



# The response of the Brazilian cashew nut supply chain to natural disasters: A practice-based view

Minelle E. Silva <sup>a,\*</sup>, Susana C.F. Pereira <sup>b</sup>, Stefan Gold <sup>c</sup>

<sup>a</sup> University of Fortaleza, Brazil

<sup>b</sup> Fundação Getúlio Vargas, Brazil

<sup>c</sup> University of Kassel, Germany

## ARTICLE INFO

### Article history:

Received 25 December 2017

Received in revised form

13 August 2018

Accepted 30 August 2018

Available online 15 September 2018

### Keywords:

Food industry

Supply chain sustainability

Practice-based view

Natural disasters

Emerging countries

## ABSTRACT

In the face of natural disasters, companies attempt to maintain the sustainability of their business by implementing an appropriate set of organisational practices. Based on the practice-based view of strategic management, this paper aims to identify intra- and inter-organisational supply chain practices that help focal companies in the cashew nut supply chain in Brazil respond to natural disasters. To this end, three in-depth, qualitative case studies informed by semi-structured interviews and secondary data were conducted in Brazil. The data were analysed using qualitative content analysis supported by NVivo software and based on an analytic framework that links resources and practices to performance in a natural disaster context. The findings indicate that companies embark on different trajectories depending on the resources and practices they deploy in response to natural disasters. While one company demonstrated a negative performance due to competitive inertia and low productivity, two companies maintained and increased their performance results based on inter-organisational collaboration. Findings demonstrate that responding to natural disasters requires companies to reorganise their strategies towards sustainability and to develop new practices such as food safety, organic production and social responsibility.

© 2018 Elsevier Ltd. All rights reserved.

## 1. Introduction

Climate change impairs food production on a global scale, and adaptation to its effects is a huge challenge for food producers, specifically in emerging and developing economies (Rosenzweig and Parry, 1994). While northern Brazil, which produces 99.4% of Brazilian cashew nuts (Vidal, 2016), has experienced a certain degree of climatic extremes for centuries, in the last years, this region has been increasingly affected by droughts that threaten livelihoods and food security and disrupt food supply chains. The droughts have had a negative effect on the harvest of many cash and subsistence crops, including cashew nuts. In Brazil, the total volume of cashew nuts exported in 2017 was US\$ 114,089,701 (AliceWeb, 2018). Although the cashew plant is generally considered a drought-tolerant crop (Oliveira et al., 2006), continuous water scarcity may substantially reduce its yield; such scarcity was,

for example, experienced in the Brazilian northern state of Rio Grande do Norte in 2015 (Pekic, 2015).

This situation has forced agribusinesses in Brazil that process and sell cashew nuts on the national and international markets to devise strategies for mitigating the impacts of these droughts on their supply chains (Dasaklis and Pappis, 2013). Some previous work has addressed cashew supply chains without, however, using natural disaster and sustainability framing. Agyemang et al. (2016) investigate the greenhouse emission reduction of cashew production in West Africa. Meanwhile, another study discusses global market access to cashew nuts via women's empowerment in the rural context of the Philippines (Dela Cruz, 2007). Regarding Brazil, Oliveira and Ipiranga (2011) claim that innovation in cleaner production helps foster the cashew industry and the involvement of different stakeholders supports local development.

In a natural disaster context, droughts are complex disasters, as they have both man-made and natural causes, and they are difficult to address (Starr and Van Wassenhove, 2014; Van Wassenhove, 2006). Responses to droughts fall into the realm of disaster management, which has been classified into various phases by scholars of the emerging research stream on humanitarian logistics and

\* Corresponding author.

E-mail addresses: [minelle.silva@unifor.br](mailto:minelle.silva@unifor.br) (M.E. Silva), [Susana.Pereira@fgv.br](mailto:Susana.Pereira@fgv.br) (S.C.F. Pereira), [gold@uni-kassel.de](mailto:gold@uni-kassel.de) (S. Gold).

supply chain management (SCM; e.g., Kovács and Spens, 2007). According to the prominent classification developed by Van Wassenhove (2006), these phases include mitigation, preparedness, response and rehabilitation, the last phase also known as reconstruction (Heaslip and Barber, 2014).

