Agent Based Simulations of the Effects of Household Structure on Patterns of Land Use Change in the Brazilian Amazon

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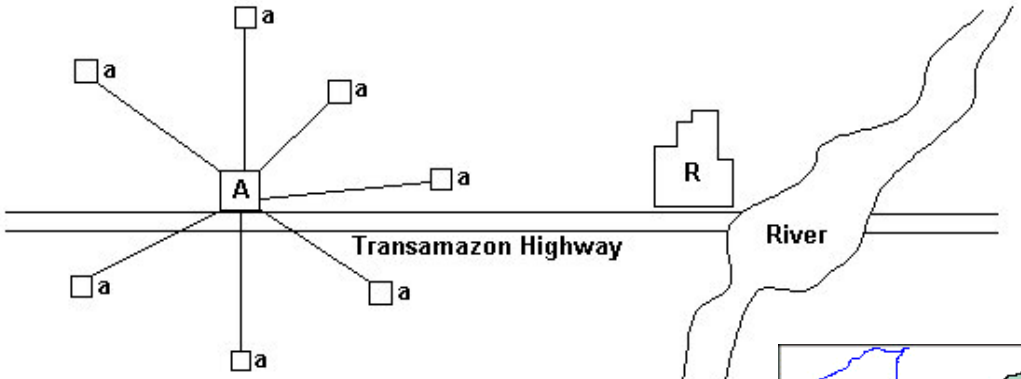
Outline

- Context
- Land Use Change in the Amazon Rainforest
  - History
  - Conceptual model of land use change
- Agent Based Simulation
  - LUCITA
  - Current Status
  - Future Directions

Land Use Change in the Amazon Rainforest

- Since 1970 there has been a rapid increase in rates of deforestation.
- Recent research has questioned the connection between deforestation and population growth.
- Land use change should be understood as products of the age and gender composition of households that migrate to, settle, and age on an agricultural frontier.

