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Construct To Be Used In Agriculture Of Operations Strategy, Interorganizational Cost Management And Production Effort Unit

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ABSTRACT
Brazilian agricultural business presents impressive results.However, the administrative management of many rural establishments is still precarious, with no adequate standards or methodology, and there is record growth even though operations management techniques commonly seen in other economic sectors are not used. In view of this, we sought to develop a construct to be used by agriculture, which integrated methodologies of Operations Strategy, Interorganizational Cost Management and Production Effort Unit, still little explored in agricultural business. It was possible to visualize a new tool to assist rural managers in the decision-making process that aims to increase productivity. The proposal began with the analysis of the Operational Performance Objectives, aiming to define strategies, continued with the creation of new partnerships following the logic of a win-win relationship between those involved, and, finally, the presentation of operational data expressed monetarily, integrating all the information collected. In short, it became clear that there are credible possibilities for improving operational performance and consequently obtaining greater competitive benefits. The construct also enables synergy with new technologies, not limited to material, human, technological and financial resources, but also connecting to non-controllable factors, such as climate and market.

Keywords:*agricultural business; operations management; rural establishments.*

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I. INTRODUCTION

Agricultural business encompasses all economic activities related to the production and commercialization of agriculture products, constituting a vast and widely present market in people's daily lives, with influence on multiple market segments. It is one of the sectors that generates the most jobs globally, and it is substantial not only to the economy, but also to human development. For the year of 2023, according to the Center of Advanced Studies in Applied Economy (CEPEA), it is estimated to account for 24,5% of Brazil's Gross Domestic Product (GDP) (CEPEA, 2023).

This was the only activity with expressive results during the Covid-19 pandemic scenario, presenting a record growth of 24,31% in the year of 2020, according to the National Agriculture Confederation (CNA, 2021). This is one of the reasons why this sector ought to be studied, especially because it represents one of the fastest-growing activities in Brazil. This is evident as fertile and productive lands, as reported by the IBGE News Agency, are projected toreach 76,6 million hectares in 2023, 4,6% more than the previous year (BRASIL, 2023a). According to the 2017 Agricultural Census, there are more than five million agricultural establishments in the Brazilian territory, leading to the generation of over 15 million occupations (BRASIL, 2017).

With so many establishments and significant representation for Brazil and the world, it is crucial that this sector be prepared for new challenges, especially the segment referred to as "within the gate", specifically the activities of livestock and agriculture. According to the Brazilian Agricultural Research Corporation (EMBRAPA), this sector, which already has an impressive record, still has much to achieve to continue elevating Brazil's name worldwide, and, above all, ensuring the food supply for billions of people (BRAZIL, 2023b). An example of this condition is the implementation of new information

technologies in the field, enabling new ways to conduct operations within the gate, in addition to the significant contribution of the No-Till Farming System (SPD) since the 1970s.

There are gaps that need to be addressed in the field of operations management, combining new technologies with traditional management, making more assertive decisions about what to cultivate, when to cultivate, among other factors. In this regard, considering that Brazil has practically two major crops per year (summer and winter), being attentive to weather conditions, cultivars and crop rotation is as important as the challenges pointed out by Margherita et al (2009), Boehlje et al. (2011), Maienfischand Stevenson (2015), Bojar et al. (2017), Neves et al. (2020), Malorgioand Marangon (2021), Quintamand De Assunção (2023) e Bartholomeu et al. (2023), among many other researchers who are dedicated to working for the advancement of this sector.

Amongst these challenges, Callado and Callado (1999) asserted that cost management is one of the most relevant administrative aspects for the sector. However, decades after this research, it was found that part of the agricultural business still calculates costs in a precarious manner, without the use of standard or appropriate methodology (SCHOUCHANA, 2015). Nevertheless, it is worth noting that cost management is a fundamental source for generating indicators, crucial elements in organizational analyses, as they assist in the processes of implantation and improvement of activities, identifying goals, controls and result verifications (CHEN *et al*. 2016;NUNES&MICHELIN,2019).

It is important to emphasize that Shank and Govindarajan (1997) and Kaplan and Cooper (1998) already advocated for the idea that cost management should encompass not only expenses related to inputs and labor involved in the process, but also other elements, such as quality, flexibility, speed, among other operational goals, fundamental elements for a sound operations strategy and competitive positioning, as defended by Porter (1985), Barney (1991), Hamel and Prahalad (1995), Allora and Allora (1995), Cooper and Slagmuder (1999) and Slack and Lewis (2009).

