REVISTA DE ESTUDOS INTERDISCIPLINARES

DECISION-MAKING FOR EFFICIENCY AND INNOVATION IN THE RICE PRODUCTION CHAIN

TOMADA DE DECISÃO PARA EFICIÊNCIA E INOVAÇÃO NA CADEIA DE PRODUÇÃO ORIZÍCOLA

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Abstract: The main objective of this article is to conduct a systematic review within the rice sector's agri-business productive chain, focusing on aspects related to the decision-making process, innovation environments, competitiveness, and methodologies for measuring performance and differentiation. The article emphasizes the importance of the agribusiness and the need for a systemic approach to addressing challenges encountered within the production chain. It highlights that pursuing competitiveness can lead to reducing production costs and adding value, and gaining competitive advantages through differentiation strategies. Within the context of the rice sector, the significance of rice is highlighted as one of the most widely cultivated cereals globally, with significant social, economic, and environmental impacts. However, fluctuations in global rice prices can result in undesirable effects.

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Therefore, new strategies are needed to add value to products and expand consumption beyond the conventional markets. Given this context, the article contributes to the literature by identifying the decision-making processes applied in these agroindustries, as well as addressing aspects related to innovation environments, competitiveness, and methodologies for measuring performance and differentiation.

Keyword: Rice Farming Sector; Agribusiness; Decision-Making; Competitiveness; Performance Measurement.

Resumo: O principal objetivo deste artigo é realizar uma revisão sistemática na cadeia produtiva do agronegócio do setor de arroz, com foco em aspectos relacionados ao processo de tomada de decisão, ambientes de inovação, competitividade e metodologias para medir desempenho e diferenciação. O artigo enfatiza a importância do agronegócio e a necessidade de uma abordagem sistêmica para enfrentar os desafios encontrados dentro da cadeia de produção. Destaca-se que buscar a competitividade pode levar à redução dos custos de produção, à adição de valor e à obtenção de vantagens competitivas por meio de estratégias de diferenciação. No contexto do setor de arroz, destaca-se a importância do arroz como um dos cereais mais cultivados globalmente, com impactos significativos sociais, econômicos e ambientais. No entanto, as flutuações nos preços globais do arroz podem resultar em efeitos indesejáveis. Portanto, novas estratégias são necessárias para agregar valor aos produtos e expandir o consumo para além dos mercados convencionais. Diante desse contexto, o artigo contribui para a literatura ao identificar os processos de tomada de decisão aplicados nessas agroindústrias, bem como abordar aspectos relacionados a ambientes de inovação, competitividade e metodologias para medir desempenho e diferenciação.

Palavras-chave: Setor de Cultivo de Arroz; Agronegócio; Tomada de Decisão; Competitividade; Mensuração de Desempenho.

INTRODUCTION

The agribusiness production chain includes a range of activities, such as agricultural production inputs fabrication, planting, management, and harvesting. Also, the agribusiness production chain involves the use of machinery, implements, pesticides, fertilizers, and technology, together with storage activities, processing, industrialization, distribution, and consumption. Different stages compose the agribusiness production chain, including meat processing facilities, supermarkets, food distribution agencies, and end-consumer markets (BAJAN; MRÓWCZYŃSKA-KAMIŃSKA, 2020). Therefore, a systematic analysis is needed to solve agribusiness production chain problems considering multiple factors' correlation. Brenes, Ciravegna, and Acuña (2020) found that value generation beyond the farm gate is a hurdle in agribusiness enterprises. Agricultural products contend with price fluctuations beyond control.

Rice is globally recognized as the second most extensively cultivated cereal, with approximately 163 million hectares of occupied land area, exhibiting substantial productivity potential, serving as a dietary foundation for over three billion individuals, and engendering impacts across social, economic, and environmental spheres (CHILDS, 2021). However, the rice price oscillation in the global market leads to undesirable impacts. New strategies should be implemented to increase product value. The competitiveness pursuit leads to production cost reduction and value addition. During the manufacturing process, by-products can be generated, including broken grains and raw materials for rice flour production, developing products for

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specific niches due to gluten absence (PARAGINSKI, 2014). Opportunities for new products and process development exist, extending the consumption of the product beyond the traditional market niche. Differentiation strategies are disseminated within market economies to gain competitive advantages, providing superior perceived value and justifying higher prices when compared with the competitors (BRENES; CIRAVEGNA; ACUÑA, 2020).

Rice cultivation and its subsequent processing into a single consumable product often lack the necessary initiatives to drive the rice industry to confront new challenges through innovation, differentiation, value addition, and the promotion of consumption, all stemming from the same raw material aimed at addressing consumer needs. The central idea behind differentiation is to provide superior quality products to end customers. Factors that impact product quality include investments in research and development, quality standards, input materials, technology, and personnel management.

Therefore, strategic and competitive decisions must be harmonized to mirror the approach to market challenges. Competitiveness is a critical factor for an organization's prosperity, where comprehending customer needs, purchasing capacity, and perceived products or brand value are essential elements in the contemporary landscape. Also, the information assists in pricing strategy determination and product mix composition, fulfilling consumer expectations and operating assertively and competitively within the market.

This article shows a systematic literature review concerning rice production chain in agribusiness, focusing on decision-making processes, innovation environments, competitiveness, and methodologies for measuring performance.

Over the years, articles have been published regarding the rice production chain in agribusiness. Lezoche *et al.* (2020) explored new technologies and supply chain methods, proposing future directions for the agri-food production chain. Fleskens, Duarte, and Eicher (2009) employed a multifactorial approach to assist olive growers cultivating on sloping and mountainous terrain. Gardas *et al.* (2019) applied the Delphi technique, modeling the primary identified challenges. Also, the cause-and-effect relation was explored and a systematic hierarchical framework through interpretive structural modeling was developed, guiding agricultural policy decision-makers in enhancing agricultural supply performance in India. Coteur *et al.* (2016) developed a flowchart proposing a specific approach within organizations, characterized by flexibility and harmonized actions to facilitate sustainable agriculture management, establishing a framework to bolster decision-making. Similarly, Margolis *et al.* (2018) constructed an optimization model incorporating cost and connectivity objectives to

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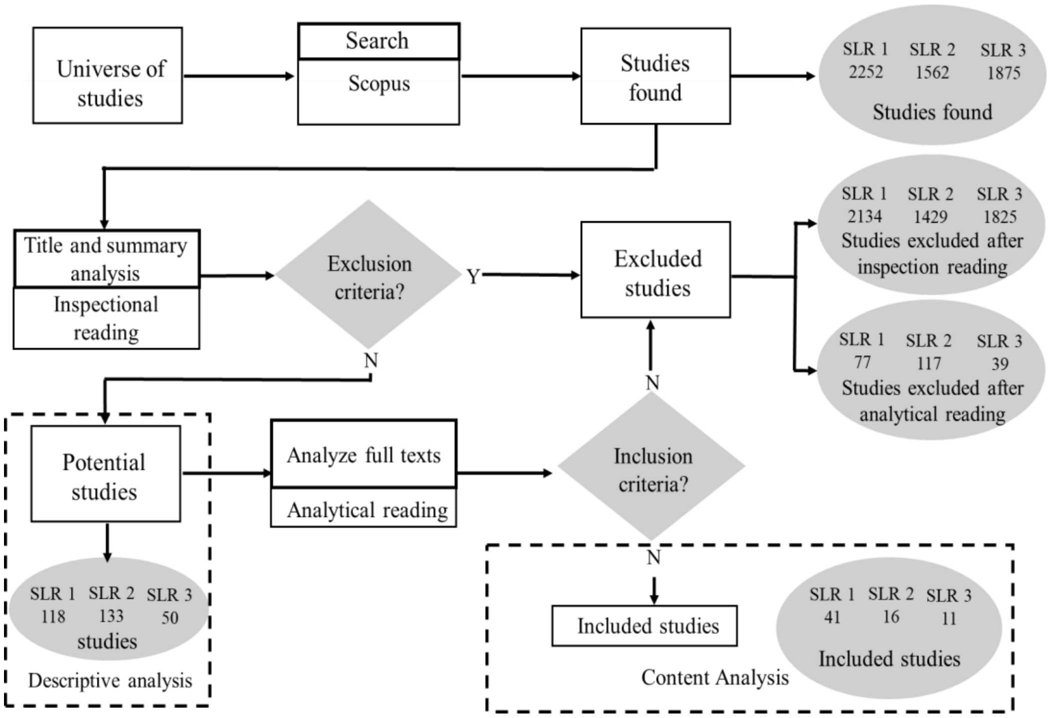
assess flow dynamics and network-related decisions, extracting insights for decision-making. The utilized methodology aligns with the deterministic multi-objective optimization model.

The remainder of this article is structured as follows: Section 2 describes the conceptual background. Section 3 explains the research protocol used to conduct the systematic literature review. Section 4 discusses the case studies per area, while Section 5 presents the critical success factors found. Section 6 shows the main difficulties found in the articles analyzed and Section 7 draws the main conclusion.

RESEARCH PROTOCOL

The research was conducted through a systematic literature review (BIOLCHINI *et al.*, 2007; KITCHENHAM, 2004; MARGOLIS *et al.*, 2018), following the structure outlined in Figure 1.

Figure 1 - Systematic literature review stages.



Source: Authors, 2023.

The article search processes were conducted in the Scopus database, recognized as the most comprehensive database for indexing high-impact scientific articles (PRANCKUTĖ, 2021; SILVA JÚNIOR *et al.*, 2023; SILVA JÚNIOR *et al.*, 2022a; SILVA JÚNIOR *et al.*, 2022b), partitioned into three sections, labeled as SLR 1, SLR 2, and SLR 3, the objective for SLR 1 aimed to address research question 1 (RQ1). "What are the drivers and barriers

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influencing competitiveness in rice agro-industries?”. For SLR 2, Research Question 2 (RQ2) is: “How can products/processes contribute to competitiveness?”. The Research Study Level 3 (SLR 3), two research questions (RQ3 and RQ4, respectively) were formulated: “How do decision-making processes correlate with the integration of innovative products and processes within the rice cultivation sector?” and “How are possible to optimize decision-making processes in the rice sector?”.

