

Risk in Agricultural Management Decisions

AEC 851 – Agribusiness
Operations Management
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What is Risk?

- “Risk is uncertainty that affects an individual’s welfare, and is often associated with adversity and loss.”
(Bodie & Merton, quoted in J. Harwood et al., p. 2)
- “Uncertainty [is] a situation in which a person does not know for sure what will happen.”

Agricultural Business Risks

- Production
- Marketing
- Financial
- Legal (Institutional)
- Human resources

Managing Production Risks

- Production risks:
 - Yield
 - Quality
- Sources of agric. production risk
 - Weather
 - Pests
- Management tools:
 - Product diversification
 - Spatial dispersion
 - Crop insurance
 - Hail, Yield (multi-peril)
 - Revenue
 - Production contracting
 - Share cropping
 - Technologies to cut risk
 - Disease resistant seed
 - Pesticides
 - Irrigation

Marketing Risk

- **Risk types**
- Price risk
 - Products
 - Inputs
- Demand risk
(quantity of sales)
- **Marketing risk tools**
- Storage
- Timely cash sale
- Contracts
 - Marketing
 - Production
- Futures
- Options
- Marketing cooperatives
- Direct marketing

Contracts & Options

- **Mktg. contract types**
- Deferred payment
- Deferred delivery (cash forward)
- Basis
- Deferred price
- Minimum price
- Hedge-to-arrive
- **Futures & options**
- Short futures hedge
 - Minimum price contract
- Put option
 - Option to SELL at a set price
- Call option
 - Option to BUY at a set price

Financial Risk

- Bankruptcy risk
 - Leveraging
 - Borrowing capacity as a resource
- Equity risk
 - Land markets may affect equity, even if no debt
- Interest rate risk for variable rate loan
- Liquidity & cash flow risk
 - Meeting payment obligations when due

Legal Risk

- Business organizational form affects:
 - Legal liability
 - Income taxation
 - Estate transfer
- Statutory compliance
 - Worker safety, housing, odors, etc.
- Tort liability
 - Employees
 - Environmental liability

Human Resource Risk

- Family communication
 - Estate planning
- Employee satisfaction
 - Hiring, orientation, training
 - Communication & interaction
 - Performance appraisal
 - Compensation
 - Discipline

- With all these types of risk and tools available to manage it, how to decide where to focus?

Analyzing Risk

- What form of risk analysis to use?
 - Available information on probabilities
 - Time & effort suitable
- Tools work best for structured or semi-structured problems
 - With risk preferences unknown
 - Break-even, scenario analysis, risk efficiency
 - With risk preferences known (risk-weighted)
 - Certainty equivalence in Monte Carlo simulation, math programming

Risk Analysis Approaches

	Risk Preferences	
	Unknown	Known
Probabilities missing	Break-even - Budgets - Programming (LP) Scenario analysis Minimax, safety-first, etc.	
Probabilities present	Risk efficiency (stochastic dominance) LP sensitivity w/ probability Stochastic budgeting	Risk programming - Quadratic programming-QP - MOTAD, chance-constrained Generalized stochastic dominance

Risk Analysis Approaches – Focus in this Course

	Risk Preferences	
	<i>Unknown</i>	Known
Proba- bilities missing	<i>Break-even</i> - <i>Budgets</i> - <i>Programming (LP)</i> <i>Scenario analysis</i> <i>Minimax, safety-first, etc.</i>	
Proba- bilities present	<i>Risk efficiency (stochastic dominance)</i> <i>LP sensitivity w/ probability</i> <i>Stochastic budgeting</i>	Risk programming - Quadratic programming-QP - MOTAD, chance-constrained Generalized stochastic dominance