

Cocoa Production Sustainability Analysis Report

Comprehensive Assessment of Financial, Operational, and Environmental Performance

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Note: This analysis is based on AI-generated dataset for demonstration and educational purposes

Executive Summary

This sustainability analysis examines cocoa production across three regions (Central, East, South-West) with focus on organic versus conventional farming methods. The operation demonstrates strong financial performance with an overall profit margin of 86.33% and total revenue of \$61.82K from 21,000kg of production. The analysis covers 60 workers across five plots, revealing significant insights into sustainable cocoa farming practices and their economic viability.

Financial Performance Analysis

Overall Financial Health

The cocoa operation demonstrates exceptional financial sustainability with key metrics indicating strong profitability:

- **Total Revenue:** \$61.82K
- **Total Costs:** \$8.45K
- **Profit Margin:** 86.33%
- **Return on Investment (ROI):** Ranging from 528% to 679% across regions
- **Profit per Hectare:** \$317.66

Regional Financial Performance Comparison

South-West Region leads in financial performance with the highest profit margins consistently above 87% throughout most months, peaking at 88.15% in June. Total revenue for this region reached \$19,936 with costs of \$2,605.

East Region follows closely with strong performance, generating \$22,125.5 in total revenue against \$2,932 in costs, maintaining profit margins above 86% consistently.

Central Region shows the most modest but still excellent performance with \$6,298.25 in revenue and profit margins around 85-86%.

Monthly Financial Trends

The financial performance shows clear seasonal patterns:

Peak Performance Period (April-June): Profit margins reach their highest levels, with June showing the strongest performance across all regions (87.7% average profit margin).

Moderate Performance Period (January-March & July-September): Profit margins remain strong but slightly lower, ranging from 84-87%.

Seasonal Revenue Pattern: Monthly revenue follows production cycles, with peaks in May (\$5.8K) and June (\$6.1K), and lower periods in January and September.

Production and Quality Analysis

Production Volume and Distribution

Total Production: 21,000kg across all regions and certification types **Production by Certification:**

- Conventional: 16,000kg (73.24%)
- Organic: 6,000kg (26.76%)

Production by Cocoa Type:

- Forastero: 10,000kg (49.3%)
- Trinitario: 7,000kg
- Criollo: 5,000kg

Quality Metrics Performance

Overall Quality Score: 89.66% average, indicating high-quality production standards

Monthly Quality Variations: Quality scores fluctuate seasonally, with March showing peak quality at 93.90% and February showing the lowest at 87.80%.

Regional Quality Comparison:

- East Region: 89.83% overall quality
- South-West Region: 88.29% overall quality
- Central Region: 86.75% overall quality

Processing Quality Indicators:

- Fermentation Quality: 91.22% average
- Drying Quality: 90.22% average

Environmental and Climate Impact Assessment

Climate Resilience Indicators

Climate Impact Index: 49.70%, indicating moderate climate vulnerability requiring attention for long-term sustainability.

Temperature Management: Average temperature of 29.26°C across regions, with variations:

- Central: 30.90°C (highest)
- East: 31.00°C
- South-West: 30.80°C

Moisture Management: 7.26% average moisture content, essential for proper fermentation and quality.

Rainfall and Yield Correlation

Regional Rainfall Patterns:

- Central: 122.67mm average (45-215mm range)
- East: 122.71mm average (42-218mm range)
- South-West: 117.50mm average (40-210mm range)

Seasonal Rainfall Distribution: Clear wet and dry seasons with peaks in March (213mm) and June-August (153-188mm), and low periods in January (48mm) and September (89mm).

Yield Performance: Strong correlation between adequate rainfall and production quality, with optimal yields achieved during moderate rainfall periods.

Organic vs. Conventional Farming Analysis

Land Use Efficiency

Area Distribution:

- Conventional: 122.4 hectares (72.86%)
- Organic: 45.6 hectares (27.14%)

Production Efficiency: Conventional farming shows higher production per hectare (130.7 kg/ha) compared to organic (131.6 kg/ha), indicating similar efficiency levels.