Each string pinpoints scientific contributions related research question, which would not be possible if a single search string were used. The systematic literature review was carried out between August 2021 and October 2022.

Table 1 - Research questions and search strings

Research question	String
RQ1: What are the drivers and barriers influencing competitiveness in rice agro-industries?	(“decision making” OR “decision making process” OR “decision making methods” OR “multi-criteria decision making” OR “multi-criteria decision-making analysis” OR “mcdm” OR “mcda”) AND (“agribusiness” “Agribus*” OR “agro*” OR “agro” OR “rice” OR “rice industry” OR “rice sector” OR “rice farming”)
RQ2: "What are drivers and barriers influencing competitiveness in rice agro-industries?	(“agribusiness” OR “rice” OR “rice farming”) AND (“innovation” OR “innovation environment” OR “innovation ecosystem” OR “open innovation” OR “evolution of innovation”))
RQ3: How do decision-making processes correlate with the integration of innovative products and processes within the rice cultivation sector?" RQ4: “How are possible to optimize decision-making processes in agro-industries in the rice sector?”.	(“agribusiness” OR “rice” OR “rice farming”) AND (“performance measurement system” OR “PMS” OR “key performance indicators” OR “indicators” OR “innovation” OR “productive chain” OR “value chain”) AND (“products” OR “process”)

Source: Authors, 2023.

RESULTS AND DISCUSSION

The current section discusses results derived from the systematic literature review, divided into three sections based on the research questions formatted to contextualize the issue.

SLR 1: THE DECISION-MAKING PROCESS IN THE RICE SECTOR

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In SLR1, a search was conducted in the Scopus database for a total of 2,252 articles. Following a comprehensive analysis of the articles and the removal of duplicates, 118 articles were ultimately selected. The extraction data resulted in the selection of 29 articles, which the decision-making methods described in Table 2.

Table 2 - Articles selected in SLR1 by decision-making methods (continue)

Article	Decision-making methods
(FOLINAS, 2007)	Organizational intelligence.
(STØRDAL; LIEN; BAARDSEN, 2008)	FIML (Full Information Maximum Likelihood) e PROBIT (Probability Unit).
(FLESKENS; DUARTE; EICHER, 2009)	Multifactorial
(THEOCHAROPOULOS; MELFOU; PAPANAGIOTOU, 2012)	Friedman statistical test and Monte Carlo simulations.
(CANKURT *et al.*, 2013)	Consumer Style Inventory and developed by Sproles and Kendall.
(QUINN; BRANDLE; JOHNSON, 2013)	The index is prepared based on the variables studied and analyzed.
(THOMAS; GÜNDEN; GRAY, 2013)	Factor analysis and cluster analysis.
(MOREL; LÉGER, 2016)	It considers the complex interactions among social, environmental, and economic variables with the aim of understanding and analyzing phenomena that encompass not only quantitative data but also pertinent social and environmental factors.
(RECK; SCHULTZ, 2016)	Multi-criteria analysis to support constructivist decision-making.
(WEDDAGALA *et al.*, 2020)	Internal application; a Maintenance Decision Support System (MDSS) for maintenance decision support and marketing strategies to make decisions in various areas such as operations, maintenance, and marketing.
(GILINSKY; NEWTON; EYLER, 2018)	Descriptive statistics, multinomial logistic regression, cross-tabulations and Pearson chi-square.
(LIZOT *et al.*, 2018)	A comprehensive of factors in various dimensions, stakeholders, and viewpoints during decision-making endeavors to foster a holistic and cooperative perspective. This approach incorporates economic, social, environmental, and ethical considerations in pursuit of sustainable and well-balanced outcomes.
(MARGOLIS *et al.*, 2018)	Deterministic multi-objective optimization model.
(SAFRIYANA *et al.*, 2018)	Business process modeling.
(CHOUSOU; MATTAS, 2021)	It incorporates additional independent variables (covariates) to adjust or control their effect on the relationship between the variable of interest and other explanatory variables, enhance the precision of statistical analyses and manage potential confounding factors or external influences in support of decision-making.
(REMENOVA; JANKELOVA, 2019)	Non-parametric indicators, ANOVA (Analysis of Variance) e Myers-Briggs.

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(DEWI ORYZA SATIVA; TARIK IBRAHIM; SUTAWI, 2021)	Descriptive tabulation, customer satisfaction index and linear regression.
(ALBISHRI; SUNDARAKANI; GOMISEK, 2020)	Goal alignment.
(ETUMNU; GRAY, 2020)	Hierarchical clustering, cost management, production price management, personnel management, production management, and asset management.
(MOTIA; REDDY, 2020)	TOPSIS (Technique for Order Preference by Similarity to Ideal Solution).
(PORTO; SILI, 2020)	It considers relevant qualitative information, analyzes their characteristics and relationships, and uses this information to support the decision-making process and enables a more comprehensive and informed understanding of the qualitative elements influencing the decision.
(SARWOSRI; MUSSHOFF, 2020)	Derivation of hypotheses.
(SWAMI; PARTHASARATHY, 2020)	Logit model.
(AKTAŞ; DEMIREL, 2021)	VIKOR (Multi-Criteria Optimization and Compromise Solution), TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) and MAUT (Multi-Attribute Utility Theory).
(DUAN; WIBOWO; CHONG, 2021)	Approximate and Fuzzy linguistic forms.
(LIZOT; TROJAN; AFONSO, 2021)	Cost management model, total cost of ownership, and multiple criteria decision analysis.
(NADJA *et al.*, 2021)	Analyzes qualitative information, weighing different perspectives and making decisions based on criteria established following the manager's experience.
(PEÑA GONZÁLEZ *et al.*, 2021)	Mathematical modeling.
(VERSIANI *et al.*, 2021)	Simulation techniques are employed to test and evaluate various scenarios and visualize the optimal alternatives based on predefined criteria, thereby reducing the uncertainty and complexity inherent in decision-making and gaining a better understanding of potential outcomes before practical implementation.

Source: Authors, 2023.

Remenova and Jankelova (2019) developed the first practical system based on decision-making methods, focusing on the assumption that leaders should possess and utilize various decision-making styles in different situations. However, the system was only able to partially address the complexity of the problem. Over the years, despite the increasing interest in accurate decision-making systems, development barriers persist due to the complexity of variables and the unique characteristics of each organization within the production chain and uncertainties regarding future challenges and the benefits of strategic choices made (COTEUR *et al.*, 2016).

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Decision-making models must into account the manager's personality and the specific characteristics of the organization, minimizing weaknesses through modeling, such as the problem is analyzed, and the resolutions are compared to the mental level of a manager and the actions taken (REMENOVA; JANKELOVA, 2019).

Daily, the organization's data is analyzed from various activities such as procurement, manufacturing, retail, marketing, and distribution (FOLINAS, 2007). Consequently, the more abstract and aligned with reality the decision-making systems are concerning categories, the more effective contribution to organizational management (MOREL; LÉGER, 2016). In Nadja *et al.* (2021), the consumer decision-making process is characterized by factors such as the identification of needs, information search, alternative assessment, and post-purchase behavior.

Peña González *et al.* (2021) proposed a mathematical model for optimizing planning decisions in the Colombian palm oil industry was developed, considering various products, warehouse types, transportation modes, and export options, thus reflecting the organization's current situation. The Multi-Criteria Decision Making (MCDM) or Multi-Criteria Decision Aid (MCDA) methods are versatile (KHEDRIGHARIBVAND *et al.*, 2019), appropriate for situations in which conflicting criteria are verified (WICHER; ZAPLETAL; LENORT, 2019). For sustainability assessment, Aktaş and Demirel (2021) the entropy method, the VlseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR), the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and the Multi-Attribute Utility Theory (MAUT) was systematically employed to facilitate the evaluation of compliance with economic, environmental, and social objectives, thus method aid in shaping managerial and strategic policies within the context of sustainable practices. Multicriteria analysis allows the evaluation of alternatives and criteria for different groups of interested parties, presenting as an advantage the recognition of measurable qualitative criteria through the integrative nature between different areas, based on the selected or ordered hierarchy, optimizing decision-making (LIZOT; TROJAN; AFONSO, 2021). The MCDA the perspective of decision-makers is pertinent, considering uncertainties and limitations while considering the values, objectives, culture, and biases of the stakeholders involved in the decision-making process, enabling to gain a deeper understanding of the problem (RECK; SCHULTZ, 2016).

The competitive advantage of agribusiness lies in frequent exposure to market fluctuations, which necessitates integrated management within computerized decision-making processes, tailored to the specific characteristics of each organization within the production chain (GARGOURI; HAMMADI; BORNE, 2002). Presently, a growing number of companies

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employ Six Sigma and the Define-Measure-Analyze-Improve-Control method to decrease operational costs and lead times, to enhance customer satisfaction and profit margins (VERSIANI *et al.*, 2021).

In strategic orientation, four distinct patterns of behavior can be identified: Regeneration; organizational rejuvenation; strategic renewal; and domain redefinition. Regeneration behavior involves redirecting towards market opportunities, such as the introduction of new products. Rejuvenation entails competitiveness improvements linked to the organization's structure and/or capabilities and strategic category changes made in alignment with the company's competitiveness (GILINSKY; NEWTON; EYLER, 2018). Although agriculture is a primary sector, the agribusiness sector is in a constant adaptation, wherein periodic assessments enable farmers to focus on overarching trends rather than micro-trends and anomalies. Success lies in formalizing the ongoing processes of adaptive management, which are inherent to many agricultural operations, and gathering valuable data and insights from applied practices (QUINN; BRANDLE; JOHNSON, 2013). Table 3 displays the 29 articles selected in SLR1 by general objective.

