Journal of Rural Studies 84 (2021) 90–99

Contents lists available at ScienceDirect

Journal of Rural Studies

journal homepage: www.elsevier.com/locate/jrurstud

Clarifying relationships between networking, absorptive capacity and financial performance among South Brazilian farmers

Júlia Aita dos Santos [a,1,*], Lucas Bonacina Roldan [a], Mark Kam Loon Loo [b]

[a] Business School, Pontifícia Universidade Católica Do Rio Grande Do Sul., Brazil
[b] Mihalcheon School of Management, Faculty of Management, Concordia University of Edmonton, Alberta, Canada

ARTICLE INFO

Keywords:
Networking
Absorptive capacity
Financial performance
Agribusiness

ABSTRACT

Financial performance is a key factor in promoting agribusiness development. Studying ways to increase these returns in the agricultural context provides a favorable environment to create solutions to attend the increasing global food consumption. The agribusiness industry has the potential to change this scenario, if farmers are financially sustainable to satisfy the demands with agricultural productivity. Would Networking between farmers and their stakeholders help increase their knowledge in order to innovate? Moreover, would their capability of applying new knowledge lead to higher financial returns? This research seeks to investigate if Networking among 222 farmers in South Brazil influences their Absorptive Capacity that leads to better Financial Performance. Using structural equation modeling, the findings show that Networking has a positive relationship with Potential Absorptive Capacity that influences Realized Absorptive Capacity and leads to higher Financial Performance. The findings and their implications were discussed followed by limitations and recommendations for future research.

1. Introduction

The world will need 70% more food to feed a global population of 9.6 billion by 2050 (United Nations, 2015). The pressing need to produce more food fast enough to meet the demand of the multiplying population is now a global concern (Higgins et al., 2018). Livestock and grain farming are components of the agribusiness sector, forming the Brazilian primary economic sector with the potential to reduce world hunger. The term agribusiness was coined after the technological revolution, when farms' status changed from subsistence into commercial (Davis; Goldberg, 1957). Furthermore, Davis and Goldberg (1957) defined agribusiness as all the manufacturing and distribution processes of the farm, such as supply chain, production, storage of commodities, its marketing and sale. The Food and Agriculture Organization (FAO) of the UN views agribusiness as a major generator of employment and income worldwide and contributes to food security and nutrition (FAO, 2017) and the sustainable business expansion of producers of agriculture in the long term (Santacoloma et al., 2005). Moreover, the food system is integrated, with linkages and interdependence with other segments (Davis; Goldberg, 1957).

Facing this situation, it is important to understand the factors that can enhance agribusiness performance where competition is high for limited resources such as land, water, quality seeds and livestock genetics, facing the challenge of retention of youth and specific agribusiness skills (Dutia, 2014; Läpple et al., 2014; Pigford et al., 2018; Toma et al., 2016). An essential engine for growth is the creation and adoption of innovative technologies to help increase yields and optimize the use of natural resources (Higgins et al., 2018; Hyland et al., 2018). For this reason, it is critical to understand farmers' openness and attitudes towards these innovations to help feed the world in a sustainable way (Connolly et al., 2018), and it is more likely to achieve this with financially sustainable farms.

The urgency to increase productivity, allied with the constant changes caused by technological advances illustrates a challenging scenario in which farmers have to survive before being able to produce commodities (Food and Agriculture Organization, 2009). Therefore, studies were conducted in order to understand what promotes the application of new ideas leading to financial benefits. Surviving involves having a satisfactory financial performance, because when farmers have low income, the value of their productive potential is lost (Davis; Goldberg, 1957). Facing the need to adapt farmers to perform in the new context, it has been found an important role of absorptive capacity on

* Corresponding author.
E-mail addresses: julia.aita@hotmail.com, julia.aita@edu.pucrs.br, julia.santos97@edu.pucrs.br (J.A. dos Santos), lucas.roldan@pucrs.br (L.B. Roldan), mark.loo@concordia.ab.ca (M.K. Loon Loo).
[1] *Corresponding author.

https://doi.org/10.1016/j.jrurstud.2021.02.011
Received 16 May 2020; Received in revised form 19 January 2021; Accepted 25 February 2021
Available online 31 March 2021

financial performance (Jansen et al., 2005; Kostopoulos et al., 2011). Furthermore, other studies show the need for social integration to generate the positive results of absorptive capacity (Tsai, 2001; Zahra; George, 2002). For this reason, it was also identified the opportunity to study networking as an element of social capital that contributes to knowledge assimilation and acquisition (Micheels; Nolan, 2016; Tepic et al., 2012; Zahra; George, 2002).

Farms that benefit from networking and absorptive capacity are the reflection of farmers that present those characteristics (Shadbolt; Olubode-Awosola, 2016). For this reason, this paper studies farmer's attitudes in order to understand the farm performace itself.

This paper aims to clarify the relationships between networking, absorptive capacity and financial performance among farmers in South Brazil. Specifically, the objective is to confirm if Networking influences the Potential Absorptive Capacity, that leads to Realized Absorptive Capacity of farmers which in turn influences their Financial Performance.

Brazil is one of the countries with the highest rates of grain farming and livestock productivity growth in the world (Brasil, 2017). Among several other goods, Brazil is one of the top producers of sugarcane, coffee, tropical fruits, soybean and corn, besides having one of the largest commercial cattle herds, and these and other commodities represent 36% of the Brazilian exports (Arias et al., 2017). South Brazilian famers have an important participation on this potential, as it is one of the regions that most contribute to leveraging Brazil's agribusiness participation in the global market (Confederação Da Agricultura E Pecuária Do Brasil, 2014).

Ultimately, growth in agribusiness lies within the farming community, dependent on the farmers' acceptance and implementation of the research proposals and technology advancements. While land and labour contributed 15.1% and 15.4% respectively, technology was the greatest contributor at 58.4% to the growth in grain farming and livestock production between 1975 and 2015 (Brasil, 2017).

