



## Conditioning factors to market fruits and vegetables from family farms to supermarket supply chains

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**ABSTRACT:** Globally, increasing number of fruits and vegetables are being consumed to maintain healthy eating habits. Family farming plays a crucial role in fruits and vegetables production; products are marketed in supply chains, which are increasingly demanding, diversified, and complex. Participation of the family farms in each of these supply chains is subject to their ability to meet the increasingly strict participation criteria. In this context, this study identified the main factors that affect the participation of the family farmers in the supermarket supply chains for fresh fruits and vegetables. A systematic literature review was conducted, covering the period from 2005 to 2019. Results indicated eleven variables that affect the participation of the fruits and vegetables family farms in the supermarket supply chains. These variables were grouped in an analytical framework, which comprised four factors: characteristics of the producer, characteristics of the farm, institutional aspects, and available infrastructure. This framework is useful for the development and implementation of the public and private policies for successful participation of fruits and vegetables family farmers in supermarket supply chains.

**Key words:** supermarket, producer characteristic, property, institutional environment, production infrastructure.

### Fatores condicionantes à comercialização de frutas, legumes e verduras da agricultura familiar em cadeias de suprimentos de supermercados

**RESUMO:** Preocupações ambientais e a busca por uma alimentação saudável têm levado ao aumento mundial de consumo de frutas, legumes e verduras. A agricultura familiar é um segmento muito importante na produção de frutas, legumes e verduras, sendo os seus produtos comercializados em cadeias de suprimentos crescentemente mais exigentes, complexas e diversificadas. A participação de produtores familiares em cada uma destas cadeias de suprimentos está submetida a capacidade deles atenderem critérios de inserção cada vez mais estritos. As cadeias de suprimentos de frutas, legumes e verduras que abastecem os supermercados não fogem a esta situação. Neste contexto, este artigo identificou os principais fatores que condicionam a inserção dos agricultores familiares nas cadeias de suprimentos de frutas, legumes e verduras dos supermercados. Para tanto, foi realizada uma revisão sistemática da literatura num período compreendido entre 2005 e 2019. Os resultados encontrados mostraram que existem onze variáveis que condicionam a inserção da agricultura familiar em cadeias supermercadistas de frutas, legumes e verduras. Estas variáveis foram agrupadas em um framework analítico composto por quatro fatores: características do produtor e da propriedade, aspectos institucionais e infraestrutura. Este framework é útil ao desenvolvimento e implementação de políticas públicas e privadas voltadas à inserção exitosa da produção de frutas, legumes e verduras de agricultores familiares nas cadeias de suprimentos de supermercados.

**Palavras chave:** supermercados, características do produtor, propriedade, infraestrutura de produção, ambiente institucional.

## INTRODUCTION

The global consumption of fruits and vegetables has increased over the years. One of the main reasons is a greater awareness regarding the benefits of a healthy diet (BERNAL et al., 2018) and environmental concerns (RIBEIRO et al., 2017). Within this context, supermarkets have become increasingly important points of sale for fruits and vegetables (NEVEN et al., 2009).

The great transformation of food chains expanded the supermarket networks on a large scale, being referred as the “supermarket revolution” (ANDERSSON et al., 2015). From the early 1990s, supermarkets have been increasing their market share and accountability for selling various durable and non-durable products such as fruits and vegetables (SAHARA et al., 2015).

Globally, family farming constitutes a major portion of the rural enterprises, regardless of the

development level (GRAEUB et al., 2016). Although, family farming is crucial for fruits and vegetables production, they can only sell to the supermarkets if they meet the minimum standards set by the retailers.

Several studies, worldwide, have been conducted to analyze the enabling processes and conditions for family farmers' participation in the supermarket chains (BLANC et al., 2009; SAHARA et al., 2015; MASPAITELLA et al., 2017). However, the literature struggles to find consensus on positive conditioning factors required for family farmers' participation. Furthermore, these studies incorporated only one or few variables in their analyses, neglecting other equally important factors. This study; however, identified and analyzed all the relevant variables, enabling the entry of the family farmers in the supermarket supply chains.

