

Problem conceptualization: A case of agricultural production in the Argentine Pampas



Understanding agriculture in the Pampas

□ Understand historical patterns

- Structural changes
- Land use
- Land tenure

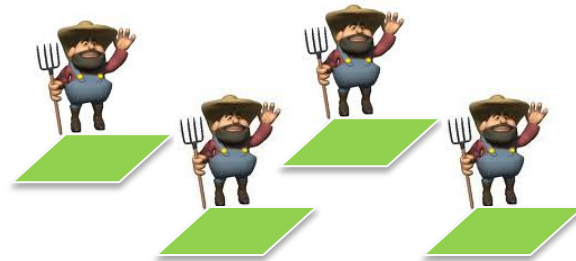


Observed changes

1980s

Present

Structure



Land use



Land tenure

Owned area

Rented area

60 %

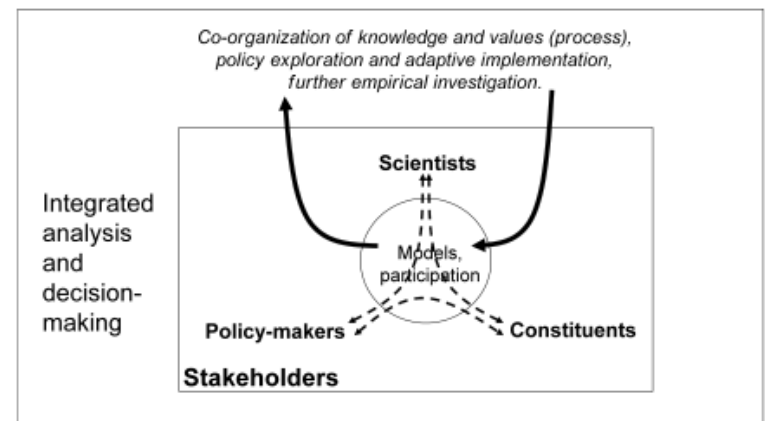
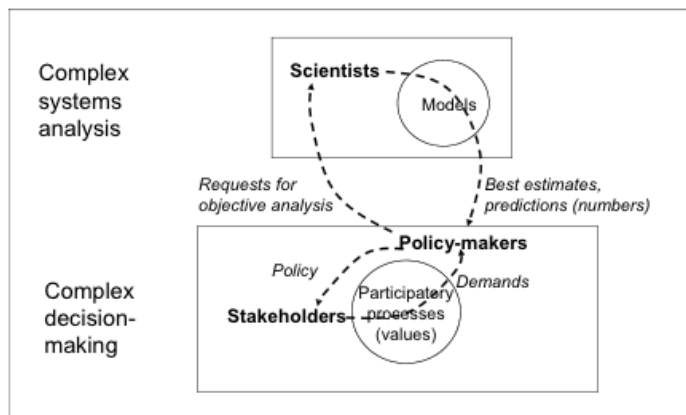
Research and policy questions

- ❑ Understand historical patterns
 - Changes in land use
 - Structural changes
- ❑ Explore future trajectories
 - Climate uncertainty (drier periods?)
 - Economic uncertainty
 - Sustainability concerns
 - Technological innovation
- ❑ Inform policy design
 - Subsidies and (dis)incentives



Why simulation/modeling?

- ❑ Forces *explicit formulation* of relevant processes
 - Identifies relevant processes
 - Clarifies what is (not) understood about processes
 - How well do we need to know value of parameter X?
- ❑ Provides “boundary object” between field, lab and stakeholders
- ❑ Provides insight/support for decisions



Components of the problem

- ❑ Drivers of agriculture in the Pampas
- ❑ Relevant actors
- ❑ Actors' mental models about the problem
- ❑ Variables
- ❑ Relationships among variables
- ❑ Feedbacks (ciclos de retroalimentación)