The farmers' acceptance for technological innovations is dependent on the exposure to such knowledge that can come about through networking with other stakeholders that form the value chain such as government and marketing agencies as well as firms that develop high tech products to enhance the farmer's productivity. Those stakeholders can contribute to creating a favorable environment to interact with farmers. While exposure is the first step to acquiring knowledge, the next challenge is to apply the knowledge to achieve financial success to enable large scale commercialization and highly technologized farms to sustain growth. This exposure could be encouraged by government agencies whose role is to provide a favorable environment to the exchange of ideas, through fairs and events. Once the ideas are available, they might be acquired and transformed into some application in the farm. The ability to acquire and process knowledge is termed as absorptive capacity, and the ability to apply the knowledge and achieve commercial success is termed Realized Absorptive Capacity (Cohen; Levinthal, 1990; Jansen et al., 2005).

The next sections of the paper proceed as follows: after the contextualization and exposure of the objective of this study in the introduction, a literature review is presented as a conceptual support for this paper in which the suggested hypotheses are described. Then, the methodological approach is presented in order to explain how the research was performed to achieve the results, which were discussed as well as their implications, followed by limitations and recommendations for future research in the conclusion section.

2. Literature review

2.1. Networking

Networking is the primary activity that builds social capital and plays an important role on agricultural and rural development as it affects how people relate to each other, organise themselves and interact for development (Rivera et al., 2019). Social capital is defined as a network of relationships that have economic value (Wilson, 2000). Trust, quality of relationships, cooperation and common interests are important elements of it (Rivera et al., 2019). The concept of social capital is important to the understanding of networking behaviour (Forret; Dougherty, 2001).

Networking is creating connections between farmers and their stakeholders. The farmer builds relationships with local rural institutions, service providers and stakeholders that assist farmers with information and inputs (Kassie et al., 2012). The farmer also interacts with universities, innovation centers, chain actors, environmental organizations and transport companies (Tepic et al., 2012) that help enhance the value chain. In the context of this research, networking is more appropriate to farmers while Social Capital is a critical resource that global multinationals invest to elevate social visibility that suggests intellectual assets, preferred employer implications and especially corporate social responsibility (Lee; Marquis, 2018; Russo; Perrini, 2010; Servaes; Tamayo, 2017).

Developing connections into personal relationships takes time and maintaining relationships requires effort, and these are important activities that define networking (Forret; Dougherty, 2001). Networking can facilitate the exchange of work related resources (Wolff; Kim, 2012) and the ability to access information and knowledge from external sources measures the firm's strength in networking (Tsai, 2001).

The capacity to absorb and transfer knowledge is related to maintaining a diverse network (Tepic et al., 2012). The goodwill generated from the social interactions among individuals or groups (Adler; Kwon, 2002) create the opportunities to access new knowledge and facilitate the process of innovative management (Cohen; Levinthal, 1990; Tsai, 2001), playing a critical role in the adoption of new agricultural technologies (jara-rojas; e. Bravo-ureta; díaz, 2012; Micheels; Nolan, 2016). This communication and reciprocity increases the quality of agricultural products, (Fu et al., 2018), which can lead to higher performance of the business.

There are studies that suggest that farmers with a broader network of relationships have a higher tendency to achieve higher innovativeness (Jara-rojas; e. Bravo-ureta; Díaz, 2012). Research has also shown that social interactions are related to innovation capabilities while structural variables, such as farm size and income, do not have as much impact on innovation capabilities as social capital variables (Micheels; Nolan, 2016). Networking comprises social interactions that helps expand one's network to facilitate acquisition of knowledge and skills that helps achieve financial objectives.

2.2. Absorptive capacity

Recognizing the need for new ideas to continue and enhance growth in agribusiness has led to several research studies. The speed of response with innovative ideas to manage environmental changes can differentiate a successful farm from the unsuccessful ones (Shadbolt; Olubode-Awosola, 2016). While adoption of an innovation has been shown to contribute to performance (Damanpour, 1991), it is important to study the adopter-firm's *absorptive capacity* which in this case refers to the farm's ability to recognize the value of new information, assimilate it, and apply it to commercial ends (Cohen; Levinthal, 1990; Jansen et al., 2005; Zahra; George, 2002).

Absorptive capacity has four dimensions: acquisition, assimilation, transformation, and the exploitation of knowledge into innovation (Zahra; George, 2002). Absorptive capacity can be divided into two categories: potential and realized. Potential Absorptive Capacity is the ability to acquire and assimilate new knowledge. Realized Absorptive Capacity is the ability to transform and exploit the new knowledge that leads to innovation and builds the competitive advantage (Gellynck, 2015; Jansen et al., 2005; Kostopoulos et al., 2011; Tepic et al., 2012).

More importantly, determining the farm's *Realized Absorptive Capacity,* that is, the capability to develop and transform the combined

existing knowledge and the newly acquired in real applications, helps identify the innovative capabilities that influence the financial performance (Cohen and Levinthal, 1990; Zahra and George, 2002).

2.3. Financial performance

Financial resources and financial position are part of the managerial perceptions (Madrid-Guijarro et al., 2009). Therefore, financial performance can be a subjective measure, based on how well a firm can use assets from its primary mode of business and generate revenues. It refers to the degree to which financial objectives are being accomplished.

Financial performance principally reflects business sector outcomes and results that shows overall financial health of the sector over a specific period. It indicates how well an entity is utilizing its resources to maximize shareholders' wealth and profitability (Madrid-Guijarro et al., 2009; Naz et al., 2016) and the process of measuring the results of a firm's policies and operations in monetary terms, reflected in the firm's return on assets and general profitability.

