Resource-Based View Analysis of Innovation and Performance in Brazilian Certified Soybean Seed Companies

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Abstract

This research, grounded in the Resource-Based View (RBV), investigated the relationship between organizational resources, innovation, and performance in certified soybean seed producing companies. Employing a quantitative, descriptive, and cross-sectional methodology, the study used a survey administered to 30 companies formally registered with the Brazilian Ministry of Agriculture. The hypotheses tested explored the influence of resources on innovative capacity and organizational performance. Results indicated that strategic resources shape market-oriented innovative practices, highlighting a demand-pull innovation process. Despite sample limitations, the study provides significant theoretical and practical contributions, suggesting actionable directions for the sector.

Keywords: Resource-Based View; Soybean Industry; Innovation Management; Organizational Performance; Agribusiness; Demand-pull Innovation.

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1. Introduction

Currently, Brazil holds the global leadership in soybean grain production. For the 2022/2023 harvest, estimated production exceeds 153.5 million tons, surpassing the 125.6 million tons of the 2021/2022 harvest, representing a growth of 22.22%, according to data published in December 2022 (CONAB, 2023).

The soybean seed market and grain production in Brazil are closely interrelated, as soybean is one of the primary crops grown in the country. Nevertheless, there are some differences in the dynamics of these two markets. The soybean seed market is more specialized, with fewer participants compared to the grain production market. Furthermore, the demand for soybean seeds is driven not only by the domestic market but also by international demand, as Brazil ranks among the largest soybean producers worldwide. Conversely, the grain production market is more diversified, cultivating various types of crops across different regions of the country.

In hypothetical perfectly competitive markets, as suggested by neoclassical economic models, all firms would eventually reach performance symmetry over the long term, with differences being only temporary phenomena, quickly corrected by market mechanisms (Brito & Vasconcellos, 2004).

In this context, innovative firms leverage their resources and competitive advantages. Internally, however, firms differ significantly due to the diversity of available resources: financial; human, physical and technological, possessing distinct assets and governance strategies, which over time foster unique skills and competencies that contribute to a specific organizational culture (Stamato & Alcantara, 2013).

Recognizing strategic resources, linking their involvement to competitive performance, and establishing relationships that create conditions favorable for growth are essential tasks for managers aiming to achieve strategic superiority. When mediated by innovation, strategic resources amplify performance (Perin, Sampaio, & Hooley, 2007).

The relationship between resources, innovation, and performance is critical within the competitive context of the soybean seed production industry. The industry's competitiveness is driven by a combination of factors, including technological advances, genetic improvements, and the capability to produce high-quality seeds at competitive prices. These factors are directly linked to the industry's ability to innovate, optimize production processes, and allocate resources effectively.

Considering this scenario, the study aimed to investigate the relationship among resources, innovation, and performance in certified soybean seed producing companies through the Resource-Based View (RBV). The choice of RBV as the central theoretical framework of this study is justified by its capacity to explain internal sources of sustainable competitive advantage based on organizational resources and capabilities. By investigating the relationships among resources, innovation, and performance, the study's objectives align directly with RBV assumptions, which attribute strategic value to an organization's tangible and intangible assets. The proposed analysis allows for understanding how resources contribute to innovation and consequently to superior performance within certified soybean seed-producing companies. Thus, RBV provides a robust theoretical framework for interpreting the obtained results and supports hypotheses related to the influence of resources on market-driven innovative practices.

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The interactions among resources, innovation, and performance underpin the research problem of this study. Specifically, within certified soybean seed producing companies, what types of resources and their interrelationships directly contribute to the company's performance and capacity to innovate?

To address this research problem, objectives were defined to guide the study's execution. The primary objective was to investigate the relationships among organizational resources, innovation, and company performance. To achieve this, the study sought to verify how resources influence organizational performance, examine the relationship between innovative capacity and corporate performance, and analyze the mediating role of innovation in the relationship between available resources and outcomes obtained by companies.

Following this introduction, the theoretical framework covering the conceptual elements representative of the study variables will be presented. Subsequently, the methodological approach, results, discussion, and final considerations will be detailed.

2. Theoretical Framework

The references aim to provide the necessary theoretical support, underpinning the construction of the study and subsequently supporting the discussion and data analysis. Conceptual elements representing the study variables such as resources, innovation, and performance will be analyzed. This section also grounds the fundamental theoretical arguments underpinning the formulation and support of research hypotheses, outlining the bibliographic elements that support this research.