The Region of Altamira, Pará, Brazil



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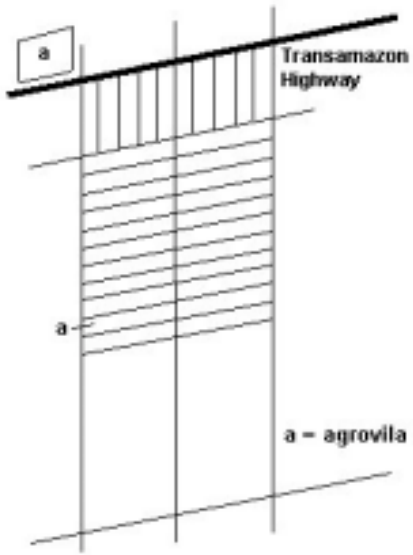
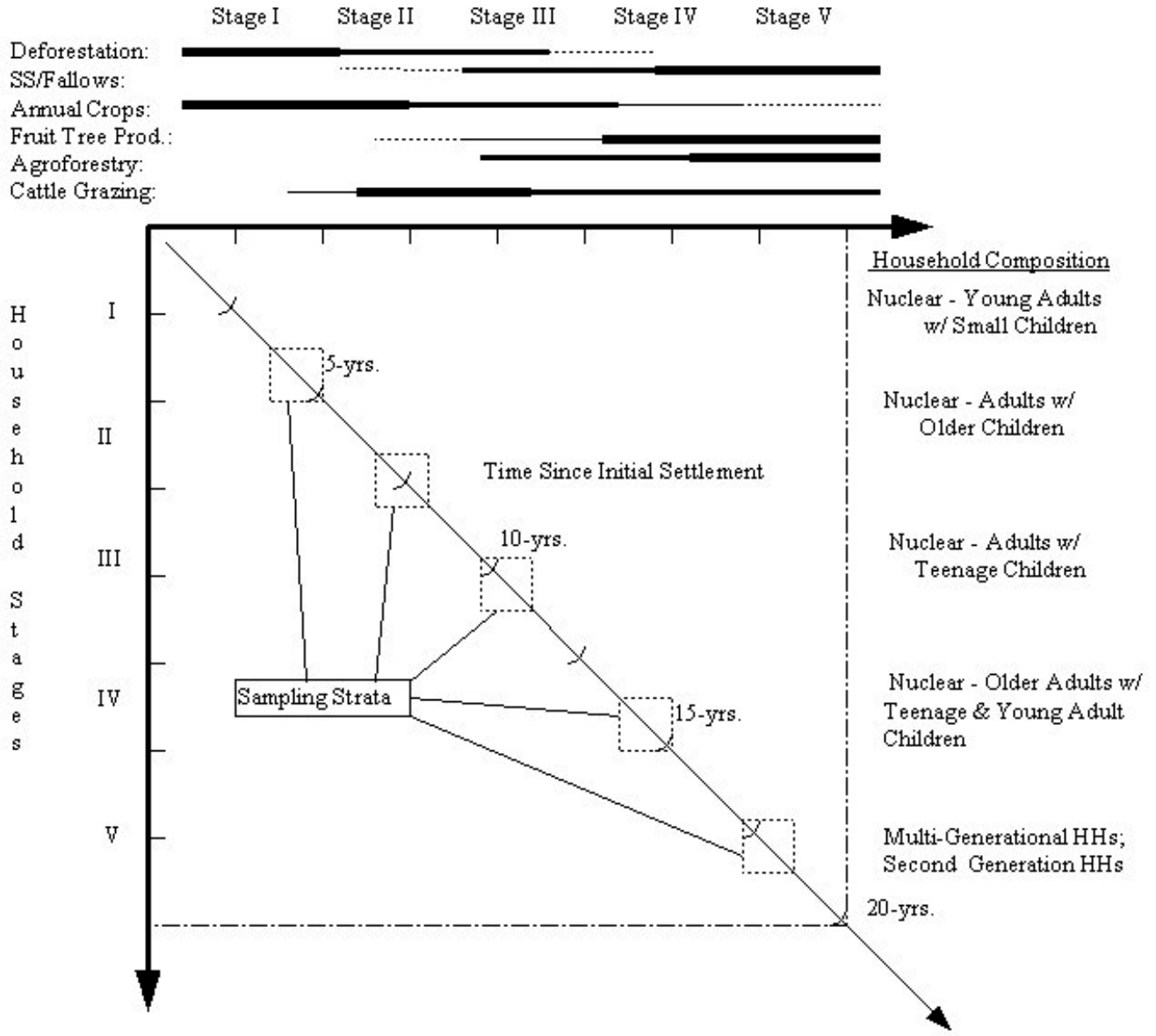
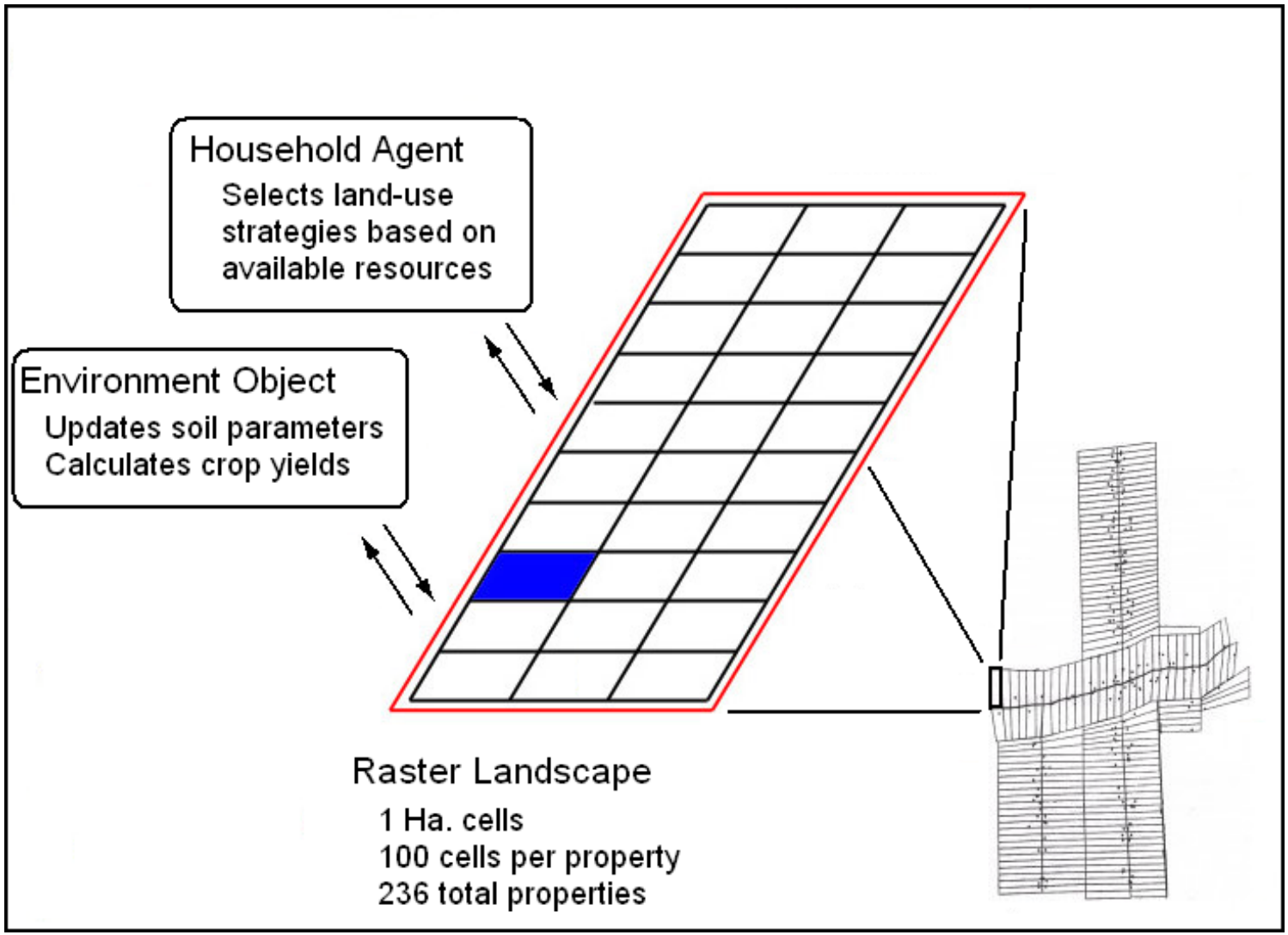