2.4. Networking, absorptive capacity and financial performance

In the agribusiness context, literature illustrates the importance of social capital to farmers (Micheels; Nolan, 2016; Wilson, 2000), and the impact of networking on the innovativeness and profitability of farmers (Tepic et al., 2012). While literature has shown the importance of the role of absorptive capacity on financial performance (Jansen et al., 2005; Kostopoulos et al., 2011), there is a lack of studies that investigate if social integration helps generate positive results of absorptive capacity (Tsai, 2001; Zahra; George, 2002). This gap calls for research on networking as an element of social capital that contributes to knowledge assimilation and acquisition (Micheels; Nolan, 2016; Tepic et al., 2012; Zahra; George, 2002).

Networking is the primary activity that builds social capital and accounts for social capital's upside and downside, that is, the vertical and horizontal associations between people and of relations within and among such organizational entities as community groups and firms (Woolcock and Narayan, 2000). While social capital has been much discussed, the activity that builds social capital has not been given due attention. The need for research on the impact of networking to absorptive capacity is supported by studies that suggest the execution of innovative ideas is dependent on the capabilities of entrepreneurs to improve networking to overcome environmental resistances, such as interpersonal and social conflicts, and improve productivity (Schumpeter, 2003).

The extent of successful adoption of technological innovations is dependent on the farmers' Potential Absorptive Capacity (Gellynck, 2015; Micheels; Nolan, 2016; Tepic et al., 2012) that may be influenced by personal characteristics such as risk attitude (Shadbolt; Olubode-Awosola, 2016), learning orientation (Micheels; Nolan, 2016), social capital or their networking capability (Micheels; Nolan, 2016; Molina-Morales; Teresa, 2010; Olawuyi; Mushunje, 2019) and information transfer among farmers (Toma et al., 2016). The farmer's network has afforded the opportunity to share knowledge and support one another (Szreter; Woolcock, 2004) which increases their absorptive capacity that in turns leads to higher performance (Kostopoulos et al., 2011; Tepic et al., 2012).

While social networking may influence the adoption of technology and profit orientation (Toma et al., 2016), the behavioural aspects of farm managers influence the extent they are capable of absorbing and applying to knowledge to improve their business (Bandiera and Rasul, 2006; Diederen, 2003; Hyland et al., 2018; Micheels; Nolan, 2016; Tepic et al., 2012).

Studies in social skills show that connectivity and socialization help increase the Realized Absorptive Capacity of firms (Jansen et al., 2005; Micheels; Nolan, 2016). In the fertilizer industry, it was found that farmers surrounded by high levels of social capital adopted new technologies faster (Isham, 2001). In addition, farmers with a broad social network were more willing to adopt innovation as a result of meeting and interacting with other adopters (Bandiera and Rasul, 2006).

Innovative farmers are defined as those who are motivated to establish social connections and seek external sources of information to enhance performance (Diederen et al., 2003; Tepic et al., 2012). Farmers with a higher networking frequency are found to invest more in innovation, and networking frequency is positively related to knowledge acquisition and assimilation (Tepic et al., 2012). Moreover, studies confirm that those with higher absorptive capacity show higher financial performance (Kostopoulos et al., 2011).

2.4.1. Hypotheses

Studies have found that innovative farmers value social interactions with external stakeholders to acquire knowledge (Diederen et al., 2003; Tepic et al., 2012). As it is necessary to first acquire knowledge before exploiting it (Zahra; George, 2002), the literature sustains the choice to first observe the influences of Networking on Potential Absorptive Capacity.

This study focuses on farmers' network with their stakeholders, mainly suppliers and customers. This type of networking between farmers and their stakeholders is the focus of this study because the wider the sources of knowledge, the higher are the changes of experiencing knowledge acquisition and assimilation (Tepic et al., 2012). As previously presented in the literature review, it is known that these interactions are determinants for creating opportunities to be in contact with new knowledge, and consequently, for the growth of the farm. With stakeholders, the network can be established in a structured way, such as fairs, events, commercial campaigns. It creates opportunities for farmers to develop their network, not simply by having a good relationship with their neighbours, which is also important, but in a way that have potential to generate direct effects on the business itself.

Thus, according to the confirmation that networking has a positive effect on acquisition and assimilation (Tepic et al., 2012), this study proposes that networking influences the ability to acquire and assimilate knowledge, generating the hypothesis:

H1. Networking positively influences Potential Absorptive Capacity.

Innovation plays a vital role in developing competitive advantage in any firm and economic sector (Tidd; Bessant, 2013). However, it is important to study the process to build a competitive advantage which requires the ability to assimilate new knowledge to enhance innovation known as absorptive capacity (Cohen; Levinthal, 1990; Jansen et al., 2005; Micheels; Nolan, 2016). The ability to innovate depends on the ability to recognize, understand and apply new knowledge and technology (Tepic et al., 2012). Since innovative behaviour is preceded by the intention to apply innovation (Van Oorschot; Hofman; Halman, 2018), the level of absorptive capacity of a firm depends on the entrepreneur's propensity to show these capabilities (Cohen; Levinthal, 1990). People in firms with absorptive capacity actively acquire relevant knowledge and they are more willing to understand the importance of technologies (Cohen; Levinthal, 1990; Tsai, 2001), and consequently, these firms manifest more competitive advantage (Tsai, 2001; Zahra; George, 2002).

Potential Absorptive Capacity has been observed as one of the determinants of Realized Absorptive Capacity as supported by research evidence that farmers with a higher level of absorptive capacity are more willing to adapt new technologies and new practices (Gellynck, 2015; Micheels; Nolan, 2016; Tsai, 2001). Hence, the following hypothesis was proposed:

H2. Potential Absorptive Capacity positively influences Realized Absorptive Capacity.