To prevent disruptions in the Brazilian cashew supply chain, the mitigation phase (i.e. reducing the potential impact of droughts) and the preparedness phase (i.e. implementing measures to respond in case of a drought) seem to require utmost attention. Hence, when facing climatic extremes in northern Brazil, managers of focal companies (i.e. cashew nut processors), together with farmers and other actors along the supply chain, may devise adequate intra- and inter-organisational supply chain practices for ensuring supply chain sustainability, as well as a stable product supply into consumer markets. Thereby, the sustainability of the Brazilian cashew industry may be operationalised along the triple bottom line (TBL). The TBL concept, as first proposed by Elkington (1997), predicates upon the assumption that economic sustainability measured by financial and operational indicators on a company or supply chain level (Shepherd and Günter, 2006) is insufficient for companies contributing to sustainable development (WCED, 1987). Dyllick and Hockerts (2002) point out in their seminal paper that in the long run, all TBL dimensions (i.e. social, environmental and economic) must be addressed and satisfied simultaneously and equitably while keeping their multiple interrelations into account, including trade-offs and conflicts between sustainability dimensions (Hahn et al., 2010).

In this study, we apply the recently emerging theoretical lens of the practice-based view (PBV; Bromiley and Rau, 2014, 2016a, b) and its extension to supply chain practice view (SCPV; Carter et al., 2017) to identify supply chain practices that substantially help the industry mitigate the potential impacts of and prepare for drought-inflicted supply chain disruptions and other negative effects on the TBL. Bromiley and Rau (2014, p. 1249) define a practice “as a defined activity or set of activities that a variety of firms might execute.” According to Carter et al. (2017, p. 116), an inter-organisational SCM practice is “a set of activities that spans different formal organisations and that other supply chain dyads or networks can imitate.” These practices are principally imitable by many other actors across the industry and thus allow specific managerial recommendations regarding how to prevent supply chain disruptions and how to maximise the overall beneficial impact on sustainability.

This leads to the following research question: Which intra- and inter-organisational supply chain practices help focal companies respond to natural disasters in the cashew nut supply chain?

The remainder of the paper is structured as follows. The next section provides a background review on the theoretical lens of the PBV and its extension to SCPV, and it reviews intra- and inter-organisational supply chain practices before proposing an analytic framework for investigating our research question. Subsequently, we describe the qualitative research design, which includes data collection via in-depth interviews and content analysis using the NVivo software. After presenting the results of our analysis, we discuss to which extent the PBV represents a powerful theoretical lens for investigating the transition of industries towards (greater) sustainability and for fostering sustainability in supply chain business practice. The final section concludes by discussing the limitations of our research and suggesting avenues for future research.

## 2. Theoretical background

In this section, we address two topics central to our research question and we then consolidate them into an analytic framework that has guided our efforts of data collection and analysis. The first topic is the PBV and its extension to the SCPV, while the second

topic is related to intra- and inter-organisational supply chain practices.

### 2.1. Practice-based view and supply chain practice view

Rather than being isolated actions that alone may not add value to companies (Hitt et al., 2016), practices are bundles of activities that interact with each other, are related to intra- and inter-organisational performance and help managers make decisions (Bromiley and Rau, 2014; Carter et al., 2017). To perform a practice, it is necessary to consider the organisational context and the level of adoption. A practice may have a positive or negative impact on corporate performance, and it can be observed directly or indirectly across firms (Bromiley and Rau, 2016a, b). The PBV, which has emerged recently, represents a largely unexplored theory (Carter et al., 2017) that could enable management researchers to understand strategic options and guide managers in their decision-making.

The PBV has been presented as an alternative to the resource-based view (RBV) for understanding firm-internal strategizing. It features the following distinct differences: (1) the dependent variable is firm performance rather than long-term competitive advantage and (2) the PBV applies to practices that do not (or only barely) have isolating mechanisms and hence that can be transferred across firms (Bromiley and Rau, 2014).

