Farm Management Principles

I. Factors of Production

The Production Function
Historical Perspective
What Is Management?

II. Decision-Making

Process
Principles

III. Decision-Making

Information
Techniques

IV. Resource Acquisition

Size Economics
Capital and Credit
Buy vs. Lease

V. Resource Use

Enterprise Selection
Efficiency

by

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Department of Agricultural Economics
and Rural Sociology
The Ohio State University

February 1989
I. FACTORS OF PRODUCTION

The Production Function

Historical Perspective

What Is Management?
A. The Production Function

1. Mathematical Formulation

\[ y = \]

\[ x = \]

\[ f = \]
2. Graphical Representation
B. Historical Perspective

1. Greek Philosophers
   a. Aristotle (384-322 B.C.)
   b. Prohibition of Usury
   c. Religious Perceptions
2. French Physiocrats (1700's)

a. Industry and Commerce Were Unproductive

b. Land and Land Products Were Only Real Wealth

c. Prosperity Rested on Freedom

d.
3. English Political Philosophers (1700’s)
   
a. Determinants of Prices

b. Concept of Rent

c. Profit Generation

d.
4. Marxian Philosophy (mid-1800's)

a. Factory System of Production

b. Exploitation

c. Labor Theory of Value

d.
5. Marginal Economists  
(late 1800's/early 1900's)

a. Mathematicians  
b. Application to Production  
c. Marginal Theory of Distribution  
d.
6. Austrian Economists (turn of century)

a. Factors of Production

b. Original Factors

c. Produced Factors

d.
7. Current Economics (20th Century)

a. Same Factors Yield Different Results

b. A Second Produced Factor

c. Managerial Revolution

d.
C. What Is Management?

1. Frequently-Heard Cliché
   a. "The Key to Success"
   b. "Difference Between Success and Failure"

2. Nebulous Definitions
   a. Art and Science
   b. Combining: Ideas, Facilities, Materials, ...
   c. For a Profit

3. Useful Farm Definition
II. DECISION-MAKING

Process

Principles
A. The Decision-Making Process

1. What Makes a Farmer Successful?

   a. Mechanical Ability?
   b. Agronomist?
   c. Animal Scientist?
   d. Managerial Ability?
2. Managerial Decisions

a. Production
   - why?
   - what?

b. Acquisition
   - how much?
   - how?
   - when?
   - where?

c. Marketing
3. Decision-Making Steps

a. Set Goals
b. Problem Recognition
c. Gather Information
d. Assessing Alternatives
e. Decide
f. Take Action
g. Accept Responsibility
h. Evaluate Decision
B. Fundamental Economic Principles

1. Production Concepts

a. Fixed and Variable Factors

b. Diminishing Returns

1) Added Output from Added Input Decreases

2) Results from Fixed Factors

3) Graphic Representation
c. Factor Substitution

1) Different Combinations
   Yield Constant Output

2) Substitution Ratio
   Changes

3) Graphic Representation
d. Product Combinations

1) Same Factors Can Produce Different Products

2) Competing Factor Use

3) Graphic Representation
2. Cost Concepts

a. Cash/Non-Cash
   1) Out-of-pocket
   2) Opportunity
   3) Depreciation

b. Fixed/Variable
   1) Avoidance and Variation
   2) Total, Average, Marginal
   3) Graphic Representation
3. Revenue Concepts
   a. Total
   b. Marginal

4. Profit Concepts
   a. Marginal Revenue - Marginal Cost
   b. Equal Marginal Revenues
   c. Least-Cost Combination of Factors
   d. Most Profitable Combination of Outputs
III. DECISION-MAKING

Information Techniques
A. Information Needs

1. Accounting
   a. Information Generation
      1) 
      2) 
   b. Permits
      1) Understanding
      2) Application of Principles
      3) Performance and Analysis
      4) Financial Statements
   c. Necessary for Problem Solving
2. Performance Factors and Measures

a. Isolate Strengths and Weaknesses
b. Limitless Set
c. Useful Set for High Priority Problems

1)  
2)  
3)  
4)  
5)  
6)  

d. Use Several Factors
e. Focus on Impact Factors
3. Standards for Comparison
   a. Comparison Necessary
      1) Good/Bad
      2) High/Low
   b. Objectives Will Vary
      1) 3) 3) 4)
      2) 4)
   c. Develop Own Objectives
   d. Sources
      1) 3)
B. Techniques

1. Budgeting: Testing Alternatives
   a. Answer 3 Questions
      1) 
      2) 
      3) 
   b. Types of Budgets
      1) Partial
      2) Total Farm
      3) Cash Flow
      4) Enterprise
C. The Partial Budget