Economic factors, including profits and performance, are among the main determinants of the decision to innovate or not (Adrian et al.,

2005; Areal et al., 2011; Toma et al., 2016). However, it is possible that the financial strength of a firm enables adoption of innovation that generates profitability. Previous research has brought the question if innovative farmers adopt innovations because they are rich or if they are rich because they are innovative (Rogers, 1995).

Other studies illustrate that farmers have more propensity to adopt new technologies when there is guarantee of profitability after the adoption (Adrian et al., 2005; Areal et al., 2011). This propensity is supported in another study that found profit-oriented farmers tend to show more intention to innovate (Toma et al., 2016).

Rogers (1995) noted that early adopters of an innovation show higher financial performance with the advantage as first movers while late adopters show less results and own smaller farm sizes. Farmers who convert knowledge exploitation into rentable applications reap a higher financial performance. While Kostopoulos et al. (2011) found that innovation mediates the positive influence of absorptive capacity on financial performance; Tepic et al. (2012) found that Realized Absorptive Capacity has a positive relation with profitability (Tepic et al., 2012).

After mapping the factors that could determine Realized Absorptive Capacity, namely economic strength to afford an innovation, guarantee of profit from an innovation and early adopter advantage, it is important to investigate if farmers with higher Realized Absorptive Capacity have higher Financial Performance, resulting in the hypothesis:

H3. Realized Absorptive Capacity positively influences Financial Performance.

The three hypotheses are shown in the structural model Fig. 1 proposing that Networking influences Potential Absorptive Capacity which in turn influences Realized Absorptive Capacity that resulted in higher Financial Performance.

3. Methodology

3.1. Questionnaire

Based on previous studies, the questionnaire was adapted from original papers covering four dimensions: Networking (Micheels; Nolan, 2016), Potential Absorptive Capacity and Realized Absorptive Capacity (Jansen et al., 2005) and Financial Performance (Gunday et al., 2011). Potential Absorptive Capacity included 2 s-order constructs of *acquisition* and *assimilation*, and similarly, Realized Absorptive Capacity included *transformation* and *exploitation* (Jansen et al., 2005; Zahra; George, 2002).

The questions to measure Networking were adapted from Micheels and Nolan's (2016) study on social capital which included questions on networking. The study examined how the level of interactions affects the level of innovation adoption among Canadian farmers, with adaptation from Molina-Morales and Teresa's (2010) study on innovation.

The questions to measure Financial Performance dimension were adapted from Gunday et al.'s (2011) study on innovation which also reflected the basic outcomes of Financial Performance such as return on assets and general profitability (Madrid-Guijarro et al., 2009; Naz et al., 2016).

The questionnaire was translated into Portuguese, adapted to the farmers' language and a content validation was made among 11 farmers. The final questionnaire included 5 questions on demographic variables, 3 questions on Networking, 10 questions on Potential Absorptive Capacity, 8 questions on Realized Absorptive Capacity and 5 questions on Financial Performance in the last three years.

A 5-point Likert Scale was used with 1 for Strongly Disagree to 5 Strongly Agree for Networking, Potential Absorptive Capacity and Realized Absorptive Capacity. For Financial Performance, the scale represents 1 for Low and 5 for High financial performance based on farmers' perception of their own business for the past three years (Gunday et al., 2011). Appendix A shows the English version of the questionnaire.

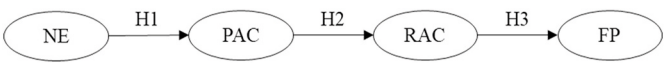

Fig. 1. Structural model.

The agribusiness industry is a sector that depends on external factors such as government policies, taxes, exchange variation and exports (Confederação Da Agricultura E Pecuária Do Brasil, 2014). Moreover, the unpredictability of the weather and seasons have an important influence on farms' performance and the entire sector in general (King et al., 2010), creating difficulties to obtain the same precision as in the other industries (Davis; Goldberg, 1957). These aspects of the agricultural context help to explain the choice of measuring the financial performance in the last three years and not simply the results of one year. With this time range, it was possible to mitigate the effects of extremely high or extremely low results in just one year, caused by the external factors previously mentioned.

In this study, this measure depends on the perceptions of the farmers about their own businesses. In addition, the intense use of formal processes, management practices and strategic budgeting is not observed in the Brazilian culture in agribusiness. Previous findings show that governance mechanisms are needed, but still not well developed in the rural sector (Machado Filho; Caleman; Cunha, 2017). The lack of governance supports the fact that the answers about financial results and indicators may contain multiple opinions based on farmers' experience which explains the subjectivity of financial performance in this context. However, studies have found that subjective measures are highly correlated with objective measures, especially in the context of innovation when comparing managerial perceptions with secondary data (Frishammar; Hörte, 2005; Zahra; Covin, 1993).

3.2. Sample

The sample comprises farmers in two South Brazilian states: Rio Grande do Sul and Paraná, which collectively represent 13% of the agricultural establishments in Brazil. These two states are among the five Brazilian states with highest competitiveness in agribusiness, measured by an index that considers six different aspects: infrastructure, education, health care, macro environment, innovation and labor market (Confederação Da Agricultura E Pecuária Do Brasil, 2014). This result means that Rio Grande do Sul and Paraná have favorable conditions to strengthen Brazilian agribusiness. Both states are also important to the Brazilian agricultural production because they provide specific products that can only be found in South Brazil due to the cold climate, for example, grapes and rice are mainly produced in the Rio Grande do Sul (IBGE, 2017a). As to the milk farms, Brazil is the sixth global milk producer (IBGE, 2017). Soybean is the main product of Brazilian grain farming and Rio Grande do Sul ranks second in soybean production followed by Parana in third place (IBGE, 2017a). Moreover, Brazil is the second country in the world with the largest cattle herd, after India, and in the South Rio Grande do Sul and Paraná have important roles in livestock production (IBGE, 2017).