Carter et al. (2017) have extended the PBV to supply chains and hence are arguing for a SCPV: “PBV focuses on differences in performance among firms across the entire range of performance ... [and] the explanatory variables in the PBV are practices that are imitable and amenable to transfer across firms, as opposed to [...] RBV” (p. 115). The authors propose extending the perspective on practices throughout the supply chain—on a dyad, triad and extended network levels. SCPV considers (1) imitable practices, (2) two or more organisations in the supply chain and (3) combined performances across organisations (Carter et al., 2017). It thus focusses on the relational character of practices and mutual, inter-organisational benefits. This means that under certain conditions, practices must be shared among supply chain members and not be performed alone to achieve a better performance in the market. This holds true, for example, for total quality management (Bromiley and Rau, 2016a, b), as well as for inventory management and corporate sustainability (Carter et al., 2017).

Hitt et al. (2016) underline that the PBV should not be seen as a substitute for the RBV; rather, these two theoretical perspectives should instead complement each other. This view is also supported by Carter et al. (2017, p. 114), who assert that there are “no discrete boundaries between practices and resources”. In fact, practices are often coupled with resources to be implemented in an effective way. The specific interplay between resources and practices may decide about how the practices actually impact organisational and supply chain performance.

Regarding the question of how to enhance sustainability within industries, it becomes obvious that the focus on transferable practices is more prolific than a focus on non-imitable resources. The latter focus indeed prevents sustainable practices from spreading over an industry. If supply chain practices for enhancing sustainability are shared across companies within a supply chain, their actual implementation still relies on firm-internal contingency factors, such as their specific coupling with firm-internal resources; thus, the implementation of supply chain practices and their effectiveness may differ between companies (Carter et al., 2017).

### 2.2. Supply chain practices

Next to flows, resources and relationships (Mentzer et al., 2001;

Burgess et al., 2006), the concept of *practices* has played an important role in SCM as well as in its extension to sustainable supply chain management (SSCM) (cf. Seuring and Müller, 2008; Pagell and Wu, 2009). In general, supply chain practices, also known as SCM practices, denominate what is actually or —more literally— *practically* done to manage supply chains. In this way, supply chain practices can be seen as activities or bundles of activities that are executed by firms across an industry, which is in line with Bromiley and Rau's (2014) definition of a practice.

In the field of SCM, Li et al. (2006), for example, have investigated the impact of SCM practices on competitive advantage and organisational performance, specifically examining the practices of strategic supplier partnerships, customer relationships, the level and quality of information sharing and postponement. Several other studies have been designed to identify SCM practices in certain countries and industry segments (e.g., Basnet et al., 2003).

In the field of SSCM, Pagell and Wu (2009), for example, compared (supply chain) practices linked to sustainability that have been previously discussed in the literature (e.g. supplier certification, supplier development, life-cycle thinking) with new (supply chain) practices identified through their multiple-case study research (e.g. traceability, decommodification, transparency) before consolidating both traditional and novel practices into a model of SSCM practices. As another example, Walker et al. (2008, p. 69) describe green supply chain management practices as “reducing packaging and waste, assessing vendors on their environmental performance, developing more eco-friendly products and reducing carbon emissions associated with transport of goods”. Traditionally, SSCM practices have focused on the environmental side (e.g. Zhu et al., 2008), but the social side has gained attention recently (e.g. Sancha et al., 2016), specifically through its integration into the comprehensive concept of sustainability operationalised as a TBL on the company and supply chain levels (cf. Dyllick and Hockerts, 2002).

Carter et al. (2017) propose a distinction between intra- and inter-organisational SCM practices on a continuum from individual, team, function and organisation (all intra-organisational) to dyad, triad and extended network (all inter-organisational). The authors note that “inter-organisational SCM practices conceptually differ from intra-organisational SCM practices in that they require mutual efforts from two or more organisations to be effective” (Carter et al., 2017, p. 116). Based on this logic, such practices as supplier-balanced scorecards, internal supply chain integration or supplier selection would be located on the intra-organisational side, while supplier development, joint product development and vendor management of inventory would be conceived as inter-organisational supply chain practices. SSCM practices could be mapped similarly along such a continuum, with supplier sustainability-balanced scorecards on the intra-organisational side and joint-sustainable product development on the inter-organisational side.

Previous literature has acknowledged the particular importance of inter-organisational resources, capabilities and practices when supply chains embrace TBL performance measures. Aiming for economic, environmental and social performance along a product's life-cycle requires even closer interaction between all firms involved (Gold et al., 2010), the consumer base and also other non-traditional members of supply chains, such as non-governmental organisations (NGOs) and governmental agencies (Pagell and Wu, 2009). Therefore, SSCM—at least in theory—is linked closely to a collaborative or partnership approach (Gold et al., 2010), and such SSCM practices as supplier development are predicated on inter-organisational collaboration (Yawar and Seuring, 2018).

