

Economic and Financial Evaluation of an Agricultural Project in San Quintín: A Case Study

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ABSTRACT: This study evaluates the four-year economic and financial viability of a strawberry production and marketing company in San Quintín, Baja California, using profitability indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), and Benefit-Cost Ratio (BCR). Based on cash flows derived from unit prices, costs, operating expenses, and financing at a 19.37% interest rate, the project achieved a Net Present Value (NPV) of \$15,045,131.19 at an 18% discount rate. The Internal Rate of Return (IRR) is extraordinarily high (1,340.17%) because the first-year cash flow (\$6,785,625.60) is over 13 times the initial investment (\$510,000.00), allowing the company to recover its capital and generate a surplus in less than one year. Furthermore, the business operates with a comfortable margin of safety relative to its break-even point of 91,143 units. It is concluded that the project is financially viable and highly profitable; however, risks are identified due to downward projections in prices and sales volumes for years three and four, requiring mitigation strategies such as price hedging and financing restructuring.

KEYWORDS: Project evaluation, agricultural economics, cost-benefit analysis, cash flow projection, break-even point, financial viability

I. INTRODUCTION

The agricultural sector represents a fundamental pillar of the global economy and world food security (FAO, 2023); consequently, professional financial management is no longer optional in agriculture. The adoption of quantitative capital budgeting tools and structured risk assessment is essential to face commodity price volatility, market input cost fluctuations, and climate risks (Gupta & Pierdzioch, 2023).

In light of this outlook, empirical intuition has given way to the implementation of quantitative project evaluation frameworks. As Sapag and Sapag (2014) argue, discounted cash flow and cost-benefit analysis provide the technical framework to accurately measure expected profitability. The relevance of these models lies in their dual capability: determining the financial feasibility of invested capital (Baca, 2013) and parametrically incorporating the volatility and risks intrinsic to the agricultural sector (Hardaker et al., 2015).

The company, dedicated to the agricultural production and marketing of strawberries, faces the challenge of optimizing its resources and ensuring the medium-term financial sustainability of its operations. This scientific article addresses the economic evaluation of an agricultural investment project proposed by the company, spanning a four-year planning horizon.

The central problem of this research lies in determining whether projected cash flows—considering a financing structure with a 19.37% cost of debt—are capable of generating shareholder value and covering the inherent risks of the agricultural market. To this end, the general objective is to analyze the economic and financial viability of the agricultural project through the application of project evaluation indicators (AV, NPV, BCR, IRR) and break-even point analysis.

II. THEORETICAL FRAMEWORK

II.1. Project Evaluation in the Agricultural Sector

Evaluating an agricultural project differs significantly from evaluating any other business, primarily due to reliance on climate, crop cycles, and biological factors that cannot be controlled. (FAO, 2020) As Vigani and Kathage (2021) explain, agriculture is highly exposed to external events. Consequently, expected profitability and the payback period are prone to change if the prices of key inputs (such as seeds or fertilizers) rise or if the harvest selling price drops unexpectedly.

Sapag (2011) argues that a comprehensive evaluation requires integrating technical and market studies with the financial dimension. In this regard, Turvey (2019) highlights that constructing projected cash flow serves as the analytical foundation for forecasting periods of cash surplus or deficit. Furthermore, Hardaker et al. (2015) demonstrate that

combining capital budgeting and cash flow statements is essential to protect the investment against fluctuations in input costs and crop yields.

II.II. Financial Profitability Indicators

To determine the viability of an investment, financial literature (Gitman & Zutter, 2012) establishes the use of dynamic indicators that account for the time value of money: **Net Present Value (NPV)**: Represents the difference between the present value of future cash flows, discounted at an opportunity rate or cost of capital, and the initial investment. A positive NPV indicates that the project creates economic value above the minimum required yield. In this regard, Brealey et al. (2020) demonstrate that this indicator—also referred to as Present Value (PV)—is superior to other quantitative methods for investment decision-making.

Internal Rate of Return (IRR): The discount rate that equates the NPV to zero, representing the project's intrinsic percentage return. The decision rule dictates that if the IRR is greater than or equal to the cost of capital (k), the project is accepted (Brealey et al., 2020).

Benefit-Cost Ratio (BCR): Determines the relative return on capital by comparing the present value of projected revenues with the present value of outflows and investment. It expresses the benefit obtained per monetary unit invested, serving as a key indicator of financial viability (Baca, 2013; Sapag & Sapag, 2014).