3.3. Data collection and analysis

As to the time classification, it is a cross-sectional study, in which data is collected in a single moment (Sampieri et al., 2010). Data was collected between December 11, 2018, and February 15, 2019. It was applied a nonprobability sampling technique called snowball sampling (Malhotra, 2015). A number of farmers were first contacted based on the region selected for the present study. Once they were reached out, their network was used to reach more farmers. Although using their own network could increase the risks of having a biased sample, the snowball sampling helped to reach a greater number of farmers. Therefore, this technique provided more respondents willing to help on the research,

due to the empathy already established by the person who introduced them to the questionnaire.

The questionnaire was sent electronically and had a term of consent for the participation of the research talking about benefices, secrecy and reliability and guarantee of clarification and access to information. The questionnaire was sent to farmers with different core businesses to achieve a diversity of farm respondents such as grain farming, livestock, milk production and agroindustries. Performing any rural activity that generates income in the farm was one of the prerequisites to qualify as a respondent for the survey. Data was collected using the software Qualtrics®.

A total of 269 responses were collected, which were analyzed and filtered on the next stage. At the stage of data cleaning, 25 farmers from Brazilian states outside of the target population were excluded. Another 12 farmers were excluded from the sample due to their incomplete answers for demographic questions. The Mahalanobis distance was calculated in order to detect multivariate outliers. The common method bias was tested using Harman's single factor score, and the results demonstrate that the model is free from common method bias (Hair et al.).

As a final procedure, 10 respondents were detected as outliers and were excluded from the sample. Confirmatory factorial analysis measuring construct validity and testing hypotheses was conducted with SPSS® and AMOS® software. After data cleaning, a total of 222 questionnaires were useable.

Multivariate analysis was performed in two phases for extract the relation presented in the hypotheses. In the first step, a factorial analysis of research structure was performed through a principal component analysis (PCA), in this stage, the objective was to explore internal consistency and reliability (content validity) between the items of each construct through Cronbach's Alpha and unidimensional tests. In addition, the discriminant validity between constructs was also examined and verified by the average variance extracted (AVE). The second step involved the analysis of relationships between these factors using the structural equation modeling (SEM) approach.

4. Results

4.1. Respondent characteristics

Table 1 summarizes the demographic results. From the 222 respondents 87.4% are male and 77% are between the ages of 25 and 54, reflecting national statistics of Brazilian farmers with 80% male and 60% between ages 30 and 59 (IBGE, 2017a). Parana respondents totalled 20.3% while 79.7%, the majority, were from Rio Grande do Sul, the state with highest use of land and livestock production in the South region (IBGE, 2017a). Large farms totalled 47.8% while medium and small farms were about the same averaging 26%. Farm activity were livestock at 81.5%, grain farming 62.6%, milk farm 9.5% and agroindustry 3.6%.

Table 1
Descriptive statistics of respondents.

Variable	Category	Count (percentage)
Gender	Male	194 (87.39%)
	Female	28 (12.61%)
Age (years)	15–24	21 (9.46%)
	25–54	171 (77.03%)
	55–64	24 (10.81%)
	≥65	6 (2.70%)
Location	Rio Grande do Sul	177 (79.73%)
	Paraná	45 (20.27%)
Farm Size	Small	57 (25.68%)
	Medium	59 (26.58%)
	Large	106 (47.75%)
Farm Activity[a]	Grain Farming	139 (62.61%)
	Livestock	181 (81.53%)
	Milk Farm	21 (9.46%)
	Agroindustry	8 (3.60%)

[a] *Note*. Farm activities overlap with each other.

Farm size was classified by governments standards. The unit of measure is called "*Módulo Fiscal*" and it represents a different number of hectares depending on the location of the farm. In the South region this measure varies between five to 50 ha. The classification is as follows: small farms have close to four times the "*Módulo Fiscal*"; medium farms have four to 15 times; large farms exceed 15 times (INCRA, 2013). For this study, each farm location was separately verified. They have from five to 35 times the "*Módulo Fiscal*".

The results show that 47.8% of respondents owned large farms. Large farms are the result of the application of new ideas and they are more open to the promotion of new ideas by government agencies and commercial agri-productivity firms (Adrian et al., 2005; Diederen, 2003; Jara-Rojas et al., 2012; Läpple et al., 2014).

The two main farm activities in Brazilian agribusiness is reflected with 81.5% respondents from livestock and 62.6% grain farming. Only 13.1% of respondents do not work with grain farming or livestock.

4.2. Factor analysis

Factor analysis was conducted using the second-order constructs of Acquisition and Assimilation forming Potential Absorptive Capacity (PAC) and Exploitation and Transformation forming Realized Absorptive Capacity (RAC). The analysis showed the need to exclude some variables to improve the model: Question PAC1 from Potential Absorptive Capacity (PAC). A Social Capital (SC) scale was used in the questionnaire, but SC1, SC2, SC3, SC4 and SC5 were excluded from it which resulted in a Networking (NE) scale. After the removal of these variables, the factor weights were significantly related, supporting the validity of the data.

Table 2 shows the factor loadings, values for Cronbach Alpha, Composite Reliability (CR), Average Variance Extracted (AVE), mean and standard deviation scores using Varimax rotation. The Cronbach Alpha and Composite Reliability are often used in structural equational models to estimate reliability of model (Hair,).

The Cronbach Alpha exceeded 0.7 for all constructs except Potential Absorptive Capacity at $\alpha = 0.638$ which is acceptable as the application of these previously tested scales is new in this specific agribusiness context. The values for Composite Reliability vary between 0.764 and 0.909. Both are adequate and show the internal consistency of the model (Kline, 2011).