Table 3 - Articles selected from SLR1 by general objective

Article	General objective
(FOLINAS, 2007)	Developing a framework that provides quick and efficient managerial responses.
(STØRDAL; LIEN; BAARDSEN, 2008)	Identifying how income from various sources, excluding forestry, may impact the harvest decision.
(THEOCHAROPOULOS; MELFOU; PAPANAGIOTOU, 2012)	Examine the factors that influence the decision to adopt or not adopt organic food products.
(CANKURT *et al.*, 2013)	Identify the consumer decision-making style regarding food purchasing behavior.
(QUINN; BRANDLE; JOHNSON, 2013)	Develop a decision-making method to determine an agricultural scale.
(THOMAS; GÜNDEN; GRAY, 2013)	Identify consumers and classify them according to purchasing behavior.
(MOREL; LÉGER, 2016)	Understand how alternative farmers construct strategic choices.
(RECK; SCHULTZ, 2016)	Construct a multicriteria model for evaluating the relationship between an agribusiness and integrated producers.
(WEDDAGALA *et al.*, 2020)	Create a digital marketplace through a market decision support system and connect value chain actors on an open platform via mobile applications.
(GILINSKY; NEWTON; EYLER, 2018)	Investigate the impact of strategic and managerial guidelines on the performance of wine businesses.
(LIZOT *et al.*, 2018)	Develop a cost management model to assist producers in decision-making.

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(MARGOLIS *et al.*, 2018)	Develop a network design optimization model using cost and connectivity objectives in the evaluation of network flow and decisions.
(SAFRIYANA *et al.*, 2018)	Determine the process of decision-making within the palm oil production chain and establish the criteria and rules involved.
(CHOUSOU; MATTAS, 2021)	Identify and evaluate factors, with consumer opinions being highlighted as important, in the authenticity of food and guidance for making "safe" food choices.
(REMENOVA; JANKELOVA, 2019)	Evaluate, using parametric ANOVA testing, the score differences in decision-making based on nominal variables.
(DEWI ORYZA SATIVA; TARIK IBRAHIM; SUTAWI, 2021)	Define the decision-making process and the factors influencing the selection of rice cultivars.
(ALBISHRI; SUNDARAKANI; GOMISEK, 2020)	Investigate the factors underlying supply chain effectiveness in networked organizations operating in the logistics sector in the United Arab Emirates - UAE context.
(ETUMNU; GRAY, 2020)	Identify the prioritization of factors leading to the success of agricultural businesses and the heterogeneity in prioritization among farmers employing different strategies.
(MOTIA; REDDY, 2020)	Develop a decision model to select design attributes for the intelligent fertilizer recommendation system (IFRS).
(PORTO; SILI, 2020)	Identify, characterize, analyze and define different decision-making models in the agricultural sector.
(SARWOSRI; MUSSHOFF, 2020)	Examine risk attitudes and time preferences involving two groups of farmers in Indonesia engaged in perennial crop cultivation.
(SWAMI; PARTHASARATHY, 2020)	Model farmers' behavior and decision-making process.
(DUAN; WIBOWO; CHONG, 2021)	Introduce a multicriteria analysis approach for evaluating and selecting the most suitable decision-making method for sustainable agribusiness.
(LIZOT; TROJAN; AFONSO, 2021)	Develop a cost management model to assist the producer in decision-making.
(NADJA *et al.*, 2021)	Describe the decision-making process for consumers to purchase brown rice.
(PEÑA GONZÁLEZ *et al.*, 2021)	Develop a mathematical model to optimize Colombian planning decisions.
(VERSIANI *et al.*, 2021)	Propose the utilization of a decision framework during the analysis and improvement phases, aiming to establish an optimized framework.

Source: Authors, 2023.

The business applications offer static reports and insights into transactional data. However, decision-makers require dynamic information to make tactical and operational decisions based on vast amounts of data from various business activities and processes, such as procurement, manufacturing, retail, marketing, sales, and distribution (FOLINAS, 2007). In Coteur *et al.* (2016) the experience of a sustainable framework developed interactively with researchers, managers, experts and advisors from five different agricultural sectors (fruit, arable agriculture, greenhouse production, dairy and meat production) is reported, ensuring

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sustainable validation, to support farmers in assessing sustainability and making decisions on strategies in production systems. Regarding the social, economic, infrastructural, and institutional factors related to farmers' decision-making processes, commodity prices are influenced by market interventions at the national or international level, moving the consumption and individual expenses, thereby influencing demand and supply. Additionally, Swami and Parthasarathy (SWAMI; PARTHASARATHY, 2020) categorized adaptation strategies into Short Duration Crops (SDC) and Drought Resistant Varieties (DRC), as well as diversified crops, considering farmers' perceptions. Farmers perceive climate variability as the primary cause of crop losses, prompting them to redirect the solutions towards climate resilience. Agricultural Decision Support Systems (DSSs) crucial role in facilitating evidence-based decision-making in agriculture, aiming to enhance productivity, systems evaluate and select appropriate methods for agribusiness, the primary challenge lies in competition with alternative productions and marketing (DUAN; WIBOWO; CHONG, 2021).

Regarding the increase in sales to the end consumer, the consumption process should commence with consumer awareness, wherein choices are influenced by needs and desires. For example, the factors determining the purchase of a specific rice-derived product and reaping the benefits of consumption are evaluated in stages. In Nadja *et al.* (2021), the assessment of alternatives is one of the stages in the consumer purchasing decision-making process, describing the beliefs and attitudes of consumers influencing decisions. In the process, the consumer conducts an evaluation, which constitutes a stage of consideration before the final decision, concerning the ultimate purchase of brown rice by consumers, compared to other types of rice, such as white and black rice.

In Remenova and Jankelova (2019), the decision-making process in organizations involves two forms of perception, Sensing (SE) and Intuition (INT), and two forms of information judgment, Thinking (THI) and Feeling (FEE). Thus, a construct is a combination of individual values, interests, and habits. Furthermore, a study aiming to identify individual decision-making styles among Slovak managers in agribusiness companies was conducted, exploring the association with personal and work-related parameters. The decision-making style most commonly used by managers is sensing thinking, with nearly 65% of respondents falling into this category. Additionally, a dependency between business and work-related parameters and individual decision-making styles was detected.

The recent advancements in e-marketing and mobile marketing have facilitated the rapid creation and expansion of mobile applications in the marketing of agricultural products.

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Weddagala *et al.* (2020) developed a market decision support system aimed at connecting stakeholders in the value chain through an open platform. Crowds connect to the platform, providing marketing insights to stakeholders in the value chain, facilitating the reduction of information gaps, idea generation, and decision support through a common platform that aids in enhancing agricultural marketing capabilities in Sri Lanka. The objectives promote traditional food production, provide advisory support, and protect and encourage entrepreneurs in underutilized agricultural production. A common platform was established for stakeholders in the value chain to unite and formulate market strategies.

According to Cankurt *et al.* (2013), 11 dimensions indicate the profile during food purchasing behavior: Brand conscious (related to price and quality); perfectionist, conscious of high quality; confused by over-choice; environmentally conscious; impulsive and careless; habitual, brand loyal; health-conscious; locally conscious; convenient and time-energy economizer; and avoidance of shopping. The food purchasing behavior profile was investigated using the Consumer Style Inventory (CSI), developed by Sproles and Kendall. In Thomas, Günden, and Gray (2013), subsequent Cluster analysis isolated four distinct consumer segments: labeled as diverse consumers (47.98%), value loyalists (16.84%), emotional consumers (21.75%), and highly conscious consumers (13.43%). The findings support targeted educational programs aimed at encouraging the adoption of healthier eating and shopping habits.

Another important factor to consider is quality, a goal constantly pursued within the agri-food industry. The quality can be examined from three distinct perspectives. The consumer perspective involves understanding quality, focusing on dimensions of risk and trust. The institutional perspective focuses on the use of objective/regulated indicators to establish quality criteria, based on hygiene requirements. Finally, the producer's perspective emphasizes both raw materials and production methods play a fundamental role in defining the quality of agri-food products (OKPALA; KORZENIOWSKA, 2020).

Quality attributes in agri-food products can be somewhat challenging to identify. The quality of the same agri-food product on two different market shelves is likely not the same when compared to each other, even if both belong to the same batch. There are specific quality attributes of a product that differentiate it from another. The underlying fundamentals of such peculiarities or specificities can be found in the conceptual, content, and contextual perspectives of quality (OKPALA; KORZENIOWSKA, 2020). The challenge of selecting the most suitable

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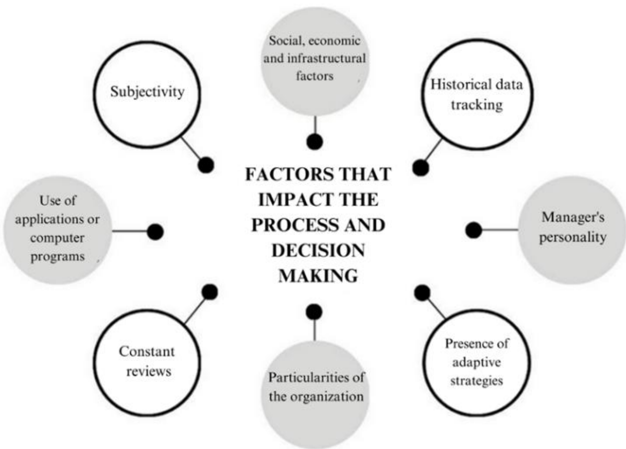
purchasing alternatives in agribusiness becomes a limiting factor in the decision-making process, competitiveness, and enhancement of quality attributes.