2.1 Resources

A solid strategy is challenged by organizational failures and particularly by the relentless pursuit of growth at any cost (Porter, 1996). According to Porter (1996), strategy involves establishing linkages to leverage existing activities, offering resources or services that competitors might find impossible to develop, imitate, or combine.

Discussions on differences between firms originated from foundational works such as Schumpeter (1934), who wrote "The Theory of Economic Development," and Penrose (1959), author of "The Theory of the Growth of the Firm," both examining heterogeneous corporate behaviors and outcomes. Until that period, the central question focused on why firms operating in the same industry, within similar environments, and under the same conditions could achieve different levels of performance.

The Resource-Based View (RBV) theory argues that resources are the source of competitive advantage (Barney, 1991). However, each firm possesses a unique combination of resources and capabilities, explaining performance differences among firms (Monson, 2024). The prudent use of strategic resources within an organization is critical for achieving strong performance (Han et al., 2023; Monson, 2024).
Barney (1986) initiated extensive studies on RBV and solidified this perspective in the 1990s through the development of the VRIO model, which consists of Value, Rarity, Imitability, and Organization. The VRIO model is regarded as a principal tool for conducting internal organizational analysis, identifying strengths and weaknesses, and directing the focus towards sustainable competitive advantage through evaluating a firm's resources and capabilities. This model enables firms to assess the potential of a resource to generate sustained competitive advantages based on the four resource-related criteria: Value, Rarity, Imitability, and Organization (Barney & Hesterly, 2011; Barney et al., 2021).

Resources, according to Barney and Hesterly (2014), can be classified into four categories. Organizational resources encompass planning, control, and coordination; financial resources involve financing acquisition and revenue generation; physical resources refer to buildings, equipment, and raw materials; and human resources include skills, training, experience, and workforce. Capabilities are built upon these resources, which in turn fuel a firm's core competencies, enabling competitive advantages to thrive.

Barney (1997) defines organizational resources comprehensively as the processes, information, knowledge, capabilities, competencies, and organizational attributes enabling a firm to create and implement strategies that optimize performance.

Consistent evidence in literature indicates that resource access enhances competitive advantages, directly influencing company performance. Helfat et al. (2023) state that RBV is a robust and influential pillar in strategic management research, while Monson (2024) highlights RBV's shift towards more specialized, strategic approaches aimed at creating competitive advantage and sustainable organizational outcomes (Han et al., 2023; Monson, 2024).

2.2 Innovation

Joseph Schumpeter conducted seminal research on the innovation process. His central argument was that entrepreneurs leverage technological innovation, whether a new product, service, or process, to achieve strategic advantages. Once this objective is reached, other companies attempt to replicate the innovation, leading to further innovations and a reduction in pioneer profits. This cycle perpetuates in continuous waves, driven by the search for new profitability sources (Schumpeter, 1934).

However, for innovation to effectively occur within an organization, internal factors such as knowledge management, strategic human resource involvement, and digital technology integration significantly impact innovation capacity and, consequently, organizational performance (Yang et al., 2022).

According to Porter (1996), corporate innovation initiatives foster the competitive advantage necessary for business growth and sustainability. Innovation as a differentiation element and organizational growth factor must be considered. Rather than merely causing market changes, innovation should represent something novel or significantly improved for the company, whether in products, processes, or methods, ensuring long-term sustainability (Strychalska-Rudzewicz & Rudzewicz, 2021).

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Intercompany cooperation reduces innovation risks and facilitates resource and cost sharing, particularly with technology laboratories, generating denser knowledge flows compared to non-cooperative companies (Castillo-Vergara & Aranibar, 2019).

Innovation is a multifaceted concept, adaptable across various fields. Effective innovation necessitates fostering an innovation culture encompassing shared values, views, and practices within the organization. This culture must emphasize open communication, creativity, collaboration, and the acceptance of risk and failure (Bendak et al., 2020). Organizations with a solid innovation culture regard innovation not merely as an isolated objective but as an integral element of their identity and operation (Bachtiar, Ibrahim & Korpysa, 2024).

The organizational innovation culture fundamentally impacts organizational development, achieving innovative outcomes, competitiveness, and adaptability. Although continuously nurturing an innovation culture is challenging, contemporary organizations recognize it as a critical objective (Arsawan et al., 2022; Bachtiar, Ibrahim & Korpysa, 2024).