### 2.3. Analytic framework

Natural disasters can cause many harms such as life losses, decreases in livelihood conditions, severe damages to infrastructure and buildings and unemployment. Data from the Centre for Research on the Epidemiology of Disasters (CRED) shows an increasing occurrence of natural disasters all over the world in the last decade and their impact on society expressed in number of victims, people affected and increase in economic costs. Data on the global distribution of natural hazards indicate that although droughts have a much lower occurrence than floods and storms together, they impact a larger number of victims (Strömberg, 2007). Some authors call attention to research that looks at the shift in types and frequency of disasters towards occurrences of more small and medium-sized disasters, such as droughts (Star and Wassenhove, 2014).

Some characteristics, such as poor infrastructure and lack of planning and governmental preparedness, worsen the impact of natural disasters in emerging and developing economies than in more developed ones (Oh and Oetzel, 2011). Disasters can more severely affect economic activities and growth in developing economies, as a wide range of industry sectors may be affected (Loayza et al., 2012). In the past two decades, there has been a growing interest in the literature in natural disasters; within this literature, however, there is a large number of studies conducted by American researchers and based on mathematical models (Leiras et al., 2014). Moreover, despite the damage and number of affected people resulting from slow-onset events, such as drought, the focus of most studies about natural disasters are mainly on sudden events (Altay and Green III, 2006). In addition, little attention is paid to commercial organisations and their supply networks in the context of natural disasters (Altay and Ramirez, 2010).

Due to their characteristics of urgency and uncertainty, disasters bring several challenges to operations management (Altay and Ramirez, 2010). Water security, which impacts both the minimum supply of water resources and the capacity to develop social and ecological resilience in agricultural landscapes, is of utmost importance for the ability of an agricultural system to continue being productive after a disruption, such as a drought (Falkenmark and Rockstrom, 2008). Moreover, in a recovery context, it is important to invest in building environmental concern as an important strategy for reducing economic, environmental and social vulnerability to achieve the sustainability of livelihood activities (Alexander and Chan-Halbrendt, 2006).

We consider that northern Brazil has been experiencing a reoccurring slow-onset disaster (i.e. aridity and droughts), which has substantially impaired the performance of the cashew nut industry. This is the organisational context, within which the cashew supply chain is situated. Therefore, to mitigate the potential impact of droughts (mitigation phase) and be prepared for when a drought happens (preparedness phase), companies may develop appropriate practices to be implemented across their supply chains, leading to performance enhancement, such as strengthening resilience in cases of reoccurring natural disasters. Based on this argument and the concepts discussed above, Fig. 1 summarises how supply chain practices can be analysed within the context of natural disasters.

According to the practice-based logic, the organisational context around companies crucially influences the implementation of the practices and hence the performance (Bromiley and Rau, 2014). For instance, once a natural disaster such as aridity and droughts, hits companies, the effective exploitation of resources and implementation of practices hinge upon a set of contingency factors. On the other hand, practices may require a combination of less

