

# Adopting Critical Success Factors (CSF) Methods to Achieve High Management Performance on Dairy Farms

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## Abstract

It is known that the agribusiness sector in Brazil is made up of several companies operating in different business models in their environment. They operate in production side as non cyclical and the market side as cyclical, such as milk and dairy products. It is, however, characterized by dynamic and complex processes and competitive events, applied technologies, specialized labor problems, with risks and uncertainties inherent to the environment. Dairy farming is a relevant segment of this sector, both in terms of representativeness and wealth generation. Therefore, dairy farms need to be aware of innovations, and be effective in the pursuit of productive performance and profitability. The present study aims to evaluate the Critical Success Factors (CSF) involved in the search for high productive performance and profitability in dairy farms assisted by technical and managerial consulting of an agribusiness alpha company. The research has a qualitative approach and a descriptive conclusive character. Multiple case studies were carried out, and the units of analysis are 6 farms, their respective leaders (owners and managers), and consultants specialized in dairy farming from the company Alfa de Consultoria. The results demonstrate that the CSFs that promote high performance in dairy farms are: financial management; leadership and people management; process management; employee training and development; adequate sizing of the project; search for continuous improvement; management of indices and technical indicators; ensure animal comfort; technical assistance and consultancy.

**Keywords:** critical success factors, dairy farming, agribusiness, competitive advantage

## 1. Introduction

### 1.1 Agribusiness

Agribusiness is the combination of numerous interconnected, path dependence activities, resources allocations that involve, directly or indirectly, many flows of the entire agricultural or livestock production chain (SNA, 2022). This approach was mentioned by Davis and Goldberg (1957), comprising a set of economic segments involved in agricultural production chains, from the upstream to the downstream segments. Due to environmental and market risks, companies operating in the sector make real bets on quality, productivity and customer demand. Malassis (1969) developed the concept of agro-industrial chains in which the existence of munificence and adequate application of human resources and technologies are necessary to minimize controllable risks, leaving the uncontrollable ones to the "luck" of nature. These concepts have in common the fact that agriculture is analyzed in an integrated way with other sectors interconnected to it within the economic system.

We can encompass the sector's activities in four major nuclei: (i) Agribusiness Nucleus, contemplating agricultural and livestock activities; (ii) amount of Agribusiness, involving the segments that provide inputs and capital to the Nucleus (industry and agro-services); (iii) downstream of Agribusiness, encompassing the segments that receive the production of the Nucleus as raw material for their own production (agro-industries); and (iv) Agribusiness distribution, composed of the segments of the service sector involved (Luiz & Foquezzatto, 2023).

Agribusiness has been recognized as a crucial vector of Brazilian economic growth. In 2020, the sum of goods and services generated in agribusiness reached R\$ 1.98 trillion or 27% of the Brazilian GDP. Among the

segments, the largest share is in the agricultural sector, which corresponds to 70% of this value (R\$ 1.38 trillion), livestock corresponds to 30%, or R\$ 602.3 billion (CNA, 2021 – Confederação da Agricultura e Pecuária do Brasil).

Despite the contemporary challenges in the domestic and international markets, the destinations and diversity of products exported by Brazilian agribusiness have increased significantly. Brazil is now the largest exporter of sugar, coffee, orange juice, soybeans, beef and chicken; the third largest of corn, and the fourth of pork. It is also the world's largest producer of soybeans, coffee, orange juice, and sugar; the second of beef; and the third in world production of chicken and corn (CNA, 2021).

As for international trade, 48% of Brazilian exports in 2020 were agribusiness products. There is also a strong contribution of agribusiness to the performance of the Brazilian economy. This is evident in diagram 1, below, which reveals that since 2010 the trade surplus of Brazilian agribusiness has more than surpassed the trade deficit of the other sectors of the Brazilian economy, and guaranteed successive surpluses to the Brazilian trade balance (CNA, 2021).

Christ *et al.*, (2022) warn that even consolidated in the international market for agricultural products, importing countries have increasingly demanded more from Brazil in relation to the phytosanitary quality of products and the sustainability of the production process. Added to this, competitive dynamization requires Brazil to invest in technologies and innovations, also called "agriculture 4.0". Valuing the importance of sustainability throughout the chain, that is, making use of all available technology, using natural resources intelligently with a view to generating the least possible impact, is essential for increasing productivity and the consumer market.

As Shimada points out, Simon, & Relief Cunha (2021), in 2050 the population will reach about 9.8 billion, around 29% more than the current number the consequent risk of food insecurity, the demand for food follows the same pace.

In this context, Brazil is expected to increase food production to contribute 40% of this additional demand by 2050 (Caligaris, Rangel, Polidoro & Farias, 2022). It is a fact that agriculture in Brazil is of paramount importance in the supply and supply of food inside and outside the country, making it important for the national economy, and for this, it increasingly needs qualified labor and more modern equipment (Araújo, 2022), responsibility in the use of fertilizers (Caligaris *et al.*, 2022) and defensive.