The Average Variance Extracted (AVE) was verified in order to measure the convergence among the items of the constructs and should be higher than 0.5 (Hair,). The constructs exceeded the recommended value except for the transformation dimension (AVE = 0.472), which can be explained by the unprecedented application of this model in this specific agribusiness context. In this case, the AVE is less than 0.5 but the composite reliability is higher than 0.6, therefore, the convergent validity of the construct is still adequate (Fornell; Larcker, 1981).

All the three variables of Networking, NE1 to NE3, show high mean scores between 4.19 and 4.32, higher than the scores in Micheels and Nolan's (2016) research. The results reinforce the findings of past studies advocating that social relations, network frequency and strong ties with stakeholders positively influence the ability to acquire new knowledge (jara-rojas; e. Bravo-ureta; díaz, 2012; Micheels; Nolan, 2016; Tepic et al., 2012; Tsai, 2001). The findings imply networking among farmers is high, providing a favorable environment where they can interact with stakeholders, generate learning and exchange new ideas. As shown in Table 3, a positive relationship was found between Networking and Potential Absorptive Capacity, supporting H1.

Potential Absorptive Capacity's (PAC) mean scores between 3.53 and 4.41 suggest that farmers view themselves capable of assimilating and acquiring knowledge (Tepic et al., 2012). This highest Acquisition score

Table 2
Results from confirmatory factor analysis.

Factors	μ	Sd	λ	A	CR	AVE
Factor 1: Networking (NE)				.764	.863	.677
NE1: Establishing networks with suppliers and customers has had a significant impact on developing new ideas for our farm	4.32	.786	.845			
NE2: Establishing networks with suppliers and customers has had a significant impact on the acquisition of important resources	4.19	.835	.804			
NE3: Establishing networks with suppliers and customers has had a significant impact on the development of new activities on our farm	4.20	.860	.827			
Factor 2: Potential Absorptive Capacity (PAC)						
Acquisition				.638	.764	.519
PAC2: Our farm participates at least twice a year in seminars and organized conferences to upgrade our expertise and knowledge	4.16	1.214	.754			
PAC3: We allocate a lot of time to establish contact with parties that provide us with knowledge about innovations in the sector	3.91	1.019	.801			
PAC4: We have sufficient skills to establish contact with parties who can provide us with knowledge about innovations in the sector	4.41	.777	.751			
Assimilation				.798	.864	.516
PAC5: Our farm is always among the first to recognize shifts in technical possibilities	3.66	1.019	.778			
PAC6: Our farm is always among the first to recognize shifts in regulation	3.53	.964	.735			
PAC7: Our farm is always among the first to recognize shifts in market competition	3.74	.933	.818			
PAC8: Our farm is very skilful in detecting new possibilities to serve new customers	3.67	.930	.617			
PAC9: Our farm allocates a lot of time to deliberating with advisors in order to recognize changes in the market early	3.79	1.057	.664			
PAC10: Our farm has sufficient skills to deliberate with advisors about how changes in the market can be used to make changes to the business on our farm	4.16	.888	.615			
Factor 3: Realized Absorptive Capacity (RAC)						
Transformation				.779	.780	.472
RAC1: We record and store newly acquired knowledge for future reference	4.10	.995	.716			
RAC2: Our farm quickly recognizes the usefulness of new external knowledge to our existing knowledge	4.04	.897	.769			
RAC3: We discuss monthly with external advisors how trends in the market could be used to improve our business	4.02	1.063	.647			
RAC4: We allocate a lot of time to translation of external information into adaptations to our business	3.61	1.078	.815			
RAC5: We have sufficient skills to translate external information into adaptations to our business	3.87	.883	.704			
Exploitation				.765	.808	.585
RAC6: We translate external information directly into new business applications	3.65	.938	.826			
RAC7: Application of external information to our business contributes to our profitability	4.22	.773	.817			
RAC8: We have sufficient skills to convert external information into profitability	3.92	.818	.837			
Factor 4: Financial Performance (FP)				.868	.909	.666
FP1: Return on assets (profit/total assets)	3.16	1.088	.792			
FP2: General profitability of the firm	3.26	1.043	.863			
FP3: Return on sales (profit/total sales)	3.27	1.105	.834			
FP4: Cash flow excluding investments	3.27	1.108	.749			
FP5: Total sales	3.50	1.067	.811			

Note. μ = mean score (range 1–5); sd = standard deviation; λ = factor loads; α = Cronbach Alpha; CR = Composite Reliability; AVE = Average Variance Extracted.

PAC4 at 4.41 shows respondents are confident they have enough skills to establish contact with parties who could provide them with knowledge about innovations that benefit them. The highest Assimilation score PAC10 shows adequate skills to involve advisors in improving the farm's business model to align with market changes. Overall, the results suggest that respondents are willing to involve external stakeholders in every stage of farm production, creating opportunities to acquire and assimilate new ideas. The findings confirm the importance of networking in agricultural environments (Micheels; Nolan, 2016) and beneficial for agribusiness when farms become a system of relationship between people (Wilson, 2000).

Table 3 shows Potential Absorptive Capacity has a positive influence on Realized Absorptive Capacity, supporting H2. This finding also supports studies such as Gellynck's (2015) research that found banana farmers in Ecuador with high scores for absorptive capacity and high scores for innovation outcome, directly related to the capabilities of transforming external knowledge into a real application.

Realized Absorptive Capacity (RAC) shows mean scores between 3.61 and 4.22. The highest Transformation score RAC1 shows farmers record and store newly acquired knowledge for future refence. The highest Exploitation score RAC7 shows farmers agree that applying external information has contributed to their profitability. Not surprisingly, the results in Table 3 confirms support for hypothesis H3 that RAC positively influence profitability.