1. Test Affected Part of Business

2. Outline
D. Investment Analysis

1. Time Value of Money
   a)
   b)
   c)

2. Compounding

3. Discounting
4. Net Present Value

a. Steps

1) Investment to Analyze
2) Initial Cash Outlay
3) Annual Net Cash Flows
4) Discount Rate
5) NPV's
6) Decide
### b. Method

<table>
<thead>
<tr>
<th>Item</th>
<th>Years</th>
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<td>0</td>
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- **Cash Flow**
- **NPV**

### c. Issues

1)  
2)  
3)  
4)  
5)  
6)  
7)
d. Interpretation

1) \(+\) NPV Not Necessarily Best

2) Compare Only = Planning Periods

3) Compare Only = Size Projects

4) Assumption

5) Financial Feasibility
IV. RESOURCE ACQUISITION

Size Economics

Capital and Credit

Buy vs. Lease
A. **Size Economics**

1. **Size Change**
   a. 
   b. 
   c. 
   d. 

2. **General Cost-Size Relationship**
3. Technical Economies of Size

a. Only Affect Costs

b. Cost Per $ Gross Income

<table>
<thead>
<tr>
<th></th>
<th>Corn Belt</th>
<th>Grain Farms</th>
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<tr>
<td><strong>Farm</strong></td>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
</tr>
<tr>
<td>Cropland</td>
<td>77</td>
<td>141</td>
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<tr>
<td>Total Cost</td>
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<td></td>
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<tr>
<td>Average</td>
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4. Price Economies of Size

a. Input Price Discounts

Discounts by Farm Size, Ohio Acres

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<th>100-179</th>
<th>260-499</th>
<th>1000+</th>
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<td><strong>% Discount</strong></td>
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<tr>
<td>Seed</td>
<td>2.4</td>
<td>4.3</td>
<td>10.8</td>
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<tr>
<td>Fertilizer</td>
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<td>2.8</td>
<td>6.6</td>
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<tr>
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<td>2.2</td>
<td>7.8</td>
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<tr>
<td>Machinery</td>
<td>1.3</td>
<td>3.8</td>
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b. Product Price Premiums
5. Managerial Economies of Size
   a. Labor Management
   b. Overall Management
B. Capital and Credit

1. How Much Capital?
   a. Equate Marginal Return with i
   b. Relationship

2. Allocation of Capital
   a. Principal: Equimarginal Returns
   b. Budgeting and NPV
3. Acquisition Methods
   a. Owner Equity
   b. Debt
   c. Outside Equity
   d. Lease/Rent

4. How Much Credit
   a. Max = Borrowing Capacity
   b. Maintain Credit Reserve
   c. Profit/Risk/Capacity
5. Leverage

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
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<tr>
<td>Total Assets</td>
<td>Debt</td>
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<tr>
<td>Net Worth</td>
<td>Leverage</td>
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6. Leverage and Profit

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<th>Leverage Ratio</th>
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<td>0.0</td>
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<th>Debt</th>
<th>Total Assets</th>
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<tr>
<td>ROA</td>
<td>R to A</td>
<td>Cost of Debt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>R to HW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ROR to NW</td>
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7. Leverage and Risk

<table>
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<tr>
<th>Leverage Ratio</th>
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<td>0.0</td>
</tr>
<tr>
<td>1.0</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Net Worth</th>
<th>Debt</th>
<th>Total Assets</th>
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<tr>
<td>ROA</td>
<td>R to A</td>
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</tr>
<tr>
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<td>(12%)</td>
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<tr>
<td></td>
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<td>R to NW</td>
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<tr>
<td></td>
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<td>ROR to NW</td>
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8. Repayment Capacity

a. Loan Length and i

<table>
<thead>
<tr>
<th>Repayment Years</th>
<th>Interest Rate 10%</th>
<th>Interest Rate 14%</th>
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<tbody>
<tr>
<td>1</td>
<td>$ 909</td>
<td>$ 877</td>
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<tr>
<td>5</td>
<td>3791</td>
<td>3433</td>
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<td>10</td>
<td>6145</td>
<td>5216</td>
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<tr>
<td>20</td>
<td>8514</td>
<td>6623</td>
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b. Estimating Repayment Capacity

