

The Relevance of Revenue Diversification in Farm Production

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Agenda

1 Maximize Value

2 Diversification

3 Conclusion

What should be the farm's objective?

- **Maximize value**

- ☐ What is value?
- ☐ How to maximize value?
- ☐ What role does revenue diversification have in maximizing value?

What mental map shapes how you see this picture?

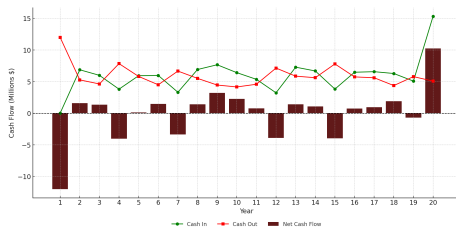


A farm,



from a business perspective, is a **stream of cash flow**.

Business perspective: cash flow stream



Cash Flow (CF) Stream

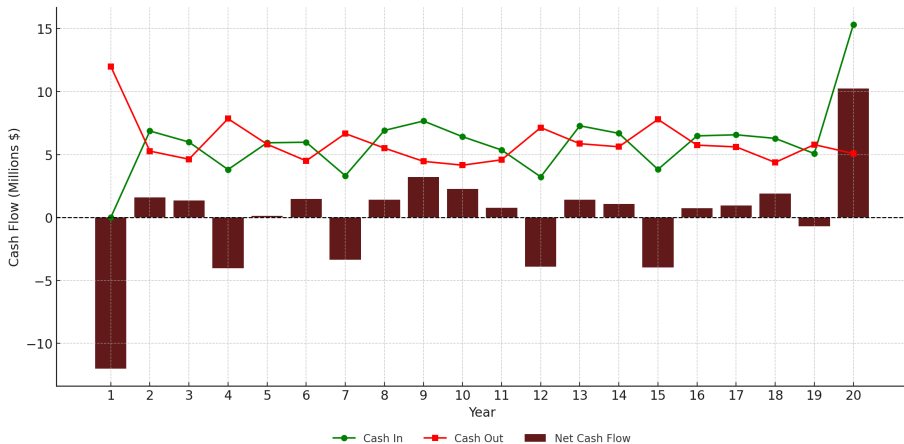


Figure 1: Cash Flow Example

$$Farm_t \equiv \{CF_t; CF_{t+1}; CF_{t+2}; \dots\}$$

(1)

Objectives + Valuation = Decision

$$Farm_t \equiv \{CF_t; CF_{t+1}; CF_{t+2}; \dots\} \quad (2)$$

Valuing a farm (asset) means evaluating a cash flow stream

$$Value\ of\ Farm_t \equiv V_t(CF_t; CF_{t+1}; CF_{t+2}; \dots) \quad (3)$$

What is V_t ?

V_t - Net Present Value (NPV)

$$NPV = -C_0 + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \frac{CF_3}{(1+r)^3} + \cdots + \frac{CF_t}{(1+r)^t} + \frac{RV_t}{(1+r)^t} \quad (4)$$

$$NPV = -C_0 + \sum_{t=0}^T \frac{CF_t}{(1+r)^t} + \frac{RV_t}{(1+r)^t} \quad (5)$$

C_0 = initial investment

RV = residual value

CF = cash flow

r = discount rate

t = time period

Management Insights: C_0, CF_t

$$NPV = -C_0 + \sum_{t=0}^T \frac{CF_t}{(1+r)^t} + \frac{RV_t}{(1+r)^t} \quad (6)$$

Net CF = Cash Inflow – Cash Outflow

$\uparrow \text{Net CF} = \uparrow \text{Revenue} - \downarrow \text{Expenses}$

$\uparrow \text{Net CF} = (\uparrow \text{Price} \times \uparrow \text{Quantity}) - \downarrow \text{Expenses}$

Management Insights: RV_t

$$NPV = -C_0 + \sum_{t=0}^T \frac{CF_t}{(1+r)^t} + \frac{RV_t}{(1+r)^t} \quad (7)$$

- Land value
- Asset protection
- Heirs property

Management Insights: *Risk*

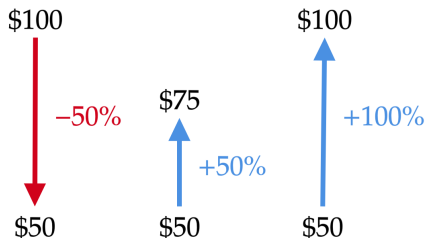
$$NPV = -C_0 + \sum_{t=0}^T \frac{CF_t}{(1+r)^t} + \frac{RV_t}{(1+r)^t} \quad (8)$$

Management Insights

“Rule 1: Never lose money.

