

The influence of relationships on loss and food waste in agrifood chains

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Abstract

This work aims to investigate the influence of interorganisational governance on losses and waste reduction in agrifood chains. The study considers dyadic relationships through Transaction Costs Economics (TCE) and Relational View (RV) theories, with interviews of multiple stakeholders in regard to the food chain in São Paulo. First, a conventional perspective from chain members that integrate the process flow, and another one focusing on stakeholders that have the role of support in the prevention. The empirical evidence shows the need to create institutional and relational mechanisms and highlight the role of external stakeholders that stimulate chain integration to reduce food waste.

Keywords: Food loss and waste; Relationships; Multistakeholders approach.

Introduction

According to FAO (2017), there are over 108 million people suffering from food security problems. And still there is 1.3 billion tons of food wasted annually, causing not only economic losses, but also a significant impact on natural resources (FAO, 2012). The relevance is highlighted as some of the targets of the Sustainable Development Goals (SDGs), where five of the seventeen objectives address food-related issues and therefore may be related to the food loss and waste phenomenon. That aims the reduction of food waste, decreasing the loss in production and supply systems until 2030 (FAO, 2017).

In the developing countries, around 40% of the loss happens in the post-harvest and processing phase (Gustavsson et al., 2011), primarily by the absence of food chain infrastructure and lack of knowledge and investment in technologies (Goldfray et al.,

2010). Previous literature on food waste show the importance of complex interrelations among different stages of the food chain (De Steur et al, 2016; Chaboud & Daviron, 2017; Gustavsson et. al., 2011; Mena et. al., 2011). Therefore, this study raises the need for a more integrated approach that mobilizes all stakeholders of the agrifood chain around a shared view for sustainable development (Sonnino & McWilliam, 2011).

The EU report (2016) showed the complexity in preventing waste in food chains and the need to perform a series of measures involving all the stakeholders along the supply chain. This study is justified for focusing on the interorganisational relationships from a multistakeholder governance approach. A multistakeholder initiative involves public, private sectors and general civil society in the formulating, implementation and monitoring of regulations for resolution of a main problem (Joachim and Schneiker, 2017). From this context, the research question is: What is the influence of interorganisational governance on food loss and waste in agrifood chains?

Besides this introduction, this study presents a theoretical background with the theoretical approaches towards involved in this theme, the methodology with the main methods used to understand the complexity of the phenomenon, as well as the data collection, the data analysis, findings and conclusions used in the conception of this study.

Theoretical Background

There are two main theories to understand supply chain governance. The first theory background is the Transactional Cost Economics (TCE). According to TCE, a formal contract, used as a transactional mechanism, is the main tool used to ensure a transaction, avoiding opportunism. The theory suggests three possible forms of governance: market, hierarchy and hybrid forms. The choice between each of these depends on the analysis of the production costs and the transaction type. In other words, the theory focusing on selecting the governance structures that minimize transaction costs for a specific firm (Williamson, 1985)

TCE is an important theory analysis of relationships between supply chain agents because it enables the analysis of the relationship as being a hybrid one, which combines the advantages of the other two forms of governance – hierarchy and market. A collaborative relationship between buyer and supplier can reduce the costs involved in the transaction and thus increasing the competitive advantage (Williamson, 1996).

However, relationships are often not purely collaborative or opportunistic. Therefore, it is necessary to have regard to the classifications used. TCE appears most often being used in conjunction with other approaches. It can be noticed that this analysis remains in the dyadic context, and do not explores another supply chain agents. The governance structure allows the involvement of multiple firms, but does not explain the interaction between them. The second theoretical background is Relational View (RV) that can be considered an extension of Resource Based View (RBV). Under both approaches, companies are considered a set of resources that are crucial for the formulation of strategies. While RBV focuses on internal resources of the company, RV suggests that idiosyncratic relationships between organizations are an important source of competitive advantage (Dyer & Singh, 1998). It means that the value generated by the relationship between the companies cannot be gained individually by the agents; they are the result of the agents combined resources. The development of relationships, alliances with suppliers who have the key capabilities, or even additional capabilities that will add are essential in the competitive landscape. Dyer and Singh (1998) propose that the relationship can generate four benefits: (1) investments in specific assets of a relationship – which works only for relations based on trust); (2) knowledge exchange –

which is due to processes and integration routines and information sharing; (3) Scarce but complementary resources – resulting in greater synergies and improved communication; and finally (4) lower transaction costs – due to more effective governance mechanisms, based on informal assurances such as trust and reputation (Dyer, 1996).