In Lizot, Trojan, and Afonso (2021), a model was proposed to provide a comprehensive overview of relevant costs, both explicit and hidden, direct and indirect, as well as non-monetary criteria traditionally not considered in cost models and MCDA. The simplicity and flexibility, approach can be particularly useful in supporting decision-making in family farming, contributing to the development of management practices. Hence, the direct marketing of commodities stands out as one of the solutions to enhance efficiency. Since farmers lack knowledge of market prices, traders buy agricultural products from farmers at low prices and sell to consumers at higher prices. Therefore, there is a significant need to impart knowledge to farmers.

In addition, standardizing and fully rationalizing prices through governmental intervention is relevant. According to Srinivasa Rao *et al.* (2019), standards be developed to mitigate unfavorable practices within the existing agricultural production marketing system. Marketing departments need to be trained alongside producer representatives, traders, local authorities, and government appointees to ensure fair compensation for farmers in the final price. The factors impacting the decision-making process in agribusiness (Figure 2) include social, economic, and infrastructural factors (also environmental aspects), historical data analysis, managerial personality, the presence of adaptive strategies (reflecting the manager's ability to adapt), organizational peculiarities, continuous evaluations, the use of applications or computer programs for monitoring, and the level of subjectivity employed by both the organization and the manager.

Figure 2 - Factors affecting the decision-making process



Source: Authors, 2023.

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SLR 2: INNOVATION AND COMPETITIVENESS ENVIRONMENTS

In SLR 2, the Scopus database search yielded 1,562 articles. After a detailed analysis of the articles and removal of duplicates, 133 articles were selected. Relevant data extraction was achieved through a thorough reading of all articles, leading to the final selection of 11 articles.

The stakeholders in agribusiness must enhance the competitiveness of the production chain (ORLANDO *et al.*, 2020). In innovation, the implementation of organic farming or agroecological approaches is growing, imposing to enhance competitiveness and improve natural resource management using interdisciplinary tools and participatory approaches (BENGTSSON; AHNSTRÖM; WEIBULL, 2005; DE PONTI; RIJK; VAN ITTERSUM, 2012; SHENNAN *et al.*, 2017). Opportunities to mitigate environmental impacts generated in the production process through eco-innovations aimed at resource optimization, regeneration, and substitution have been identified over the years, thus the findings emphasize that eco-innovation is oriented toward ecological, environmental, and industrial economics (GHISELLINI; CIALANI; ULGIATI, 2016).

Both farmers and agribusiness managers operate within a context composed of complex activities dependent on multiple factors, subject to spatial and temporal variations, avoiding universal managerial practices typical of a reductionist approach. The integration of management with farmers necessitates support for the introduction of environmental innovations, particularly addressing driving ecological and agricultural concerns, ensuring their position as distinctive elements (ORLANDO *et al.*, 2020). Eco-innovation is pivotal for achieving a balance between the industrial and natural systems, enabling the development of a sustainable model through eco-innovative management and investments, facilitating sustainable strategies (GEISSDOERFER *et al.*, 2017; GHISELLINI; CIALANI; ULGIATI, 2016; MANNINEN *et al.*, 2018).

The impact on daily agribusiness activities is related to the transformation of data, information, and experiences, enhancing decision-making capabilities for competitive practices. The distinction between a farmer and an agroindustry manager in the decision-making process lies in abilities to interpret and adapt to reality, modulating practices and addressing the specific needs of daily activities, renders the agribusiness supply chain competitive is the know-how exchange between farmers and bottom-up oriented innovations, as observed in crop twisting practices (MANNINEN *et al.*, 2018; ORLANDO *et al.*, 2020).

Thus, dynamic production chain, assessments utilizing Life Cycle Analysis (LCA), carbon or water footprint, can yield diverse outcomes contingent upon specific features such as

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agronomic inputs, management options, temporal variability, spatial variation, and per-hectare harvest fluctuations. Assessment scenarios should be implemented and analyzed before decision-making, guided by principles of management, agroecological considerations, and flexible agronomic solutions instead of universal recipes (ORLANDO *et al.*, 2020). Corporate Social Responsibility (CSR) is a flexible option capable of fostering differentiated performance over time. Briones Peñalver, Bernal Conesa, and de Nieves Nieto (2018) demonstrated the link between CSR, innovation, and cooperation in the performance of agribusiness companies, observing that a CSR-oriented strategy is significant for the performance of companies, creating competitiveness in sustainability for technology companies.

Employee recognition and social recognition are prominent indicators. Additionally, the indicator 'increase in productivity' shows a favorable value, enhancing the relationship between strategy adoption and innovation. Other empirical findings suggest the relationship between company productivity and innovation activities can be positive (ZOUAGHI; SÁNCHEZ, 2016). Regarding innovation, personnel qualifications are the most significant indicator. Consequently, companies may consider, lacking a highly skilled team to engage in cooperation with other stakeholders to enhance knowledge and foster innovation.

For cooperation, the most notable aspect is the enhancement of efficiency in natural resource conservation or economy. Cooperation influences innovation and also aids in customer relations and sales growth, as demonstrated by the performance variable (BRIONES PEÑALVER; BERNAL CONESA; DE NIEVES NIETO, 2018).

Governance inclusion forms in science with Responsible Research and Innovation (RRI) in rural India are explored and many ideas are focused on discursive inclusion, with limited space for ontologies (theories of being) and epistemologies (theories of knowledge) (VALKENBURG *et al.*, 2020). RRI expands its contribution to innovation governance, demonstrating the necessity of including epistemological dominance. Shaping RRI in a context where epistemological and ontological divisions appear insurmountable demands increased efforts to ensure the inclusion of stakeholders at the epistemological level. The creation of non-dominant, secure spaces is necessary to empower various epistemologies equally (VALKENBURG *et al.*, 2020).

Regarding potential innovative aspects, large and small agribusinesses contemplate three motivational foundations for innovative activity: Changes in products, changes in the market, and changes in technologies. For changes in products, parameter estimates for rice varieties provided *insights* into the influence of management practices, farm size, and

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availability of complementary inputs on rice productivity (MAO *et al.*, 2021). Rice producers, in particular, tend to adopt enhanced technologies related to rice varieties, fertilizers, and herbicides in an interdependent manner, reject all technological options, choose only one specific technology (improved rice varieties, fertilizers, or herbicides), adopt two of the technologies (improved rice varieties and fertilizers, improved rice varieties and herbicides, fertilizers and herbicides), or adopt all available technological options. The adoption of technologies for product changes varies based on farm size, scale, education, demonstration, availability of complementary inputs, and fertilizer marketing.

In the context of market changes, the theoretical model proposed in Santos *et al.* (2021) allows the evaluation of the market eco-innovative performance of agribusinesses from a sustainability perspective, considering the metrics of the Global Reporting Initiative (GRI). Miranda, Monteiro, and Rodrigues (2021), organizational arrangements supporting the adoption of sustainability-oriented innovations (SOIs) in the agri-food industry were evaluated, revealing that a gap between the creation and diffusion of SOIs occurs due to the neglect of the governance dimension in sustainable agri-food supply chains.

Finally, the technological changes transfer of technological knowledge can create new business opportunities, diversify agricultural production, and enhance sustainability, as proposed by Zouaghi and Sánchez (2016). Additionally, opening up Research and Development (R&D) activities through cooperation agreements with research institutions facilitates the innovation process. An Agri Food-Tech model involves technology applied to various objectives within different e-business models and also encompasses the support of the food supply chain through digital technology systems in the process of transporting products from the farm to the consumer. Thus, with considerable activity in agricultural technology, leading to digital disruption, there are no clear pioneers in terms of specific types of technology a business solution incorporates, apart from agricultural processes (VLACHOPOULOU *et al.*, 2021).

Furthermore, there are different types of farmers, including a large number of small-scale producers in developing countries who lack internet infrastructure and digital literacy. The challenges faced are diverse, ranging from lack of access to information regarding inputs and markets and financial difficulties to the inability to analyze market data and forecast production accurately. The characteristics pose a challenge to the diffusion of innovation, which is fundamental for enhancing the competitiveness of the rice production chain.

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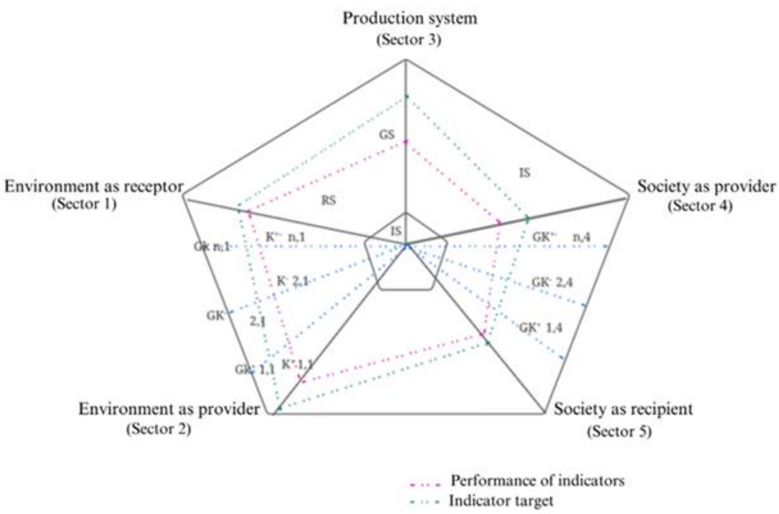
SLR3: MEASUREMENT METHODS (INNOVATION AND DIFFERENTIATION INDICATORS)

In SLR3, initially, 1,875 articles were identified in the Scopus database. After a detailed review and removal of duplicate articles, the number was reduced to 50 selected articles. Subsequently, a thorough reading of all remaining articles was conducted to extract relevant data, leading to the final selection of 11 articles.