Thus, time, as a fundamental element for agriculture, not only in the climatic sense, but in the essence of its expression, will be extensively addressed as a crucial element for generating competitive positioning. This approach will allow the integration of cost reduction through win-win partnerships, involving Operations Strategy (OS) with Interorganizational Cost Management (ICM) and the Production Effort Unit (PEU) costing methodology. Therefore, the general objective of this research is to develop a construct for the use of OS, ICM, and PEU in agriculture. With this construct, it will be possible to highlight information useful clearly and objectively for decision-making. By integrating the principles offered individually by these three methodologies, a new way of cost management will emerge based on PEU concepts. This involves operational performance goals such as speed, quality, flexibility, and dependability based on OS concepts, choosing these as the main vectors for decision-making, supporting the supply chain through partnerships based on ICM principles. Thus, the aim is to optimize results and generate competitive advantages.

II. THEORETICAL FRAMEWORK

Operations Strategy (OS)

The OS has a framework of techniques and methodologies capable of supporting decisions with a focus on generation of competitive advantages (SLACK& LEWIS, 2009). Therefore, agribusiness, as an important sector for humanity, cannot be excluded from the use of these capabilities.

For instance, defining strategies for the supply chain will allow an understanding of capacity, process technologies and, most importantly, the development of each organization so that the key performance goals (quality, speed, dependability, flexibility and costs) can be reached. These goals will initially be incorporated to competitive advantages known as qualifiers for order winners, potentially reaching the surprise element, which frequently represents an exponential gain in competitiveness, delivering to the market a product or service that was not expected.

To do so, it is necessary to measure the operations at the current stage and understand where the agribusiness is positioned. From there, define its capacity strategy in the short, medium and long term, determining improvement strategies and process technologies. This involves precisely incorporating the cost trade-off versus advantages developed through a supply chain strategy, that will be further detailed in the next section through the incorporation of Interorganizational Cost Management.

In a way, the significant critics of traditional decision making is that the financial result will prevail over others. However, by examining operation performance goals, it can be noted that accelerating operations could bring an increase in productivity and, consequently, profitability. On the other hand, there could be quality loss and increase in costs due to rework. Therefore, involving operations strategy within a specific and suitable logic for agribusiness, mainly "within the gates" activities, is crucial.

In the literature, it is very common and frequent the use of OS in case studies related to the industry. There are few national research addressing the application of OS in agribusiness. De Andrade, Da Costa and Leite (2017) conducted a study in the city of Petrolina, in the state of Pernambuco, Brazil, with a company that

produces mango for exportation, aiming to analyze operation performance goals as guidelines for defining competitive positioning. Quality and liability are basic premises, and therefore cannot be treated as differentiators, since buyers demand a certain standard of fruits, resulted from specific treatments during crop cultivation, such as absence of certain chemical elements, among others. However, the speed goal was an element that generated a differential for the company, as it enabled a better cost allocation when competitors supply decreases. The producer continues to offer products even when competitors face shortages. This is a very interesting case, because the late cultivation, at first, seems to lead producers to losses, however ends up delivering a flexible product, increasing offer for longer due to choosing the speed goal, even if reduced.

Similar research was conducted by Stiegler and Sznitowski (2018) in Campo Novo do Parecis (MT) with soy producers, exploring, on the other hand, the results related to decision areas (structural and infrastructural). The conclusion was that the majority did not invest in planted areas or facilities, although a large portion invested in technology, allowing gains in performance goals of operations cost and speed, according to what was declared by most of the interviewed. They also stated that, at a later stage, these investments would reflect on the remainder operation performance goals.

Research was also conducted recently in national ground, such as Leitner and Alves Filho (2019) and Rolao et al. (2020), aiming to test the viability and adherence of operations strategy in agribusiness. The conclusion drawn was that, when necessary adjustments are made, mainly considering that grain production is an open-sky factory, it is, indeed, possible to apply literally all principes of OS in agribusiness.

However, on an international scale, the reality is something else.The studies of Wilk and Fernsterseifer (2003), Wilk et al. (2013), Brenes et al. (2014), Bannikova et al. (2015), Benos et al. (2016), Lin et al. (2020), Abrudan et al. (2022), among many others, report the influence of OS on decision making (top down and bottom up), modifying the way everyday operational activities are carried out year by year, as well as those related to long term decisions.

It is essential, however, that every operational process is supported by a costing system, that generates a repository, that reports the conditioning of the operational variables in action.

