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ANALYSIS OF THE POTENTIAL OF WATERMELON PRODUCTION AND COMMERCIALIZATION IN THE STATE OF GOIÁS 2019 TO 2023

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ABSTRACT

The state of Goiás stands out in agribusiness, especially in fruit growing, due to the growing domestic and foreign markets. Among the fruits, watermelon (Citrullus lanatus) stands out, being relevant both economically and socially, generating jobs in various sectors. However, this emerging market lacks policies and techniques as developed as those present in sectors such as soybeans and corn, which highlights the underutilization of the potential of watermelon production in the state. This study aims to evaluate innovations, whether public policies or private initiatives, that can improve the production and commercialization of watermelon in Goiás. The research seeks to analyze performance indicators and identify actions that promote efficiency and gains for the local community and producers, considering that watermelon is widely consumed in various sectors, standing out for its nutritional and cultural value. The methodology of the study follows two stages: a review of the literature on fruit production chains and the agricultural market in Goiás, followed by an analysis of data on competitiveness, consumption trends and opportunities in the watermelon production chain. Based on these results, strategies will be proposed to optimize production, increasing the competitiveness of producers and promoting the sustainable development of the sector. The study will also highlight the main weaknesses and strengths of marketing and production, using variables such as production size, demand, and available technologies.

Keywords: Watermelon Production. Agricultural Marketing. Agribusiness. Goias. Fruit growing. Public Policies.

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INTRODUCTION

The analysis of the potential for watermelon production and commercialization in the State of Goiás is undeniable in the current scenario of Brazilian agribusiness. Brazil is the third largest fruit producer globally, but occupies only the 23rd position among the largest exporters, according to FAO (2021), which highlights the need for a more intense export culture, as pointed out by Laudemir André Müller, international business analyst at ApexBrasil. In this sense, fruit growing emerges as strategic, especially in Goiás, a state with diversified agricultural production and a relevant position in national production.

Watermelon, along with other fruits such as oranges, bananas, apples, and grapes, is one of the main fruits produced in the country, according to IBGE data (2022). In the context of Goiás, the growing production and internal and external demand for watermelon not only demonstrate its economic relevance, but also its social impact, generating jobs and promoting development in different areas, such as agriculture, administration and technology.

Therefore, this study arises in response to the identification of the problem of underutilization of the potential of watermelon production and commercialization in Goiás, with the objective of exploring the opportunities and challenges to boost not only the agricultural sector, but also the regional and national economy.

The importance of this theme lies in the urgent need to commercially take advantage of the potential of watermelon production in Goiás, one of the leading states in agricultural production in the country. As mentioned by several authors, watermelon is a fruit vegetable with a strong socioeconomic impact, generating employment and income throughout the production chain (Junqueira & Almeida, 2010).

In addition to this perspective, its production is a vital source of livelihood for many families on family farms (Melo & Vilela, 2007), which further highlights its relevance for regional development. Considering the context presented, investigating the possibilities of watermelon cultivation in Goiás not only aims to optimize agricultural production, but also to contribute to the economic and social growth of the state and the country as a whole.

The objective of this study is to understand the current scenario of watermelon production and commercialization in the state, with the specific objectives of identifying the main challenges faced by producers and pointing out the opportunities for improvement in this sector.

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Our hypothesis is that, despite the evident potential, there are obstacles that limit the full expansion and use of fruit production, which may include issues related to logistics, technology, market and public policies.

In short, the detailed analysis of watermelon production and marketing in Goiás is crucial not only to understand the current panorama of this sector, but also to identify possible paths for optimization and growth. By exploring the challenges and opportunities associated with this crop, this study aims to contribute to the sustainable development of state agriculture and to the enhancement of national agribusiness.

THEORETICAL FRAMEWORK

The present study investigates the watermelon production chain, the agricultural market of Goiás and the evidence already documented in the scientific literature. The following critical and contextualized analysis is structured around the following topics: fruit production chain, agricultural market and watermelon production, technologies and innovations in cultivation, public policies and sustainability, and challenges and perspectives in watermelon cultivation in Goiás.

