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CapEx and ROI: Critical to the Economic Performance of Indoor Agriculture (IA)

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IA Profitability

- All members of the Indoor Agriculture industry are working to enhance their individual profitability.
 - In the light of recent business failures, the search for profitability is crucial for the industry's economic sustainability.
- But profitability is **not** just about having revenues exceed costs
 - Positive net income is just the start of profitability.
 - Return on Investment (ROI) is a much more powerful measure of profitability.
 - ROI is what attracts investors.
 - Venture capitalists want 30-40% ROI. Individual entrepreneurs often target 10-20%.
 - ROI can be used to evaluate individual investment opportunities.
 - ROI can also be used to measure and manage performance of an entire IA farm.
- ROI is critical to IA performance because of the large **capital expenditures (CapEx)** needed to invest in a complete farming system.



IA Cap EX

- **CapEx represents the investment in long-term assets**, including:
 - Plant growing infrastructure (trays, towers, HVAC, and delivery systems for light, water, and nutrients)
 - Controls (computers, sensors, and software to optimize the plant environment)
 - Plant harvesting and packing equipment
 - Buildings and property
- **IA CapEx normally exceeds that for greenhouses and field grown systems.**
 - Greater investment for enclosed facilities, vertical technology, and environmental controls
 - Greater investment due to little standardization in growing infrastructure and controls
- **IA CapEx varies widely farm by farm** depending on the system components and how they are integrated and controlled.



Interactions between IA CapEx and OpEx

- **IA farms need to offset high CapEx by lowering operating costs (OpEx) or enhancing revenue:**
 - Efficiencies in operating costs (energy and labor most especially)
 - Enhanced plant output and quality
 - Revenue enhancement based on market prices that realize the value of enhanced output attributes (taste, freshness, and consistency in supply)
 - Renting and leasing buildings and property as opposed to outright ownership (turning what would otherwise be CapEx into operating expenses)
- **As opposed to CapEx (balance sheet assets), OpEx are the daily costs (income statement items) needed to run the business and turn out marketable produce.**
 - The Big Three Cash OpEx: Labor, energy, and consumables (growing media, seeds, water, etc.)
 - The fourth critical OpEx is depreciation (non-cash).
 - It represents the consumption of CapEx over time—an interaction between balance sheet and income statement.
 - Just as with CapEx, OpEx varies widely depending upon the production system.
 - More automation (increased capital cost) can lower operational labor costs and plant growing costs.
 - Conversely, more labor can substitute for more capital.



The DuPont Analysis of ROI

$$\begin{aligned} \text{Return on Investment (ROI)} &= \frac{\text{Income}}{\text{Investment}} \times 100 \text{ (to convert to \%)} \\ &= \frac{\text{Income}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Investment}} \times 100 \\ &= \text{Profit Margin (\%)} \times \text{Investment Turnover} \end{aligned}$$

Two ways to increase ROI:

1. ↑↑↑ profit margin (PM) = income/revenue
2. ↑↑↑ investment turnover (ITO) = revenue/investment



Your DuPont Analysis should reflect your business strategy!

- Two Ways to Generate 10% ROI?
 - $PM \times ITO = ROI$
 - 5% x 2 = 10% (high margins from high prices tradeoff lower unit sales)
 - 2% x 5 = 10% (low margins from low prices tradeoff higher unit sales)
- Which way do you go?
 - **Product Attribute leader:** A higher value product leader can increase price or market share as lower value competitors lose out.
 - **Cost leader:** A low-cost producer can drive down price and be profitable as higher cost competitors lose out.
- In the produce market, which type of firm are you?



Lesson 1: PM & ITO are normally tradeoffs

- **Ideal situation: \uparrow both PM and ITO \rightarrow $\uparrow\uparrow$ ROI.**
 - Example: You sell a truly unique product that everybody wants.
 - Market disruption or reinvention allows this to happen. Think Starbucks!
 - How probable?
- **Very difficult to \uparrow PM and ITO at the same time.**
 - \uparrow ITO by \downarrow price \rightarrow \uparrow revenue through \uparrow unit sales, but that \downarrow PM
 - \uparrow PM by \uparrow unit price which can \downarrow revenue through \downarrow unit sales and \downarrow ITO.
 - In the real world, PM and ITO are normally tradeoffs.