2.3 Performance

The observed diversity in firm performance within the same market demonstrates that performance is heterogeneous. Organizational studies, particularly in strategic management, traditionally seek to understand the origins of sustainable competitive advantage and develop premises explaining organizational performance differences (Porter, 1980).

Unlike neoclassical economic theory, new perspectives linking organizational performance to internal factors are emerging (Andrews, 1971; Wernerfelt, 1984; Porter, 1980; Grant, 1991; Peteraf, 1993). Industrial economics supports the view that firm performance depends on the industry structure, determined by economic entities' behavior, pricing, and competitive dynamics.

Porter (1980, 1991) align with industrial economics theories, confirming that industry conditions determine strategic choices and firm performance. However, performance differences within the same industry reveal that sector alone is insufficient to explain performance and competitive advantage. Vasconcelos and Cyrino (2000) discussed competitive advantage by comparing four theories: industrial organization, RBV, market process theory, and dynamic capabilities theory. They propose convergence between competitive advantage and organizational change themes to better reflect organizational reality amid market uncertainty and rapid changes.

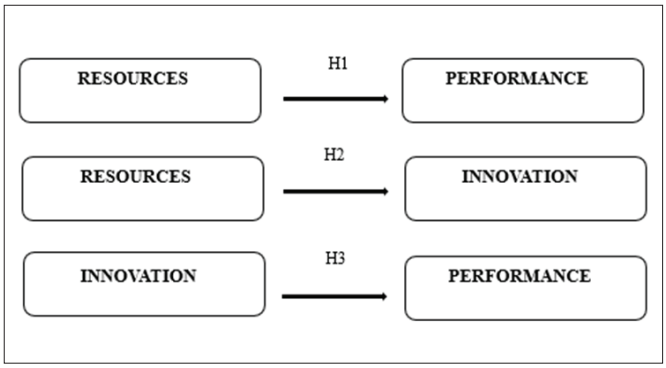
Considering the performance variable in organizational analysis requires addressing multiple conceptual and empirical facets. Performance dimensions vary significantly depending on the analysis levels. Wang and Ahmed (2007) emphasize performance measures comparing financial outcomes against competitors or industry averages over time. Barney (1991) conceptualizes organizational performance as the perceived value generated by utilizing specific capital resources. RBV views resource identification and organization for sustainable competitive advantage and favorable market positions as critical strategic differentiators.

Thus, superior market performance emerges from strategic accuracy in resource configuration (Barney & Hesterly, 2011). RBV emphasizes competitive parity through resources generating economic value without scarcity, enhancing performance, and contributing to competitive advantage. Consequently, RBV is foundational for strategic management and competitive advantage research (Barney & Mackey, 2016).

Performance also presents an opportunity to generate systematic improvement actions, with organizational structures significantly impacting company performance (Van Dooren et al., 2015; Restrepo-Morales et al., 2024).

The analysis of the relationships is presented in Figure 1, which graphically demonstrates the paths of analysis to be developed.

Figure 1: Representation of the analysis model



Source: Prepared by the authors (2024)

The study hypotheses formulated are:
Hypothesis (H1): Resources directly and positively influence firm performance.
Hypothesis (H2): Resources positively influence firm innovation.
Hypothesis (H3): Innovation positively relates to firm performance.

3. Methodological Procedures

This study was conducted in cooperation with the Association of Producers and Traders of Seeds and Seedlings (APASSUL), which, after formalizing legal terms and responsibilities in accordance with its internal regulations and ethical standards of academic research, authorized access to the database of 54 certified soybean seed producing companies. The choice of these companies is justified by their representativeness in the raw material supply chain for national soybean production, which, according to Abrasem (2022), amounts to approximately 1.4 million tons of seeds annually, sufficient for cultivating 25 million hectares. Between June and August 2022, owners or managers were invited to participate in online interviews lasting approximately 60 minutes, scheduled and confirmed via email, telephone calls, and Google Calendar reminders. Out of the total 54 contacts, 30 completed the questionnaire, while 24 did not participate in the data collection.