RV may complement other theoretical approaches, such as TCE. It demonstrates the potential and possibility of using relational resources – such as trust, to achieve competitive advantage and value creation in inter-organizational relations. This is not restricted to the agents involved in the classic dyadic transactions, but also to other stakeholders.

Dyadic relationships focuses on capabilities that can include the development of a long-term relationship, a collaborative communication, the design and use of cross-functional teams, the reduction of the supplier base, and the involvement of supply chain partners in order to create and deliver strategic value to customers and other stakeholders (Chen and Paulraj, 2004). The knowledge transferred from these business relationships are able to increase the quality and efficiency of the dyadic operations resulting in greater competitive advantage to the extended supply chain.

Nooteboom (1999) defined governance as a much broader notion than control. The author argued that the term aims to express that there are multiple interests, and that one of the greatest challenge is the balance of these interests and power relations, since in addition to economic and technological issues, moderators factors of inteorganisational relationships such as trust, relational risks, (Cao and Lumineau, 2015), regulatory structures, sustainability issues, political factors, among others (MacCarthy et al., 2016) need to be considered.

It is important to highlight that governance makes use of formal and informal mechanisms (Lumineau and Henderson, 2012, Liu et al., 2009). In general, formal governance mechanisms are adopted in dynamic and unstable circumstances defined as risky, uncertain, unpredictable, or organizational changes. These can result in coordination, control, availability results and performance. On the other hand, the informal mechanisms tend to be used in contexts where there are previous and long-term relationships between the members (Pilbeam et. al., 2012).

Formal mechanisms are described in the form of contracts and rules (Poppo and Zenger, 2002; Yang, et al. 2012). Legal contracts have been used to reduce the uncertainty about critical resources dependence in dyads. In addition, it specifies the follow-up procedures and sanctions in case of noncompliance, and determines when and what results should be delivered (Lumineau and Henderson, 2012).

Informal mechanisms are often linked to human assets, such as knowledge sharing routines developed over time that provide effective communication and cooperation (Dyer and Singh, 1998). Thus, the focus on governance in supply chains is the establishment of formal and informal mechanisms that enable the reduction of opportunism (Liu et al., 2009). On the other hand, it has been presented as one of the challenges of interorganisational relationships governance in order to encourage the cooperation, which will be directly depend on the dyad relationship power exerted by the focal company throughout the relationship length (Maloni and Benton, 2000).

The idea of complementarity is adopted in this research (Cao and Lumineau, 2015). As an example, Cao and Lumineau (2015) conducted a qualitative review and meta-analysis of the literature in order to better understand the relationship between contractual and relational governance. The results also indicated when the contracts, trust and relational norms are used together; they can improve relationship satisfaction and performance, and reduce the opportunism. These results provide strong evidence for

the complementarity argument of contractual-relational governance mechanisms and their joint impacts on performance.

In this paper, we expand to the concept of multistakeholder governance that is represented by dyadic relationships in a horizontal and network configuration. This expansion is proposed as stakeholders such as public agencies and third sector (Johnson et al., 2018) influence at the value chain level in many cases, such as food waste and loss. However, methodologically, the analysis uses dyads from the network to understand governance as it ranges in each relationships.

Method

This study aims to investigate the influence of interorganisational relationships in losses and waste in agrifood chains. Thus, its efforts focus on understanding this phenomenon in the different supply chain activities as well as the "why" and "when" they occur. The data was collected from producers, distributors, food service providers and small retailers within the same agrifood context in the largest Brazilian metropolis: the city of São Paulo. This city was chosen due to the complexity that surrounds large centres and the possible replicability of this research. The Brazilian context was deemed appropriate, since the country is an international food supplier.

This research uses a qualitative approach, which describes the complexity of a certain question and seeks to understand and classify dynamic processes of relationships on the supply chain. Semi-structured interviews were conducted *in loco* for different supply chains, with several local stakeholders involved. The data were analysed using content analysis, aiming to interpret ideas and categorize them by topic (Laurenci, 2009).

Data collection

The study began by developing a semi-structured guide for each value supply chain. This initial script was pre-tested with academic experts that suggested changes to some questions so the script would become more easily understood by supply chain agents. Then, data collection started with public agencies supporting agriculture in the target regions and these interviewees suggested local producers as important additional contacts. This process characterised the technique of snowball sampling (Scarborough et al., 2004).

