Strategic Risk Management and Agribusiness

Farm Credit West
Young Farmer and Rancher Executive Institute
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“Risk management is not a checklist; it is a mentality that needs to be top-of-mind.”

– Frederick W. Smith, Chairman, President, CEO
FedEx Corporation
Need to Know the Costs

• Costs are Determined by Industry Structure
• Difficult if You Don’t Know Costs of
  – labor
  – water, seed, fertilizer, feed, services
  – regulation
  – equipment
  – maintenance
  – shipping
• Most Don’t Know Cost of an Important Input
What Does Money Cost?

• Very Important Input
  – what does money cost?
  – A = L + E
  – WACC = w_d r_d (1 – t) + w_e r_e

• Part of Cost of Risk
Risk and Uncertainty Are the Rule

- Risk and Uncertainty are Not Well Understood
- Tendency to Confuse Risk and Uncertainty
- Uncertainty Implies Risk; Risk Implies Danger; Danger Implies Loss
- Risk is Quantifiable; Uncertainty is Not
  - if we can measure we can try to manage
  - we can see it
  - if we can’t measure or see it, it is unknown, uncertain
- Examples?
Greater Risk and Uncertainty Ahead

• Typical Responses
  – insurance (buy policies, build reserves)
  – focus on managing revenue
  – change inventory levels (buffer stocks)
  – diversify production geographically
  – pay down debt; deleverage; sell assets
  – reduce time exposure to risk
  – try to time markets
  – restructure operations

• Benchmark: Do Nothing; Hope for the Best
Broad Trends Driving Risk

- Global Demand for Agricultural Products
  - growth rate of 2% to 3% per year

- Increasing Productivity in Agriculture
  - yield growth rate of 0.5% to 1.0% per year
  - needs to grow 1.5% per year to keep up with population growth

- Ag Biotech
  - could increase productivity rate to 3% to 3.4% per year by 2030

Sources: The Economist
Federal Reserve Bank of Kansas City
Re-examine Risk Management

• No Risk, No Reward
  – no one has problem with prices going up
  – when prices go down there is trouble
  – can’t have one without the other

• Ag Risk Understood Generally in Terms of
  – prices
  – yields
  – revenues

• Result: Risk Management Focus on Revenues
Risk Represents a Cost

- Company is Portfolio of Assets
  - assets have value \( A = L + E \)
- Risk is About Future Losses
- Managing Risk Incurs Costs Today
  - insurance, opportunity, loss of assets, capital losses, etc.
- Reduces Present Value of Firm’s Operations
  - increased cost of capital
What Risks to Manage?

• Financial and Market Risk Are Most Familiar
  – faced by most actors in supply chain
  – common tools and strategies available

• Many Variables to Consider
  – what is the scope of your market?
  – global, international, national, regional, local
  – who are your financial partners?
  – Farm Credit West, others (commercial, local, regional, national, too-big-to-fail)
Risk is Built In to the Industry Structure

The Five Forces That Shape Industry Competition

- Threat of New Entrants
- Rivalry Among Existing Competitors
- Bargaining Power of Suppliers
- Threat of Substitute Products or Services
- Bargaining Power of Buyers
Where Are You in the Big Picture?

• Risk Depends on Industry Structure
• Substitute Products? Complementary Products?
• What Are Their Specific Risks?
• How Do Risks Differ by Role in Industry?
• How Do You Fit into Supply Chain?
How Do You Fit In?

Foreign Markets

Exporters

Processors

Distributors/Brokers

Producers

Input Suppliers

US Markets

Retailers

Services

Ag Support

Logistics

Finance

Technical

Financial Flows

Product Flows

Information Flows

Source: World Bank, ARD
Source: dairyfootprint.org
Demand-Driven Supply Chain (DDSC) is a set of capabilities that enables enhanced value chain performance and profitability.

