Farm-Level Decision Analysis: Introduction

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Farm-Level Decisions

A Few Climate-Sensitive Examples

- Farm resource acquisition and allocation
- Enterprise portfolio / risk management
- Interactions between enterprises
- Farm vs. non-farm livelihood activities
- Work vs. leisure
- Household consumption
Farm-Level Decisions

Farm Resource Allocation

How do I allocate farm land among competing production enterprises? ...between production and fallow? ...between annual crops and tree crops or forest?

How much time should my family members spend on each enterprise? How do I manage the timing of activities to make best use of limited labor?
Farm-Level Decisions

Farm Resource Aquisition

When should I purchase or replace equipment?

Should I hire seasonal labor? ...permanent labor?

Should I purchase a draft animal or hire someone to do my plowing this year?
Low Correlation + Diversification = Reduced Risk

PA & B independent (not correlated) random normal

\[ C_t = 0.5 A_t + 0.5 B_t \]

\[ SD_A = 1.027, \quad SD_B = 0.964, \quad SD_C = 0.510 \]
Farm-Level Decisions

Enterprise Portfolios

- For n = 1, SD = 0.93
- For n = 2, SD = 65
- For n = 3, SD = 0.58
- For n = 5, SD = 0.45
- For n = 10, SD = 0.31
- For n = 20, SD = 0.19
Should my son help me cultivate all of my land, or should we grow less, and send him to look for temporary employment in the city?
Suggested Strategy

PStart with the farmers (maybe their advisors). Involve them throughout.

PUnderstand farmer goals

PInventory important decisions:

<Which are most sensitive to climate forecasts?
<Which of these are inherently farm level?
<What influences constrain each?
Suggested Strategy

PSimulate, analyze, perhaps optimize individual enterprises first

PStructure decisions & determinants in LP tableau. Adapt “textbook” examples.

PGeneralize to nonlinear
  \(<\text{Start with simplest (e.g., only land constraints)}\>
  \(<\text{Add activities and constraints incrementally}\>

PLet farmers validate and refine
Market Impacts

What happens if many farmers try it?

If wise use of climate forecasts would benefit a typical Argentine sunflower farmer an average of $5000 y^{-1}$, what would the benefit be if 20,000 similar Argentine farmers used forecasts similarly?

$20,000 \times 5000 \text{ y}^{-1} = 100,000,000 \text{ y}^{-1}$?
Market Impacts

Price

Quantity

D
Market Impacts

Price

Quantity

S

D

P

Q
Market Impacts

Price

Quantity

D
S

P

consumer surplus

Q
Market Impacts

- **Quantity**
  - producer surplus
  - consumer surplus
Market Impacts

What factors disadvantage producers?

PSteep (inelastic) demand

- Small portion of family expenditure
- Necessity
- Few substitutes
Market Impacts

What factors disadvantage producers?

P Small market relative to production effects of forecast use

< Homogeneous response to forecasts by large-scale producers and/or large number of producers

< Local or specialty commodity

< Perishable or otherwise difficult to transport

< Constrained by processing or transportation system