Secondary data, such as annual sectoral reports, found either on the web or through printed leaflets, complemented the data collection. The initial information guided our sample coverage regarding the diversity and representativeness in each supply chain.

The scope of the research was defined based on reports from the Broad National Consumer Price Index on the calculation of seasonal food products, and on lists of the most consumed products in São Paulo. Only producers in the state of São Paulo who supplied food to the capital were chosen. A group of ten products, including their nutritional value and product variations, was considered for analysis. The products analysed were: lettuce, cauliflower, cabbage, rice, bean, corn, orange, potato, pineapple and apple.

In addition to the ten products chosen, the study also tracked how the losses occur in each activity of the supply chain. There were two broad analysis categories, the first category composed of supply chain members' activities that integrate the flow of production process and the commercialisation of food, called producer (PR), distribution (DS), food service (self-service restaurants) (PC), and small and medium retailers (RE). The second category is made up of supply chain member stakeholders that are transversal to the chain, regarded as stakeholders that have the role of support,

either in the prevention of losses and waste or food reuse. These stakeholders were NGOs and food banks (FB), Social businesses (SB), and public institutions, cooperatives and unions (PI). Furthermore, thirty-one interviews (numbered from 1 to 31) were carried out, considering a focus group and other interviews with more than one interviewee. New interviewees were included in the sampling to the point of theoretical saturation, where no new insight was provided (Strauss, 1998). The interviews included supply chain members as follows: 9 producers, 3 small retailers, 6 self-service restaurants, 1 large distributor. Other stakeholders interviewed were: 3 public agencies (Coordination of Integral Technical Assistance, an public organisation of support for the producer), 4 cooperatives, 1 union, 2 NGOs, and 2 social businesses.

The interviews were carried out from August 2017 to February 2018 with stakeholders from each value chain activity. All interviews were face-to-face (with an average duration of one hour), conducted each week during the six months, and recorded in audio with consent. In cases in which recording was not possible, the researchers took notes for data analysis.

The interviews used a semi-structured protocol as proposed by Yin (1989), based on the literature review that guided data collection and ensuring the reliability and replicability of the research. The protocol included questions about relationships, possible causes and solutions to waste generation, processes and level of supply chain integration. Respondents were also asked to provide illustrative examples whenever possible.

Data analysis

In the process of analysing and interpreting the collected data, the study followed the content analysis guidelines, according to which some categories emerged from collected data. During data collection, the main findings and perceptions were recorded immediately after each interview and the emerging topics were explored in subsequent interviews.

Each of the researchers coded the interviews separately, but they were shared through an online system and the coding scheme was discussed later. Data analysis began with the identification of the main categories within each group (members of value supply chain activities). Existing relationships, the type of relationship and the profile characteristics among these stakeholders were initially identified.

After that, the specificities of each value chain activity were examined in order to define first-order categories, which consists of the interviewee's own language (Gioia, Corley & Hamilton, 2013). This process resulted in 67 first order categories, and later a search for more categories that could relate to the topics observed and that would lead to more open categories was carried out; 11 second-order categories were found. At the end of this step, the second-order categories were grouped into 4 larger theoretical dimensions (Strauss & Corbin, 1998). To better understand the process in different supply chain members, this research adopted an analysis for dyad relationships (Brito & Miguel, 2017), and this dynamic helped to investigate how formal and informal mechanisms influencing these relationships happen.

Finally, the data structure was discussed in attempt to understand the complexity of the relationships from emerging concepts and the collected data was consulted for confirmation (Gioia et. al., 2013). The data were collected and rigorously analysed to ensure the reliability of the results.

Findings

This research aimed to understand how relationships influence food losses and waste in a metropolis such as the city of São Paulo, Brazil. There are different supply chain members involved in the food chain. The product goes along these supply chain members through relationships, with each of these processes presenting different dynamics that determine how much food will be consumed and how much will be wasted throughout the process.

The results point to different and multiple relationship between stakeholders, whether contractual or informal, and the level of these relationships, the difference between public and private relationships and the level of influence of different ways on food loss and waste. Some weaknesses, such as regulatory institutional voids and lack of supply chain governance were highlighted. Besides, joint actions between the private and public sector were not found.