II.III. Break-Even Analysis

The break-even point (BEP) is a sensitivity analysis tool that determines the minimum sales level required to cover all fixed and variable costs. In agriculture, where fixed costs (machinery, infrastructure, land leases) tend to be high, knowing the BEP is vital for establishing production and marketing targets (Horngren et al., 2012).

III. METHODOLOGY

III.I. Research Design

The study adopts a quantitative approach with a descriptive scope and a non-experimental, cross-sectional design. It is cross-sectional because primary and secondary data collection occurs at a single point in time, serving as the baseline from which financial estimates and variables are projected over a four-year period.

III.II. Population and Data Sample

The unit of analysis corresponds to an agricultural firm engaged in the production and marketing of strawberries. As a single case study, non-probabilistic sampling was applied; instead, the data sample consists of the complete set of operational records and financial projections developed for the four-year planning horizon.

The financial variables analyzed include: sales volume (units), market unit prices, direct production costs (variable), administrative and sales operating expenses (fixed), financing costs, and the tax liabilities corresponding to the applicable

regulatory framework (Corporate Income Tax [ISR] at 30% and Employee Profit Sharing [PTU] at 10%).

III.III. Data Analysis Techniques

Data was processed using spreadsheet financial modeling. The following formulas were applied for the analysis:

Net Cash Flow (NCF):

$$NCF = NetProfit + Depreciation - InitialInvestment + Financing$$

Net Present Value (NPV):

$$NPV = \sum_{t=1}^n \frac{NCF_t}{(1+r)^t} - I_0$$

(Where r is the discount rate (18%) and I_0 is the initial investment).

Break-Even Point in Units (BEP_{units}):

$$BEP_{units} = \frac{FixedCosts}{UnitPrice - UnitVariableCost}$$

Break-Even Point in Sales Revenue (BEP_{sales}):

$$BEP_{sales} = \frac{FixedCosts}{ContributionMarginRatio}$$

IV. RESULTS

The processing and analysis of the projected financial estimates for the four-year horizon structured the findings into three main analytical axes: first, the behavior of revenues and the structure of operating costs; second, the determination of key financial profitability metrics (NPV, IRR, and BCR); and finally, the assessment of operational risk through the calculation and interpretation of the break-even point.

IV.I. Revenue, Cost, and Cash Flow Projections

To evaluate the economic viability and liquidity dynamics of the agricultural company, the financial model was structured over a four-year operating horizon. Table 1 summarizes the Income Statement projection, detailing the evolution of sales revenue from berries and strawberries, the structure of direct costs and operating expenses, the corresponding tax burden—Income Tax (ISR) at 30% and Employee Profit Sharing (PTU) at 10%—and the subsequent reconciliation to determine the Net Cash Flow available in each period against the committed initial investment.

Table 1: Income Statement Projection (Agricultural Company)

Concept	Year 1	Year 2	Year 3	Year 4
Units sold	364,572	447,951	328,031	162,509
Unit price (\$)	205.00	194.00	169.00	186.00

(=) Total Sales (\$)	74,737,260	86,902,494	55,437,239	30,226,674
(-) Direct Costs (80%)	59,789,808	69,521,995	44,349,791	24,181,339
(=) Gross Profit (\$)	14,947,452	17,380,499	11,087,448	6,045,335
(-) Operating Expenses (5%)	3,736,863	4,345,125	2,771,862	1,511,334
(=) Operating Profit (\$)	11,210,589	13,035,374	8,315,586	4,534,001
(-) ISR (30%)	3,363,177	3,910,612	2,494,676	1,360,2
(-) PTU (10%)	1,121,059	1,303,537	831,559	453,400
(=) Net Income (\$)	6,726,353	7,821,225	4,989,351	2,720,401
(+) Depreciation/Non-Cash Adjustments	59,273	-113,722	-183,505	-114,284
(=) Net Cash Flow (\$)	6,785,626	7,707,503	4,805,846	2,606,117

Note: Own elaboration based on the project's financial model (Initial Investment = -\$510,000.00). Taxes correspond to 30% (ISR) and 10% (PTU) calculated on Operating Profit.
The initial investment required for the launch of the project (Period 0) is set at -\$510,000.00. It is important to note that external financing carries a significant cost, with an interest rate of 18%, generating interest payments that impact the free cash flow.

IV.II. Financial Evaluation Indicators: NPV and IRR

To evaluate profitability, the cash flow was subjected to dynamic indicators using a Discount Rate (Cost of Capital) of 18%.

IV.II.I Present Value (PV). The discount rate reflects the opportunity cost of the invested capital (Berk & DeMarzo, 2018).