Interorganizational Cost Management (ICM)

Seeking out partnerships and reliable partners for the development of business activity has always been a premise (PORTER, 1989; SHANK & GOVINDARAJAN, 1997; BARNEY & HESTERLY, 2011). In this manner, Souza and Rocha (2009) defended that ICM is an essential management method for companies involved in the same value chain to collectively seek the creation of value.

In agribusiness, several activities are conducted in a repetitive manner, especially in agriculture, such as pre-planting, planting, crop management, harvesting, processing and storing. According to Nunes and Michelin (2019), the small producer has used these partnerships to perform these activities, unlike large properties that have operational infrastructure suited for its size.

For the business activities, it is very important to share costs. On the other hand, for agribusiness in general, where investments in land and other capital goods are extremely burdensome, partnerships become essential for the development and the ability to compete based on more qualifying attributes, as shown in Figure 3.

In this context, the trust that will be established among the parties involved in cost management is fundamental. One of the premises for that to happen is the establishment of open book accounting (SOUZA& ROCHA, 2009). According to these authors, demonstrating profit and cost margins is crucial for the beginning of a deep partnership that will guide a win-win policy.

In agribusiness, the pursuit of partnerships often arrives merely due to the absence of equipment or specialized labor, without thoroughly analyzing the results of the collaboration. In other economic segments, partnerships are much more solidified, as shown by Monte and Carvalho (2005), Silva et al. (2012), and Bastos (2019).

These partnerships often happen due to the specialization of the partner in the development of a particular activity. Their expertise, beyond structural preparation, may be a strong ally for the generation of competitive advantages, as outlined in Chart 1. However, it is necessary that the partnership is built on a solid foundation of trust.

Therefore, trust serves as the starting point for establishing ICM. This premise has been developed by agribusiness, especially in grain farming at various stages of a crop cycle, such as the outsourcing for planting, harvesting, spraying, among others (LAURENTI, 1996; PAULILLO, 1999; ZANCHET, 2009).

Yet, according to Souza and Rocha (2009), there will be no ICM unless there's observance of conditional factors, i.e. the analyses of variables leading to the partnership, which can be visualized in Figure 3. In fact, this is a definition by the authors writing this paper, whose perception clearly outlines the goal of this research.

There are several cases of success of ICM application on Brazilian agribusiness, as evidenced in the works of Moura and Lima (2016); Duarte (2017); Junior and Lima (2018); Macohon et al. (2019); Costa et al. (2020). However, there is no record of papers that combine ICM to OS as a mechanism for changing management methods, especially in agriculture.

This, as described in this section, the aim was to substantiate principles capable of establishing a positive partnership for both parties, and that can be conditioned to the goals of operations performance derived from OS, which according to Slack and Lewis (2002) can generate great advantages for their users.

Production Effort Unit (PEU)

Most costing methods prioritize the records of materials and valuesconsumedin activities and services rendered. However, it is necessary to consider time as an important factor that may interfere in the utilization of these resources in most cases (HANSEN *et al*., 2021).

The Production Effort Unit (PEU) costing method is based on product unification. This is where its goal is derived, creating a common unit of measurement for organizations with diversified productions (MOROZINI*etal*,2006). Therefore, the method aims to simplify the process of management control, starting with only two items: the costs of raw material and costs of transformation. With that, the business' performance analyses are conducted through costs and measured by efficacy, efficiency and productivity (BORNIA, 2010).

Capable of transforming a diversified production into a unified one, the PEU method incorporates economic as well as technical aspects to multiproduct companies. It provides all the conveniences that single-product manufacturers have in their production management (ALLORA; ALLORA, 1995). This method is characterized as versatile and serves as the foundation for planning, scheduling, and controlling production processes because it facilitates and simplifies the management of the organization's complex production processes, as demonstrated in Figure 1.