To contextualize the relationship between decision-making processes and the inclusion of innovative products and processes in the rice sector, measurement methods were developed, incorporating differentiation indicators tailored to innovation management contexts. In Moreno García *et al.* (2021), the sustainability of the rice (Oryza sativa L.) agricultural supply chain in Brazil and Cuba is assessed using a conceptual model with five sectors (5 SEnSU) of sustainability, supported by goal-setting as tools for multicriteria analysis. The 5 SEnSU methods in radar format are employed to represent the performance of multidimensional indicators within five dimensions (Figure 3).

Figure 3 - 5 SEnSU



Source: Adapted from García et al. (MORENO GARCÍA *et al.*, 2021)

The indicators of the 5SEnSU model enable the recognition of dual roles (as both donor and receiver) of the natural environment and society, as well as goal programming to obtain the unique synthetic sustainability indicator. The 5SEnSU model revealed a high per capita consumption of rice as a staple food among the Cuban population, coupled with low production volumes and agricultural yields. Additionally, the sustainability indicators for the cereal

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exhibited weak performance in comparison to Brazil. Another crucial aspect involves replacing traditional artisanal cultivation techniques with more efficient irrigation and drainage methods for water usage. Similarly, providing access to financial resources to enhance soil quality, optimize human resources, and improve seed quality are essential measures to mitigate the effects of climate change.

In Bijman and Bitzer (2016), the integration of small South African farmers into Institutional Arrangements (IA) was based on a conceptual framework centered on quality specifications and grounded in the analysis of the Global Value Chain (GVC), as well as governance practices and operational quality. The strategies to meet the increasing quality standards were categorized into four areas: process upgrading, product upgrading, functional upgrading, and intersectoral modernization. The results identified that the Institutional Arrangements (IAs) are highly relevant in facilitating access to export markets for small citrus fruit producers, performing three functions. The results identified the IAs as highly relevant in facilitating access to export markets for small citrus fruit producers, performing three functions. Initially, it enabled the agribusiness sector to provide farmers with information on market developments and demands, facilitating the adjustment of productive activities. Subsequently, supporting small-scale farmers through training, technical assistance, access to inputs, and working capital. Kashapov *et al.* (2017) present a method for selecting optimal agricultural equipment in preparing sweet sorghum beds, considering the economic efficiency of cultivation technologies along with operational costs, reducing the number of fields passes by combining the use of wide machines, decreasing soil compaction and labor costs. The optimization of machinery and the configuration of the machine and team reduce fuel costs, lubricant expenses, and fieldwork time.

Flores Leal and Soto Flores (2013), the innovative behavior of the agricultural sector in Sinaloa, Mexico, and its effects on product enhancement were analyzed using an innovation model based on pragmatic logic (Figure 4). The innovation model consists of two horizontal blocks. The block that guides and directs the process is related to the market or specific customer, labeled with the letter "C" (customer). The phases for developing a product blend market intelligence and technology transfer. Each phase has a feedback loop to the previous phase, labeled with the letter "F" (feedback). At the top of the innovation model is the research block, labeled with the letter "R". Knowledge exchanges with each phase of the market block are facilitated by technology transfer, labeled with the letter "K" (knowledge). The innovation model was applied in three companies, resulting in the creation of value-added products.

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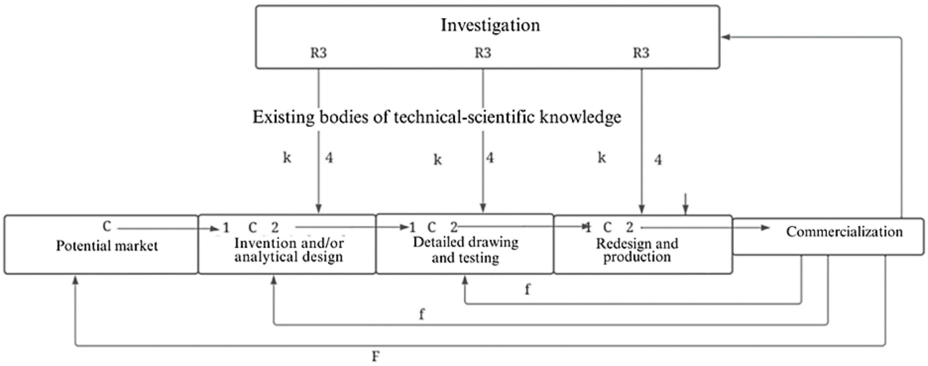
Figure 4 - Innovation model proposed in Leal and Flores.



Source: Adapted from Leal and Flores [65].

The Kline model proposed in Kline and Rosenberg (2009) offers an alternative to the linear model, also known as the continuous line model, incorporating thus model incorporates five different pathways, such as the application of developmental routes for each of the agricultural companies in Sinaloa. The routes are as follows:

a) The first pathway involves a product idea that addresses a market need. Innovation lacks meaning without market analysis. The pathway is graphically represented by the letter "C" within the model;

b) The second pathway involves refining the idea through in-depth market research, expert analysis, and areas within the company. These stages are graphically represented in the model within the boxes labeled as "C" and "R";

c) The third pathway involves connecting the idea with available technology, where the technology enables product development, whether through invention, adaptation, or licensing. The route can be visually traced in the "C", "K", and "R" boxes;

d) The fourth pathway in the model pertains to the connection between technological development and innovation, meaning realizing the technological application in a production process materializes the platform for the new product. The pathway can be visually traced in the "C", "K", and "R" boxes;

e) The fifth pathway pertains to the connection between innovation and the product, defining processes to analyze capabilities and generate new applications. The model signifies innovation occurs when an idea transformed into a product or service aligns with market laws. Market approach and technology application are fundamental processes; therefore, to graphically analyze aspects the entire model needs to be reviewed.

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In the Kline model, there is a regional reference on how new behaviors can be designed and generated within business schemes through market intelligence-based innovation and technology transfer (FLORES LEAL; SOTO FLORES, 2013).

Innovation in the investigated models is pertinent in the current business models of agricultural supply chains, such as the downstream model, used to assist in decision-making through a multi-label decision tree or a method known as Bayesian Chain Classifier (SAFRIYANA *et al.*, 2018). The application of designers underscores the importance of having a decision-making model that aids in personalized identification and selection. Employing a standardized method purpose is crucial, as it ensures a faster and more objective process (SAFRIYANA *et al.*, 2018). Hence, it's essential to delineate the decision-making process, including how to conduct it and the methods or models employed for effective decision-making (PORTO; SILI, 2020).

The innovation technology aims to enhance rice productivity through double-row planting, utilizing the Jaja Legowo planting technology based on two distinct parameters: The incorporation of manual and rice transplanting machines. The adoption of technology proves advantageous when employed on transplanters, as opposed to manual machines, proving beneficial for both farmers and agro-industries (NINGSIH *et al.*, 2021).

The cultivation at present of high-quality and high-yielding rice varieties stands as one of the most important tasks for enhancing the grain. The consistency of starch gelatinization serves as a vital indicator of rice cooking quality, a primary concern for agro-industries regarding the final product's quality (LIU *et al.*, 2021). The technological method of analyzing rice starch gelatinization consistency through infrared spectroscopy, as observed in Liu *et al.* (2021) is a non-destructive method, rapid, and pollutant-free, capable of substituting traditional chemical methods. The screening of various types of high-quality rice at the beginning of production and the rapid analysis of gum consistency in batches provide technical support assurance in agroindustries.

In Somsong, Mcnally, and Hsieh (2020), consumer segment preferences for innovative rice products can be examined, alongside transcultural determinants of perceived value and customer loyalty. Structural equation modeling was employed to explore the interactions between marketing mix, emphasizing customer perceived value, and post-purchase behavior, comparing trajectory coefficients among two cultural groups (Eastern and Western). The marketing mix, examined across perceptions of Eastern and Western customers, influences value perceptions, enhancing the preference for Thai rice. In the context of continuous risk

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assessment, the Thai government explored alternatives to yield economic and environmental benefits across various levels of the production chain (residents, farmers, agro-industries, and consumers). In Thailand specifically, Agriculture 4.0 policies are being implemented to facilitate the shift from low-yield, labor-intensive commodities like rice cultivation to innovative products with higher profit margins.

The interaction between companies and industries within the food sub-complexes with federal executive agencies is possible. A substantial volume of information for analysis, planning, and forecasting activities will promptly address the issues hindering agricultural production development in the country (ZHEVORA; TULCHEEV; BORISOV, 2021). Volatile compounds are composed of the flavor of fermented brown rice milk with various formulations and assess the product quality alongside sensory evaluation indicators. The purpose was to develop new grain rice milk products and enhance sensory quality, providing a theoretical foundation, and assisting the decision-making process regarding the expansion of the product range (GUO *et al.*, 2015). Similarly, Savchenko *et al.*, (2020) assert the global market, many resource factors, primarily cheap labor or land, no longer determine the competitiveness of agricultural products. The decisive factor influencing the product's competitiveness level is modern technological solutions, agribusiness digitalization, and innovative capacity. The set of professional skills of agribusiness experts is also transforming. In today's context, the skill set encompasses Biotechnology, Bioinformatics, Chemistry, Physics, and Geographic Information Systems (GIS). In the framework of the European Union’s agricultural policy, three priority areas have been identified for implementing protective and strengthening measures for agribusiness:

a) Conservation of biodiversity and development of 'natural' agriculture and forestry systems in traditional agricultural landscapes;

b) Rational use of water; trading grains as raw materials only hampers the promotion of processed products and restricts it;

c) Consideration of impacts on climate change.