**Old Way Of Thinking**
- Retailer Focus
- Standard Assortment
- Warehouse Orientation
- Order Management

**New Way Of Thinking**
- Shopper Focus
- Smart Assortment
- Store Execution Orientation
- Consumption Management

**Demand Driven Value Chain**
Leveraging POS and Predictive Analytics

New Data + Greater Detail + Faster Decisions = A New Way to Win

Source: Glenn Seymour, ConAgra Foods
THE FOOD SUPPLY CHAIN

Imports
- Water
- Energy
- Transport
- Fertilizers
- Machinery
- Water
- Energy
- Transport
- Materials
- Equipment
- Chemicals
- Water
- Energy
- Transport
- Equipment
- Sellers
- Water
- Energy
- Transport
- Equipment
- CONSUMERS

System Inputs
- Breeding
- Seed Production
- Agricultural Growing
- Packaging
- Processing
- Final Manufacture
- Merchants
- Wholesalers
- Retailers
- Food Service
- Green Grocers
- CONSUMERS

Supply Chain Stage
- Exports
- Air Emissions
- Waste Water
- Waste
- Waste Water
- Waste
- Waste
- Waste

Outputs
- Air Emissions
- Waste Water
- Waste
- Waste Water
- Waste
- Waste
- Waste
- Waste

Exports
- Air Emissions
- Waste Water
- Waste
- Waste Water
- Waste
- Waste
- Waste
- Waste

Source: http://guides.library.duke.edu/food_energy
Hard to See the Forest for the Trees

- Risk Picture is Very Complicated
- We See Only Our Link and a Few Others
- Our Links Fail; Disaster for Us (and Possibly Others)
  - certainly trouble for others
- Their Links Fail; Disaster for Them (and Possibly Us)
  - other links fail beyond our control
  - risk? or uncertainty?
Some Goals

• Minimize Risks
  – cannot eliminate risks

• Understand Risk-Return Relationship
  – maximize returns for risks we take
  – a definition of efficiency

• Learn from Failure
  – cannot avoid failure

• Assure Failure is not Catastrophic
  – need to manage failure
Re-examine Risk Management

• Need to Diversify Our View of Risk
  – what are our immediate risks?
  – what are risks of those we are linked to?
  – what are other risks in the system?

• Understand Our Risks
  – risks we take
  – risks others take that we are exposed to

• Understand Risks We Present to Others
  – risks we expose others to

• Risk Management is Strategic For System
Rice Prices, 1970 to 2010
Rice Yields, 1970 to 2010
Orange Prices, 1970 to 2010

[Graph showing the price of oranges from 1970 to 2010.]
Orange Yields, 1970 to 2010
Strawberry Prices, 1970 to 2010
Strawberry Yields, 1970 to 2010
Almond Prices, 1970 to 2010

$0.00
$0.50
$1.00
$1.50
$2.00
$2.50
$3.00

Almond Yields, 1970 to 2010
What About Costs?

• Must Manage Revenue Side
• Costs are Major Source of Risk
  – land, fertilizer, energy, water, seed, weather, pests, disease, regulations, technology, food safety, foreign currency
  – all require management
Nominal and inflation-adjusted farm production expenses, 1970-2013F

F = Forecast. Values are adjusted using the chain-type GDP deflator, 2005=100.

Source: Farm Income and Wealth Statistics, Economic Research Service, USDA.

Data as of February 11, 2013.
Principal crop-related and fuel/oil expenses, 2003-2013F

$ billion

Fertilizer

Seeds

Fuels & oils

Pesticides


F = Forecast.
Source: Farm Income and Wealth Statistics, Economic Research Service, USDA.
Data as of February 11, 2013.
Anhydrous Ammonia, 1970 to 2012
CA № 2 Diesel Prices, 1995 to 2012
Interest Rates, 1962 to 2012

10-Year Treasury Constant Maturity Rate (DGS10)
Source: Board of Governors of the Federal Reserve System

Shaded areas indicate US recessions.
2012 research.stlouisfed.org

Source: Federal Reserve Bank of St. Louis
Regulatory Risk, Economic Loss

Source: The Impact of California Regulatory Compliance Costs on California Orange Producer Profitability
Government payments, 2003-2013F

F = Forecast.
1/ Production flexibility contract payments and direct payments whereby payment rates are fixed by legislation.
2/ Counter-cyclical payments, average crop revenue election (ACRE) payments, loan deficiency payments, marketing loan gains, and certificate exchange gains in which commodity payment rates vary with market prices. The certificate exchange program ended after making payments for the 2009 crop year.
3/ All other payments include disaster relief payments, tobacco transition payments, and dairy program payments.