For CNA (2021), Brazil currently has an agriculture adapted to different types of regions and with rural producers increasingly aware of their responsibilities with the increase in food production, but with environmental responsibility, using techniques that are more modern every day, which causes improvements in the country's economic indicators.

For this growth to be possible, the market has service providers who bring knowledge to the field, as well as innovations and techniques so that the development and improvement of performance is feasible in rural areas. An example of these is the consulting firm Alfa. With its identity preserved for ethical reasons, the Alpha company delivers several solutions for agribusiness: consulting, courses, data management software, laboratory diagnosis, research and biological agents. With a strong educational bias, the company Alfa operates mainly in the areas of dairy and beef cattle farming, grain production and coffee farming.

In each specialty, the Alfa company deals with not only technical management, but also financial and people management, family succession, governance and taxation, and sales technique. The main differentiator of the alpha company is the strongly applicable knowledge.

The Alpha company applies an educational process, in which for the transformation to happen, it is necessary that those who are learning apply and take possession of the knowledge. To this end, it has a team of highly qualified consultants who are up-to-date with market news. Professionals with technical training in the area of expertise who make up a multidisciplinary team in terms of specializations and areas of technical mastery.

### 1.2 Dairy Farming

Dairy farming is the productive activity of the agribusiness sector in which milk and its derivatives are produced. *"Milk, without further specification, is understood to be the product derived from the complete, uninterrupted, hygienic milking of healthy, well-fed and rested cows. The milk of other animals must be named according to the species from which it comes"* (Normative Instruction 51, of 18/09/2002, Brazil, 2002, p.2).

Milk is among the six most important products in Brazilian agriculture, ahead of traditional products such as processed coffee and rice, and playing a relevant role in the food supply and in generating employment and income for the population (EMBRAPA, 2022a).

In addition to its economic importance, milk is a natural food of great nutritional value with a higher concentration of calcium, which is essential for the formation and maintenance of bones. Milk proteins are complete, promoting the formation and maintenance of tissues. In addition to vitamin A, milk contains vitamin B1, B2 and minerals that promote growth and the maintenance of a healthy life. The dairy industry has boosted the nutritional value of the product and, currently, there are a number of dairy drinks enriched with vitamins, minerals and omegas on the market, as well as special milks for people who cannot digest lactose (EMBRAPA, 2022a).

In addition to its nutritional and economic importance, milk plays a relevant social role (EMBRAPA, 2022a). The milk and dairy products production chain is a sector of great economic and social importance for Brazil. The country is the world's third largest producer of milk, with more than 34 billion liters per year, with production in 98% of Brazilian municipalities, with a predominance of small and medium-sized properties, employing close to 4 million people (MAPA, 2022).

Brazil is the 4th largest producer of raw cow's milk in the world, behind only India, the United States, and China (FAOSTAT, 2021). In the last five decades, milk production in Brazil has grown sevenfold, jumping from 5 to more than 34 billion liters per year. Although the country is consolidated as one of the four largest producers in the world, this volume is only enough to supply the domestic market (Canal Rural, 2021).

Dairy farming is an activity of great socioeconomic importance for Brazil and its practice uses natural resources as raw material, however, improper management of these resources can harm the soil, contaminate water, and impair the maintenance of biodiversity (Abrahão & Natel, 2022).

Milk production can play a strategic role in promoting rural and regional development. Due to the potential to absorb work, add value and generate monthly income – especially in spaces with an intense presence of family farmers – the activity raises the levels of quality of life in the countryside, which contributes to maintaining the population in rural areas (Thies, Schneider & Matte, 2023).

Brazil has more than 1 million dairy farms and the agribusiness projections of the Secretariat of Agricultural Policy estimate that, for 2030, the most efficient producers will remain, who adapt to the new reality of technology adoption, improvements in management and greater technical and economic efficiency (MAPA, 2022).

It is important to say that there have been important changes in dairy farming in the last decade. In Brazil, we can mention the changes in the geography of production, greater concentration and professionalization of the activity, in addition to the significant growth in milk production in practically all states, reflecting the greater productivity of the national herd (Ferrazza & Castellani, 2022). In the world, there is another striking trend, which is the growth of cow productivity combined with the reduction of environmental impacts and greater herd efficiency (Leite, Bambino & Hein, 2017).

The key factor that has contributed and is believed to continue to contribute to this increase in productivity in Brazil is the use of technology in production. Dairy farming technologies are developed to improve management and decision-making within farms, with the potential to transform production through efficient nutrient utilization, reproductive and climate control, early warning of health problems, reduction of pollutant emissions, and provision of useful information to farmers. Thanks to the implementation of new technologies, it is possible to improve product quality, traceability, resource efficiency, animal welfare and reduced environmental impact, generating greater consumer confidence (Fonseca *et al.*, 2022).