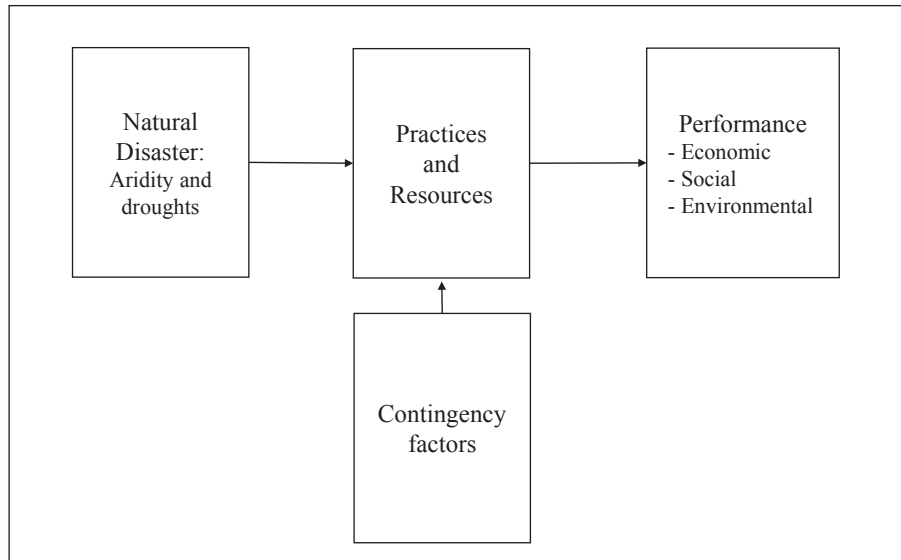


Fig. 1. Analytic framework for investigating the resources and practices when facing a natural disaster.

imitable resources and assets; the way resources are combined ultimately influences performance across firms (Carter et al., 2017). Following this logic, in the case of the Brazilian cashew supply chain, several contingency factors (e.g. institutional factors, complementary partner resources, orientation towards sustainability) determine how companies combine resources and perform practices to respond to disasters and improve performance on economic, social and environmental dimensions. For instance, a new practice influence the emergence of new performance outcomes, which is possible from individual or a set of companies' behaviour.

### 3. Methodology

To answer the research question, we applied a qualitative, multiple-case study design (Yin, 2014) and examined three in-depth cases of cashew nut processors in Fortaleza city (Brazil). The research is structured along the five-stage research process as proposed by Stuart et al. (2002), which comprises formulating the research question, instrument development, data gathering, data analysis and dissemination. As we have formulated the research question at the end of the introduction, we describe the four subsequent steps below.

#### 3.1. Instrument development

Data collection started in September 2016 in Ceará state, northern Brazil, when an exploratory interview was conducted with Brazilian Agricultural Research Corporation (Embrapa) members (Appendix A). This pilot phase was necessary to understand better how strategies and technologies are being developed in the sector to increase cashew production in northern Brazil and to understand how members of the supply chain are responding to reoccurring droughts. Based on the exploratory interview, a new interview guideline was developed to understand clearly the site context. Thus, semi-structured interviews were conducted face-to-face with each company's participant (Appendix B).

#### 3.2. Data collection

Currently, only four companies in the region are still processing cashew nuts because 21 companies ceased their activities in the last

years. The reasons for those companies abandoning the market include the international economic crisis, as well as the lack of natural resources (Vidal, 2016). For the case studies, two companies still processing cashew nuts were selected as well as one company that had abandoned its activities at the end of 2015. Therefore, three companies were interviewed to understand organisational practices (Table 1). By including one company that has closed, we are responding to calls to study "negative" or "deviant" cases (Piekkari et al., 2009).

Primary data were collected from September to December 2016 through interviews. Relevant secondary data (e.g., website information, internal files) complemented and validated the information gathered during the interviews. Interviews and secondary data were collected in Portuguese, and two scholars translated them into English using the reverse translation strategy to ensure no misunderstanding in the data. During analysis, some transcripts along with additional questions were sent back to some interviewees to solve questions that had emerged. Finally, during technical field visits to each company, the entire production process was presented to the lead researcher, which helped in understanding how and under which circumstances cashew nuts are processed in northern Brazil.

#### 3.3. Data analysis

To make our content analysis more robust, we used a structured technique supported by NVivo version 11, a software for qualitative data analysis. Aiming at building theory from case study, our data analysis processes were "recursive cycling among the case data, emerging theory, and later, extant literature" (Eisenhardt and Graebner, 2007, p. 25). These processes allowed a close interaction between data collection and data analysis. A coding system was developed based on the literature, and it was adopted to analyse each interview (Miles and Huberman, 1994). Using this process, we were able to identify commonalities and differences existing between SCM practices and resources (Eisenhardt and Graebner, 2007). However, although some categories were previously defined based on literature and on our proposed framework, by constantly comparing data with the existing literature some categories were further expanded (Eisenhardt and Graebner, 2007, p. 25) and new ones emerged.