Ways to Increase ROI

	Action	How?	Income	Revenue	Investment	PM	ITO	ROI
1	↓ an operating cost	↑ efficiency	↑	---	---	↑	---	↑
2	↓ an operating cost	Use better technology	↑ Depreciation impact? Debt cost impact?	---	↑	↑	↓	?
3	↑ unit sales	↑ sales effort	↑ Cost of sales effort?	↑	---	↑	↑	↑
4	↑ unit sales	↓ price	↑ ↓	↑ ONLY IF Rev. \$ ↑ unit sales > Rev. \$ ↓ price	---	↑ ↓	↑ ↓	↑ ↓
5	↑ revenue	↑ price	↑ ↓	↑ ONLY IF Rev. \$ ↑ price > Rev. \$ ↓ unit sales	---	↑ ↓	↑ ↓	↑ ↓
6	↓ Investment	minimize capital at startup	↑	---	↓	↑	↑	↑



ROI Data Sources and Analysis Levels

- Data Sources
 - Time period
 - Annual operating numbers for revenue, operating costs, and income
 - Moment-in-time capital costs for investment
 - Profit: Total Net Income vs Earnings Before Interest and Taxes (EBIT)
 - Alternatives: free cash flow or other variations on profit measures
 - Contribution margin, EBT, EDITDA
 - The target ROI needs to reflect how close or far away is the profit measure from net income.
 - Investment: Total Assets vs. Specific Capital Costs
- ROI Analysis Levels
 - Entire firm: Total Net Income/Total Assets
 - Product line: EBIT from line/Capital Costs of line
 - New capital project: Projected annual EBIT from project/CapEx of project



What is a reasonable ROI goal?

- ROI goal depends in part on the industry you are in
 - **10% is common for many commercial enterprises.**
 - High-tech firms make 30% as a minimum and can make considerably higher.
 - Venture capitalists can want 30-50% or more.
 - Note: $ROI = \text{Net income} / \text{Total assets}$ in these cases.
- In comparing firms, ROI is often based on EBIT/Investment to avoid the various financing and tax situations that are unique to each firm.
 - **20% is a reasonable benchmark in this case** allowing enough added return to cover taxes and financing costs.
- **Scenarios of Various Ways to Generate a ROI of 20% for an IA farm**
 - **Based on the Japanese Plant Factory with Artificial Lightning (PFAL)**

Scenario Analysis of Changes in Japanese Plant Factory Profitability

	Revenue*	EBIT*	Capital Investment*	ROI	Driver of ROI Change
2016 capital cost	\$1,400	\$39	\$2,208	1.8%	
Base Case 2020 capital cost	\$1,400	\$173	\$1,207	14.3%	45% decline in equipment cost
Changes to Scale					
Scenario 1: Half scale	\$700	-\$3	\$603	-0.5%	Fixed costs do not halve
Scenario 2: 2x scale	\$2,800	\$524	\$2,414	21.7%	Fixed costs do not double
Changes to Operations					
Scenario 3: -4 days growth cycle	\$1,568	\$241	\$1,216	19.8%	Added capacity utilization
Scenario 4: 30% ↑ plant density	\$1,680	\$306	\$1,196	25.6%	Revenue benefit exceeds cost
Scenario 5: +10% biomass/plant	\$1,540	\$313	\$1,207	25.9%	Major boost in revenue
Scenario 6: +20% lighting effic.	\$1,400	\$201	\$1,207	16.7%	Savings go directly to EBIT
Changes in Market Context					
Scenario 7: US Labor Costs	\$1,400	\$21	\$1,207	1.8%	\$12/hr with 50% benefit load
Scenario 8: Crop w/ 1 25-day cycle	\$2,016	\$464	\$1,217	38.1%	Redirect facility use to new crop
Scenario 9: Increase price 5%	\$1,470	\$243	\$1,207	20.1%	Adjust price to achieve 20% ROI
*Thousands of dollars					



Takeaways on CapEx and ROI

- Return on Investment (ROI) is a powerful measure of profitability.
 - Positive net income is just the start of profitability.
 - ROI takes into account capital investment which is high for IA farms.
- CapEx represents total investment in plant growing infrastructure, controls, plant harvesting and packing equipment, buildings and property.
- $ROI = \text{income/revenue (PM)} \times \text{revenue/investment (ITO)}$
- Many actions can increase ROI but be cautious of tradeoffs among components of income, revenue, and investment.
- Adopt a 10-20% target.



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