Successful entry of the farms in the supermarket chains depends on multiple factors. Thus, multifaceted solutions are required. This study proposed a theoretical framework incorporating this concept, which serves as an analytical tool to provide theoretical and empirical support for establishing public and private policies, enabling larger participation of the family farms in the supermarket supply chains.

## MATERIALS AND METHODS

A systematic literature review was conducted to explore the following research question. "What are the conditioning factors for family farmers to supply fruits and vegetables in supermarket chains?" Literature was extracted using the Web of Science, Scopus, and SciELO databases. Compared with the other databases, SciELO provided the lowest number of articles, summaries, and citations but was still used because it contained relevant Brazilian studies (BUCHINGER et al., 2014). The database searches were based on a combination of the following words and expressions: (access or participation) AND (smallholder or "small farm" or "family farm") AND (supermarket). Four filters were used to select the articles. The first filter specified the product group using the words "horticulture", "fruits," and "vegetables". The second specified the fields of Social and Agricultural Sciences. The third restricted the documents to articles, reviews, book chapters, and conference articles. Finally, only the English and Portuguese languages were selected.

The procedures led to the selection of 36 articles from the Web of Science, 18 from Scopus, and none from SciELO, which demonstrated the scarcity of Brazilian studies on the subject. Subsequently,

inclusion and exclusion criteria were determined to exclude articles that did not meet the study objectives (Table 1). These criteria were designed through a prior reading of the five best-ranked articles (score) defined by the START software (Laboratory of Software Engineering Research, 2020).

Twelve studies were selected after going through the introduction and conclusion of these articles. Subsequently, a reverse search was conducted in the references, identifying studies undetected in the first search. This procedure resulted in 21 studies.

The enabling variables for family farmers' participation in supermarket supply chains, identified from the selected articles, were grouped into four constructs, which were composed of the nomenclature and the same classification logic used by the related authors of similar studies.

## RESULTS AND DISCUSSION

The systematic literature identified the variables facilitating family farmers' participation in the supermarket supply chains. The articles that provided the definitions and supported the theoretical formulation for this study are presented in table 2. Each of the variable used is briefly described below.

### *Age*

The literature widely addresses age as an enabling factor in family farmers' participation in the supermarket supply chains, though in conclusions they remain insignificant. Some studies stated that younger farmers are more willing to participate in the supermarket supply chains (SAHARA et al., 2015; MASPAITELLA et al., 2017), while others (RAO et al., 2012) concluded that older farmers are more suitable.

According to SAHARA et al. (2015), younger family farmers are more entrepreneurial, take quicker decisions and are willing to use newer technologies to analyze market conditions, thereby creating a suitable environment to negotiate with the supermarkets. Alternatively, MASPAITELLA et al. (2017) and RAO et al. (2012) concluded that older farmers have more experience and knowledge, in addition to a reputation that enhances their relationship with the supermarkets.

### *Education*

The farmer's education may directly influence his or her ability to participate in the supermarket supply chains (BLANDON et al. 2009). The reason, in addition to being more confident and innovative, is higher farmers education, which is more willing to undertake necessary investments, meeting

Table 1 - Inclusion and exclusion criteria for the systematic literature review.

-----Inclusion and exclusion criteria for the systematic literature review-----	
The study does not focus on the supermarket	EXCLUDE
The study does not focus on the family farms	EXCLUDE
Mentions the criteria of participation in the supermarket chain and the correlated conditioning factors	INCLUDE
Unavailable for download	EXCLUDE

Source: Designed by the authors.

the supermarket standards (SAHARA et al., 2015).

MASPAITELLA et al. (2017) identified a positive correlation between education and the participation of farmers in the supermarkets. Educated farmers possess better managerial abilities, which are important for negotiating with the supermarkets, in

addition to a better understanding of the fruits and vegetables production processes.

#### *Farm size*

The farm size has a significant influence on the farmers' participation in the supermarkets, since

Table 2 - Selected articles.