Based on data analysis, four dimensions and eleven categories were identified that help to explain how these relationships can influence the losses and waste in agrifood chains, as well as the most relevant aspects in the complexity of each dyad, which are: the legal context (legislation); power (asymmetry of power, trust and transparency in the relationship); compliance (control, contract and institutional partnerships); performance (engagement, transfer of responsibility, institutional responsibility, integration and communication).

Legal context

Brazilian legislation is complex and this can contribute to certain supply chain members and inhibit actions that could influence others members. The role of dissemination of information and communication in a problematic legal context such as the Brazilian one, which can reflect important institutional and social changes, is also highlighted.

The government, despite not being in the traditional value chain, acts through the laws as an influencer of all supply chain members; the Brazilian legal context may represent an institutional barrier for some supply chain members such as food service and retailers, but a partner for producers and distributors. Some Brazilian resolutions establish rules on donations that discourage restaurants or retailers from adopting this kind of practice. In addition to safety margins for shelf life, impeding donations and leading to severe punishment to establishments.

The relationship between producer and distributor is characterized by different contexts, which may be influenced by the size of the rural property, since the small producers have the alternative of taking advantage of government programs. In this dyad, there are controversial aspects between producer and distributor, largely because of the lack of bargaining power between the parties, food transport and high costs for the producer.

In the dyadic relationship between *producer - retailer*, *retailer - distributor* and *food service- retailers*, the legislation exerts little influence in the transactions. However, communication is one of the categories of this dimension that can present itself as a barrier. There is little space for information exchange or shared guidelines among these supply chain members, and for participation in discussions or courses focused on topics of interest, including losses and waste.

Other stakeholders, such as NGOs and food banks act as important agents in both food reuse and in the process of communication and information. Excessive demands and severe punishments on food donors are inhibiting their activities in the country, and these NGOs take on this responsibility, significantly contributing to food waste. Social

businesses are contributing to the creation of consumers that are less concerned with the appearance of the product and more aware of the nutritional quality of the food.

Power

The dimension of power corresponds to the aspects that determine the type of relationship between the supply chain members. The power asymmetry in relation to the supplier, can be through formal or informal mechanisms.

There is also an influence of trust that can result in more flexible relationships to facilitate negotiations. Also, transparency can develop a sense of justice, reducing bottlenecks that impede more organized action in the relief of food waste.

Considering the producer and distributor relationship, there are often intermediations made by stakeholders such as cooperatives and transporters. The producer has little bargaining power and difficulties of direct access to the market. As a result, it often discourages the producer from selling to the food distributor in urban cities (such as São Paulo).

In the relationship between producers and retailers, there is an intense demand of standards regarding product appearance. The selective process made by the producer is sometimes intermediated by a cooperative that also makes another selection and adopts the retail standards that choose the products that are going to be on the shelf. Small producers can have their relationships with retailers intermediated by cooperatives, since there is little direct relationship with retailers, more formal mechanisms are used, since larger producers with less dependence on retailers can manage both supply chain members and use their own brand. Additionally, there is no trust and transparency in the relationship between retailers and producers, generating a competition that is often based on price among producers. This scenario directly influences the small producer, who often decides not to sell the product and lets the crops rot due to the logistics costs.

When considering the relationship between retailer and distributor, formal mechanisms are used more often, and, also, the distance and transportation to the city centre are facilitated by the location of the retailer. However, the route the food travels is longer and can contribute to greater losses throughout the process. In the dyad of food processor and retailer, there is no relationship between these supply chain members, neither formal nor informal, but part of the food service in more sophisticated segments seeks a direct relationship with the producer, through more informal mechanisms, eliminating the intermediaries and increasing the trust in the delivery of the products with transport made by the own producer.

In the case of the stakeholders outside the supply chain, the relationship is balanced and there are no formal mechanisms involved, NGOs, social businesses and government institutions act as important bridges between supply chain agents, connecting supply and demand.

Compliance

The interorganisational relationships include a range of practices that can exert influence on losses and wastes. The institutional partnerships involving the public, private and third sectors can be governed by contracts that determine the quality and appearance standards, as well as control what is not fixed in a formal relationship. These criteria are more subjective, thus both practices (formal and informal) can influence the amount of food wasted.