<table>
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<tr>
<th>Description</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Net Farm Income</td>
<td>60,000</td>
</tr>
<tr>
<td>+ Depreciation</td>
<td>+20,000</td>
</tr>
<tr>
<td>+ Interest Paid</td>
<td>+15,000</td>
</tr>
<tr>
<td>- Family Living</td>
<td>-20,000</td>
</tr>
<tr>
<td>- Income Tax</td>
<td>-10,000</td>
</tr>
<tr>
<td>- Current Loan Payments</td>
<td>-40,000</td>
</tr>
<tr>
<td>- Down Payments</td>
<td>-5,000</td>
</tr>
<tr>
<td>+ Non-Farm Income</td>
<td>+3,000</td>
</tr>
<tr>
<td>+ Gifts, etc.</td>
<td>+0</td>
</tr>
<tr>
<td>= Repayment Capacity</td>
<td>=17,000</td>
</tr>
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</table>
C. Buy vs. Lease

1. Land

   a. Which To Do?

      1) Preference to Own
      2) Preferred Loan Security
      3) Windfall Gains/Losses
      4) Flexibility
      5) Expansion
      6) Risk
      7) Changing Economy
      8) Land Security
      9) Living Conditions
     10) Financial Situation
b. Purchasing

1) Max Bid: Profitability

2) Max Bid: Feasibility

3) Risk

4) Ownership Cost
c. Lease

1) Local Custom

2) Fairness

3) Profitable

4) Market

5) Lease Costs
2. Machinery
   a. Purchase
      1) Ownership Costs
         DIRTI 5
      2) Operating Costs
      3) Total Cost Per Acre
b. Lease

1) Control Without Owning

2) Not Widely Used

3) Not Renting

4) Use Situations
c. Use NPV to Decide

### Purchase

<table>
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<th>Item</th>
<th>Year</th>
<th></th>
<th></th>
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<tr>
<td></td>
<td>Year</td>
<td>0</td>
<td>1</td>
<td>5</td>
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<tr>
<td>Purchase</td>
<td></td>
<td>50,000</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Income Tax</td>
<td></td>
<td>0</td>
<td>-7,280</td>
<td>-3,192</td>
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<td>After Tax CF</td>
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<td>-3,192</td>
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<td>Discount F</td>
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<td>.6209</td>
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<tr>
<td>PV</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>NPV</td>
<td></td>
<td></td>
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</table>

### Lease

<table>
<thead>
<tr>
<th>Item</th>
<th>Year</th>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Year</td>
<td>0</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Lease</td>
<td></td>
<td>11,500</td>
<td>11,500</td>
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<tr>
<td>Income Tax</td>
<td></td>
<td></td>
<td>-3,700</td>
<td>-3,700</td>
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<tr>
<td>After Tax CF</td>
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<td>10,000</td>
<td>7,800</td>
<td>1,300</td>
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<td>.6209</td>
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<tr>
<td>PV</td>
<td></td>
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<tr>
<td>NPV</td>
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V. Resource Use

Enterprise Selection

Efficiency
A. Enterprise Selection

1. Determinants of Production
   a. Physical
      Climate
      Topography
      Soils
      Biology
   b. Economic
      Comparative Advantage
      Competitive Advantage
   c. Process
2. Location

a. What Have Farmers Decided?

1) World

2) U.S.

3) Ohio
3. Comparative Advantage

a. Principle

"Produce That Product Where Your Production Advantage Is Greatest or Your Disadvantage Is Least"

b. Illustration

<table>
<thead>
<tr>
<th></th>
<th>Illinois</th>
<th>Kansas</th>
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<tbody>
<tr>
<td>Wheat (bu)</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>Corn</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>Ratio</td>
<td>2.4</td>
<td>2.0</td>
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c. Sources
4. Competitive Advantage

a. Principle

"Produce That Product Which Has Lowest Opportunity Cost"

b. Illustration

c. Source
5. Enterprise Combination

a. Common Sense
   1) Identify Resources

2) Enterprise Examination

3) Choose Most Profitable

4) Next Most Profitable

5) Add Others
b. Linear Programming

1) Elements of Solution

Enterprise Choices

Resources

Requirements

Limits

Net Returns Per Acre
2. Graphical Presentation

\[ \text{Corn} \]

\[ \text{Soybeans} \]
B. Efficiency

1. Definition

2. Inputs

3. Outputs
4. Principles

a. Fixed Inputs

Overhead Cost Per Unit

b. Variable Inputs

1) Not Maximum Output Per Unit

2) Marginal Cost = Marginal Revenue

<table>
<thead>
<tr>
<th>N</th>
<th>N Cost</th>
<th>MC</th>
<th>Yield</th>
<th>MR</th>
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<tbody>
<tr>
<td>30</td>
<td>$ 6.00</td>
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<td></td>
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<tr>
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