Author (s)	Year	Journal	Sample (farmers)
HERNÁNDEZ et al. (2007)	2007	American economics	600
MYIATA et al. (2009)	2009	World development	162
NEVEN et al. (2009)	2009	World development	166
BLANDON et al. (2009)	2009	Journal of international development	32
OUMA et al. (2010)	2010	Agricultural economics	100
MARKELOVA & MWANGI (2010)	2010	Review of Policy Research	Not mentioned
RAO & QAIM (2011)	2011	World development	402
BRANDÃO (2011)	2011	PhD Thesis	
RAO et al. (2012)	2012	American journal of agricultural economics	402
ISMAIL et al. (2013)	2013	Journal of agricultural economics and development	60
MATSANE & OYEKALE (2014)	2014	Mediterranean journal of social sciences	47
ANDERSSON et al. (2015)	2015	American journal of agricultural economics	402
HERNANDEZ et al. (2015)	2015	Bulletin of Indonesian economic studies	600
SAHARA et al. (2015)	2015	Bulletin of Indonesian economic studies	60
BRANDÃO & ARBAGE (2016)	2016	Rural Extension	Not mentioned
SLAMET et al. (2015)	2017	Agriculture	137
MASPAITELLA et al. (2017)	2017	International food and agribusiness management review	126
OCHIENG et al. (2018)	2018	Journal of agricultural education and extension	300
ELDER (2019)	2019	Agriculture and human values	110
DLAMINI- et al. (2019)	2019	African journal of science, technology, innovation and development	170
MWANGI & CREWETT (2019)	2019	Agricultural water management	176

Source: Designed by the authors.

the size is related to the required production level for supplying (NEVEN et al., 2009; ISMAIL et al., 2013; BRANDÃO & ARBAGE, 2016).

#### *Location*

The farm location may be an obstacle for family farmers to deliver their produce to the supermarkets (SAHARA et al., 2015). The farther the farm from the supermarket, the higher the transportation costs and thus, lower the margins.

MYIATA et al. (2009) concluded that the shorter the distance between the farm and the delivery point, the higher is the probability of becoming a supermarket supplier. HERNÁNDEZ et al. (2007) reported a negative correlation between the distance of the farm from the supermarket and participation, indicating that supermarket managers favor farmers who are located closer to the highways. BRANDÃO (2011) studied the governance structure of the fruits and vegetables supply chains in five micro-regions of the state of Rio Grande do Sul, Brazil, and observed that the farms were located less than 10 km away from the delivery points.

#### *Access to the farm*

The fragility and perishability of fruits and vegetables cause product quality to depend on the transportation conditions (DLAMINI-MAZIBUKO et al., 2019). Poor road quality may prevent family farmers from supplying supermarkets, forcing them to sell their products in less profitable and more risky markets (ANDERSSON et al. 2015). ISMAIL et al. (2013) and DLAMINI-MAZIBOKU et al. (2019) analyzed the influence of road conditions on the supply of fruits and vegetables by family farmers to the supermarkets. The authors concluded that 44.2% of the interviewed farmers identified poor road conditions as the principal obstacle in transporting fruits and vegetables to the supermarkets.

#### *The packing and storage*

The choice and use from a large range of packages and storage equipment are essential for supplying agricultural produce (MATSANE & OYEKALE, 2014). SAHARA et al. (2015) concluded that the supermarket chains pay better for high-quality, evenly shaped, and colored products stored in plastic bags or boxes.

SAHARA et al. (2015), SLAMET et al. (2017), and NEVEN et al. (2009) opined that family farmers who supply to the supermarkets must use packages that provide better preservation, in addition to owning storage, packaging, and distribution

infrastructure. BRANDÃO (2011) stated that one of the retailer chains demanded plastic packages from farmers, attempting to reduce contamination.