Brazilian dairy farming has been moving towards the realization of a competitive professional system, incorporating increasingly intensive technologies. There is a continuous movement to reduce the number of milk producers in the stratum up to 100 liters, with a forecast reduction to less than 937 thousand in 2021, corresponding to a 45.3% reduction compared to 1996. Considering that the average Brazilian productivity (2,600 liters/cow/year) is still very low in relation to other countries with advanced dairy farming, and that there are farms in Brazil with a technological level equal to those of more modern cattle ranching, it can be seen that there is a huge room for growth for medium and small producers. The technology exists and is available, and the great challenge is its adoption in an economically viable way in the conditions and particularities of the different properties (Leite *et al.*, 2022).

Abroad, as well as in Brazil, the number of producers attracted by the new tools available in the sector is growing. And technologies have not only promoted improvements in management efficiency, with significant increases in productivity indicators, but have also promoted a reduction in hours of work required (EMBRAPA, 2022b).

As can be seen, dairy farming occupies a prominent position in the Brazilian economy, and expectations are high to continue the growth of production and productivity, with rates higher than those that have been achieved in recent years (EMBRAPA, 2022a).

### 1.3 Performance

Performance is a term that has been widely used and discussed in the scientific community. Performance refers to the way someone or something behaves taking into account their efficiency, their performance (Dicio, 2023). Several authors agree in their understanding that the concept of performance involves producing with efficiency and effectiveness and, therefore, also encompasses productivity metrics. Leite *et al.* (2017), state that performance is the organization's ability to achieve objectives, through the use of a system of performance indicators that allows the monitoring and control of strategic management. The authors add that economic and financial performance can be defined as the maximization of the wealth of entrepreneurs through growth in profitability, profitability and market value.

There are multiple methods and models of performance appraisal. Resources are potential elements, a stock at the disposal of the organization, the mere existence of which does not necessarily translate into performance. Such resources need to be mobilized, coordinated, and "delivered" to ensure organizational performance (Torrens *et al.*, 2010).

According to Assaf Neto (2012), the most commonly used technique to evaluate organizational performance is the calculation of economic and financial indexes, which are basically extracted from the financial statements collected by companies. Despite being a common technique, the author warns that the indices should not be analyzed in isolation, but in a sectoral and temporal manner, taking into account a series of aspects in relation to the analyzed company or a group of companies.

An example of how performance measurement can be useful in practice is the strong relationship between management information systems, strategies, and the decision-making process. The costs of processes, products and activities, organized through a performance measurement system, can guide the strategic actions of the organization. By being aware of direct, indirect, fixed and variable costs, it is possible to assess whether they are high or low, whether there is a need for cuts and adjustments (Torrens *et al.*, 2010).

It would be absurd to claim that an index or performance indicator is "good" or "bad" in absolute terms. Instead, based on its objectives and other relevant factors (e.g., cost, quality), an indicator may be considered fit or unfit for purpose (Micheli & Mari, 2014).

Evaluating the performance of dairy farming allows the identification of possible obstacles to its development and failures in management, providing subsidies for public and private decision-making (Fassio, Reis & Geraldo, 2006).

In a study conducted by Lima & Soares (2022) in which the management instruments used in 117 dairy farms distributed in 14 states of Brazil were evaluated, the following stood out as a financial analysis instrument used by the farms: a) cost and expense control; b) cash flow control; c) Monthly billing list. In this study, the financial measurement instruments showed statistical significance ( $p < 0.005$ ) with 4 of the 5 performance indices evaluated.

In a case study conducted by Gomes *et al.* (2022) the indicators of 34 years of activity of a farm in the state of Minas Gerais were evaluated. In this work, a strong relationship was identified between productive efficiency (performance) and profitability in dairy farming.

In this same study, the authors reinforce the importance of correct monitoring of production costs, since they are financial indicators that reflect the recent past of the activity and guide future actions. It is necessary to view the process as a cycle, that is, the technical actions influence the revenue and costs of the activity, which, in turn, must be interpreted and used for more assertive investment decisions and, consequently, improvements in the technical indicators, which, in turn, will reflect in the indicators.

Certainly, it is not easy to increase performance in dairy farming, or even to maintain it at high levels. However, the correct calculation of costs, their interpretation and use in decision-making on which actions to take will certainly have a positive impact on the productive efficiency of the activity (Gomes *et al.*, 2022).

## 2. Critical Success Factors - CSF

The so-called CSFs are, for any business, the limited number of focuses of attention of managers to conduct decisions in their business, areas in which the results, if satisfactory, will ensure a competitive performance that meets the aspirations of the managers and maintains or grows the business, the organization. These are the few

key areas where "things must go right" in order for the business to flourish. If the results in these areas are not adequate, the organization's efforts for the period will fall short of what is desired (Rockart, 1979).

The author has selected 4 main sources of CSFs: the company's specific structure, competitive strategy, environmental factors, and time factors. Thus, it is to be expected that organizations in the same industry will experience different CSFs as a result of differences in geographic location, strategies, and other factors.