The research instrument consisted of an online questionnaire with 42 items, organized into sections covering organizational characteristics, physical, human, financial, and operational resources, innovation,

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and performance. All items were rated on a Likert scale ranging from 0 (strongly disagree) to 10 (strongly agree). Before the final deployment, the questionnaire underwent pretesting with academic experts and industry entrepreneurs, received adjustments for improved clarity, and was piloted to ensure item comprehension by respondents. The choice of an eleven point scale aimed to maintain familiarity with numeric assessments traditionally used in surveys and performance evaluations.

Upon completion of data collection via Zoom video calls, the data were initially tabulated in Microsoft Excel to check for inconsistencies and missing entries, and subsequently exported to IBM SPSS Statistics v.21. Analyses included descriptive statistics such as frequency distribution, Shapiro Wilk normality test, means, and standard deviations, and linear regression to test theoretical hypotheses that organizational resources directly influence innovation and performance, and that innovation, in turn, impacts organizational performance. The sampling employed a nonprobabilistic convenience criterion based on geographic proximity and availability of indicated managers (Malhotra, 2012), ensuring a representative set of cases reflecting the reality of certified soybean seed companies in Brazil.

4. Results and Discussion

Initially, the research results will be presented descriptively, from the volume of seeds marketed to a more effective characterization of the responding companies. Table 1 presents the distribution of companies according to sales volume.

Table 1: Categorization of the volume of seeds commercialized

		Frequency	Percentage	Cumulative Percentage
What is the volume of seeds commercialized by your company in the last harvest?	Up to 2000 tons	9	30.00%	30%
	From 2001 to 4000 tons	6	20.00%	50%
	From 4001 to 6000 tons	5	16.67%	67%
	From 6001 to 8000 tons	0	0.00%	67%
	From 8001 to 10000 tons	1	3.33%	70%
	Above 10000 tons	6	20.00%	90%
	Did not respond	3	10.00%	100%
	Total	**30**	**100%**	

Source: Prepared by the authors (2024)

The sample included 30 seed-producing companies, with 30% of them marketing up to 2,000 tons of soybeans per season (n=9), and 20% marketing more than 10,000 tons (n=6). Within the sample, 67% of the companies (n=20) market up to 8,000 tons, while 23.33% (n=7) produce more than 8,000 tons.

Table 2: Characterization Data of Participating Companies

	Frequency	Total	Average
Total seed production (t)	28	195,27	6,973.93
Constructed area designated for production (m^2)	27	251,35	9,309
Grain storage capacity (t)	30	275,54	9,184.67
Processing capacity (t/h)	26	452,00	17.38
Industrial treatment capacity (t/h)	25	470,00	18.80
Final product storage capacity (t)	30	266,78	8,892.67
Percentage of production in own areas	30	-	60.00%
Percentage of production in irrigated areas	30	-	18.37%
Percentage of seed business participation in total revenue	29	-	38%

Source: Prepared by the authors (2024)

After characterizing the sample, the study aims to examine the association and relationship between resources, innovation, and performance within the companies. As an initial step in testing the data, normality was assessed using the Shapiro-Wilk test (Table 3), followed by Pearson's linear correlation technique (Table 3) as a precursor to linear regression (Malhotra, 2012). It was found that resources, innovation, and performance, when correlated with one another, show positive and significant indicators. The results indicate that the variables are moderately associated, with the strongest association observed between Resources and Innovation.

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Table 3: Pearson Linear Correlation Results

	Normality Test	Standard Deviation	Resources	Innovation	Performance
Resources	0.122	0.690	1.000		
Innovation	0.498	0.760	0.621**	1.000	
Performance	0.206	1.189	0.541**	0.477*	1.000

Source: Prepared by the authors (2024)
** significant $p < 0.001$
*significant $p < 0.05$

Based on the study's hypotheses, the linear regression models considered the following relationships: (1) Resources and Performance, focusing on verifying the relationship between resources and company performance; (2) Resources and Innovation, to investigate the relationship between resources and innovation; and (3) Innovation and Performance. The correlations were positive and significant, with the strongest association found between resources and innovation. Additionally, linear regressions were conducted to further test the relationships between the constructs.

Table 4: Linear regression results of the constructs

Dependent Variable	Independent Variable	R^2	$R^{2\ Adjusted}$	Standardized Beta	p
Performance	Resources	0.293	0.268	0.541	0.0020**
Innovation	Resources	0.385	0.363	0.621	0.0498*
Performance	Innovation	0.227	0.200	0.477	0.0077**

Source: Prepared by the authors (2024)
** significant $p < 0.001$
*significant $p < 0.05$

The analysis of the regression coefficients shows that the contribution percentages of the independent variables are close to or above 50% in explaining the dependent variables. In the model for resources and performance, it is observed that resources have a positive effect on company performance ($\beta = 0.541$, $p < 0.001$), confirming that access to resources has a direct and positive influence on company performance, thus confirming Hypothesis 1 of this study.

