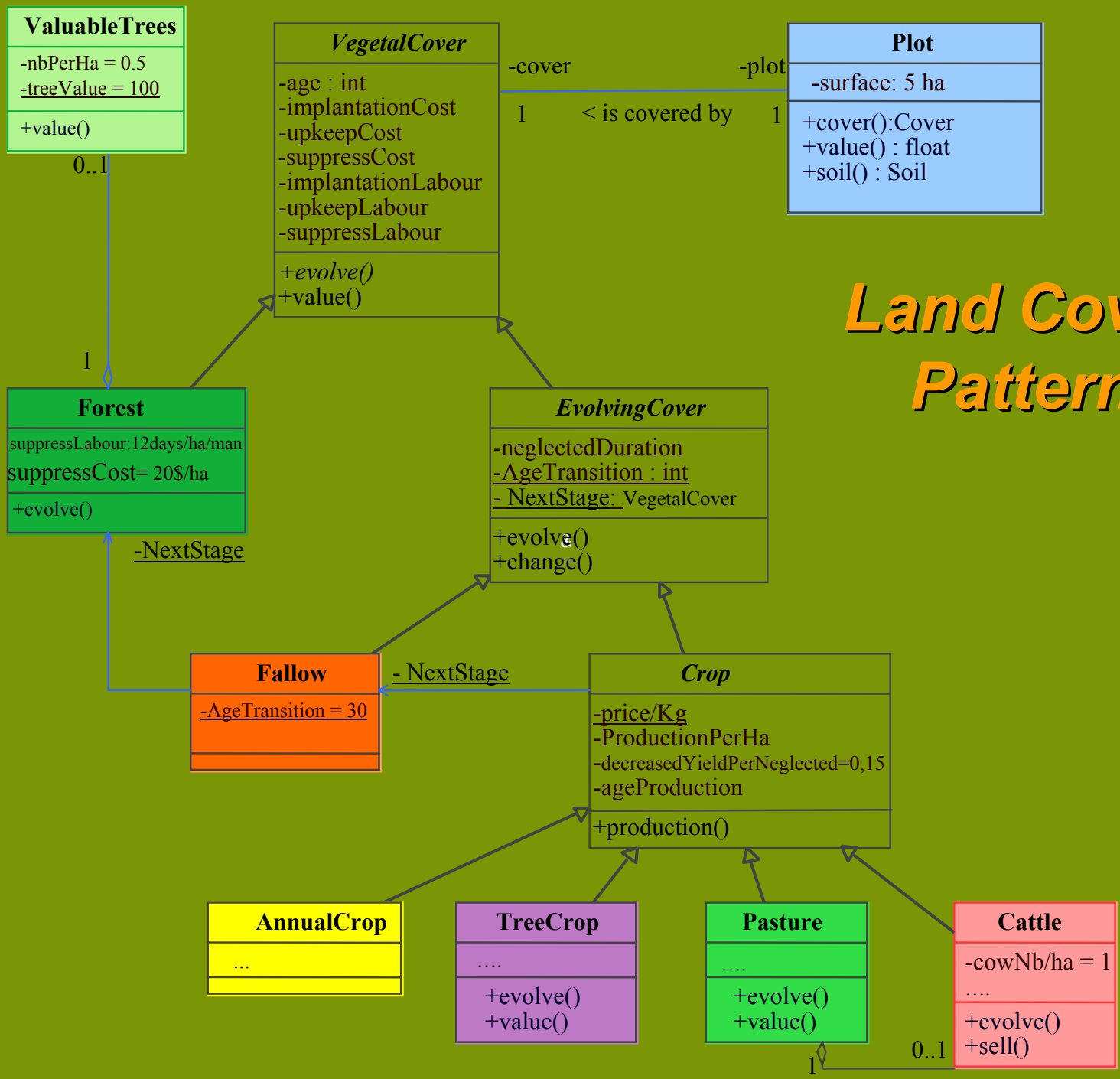


Amarela: 50%

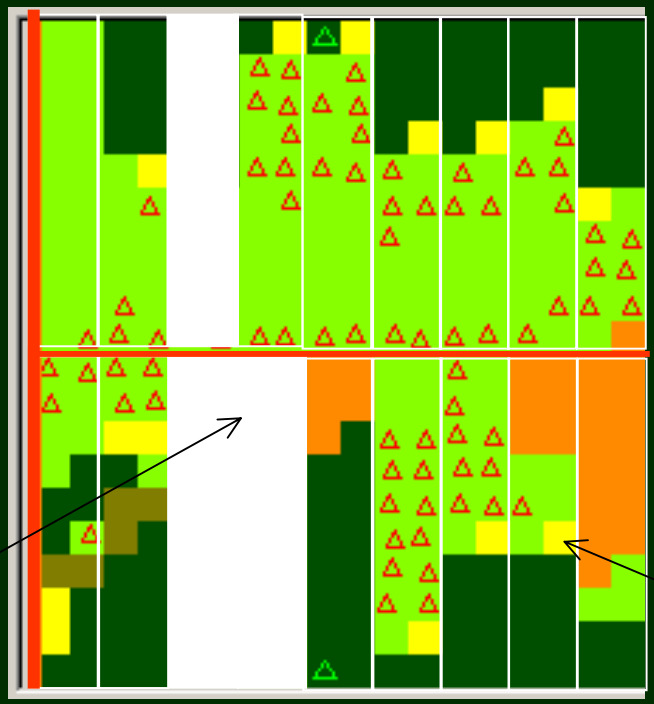
Mista: 40%

Roxa: 10%



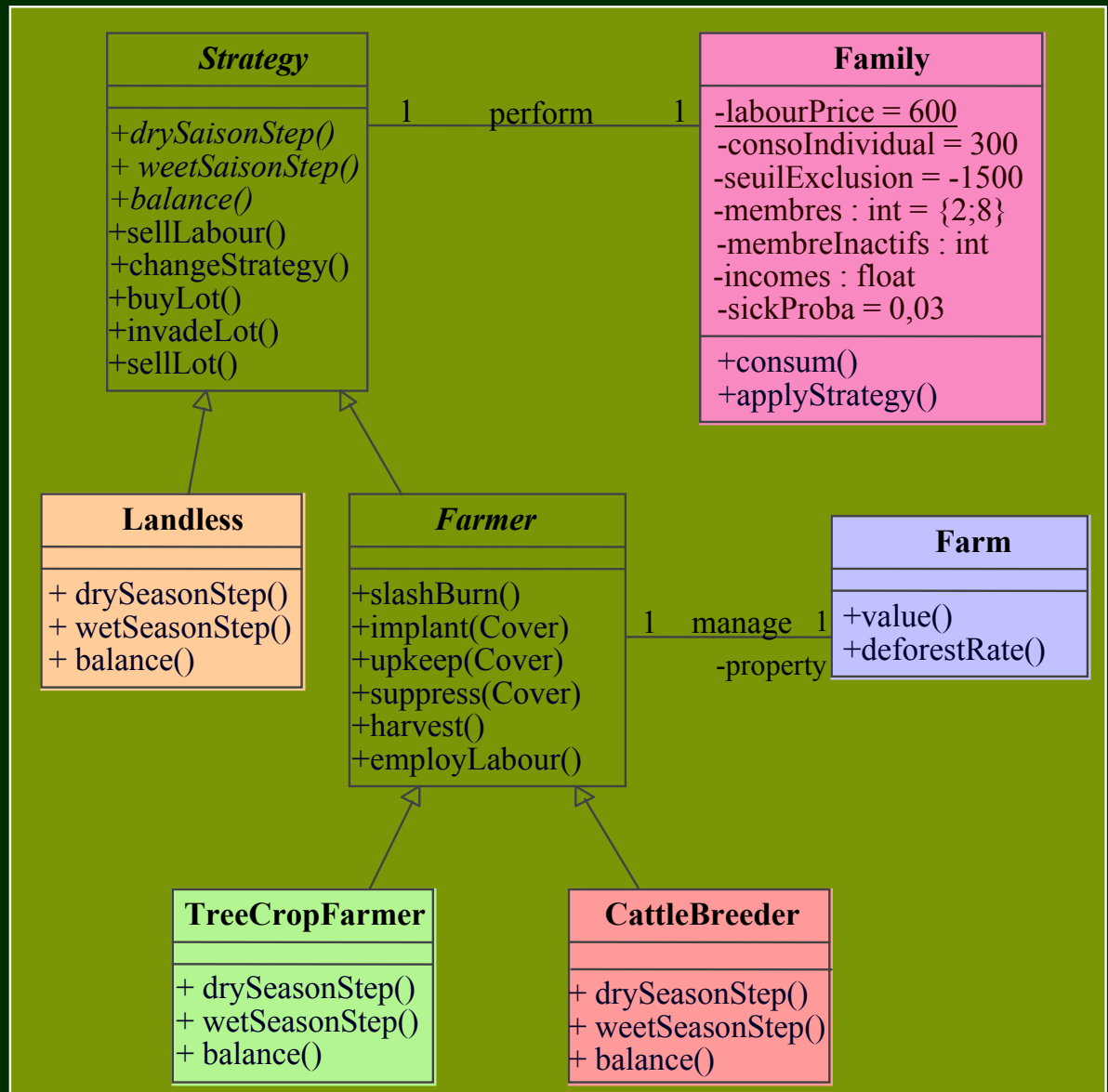

ValuableTrees
-nbPerHa = 0.5
-treeValue = 100
+value()
0..1
1
VegetalCover
-age : int
-implantationCost
-upkeepCost
-suppressCost
-implantationLabour
-upkeepLabour
-suppressLabour
+evolve()
+value()
-cover
1
< is covered by
-plot
1
Plot
-surface: 5 ha
+cover():Cover
+value() : float
+soil() : Soil
Land Cover Pattern
Forest
suppressLabour:12days/ha/man
suppressCost= 20$/ha
+evolve()
-NextStage
EvolvingCover
-neglectedDuration
-AgeTransition : int
- NextStage: VegetalCover
+evolve()
+change()
Fallow
-AgeTransition = 30
- NextStage
Crop
-price/Kg
-ProductionPerHa
-decreasedYieldPerNeglected=0,15
-ageProduction
+production()
AnnualCrop
...
TreeCrop
....
+evolve()
+value()
Pasture
....
+evolve()
+value()
Cattle
-cowNb/ha = 1
....
+evolve()
+sell()
1
0..1