Bullen and Rockart (1981) add that Critical Success Factors (CSF) are related to the specificities of a particular manager's situation, in their perspective of 'directing and choosing' information and processes to better position the firm. This means that CSF should be tailored to the market segment, the company, and the individual being interviewed.

It's important to understand what CSFs are not. They are not a standard set of "key indicators" that can be applied to every department in a company. They are not limited to factors that can be reported only by historical data, and financial information. On the contrary, the CSF method looks at the world from the point of view of a current manager. CSF are the specific areas of great importance to a particular manager, in a particular department, at a certain point in time. They therefore require specific and diverse situational measures, many of which must be evaluated by means of soft and subjective information not currently collected in an explicit formal manner by the firm (Bullen & Rockart, 1981).

In a study conducted by Rockart (1979) at MIT (Massachusetts Institute of Technology) he suggested that the CSF approach is highly effective in helping top management define their needs for meaningful information.

Huirne, Harsh & Dijkhuizen (1997) were pioneers in studying CSF in agribusiness. They conducted 13 workshops with dairy farmers from the Netherlands and Michigan (located in the United States of America), focused on assessing their objectives, CSFs and information needs. The events took place in 1993 and 1995, with a total of 155 participants. The results of this study indicated that CSFs and information needs varied across regions, but are consistent over time if producers were analyzed as a group. However, significant differences were found between the 1993 and 1995 responses if farmers were analyzed individually. This low level of consistency has implications for the provision of information at the farm level. CSF in relation to finances were considered the most important.

In a study by Conejero, Alves & de Lima (2020), 9 CSFs were surveyed and the results showed that in for-profit businesses, the most important CSFs revolve around the quality of leadership and the team of employees.

In another study, by Santos (2020), the performances of six companies in the agribusiness industrial segment, located in Santa Maria (RS), were analyzed, and the results indicate that the most important factors are the quality of the products and the efficiency of the processes.

These examples reinforce that the CSF method elucidates important information for decision-making that applies to a certain type of company in a given temporal and economic conjuncture, according to Bullen and Rockart (1981).

### 3. Methodology

The present study aims to elucidate the CSFs of high-performance dairy farms. To this end, the following research objectives were addressed: a) To characterize dairy farms assisted by technical and economic-financial consultancy of an alpha agribusiness company; and b) Identify, through multiple case studies, which are the critical factors that promote high performance in dairy farms (method: CSFs, ordered by degree of importance). Other important characteristics of adopting the CSF method include (i) its ability to address the 7±2 variable engrams of the manager's experience, it's the domain channel capacity (Miller, 1956); (ii) meeting the decision-maker's data needs expectations; (iii) promoting engagement in the firm's model construction; (iv) its simplicity of application; (v) is also considered a method encompasses Eidetic Reduction. Its limitation lies in the limited rationality of managers and the attempt to seek ad hoc valorization."

The present study has a qualitative approach and is conclusive descriptive. To this end, a multiple case study was conducted. The main reason is the scarcity of studies on CSF on dairy farms in Brazil. For the study, it was appropriate to choose farms in similar contexts of development in order to have coherence in the findings, and to make the approach viable. There are two units of analysis: leaders (owners and managers) of dairy farms assisted by the consulting firm Alfa; and expert dairy farming consultants who serve these farms.

The chosen farms are part of the group of the 20% best performing customers according to a 2021 benchmarking by the consulting firm Alfa. To be part of the benchmarking, the farms had to meet two criteria: to have control of technical data, economic and financial data, and to present economic and financial results considered above

the standard for dairy farming. The financial indicator chosen to rank the performance of the farms was EBITDA (Earnings Before Interest, Taxes, Depreciation and Amortization).

Six farms that meet all these inclusion criteria were chosen. The study was directed by the case study method (Eisenhardt, 1989). Data collection was done through the application of an interview script, according to the CSFs method, ordered by degree of importance (Rockart, 1979). The study was carried out in three stages: interviews with consultants specialized in dairy farming, interview with leaders of dairy farms, Characterization of dairy farms.

#### Step 1: Interview with Expert Dairy Farming Consultants

In stage 1, the consultants (seven) were interviewed individually. The questionnaire "Interview script - consultants" was applied in the appendices. The objective of the questionnaire was:

- (a) characterize the expert consultants;
- (b) identify which CSFs are to have high performance in dairy farms, in order of priority;

A conference was held with each consultant 14 days after the interview to verify their position regarding the CSFs mentioned by themselves (Rockart, 1979). Each consultant was asked; "Here is the list of critical success factors you cited in the interview. Do you agree with the factors, or would you like to change, add or remove something from this list?" The consultants then made their adjustments and the list resulted in the original factors used in this step.

After completing the individual interviews, the original factors (cited by the consultants) were compiled with their respective priorities established by the interviewees (1st, 2nd, and so on).