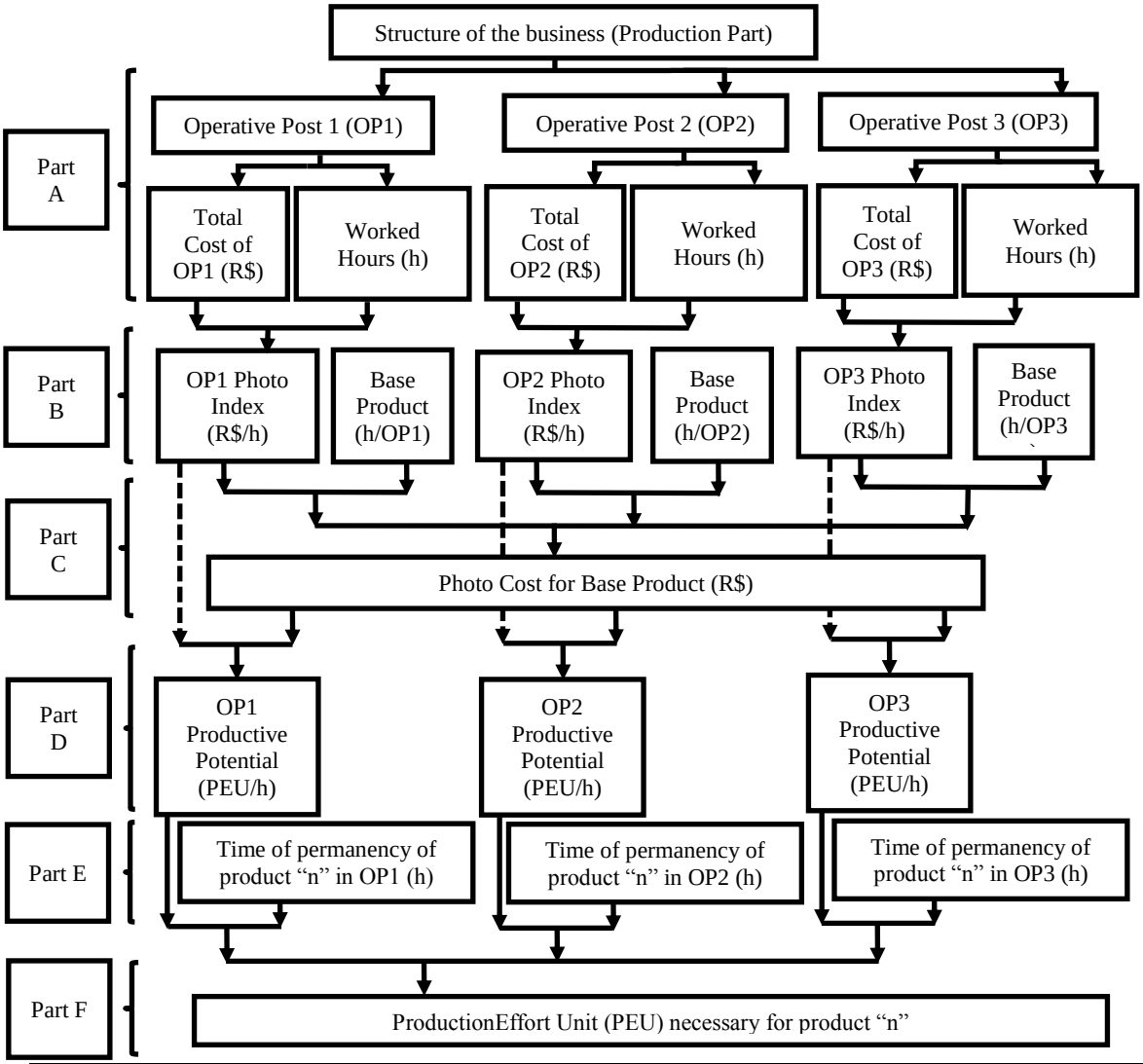

Figure 1 – Basic diagram for determining the value of PEU. Source: adapted from Morgado (2003) and Fernandes (2003).

The costing by Production Effort Unit prioritizes the determination of cost through the transformation ofraw material into final productsbased on the expenses used in operations (ZANIN *et al*., 2019).General advantages of the method are the standardization of production,ease of management and performance comparison between periods, the use of information for financial accounting, among others. Limitations include the need of constant review and the non-consideration of costs and expanses of the business' structure (WERNKE*etal.*, 2020).

Therefore, PEU can facilitate the analysis of profitability of manufactured products. According to Lembreck and Wernke (2019), analyzing the situation can optimize the commercialized mix, providing increasing levels of value and market presence to the institution. Additionally, it is possible to account for the measurement of installed capacity, used and idle, as well as monitor production using fiscal measures (ZANIN *et al*., 2019; WERNKE; JUNGES; ZANIN, 2019).

The greatest advantage of this method lies in its simplicity of operation. Once the productive potentials and equivalents of PEU for products are known, calculations become easy and quick. Furthermore, it provides an index for more uniform production with fewer variations, allows visualization of activities that are not adding value to production, enables measuring cost-benefit using new technologies (through resources like benchmarking), adheres to macro-strategies by aiming for cost-oriented goals and cost leadership, among other positive management aspects (BORNIA, 2010).