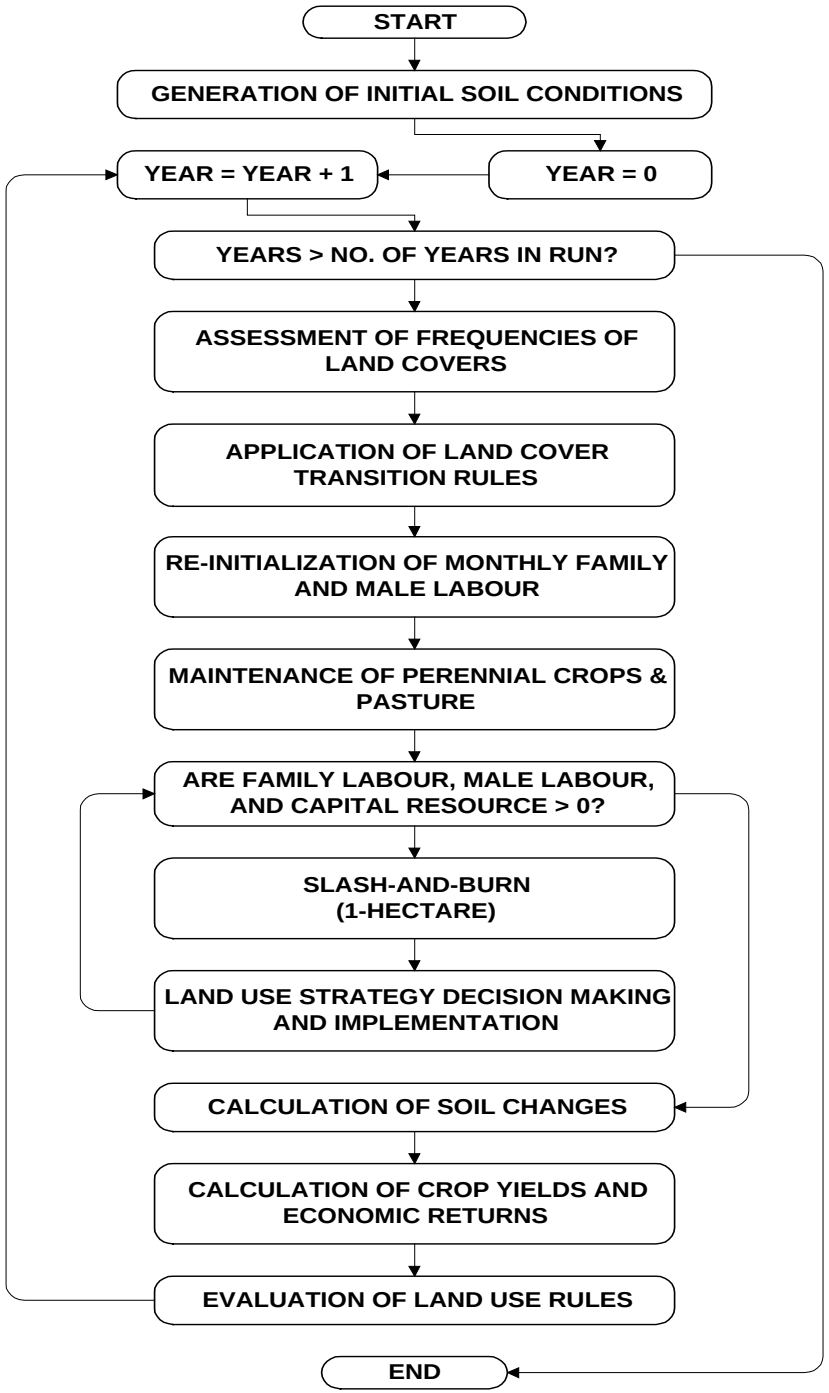
Conceptual Model



Source: McCracken et al. (1999)

LUCITA Model Design

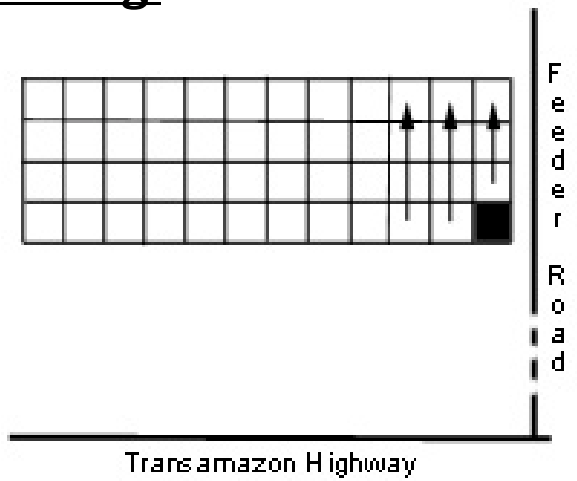


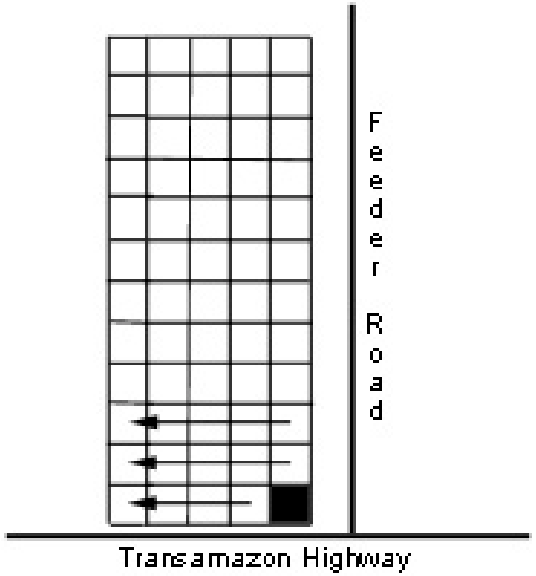


Schedule of Events

Simulation Scenario

Clearing:





Household Composition:

Family Size = varies between 2 and 6

No. of Males = varies between 1 and 5

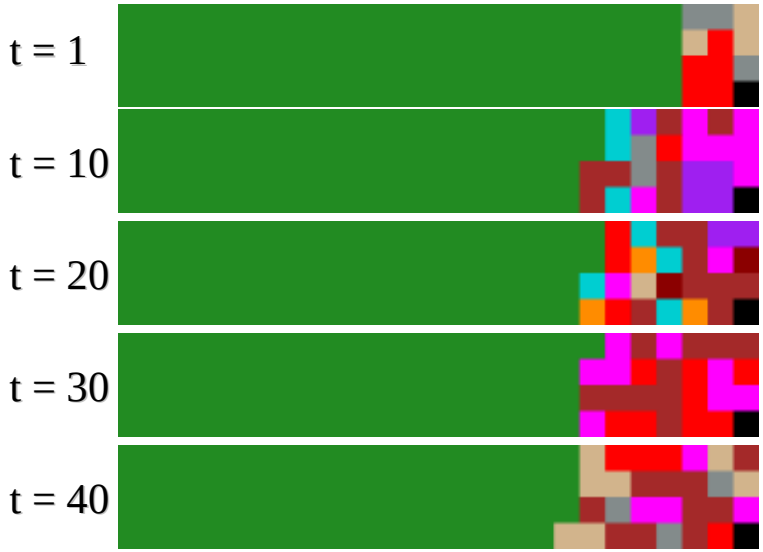
Initial Capital = Cr$0

Clearing Preferences:

