

# Economics of Risk Management in Agriculture

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# Fundamental Problem of Farmers

- In market-oriented agricultural sectors, farmers choose which crops to grow and how best to grow them by considering potential profits and potential risks.
- In general, there is a tradeoff between potential profit and risk.
- Successful farmers will be those that choose high-profit activities who successfully manage associated risk.



# Sources of Risk in Agriculture

- Common risks of farmers and non-farmers
  - Property: Damage to buildings and equipment
  - Casualty and health: Loss of life or injury
- Farmers face unique risks
  - Damage to crops from adverse weather or unexpected disease or insect infestations
  - Unexpected declines in price
- Farmers also face new risks
  - BSE, foot and mouth disease, avian flu have led to widespread loss of markets, especially export markets. Result is large price decline.



# Management of Property and Casualty Risk

- Use Insurance
  - Self-insurance: farm assets cover the loss
  - Market insurance: insurance company covers the loss in exchange for an annual pre-paid premium
- First Principle of Insurance:
  - Premiums of the many pay the losses of the few.



# Management of Yield Risk

- Diversification of production across space and crops.
  - Don't put all your crops into one area (if possible)
  - Don't plant only one crop
  - Raise both crops and livestock
- Buy crop insurance



# Types of Crop Insurance

- Insure each crop separately,
  - Most complete and expensive insurance
- Or pool production from multiple crops
  - Reflects actual financial risk
- Insure individual yield,
  - Most complete and expensive insurance
- Or, insure area yield
  - Easier to implement and more cost effective



# Other Crop Insurance Decisions

- How low should deductible be?
  - Cost of insurance rises dramatically as insurance deductible decreases.
- What role should government play?
  - Farmers are often reluctant to buy crop insurance without some help with premium.
  - Justification for premium help is that crop insurance could replace disaster aid.



# Management of Price Risk

- Government programs can create a minimum guaranteed price
  - Intervention price in CAP
  - U.S. loan rate
- Price risk can be hedged with futures or options on futures



# Hedging Price Risk with Futures

- On October 1, 2003, Kansas wheat farmers could have sold their 2004 crop for \$140/mt by selling a July 2004 futures contract on the Kansas City Board of Trade.
- If wheat price at harvest in July is \$90/mt:
  - Farmer buys a futures contract for \$90/mt for a net gain of \$50 on the futures market
  - Farmer sells wheat for \$90/mt in the cash market
  - Net position is \$90 plus \$50 = \$140/mt
- If wheat price at harvest is \$180/mt:
  - Farmer buys a futures contract at \$170/mt for a net loss of \$30 on the futures market
  - Farmer sells wheat for \$170/mt in the cash market
  - Net position is \$170 minus \$30 = \$140/mt



# Hedging with Options

- On October 1, 2004, Kansas wheat farmers could have bought an option that gave them the right to sell a July futures contract for \$140.
- If wheat price at harvest is \$90, exercise the option.
  - Sell a futures at \$140, buy one at \$90, for a gain of \$50.
  - Sell the crop for \$90, for a net of \$140.
- If wheat price at harvest is \$170, do not exercise the option.
  - Sell the crop for \$170
- Options reduce the downside risk without giving up the upside potential.



# But Options Cost Money



# No Government or Futures Markets?

- Alternative 1. Enterprise diversification.
  - Downside risk from a diversified farm is much lower than a non-diversified farm.
- Alternative 2. Forward contract with processor.
  - Many U.S. producers doing this
    - Processing tomatoes and potatoes
    - Specialty grains
    - Cattle and hogs



# Downside of Hedging or Forward Contracting

- Suppose a farmer promises to deliver a certain quantity for a certain price at some time in the future. But then poor growing conditions occur and the farmer produces less than the agreed-upon amount.
  - If the harvest price is lower than the hedge price, farmer benefits by buying low and selling high to fulfill the contract.
  - If the harvest price is higher than the hedge price, the farmer must buy high and sell low, thereby losing an additional amount.



# Best and Worst Case Scenarios

- Best Case: Price is high and yield is high and farmer has not bought insurance or forward contracted crop.
- Worst Case:
  1. Price is low and yield is low, and farmer has not bought insurance or forward contracted crop.
  2. Price is high, yield is low and the farmer has forwarded contracted the crop, but has no yield insurance.



# What About Revenue Insurance?

- Most efficient insurance is to provide a revenue guarantee:
  - Insurance makes up the difference between harvest revenue (harvest price times yield) and a revenue guarantee.
- Two kinds of revenue guarantee:
  - Fixed guarantee = expected yield times expected price
  - Variable guarantee = expected yield times harvest price



# Crop Insurance and Price Insurance Work Together

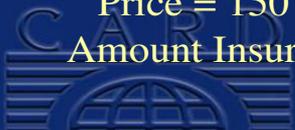
- Yield or revenue insurance decisions help reduce the additional marketing risk that occurs when farmers hedge their crop.
- The best yield or revenue insurance replaces lost production at actual harvest price.



# Revenue Outcomes from Alternative Price and Insurance Scenarios

	Market Revenue	Hedge Revenue	Yield Insurance	Revenue Insurance	Total Revenue
<b>No Hedge, No Insurance</b>					
Price = 50	25,000	-	-	-	25,000
Price = 100	50,000	-	-	-	50,000
Price = 150	75,000	-	-	-	75,000
<b>No Hedge, Yield Insurance</b>					
Price = 50	25,000	50,000	50,000	-	125,000
Price = 100	50,000	-	50,000	-	100,000
Price = 150	75,000	-	50,000	-	125,000
<b>Hedge, No Insurance</b>					
Price = 50	25,000	50,000	-	-	75,000
Price = 100	50,000	-	-	-	50,000
Price = 150	75,000	(50,000)	-	-	25,000
<b>Hedge, Yield Insurance</b>					
Price = 50	25,000	50,000	50,000	-	125,000
Price = 100	50,000	-	50,000	-	100,000
Price = 150	75,000	(50,000)	50,000	-	75,000
<b>Hedge with Revenue Insurance</b>					
Price = 50	25,000	50,000	-	75,000	150,000
Price = 100	50,000	-	-	50,000	100,000
Price = 150	75,000	(50,000)	-	75,000	100,000

Amount Insured and Hedged = 1000 mt. Actual Production = 500 mt



# Conclusions

- In deciding what type of crop insurance programs should be developed, countries need to look at both price vulnerability and yield vulnerability.
- Move to decoupled payments in the CAP increase market orientation but also vulnerability to price risk.
- Will Italian farmers start using price insurance (hedging and forward contracts) to reduce this new vulnerability?
  - If so then best approach to crop insurance is to provide farmers the opportunity to have indemnities based on harvest prices.
  - If not, then indemnities can be based on expected price.