Despite the PEU method requiring effort and dedication from the producer, it's proven itself beneficial for organizations in the agribusiness sector, for it allows a detailed view of the production process for each product and the composition of cost. This allows the manager to monitor these costs and make more assertive strategic choices (OENNING, 2010). However, there are a few disadvantages, such as difficulty in dealing with organizational waste, as only the productive operations are considered. Furthermore, for agriculture, it is not advised for a large rotation of production crops (ABBAS, 2012).

According to Meyssonnier (2003), hidden operations in the implementation of the method can also be seen as a disadvantage, for it assumes that the relationship of operational positions remains constant over time, disregarding possible improvements in the process. Moreover, there is a subjectivity that the method needs to adopt regarding precise time estimates, to keep production times updated (PEREIRA, 2015). Thus, all advantages and disadvantages should be weighted according to the characteristics and goals of the business that might consider it as the main costing method.

III. METHODOS

According to the methodological notes by Bromiley and Jhonson (2005), this research can be classified as an applied mobilization, because it consists in generating practical knowledge for obtaining specific purposes.

For the objectives, it is considered exploratory and descriptive. Descriptive research is in its embryonic phase and focuses on gaining familiarity with the problem, seeking to know more about elements related to the theme (KÖCHE,2011).By aiming to comprehend these elements without changing their nature, these phenomena are described and related to the objectives defined for the research, through cause-and-effect relationship derived from the analysis of resources used and the likely generation of competitive positioning.

This construct is based on the joint application of three distinct methodologies that, nevertheless, complement each other. After conducting research, no similar practices have been identified in the market and there were no reports of this combination in academic publications.

Observing the principles of OE (Operations Strategy), a matrix is developed to analyze in which operations the OPO (Operational Performance Objectives) are producing competitive benefits and in which they are not. It is important to seek maximum transparency in the process, and to rely on experienced consultants for this type of measurement, as shown in the matrix in the next section, Chart 1.

After surveying the operations with a focus on OPOs, the solution will be sought with partners through ICM (Interorganizational Cost Management), as depicted in Figure 3. This search cannot occur through a conventional buying relationship, but rather should necessarily aim to apply the principles of a win-win policy. Therefore, it is necessary to use the open book accounting approach, establishing a long-term contractual relationship.

Last, but not least, is to format the operational data highlighted in the use of resources (material, human, technological and financial), expressed monetarily in Production Effort Unit (PEU), as shown in

Figure 1. This final step serves as the ultimate benchmark for users of this construct to strive for competitive performance as a "order winner", according to Slack and Lewis (2009).

IV. CONSTRUCT

It is essential that all parties involved in the business world know for which goals they compete for. This was one of the conditions strongly emphasized by Porter (1985).

Thus, every agriculture entrepreneur, along with their managers, should use Chart 1 to create a matrix and define the goals they are competing for and the goals they wish to compete for. Consequently, the answer will lead to one of the three performances presented in Figure 2.

After this analysis, it is time to highlight which OPO are not reaching competitive advantages, and after a deep reflection, comprehend when they should reach them, i.e., if in the present moment or near or even distant future. These reflections lead to the analysis of internal forces and the opportunities offered by the market,which leads to the business being re-evaluated, as shown by Barney (1991), Hamel and Prahalad (1995), Margherita et al (2009), Benos et al. (2016), De Andrade et al. (2017), Leitner and Alves Filho (2019) Abrudan et al. (2022), among others mentioned in this article.

Regardless of the advantage achieved in each OPO, it is always important to analyze whether the result could be better if the operation was to be outsourced to a partner via ICM. This is the moment to elaborate the questionnaire mentioned in the previous section.

It is important to emphasize that the OPO called "costs" cannot be the critical success factor (CSF) in this partnership, as in many cases it will cost more to achieve a better performance in operations that inevitably encompass the other OPO. Consequently, in order to achieve a competitive advantage called surprise (Figure 2), in many cases, in addition to significant investment in research and development (P&D), it will also be necessary to make substantial investments in operations, thereby raising the performance to be achieved for each OPO.