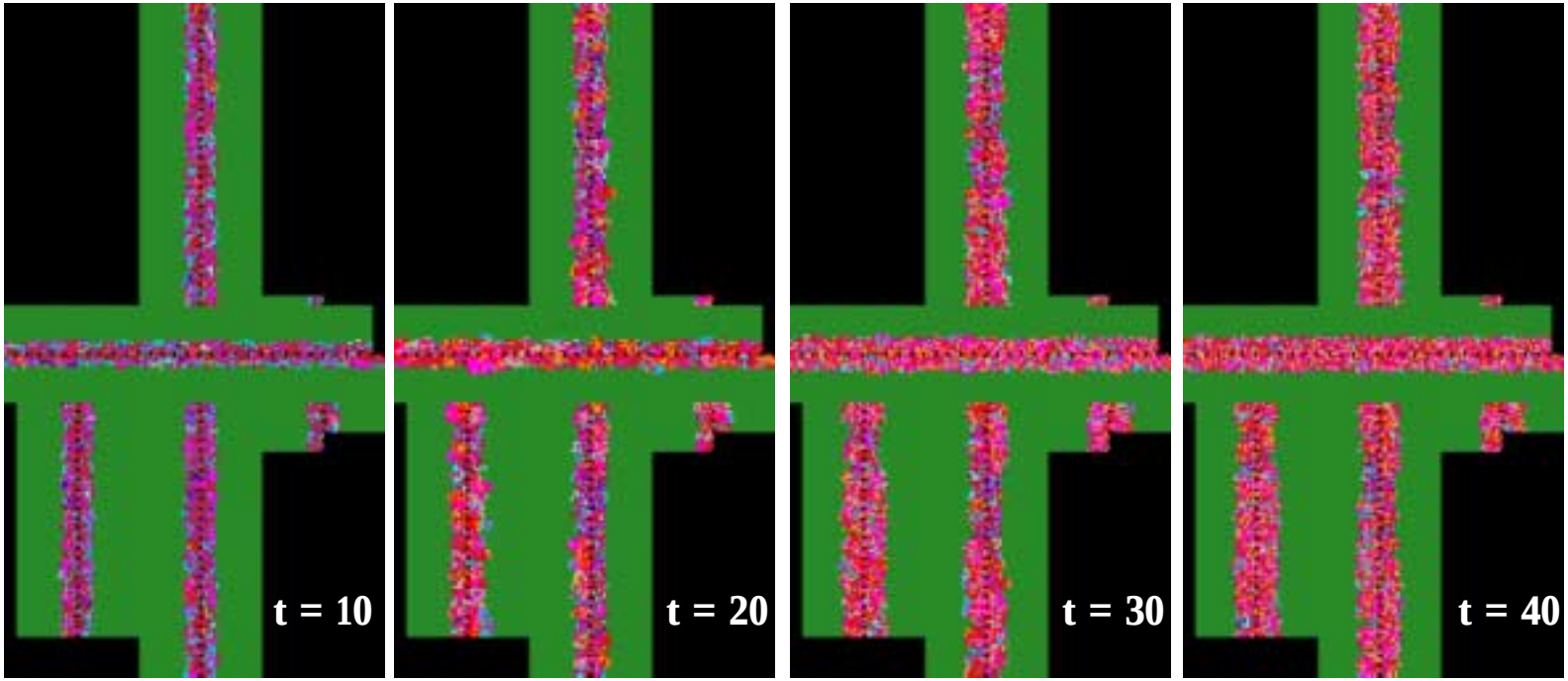
1. SS7 (over 20 years of age)
2. SS6 (17 to 20 years of age)
3. SS5 (12 to 16 years of age)
4. SS4 (7 to 11 years of age)
5. SS3 (4 to 6 years of age)
6. SS2 (2 to 3 years of age)
7. SS1 (greater than 1 year of age)
8. Weeds & Bare (less than 1 year of age)
9. Virgin Forest