Source: FSA, NRCS, and CCC. Data as of February 11, 2013.
Hope is Not an Option

• Risk Management is a Strategic Function
  – core competitive advantage
• Major Management Responsibility
  – operations, harvest, distribution, sales
  – operations and finance intersect in margins
  – integral part of strategic activities
  – contributes to success or failure of company
  – needs daily attention, high level of expertise, and good information
Reconsider Our Treatment of Risk

- Mistake to Focus Mainly on Prices
  - ignores effect of financing and capital costs
- Must Focus on Revenues and Costs – Margins
- Margin Risk Management is Key Strategic Competence
Two (Related) Types of Ag Risk

- Operations and Financing
  - price, cost, and yield
  - debt (including interest expense)

- They Can be Related
  - debt incurred to cover thin or negative margins

- Address Margin Risk Perspective
  - revenue is volatile; a function of price and yield
  - costs are volatile
  - margin risk results
Managing Margin Risk

• Operational and Financial Risks Intersect in Margins
  – low prices, high costs, low yield
  – margins indicative of risks in other areas
  – manage margins and address broader risk issues

• Important Strategic Function
  – success or failure can depend on margin management strategy

• Revenues, Input Costs, and Yields Volatile
• Margin Volatility Even Greater (2× to 4×)
U.S. Farm Gross Cash Income
Total Cash Receipts Plus Other Farm-Related Income

- Record Farm Cash Receipts expected in 2012 & 2013
- Other Farm-Related Income at historic levels in 2011 & 2012 drought years
- Crop insurance indemnity payments is major component of Other Farm-Related Income

Net farm income and net cash income, 2000-2013F

$ billion

Net cash income
(and 10-year average)

Net farm income (and 10-year average)

F = Forecast.
Finance: a Central Strategic Function

- Credit Harder to Acquire
- Agribusinesses Have to Manage Margins
  - stabilize margins at some acceptable range
- Agribusinesses to Become More Cost Sensitive
  - more input needed to meet additional demand
  - reluctant to let costs eat into margins
- Agribusinesses to Become More Efficient
  - demand same from suppliers
Farm Credit Administration Says

- A Borrower Needs to Demonstrate to Lenders He (or She):
  - has risk management plans in place
  - understands risk management practices (strengths and weaknesses)
  - can report on your evolving risk management practices
  - can maintain sufficient working capital and liquidity for bad times
Farm Credit Administration Says

• Borrowers Should Have
  – business and marketing plans
  – a succession plan
  – hedging and insurance strategies
  – separate line of credit for risk management activities
Managing Revenue Risk

Focus on Stabilizing Revenue

- Revenue
- Costs

Time

$
Managing Cost Risk

Focus on Stabilizing Costs

- Revenue
- Costs

Time

$
Managing Margin Risk: Two Goals

- Minimize Volatility
  - revenues
  - costs

- Maintain Revenues in Excess of Costs
  - margin will squeeze; that’s OK
  - minimize chance of going negative

- Do These Simultaneously
Managing Margins

Focus on Stabilizing Margins

- Revenue
- Costs
Margin Management at Work: The Case

- Iceberg Lettuce Grower and Shipper
  - leases 1500 acres in Salinas Valley
  - two harvests a year
  - 850 cases per acre average
  - borrows 50% of cultural costs
  - rule of thumb: hedge 80% of production
The Problem

- Farm Credit Wants Operator to Manage Margins
  - default risk too high
  - operational (not credit) issue
  - condition of credit
  - manages risk to revenue using forwards
  - hedge ratio insufficient
  - no management of risk to costs
## Revenues Driven by Spot and Yield

<table>
<thead>
<tr>
<th>Year</th>
<th>Average Spot Price</th>
<th>Yield (40 lbs per carton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>$8.10</td>
<td>850</td>
</tr>
<tr>
<td>2005</td>
<td>$7.93</td>
<td>804</td>
</tr>
<tr>
<td>2006</td>
<td>$10.75</td>
<td>725</td>
</tr>
<tr>
<td>2007</td>
<td>$12.38</td>
<td>830</td>
</tr>
<tr>
<td>2008</td>
<td>$11.93</td>
<td>824</td>
</tr>
<tr>
<td>2009</td>
<td>$9.08</td>
<td>928</td>
</tr>
<tr>
<td>2010</td>
<td>$12.88</td>
<td>983</td>
</tr>
<tr>
<td>Mean</td>
<td>$10.44</td>
<td>849</td>
</tr>
</tbody>
</table>

### Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Yield</th>
<th>Average Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (40 lbs per carton)</td>
<td>1</td>
<td>0.2082</td>
</tr>
<tr>
<td>Average Spot Price</td>
<td>0.2082</td>
<td>1</td>
</tr>
</tbody>
</table>

Forward Contract Prices Vary with Spot Price Between $11.50 and $12.50 on Sliding Scale ($0.25 Increments)
Total Revenue, 50% Leverage, $12.50 Contract
Regression Coefficients