Chart 1 – Matrix for surveying OPO

PotentialInternalAdvantages	Operational Performance Objectives	PotentialExternalAdvantages
• **No mistakes in the process** • **Lesscomplexity** • **Lower costs**	**Quality**	• **No mistakes in products and services** • **Reliableproductsandservices** • **High levelespecialization**
• **Lesslinesand/orinventory** • **Fasterprocessing time**	**Speed**	• **Short delivery time** • **Fast replytorequests**
• **Betteroperationaldependability** • **Lessnecessary contingencies** • **More internalstability**	**Dependability**	• **Punctual delivery/arrival of products and services** • **Knowledgeof delivery time**
• **Better response tounpredictedevents** • **Better response to the variety of activities**	**Flexibility**	• **New products and services often** • **Wide variety of products and services** • **Adjustments to volume and delivery**
• **Productive processes** • **Highermargins**	**Costs**	• **Lower prices**

Source: Slack&Lewis (2009)

As the initial proposal of this paper also involves the element of time, identified in Chart 1 by the OPO speed, elaborated in previous steps, it can be concluded that there might be an increase in productivity with the increase of another crop season from the combination of the other OPO, using speed as the CSF. The outsourcing of operations proposed in ICM may increase costs initially, however these can be surpassed if there is the possibility of an increase in work fronts, in the case of grain agriculture, of another crop season. This goal has been persued, as seen in the research conducted by Malorgio and Marangon (2021) and Quintam and De Assunção (2023).

Furthermore, as for speed and its relationship with the other OPO, an example of this is seen in the dependability of the operation, that is, an effective and efficient operation will be complete in grain agriculture if executed within the stipulated timeframe, with no machine breakdowns or failures during the planting. It is necessary that the machine's operation time achieves a satisfactory performance as much as the seed dropping in the soil, eliminating failures, commonly known as gaps in agriculture.

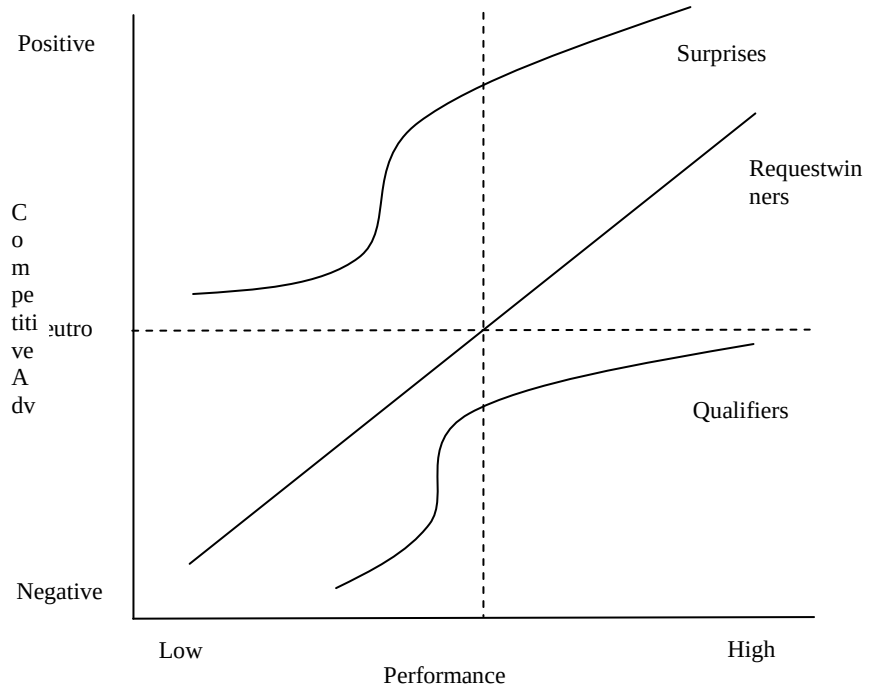

Figure 2 – Measurement of Current Competitive Advantage. Source: Slack & Lewis (2009)

Therefore, when applying the questionnaire to potential partners in the supply chain, it is necessary to measure the proximity levels in the relationship, as seen in Figure 3 and supported by Laurenti (1996), Paulillo (1999), Cooper andSlagmulder (1999), Souza and Rocha (2009),Moura and Lima (2016), Duarte (2017), Bastos (2019).Questions involving trust, potential success sharing, transparency, dedicated actives, and problem solving and joint learning, in addition to long-term expectations, are essential, thus, they must be well elaborated. Hence the need of experienced consultants in this process, as they will use adequate techniques for formulating these questions, subsequently subjecting them to statistical treatment to obtain confidence levels and to analyze responses appropriately.