Simulation Results

1-Household:



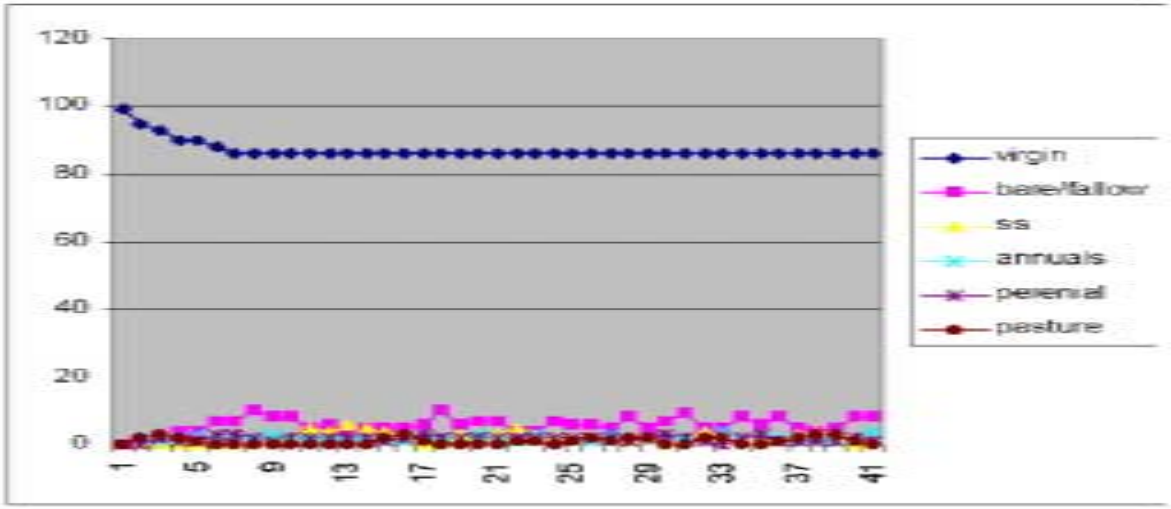
Landscape Version:

