

Dairy Productivity

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[MENU.](#)

[Click to return to this page.](#)

THE COMPANY

CONTEXT

THE PROBLEM

ALTERNATIVES

THE DECISIONS

REFERENCES

2-SP16-09-182

Publication date: August 7, 2026

Last review: August 7, 2026

THE COMPANY

Lechería Villaflores is a cattle company located in the municipality of Villaflores, in the state of Chiapas. Its owner, Artemio Cruz Sánchez, started it in 2005 when he purchased 50 hectares of land that he modified with suitable installations. He acquired an initial herd of eight dairy cows, each with her own calf, as well as one bull and five heifers. In short order, Artemio was able to multiply the number of milk cows by buying more dairy cattle, which also enabled him to increase his working capital to operate under more favorable conditions.

In the past year, the company has produced over 220,000 liters of milk according to its historical records. Although it is still a medium-sized operation, Artemio's goal is to achieve at least one thousand liters per day within three years to make it a large company and even install his own pasteurized milk bottling plant.

Image. Magnific, 2026.

From the outset, the company focused on selling its production to a local bottling plant because the characteristics of the milk it produces comfortably meet the quality requirements set by the bottling plant.



CONTEXT

The agricultural and livestock sector plays a strategic role in the Mexican economy by contributing to food production, employment generation, and rural community development. Besides their importance for food security, agricultural and livestock activities represent a source of income for millions of families and supply both the national and export markets. Growing demand for food, together with the effects of climate change and an increase in production costs, has driven the need to adopt more efficient technologies and management practices that enable growth of the sector's productivity and competitiveness (DGSIA, 2025).

Against this backdrop, cattle farming constitutes one of the most important livestock activities in Mexico due to its production of beef and milk, as well as its economic and social impact in several of the country's regions (Sader, 2024). Chiapas stands out nationwide as one of the main states for producing cow's milk; it holds seventh place with production of over 472 million liters per year, equivalent to 3.5% of the total produced in Mexico (Dirección de Información Geográfica y Estadística, 2025).

Its productive system chiefly consists of small production units that represent over 75% of the state's cattle farms. These businesses display the characteristics typical of family enterprises, have a limited level of modernization, and face high costs associated with supplementary feeding of cattle (Camacho-Vera et al., 2021).



Image. Magnific, 2026.

The Frailesca region has been identified as one of the zones with the most livestock activity in the state.

THE PROBLEM

In this context, producers face challenges related to the increase in the price of inputs, climate variability, and the need to improve efficiency in their use of resources. As a result, decision-making based on production metrics and historical information analysis has become an essential tool for bolstering the profitability and sustainability of agricultural and livestock production units.

The rise in prices of fuel, electricity, cattle feed, and other indispensable inputs has significantly increased the company's production expenses, which has apparently affected its profitability.

From the start, Artemio experimented with different formulations of nutritional

concentrate until finding one mixture that has given him good results. However, he has recently discovered the regenerative livestock farming approach, which promotes practices such as rational grazing, the reduction of external inputs, and the gradual elimination of ivermectin treatments to fa-

vor soil health and biodiversity. Although he believes that this model could improve sustainability and reduce long-term costs, he wishes to evaluate whether these changes would have any impact on productivity, the health of the herd, and the ranch's profitability before implementing them.

Image: Magnific, 2026.



In recent years, Artemio has observed how the increase in operating costs seems to have reduced his company's profitability, despite its production recording important growth.

ALTERNATIVES

As Artemio has no control over the price he sells milk for, he has set himself the goal of making his production cost schedule more efficient. Besides grass being their main source of food, his cows need food supplements that cover their nutritional requirements at the lowest possible cost.

After consulting various references on bovine nutrition, he found that one dairy cow weighing 500 kilograms needs to consume a daily amount of dry material (DM) equivalent to 3% of its weight, i.e., 15 kilograms of dry material per day (Barrera, 2024). Under the current conditions of his fields, Artemio estimates that free-range grazing contributes approximately 2% of live weight in dry material, equivalent to 10 kilograms per day, so the remaining one percent (five kilos of dry material) should be administered by means of a food concentrate prepared on his ranch.

In order to minimize feed costs, Artemio wishes to formulate the concentrate by using a mixture of ground corn, soybean paste, wheat bran, and molasses. This concentrate should contribute exactly five kilograms of dry material and contain at least 16% of raw protein, a level he believes adequate for medium-yield dairy cows (Kaufman, n.d.).

The nutritional composition and estimated cost of each ingredient are as follows:

INGREDIENT	DRY MATERIAL (%)	RAW PROTEIN (%)	COST (\$/KG)
Corn	88	9	7.00
Soybean Paste	89	44	12.50
Wheat Bran	89	16	6.00
Molasses	75	4	4.00

Source: Own elaboration with support from ChatGPT, 2026.



Image. Magnific, 2026.

Under nutritional and formulation criteria, the mixture should meet the following conditions:

- Soybean paste cannot represent more than 25% of the concentrate's total weight due to its high cost and the fact that excess protein may cause nutritional imbalances.
- Ground corn should represent at least 40% of the mixture's total weight because it is the portion's main source of energy.
- Wheat bran cannot exceed 30% of the mixture's total weight to avoid an excess of fiber in the concentrate.
- Molasses cannot exceed 10% of the mixture's total weight; this ingredient is solely used to improve palatability and contribute readily available energy.

Besides minimizing feed costs, Artemio wishes to estimate the milk production levels he can expect from his herd, supposing that the historical behavior would continue without too many fluctuations. To do so, he supposes that different factors influence the yield of his cows and has compiled a database of historical information for recent years in order to analyze it and use it as the basis for his administrative and production decisions.

Image: Magnific, 2026.



THE DECISIONS

Artemio is convinced that many of the decisions he currently makes based on experience could be supported by a systematic analysis of the information he has gathered over the years on his ranch's operations. He believes that the use of data analysis tools and quantitative models will enable him to better understand the behavior of his production system, identify opportunities to reduce costs, optimize the use of resources, and improve the herd's productivity without compromising animal health or feed quality.

Moreover, he wants to transform his historical records into information that helps him anticipate future scenarios and base his decisions on quantitative evidence.

Based on the available information, Artemio believes he will be able to answer the following questions: What is the optimum amount, in kilograms, of each ingredient that the concentrate should contain to minimize its cost and meet the nutritional requirements of his cattle? Does the time factor influence milk production behavior, and can it be used to predict future production levels? Which variable or set of variables best explains milk production and which has the greatest impact on the ranch's production performance?

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