The original factors were classified according to semantic meaning, generating 8 factors at the end of step 1.

For each original factor, the following calculation was performed: number of consultants interviewed (7), divided by the order of importance attributed to each factor for each consultant. The sum of these results, for each factor analyzed, generated the result of each final factor. The final factors were classified by degree of importance, from the highest to the lowest numerical value.

#### Stage 2: Interview with farm leaders

With the 8 CSF obtained in stage 1, stage 2 was performed.

In stage 2, the farm leaders were interviewed individually. The questionnaire "Interview script - leaders" was applied in the appendices. The objective of the qualitative questionnaire was:

- a) characterize the leadership of the dairy farms studied;
- b) identify which CSFs are to have high performance in dairy farms, in order of priority;

The interviewer asked, "We have below a list of factors that influence dairy farming. On a scale of 1 to 7 (Miller, 1956), you agree that each item on the list contributes to the success of dairy farming." The factors and their respective ranking orders (1st, 2nd and so on) were noted. At the end, the interviewees were given the opportunity to add any factor they deemed necessary. When there was an addition of factor(s), the interviewee was given the opportunity to review the ranking order.

After completing all the individual interviews with the farm leaders, the new factors cited by the leaders were compiled. If the new factor mentioned had a semantic meaning compatible with the final factors of step 1, the new factor was included along with them. If the meaning of the new factor differed from the final factors in step 1, another factor was created. This process resulted in a larger list of factors than the one used at the beginning of step 2.

For each factor in the list obtained in step 2, the following calculation was performed: Number of leaders interviewed (7), divided by the order of importance attributed to each factor for each leader. The sum of these results, for each factor analyzed, generated the result of each final factor. The final CSFs were classified by degree of importance, from the highest to the lowest numerical value.

At the end of stage 2, a list of 13 factors was obtained, of which the first 9 were used for the study analyses. The interviews were recorded, with the consent of the interviewees, so it was possible to obtain as much detail as possible, and the identity of the farms is kept confidential, for ethical reasons.

The two compilations obtained with steps 1 and 2 were evaluated using the Gioia Method (Corley & Gioia, 2004), seeking to find points of agreement and points of dissonance about the CSFs.

#### Step 3: Characterization of dairy farms

To characterize dairy farms, technical data from the 2021 benchmarking of the consulting firm Alfa were used. Such data were compiled and used in the description of the main characteristics of the business.

The "Characterization of the farms" list, which contains the data that was requested about the farms, is available in the Annex.

#### **4. Results and Discussion**

##### *4.1 Characterization of High-Performance Farms*

There were 6 farms studied, 2 of them located in Minas Gerais and 5 located in Goiás, all of them with family management.

In all farms, the main activity is dairy farming, with 1 working exclusively with this activity, and the other farms have other activities: production of grains, soybeans, hay and cheese.

As for the technical indicators, the productive area of the evaluated farms varies from 75 to 400 hectares, and the number of animals varies from 150 to 1400 animals. The average productivity per animal ranges from 30 to 39 liters/day, and the average total production ranges from 5,000 to 36,000 liters/day.

In all farms the type of facilities used for lactating animals is confinement, with three of them using *the Free Stall* and in four farms the *Compost Barn*.

The farms have had technical assistance for an average of 23 years, technical consultancy for an average of 21 years, and economic and financial advice for 10 years.

##### *4.2 Characterization of Farm Leaders*

The leaders interviewed were 7 in total, 5 male and 2 female, with exclusive dedication to the activities of the farm and occupying a role in the management of the business.

Regarding professional training, 2 leaders have training in courses focused on agribusiness, namely Veterinary Medicine and Agricultural Technician. The others have higher education degrees in other professional areas. The last update (participation in courses and events) of the leaders related to the activities on the farm was on average 5 years ago, and 2 claimed to have never been updated.

The satisfaction of the leaders with the dairy activity was unanimous, all say they are very satisfied.

##### *4.3 Characterization of the Expert Consultants*

There were 7 consultants interviewed in total, all male. Regarding professional training, all of them have a degree in veterinary medicine, 1 of them being a post-doctorate, 1 doctor, 4 specialists and 1 graduate, attending post-graduation. All interviewees reported having completed technical specialization/updating less than 1 year ago.

Regarding the area of operation, 2 of them work with technical assistance and technical consulting. The other 5 work only with consulting, and of these, 4 work with technical consulting and economic-financial consulting, and 1 works only with economic-financial consulting.

The average time of experience in consulting, both technical and economic-financial, is 11 years, and the average time of experience in technical assistance is 13 years among the interviewees.

##### *4.4 Concept of Good Performance*

The expert consultants were asked "what is a good performance on a dairy farm?". In the answers, three items stood out: the first was the generation of wealth/profit – which had unanimity in the answers; The second item highlighted in the performance concept was the importance of the technical aspects of the milk business, followed by the third item, the importance of meeting the objectives of the shareholders of the business.