The RAC results support the relationship between acquisition and transformation of knowledge resulting in profitability found in other studies such as Tepic et al.'s (2012) study of pig farming in the Netherlands and Micheels and Nolan's (2016) study of agricultural farms in the Canadian Prairies, as well as Kostopoulos et al.'s (2011) study of manufacturing and service firms in Greece. The study suggest that willingness to learn and apply innovation helps improve financial performance contradicting studies that did not find a connection between innovation outcome and business performance (Chen; Lin, 2007; Gellynck, 2015). The higher the farmer's capacity for innovating, the higher their preparedness to meet market chances and higher financial performance.

The mean scores for Financial Performance (FP) are above neutral between 3.16 and 3.5. While they are not high, none of the statements scored less than 3, suggesting they observe improvements though not dramatic. The scores indicate that farmers may not notice significant improvement in financial performance in the last three years. The results are similar with Gunday et al.'s (2012) study of innovation among manufacturer firms while Tepic et al.'s (2012) study among pig farmers in the Netherlands showed even lower results when performance was compared to competitors. Demographic data were tested through ANOVA in order to investigate if the type of farm activity influences on the results of FP. The findings show that there was not a significant difference on the FP between grain farming, livestock, milk farms and agroindustries. Table 3 also shows the goodness of fit measures that support the model (Kline, 2011). Then, the Structural Model was analyzed, where the Factorial Confirmatory Analysis was initially performed. Based on the reference values proposed by Hair, it is observed that the values of the significance parameters, Chi-square norms and RMSEA are within the limits established as adequate. The verification of the convergent and discriminant validities was conducted using the previously studied criterion (Fornell and Larcker, 1981).

The results show the most significant influence is found in PAC on RAC to impact performance positively. Networking also showed a

Table 3
Hypotheses and path results.

Hypotheses				ß	Standardized path estimate	z-test	p-Value	Result
H1	PAC	<—	NE	.308	.194	4.952	.000	Supported
H2	RAC	<—	PAC	1.246	.207	6.018	.000	Supported
H3	FP	<—	RAC	.443	.118	3.752	.000	Supported

$X^2/df = 1.952$; CFI = 0.890; NFI = 0.801; IFI = 0.892; TLI = 0.872; RMSEA = 0.064.

significant influence as an antecedent to PAC that in turn become an antecedent to RAC and subsequently RAC to FP. As a summary, all three hypotheses were supported with p-values lower than 0.01 (Hair et al., 2014).

5. Conclusion: contributions and managerial implications

This research aimed to clarify the relationships between four dimensions: Networking, Potential Absorptive Capacity, Realized Absorptive Capacity and Financial Performance. The positive relationships expected between the constructs was confirmed among South Brazilian farmers. This research presents Networking as an antecedent to the process of influencing PAC on RAC to impact FP.

The findings show that, once social relations are established, farmers need first to be capable of assimilating and acquiring new knowledge (Cohen; Levinthal, 1990; Zahra; George, 2002) in order to be able to apply it later. Nevertheless, one of the facts that can help South Brazilian farmers to apply and exploit new knowledge is their exposure to new ideas.

The results show farmers already recognize the value of networking with high mean scores between 4.19 and 4.32, which implies they are establishing connections with suppliers, customers and other stakeholders to acquire knowledge. For this reason, the creation of fairs and events would promote even more interactions in the agribusiness context, supported by the fact that they already see the value in these interactions. Also, it would put farmers in contact with new knowledge. Thus, this research contributes not only to academic literature but also to government agencies and agribusiness firms that benefit from providing a favorable environment to generate networking. Farmers can profit from government actions such as promoting regional fair, where they will have the exchange of ideas.

The Acquisition scores in PAC have scores between 3.91 and 4.41, but the Assimilation scores have all statements lower than 3.8 except PAC10 at 4.16. The farmers perceive that they are not quick to recognize shifts in technical possibilities, regulation, market competition and new customers as well as deliberating with advisors to recognize market changes early enough.

The Transformation scores in RAC show that allocating time on transforming new knowledge into concrete applications to their farms (RAC4 = 3.61) is the attitude less present in terms of transformation, followed by the fact that they consider to have enough skills (RAC5 = 3.87) to do it. However, the mean scores show high value in recording the knowledge acquired for future reference, which already shows their intention on using that information when needed. Therefore, it supports the confirmed relationship between acquire and transform knowledge, evidenced by their willingness to record that knowledge. The Exploitation scores indicate the challenges farmers face in translating external information into new business applications (RAC6 = 3.65). The government could set up mobile units to provide regular support to farmers, and university professors and their students could help determine the causes for the gap between acquisition and exploitation of knowledge.

Although none of the FP scores fall below neutral, none of the statements scored over 3.5. The results imply farmers feel they are working diligently but the returns do not correspond with efforts in Networking, building PAC and striving for RAC to achieve higher FP. This argument is supported by the results found with this model.

With these results, farmers have a direction to seek for financial performance, and to mitigate the risk of not surviving in order to provide society with agribusiness goods and products. This was a concern since the first studies around the term agribusiness and its linkages with other components of the society (Davis; Goldberg, 1957). By knowing that the application and transformation of new knowledge is a way to increase incomes, farmers can be encouraged to put their ideas into practice.

With respect to the role of government, technological fairs and innovation events may be promoted in Paraná and Rio Grande do Sul to help farmers gain new knowledge and build networking with agencies and suppliers that can help them acquire, assimilate, transform and exploit knowledge for better financial performance (Jara-Rojas; E. Bravo-Ureta; Díaz, 2012; Micheels; Nolan, 2016; Tepic et al., 2012; Tsai, 2001). From a managerial perspective, promoting fairs and innovation events not only creates an ecosystem of interactions, but also brings attention to the local economy. This is a way how government agencies, agribusiness multinationals, universities and public initiatives could help to bring solutions to increase farmers' financial performance. While their businesses are well functioning, they can keep providing the society with agribusiness goods and feeding the world.