According to Savchenko *et al.* (2020), TOP-10 trends were identified in the development of Environmental Engineering in agribusiness in Russia, as shown in Figure 5.

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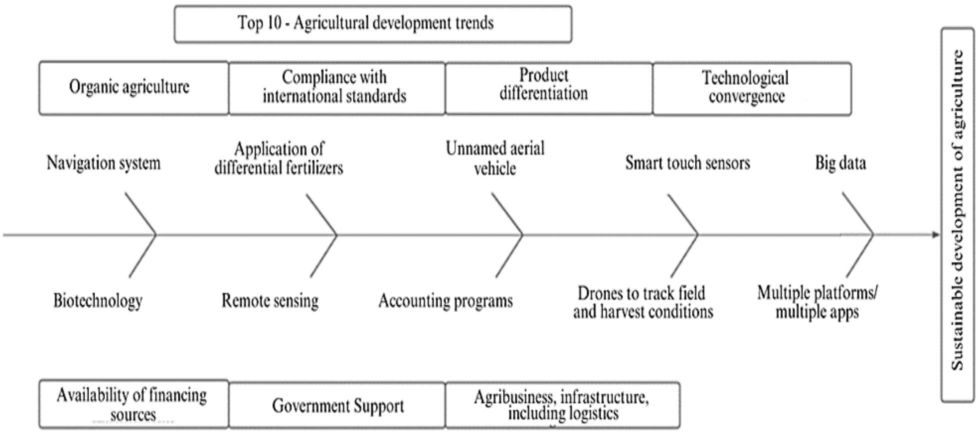
Figure 5 - Agricultural development trends



Source: Savchenko et al. [72].

The results obtained in the article indicate directions in agribusiness development focused on the need for faster implementation of environmental technological and digital innovations, biotechnologies, and new materials, including changes in the value chain by transitioning to the production of high-value-added and differentiated products, transforming existing business models with shifts in export structures, and expanding the potential for development and organic farming methods.

CONCLUSIONS

Decision-making in organizations is a complex challenge, particularly due to the variety of variables, organizational peculiarities, and uncertainties regarding future challenges and benefits of strategic choices. Although growing interest in precise decision-making systems, development barriers persist. It's important to customize decision-making methods to account for a manager's personality and organizational specificities. Moreover, the need to handle large volumes of data from various activities necessitates abstract and contextually coherent decision-making systems.

Multicriteria analysis stands as a widely used method enabling the evaluation of alternatives and criteria for diverse stakeholders, measuring qualitative criteria, and integrating different areas. Decision-makers' perspectives and uncertainties are also factored methods, allowing a more profound understanding of the problem and the construction of relevant models and criteria.

In the context of agribusiness, decision-making management is important to address the constant market. Methods such as Six Sigma can continuous improvement can enhance customer satisfaction and profitability. Despite being a traditional sector, requires renewal and

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continuous evaluation. Adaptation and periodic assessment are essential for farmers to focus on overall trends and make decisions based on valuable insights and applied practices.

The decision-making process in agribusiness is complex, demanding dynamic information derived from vast datasets encompassing diverse activities and business processes. Business applications offer static reports and insights on transactional data; however, decision-makers require real-time information for tactical and operational decision-making. Sustainability stands as a pivotal factor in decision-making within agribusiness, necessitating assessment and strategic choices in production systems. Farmers' perceptions of social, economic, infrastructural, and institutional factors also impact the decision-making process.

In the context of the end consumer, the purchasing decision-making process is influenced by factors such as awareness, needs, desires, and evaluation of alternatives. The quality of agri-food products is a significant factor to be considered, encompassing distinct and specific quality attributes. Cost analysis and supplier selection also play a role in decision-making.

The individual decision-making styles of managers can vary, involving different combinations of perception and judgment of information. Additionally, the direct marketing of agricultural commodities and price standardization are relevant issues for enhancing efficiency and ensuring fair compensation for farmers. Overall, decision-making in agribusiness is influenced by a range of factors, including social, economic, infrastructural aspects, sustainability, quality, costs, individual styles, and adaptive strategies.

Finally, innovation plays a crucial role in agribusiness, enabling companies to become more competitive and sustainable. The implementation of organic or agroecological farming practices, coupled with the use of eco-innovations and participatory approaches, aims to enhance natural resource management and mitigate environmental impacts. Management in the agricultural sector necessitates interpretation and adaptation skills to reality, both from farmers and agribusiness managers. Effective decision-making is fundamental for the development of a competitive production chain, emphasizing technical expertise and bottom-up innovations.

Evaluating innovative practices and technologies in agribusiness involves considering various scenarios and employing appropriate measurement methods. Life cycle analysis, carbon footprint, and water footprint are vital tools in this process, enabling a comprehensive understanding of environmental impacts and facilitating more informed decision-making. Corporate social responsibility (CSR) also plays a significant role in the performance of agribusiness companies, fostering competitiveness in sustainability. Collaboration among

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various actors in the production chain, such as farmers, agro-industries, and research institutions, can facilitate the adoption of innovative practices and promote sustainable development. Moreover, the adoption of innovative technologies and practices in the agricultural sector can lead to changes in products, markets, and technologies. These changes may involve improvements in productivity, diversification of production, enhanced product quality, and meeting specific market demands. The transfer of technological knowledge and the openness of research and development activities through cooperation facilitate this process.

In agribusiness innovation, the use of appropriate measurement models and methods is fundamental. Models such as 5SEnSU, the Kline model, and infrared spectroscopy analysis can provide valuable insights for assessing the sustainability, quality, and perceived value of agricultural products. The digitization and technology play an increasingly vital role in agribusiness, enabling access to information, process optimization, and improved communication throughout the production chain. Digital platforms and integrated information systems are tools that facilitate decision-making and drive innovation in the sector.

Therefore, research justifying the optimization of decision-making processes in rice agribusinesses is warranted, with numerous studies indicating the need. However, in-sector technologies are sparsely adopted and existing ones lack adaptability to the diverse realities present in Brazilian agribusiness.

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REFERÊNCIAS

AKTAŞ, N.; DEMIREL, N. A hybrid framework for evaluating corporate sustainability using multi-criteria decision making. **Environment, Development and Sustainability**, [*s. l.*], v. 23, n. 10, p. 15591–15618, 2021. Disponível em: https://doi.org/10.1007/s10668-021-01311-5.

ALBISHRI, Dalal Yousuf; SUNDARAKANI, Balan; GOMISEK, Bostjan. An empirical study of relationships between goal alignment, centralised decision-making, commitment to networking and supply chain effectiveness using structural equation modelling. **International Journal of Logistics Research and Applications**, [*s. l.*], v. 23, n. 4, p. 390–415, 2020. Disponível em: https://doi.org/10.1080/13675567.2019.1700219.

BAJAN, Bartłomiej; MRÓWCZYŃSKA-KAMIŃSKA, Aldona. Carbon footprint and environmental performance of agribusiness production in selected countries around the world. **Journal of Cleaner Production**, [*s. l.*], v. 276, p. 123389, 2020. Disponível em: https://www.sciencedirect.com/science/article/pii/S095965262033434X.

BENGTSSON, JANNE; AHNSTRÖM, JOHAN; WEIBULL, ANN-CHRISTIN. The effects of organic agriculture on biodiversity and abundance: a meta-analysis. **Journal of Applied Ecology**, [*s. l.*], v. 42, n. 2, p. 261–269, 2005. Disponível em: https://doi.org/10.1111/j.1365-2664.2005.01005.x.

BIJMAN, J.; BITZER, V. **Quality and innovation in food chains**. [*S. l.*]: Brill | Wageningen Academic, 2016. *E-book*. Disponível em: https://brill.com/view/title/68719.

BIOLCHINI, Jorge Calmon de Almeida *et al.* Scientific research ontology to support systematic review in software engineering. **Advanced Engineering Informatics**, [*s. l.*], v. 21, n. 2, p. 133–151, 2007. Disponível em: https://linkinghub.elsevier.com/retrieve/pii/S147403460600070X.

BRENES, Esteban R; CIRAVEGNA, Luciano; ACUÑA, Joseph. Differentiation strategies in agribusiness – A configurational approach. **Journal of Business Research**, [*s. l.*], v. 119, p. 522–539, 2020. Disponível em: https://www.sciencedirect.com/science/article/pii/S014829632030504X.

BRIONES PEÑALVER, Antonio Juan; BERNAL CONESA, Juan Andrés; DE NIEVES NIETO, Carmen. Analysis of Corporate Social Responsibility in Spanish Agribusiness and Its Influence on Innovation and Performance. **Corporate Social Responsibility and Environmental Management**, [*s. l.*], v. 25, n. 2, p. 182–193, 2018. Disponível em: https://doi.org/10.1002/csr.1448.

CANKURT, Murat *et al.* Consumer decision-making styles: Investigation of food shopping behavior. **Journal of Food, Agriculture and Environment**, [*s. l.*], v. 11, p. 224–227, 2013.

CHILDS, Nathan. **Rice Outlook**. [*S. l.*]: U.S. Department of Agriculture, Economic Research Service, 2021. Disponível em: https://www.ers.usda.gov/webdocs/outlooks/100237/rcs-21a.pdf?v=9463.9.

CHOUSOU, Charoula; MATTAS, Konstadinos. Assessing consumer attitudes and perceptions towards food authenticity. **British Food Journal**, [*s. l.*], v. 123, n. 5, p. 1947–1961, 2021. Disponível em: https://doi.org/10.1108/BFJ-03-2019-0177.

COTEUR, Ine *et al.* A framework for guiding sustainability assessment and on-farm strategic decision making. **Environmental Impact Assessment Review**, [*s. l.*], v. 60, p. 16–23, 2016. Disponível em: https://www.sciencedirect.com/science/article/pii/S0195925516301081.