WATERMELON PRODUCTION CHAIN

The concept of "production chain" is crucial for us to understand the activities that add value from production to acquisition by the final consumer. Porter (1985) introduced the value chain model, which evaluates how activities along the chain contribute to the value creation and competitiveness of a business. This model is essential for the analysis of the fruit production chain, including watermelon. According to Kaplinsky and Morris (2001), the optimization of activities along a production chain is essential to ensure efficiency and long-term viability. In this perspective, the need for integration between agricultural production and industry is evidenced, aiming to increase efficiency and reduce costs. Porter's value chain model is a valuable instrument to assess competitiveness in the fruit production chain, and the optimization of activities, as proposed by Kaplinsky and Morris, is essential for the sustainability of the sector.

Considering the object of research, it is necessary to understand the fundamental points surrounding watermelon production, which leads to understanding specific challenges, such as those related to water needs and soil management. Marouelli *et al*. (2012) address cultivation and sanitary control techniques, while Sousa *et al*. (2019)

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highlight the importance of efficient irrigation. Additionally, the economic analysis of watermelon production is vital for the sustainability of the crop. Magalhães and Souza (2022) discuss the economic viability of cultivation and the challenges related to prices and market access, complemented by Vilela *et al*. (2014). These authors bring as influential factors the efficient management of water and soil, since it is crucial for watermelon productivity; They also inform that it is essential for economic viability to consider market challenges, which must be constantly evaluated to ensure the competitiveness of producers.

TECHNOLOGICAL INNOVATIONS

The adoption of technologies and innovations is essential to improve efficiency and sustainability in agriculture. Georeferencing, for example, allows the spatial analysis of production, optimizing logistics and strategic decision-making (Sousa *et al*., 2019). In addition, Guedes and Nascimento (2019) demonstrate the positive impact of introducing advanced irrigation technologies and improved cultivation techniques on productivity and sustainability. Georeferencing technologies and innovations in agricultural management are essential to increase production efficiency and sustainability in the watermelon production chain.

PUBLIC POLICIES

Public Policies are a basic component for the sustainability of any production chain, considering that the impact of global factors is eminent. They play a crucial role in promoting sustainable agricultural practices. As stated by Assunção et al. (2013), the development of effective public policies is significant to improve the efficiency and sustainability of agricultural production. The Food and Agriculture Organization of the United Nations (FAO, 2021) corroborates this view, emphasizing that sustainable agriculture involves practices that reduce environmental impact and promote the efficient use of natural resources. The effectiveness of public policies is decisive for the implementation of sustainable agricultural practices, where the reduction of environmental impact and the rational use of resources must be prioritized.

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CULTIVATION OF MELANCIA IN THE STATE OF GOIÁS

Watermelon Cultivation has its regional peculiarity throughout the country and, in Goiás, some factors are particularly evident. Watermelon cultivation in the state faces specific regional challenges, such as climate and soil characteristics, which require management practices adapted to local conditions (Dias and Santos, 2019). However, the Government of the State of Goiás (2022) highlights significant opportunities with the expansion of consumer markets and the adoption of innovative solutions, which can improve the competitiveness and sustainability of watermelon production in the region. Adapting management practices to regional conditions is essential to overcome local challenges. In addition, the exploration of new markets and technological innovations can provide advances in the competitiveness and sustainability of cultivation.

The concepts of production chain and value established by Porter (1985), and the optimizations proposed by Kaplinsky and Morris (2001), are fundamental to understand how the integration between agricultural production and industry can add value and increase competitiveness in the sector. These concepts provide a theoretical framework to analyze the efficiency of the watermelon production chain, suggesting a holistic approach that includes everything from production to final distribution. Through the analysis of the main references and their conclusions, it is possible to identify areas for improvement and innovations in the sector, which can potentially promote the sustainable development and competitiveness of watermelon production.