Item	Year 1	Year 2	Year 3	Year 4
Cash Flow	6,785,625.60	7,707,502.75	4,805,846.07	2,606,117.22
Discount Factor	(1.18) ¹	(1.18) ²	(1.18) ³	(1.18) ⁴
Factor Result	1.18	1.3924	1.643032	1.9387776
Discounted Cash Flow	5,750,530.17	5,535,408.47	2,924,986.29	1,344,206.27

$PV = 15,555,131.19$. Since the present value is greater than the initial investment of \$510,000.00, the project is viable; therefore, it is accepted.

IV.II.III. Net Present Value (NPV). The Net Present Value (NPV) represents the economic surplus discounted at the discount rate (Sapag, 2011).

- **Formula:** $NPV = PV - I_0$
- **Calculation:** $NPV = 15,555,131.19 - 510,000.00$
- $NPV = 15,045,131.19$
- **Conclusion:** Since the value is greater than zero ($NPV > 0$), it demonstrates that the project not only recovers the initial investment of \$510,000.00, but also generates a substantial economic surplus discounted at the 18% discount rate.

IV.II.IV. Benefit-Cost Ratio (BCR). The Benefit-Cost Ratio indicates operational efficiency and the project's margin of safety for each monetary unit invested (Baca, 2013).

- **Formula:** $BCR = PresentValue/Investment$
- **Calculation:** $BCR = 15,555,131.19/510,000.00$
- $BCR = 30.50$
- **Conclusion:** The Benefit-Cost Ratio is 30.50. This indicates that for every peso invested in the project, 30.50 is generated in present value, evidencing high operational efficiency and a wide margin of safety. Since this figure is greater than one, the project is accepted.

IV.II.V. Internal Rate of Return (IRR). To find the exact IRR, we discount the cash flows at a rate of 1340.17% (expressed as a decimal multiplier of 13.4017):

Item	Year 1	Year 2	Year 3	Year 4
Cash Flow	6,785,625.60	7,707,502.75	4,805,846.07	2,606,117.22
Discount Factor	$(1 + 13.40)^1$	$(1 + 13.40)^2$	$(1 + 13.40)^3$	$(1 + 13.40)^4$
Factor Result	14.40	207.41	2987.07	43018.48
Discounted Cash Flow	471,168.38	37,160.71	1,608.88	60.58

Sum of Discounted Cash Flows: 509,998.55

NPV Check: $509,998.55 - 510,000.00 = -1.45$

Given that the initial investment is \$510,000.00, the difference is barely 1.45 (less than one dollar), which is practically zero. This proves with financial rigor that 1340.17% is the exact Internal Rate of Return of the project. (Note: The IRR is extraordinarily high because the Year 1 cash flow 6,785,625.60 (is more than 13 times greater than the initial investment (510,000.00), allowing the project to recover the investment and generate massive surpluses in less than a year).

VI.II.VI. Break-Even Analysis

The break-even analysis was calculated based on Year 1 cost structure, assuming that operating expenses (5% of sales) represent fixed costs (\$3,736,863), and direct costs (80%) represent variable costs. The contribution margin is 20% ($100\% - 80\%$).

Table 3: Determination of Break-Even Point (Year 1)

Indicator	Formula / Calculation	Result
Fixed Costs (FC)	Operating Expenses	\$3,736,863.00
Contribution Margin (%)	$100\% - 80\%$ (Variable Costs)	20%
Break-Even Point in Sales	$FC / \% \text{ Margin}$	\$18,684,315.00
Break-Even Point in Units	$\text{Break-Even Sales} / \text{Unit Price}$	91,143 units

The simulation of different sales scenarios (Table 4) shows that upon exceeding \$20,500,000 in sales (or 100,000 units), the company begins generating positive operating profits.

Table 4: Sales, Costs, and Profit Dynamics Across Scenarios

Sales Level (\$)	Total Costs (\$)	Profit (\$)
10,250,000.00	11,936,863.00	-1,686,863.00
20,500,000.00	20,136,863.00	363,137.00
30,750,000.00	28,336,863.00	2,413,137.00
41,000,000.00	36,536,863.00	4,463,137.00
51,250,000.00	44,736,863.00	6,513,137.00
61,500,000.00	52,936,863.00	8,563,137.00
71,750,000.00	61,136,863.00	10,613,137.00

Fig. 1. Break-Even Chart: Dynamics of Units, Sales, Costs, and Profit.