DE PONTI, Tomek; RIJK, Bert; VAN ITTERSUM, Martin K. The crop yield gap between organic and conventional agriculture. **Agricultural Systems**, [*s. l.*], v. 108, p. 1–9, 2012. Disponível em: https://www.sciencedirect.com/science/article/pii/S0308521X1100182X.

DEWI ORYZA SATIVA, Rima; TARIK IBRAHIM, Jabal; SUTAWI, Sutawi. Analysis of Taking Decision of Farmers in Choosing Rice Cultivars: Case of Pakel District, Tulungagung,

DOI: https://doi.org/10.56579/rei.v5i7.985

v. 5, n. 7, nov.-dez. 2023.

ISSN 2674-8703

Indonesia. **E3S Web of Conferences**, [*s. l.*], v. 226, p. 00037, 2021. Disponível em: https://www.e3s-conferences.org/10.1051/e3sconf/202122600037.

DUAN, Sophia X; WIBOWO, Santoso; CHONG, Josephine. **A Multicriteria Analysis Approach for Evaluating the Performance of Agriculture Decision Support Systems for Sustainable Agribusiness**. [*S. l.: s. n.*], 2021.

ETUMNU, Chinonso; GRAY, Allan W. A Clustering Approach to Understanding Farmers' Success Strategies. **Journal of Agricultural and Applied Economics**, [*s. l.*], v. 52, n. 3, p. 335–351, 2020. Disponível em: https://www.cambridge.org/core/article/clustering-approach-to-understanding-farmers-success-strategies/BB6684367D0109AEE4CBE05F5C2BC156.

FLESKENS, Luuk; DUARTE, Filomena; EICHER, Irmgard. A conceptual framework for the assessment of multiple functions of agro-ecosystems: A case study of Trás-os-Montes olive groves. **Journal of Rural Studies**, [*s. l.*], v. 25, n. 1, p. 141–155, 2009. Disponível em: https://www.sciencedirect.com/science/article/pii/S0743016708000600.

FLORES LEAL, Pedro; SOTO FLORES, María del Rocio. El Comportamiento Innovador en Valor Agregado del Sector Agrícola en el Estado de Sinaloa. **Journal of technology management & innovation**, [*s. l.*], v. 8, p. 42, 2013.

FOLINAS, Dimitris. A conceptual framework for business intelligence based on activities monitoring systems. **International Journal of Intelligent Enterprise**, [*s. l.*], v. 1, n. 1, p. 65, 2007. Disponível em: http://www.inderscience.com/link.php?id=13811.

GARDAS, Bhaskar B *et al.* A hybrid decision support system for analyzing challenges of the agricultural supply chain. **Sustainable Production and Consumption**, [*s. l.*], v. 18, p. 19–32, 2019. Disponível em: https://www.sciencedirect.com/science/article/pii/S2352550918303129.

GARGOURI, E; HAMMADI, S; BORNE, P. A study of scheduling problem in agro-food manufacturing systems. **Mathematics and Computers in Simulation**, [*s. l.*], v. 60, n. 3, p. 277–291, 2002. Disponível em: https://www.sciencedirect.com/science/article/pii/S0378475402000204.

GEISSDOERFER, Martin *et al.* The Circular Economy – A new sustainability paradigm?. **Journal of Cleaner Production**, [*s. l.*], v. 143, p. 757–768, 2017. Disponível em: https://www.sciencedirect.com/science/article/pii/S0959652616321023.

GHISELLINI, Patrizia; CIALANI, Catia; ULGIATI, Sergio. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. **Journal of Cleaner Production**, [*s. l.*], v. 114, p. 11–32, 2016. Disponível em: https://www.sciencedirect.com/science/article/pii/S0959652615012287.

GILINSKY, Armand; NEWTON, Sandra; EYLER, Robert. Are strategic orientations and managerial characteristics drivers of performance in the US wine industry?. **International Journal of Wine Business Research**, [*s. l.*], v. 30, n. 1, p. 42–57, 2018. Disponível em: https://doi.org/10.1108/IJWBR-08-2016-0029.

GUO, Shaodong *et al.* Effects of agricultural waste-based conditioner on ultrasonic-aided

DOI: https://doi.org/10.56579/rei.v5i7.985

v. 5, n. 7, nov.-dez. 2023.

ISSN 2674-8703

activated sludge dewatering. **RSC Advances**, [*s. l.*], v. 5, n. 54, p. 43065–43073, 2015. Disponível em: http://xlink.rsc.org/?DOI=C5RA05743D.

KASHAPOV, N F *et al.* Comparative evaluation of different machines for seedbed for sorghum. **IOP Conference Series: Materials Science and Engineering**, [*s. l.*], v. 240, p. 012033, 2017. Disponível em: https://iopscience.iop.org/article/10.1088/1757-899X/240/1/012033.

KHEDRIGHARIBVAND, Hojatollah *et al.* Sustainable Rangeland Management in Southwest Iran: Understanding Changes in Experts' Attitudes Toward Livelihood Alternatives. **Rangeland Ecology & Management**, [*s. l.*], v. 72, n. 3, p. 433–445, 2019. Disponível em: https://www.sciencedirect.com/science/article/pii/S1550742418301118.

KITCHENHAM, Barbara. **Procedures for Performing Systematic Reviews**. [*S. l.*]: Technical Report TR/SE-0401 and National ICT Australia Ltd, 2004.

KLINE, Stephen J; ROSENBERG, Nathan. An Overview of Innovation. *In*: STUDIES ON SCIENCE AND THE INNOVATION PROCESS. [*S. l.*]: WORLD SCIENTIFIC, 2009. p. 173–203.

LEZOCHE, Mario *et al.* Agri-food 4.0: A survey of the supply chains and technologies for the future agriculture. **Computers in Industry**, [*s. l.*], v. 117, p. 103187, 2020. Disponível em: https://www.sciencedirect.com/science/article/pii/S0166361519307584.

LIU, Hong-mei *et al.* Construction and Verification of a Mathematical Model for Near-Infrared Spectroscopy Analysis of Gel Consistency in Southern Indica Rice. **Spectroscopy and Spectral Analysis**, [*s. l.*], v. 41, n. 8, p. 2432, 2021.

LIZOT, Mauro *et al.* Application of a model of management of costs for decision making in family agribusiness. **Custos e Agronegócio Online**, [*s. l.*], v. 14, p. 219–313, 2018.

LIZOT, Mauro; TROJAN, Flavio; AFONSO, Paulo. **Combining Total Cost of Ownership and Multi-Criteria Decision Analysis to Improve Cost Management in Family Farming**. [*S. l.: s. n.*], 2021.

MANNINEN, Kaisa *et al.* Do circular economy business models capture intended environmental value propositions?. **Journal of Cleaner Production**, [*s. l.*], v. 171, p. 413–422, 2018. Disponível em: https://www.sciencedirect.com/science/article/pii/S0959652617322965.

MAO, Hui *et al.* Time Preferences and green agricultural technology adoption: Field evidence from rice farmers in China. **Land Use Policy**, [*s. l.*], v. 109, p. 105627, 2021. Disponível em: https://www.sciencedirect.com/science/article/pii/S0264837721003501.

MARGOLIS, Joshua T *et al.* A multi-objective optimization model for designing resilient supply chain networks. **International Journal of Production Economics**, [*s. l.*], v. 204, p. 174–185, 2018. Disponível em: https://www.sciencedirect.com/science/article/pii/S0925527318302524.

MIRANDA, Bruno Varella; MONTEIRO, Guilherme Fowler A; RODRIGUES, Vinicius Picanço. Circular agri-food systems: A governance perspective for the analysis of sustainable

DOI: https://doi.org/10.56579/rei.v5i7.985

v. 5, n. 7, nov.-dez. 2023.

REVISTA DE ESTUDOS INTERDISCIPLINARES
ISSN 2674-8703

agri-food value chains. **Technological Forecasting and Social Change**, [*s. l.*], v. 170, p. 120878, 2021. Disponível em: https://www.sciencedirect.com/science/article/pii/S0040162521003103.

MOREL, Kevin; LÉGER, François. A conceptual framework for alternative farmers' strategic choices: the case of French organic market gardening microfarms. **Agroecology and Sustainable Food Systems**, [*s. l.*], v. 40, n. 5, p. 466–492, 2016. Disponível em: https://doi.org/10.1080/21683565.2016.1140695.

MORENO GARCÍA, Roberto R *et al.* Assessing the sustainability of rice production in Brazil and Cuba. **Journal of Agriculture and Food Research**, [*s. l.*], v. 4, p. 100152, 2021. Disponível em: https://www.sciencedirect.com/science/article/pii/S2666154321000545.

MOTIA, Sanjay; REDDY, S R N. Application of TOPSIS method in selection of design attributes of decision support system for fertilizer recommendation. **Journal of Information and Optimization Sciences**, [*s. l.*], v. 41, n. 7, p. 1689–1704, 2020. Disponível em: https://doi.org/10.1080/02522667.2020.1799513.

NADJA, R A *et al.* Decision-making process to purchase brown rice at the traditional market. **IOP Conference Series: Earth and Environmental Science**, [*s. l.*], v. 681, n. 1, p. 012096, 2021. Disponível em: https://iopscience.iop.org/article/10.1088/1755-1315/681/1/012096.

NINGSIH, R D *et al.* The Growth and productivity enhancement of rice by jajar legowo (double row) planting method in freshwater swampland. **IOP Conference Series: Earth and Environmental Science**, [*s. l.*], v. 807, n. 4, p. 042025, 2021. Disponível em: https://iopscience.iop.org/article/10.1088/1755-1315/807/4/042025.