While this research presented important findings of the behaviour and perceptions of South Brazilian farmers, it has limitations. First, although the sample size was satisfactory, the sample characteristics do not represent the diversity of the Brazilian agribusiness as most of the respondents represented two main activities – agriculture related to soil cultivation (grain farming) and livestock farming. Second, the snowball sampling technique was used in order to reach a greater number of respondents but this choice could have created some bias to the sample. Therefore, the use of a random sample is recommended in future studies in order to mitigate biased responses.

Another limitation related to the relationships of the model consists on the fact that the results for financial performance have led to understand that it is possible that mediator factors have influence on achieving higher financial performance.

Although was mentioned that innovation capabilities are a consequence of the ability to transform and exploit new knowledge, this relationship was not studied in the present paper. Finally, while the model was applied in a cross-sectional study in this research, the model could be applied to a longitudinal study to track incremental improvements among farmers over a specific time frame.

As to the data collection, future research could collect data from a more representative number of respondents for milk farming and agroindustries that convert raw agricultural products into value added products. Covering other rural farm activities would provide a more representative sample in order to validate these findings from a more diverse agricultural perspective. The academic field could also benefit from a study of mediator factors influencing the financial performance by the investigation of factors that can lower it. Another recommendation is to include an innovation adoption scale to determine if farmers with high levels of networking, absorptive capacity and financial performance have a corresponding level of innovativeness.

Faced with those opportunities, the literature can help explain and develop the agribusiness industry. In light of these recommendations, future research can enrich the literature of this important sector. Also, as Brazil is an emerging economy, there will be many opportunities to apply the model with the increase rate of agribusiness production and potential new areas of agribusiness.

Credit author statement

Júlia Aita dos Santos, Term, Conceptualization, Methodology, Investigation, Data curation, Writing- original draft preparation, Visualization. Lucas Bonacina Roldan, Methodology, Software, Validation, Formal analysis, Writing-reviewing and editing, Supervision. Mark Kam Loon Loo, Validation, Resources, Writing-reviewing and editing, Visualization, Supervision.

Declaration of competing interest

None.

Appendix A

The Questionnaire

Networking

Please rate the following statements with 1 for Strongly Disagree (SD), 2 for Disagree (D), 3 for Neither Agree nor Disagree (N), 4 for Agree (A) and 5 for Strongly Agree (SA).

	SD	D	N	A	SA
NE1: Establishing networks with suppliers and customers has had a significant impact on developing new ideas for our farm.	1	2	3	4	5
NE2: Establishing networks with suppliers and customers has had a significant impact on the acquisition of important resources.	1	2	3	4	5
NE 3: Establishing networks with suppliers and customers has had a significant impact on the development of new activities on our farm.	1	2	3	4	5

Potential Absorptive Capacity

Please rate the following statements with 1 for Strongly Disagree (SD), 2 for Disagree (D), 3 for Neither Agree nor Disagree (N), 4 for Agree (A) and 5 for Strongly Agree (SA).

	SD	D	N	A	SA
PAC1: We collect information about developments in the sector through discussions with business partners in the sector.	1	2	3	4	5
PAC2: Our farm participates at least twice a year in seminars and organized conferences to upgrade our expertise and knowledge.	1	2	3	4	5
PAC3: We allocate a lot of time to establish contact with parties who can provide us with knowledge about innovations in the sector.	1	2	3	4	5
PAC4: We have sufficient skills to establish contact with parties who can provide us with knowledge about innovations in the sector.v	1	2	3	4	5
PAC5: Our farm is always among the first to recognize shifts in technical possibilities.	1	2	3	4	5
PAC6: Our farm is always among the first to recognize shifts in regulation.	1	2	3	4	5
PAC7: Our farm is always among the first to recognize shifts in market competition.	1	2	3	4	5
PAC8: Our farm is very skilful in detecting new possibilities to serve new customers.	1	2	3	4	5
PAC9: Our farm allocates a lot of time to deliberating with advisors in order to recognize changes in the market early.	1	2	3	4	5
PAC10: Our farm has sufficient skills to deliberate with advisors about how changes in the market can be used to make changes to the business on our farm.	1	2	3	4	5

Realized Absorptive Capacity

Please rate the following statements with 1 for Strongly Disagree (SD), 2 for Disagree (D), 3 for Neither Agree nor Disagree (N), 4 for Agree (A) and 5 for Strongly Agree (SA).

RAC2: Our farm quickly recognizes the usefulness of new external knowledge to our existing knowledge.	1	2	3	4	5
RAC3: We discuss monthly with external advisors how trends in the market could be used to improve our business.	1	2	3	4	5
RAC4: We allocate a lot of time to translation of external information into adaptations to our business.	1	2	3	4	5
RAC5: We have sufficient skills to translate external information into adaptations to our business.	1	2	3	4	5
RAC6: We translate external information directly into new business applications.	1	2	3	4	5
RAC7: Application of external information to our business contributes to our profitability.	1	2	3	4	5
RAC8: We have sufficient skills to convert external information into profitability.	1	2	3	4	5

Financial Performance

Please rate your farm's financial performance during the last three years in the indicators below with 1 for Low Performance and 5 for High Performance.

	Performance				
	Low				High
FP1: Return on assets (profit/total assets)	1	2	3	4	5
FP2: General profitability of the firm	1	2	3	4	5
FP3: Return on sales (profit/total sales)	1	2	3	4	5
FP4: Cash flow excluding investments	1	2	3	4	5
FP5: Total sales	1	2	3	4	5

Demographic data

1. Age: ___ years.
2. Gender:
   - Male
   - Female
3. Farm Location:
   - City: _____.
   - State: _____.
4. Farm size: ___ hectares.
5. Mark the core activity (ies) of the farm:
   - Grain Farming
   - Livestock
   - Milk farms
   - Agroindustry
   - Other: _____.

Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrurstud.2021.02.011.

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