Similarly, the model for resources and innovation, which tests the hypothesis that resources have a direct positive effect on company innovation (Hypothesis 2 of this study), demonstrated a positive effect relationship ($\beta = 0.621$, $p < 0.05$), indicating that resources contribute to innovation within the company. Compared to other models, this one showed the highest absolute explanatory power, with an R^2 of 0.363. Hypothesis 3 of this study, which proposed a positive relationship between innovation and business performance, was confirmed through the innovation and performance model. This model yielded a result of ($\beta = 0.477$, $p < 0.001$), confirming the hypothesis with an explanatory percentage of 47.7% of the dependent variable.

Through the analysis of the significance of the regression coefficients, aiming to determine the influence of the independent variables in each model on the dependent variables, the regression analysis presented significant results.

Following the confirmation of significant effects among the hypothesis variables, an additional regression analysis was conducted on the variables that comprise the Resources construct. Based on the significant results previously presented in the regression model, the objective was to identify which variable within the construct most significantly influences the contribution of resources to the company's performance and innovation.

For this analysis, the variables related to Resources were named and labeled as follows: the company is flexible in responding to market conditions and changes (RO1); the company has an internal quality control process for seed production (RO2); the company is capable of mapping and developing market strategies (RO3); the company implements ESG-related actions and projects – Sustainable Actions with a Focus on Social, Environmental, and Governance aspects (RO4); the company has a defined governance structure and succession process (RO5). Table 5 below presents the regression results for the Resources construct.

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Table 5: Results of linear regression models in the Organizational Resources aspects

Dependent Variable	Independent Variable	R	R^2	$R^{2\ Adjusted}$	p	Standardized Beta
Innovation	R01	0.655	0.430	0.311	0.338	0.174
	R02				0.534	0.127
	R03				0.044*	0.393
	R04				0.973	0.006
	R05				0.200	0.249
Performance	R01	0.704	0.495	0.390	0.070	0.317
	R02				0.721	0.069
	R03				0.005**	0.545
	R04				0.661	0.069
	R05				0.546	0.109

Source: Prepared by the authors (2024)
** significant $p < 0.001$
*significant $p < 0.05$

Table 5 presents the results of the linear regression model that analyzes the relationship between the independent variables (RO1, RO2, RO3, RO4, RO5) and the dependent variables (Innovation and Performance) related to Organizational Resources.

The analysis of R^2 values, the coefficients of determination obtained for the individual variables, shows an explanatory degree of 43% for the relationship between resources and innovation ($R^2 = 0.430$). For the proposed relationship between resources and performance, the statistical analysis resulted in $R^2 = 0.495$, indicating an explanatory degree of 49.5%. These results represent the proportion of variance in the dependent variable explained by the independent variables.

The significance values indicate whether the relationship between the independent variable and the dependent variable is statistically significant. In the Innovation model, variable RO3 shows a statistically significant level of significance ($p = 0.044$), while the other independent variables do not show significant levels. In the Performance model, variable RO3 also shows a statistically significant level ($p = 0.005$), while the others do not. The coefficients indicate that the proposed relationships of the individual variables have significant effects on item RO3 in both the resources-innovation and resources-performance relationships ($p < 0.05$).

In the Innovation model, the proposed variable "the company is capable of mapping and developing market strategies" (RO3) had a result of ($\beta = 0.393$), standing out from the other variables and confirming its significant effect on the proposed relationship. This situation is repeated in the Performance model with a result of ($\beta = 0.545$) for RO3. Positive standardized beta values indicate a positive relationship between the independent and dependent variables, while negative values indicate a negative relationship. Variable RO3, with quantitative indicators of the company's relationship with the market, validates the dependent relationship of innovation and improved performance based on externally generated actions within organizations in the analyzed sector, as confirmed by the standardized beta and obtained significance coefficients.