The questionnaire should be formulated according to the needs identified in the analysis process explained by Chart 1 and Figure 2. After observing the necessary operation changes to achieve a performance capable of representing an evolution in the competitive advantage, that represents at least a request winner condition, it is the moment to formalize the partnerships and to establish long-term expectations.

Obviously, in grain culture, many uncontrollable variables such as the weather or commodities prices can positively or negatively influence this relationship. Therefore, creating mechanisms to compensate for potential losses in the partnership is crucial, and it becomes essential to establish reserves, which must be precisely extracted from the surplus of operational performance and consequently from the achieved competitive advantage, as demonstrated by Souza and Rocha (2009).

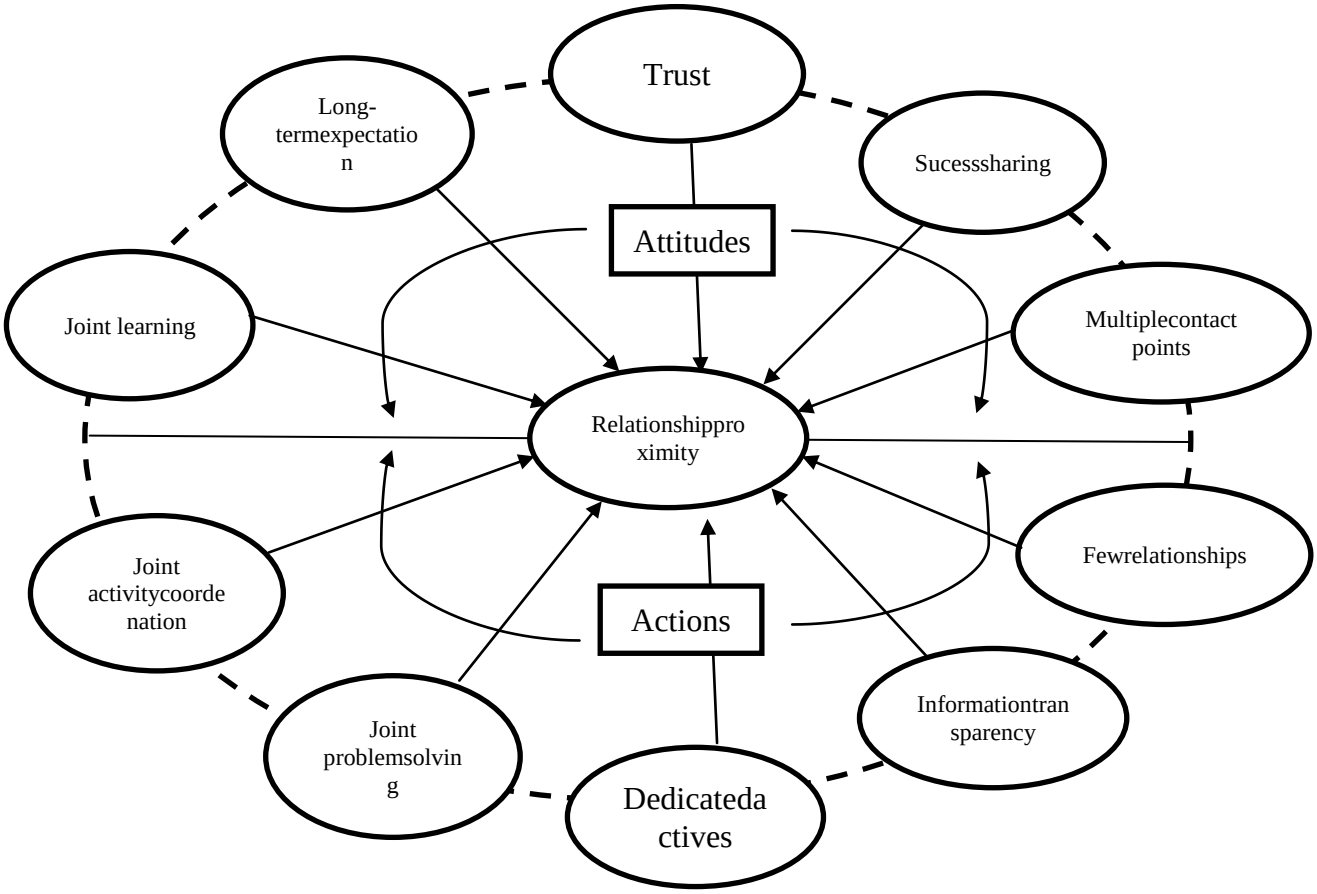

Figure 3 – Matrix for surveying partners in ICM. Source: Slack and Lewis (2009)

These two crucial steps need to be very well planned and coordinated, because indiscriminately eliminating tasks in this process means sowing failure. It is necessary to determine even the temporal lapse to achieve each defined goal and only then start step three, which is the inclusion of the PEU costing method.