All 7 consultants interviewed mentioned the first item: "[good performance] is the farm being able to optimize all the resources (material, financial, land, people's time, for example) available in a sustainable way to generate wealth"; "[It's the farm having] healthy cash flow, good working capital, interesting economic results, competitive costs."

The importance of technical aspects was mentioned by 4 of the 7 consultants interviewed: "[good performance is] to have good zootechnical indices and generate profit"; "The economic number, in addition to indicating the zootechnical result, makes it possible to find opportunities for improvement."

In addition, 3 of the 7 consultants cited the importance of meeting the goals of the shareholders of the business: "Good performance is achieving the goal of the shareholders"; "The farm brings a result to the producer. A

*satisfactory economic return. The farm needs to be looked at as a business. The producer needs to understand this. The farms that are more successful are concerned beyond the economic with the gain in efficiency, which has an environmental concern, and concern for people. Profit needs to be in context.*

#### 4.5 Critical Success Factors

The expert consultants were asked "What are the CSFs that lead the farm to achieve high performance?", and the CSFs cited by each respondent were ordered by themselves in order of importance. At the end of the process, we obtained the CSFs, from the point of view of the consultants, in descending order of importance, as shown in table 1.

With the list of CSFs, the leaders of dairy farms were interviewed. When evaluating the available list, the leaders chose the degree of agreement on a *Likert-type* scale, in which all interviewees agreed in grades 5 to 7 (which indicate agreement: partially agree: 5; agree: 6; strongly agree: 7) with the factors presented. Only one leader disagreed with the "Ensuring animal comfort" factor, to which it gave a score of 2. Subsequently, the interviewees ordered the factors according to their importance for the good performance of the dairy farm.

Table 1. Percentage of CSFs according to dairy farming consultants

<b>Critical Success Factors according to expert dairy farming consultants.</b>		<b>% of citations</b>
(1)	Leadership and people management	54,24%
(2)	Management of indices and technical indicators	26,54%
(3)	Process management	10,73%
(4)	Financial management	1,94%
(5)	Search for continuous improvement	1,94%
(6)	Employee training and development	1,61%
(7)	Proper project sizing	1,45%
(8)	Ensuring animal comfort	1,55%
Total		100,00%

Table 2. Percentage of critical success factors in high-performing dairy farms

<b>Critical Success Factors in High-Performing Dairy Farms</b>		<b>% of citations</b>
(1)	Financial management	17,44%
(2)	Leadership and people management	17,06%
(3)	Process management	13,76%
(4)	Employee training and development	11,86%
(5)	Proper project sizing	11,07%
(6)	Search for continuous improvement	10,80%
(7)	Management of indices and technical indicators	9,84%
(8)	Ensuring animal comfort	5,42%
(9)	Technical assistance and consulting	1,91%
(10)	Clarity of business objectives	0,27%
(11)	Food production	0,27%
(12)	Succession	0,20%
(13)	Family stake in the business	0,10%
Grand Total		100,00%

At the end of the analysis, some factors were added to the list, resulting in the CSF recorded in Table 2. The research was continued with the 9 factors that had the most repeatability in the second stage: financial management; leadership and people management; process management; employee training and development; adequate sizing of the project; search for continuous improvement; management of indices and technical indicators; ensure animal comfort; technical assistance and consultancy.

Considering the scarcity of previous studies, and the pioneering spirit of the present study, this study investigated dairy farms considered to be of high performance. According to official data from IBGE (2022), the average productivity of dairy farms in Brazil is 7 to 8 liters/day, while the average in the evaluated properties is 30 to 39 liters/day. In order to access these farms, it was decided to select them based on an economic and financial criterion that would allow the identification of high performance from the point of view of profitability, and, in



the dairy activity, an indicator that translates the financial health of the enterprises is EBITDA (Zimmer *et al.*, 2019).

Alfa Farm Consulting serves more than 200 dairy farms in Brazil, and annually conducts its own benchmarking, in which various technical, economic and financial aspects of the activity are evaluated. The 6 farms selected for this study occupied the top 20% of the best evaluated farms in this benchmarking. According to Assaf Neto (2012) and Zimmer *et al.* (2009), this is one of the most commonly employed techniques to evaluate organizational performance.

Considering performance as the "way someone or something behaves taking into account their efficiency, their income" (DICIO, 2023), and economic-financial performance, as "maximizing the wealth of entrepreneurs through growth in profitability, profitability, and market value (Leite *et al.*, 2017), such a choice of analysis is appropriate and assertive.

On the farms evaluated, the average time in which the business is accompanied by technical assistance is 23 years, technical consulting 21 years, and economic and financial consulting 10 years. Such monitoring triggers a flow of continuous improvement that is strongly related to increased productivity and performance improvement.