A land cover view

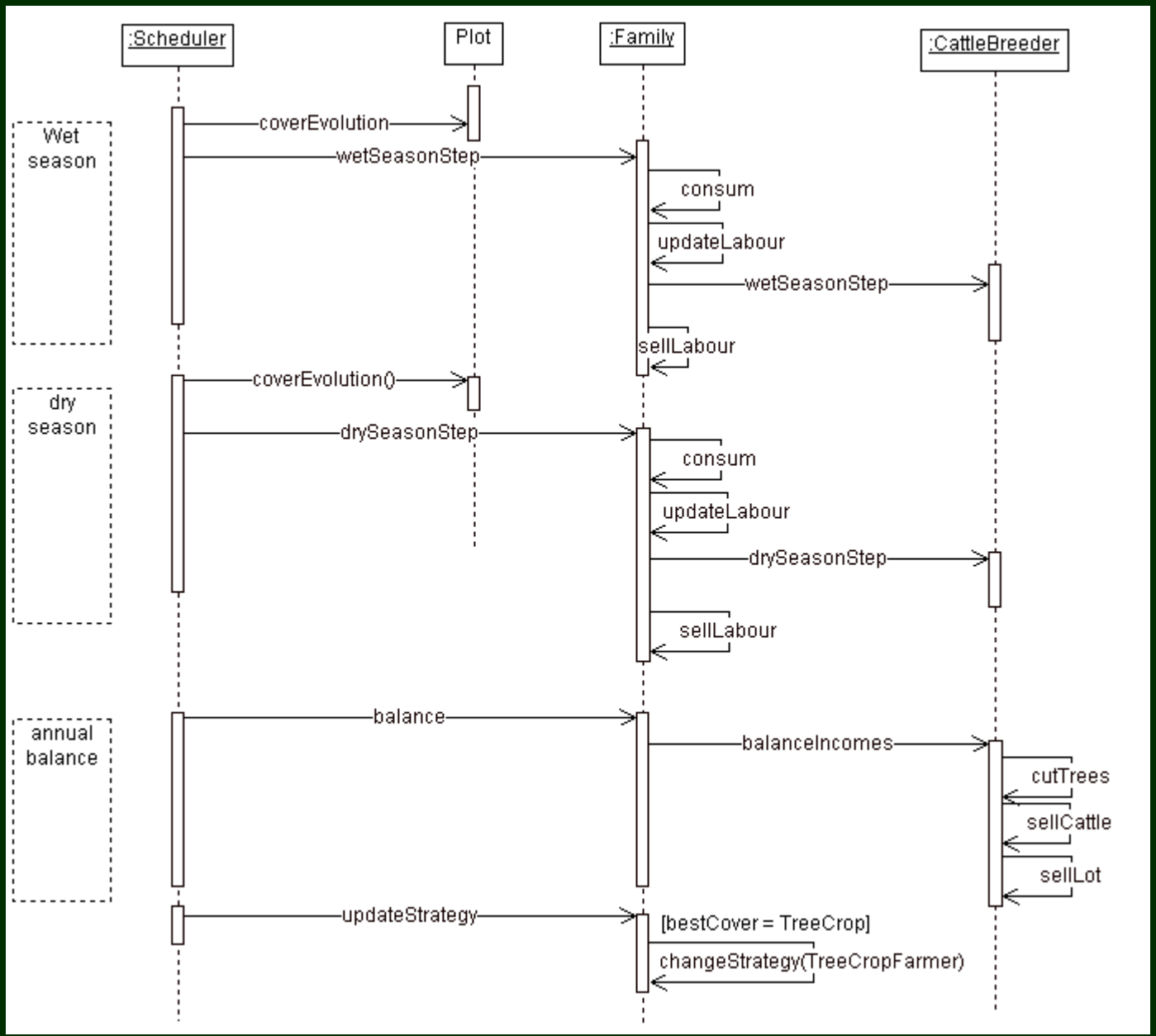


- Annual Crop
- Fallow
- Tree Crop
- Pasture
- Forest
- Cattle
- Valuable Tree

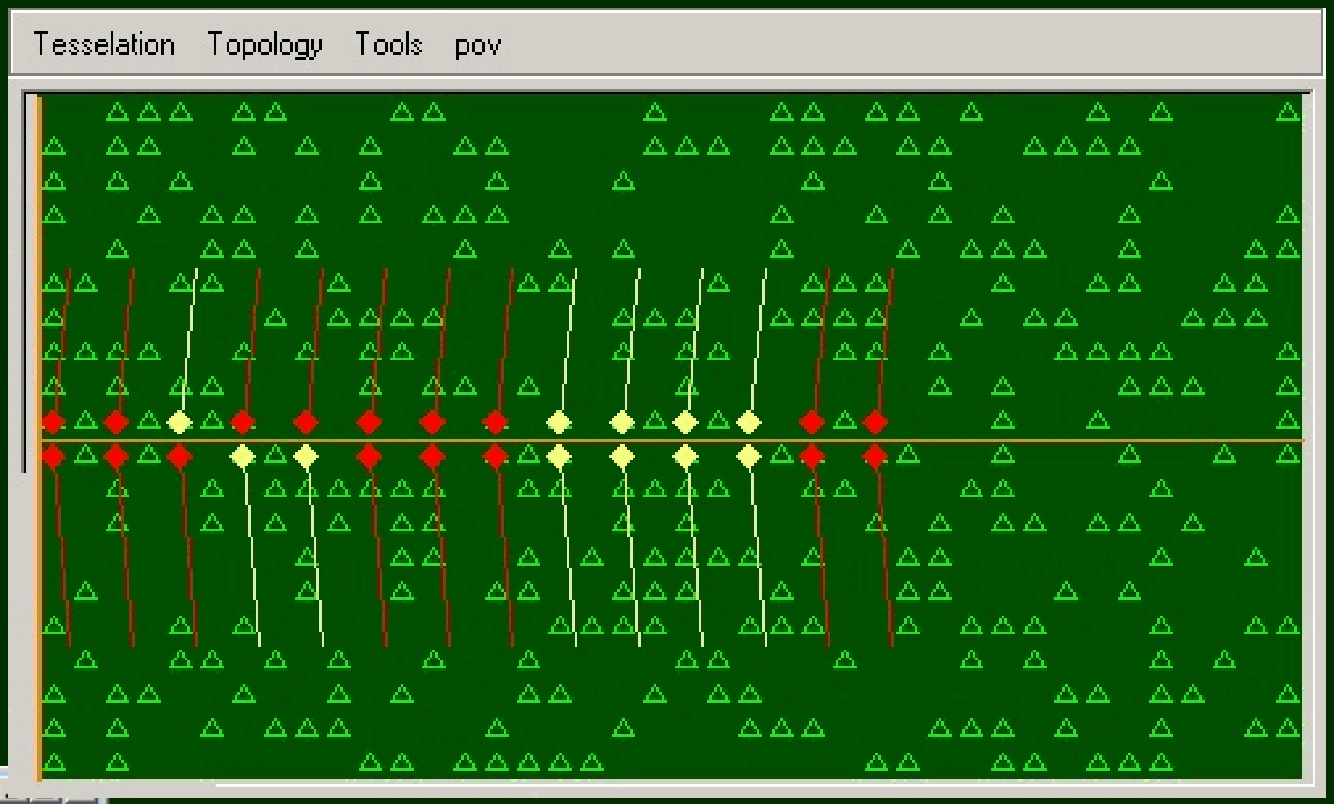
The agent: a family + a strategy

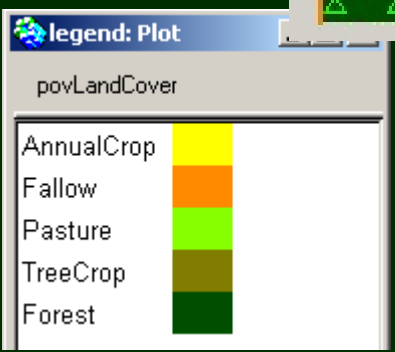


Sequence diagram: Main step (annual)



Results: Example of simulation





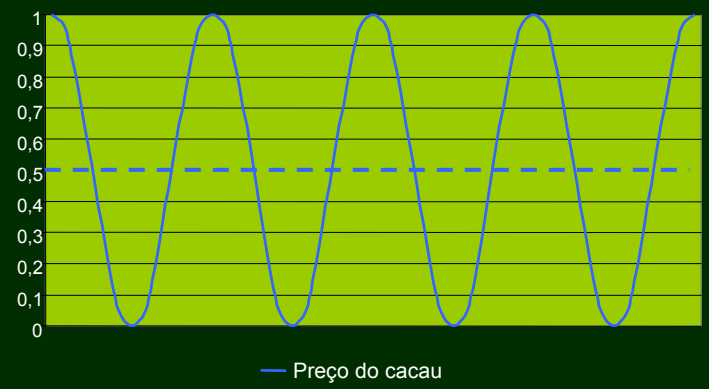
Tree Crop Farmer and its lots

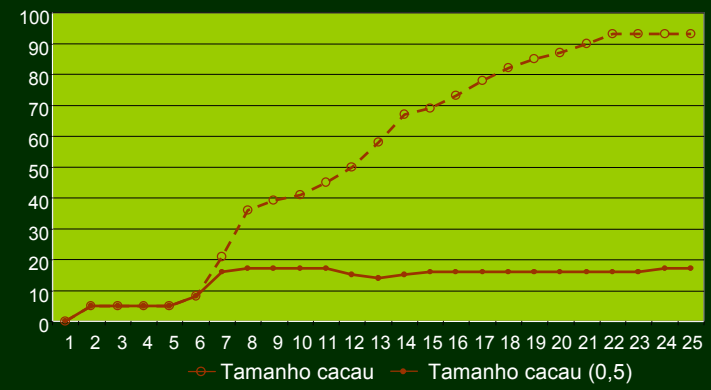
Cattle Breeder and it lot

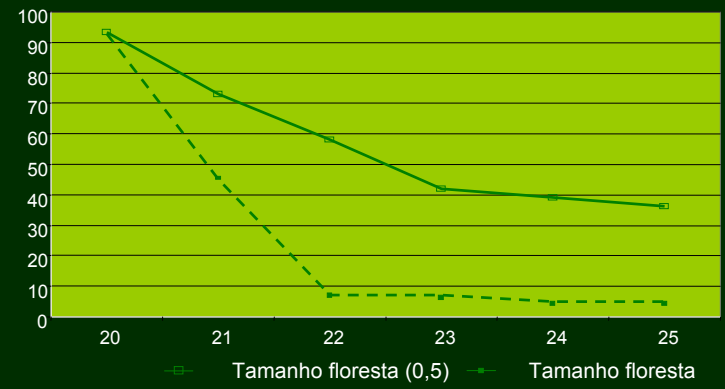
Results: consistency

- The simulated land uses patterns are consistent with the observed ones
- Pastures increase although they are less profitable than tree crop culture.
- From the only 3 modelled actor's strategies, the outputs of the simulation exhibit the 7 known types of farmers : Landless, Survival, Accumulation, Tree crop farmers, Cattle breeder and Diversified.

Results: theoretical insights







- Stabilizing the cocoa price to 1 $/kg limits the pasture expansion and therefore moderates the deforestation: “win-win” situation
  - Contribution to theoretical models of deforestation (Hamburger connection, Free access, *Relative price*)

Perspectives and conclusion

- An iterative loop between
  - Synthesis of knowledge of experts and of actors
  - models development by experts
  - and their modification and validation by stakeholders (ongoing).
- A RPG to pay attention to the multitude of points of view among the various actors
- Do not clear the forest but clear the model
  - Simple and descriptive
  - Controversial and refutable