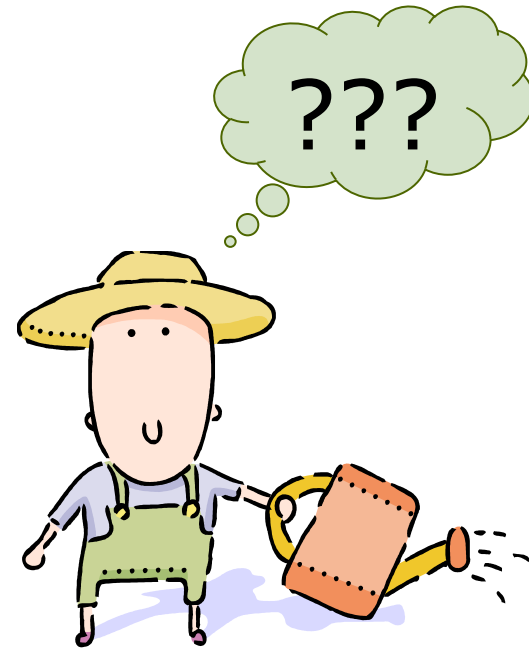
Drivers of change



Relevant actors in agriculture

□ Farmers

- Buy or rent more land?
- Activities
 - Crop mix? Cattle?
- Management
 - How much fertilizer?
 - What crop varieties?
- Financial management
 - Futures markets



Life Cycle Assessment (LCA)



BIOPLASTICS

Transport

Water

Fertilizer,
Pesticides

Equipment



Typically starts with crops such as sugar cane, corn, or wheat that are high in starch. These are the raw materials that are used to produce bioplastics.



Extraction

The plant materials are harvested and processed to extract their starches.



Refining

The starches are processed further in bio-refineries using the use of special enzymes and fermentation (much like beer) to produce chemical compounds that can be used to make plastics. These can be refined to fit the specifications manufacturers need for different products.

Electricity

Natural gas

Additives

Water

Transport

The Life Cycle of Bioplastics

Some bioplastics decompose in a fairly short period of time, and the full life cycle of such products is shown here. Other bioplastics aren't biodegradable. But even in those cases, the use of plant-based raw materials means that pollution is being removed from the atmosphere while the plants grow, giving bioplastics a green appeal.

Land



Compost and Renewal

The organic waste will compost and return to the earth as mulch to help new crops grow, completing the cycle.

Disposal

When disposing of a bioplastic product that is fully biodegradable, consumers can place it in an organic-waste collection bin.



Manufacturing

Electricity

Transport

compounds
cup linings,
products.

Transport

GmbH; WSJ reporting

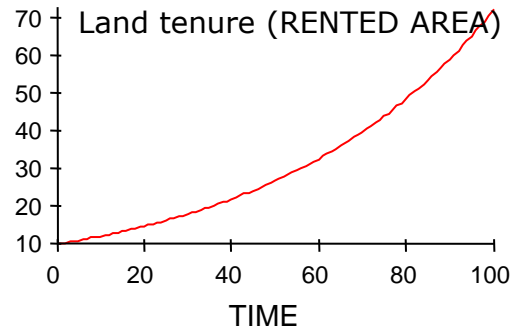
Advantages of system dynamics modeling

- ❑ The Structure of the system generates Aggregated patterns
 - ❑ Land use
 - ❑ Technology diffusion
- ❑ Decision making and policy design from the learning perspective
- ❑ Systemic perspective
- ❑ Multi cause–effect explanations
- ❑ Understanding of non linearities
- ❑ Not only computerized modeling
- ❑ Tools for mental models sharing

What is systems dynamics modeling?

Emphasis in understanding and policy design

BEHAVIOR - COMPORTAMIENTO

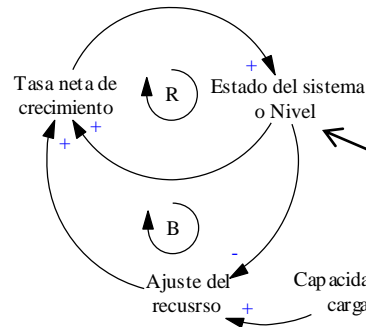


Real systems

Virtual systems

Mental models

STRUCTURE



Policy making

Decision making

Advantages of agent-based modeling

- ❑ Aggregated patterns *emerge* from individual decisions: microscopic → macroscopic
 - ❑ Land use
 - ❑ Technology diffusion
- ❑ Heterogeneity in...
 - ❑ Decision-makers (personality, goals, experience)
 - ❑ Environmental, economic, social contexts
- ❑ Interactions between agents
 - ❑ Channeled through social networks
 - ❑ Imitation, learning
 - ❑ Social norms, social status

What is agent-based modeling?