Rauta and Da Silveira (2020) evaluated the effect of consulting on dairy farms in the states of Rio Grande do Sul and Paraná, in a multiple case study, and identified that consulting contributed to significant financial and performance improvements, which reached up to 190% increase in productivity and 52% increase in profitability in the period analyzed. The authors pointed out that the main point of improvement coming from the consultancy was the personalized work for each farm and the application of management methods.

In the study conducted by Gomes *et al.* (2022), the performance of a farm during 34 years of activity was evaluated, and the findings indicate that technical assistance contributed to a significant expansion in milk production, which was accompanied by strong improvements in technical indicators.

Another study, which evaluated 34 properties in Tocantins assisted by technical and managerial consulting, revealed that the main impact generated by agricultural companies is related to financial gains, with emphasis on the increase in revenue after undergoing a consulting service (Nunes, 2021).

The Rockart method (1979) was used to survey the CSFs. Considering that the expert consultants have a broad view of the business, the interviews were initiated by them, and then the leaders of the farms were interviewed.

A dissonance was observed regarding the way of seeing CSF and its effects on the performance of dairy farms, as shown in Figures 3 and 4.

For the specialist consultants, the CSF "Leadership and people management" is essential for the other CSFs to be performed with quality (figure 3). According to one of the interviewees, "*without people management, without a present and effective leader, nothing on the farm works. It's no use, because without leadership, processes don't happen properly, which reflects in bad rates, and so on.*"

An organization can only be successful if it has competent, capable, and motivated people, because the success of any company is linked to people (Da Silva Cunha & Da Luz Rodrigues, 2022).

In the field, however, few actions have been identified in order to develop, train and value people. In a study carried out in the dairy basin of Pernambuco (Gomes, Honorato & de Carvalho, 2020), the results pointed to the lack of people management techniques in the region, a low rate of training, employee dissatisfaction, and a high rate of informality. In another study conducted with soybean producers in western Goiás (Ceolin, 2019), simple people management practices were identified in the contexts analyzed, even with high productions incorporated into the use of complex technologies.

Ceolin (2019) explains that the high complexity of business does not seem to be linked to the use of more robust people management tools. The author proposes that the cause of this is the shared belief that people management practices do not necessarily have a direct impact on production.

For the leaders of dairy farms, the vision is different: the essential CSF is financial management (figure 4). According to the leaders, the absence of adequate financial management compromises the progress of all project activities. One of them reported that "*without looking at the money, and having all the bills in our hands we cannot make a quick and assertive decision, this compromises everything on a daily basis*", another leader added "*The business is getting tighter every day and to be competitive we need to have financial management very well done, without it nothing goes forward*".

This view focused on economic and financial aspects was present throughout the interview with the leaders, and the reasons that apparently lead to this reasoning are mainly threefold. The first is the fact that the leaders

dedicate themselves exclusively to the business, which allows for a very close monitoring of all demands. The second reason is that dairy farming is the main activity of the business, so there is a strong concern of the leaders with profitability and continuous improvement. And the third reason is the fact that the farm is family-run, which reinforces the commitment to have a good performance, which reflects in concern and a close look at financial management.

In addition to the reasons observed in the interviews, the literature reinforces that the best indicators to measure the performance of enterprises are the economic-financial indicators (Assaf & Neto, 2012; Matiz & Bulgacov, 2011; Leite *et al.*, 2017). In fact, in a case study on a dairy farm, Gomes *et al.* (2022) identified a strong relationship between technical performance and business profitability.

When observing the final list of CSFs, it is possible to identify a coherence with the considerations of Miller (1956), who proposes that in interviews one finds the so-called "magician" number 7+-2, in which the interviewees tend to answer 7 factors, more or less 2 units, that is, 5 to 9, of the items in question. In stage 1 of the research we obtained 8 factors by interviewing the leaders, in stage 2 this number increased to 13 factors, however, of the 13 only 9 had repeatability, which reinforces Miller's proposition.



Figure 3. Experts Consultants cognitive experience perceptions in management (“Experts Consultants view”) of the Critical Success Factors for high-performance dairy farms

Source: Prepared by the authors.



Figure 4. Farm leaders' cognitive experience perceptions (“Leaders view”) on critical success factors for high-performance dairy farms

Source: Prepared by the authors.

An interesting aspect of the increase in factors from stage 1 (8) to stage 2 (13) was the addition of factors suggested by the farm leaders. In step 2, when asked if they agreed (on a standard scale *likert*) with the list of factors (proposed by the consultants), the leaders of the farms agreed almost unanimously (only one leader disagreed with a factor). In the speech, the interviewees reinforced how much the factors strongly represented what is important to the business.

Despite this, when asked if they would like to add any factors, some leaders wanted to add, resulting in 13 factors. At that moment, we understood that from the leaders' point of view, although they agreed with the factors suggested by the consultants, there were still some specific aspects, which in the leaders' view, were critical for the farm to have high performance.