Rule 2: Never forget rule 1.”

– Warren Buffett



A 50% gain doesn't reverse a 50% loss.

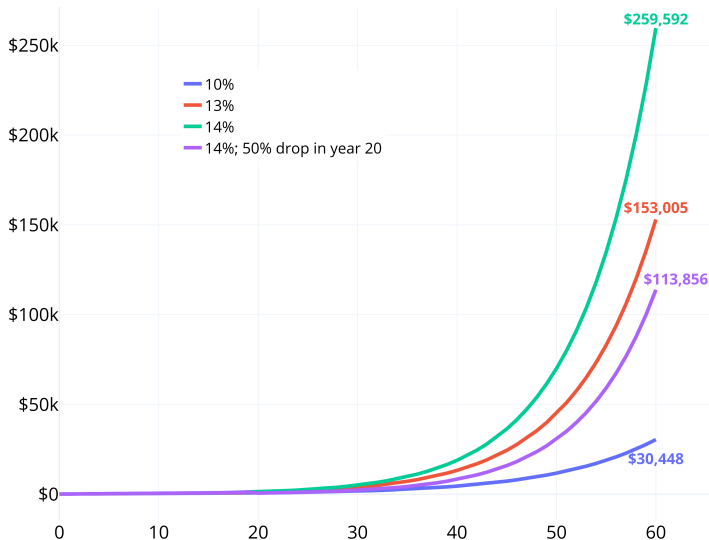


Figure 2: Future Value of \$100 Under Different Scenarios

The Power of Diversification

Imagine this...

You're a South Texas landowner.

- You plant only **cotton**. One drought, and you're at a loss.
- Now imagine you also raise **cattle** and lease land for **wildlife hunting**.

You've just diversified — and protected your income.

Co-relation between income sources matters

Expected Return:

$$E(R_p) = w_1 E(R_1) + w_2 E(R_2) \quad (9)$$

Portfolio Variance:

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2w_1 w_2 \sigma_1 \sigma_2 \rho_{12} \quad (10)$$

w_1, w_2 = weights of cotton and wildlife lease income

σ_1, σ_2 = standard deviations (risk) of each asset

ρ_{12} = correlation between cotton and wildlife

Cotton and Wildlife Portfolio Example

- Cotton: $E(R_1) = 12\%$, $\sigma_1 = 18\%$
- Wildlife Lease: $E(R_2) = 8\%$, $\sigma_2 = 6\%$
- Weights: $w_1 = 0.6$, $w_2 = 0.4$

Expected Portfolio Return:

$$E(R_p) = 0.6 \times 12\% + 0.4 \times 8\% = 10.4\%$$

Portfolio Variance ($\rho = 0.1$):

$$\begin{aligned}\sigma_p^2 &= (0.6)^2(0.18)^2 + (0.4)^2(0.06)^2 + 2(0.6)(0.4)(0.18)(0.06)(0.1) \\ &= 0.011664 + 0.000576 + 0.0005184 = 0.0127584\end{aligned}$$