METHODOLOGY

The present methodology uses an exploratory approach of secondary data for the analysis of its object. Within a scientific context, the methodological process was structured in two main stages. In the first stage, secondary quantitative elements were obtained, extracted from verified databases and of undeniable credibility. Subsequently, the data collected were standardized, systematized and analyzed through tools such as Excel spreadsheets. In order to better understand the context, technical standards and institutional documents that guide institutional policies were read.

In the second stage, exploratory and descriptive techniques were applied to the secondary quantitative data collected. The objective of these techniques was to identify patterns and trends, essential elements for the diagnosis of the organization studied. Although no formal correlation or regression calculations were applied, trends were

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observed that suggest possible connections between factors such as production volume, market demand, and the use of agricultural technologies. This approach follows the methodological guidelines discussed by Selltiz et al. (1987) and Gil (2017), providing a flexible and broad analysis that facilitates the generation of ideas and the understanding of the problem under study.

The methodology employed enabled a comprehensive understanding of the results in the face of the challenges and potentialities inherent to the watermelon production chain in the state of Goiás. These procedures not only uncovered strengths and opportunities, but also highlighted weaknesses and threats. The detailed and systematized analysis of secondary data, combined with exploratory and descriptive techniques, contributes significantly to the proposition of strategies aimed at optimizing management and marketing, strengthening watermelon production chains and benefiting the local economy and society.

RESULTS AND DISCUSSIONS

The watermelon production process in Brazil, including Goiás, is presented from the perspective of production and commercialization. Then, watermelon production is described based on data of kilograms per hectare. Finally, the processes of commercialization and export of watermelon are discussed, both at the regional level, in Goiás, and nationally.

WATERMELON PRODUCTION PROCESS

Watermelon cultivation follows a defined agronomic process, starting with soil preparation, which includes harrowing, subsoiling and leveling. Planting involves opening holes, sowing and initial irrigation to promote germination. If necessary, replanting is carried out in areas with failures. Crop maintenance is essential, especially during flowering and fruit development.

Due to the irregular weather between June and December, most growers use irrigation systems, with drip and cannon being the most common methods. Adequate irrigation and fertilization are crucial to ensure quality fruits, as producers face challenges such as pests and adverse weather conditions, including prolonged droughts and hailstorms (DIAS, 2019).

Brazilian producers have stood out by offering products that largely meet the preferences of the consumer market. Historically, the most popular cultivars have been

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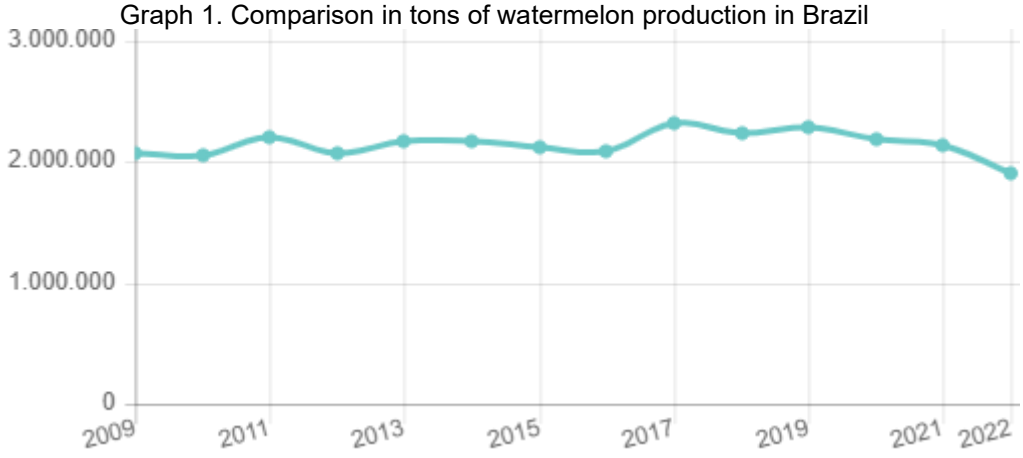
those developed in the United States and Japan, due to their adaptability to different regions of the country. Among these cultivars, the American variety Crimson Sweet stands out as the most consumed in the domestic market, representing approximately 90% of the supply of watermelons in Brazil, as reported by Dias *et al.* (2010).