Of these aspects, what stood out was precisely "Technical assistance and consulting", which is represented by the presence of the consultant himself, and in the view of the consultants, as interviewees he was not present. This was reinforced by evaluating the repeatability of the list of factors from stage 2, in which the factor "Technical assistance and consulting" had greater repeatability and was added to the final list of CSFs in the present study.

Interestingly, the development of the factors of higher abstraction in FCS's (7±2) are considered as "explanatory variables".

## 5. Final Thoughts

The present study played a pioneering role in investigating CSFs in a context that was little explored until then in dairy farming, an important economic segment of Brazilian agribusiness.

This innovations, investigating and identifying the consensus success factors presented by 7 experts using the FCS method applied empirically, in a real case with experts. The results indicate that the factors that determine performance are, in this order, (1) Leadership and people management; (2) Management of indices and technical indicators; (3) Process management; (4) Financial management; (5) Search for continuous improvement; (6) Employee training and development; (7) Proper project sizing; (8) Ensuring animal comfort.

It is important to note that the first 2 add up to 80.78% (Table 1) of weight in decision making, presenting a strong Pareto footprint.

An important finding is the inversion of some factors on the side of experts and leaders. For leaders, financial management is more important than people and leadership management. Therefore, the unmet financial factor generates greater stress in system management.

We observe that the CSFs allows to identify factors that promote high performance on dairy farms are financial management; leadership and people management; process management; employee training and development; adequate sizing of the project; search for continuous improvement; management of indices and technical indicators; ensure animal comfort; technical assistance and consultancy.

The study elucidated in practice that the CSFs of a business depend on the leader's vision and what he considers important at the moment. In the present study, this became clear when observing the choice of specialist consultants versus farm leaders in prioritizing CSFs for high performance dairy farms. While the expert consultants chose the CSF "Leadership and people management" as the first most important, the leaders of dairy farms chose the CSF "financial management".

The results of the present study contribute significantly to the understanding of CSFs applied to find the main performance factors in dairy farming. Therefore, it is proposed that the method be adopted periodically for management adjustments and/or as a Strategic Planning phase for companies in the sector. However, more studies are needed to deepen and better elucidate the nuances related to the themes covered in this work.

### Informed consent

Obtained.

### Ethics approval

The Publication Ethics Committee of the Canadian Center of Science and Education.

The journal and publisher adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

### Provenance and peer review

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### Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### Data sharing statement

No additional data are available.

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## Appendix

### Characterization of farms

1. Property details
  - 1.1. Usable area of the property (in hectares):
  - 1.2. Location (City & State):
  - 1.3. Main activity is milk?
  - 1.4. Do you have other activities?
  - 1.5. What is the type of management? (e.g. family, corporate)

- 1.6. Property Location (City & State):
- 1.7. Number of lactating animals:
- 1.8. Average milk production:
- 1.9. Total production/day:
- 1.10. Type of facilities for lactating animals:
2. Technical Assistance and Consulting
  - 2.1. Since when (year) has there been technical assistance/consultancy on the property?
  - 2.2. Since when (year) has there been economic and financial consulting on the property?
  - 2.3. Do you consider yourself satisfied with dairy farming (yes or no)?

#### Interview script – consultants

1. Personal data (consultant)
  - 1.1. Gender:
  - 1.2. Education: Vete
  - 1.3. When (year) was the last course/event/refresher you attended related to dairy farming:
  - 1.4. Do you work with technical assistance/consulting?
  - 1.5. How long (year) have you been working with technical assistance/consulting?
  - 1.6. Do you work with economic and financial consulting?
  - 1.7. How long (year) have you been working with economic and financial consulting?
2. Critical Success Factors
  - 2.1. Which dairy farms do you serve that perform well?
  - 2.2. What do you think is a "good performer" on a dairy farm?
  - 2.3. What are the critical success factors that drive the farm to achieve high performance? (projective question "what does he think")
  - 2.4. Sort these factors by degrees of greatest importance.
    - 2.4.1. Describe the factor (What does this factor mean to you?)
    - 2.4.2. Why does this factor lead to high performance?

#### Interview script – leaders

3. Personal data:
  - 3.1. Gender:
  - 3.2. Education:
  - 3.3. Occupation:
  - 3.4. Do you work in other activities besides the rural business?
  - 3.5. When (year) was the last course/event/refresher you attended related to dairy farming:
4. Critical Success Factors:
  - 4.1. Below is a list of factors that lead the dairy farm to achieve high performance. Rate on a scale of 1 to 7 (where 1 you strongly disagree and you strongly agree) how much you agree that each item on the list contributes to the success of Dairy Farming.
  - 4.2. Order the factors from most important to least important.
    - 4.2.1. For each ordered factor, explain:
      - 4.2.1.1. Describe the factor (What does this factor mean to you?)
      - 4.2.1.2. Why does this factor lead to high performance?
      - 4.2.1.3. What are the challenges in achieving this factor?

4.2.1.4. What are the principles of success for this factor (what do you think needs to be done for this factor to be successfully achieved?)

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