HIGH-ANDEAN OAT (ALTOANDINA) AS ALTERNATIVE FOR COLOMBIA'S HIGH-ALTITUDE DAIRY SYSTEMS: AN ECONOMIC ANALYSIS

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Introduction

» Kikuyu grass (*Cenchrus clandestinus*) is the main feed source for the dairy system in the Colombian high-altitude tropics (2200–3000m a.s.l.).

» Kikuyu grass has a high adaptability and productivity but is affected by frost, grass bugs (*Collaria sp.*) and precipitation-related production seasonality (Forage deficits at several times in a year).

» As a strategy to maintain production levels, dairy farmers use commercial feed concentrates, which increase production costs.

» As a response to this, Agrosavia evaluated and selected new forage species for the Colombian high-altitude tropics.

» The oat *Avena sativa* AV25T (Altoandina) was identified as promising alternative to supply the requirements of dry matter in times of deficit.

Objective

To evaluate the economic viability of Altoandina in Colombia's high-altitude dairy systems.

Altoandina (Aa) was provided as silage in two different diets, which were both compared to a third diet based on Kikuyu:

- **Yellow diet (YD):** 35% Aa - 65% Kikuyu
- **Red diet (RD):** 65% Aa - 35% Kikuyu
- **Blue diet (BD):** 100% Kikuyu grass (traditional scenario)

(All diets were supplemented with 6 kg commercial feed concentrate, 0.5 kg cotton seeds and 0.5 kg Alfalfa meal per cow/day).

Methodology

A discounted cash flow model for the estimation of financial profitability indicators was developed and a quantitative risk analysis carried out by running a Monte Carlo simulation (software @Risk).

Results

Productive indicators

Compared to **BD**, the supplementation with **Aa** shows on average:

» For the **YD**: Increased milk production/day/cow (5.8%), animal stocking rate/ha (41%) and milk production/ha (82.3%).

» For the **RD**: Reduced milk production/day/cow (7.7%), increased animal stocking rate/ha (71%) and milk production/ha (220%).

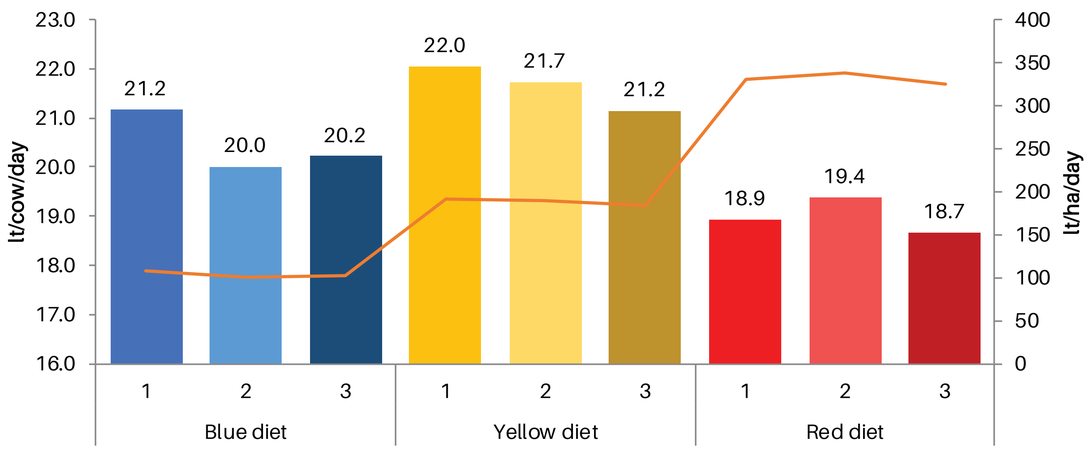

Figure 1. Milk production per three cycle⁎ in diets with Altoandina. ⁎each cycle is a period of 7 days

Economic evaluation

Table 1. Costs and yields per hectare of Altoandina. ⁎Prices in USD – /USD/COP XRT: Average 2019.

Variable	Value
Green forage (kg/ha)	46,545
Silage obtained (kg/ha)	41,891
Dry Matter: 33.79% (kg/ha)	14,155
Total Cost: Planting, harvesting, and silage making (USD/ha)	$ 998.00
COST (USD/kg/Green forage)	$ 0.02
COST (USD/kg/Dry Matter)	**$ 0.07**

Table 2. Overview of principal economic indicators per diet.