#### *Transport*

Transport plays a significant role in the supermarket supply chains and is an important competitive variable for family farmers. The perishability attributes demand quality-preserving modes of transport. The vehicle of choice depends on the infrastructure and the farmer's purchasing power, in addition to the product type, the production rate, and the frequency of delivery (OUMA et al., 2010).

RAO and QAIM (2011), and ANDERSSON et al. (2015) showed that family farmers who own vehicles probably supply supermarkets better. Similarly, HERNÁNDEZ et al. (2007) concluded that family farmers who own vehicles have a 30.5% better probability of supplying the supermarkets, compared with those who do not own one.

#### *Information exchange systems*

Family farmers who work in the fresh fruits and vegetables supply chains face the increasing demand of the modern supply chains regarding the flow of information among the agents. Thus, mobile phones and other communication services are vital for family farmers (SAHARA et al., 2015; SLAMET et al., 2017; DLAMINI-MAZIBUKO et al., 2019).

#### *Irrigation systems*

Irrigation systems are important for agricultural production, since they increase the quality, mitigate climate and sanitary risks, increase the planning ability and decrease production seasonality. They also lower costs and increase production rates, which favor the entry of family farms in the supermarket supply chains (BLANDON et al., 2009; RAO & QAIM, 2011; RAO et al., 2012; MWANGI & CREWETT, 2019).

HERNÁNDEZ et al. (2007), HERNÁNDEZ et al. (2015), NEVEN et al. (2009), and ANDERSSON et al. (2015) specified a positive correlation between irrigation and supply to supermarket chains. NEVEN et al. (2009) showed that drip irrigation increased the probability of the family farmers to participate in the supermarket supply chains by 46%, indicating that irrigation is an important factor for farmers who intend to supply to the supermarkets.

#### *Collective organizations*

Participation in collective organizations, such as associations and cooperatives allows family



farmers to reduce transaction and input costs and have better access to market information, services, and technical support (OCHIENG et al., 2018). Furthermore, collective companies of production and sales overcome barriers arising from markets that demand larger production rates. The scale provided by these organizations increases the bargaining power of the farmers, enabling them to compete against large farmers when it comes to more demanding supply chains such as supermarkets (MARKELOVA & MWANGI, 2010; MASPAITELLA et al., 2017; ISMAIL et al., 2013; ELDER, 2019). Furthermore, it is worth noting that collective organizations favor the establishment of short supply chains, directly connecting family farmers to markets and eliminating intermediaries (MARKELOVA & MWANGI, 2010).

#### *Access to rural extension services*

By offering technical support, public and private rural extension services enable farmers to adopt new management practices, thereby making them capable, providing a good quality product,

meet supplier demands, and increasing their competitiveness (MASPAITELLA et al., 2017).

MATSANE and OYEKALE (2014), BRANDÃO & ARBAGE (2016), and DLAMINI-MAZIBUKO et al. (2019) pointed out that access to the rural extension services is a determining factor in supplying fruits and vegetables to supermarkets. The technical support offered by extension services proved to be crucial for farmers to access new knowledge and learn abilities in management and more efficient production processes.

The variables discussed so far were brought together through a theoretical framework (Figure 1), defining the principal positive or negative conditioning factors for the family farmers to participate in the fruits and vegetables supermarket chains.

Understanding these factors and their behavior is important for the family farmers who seek to integrate themselves into the fruits and vegetables supermarket supply chains. They are also essential for the supermarkets that negotiate with the family farmers. The supermarkets can quickly gauge which