+Yield / Stochastic (Empirical Distribution) 0.94

+Price / Stochastic (Empirical Distribution) 0.33
# Harvest Costs Variable (Yield Driven)

## Cultural Costs Fixed

Production Costs (per Acre, Single Harvest)

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed</td>
<td>$144.00</td>
<td>Total Production Costs</td>
<td>$7,457.06</td>
</tr>
<tr>
<td>Fertilizer</td>
<td>$359.00</td>
<td>Cash Overhead per acre</td>
<td>$130.00</td>
</tr>
<tr>
<td>Weed Control/Thinning Labor</td>
<td>$146.00</td>
<td>Land Rent per Acre</td>
<td>$1,100.00</td>
</tr>
<tr>
<td>Pest Management (includes PCA costs)</td>
<td>$582.00</td>
<td>Interest on Operating Capital (based on 6.275% per year on half of cultural cost)</td>
<td>$38.98</td>
</tr>
<tr>
<td>Water</td>
<td>$280.00</td>
<td>Total Overhead Cash Cost</td>
<td>$1,268.98</td>
</tr>
<tr>
<td>Irrigation Labor</td>
<td>$241.70</td>
<td>Depreciation and Interest on Investments</td>
<td>$50.00</td>
</tr>
<tr>
<td>Tractor Labor</td>
<td>$148.35</td>
<td>Total per Acre Cost</td>
<td>$8,776.04</td>
</tr>
<tr>
<td>Fuel</td>
<td>$172.93</td>
<td>Total Cost less Harvest Cost</td>
<td>$3,803.54</td>
</tr>
<tr>
<td>Tractor and Machinery Cost</td>
<td>$255.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervision and General Labor</td>
<td>$105.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compost</td>
<td>$50.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Cultural Costs</td>
<td>$2,484.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fresh Market Harvest Cost ($/Carton)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cut/Pack/Haul</td>
<td>$5.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Yield/Acre (Cartons)</td>
<td>850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Harvest Cost (cooling, palletize, and sell) per acre</td>
<td>$4,972.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
No Hedge, 50% Leverage

$\sigma_{Revenue} = $1464

$\sigma_{Cost} = $498
100% Hedge, 50% Leverage, $12.50 Contract

σ_{Revenue} = $894  
σ_{Cost} = $492
Hedge at $12.50: Net Income, Total Costs, Total Revenue...
The Hedge

• Analysis Says 100% Hedge at $12.50 is Sensible
• In Practice, 80% Hedge Ratio
  – acting as though contract price is $11.25
  – locking in a reduction in net income
• Why Take the Risk?
  – retail market and supply chain dynamics
  – strategy not focussed on minimizing margin risk
  – trading upside for chance at extra $150 per acre
  – self-insured; moral hazard; “What the hell?” attitude
80% Hedge Ratio (@ $11.25 Contract Equivalent)
Net Income with 50% Leverage

Net Income

-5,000 -4,000 -3,000 -2,000 -1,000 0 1,000 2,000 3,000 4,000 5,000 6,000

Cum Probability

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

-5,000 -4,000 -3,000 -2,000 -1,000 0 1,000 2,000 3,000 4,000 5,000 6,000

No Hedge

All Hedge, $12.50 Contract

All Hedge, $11.25 Contract
P&L For Resulting Hedge

Cum Probability

Net Income
Strategic Implications

• Manage to Stabilize Margins
  – focus on managing costs as well as revenue
  – no perfect hedge; basis risk remains

• Use Crop Insurance When Needed

• Optimize Leverage
  – pay down debt if overleveraged
  – don’t overextend financial situation
Strategic Implications

• Prepare to Adapt and Change
  – in other words, research, develop, innovate

• There Will be Failure; Risk Taking Required
  – small scale failure (no catastrophes)
  – fail quickly, learn, move on
  – risk management more important than ever

• Innovation Creates Value
  – share risks and benefits with others in supply chain
Margin Risk Management Benefits

- Improve Financial Position
  - build up financial reserves
- Provides for Moderate Growth
  - costs of capital should increase in future
- Strengthens Cost Controls
- Improves Operational Efficiencies
- Requires Focus on Strategic Investments
- Makes Your Lender Happy
Data Sources

• Dr. Jay Noel, Chair, Agribusiness, Cal Poly
• University of California Cooperative Extension (2009)
• USDA Agricultural Marketing Service Market News
• Monterey County (CA), Office of the Agricultural Commissioner
• Proprietary Sources
Contact Information

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