Watermelon production data in Brazil until 2019 indicate that 105,064 hectares were harvested, resulting in a total production of 2,314,700 tons. The Northeast stands out as the main producing region, with 36,864 hectares planted and 663,458 tons produced. The state of Ceará stands out with the highest national average productivity in irrigated crops, reaching 34.0 tons per hectare. The South, North, Midwest and Southeast regions come next. Among the states, Rio Grande do Sul is the largest producer, with 18,551 hectares planted (FAO, 2021). The national average productivity of watermelon is 22 tons per hectare. The Central-West region has the highest average productivity, with 33.26 tons per hectare, with Goiás standing out as the main producer in the region, with 32.0 tons per hectare (DIAS, 2019).

Compared to 2022 data, production was 1,912,909 tons, with a harvested area of 85,729 hectares and an average yield of 22,313 kg per hectare. In 2022, Goiás remained the largest producer of watermelon in Brazil. (IBGE, 2023). The IBGE production graph, presented below, can better illustrate the comparison, in tons, of Brazil's production over the years.

Graph 1. Comparison in tons of watermelon production in Brazil



Source: IBGE data (2023) and graph prepared by the authors themselves.

This second graph, also from the IBGE, shows the comparison of production in tons in the state of Goiás over the years.

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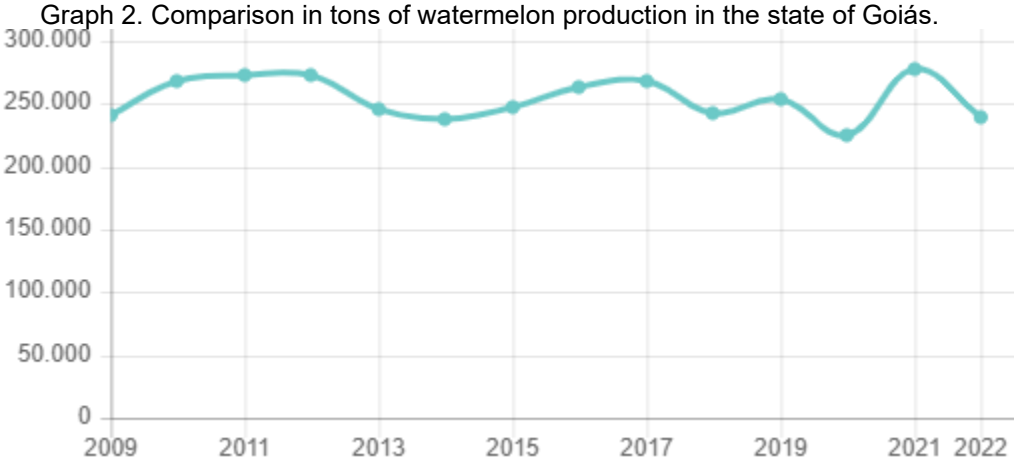
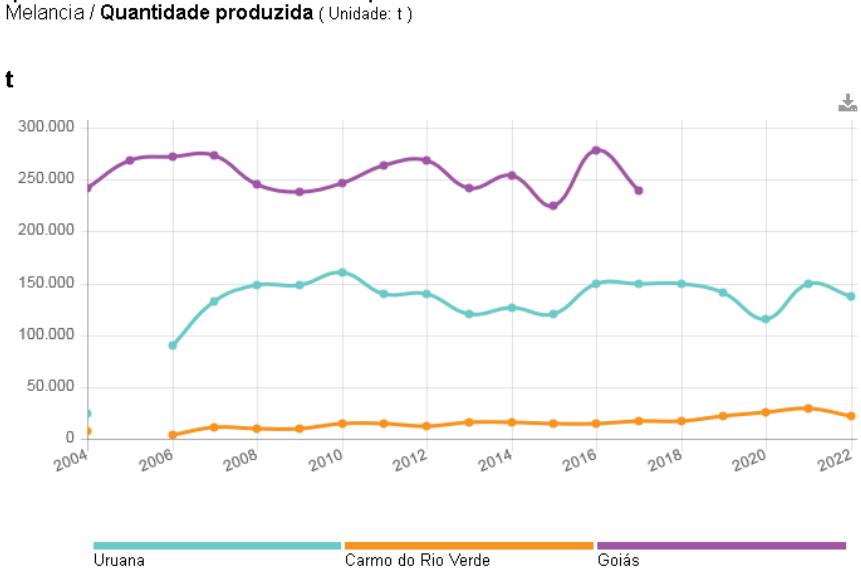
Graph 2. Comparison in tons of watermelon production in the state of Goiás.



