

Appendix 3:
FEARLUS Pseudo-class templates for “Mr. Potatohead” generic ABM/LUCC
modeling framework
9 June 2006

I. Information/Data classes:

1. Landscape Representation
 - Structure (Functionality)
 - *Realism
 - Theoretical
 - *Spatial data structure:
 - cell-based (raster, hex, etc.)
 - *Parcel structure
 - Fixed
 - *Agent holdings
 - Multiple holdings possible
 - *Decision-making units
 - Single decision/land use per parcel
 - Data Layers/Themes
 - *Land ownership
 - Land use
 - Biophysical characteristics (an abstract conceptualization using bitstrings of such things as soil type, gradient, aspect, altitude)
 - Land manager subpopulation locations
 - Climate (spatially homogenous, subject to temporal change; abstract representation based on bitstrings)
2. Other spatial data inputs (potentially, GIS functionality)
 - Neighborhood effects (influences social interaction for imitation)
 - fixed-radius for various spatial topologies
3. Non-spatial networks
 - Social neighborhood: owners of neighboring parcels
4. Institutional/Political rules and constraints
 - *Land tenure rules: Agent controls land use
 - Break-even threshold parameter affects viability
 - Negative wealth results in loss of land
5. Economic structures
 - Economic data values (data)
 - Global market for land uses subject to temporal change (abstract representation based on bitstrings)
 - Break-even threshold parameter
6. Potential Land Uses
 - Multiple abstract (represented by bitstrings)
7. Factors affecting land productivity
 - Match between land use, climate, and economic bitstrings

III. Demographics classes:

1. *Agent class

- Land manager/farm household

*Agent decision model (function)

- *Calculate payoffs: returns to each land use
- *Decision strategy (various available according to subpopulation)
 - Profit maximization (under incomplete information)
 - Adaptive (imitative agents can change the relative weighting given to their own versus neighbors' experiences)
 - Imitative
 - Heuristic
 - Satisficing
 - Experimentation

Internal characteristics (Data)

- Cultural identity/affiliation (as subpopulation)
- Age of household
- Weighting given to neighboring experiences when imitating
- Amount to change weighting by when land parcels lost or gained
- Aspiration threshold
- Probability of imitating (rather than experimenting or attempting to maximize profit) when aspiration threshold not met
- Memory of earlier climatic and economic conditions, yields and land use decisions
- Amount of accumulated wealth above which bids for land parcels will be made
- Human capital
 - Expertise
 - Memory of earlier climatic and economic conditions, yields and land use decisions (FEARLUS)
- Time horizon and discount rate
 - Variable (FEARLUS)

Resources (Data)

- Financial capital

2. Demographic dynamics (functions)

- In-migration and out-migration
 - All land parcels lost have a chance of being taken on by an in-migrant land manager
 - Land managers losing all their land parcels out-migrate

IV. Land-use decision class

1. *Land-use decision

- *Agent decision model (III.1)

Data

- *Potential land uses (choice set, I.1)
 - Number of choices configurable
 - Abstract representation using bitstrings (also configurable)
- Yields and land uses from neighboring land parcels
- Neighborhood effects (I.2)
 - Imitation
- *Institutional rules and constraints
 - Land-tenure rules (I.3)
- Previous experience of the land manager
 - Economic data values (I.4)
 - Climate data values
 - Yield
 - Land uses
- Biophysical suitability/capability
 - Constant over time, but spatially heterogeneous

V. Land exchange class

1. Suppliers of land

- Motivation for supply
 - Migration
- Parcels supplied
 - All parcels owned
- Terms offered
 - Minimum bid accepted

2. Acquirers of land

- Neighbouring land managers based on Land parcel purchasing decision strategy (various available according to subpopulation)
 - In-migrants
- Motivation for acquiring land
 - Profit
 - Migration
- Parcels they hope to acquire
 - Dependent on Land Parcel Purchasing decision strategy
- Terms offered
 - Based on expected profits

3. Exchange rules

- Event sequencing/triggers for land transfers
 - Bankruptcy
- Allocation mechanism
 - Auction

VI. Model operation class

1. Model initialization

- *Initial landscape structure (I.1)
- Neighborhood effects (I.2)
- *Institutional rules and constraints (I.3)
 - Economic (I.4) & Climatic (I.1) data values
- *Agent types, numbers, and resource endowments (III)
- Random seeds (initialization and post-initialization)

2. Temporal Dynamics

- *Number of iterations
 - Around 200)
- *Event Scheduling
 - Discrete time