Adapting Figure 1 from Morgado (2003) and Fernandes (2003), the operative posts can be considered as the planting areas, considering performances are different for summer and winter crops. Therefore, it is necessary to clarify that if the property initially works with two crops, it will have, thus, two PEU. It should be emphasized that there will also be a PEU for each cultivar in each field, for different cultivars require their own PEU, and it is necessary to remember that you cannot measure different weights with the same measure.

As highlighted at the beginning of this section, by applying this methodology, the final cost may be elevated. However, performance may be better with the responses obtained in the other OPO, especially speed, and it should be well characterized in Part A of Figure 1. Along with other favorable climatic conditions and early cultivar choices, grain agriculture can reach three crops a year, as advocated by Embrapa (2023b).

Parts B and F of Figure 1 are the operationalization of PEU methodology, which can be applied by any user, provided there is repetition in their operations. In grain agriculture, not only planting, but also cultivars. This condition has been defended in the works ofMeyssonnier (2003), Bornia (2010),Abbas et al. (2012), Nunes and Michelin (2019), Zanin et al. (2019) and Wernke et al. (2020).

The PEU costing methodology can be developed in parallel wit other costing methodologies without major issues, with the necessary adjustments, as mentioned by Bornia (2010). However, the result will be so satisfactory that, probably, upon obtaining PEU and initiating the planning, considering it as both an index and a goal to be achieved, all parties involved will end up prioritizing its use, for it will eliminate distortions caused by inflation in costs shown monetarily and, more importantly, because it will highlight the best performance achieve – a new attribute added to cost management, which is the OPO.

V. FINAL CONSIDERATIONS

After lengthy scientific research to substantiate the objective of this paper, which was to develop a construct to be used in agriculture on OE (Operations Strategy), ICM (Interorganizational Cost Management) and PEU (Production Effort Unit), the following considerations were reached.

First, it is emphasized that this construct will demand knowledge and dedication from its users. Several problems are related in the mentioned papers in the bibliographical references, however, they were subject to restructuring. Due to the page limit (characters and words), these could not be reproduced literally and wholly in this paper, possibly resulting in a new publication.

As declared several times, the investment in experienced consultants may be a fast solution for this condition. However, it will demand a cost that should be previously planned, considering service contracts will tend to be extended due to unpredicted situations or even adjustments to the initial plan.

Work fronts may be developed simultaneously, such as the analysis of OPO and achieved competitive advantage (Chart 1 and Figure 2), in parallel to the surveying of potential partners that will constitute Figure 3. That is, the user, by deciding to use this construct, should take into consideration that some of their current partners will not be suitable or keen to this type of long-term partnership. Thus, they can already identify which ones will be excluded by this premise.

A relevant matteris that partnerships developed through ICM do not need to be restricted to only pre-planting, planting, crop conduction and harvesting operations, that is, to "within the gate" activities. They may extend to before and beyond the gate. It is emphasized especially the partnership with inputs and seed suppliers, seeking a new link in the partnerships not mentioned in this paper, that can be the objective of new research.

This relationship may develop from the analysis of Figure 3, adding or substituting actions and attitudes, focusing primarily on result, which is an increasingly bigger harvest, overcoming productivity through the application of OS with ICM and PEU. An example of this can already be seen in many regions of the country, where many seed and fertilizer suppliers end up trading their inputs for a part of the production and its surplus, predicted by the inputs delivery with better quality and considered avant-garde (genetic enhancement) by the market.

Beyond the gate, especially in the processing and storing of harvest grains, partnership was also not presented in this paper, and it could be subject of a new article. However, it is straightforward to conceive its results from the same principles detailed here, always considering the OPO predicted in the OS.

Finally, by disseminating this paper, the proposal of this construct is to bring to farmers in Brazil and around the world a perspective on techniques already developed and successfully applied by other economic sectors. It demonstrates that there are credible performance improvements and consequently the generation of competitive advantages, beyond the ones currently generated, and it can even align information technology and resource allocation (material, human, technological and financial) to more properties and at the right time, bringing in the analysis of uncontrollable factors such as climate and market conditions (commodities).

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