Source: IBGE data (2023) and graph prepared by the authors themselves.

Analyzing the data and comparing them with those of 2022, it can be seen that Brazil's production was 1,912,909 tons, while Goiás' was 239,090 tons, representing 12.49%. This demonstrates that the state has a constancy and an expressive representativeness in production. Next, we present a comparison of Goiás' production in relation to the two largest producers in the state, Uruana and Carmo do Rio Verde, based on data obtained from the 2022 Agro em Dados magazine, from the State Secretariat of Agriculture, Livestock and Supply (Seapa). In these cities, the numbers presented in the years analyzed below stand out.

Graph 3. Comparison in tons of watermelon production in the state of Goiás and its featured cities.



Source: IBGE, Municipal Agricultural Production 2022. Rio de Janeiro: IBGE, 2023

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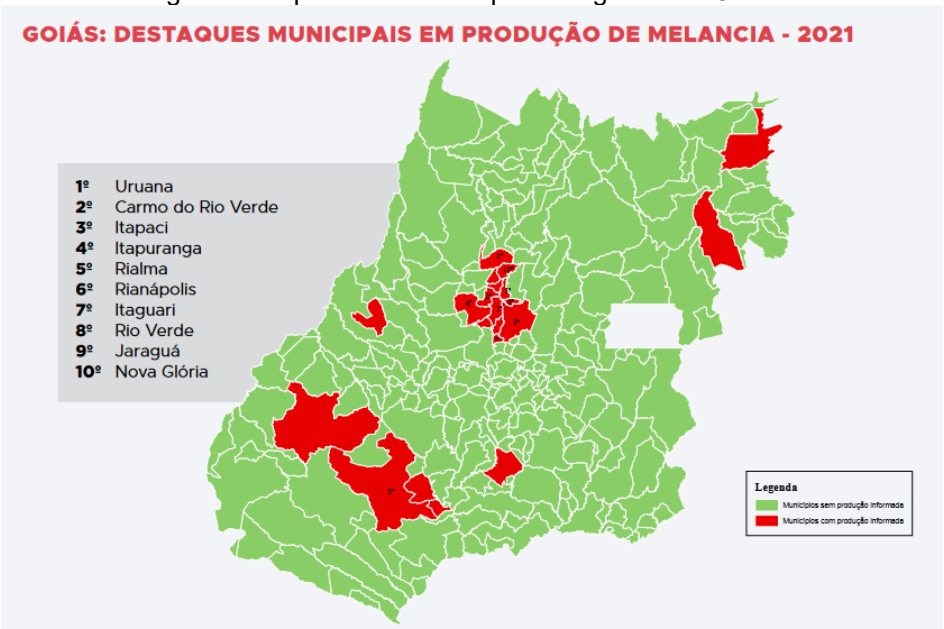
Figure 1. Map of watermelon producing cities in Goiás



Source: According to the Government of the State of Goiás (2022) Agro in November Data

In figure 1, in addition to the ranking presented in the magazine, we can see the region of agglomeration of production, especially the region of Ceres, in the center of the state, and from the southwest of Goiás to two cities in the northeast of Goiás. It is noted that the areas with smaller territorial extension, but with high productivity, are well positioned in the production ranking. Geographically, these regions are also strategically located close to the Federal District and the capital of Goiás, Goiânia, which have the largest Supply Centers (CEASAS).