Thus, innovation is not justified solely by the isolated existence of market demand or technological opportunities, but rather by the simultaneous combination of these drivers, associated with appropriate stimuli to the innovation process. As demonstrated by Mowery and Rosenberg (1979), the success of an innovation depends on the coordinated action of market forces, which signal needs and trends and internal capability, which transform these signals into technological and organizational solutions. Innovations that do not encompass both dimensions tend to lack support and fail to achieve the desired results. This initial understanding paves the way for a deeper consideration of the relevance of internal resources as an indispensable complement to external factors.

In this sense, the Resource-Based View (RBV) expands this perspective by emphasizing that the ability to generate and incorporate innovations is rooted in the organization's internal resources (Barney, 1991). Specialized knowledge, technological capabilities, human competencies, and intangible assets constitute competitive advantages that allow companies not only to respond to external opportunities but also to proactively develop new capabilities. However, although RBV highlights the autonomy such resources confer upon firms, it becomes evident that, to generate value, these competencies must align with external demands and be oriented toward real market needs.

From this synergy between internal and external elements, Corchuelo Martínez-Azúa, Dias, and Sama-Berrocal (2025) argue that successful innovations result from the articulation between demand signals from clients, competitors, and regulators, and the internal resources and competencies of the firm. Without this articulation, the innovation process tends to be fragmented, underutilizing both market opportunities and internal technological potential. To operationalize this articulation, the demand-pull model emerges as an analytical approach.

Developed in the 1960s and consolidated by Rothwell (1994), the demand-pull model places the market as the driver of research and development (R&D) initiatives, assigning a predominantly reactive role to the R&D department. Guimarães and Viana (2007) explain that, within this paradigm, organizations choose from technically feasible

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internal options, guided by market signals. However, Dosi (1984) highlights important limitations: the lack of practical experience in using the market as a driver of innovation, uncertainty regarding when and why to adopt a specific technology, and underestimation of internal developments, which increases the gap between innovation capacities and market conditions. Thus, although it offers a valuable framework, demand-pull proves insufficient when not accompanied by strategies that strengthen internal competencies.

In response to these critiques, Cribb and Cribb (2007) propose that technological change should begin with the recognition of internal company needs, followed by deliberate R&D efforts to address these gaps. In this way, technological change does not emerge exclusively from external economic conditions but from an internal strategy of efficient resource allocation and the strengthening of organizational competencies. This approach balances responsiveness to market signals with the proactive capacity to develop new technologies.

To illustrate how this integrated dynamic manifests in practice, the Brazilian soybean seed sector, according to Abrasem (2022), has around 300 producers and several plant breeding programs, which account for more than 90% of the cultivated area in the country (Abrasem, 2022), with seed producers, retailers, cooperatives, and consultants acting as the main demand drivers. The adoption of genetically modified soybeans has exceeded 90% of the planted area in Brazil, and the fourth generation of this technology is already available in the market, evidencing rapid acceptance by farmers. In this context, the constant pressure for higher productivity and superior sanitary conditions compels companies in the sector to implement successive innovations in genetics, production processes, and resource management.

In summary, innovation success requires the convergence of market demand signals, robust internal resources, and an R&D model that combines reactivity with proactivity. In the context of Brazilian agribusiness, especially in the soybean seed segment, this synergy translates into continuous advancements, supported by a competitive environment and organizations capable of transforming resources.

5. Final considerations and contributions

This study aimed to investigate the relationships between resources, innovation, and performance in certified soybean seed companies, providing empirical evidence to validate these connections and offering an integrated analysis of these constructs.

The findings confirm positive and significant relationships between organizational resources and performance, between resources and innovation, and between innovation and performance. In particular, the certified soybean seed sector, characterized by high technological requirements and strong market pressures for productivity and sanitary standards, emerges as a clear example of the demand pull model, in which market orientation stimulates and guides R&D efforts. Strategic resource management, when aligned with external demands, proves to be a critical factor for achieving competitive advantage and sustaining the innovations required for the development of new cultivars and processes.

As a contribution, the study highlights the importance of individually analyzing each component of organizational resources. One of the most important aspects for companies in the sector is prioritizing investments in continuous monitoring of market demands to quickly adjust their innovation strategies.

For future research, the following recommendations are made: (a) expand the geographical scope of the sample by incorporating companies from different regions and levels of technological maturity to strengthen the generalizability of the results; (b) investigate the role of governance models and market intelligence in resource allocation for innovation; and (c) explore collaborative networks with research institutions to identify practices that accelerate the innovation process in regulated and highly technological environments.

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