**Table 1**  
Interview information.

Organisation	Interviewees	Role of participant	Interview length
Embrapa	Research and development (R&D) manager	Manager of the Brazilian research centre of the cashew plantation and develop solution for the cashew waste with its group.	51 min
Company 1	Consultant	Responsible for research on watering of the cashew plantation.	30 min
	Quality manager	Responsible in Company 1 for ensuring the products are under specification	48 min
Company 2	Purchasing manager	Manager responsible for integrating the relation with suppliers and engaging them in the SC	40 min
	Quality manager	Responsible in Company 2 for ensuring that all certifications are under specification	42 min
Company 3	Purchasing manager	Manager responsible for integrating the relation with suppliers and engaging them in the SC	52 min
	Quality manager	Responsible in Company 3 for ensuring that all certifications were under specification	60 min
	Purchasing manager	Manager responsible to negotiate with and integrate suppliers in the SC	40 min

First, we read each interview to capture important aspects of the concepts involved in the study and depicted in the analytical framework (Fig. 1): drought, SCM practices, resources, contingency factors and firm performance. It was possible to identify quotes related to these concepts in all the interviews. Fifty-four codes were created, and the language of the ideas and examples was retained as expressed by the interviewees whenever possible. Then, we analysed each code to verify the possibility of merging them by considering similarities and differences, and at the same time searching for conciliation with the literature concepts (Gioia et al., 2013), which enabled the changing of the names of some codes and the reducing the quantity to 48 codes. The next phase was to link and relate the codes following a relational logic. For example, low crop yields are a consequence of some phenomena reported by the interviewees: drought, old cashew trees and low preparation to deal with nature. This process was supported by the software, researchers' experience and close interaction with empirical reality and the literature review.

### 3.4. Dissemination of findings

To ensure this case study research was rigorous—following the final step by Stuart et al. (2002)—three main actions were conducted. First, reliability of the findings was supported using a research protocol and creating a database to understand the cases comprehensively (Yin, 2014). Additionally, high levels of internal validity were ensured by triangulating all the data sources that were collected (Yin, 2014) and by seeking to reduce researcher bias during data collection and analysis through reflecting findings back to the interviewees. Moreover, construct validity (Gibbert et al., 2008) was addressed using the deductive research approach, which uses theoretical elements proposed and corroborated by previous research. Finally, this case study research may claim some degree of external validity (i.e. generalisability) beyond the Brazilian context and the cashew nut industry through theory-led abstraction of the findings.

## 4. Findings

### 4.1. Case overview

The country's cashew production is concentrated in the northern region of Brazil. Ceará state represents 36% of all Brazilian cashew nut production (IBGE, 2017). Cashew production has a significant social and economic impact in this region; therefore, it has been defined as a cultural heritage. Cashew nuts have been both the source of livelihood and a symbol of the region since the 1970s, when the cashew tree started to be commercially used as a result of several programmes implemented by the Brazilian government. Well-adapted to the semi-arid climate of the region, the cashew tree was assigned the role of spurring development in the region. However, during the last six years, total rainfall has been

less than expected, which may be characterised as a slow-onset natural disaster.

Different actions have been taken to address the impacts of the drought and to be prepared for future drought periods. These actions spur new behaviours in the market and stimulate more integration between the actors within the sector. One of the major players that aims to facilitate the increase in cashew production is the Brazilian Agricultural Research Corporation (Embrapa). Since the 1990s, Embrapa has focused on Tropical Agribusiness in Ceará state to foster the efficiency of cashew production by developing several technologies. For instance, according to Embrapa's R&D manager, "there is currently technology to increase the production from 130 kg/ha to 1000 kg/ha"; however, there are problems with implementing some technologies. As claimed by Embrapa's consultant during the interview, "there is lacking much more than water, because the majority of producers does not manage correctly the production."

This shows that new behaviours must be adopted by members of the cashew nut sector. These personnel must devise and implement practices that make companies and their supply chains more resilient to drought and aridity. To do this effectively, actors within the sector must collaborate horizontally and vertically. Considering the complexity of the cashew supply chain, we selected for this case study research the focal companies (i.e. cashew nut processors) that have significant power to influence industry performance—see for a similar approach Carraresi et al. (2018). The characteristics of each of the three focal companies are presented as follows.