MARKETING AND EXPORT OF WATERMELON

In addition, the state is going through an approval process for export in some cities, allowing for better preparation of farmers and production scheduling for the foreign market. The Ministry of Agriculture, Livestock and Supply (Mapa) approved the expansion of the number of municipalities in Goiás able to export watermelon and pumpkin, which are now 13: Uruana, Carmo do Rio Verde, Itapuranga, Jaraguá, Rio Verde, Santa Helena de Goiás, Maurilândia, Cristalina, Ipameri, Goianésia, São Miguel do Araguaia, Luziânia and Edealina. The growth of production is observed in the municipalities that obtained this ability for export, according to EMATER Goiás (2024).

According to Cepea (2023), an evaluation of the state of Goiás was carried out, showing that in the Uruana region, the price paid per kilogram of average watermelon directly to the producer, in October 2023, was R$1.40. In October 2022, the amount paid

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per kilogram of watermelon was R$1.09. Compared to the previous year, there was an increase of approximately 28.44% in the price paid to the producer.

The Goiás Agency for Agricultural Defense (Agrodefesa) managed to include one more municipality in the Risk Mitigation System (SMR) for the pest Anastrepha grandis; allowing producers from Jussara, in the Northwest Region of Goiás, to export fresh cucurbit fruits, such as watermelon, to international markets that impose quarantine restrictions. This advance reflects the continuous effort of the government of Goiás to strengthen the agricultural sector in the region, expanding export opportunities for local producers.

Jussara now joins 16 other municipalities in Goiás that have obtained the necessary status for export, as recognized by the Secretariat of Agricultural Defense of the Ministry of Agriculture and Livestock (SDA/Mapa), through the publication of Ordinance No. 1,002/2024 in the Official Gazette of the Union. With the reduction in the supply of watermelons at the national level, due to the end of the off-season in São Paulo, the fruits of Uruana (GO) began to dominate the market; although supply is still lagging behind demand, resulting in an increase in prices.

ECONOMIC OUTLOOK

The Institute for Applied Economic Research (Ipea, 2023) released an analysis of the performance of the Brazilian economy in the third quarter of 2023, projecting GDP growth of 3.2% for this year. This increase is mainly attributed to the growth in household consumption and exports, especially of agricultural products and oil. For 2024, the projection is for growth of 2.0%, with a slowdown expected due to the drop in the agricultural sector caused by adverse weather conditions. However, sectors such as oil can show a positive performance. The fall in commodity prices has contributed to the reduction of inflation, especially benefiting the lower income classes. The increase in the purchasing power of families and the expansion of the service sector are pointed out as important factors for economic growth in 2023. However, tax collection did not increase in the same proportion, due to the fall in commodity prices and the deterioration of the industry. For 2024, a recovery in investments and the industrial sector is expected, driven by BNDES financing and federal credit incentive programs. (IPEA and IBGE, 2023).

In the state of Goiás, between April and October, the planted area increased from 6,500 ha in 2018 to 7,250 ha in 2019, representing a growth of 11.53%. However, this trend was not repeated in the state of São Paulo, where, between February and April, the total

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planted area decreased from 3,300 ha in 2018 to 3,223 ha in 2019, a reduction of 2.33%. Similarly, in the state of Tocantins, between June and September, there was a significant decrease in the planted area, from 3,950 ha in 2018 to 2,900 ha in 2019, which corresponds to a drop of 26.58% (Mendes *et al*., 2020).