OKPALA, Charles Odilichukwu R.; KORZENIOWSKA, Małgorzata. Concept, Content, and Context Perspectives of Quality of Agrofood Products: Reflections on Some Consumer Decision-Making-Purchase Scenarios. **Frontiers in Nutrition**, [*s. l.*], v. 7, 2020. Disponível em: https://www.frontiersin.org/articles/10.3389/fnut.2020.578941/full.

ORLANDO, Francesca *et al.* Participatory approach for developing knowledge on organic rice farming: Management strategies and productive performance. **Agricultural Systems**, [*s. l.*], v. 178, p. 102739, 2020. Disponível em: https://www.sciencedirect.com/science/article/pii/S0308521X18312241.

PARAGINSKI, Ana Laura. A natureza das inovações em agroindústrias de arroz do rio grande do sul. **INMR - Innovation & Management Review**, [*s. l.*], v. 11, n. 1 SE-, p. 55–72, 2014. Disponível em: https://www.revistas.usp.br/rai/article/view/79899.

PEÑA GONZÁLEZ, Darwin *et al.* An optimization approach for the design and planning of the oil palm supply chain in Colombia. **Computers & Chemical Engineering**, [*s. l.*], v. 146, p. 107208, 2021. Disponível em: https://www.sciencedirect.com/science/article/pii/S0098135420312515.

PORTO, Roberto Torrado; SILI, Marcelo Enrique. **Toma de decisiones y gestión productiva en el sector agropecuario del Noreste de La Pampa (Argentina)**. [*S. l.*]: scielo , 2020.

PRANCKUTĖ, Raminta. Web of Science (WoS) and Scopus: The Titans of Bibliographic

DOI: https://doi.org/10.56579/rei.v5i7.985

ISSN 2674-8703

Information in Today's Academic World. **Publications**, [*s. l.*], v. 9, n. 1, p. 12, 2021. Disponível em: https://www.mdpi.com/2304-6775/9/1/12.
QUINN, John E; BRANDLE, James R; JOHNSON, Ron J. A farm-scale biodiversity and ecosystem services assessment tool: the healthy farm index. **International Journal of Agricultural Sustainability**, [*s. l.*], v. 11, n. 2, p. 176–192, 2013. Disponível em: https://doi.org/10.1080/14735903.2012.726854.

RECK, Ângelo Brambila; SCHULTZ, Glauco. **Aplicação da Metodologia Multicritério de Apoio à Decisão no Relacionamento Interorganizacional na Cadeia da Avicultura de Corte**. [*S. l.*]: scielo , 2016.

REMENOVA, Katarina; JANKELOVA, Nadezda. Decision-making style of agribusiness managers. **Agricultural Economics**, [*s. l.*], v. 65, n. 7, p. 322–330, 2019. Disponível em: https://agricecon.agriculturejournals.cz/artkey/age-201907-0004.php.

SAFRIYANA *et al.* An Analysis and Design of Downstreaming Decision System on Palm Oil Agroindustry Based on Multilabel Classification. *In*: , 2018. **2018 International Conference on Advanced Computer Science and Information Systems (ICACSIS)**. [*S. l.: s. n.*], 2018. p. 247–252.

SANTOS, Fernanda Ferreira dos *et al.* Proposta para estudo das cadeias agroalimentares curtas: aplicação na ovinocultura leiteira no Brasil. **Revista em Agronegócio e Meio Ambiente**, [*s. l.*], v. 14, n. 3, p. 1–21, 2021. Disponível em: https://periodicos.unicesumar.edu.br/index.php/rama/article/view/7205.

SARWOSRI, Arieska Wening; MUSSHOFF, Oliver. Are Risk Attitudes and Time Preferences Crucial Factors for Crop Diversification by Smallholder Farmers?. **Journal of International Development**, [*s. l.*], v. 32, n. 6, p. 922–942, 2020. Disponível em: https://doi.org/10.1002/jid.3483.

SAVCHENKO, Y Y *et al.* The trend for environmental engineering in agribusiness: leaders and prospects. **IOP Conference Series: Materials Science and Engineering**, [*s. l.*], v. 734, n. 1, p. 12187, 2020. Disponível em: https://dx.doi.org/10.1088/1757-899X/734/1/012187.
SHENNAN, Carol *et al.* Organic and Conventional Agriculture: A Useful Framing?. **Annual Review of Environment and Resources**, [*s. l.*], v. 42, n. 1, p. 317–346, 2017. Disponível em: https://doi.org/10.1146/annurev-environ-110615-085750.

SILVA JÚNIOR, Claudio Roberto *et al.* Evolution of start-up investments: An overview and future research directions. **International Journal of Business Innovation and Research**, [*s. l.*], v. 1, n. 1, p. 1, 2022b.

SILVA JÚNIOR, Claudio R *et al.* **Mapping Risks Faced by Startup Investors: An Approach Based on the Apriori Algorithm**. [*S. l.: s. n.*], 2023.

SILVA JÚNIOR, Claudio Roberto *et al.* Overview of the factors that influence the competitiveness of startups: a systematized literature review. **Gestão & Produção**, [*s. l.*], v. 29, p. 1–23, 2022a. Disponível em: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-530X2022000100225&tlng=en.

SOMSONG, Pimpinan; MCNALLY, Regina C; HSIEH, Chi-Ming. Consumers' perceptions towards Thai rice. **British Food Journal**, [*s. l.*], v. 122, n. 1, p. 151–169, 2020. Disponível em: https://doi.org/10.1108/BFJ-01-2019-0040.

SRINIVASA RAO, Ch. *et al.* Agro-ecosystem based sustainability indicators for climate resilient agriculture in India: A conceptual framework. **Ecological Indicators**, [*s. l.*], v. 105, p. 621–633, 2019. Disponível em: https://www.sciencedirect.com/science/article/pii/S1470160X18304783.

STØRDAL, Ståle; LIEN, Gudbrand; BAARDSEN, Sjur. Analyzing determinants of forest owners' decision-making using a sample selection framework. **Journal of Forest Economics**, [*s. l.*], v. 14, n. 3, p. 159–176, 2008.

SWAMI, Deepika; PARTHASARATHY, Devanathan. A multidimensional perspective to farmers' decision making determines the adaptation of the farming community. **Journal of Environmental Management**, [*s. l.*], v. 264, p. 110487, 2020. Disponível em: https://linkinghub.elsevier.com/retrieve/pii/S0301479720304217.

THEOCHAROPOULOS, A; MELFOU, Katerina; PAPANAGIOTOU, E. Analysis of decision making process for the adoption of sustainable farming systems: The case of peach farmers in Greece. **American-Eurasian Journal of Sustainable Agriculture**, [*s. l.*], v. 6, p. 24–32, 2012.

THOMAS, Terrence; GÜNDEN, Cihat; GRAY, Benjamin. Consumer decision-making styles in food purchase. **Agro Food Industry Hi-Tech**, [*s. l.*], v. 24, p. 27–30, 2013.

VALKENBURG, Govert *et al.* Responsible innovation as empowering ways of knowing. **Journal of Responsible Innovation**, [*s. l.*], v. 7, n. 1, p. 6–25, 2020. Disponível em: https://doi.org/10.1080/23299460.2019.1647087.

VERSIANI, Alice F *et al.* A required isolation index to support the health system during the pandemic of Covid-19 in Minas Gerais, Brazil. **IEEE Latin America Transactions**, [*s. l.*], v. 19, n. 6 SE-Special Issue on Fighting against COVID-19, p. 961–969, 2021. Disponível em: https://latamt.ieeer9.org/index.php/transactions/article/view/4358.

VLACHOPOULOU, Maro *et al.* Analyzing AgriFood-Tech e-Business Models. **Sustainability**, [*s. l.*], v. 13, n. 10, p. 5516, 2021. Disponível em: https://www.mdpi.com/2071-1050/13/10/5516.

WEDDAGALA, W.M.T.B. *et al.* Crowd sourcing for value chain management: a case of market decision support system in Sri Lankan agriculture market. *In*: , 2020. **Acta Horticulturae**. [*S. l.*]: International Society for Horticultural Science (ISHS), Leuven, Belgium, 2020. p. 173–178. Disponível em: https://doi.org/10.17660/ActaHortic.2020.1278.26.

WICHER, Pavel; ZAPLETAL, František; LENORT, Radim. Sustainability performance assessment of industrial corporation using Fuzzy Analytic Network Process. **Journal of Cleaner Production**, [*s. l.*], v. 241, p. 118132, 2019. Disponível em: https://www.sciencedirect.com/science/article/pii/S0959652619330021.

DOI: https://doi.org/10.56579/rei.v5i7.985

v. 5, n. 7, nov.-dez. 2023.

ISSN 2674-8703

ZHEVORA, Sergey V; TULCHEEV, Vladimir V; BORISOV, Maxim Yu. Innovations and Perspective Technologies in the Potato and Vegetable Subcomplex of the Agro-Industrial Complex in Russia. *In*: BOGOVIZ, Aleksei V (org.). **Lecture Notes in Networks and Systems, vol 205.** Cham: Springer International Publishing, 2021. p. 65–72. *E-book*. Disponível em: https://doi.org/10.1007/978-3-030-73097-0_9.

ZOUAGHI, Ferdaous; SÁNCHEZ, Mercedes. Has the global financial crisis had different effects on innovation performance in the agri-food sector by comparison to the rest of the economy?. **Trends in Food Science & Technology**, [*s. l.*], v. 50, p. 230–242, 2016. Disponível em: https://www.sciencedirect.com/science/article/pii/S0924224416000170.

DOI: https://doi.org/10.56579/rei.v5i7.985

v. 5, n. 7, nov.-dez. 2023.

REVISTA DE ESTUDOS INTERDISCIPLINARES
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