**Case 1:** Company 1 has processed cashew nuts since 1992. According to its strategic plan, it has been highly committed to stimulating positive changes in society at large during the last two decades. The company is medium-sized, with around 600 employees. In 2017, the company obtained organic certification, which indicates that the drought period allowed the company to take opportunities to change its practices towards greater sustainability, such as implementing organic farming. Indeed, the company has several ongoing social responsibility projects and has achieved related rewards, it features rather high-level patterns of environmental efficiency (e.g. in 2017, wind power accounted for 100% of its energy consumption) and it performs local developmental actions that include the poor community around the company in the company's manufacturing processes. Additionally, the company meets the FSSC 22000 (Food Safety System Certification) standard. To ensure its activities during this drought period, it has imported cashew nuts from Africa (mostly from Ivory Coast) in partnership with other local companies; at the same time, it maintains a close relationship with Brazilian suppliers to gain the organic label. This shows that during the last years, this company has adapted several practices to reduce the impact of the drought and to increase the company's economic, social and environmental performance.

**Case 2:** Company 2 is one of the major export companies in Ceará state, with 95% of their products being traded or

commercialised in the international market (e.g. the Netherlands, Italy). The company is more than 50 years old and it employs more than 700 people. In the face of the current drought period, the company has maintained its organic cashew nut production line, mostly because the company has its own farms. Sustainability is part of its strategy, and the company has environmental programmes to strive for a lesser environmental impact in various capacities, such as solid waste and greenhouse gases. Additionally, the company combines local development and social practices at the four farms it owns, thus enhancing the quality of life of both their employees and the local community. The company applies several standards, including the FSSC 22000, ISO 9001 (i.e. quality management) and ISO 22000 (i.e. food safety management). Currently, the company conducts regular audits of their farms to ensure organic production standards and to develop their supplier to become more sustainable. In response to the drought, the company has adapted some of its activities to maintain its performance.

**Case 3:** Company 3 was founded in 1968 as a family-owned company. The company started organic cashew nut production in 1992, and it was considered a first-mover in the organic market. However, over the years, the company's production capacity has been reduced due to several factors, including the current natural disaster. For several years, the company held the first position in total production in Ceará. However, in 2015, the company was forced to cease its operation. The company had several sustainability projects, including social responsibility and environmental programmes. Additionally, similar to other companies, it started to import cashew nuts from Africa to satisfy customer demand. At the same time, the company remained tightly connected to local

suppliers and its own farms, who were both strongly impacted by the drought period.

4.2. Cross-case analysis

This section presents the findings from the cross-case analysis. A comparison of the data with the conceptual framework along the three cases introduced above led to a revision of the initial analytic framework (Fig. 1), specifically by inserting resources as antecedents of practices and highlighting the natural disaster management phases.

4.2.1. Resources based on assets

In the face of a natural disaster, Brazilian cashew nut processors are being pushed to develop new strategies and practices in response. Differing from what the PBV literature suggests, we found that resources are important components for conceptualising the need for and specific emergence of new practices. Fig. 2 shows a frame of our analysis, and it represents how to understand the combination of assets and contingency factors to develop these new practices. This demonstrates the existence of an environment of changes, as it is not possible to observe only the practices. In our analysis, the resources are rooted in the assets that can support companies to develop their resources to support the practices performed.

As depicted in Fig. 2, the interaction between assets and contingency factors creates the requirement, as well as the setting for new practices. For instance, by replacing old cashew trees with young cashew trees that return higher yields, production can be increased and rendered more resilient to external conditions, such