These data show that, over the years analyzed until 2019, Goiás has shown a healthy growth in production, with good prospects for continuity. Regions that show this growth, in partnership with government companies, are standing out in production and marketing, as pointed out by the data, graphs and maps mentioned above.

We can observe that, in the following years analyzed, due to the uncertainties generated by the pandemic, Hortifruti/Cepea recorded a drop in watermelon planted areas. However, the price remained healthy after the high quarantine period, between July and August, ensuring positive profitability. Goiás went through this period well and had a good margin along with the state of Tocantins. Uruana even presented a record in the price of large watermelon (>12kg) in the field, reaching the value of R$ 1.56/kg. It is observed that the growth pointed out in the graphs was held, in part, by the uncertainties of the pandemic, where investments were limited due to the costs of inputs. According to the data, while 2019 presented 6,500 ha of planted area, 2020 produced only 5,700, representing a drop of approximately 12.31%. According to Paiva, Bezerra and Palmieri (2020), the appreciation of the dollar and the costs of spraying were specific factors in the drop in productivity. However, the offer was redeemed and pointed to the high prices of the market, giving rise, at the end of 2020, to gratifying results; making it possible to recover the planted area in 2021. This fact made the farmers excited. (HORTIFRUTI/CEPEA 2020).

In addition, we can observe that the economic impact of price fluctuation on production is very significant to the point of interfering in the produced area, considering that the entire process is entirely linked to production costs.

The results presented in the study highlight the need for advanced technologies and innovations to provide the efficiency and sustainability of watermelon cultivation. The introduction of technologies, as described by Guedes and Nascimento (2019), shows an evident positive impact, optimizing logistics and strategic decision-making. The economic analysis presented by Magalhães and Souza (2022) reinforces the need to consider economic viability as a crucial aspect for the sustainability of cultivation.

Based on the theoretical framework and the results discussed, it is clear that one of the main challenges in watermelon cultivation is the harmonization between advanced

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agricultural practices and the adoption of technological innovations. Porter's (1985) concept of the production chain should be seen as a guide to identify and optimize each step of the process, while Kaplinsky's and Morris' recommendations should be applied to ensure long-term sustainability. This is reinforced by the economic analysis of Magalhães and Souza (2022), which suggests that an integrated approach that considers all these factors is essential to ensure economic viability and competitiveness in the market.

Competitiveness and sustainability in watermelon cultivation in Goiás depend on efficient management of the production chain, combined with the adoption of technologies and innovations. It is imperative that agribusiness producers and managers work collaboratively, using theoretical models such as those of Porter, Kaplinsky and Morris, to create an optimized and sustainable production environment. Such practices not only increase productivity but also ensure that production is economically viable and environmentally conscious, ensuring the longevity and prosperity of the agricultural sector in Goiás and beyond.

CONCLUSION

Fruit growing, especially watermelon production, has been consolidating itself as a growing sector in the state of Goiás and throughout Brazil, with significant economic and social impacts. This study showed that Goiás has a relevant potential, supplying two important capitals, Goiânia and Brasília, and expanding its participation in the international market, especially in South America. The competitiveness of the watermelon sector in Goiás can be significantly improved through the integration of technological innovations and efficient management of the production chain, based on Porter's value chain model. In addition, collaboration between producers, government and research institutions is crucial for the sustainable development of the sector. Producers can contribute to the professionalization of employees, while the government must implement public policies that encourage the adoption of technological innovations and expansion into international markets. Research institutions, in turn, can offer support with studies and innovations applied to the field. An integrated approach, which takes into account technical, economic and social aspects, such as professional training, improvements in transport and logistics infrastructure, in addition to the strengthening of sustainability policies, is essential for the growth of the sector. By strengthening these aspects, watermelon from Goiás will not only be able to meet the growing national and international demand, but also become a global

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reference, boosting the economic development of the state and contributing significantly to the Brazilian economy.

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