

Appendix 5
SYPRIA Pseudo-class templates for “Mr. Potatohead” generic ABM/LUCC modeling
framework
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I. Information/Data classes:

1. Landscape Representation
 - Structure (Functionality)
 - Realism
 - Real-world
 - Spatial data structure:
 - Cell-based (predominantly) w/ vector (some)
 - Parcel structure
 - Variable
 - Agent holdings
 - Multiple holdings possible
 - Decision-making units
 - Single decision/land use per parcel
 - Data Layers/Themes
 - Land use
 - Land cover
 - Soil type
 - Topography
 - Climate
 - Roads
 - Market
 - Census data
2. Other spatial data inputs (potentially, GIS functionality)
 - Network models
 - Transportation
 - Information diffusion
 - Hydrology
 - Neighborhood effects
 - Adjacent cells have environment spillovers (Invasive species spread, seed diffusion, fire). See II.1.
3. Non-spatial networks
 - Agents can learn from affiliations with (very simple networks)
 1. Neighbors
 2. Cultural group
 3. Ethnic group
4. Institutional/Political rules and constraints
 - Land tenure/usufruct rules
 - Subsidies
5. Economic structures
 - Economic data values (data)
 - Input prices
 - Global and regional output prices
 - Transportation costs (by mode)
 - Subsistence costs

- Subsidies (given in #4)
- 6. Potential Land Uses
 - Subsistence agriculture (maize, beans, agroforestry)
 - Market crops (chile, citrus)
- 7. Factors affecting land productivity
 - Assessed by agents as function of input layers

II. Interfaces to other models:

1. Biophysical process models (cellular automata)
 - Species colonization/secondary succession
 - Soil fertility/crop yields
 - Fire
2. Socioeconomic models
 - Population

III. Demographics classes:

1. Agent class

- Households
- Institutions

Agent decision model (function)

- Calculate payoffs (
 - Expected yields/returns based on previous years)
- Decision strategy (based on genetic programs)
 - Satisficing
 - Boundedly rational profit maximization
 - Utility maximizing, but with incomplete information
 - Adaptive
 - Imitative

Internal characteristics (Data)

- Cultural identity/affiliation (e.g., controls fallow practices, crop type)
- Cultural preferences/norms
 - Cultivation preferences (SYPRIA)
- Human capital
 - Education
 - Experience
- Household composition (gender/age)

Resources (Data)

- Available farm labour
- Physical capital
- Financial capital

2. Demographic dynamics (functions)

- In-migration and out-migration
- Birth/death
- Life cycle dynamics
 - Aging

IV. Land-use decision class

1. Land-use decision

- Agent decision model (genetic program satisficing, (III.1))

Data

- Potential land uses (I.1)
- Parcel accessibility (transport, I.2)
- Neighborhood effects (per I.2)
- Institutional rules and constraints (per I.4)
- Economic data values (per I.5)
- Biophysical suitability/capability (per II.1)

V. Land exchange class

1. Suppliers of land

- Parcels supplied by Mexican Government

2. Acquirers of land

- Motivation for acquiring land
 - Profit
 - Subsistence
 - Migration

3. Exchange rules

- Event sequencing/triggers for land transfers
 - In-migration
 - Out-migration
- Allocation mechanism
 - Parcels taken on first come first served basis but actors limited by institutions (Mexican community property rules)

VI. Model operation class

1. Model initialization

- Initial landscape structure (I.1)
- Transport networks and initial accessibility/travel costs (I.2)
- Network and neighborhood effects (I.2)
- Non-spatial networks (I.3)
- Institutional rules and constraints (I.4)
- Economic data values (I.5)
- Initial input from external biophysical and socioeconomic models (II)
- Agent types (3), numbers (approx 5k), resource endowments (III)

2. Temporal Dynamics

- Number of iterations (10 – 40, each one year)
- Event Scheduling (queue, randomized every iteration)
- Discrete events (population, market, tenure scenarios)
- Updating environmental model (II.1)
- Updating population model (II.2)