$$\sigma_p = \sqrt{0.0127584} \approx 11.3\%$$

The Power of Diversification - Correlation

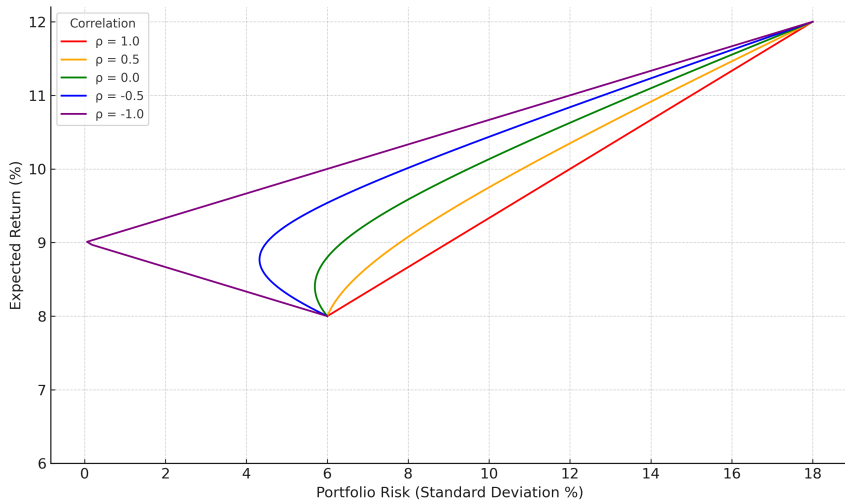


Figure 3: Impact of Correlation on the Risk-Return Tradeoff in a Two-Asset Portfolio

The Marginal Benefit of Diversification

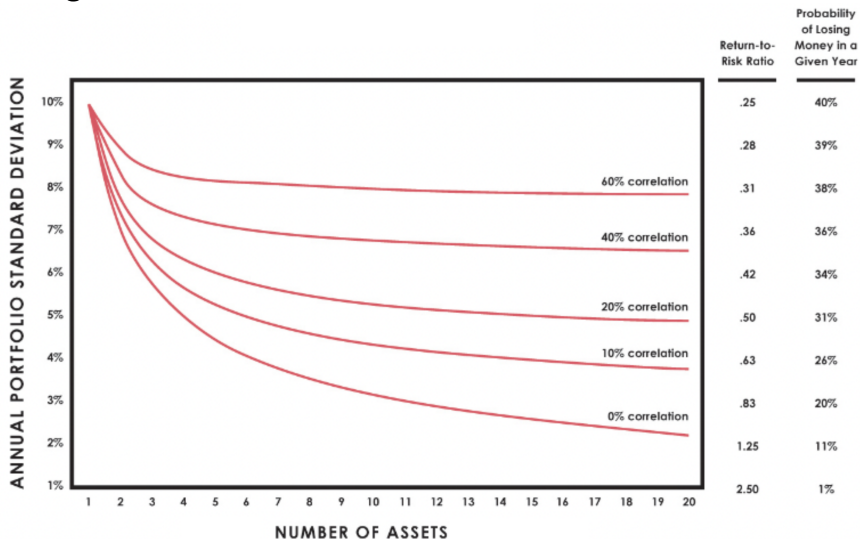


Figure 4: Impact of Correlation on Portfolio Risk in Multi-Asset Portfolios

Source: Dalio (2017)

Why Income Diversification is Important

- Reduces dependence on a single income source
- Protects against price swings and market shocks
- Makes use of underutilized resources
- Helps stabilize cash flow year-round

Examples of Diversification

- Crop-livestock integration
- Wildlife leases or hunting access
- Beekeeping or honey production
- Agritourism (e.g., farm tours, pumpkin patches)
- Direct-to-consumer sales (farmers markets, CSAs)

Example: Crop-Livestock Integration



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Economic Feasibility of Crop-Livestock Integration System in Brazil

Yuri C. D. Calil Luis Ribera

First published: 21 December 2024 | <https://doi.org/10.1002/agr.22007> |

JEL classification: Q12, Q14, Q16, Q56

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ABSTRACT

We investigate the economic feasibility of the Brazilian crop-livestock integration system. Under this system, the Brazilian farmer can produce soybeans, corn, and graze for cattle on the same land during one crop year. This technology can substantially increase agricultural production in the country. We contrasted the stochastic net present value of traditional farming with the integrated system under four different scenarios. To rank the scenarios, we use stochastic dominance methods. The results suggest more significant economic gains for crop-livestock integration scenarios.

Impact on Farm Resilience

- More stable annual income
- Better creditworthiness
- Improved ability to reinvest and grow
- Lower risk of catastrophic losses

Takeaways for Producers

- Start small — test one new income source
- Use enterprise budgets to evaluate profitability
- Talk to your county agent or advisor
- Diversification is a long-term strategy

Conclusions

- Maximize value
- Diversification
- Management Insights

Let's talk.

What are your thoughts on applying this in your operation?