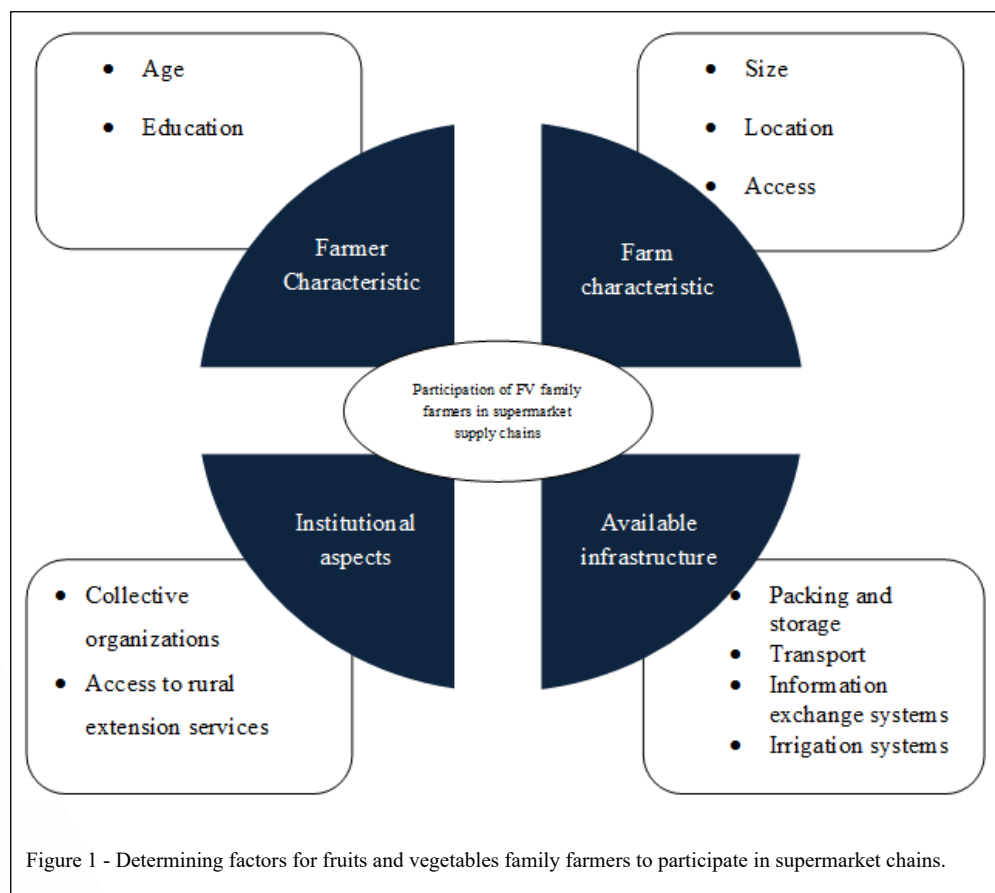


Figure 1 - Determining factors for fruits and vegetables family farmers to participate in supermarket chains.

factors are present in the farmers to build an effective and efficient supply chain relation.

## CONCLUSION

This article identify and assimilate the conditioning factors for participating the family farmers in the fruits and vegetables supermarket supply chains by developing an analytical framework, which allows family farmers to assess the main obstacles in selling their products to the supermarkets. The literature review led to the conclusion that the characteristics of the farmer and farm, the available infrastructure, and institutional aspects compose a set of variables that significantly affect the capacity of the family farmers to sell their products to the supermarkets.

It is worth mentioning that separately, these factors are unable to explain the higher or lower participation of fruits and vegetables family farmers in the supermarket supply chains. Thus, results reported in this study have the academic merit of bringing together, in an analytical framework, the enabling and limiting factors in family farmers' participation in fruits and vegetables supply chains. Therefore, the entry of the family farmers into the supermarket supply chains does not only depend on the farmer and farm characteristics but also from the institutional aspects and the available infrastructure, to secure the conditions demanded by the buyers. The inevitable challenges for the family farmers to meet these requirements require the public and private policies that are demanded by supermarket supply chains.

We suggest that further research to empirically validate the theoretical proposition of this article. Since every study identified and analyzed in this research was developed abroad, it is important to validate these results considering the various regions in Brazil. Quantitative research on the family farmers allow us to validate and complement the theoretical constructs proposed in this study. The absence of Brazilian study puts forth an important limitation of this study and corroborates the importance of this article and how it fills the gap in the related Brazilian literature.

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## DECLARATION OF CONFLICT OF INTERESTS

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

## AUTHOR CONTRIBUTION

All authors contributed equally to designing and writing this study.

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