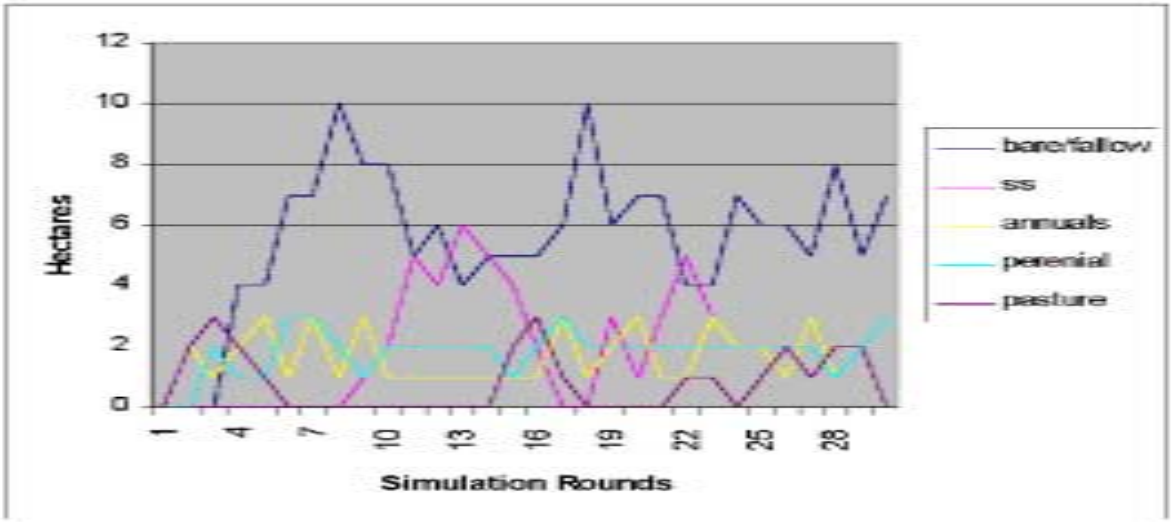


Simulation Results

1 Household

Household Size = 2

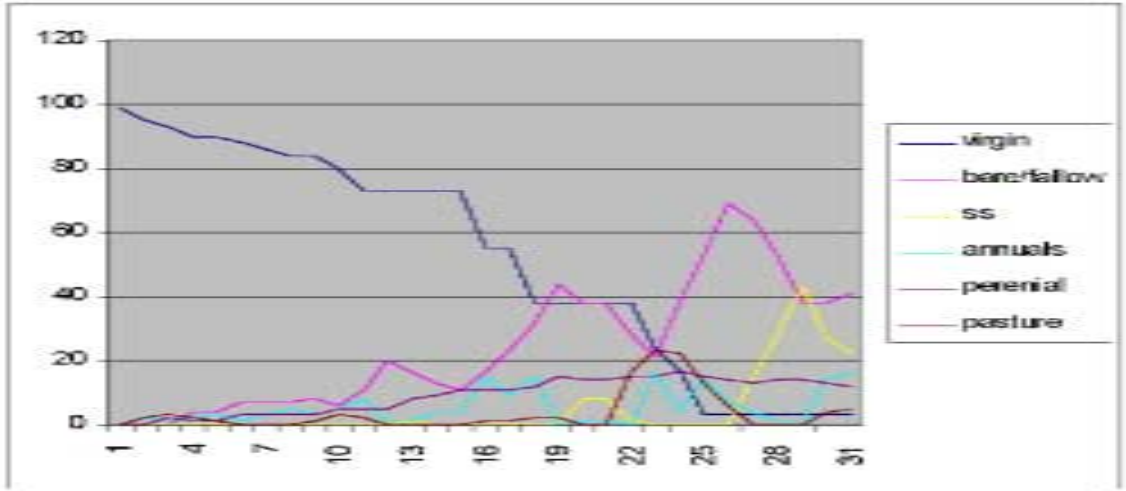


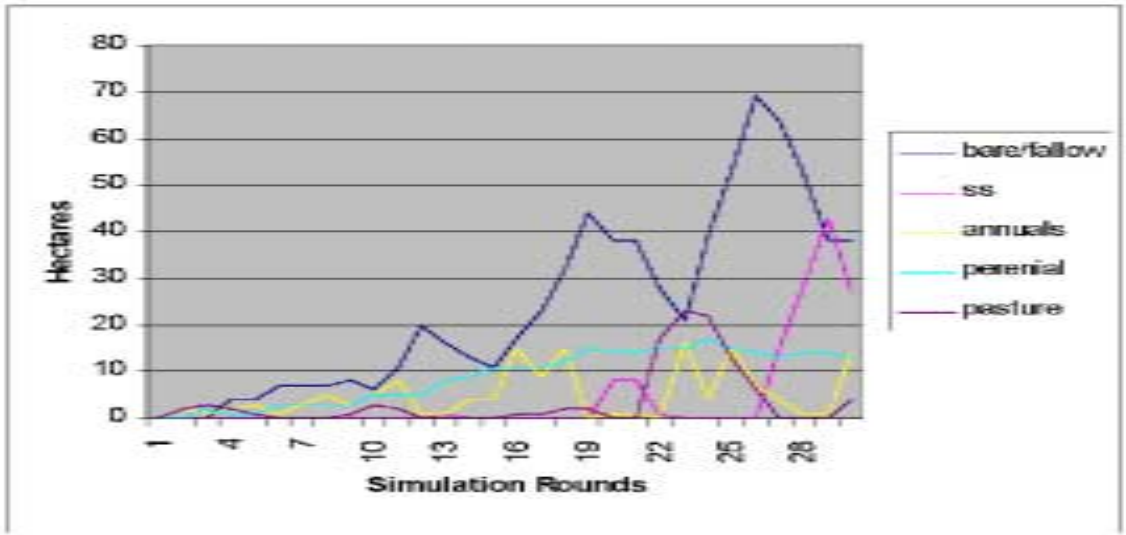


Simulation Results

1 Household

Household Size = 6





Conclusion

- Simulations show some replicative validity
- Emphasis is NOT on emulating a real world system. (yet)
- Focus is on local human-environment interactions and emergence. (complexity)
- Utility for environmental management is still unknown. (exploratory)

Future Directions

- Implement a simulation with unique and changing household agents distributed on the landscape space
- Continue data collection
  - Household behaviour
  - Biophysical resources and processes
- Explore the effects of external factors such as commodity prices and credit policies
- Explore performance of simulation in multiple study sites