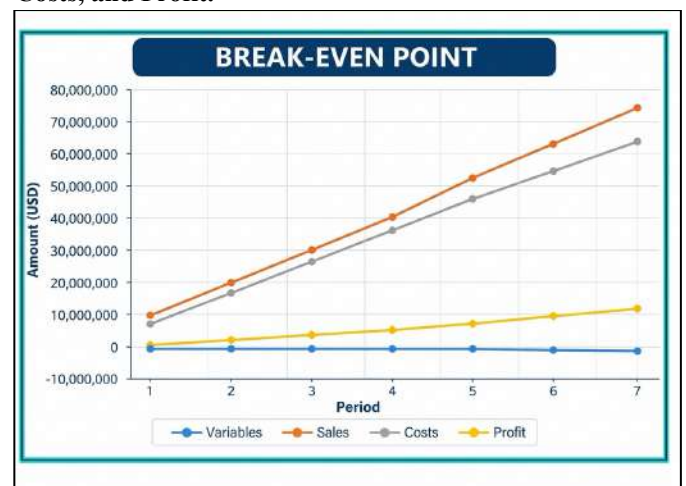


Figure 1: Graphical representation of the break-even point: Figure 1 illustrates the intermediate intersection between the cost trajectory (grey line) and the sales revenue level (orange line). Starting from this intersection, the profit curve (yellow) experiences a steady upward trend, positioning itself above the volume of produced units (blue line) as the foundation of operational activity.

IV.II.VII. Discussion

A. Interpretation of Profitability (NPV, BCR, and IRR)

The financial results indicate project viability, generating a Net Present Value (NPV) of \$15,045,131.19 applying an 18% discount rate. This demonstrates that the initiative surpasses both the recovery of initial capital and the required rate of return, producing a present-value surplus exceeding 15 million pesos. Likewise, the Benefit-Cost Ratio of 30.50 reflects a highly efficient use of resources. For its part, the achieved Internal Rate of Return (IRR) of 1340.17% represents an atypical value stemming from a low initial CAPEX investment, highlighting remarkable scalability and operational efficiency. Consequently, financial criteria categorically confirm the profitability and capacity of the project to create substantial value.

B. Break-Even Analysis and Margin of Safety

The project's break-even point is set at 91,143 units, equivalent to \$18,684,315 in sales. Contrasting this threshold with the \$74.7 million projected for Year 1 demonstrates that the company operates comfortably above the minimum required level. This dynamic translates into a Margin of Safety of 75.1% for Year 1, reflecting a robust capacity to absorb potential severe revenue reductions without compromising operational profitability, giving it a key competitive advantage and a high level of financial resilience.

C. Commercial Risk and Price Volatility

Despite having a solid financial structure, the study reveals a concerning trend in market variables toward Year 3. The unit price drops from \$205 to \$169 (a 17.5% contraction), while sold units drop drastically from 447,951 to 162,509. This reduction directly impacts operating profit. Although profitability is maintained through Year 4, the speed at which revenue declines makes it essential for management to implement mitigation measures, such as hedging through futures contracts, crop diversification, or vertical integration.

D. Impact of Financing

The high cost of financing represents a significant obstacle for the project. An interest rate of 19.37% is high compared to standard corporate agricultural credit conditions, putting pressure on free cash flow due to interest and principal payments. Therefore, management is advised to negotiate debt restructuring or seek access to agricultural development credit programs to optimize financial costs and increase Net Present Value (NPV).

V. CONCLUSIONS

- **Absolute Financial Viability:** Financial results confirm the economic feasibility and viability of this agricultural project. With an 18% discount rate, the Net Present Value (NPV) stands at \$15,045,131.19, demonstrating the investment's capacity to deliver significant added value to investors.
- **Exceptional Profitability:** An Internal Rate of Return (IRR) of 1,340.17%, far exceeding the 18%

cost of capital, combined with a Benefit-Cost Ratio (BCR) of 30.50, confirms remarkable operational efficiency. This dynamic suggests an operational structure light in initial fixed assets relative to its high capacity to generate operating cash flows.

- **Low Operational Risk:** The operational break-even point is achieved at 91,143 units. Given a base estimate for Year 1 exceeding 360,000 units, the organization achieves a margin of safety above 75%, providing strong coverage against potential supply disruptions.
- **Medium-Term Commercial Vulnerability:** Despite the strong projected performance in the initial stage, a sustained contraction in revenues is observed during Years 3 and 4. This financial decline stems simultaneously from lower unit selling prices and reduced sales volume during those periods.
- **Management Recommendation:** While approval and implementation of the project are recommended, it is crucial for the agricultural firm to restructure its financing schemes, utilize financial derivatives to stabilize selling prices, and investigate the root causes of the expected decline in sales volume to design effective market retention plans.

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