Regional Organic Adoption

East Region: Balanced distribution with 7,000kg organic and 3,000kg conventional
South-West Region: Strong organic presence with 9,000kg organic and 3,000kg conventional

Central Region: Data suggests lower organic adoption

Quality Impact of Certification

Both organic and conventional methods achieve high quality scores, suggesting that sustainable practices don't compromise quality while potentially offering premium market access.

Labor and Operational Efficiency

Workforce Distribution

Total Workers: 60 workers across 5 plots (P001-P005) **Equal Distribution:** 12 workers per plot (20% each), indicating balanced operational structure

Labor Productivity: 373.23% productivity index suggests highly efficient workforce utilization

Production per Worker: 357kg per worker annually, indicating strong individual productivity

Labor Hours: 95.52 average labor hours, suggesting efficient time management

Pricing and Market Performance

Pricing Trends

Monthly Price Variations: Selling prices range from \$13.95/kg to \$15.20/kg, with peak prices in May-June (\$15.20/kg) and lower prices in January and September.

Average Price: \$14.59/kg across the year, indicating premium market positioning

Price Seasonality: Clear seasonal pricing patterns align with global cocoa market trends and local harvest cycles.

Input Cost Management

Monthly Input Costs: Range from \$685 to \$755, with gradual increases from January to June, followed by decreases.

Cost Efficiency: Input costs represent only 13-14% of total revenue, demonstrating excellent cost management.

Strategic Recommendations

Financial Sustainability Enhancement

Revenue Optimization: Capitalize on the May-June peak pricing period through strategic harvest timing and storage capabilities to maximize revenue during high-price months.

Cost Management: Maintain the excellent cost control demonstrated, with input costs remaining below 15% of revenue.

Production Quality Improvements

Quality Consistency: Address monthly quality variations by implementing standardized processing protocols, particularly during February low-quality periods.

Organic Expansion: Consider expanding organic certification given similar productivity rates and potential premium pricing opportunities.

Climate Adaptation Strategies

Climate Risk Mitigation: Develop irrigation systems and drought-resistant varieties to address the 49.70% climate impact index and reduce vulnerability.

Rainfall Management: Implement water harvesting during peak rainfall months (March, July-August) to support production during dry periods.

Market Position Strengthening

Premium Quality Focus: Continue emphasis on high-quality production (89.66% quality score) to maintain premium pricing above \$14/kg.

Certification Strategy: Evaluate expansion of organic certification to capture growing sustainable cocoa market demand.

Operational Efficiency Optimization

Seasonal Planning: Optimize labor allocation and input procurement based on clear seasonal patterns in production and pricing.

Technology Integration: Consider precision agriculture technologies to further improve the already strong labor productivity (373.23%).

Risk Assessment and Mitigation

Climate Risks

The moderate climate impact index (49.70%) indicates vulnerability to climate change. Recommended mitigation includes diversifying cocoa varieties and implementing climate-smart agriculture practices.

Market Risks

Price volatility from \$13.95 to \$15.20/kg suggests exposure to market fluctuations. Forward contracting and value-added processing could provide price stability.

Production Risks

Quality variations (87.80% to 93.90%) indicate process inconsistencies that could affect premium market access.

Conclusion

The sustainability analysis reveals a highly profitable and well-managed cocoa operation with strong financial performance across all regions. The 86.33% profit margin and \$317.66 profit per hectare

demonstrate excellent economic sustainability. Quality metrics at 89.66% indicate premium market positioning, while the balanced approach to organic and conventional farming shows operational flexibility.

Key success factors include effective cost management (keeping input costs below 15% of revenue), strong labor productivity (373.23%), and consistent quality production. The moderate climate impact index (49.70%) represents the primary sustainability challenge requiring proactive adaptation strategies.

The operation serves as a model for sustainable cocoa production, demonstrating that environmental stewardship and economic viability can be successfully integrated. Continued focus on quality consistency, climate adaptation, and strategic market positioning will ensure long-term sustainability and profitability in the evolving global cocoa market.