Economic indicator	Blue diet	Yellow diet	Red diet
Milk production (lt/ha/year)	31,544	57,316	101,544
Gross income from milk sales (USD/ha/year)	11,355	20,631	36,552
Production Costs (USD/ha/year)	9,695	16,815	34,383
Net utility (USD/ha/year)	1,381	2,949	2,646
Production Unit Cost (USD/lt)	0.31	0.29	0.34
Milk price (USD/lt)	0.36	0.36	0.36
Unit Profit Margin (USD/lt)	0.05	0.07	0.02
Financial Viability indicators[1]			
NPV_mean	5,194	11,842	7,853
IRR	40.8%	49.9%	23.5%

[1]NPV (Net Present Value) e IRR (Internal Rate of Return); NPV mean value obtained through simulation (5,000 repetitions at 95% confidence level).

- The **YD** is the most efficient considering the cost of producing one additional liter of milk.
- According to the results, the **YD** is the best alternative. The NPV_mean was highest in >80% of the cases and showed a lower variability (CV=29%) compared to the other diets.
- Value at Risk (VaR) and probability (NPV<0) show the **YD** to have the lowest risk for economic loss under different scenarios.
- The profitability indicators are highly sensitive to variations in milk production (contribution to variance of NPV >70%) in all the diets.

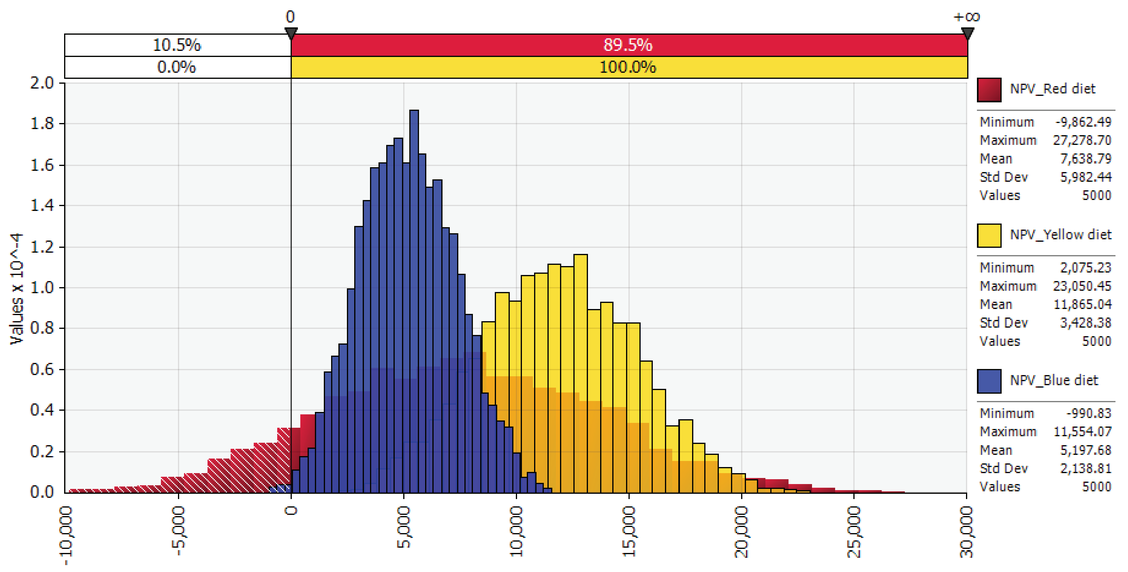

Figure 3. Probability density of NPV.

Conclusions

» The supplementation with **Aa** proved to be an efficient alternative for the milk production system in the Colombian high-altitude tropics to supply the feed requirements in critical seasons.

» **Aa** has shows tolerance to Roya (*Puccinia sp*), drought and frost resistance, making it a valuable option for the specific climatic conditions and pests in the Colombian high-altitude tropics. It contributes to both reducing production seasonality and improving production parameters.

» According to the economic evaluation, the Yellow diet with 35% **Aa** supplementation was the best alternative to improve the efficiency and profitability at farm level. It shows the lowest costs and highest per cow productivity, and reduces the risk of economic loss – this is a key element to encourage adoption.

References

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