Contracts, mechanisms of control and partnerships are structures that influence waste, either by the excess of standards that increase the aesthetic quality of the food, nevertheless generate losses and waste, or by the formalization of contracts to govern

the relationship, reducing the uncertainty of the business and guaranteeing the sale, thus reducing the possibility of losses.

The dyadic relationship between producer and distributor is based on informality, with a high degree of uncertainty. There are no formal contracts in this relationship but the distributor sets the rules, exerting control, and creates an asymmetrical relationship. This creates a market dependence for producers.

The relationship between retailer and producer remains asymmetrical, although it is formalised by contracts that guarantee the business and control with high level of strictness. Packaging is a control mechanism seen as positive in the fight against food waste, since it allows greater food protection and conservation. Even with the formalization of contracts, in the relationship between retailer and distributor there is a possibility of negotiation. This partnership is still governed by formal mechanisms to reduce food waste and to guarantee the exchange and maintenance of stocks.

The relationship between the food service and the other supply chain members, regarding compliance, is based on spot market transactions and not on relationships. According to the interviews, there are no contracts and the control is done based on the quality of the product versus the price.

Stakeholders in this category have a important role in partnership.. Producers interact with public institutions through technical support programs. NGOs and social businesses relate to producers and retailers for the same purpose. Partnerships in this relationship are essential to ensure that food that could be wasted is withdrawn by companies for re-destination.

Performance

Each activity carried out corresponds to the level of supply chain members commitment and engagement to the relief of food losses and waste. These activities usually do not expand to other supply chain members' activities. Although they have proved important in the context in which they are inserted, each member represents a responsibility, with practices that can collaborate to mitigate food waste.

There are signs of transfer of responsibility, some supply chain members exempts itself from that responsibility, attributing the need for commitment always to the subsequent member. Integration in the supply chain was also an important aspect. As the relationship between producers and retailers includes an intense control mechanism, engagement is fundamental for compliance with the rules and specifications of the relationship. Control mechanisms and asymmetry of power also generate a transfer of responsibility to the producer, which absorbs the costs.

In the producer and distributor relationship, there is no integration or engagement, the distributor has an informal relationship marked by uncertainty, causing the producer to lose with the absence of a stakeholder that integrates it in the chain with the retailers, markets and consumers. Just as in the producer's relationship, the retailer and distributor relationship is also characterised by the loss of food due to lack of integration; the product does not get to supermarket shelves. However, when this relationship occurs in an integrated way, the responsibility is solidary; both take the commitment to avoid waste.

Food service operate isolated from the rest of supply chain. There is no engagement, and their relationship with the retailer is only by spot market. The responsibility is attributed to the processor, who justifies this action due to the costs generated by food waste. However, it is not the case that there is a lack of information about the relationship between these categories and the extent of the exchange of information and waste.

The NGOs are more focused on prevention, and social businesses in creating alternatives for the disposal of products outside the conventional aesthetic standard. Integration and engagement are also important aspects of these drivers, which act to eliminate the institutional voids created by the absence of distributors.

Other stakeholders can influence relationships, such as government agencies and cooperatives. These are important partners of producers, since communication in the relationship between producers and public institutions is characterised by an intensity in the frequency of the relationship, with courses and as producers find difficulties to interpreting laws and planning production, among others.

Conclusions

The study aimed to answer what the influence of interorganisational governance is on food loss and waste in agrifood chains. The research was developed through interviews with multistakeholders. Based on the results, four dimensions were identified that integrate important aspects that influence food loss and waste. These dimensions are composed of groups of categories related to theories used, as well as emerging categories, such as institutional engagement.

Considering the supply chain governance based on the traditional aspects of the market, it is possible to explain its relationships from the perspective of Transactional Cost Economics (TCE), in which there is a coordination through contracts, control and formal aspects.

The development of relationships, alliances and partnerships among multistakeholders acts as an important driver of change, acting on the gaps between supply chain members more efficiently. The dyadic relationships between stakeholders and supply chain members reduces asymmetry of power, lack of communication and integration into the chain. Explained by a Relational View (RV) theory, this type of could benefit the entire chain if it were expanded to supply chain members and their vertical linkages.

Despite the individual efforts of supply chain members, there is a lack of integration in the chain, communication difficulties and lack of sharing responsibility that barrier reducing food loss and waste.

The research highlights the need for creating more efficient institutional and relational mechanisms emphasizing the meaningful influence the role of stakeholders has on reducing loss and waste in agrifood chains.

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