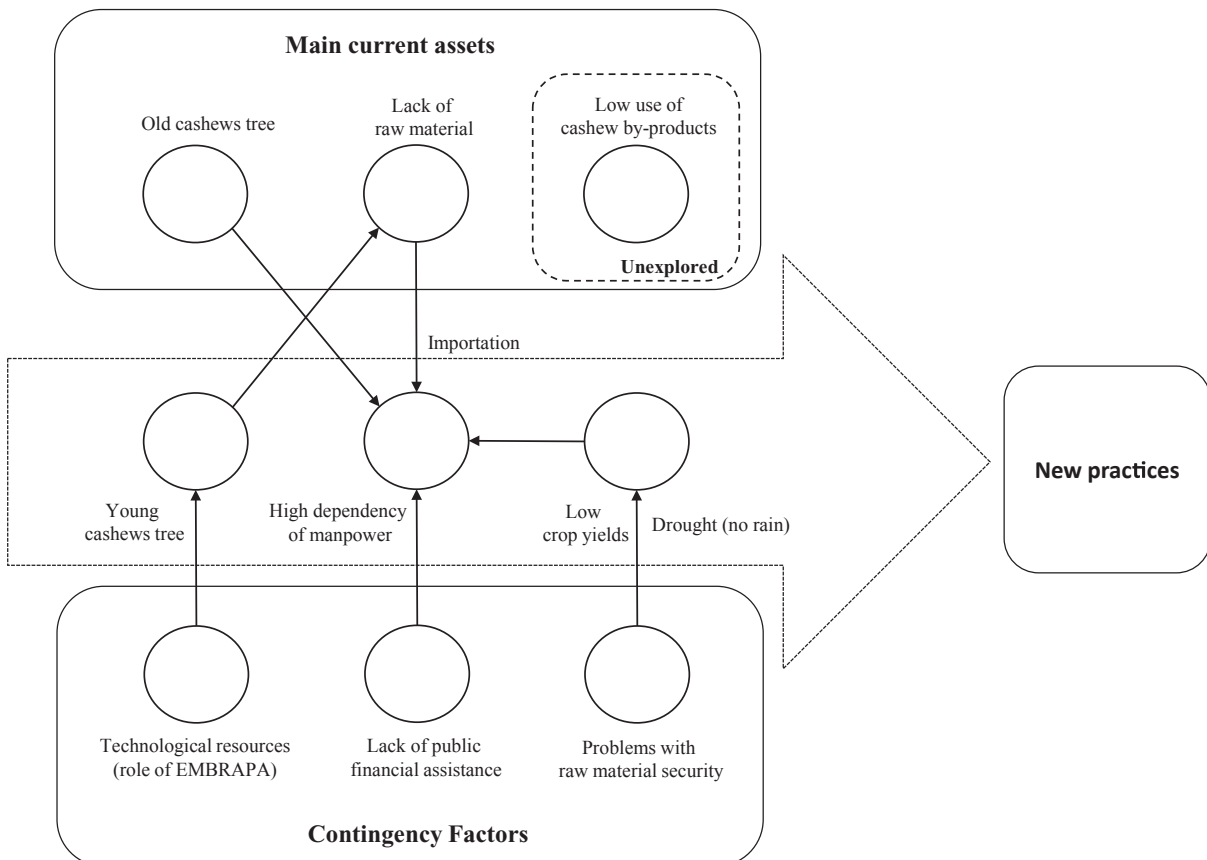


Fig. 2. Assets and contingency factors form new practices.

**Table 2**  
Contingency factors.

Contingency factor	Exemplary quote	Source
Technological resources	[Companies from other countries] came here, took our technology from Embrapa and they have been over the years replacing the giant cashew tree with the precocious cashew tree. For example, [some of them] were replacing gradually to not have a year with nothing, no cashew nuts, because it is necessary to be able to grow, to fruition. And today they have 100% precocious cashew. Their planted area is half of ours, and today they have higher productivity.	Purchasing manager - Case 2
Lack of public financial assistance	The government here, they turned their backs on cashews ... There was a time that had much incentive, in the time of Sudene [a local institution]. It was at that time, 40 years ago, that we began to produce cashews. We had incentives.	Purchasing manager - Case 3
Problems with raw material security	It's been a long time, at least six years that you do not reap a pound of cashews from there (own farm). It's five or six years that we do not harvest because they steal everything.	Quality manager - Case 2
Regulations	Brazil has a great food law, but Africa, for example, India, Vietnam ... these third-world countries, they do not have much of those quality standards, these legal requirements.	Quality manager - Case 1

as aridity. This demonstrates the need for technological innovations, such as those developed by Embrapa. According to Embrapa's R&D manager, if producers (i.e., farmers) implement new technological developments, such as using robust high-yield cashew trees, it is possible to ensure that lack of water does not directly impact cashew yield.

In contrast, retaining to old cashew trees makes production inefficient: “[...] the cashew trees are old, they no longer have that production as it had before” (Purchasing Manager, Case 2). The majority of huge farms are still using old cashew trees, which limits the farms' ability to increase their production. Using old cashew trees creates high dependence on manpower, who has significant power because of direct contact with small producers. Because cashew production is almost entirely a handmade process, it is difficult to reduce the dependence on manpower. However, using young cashew trees increases production and rectifies the power imbalance between manpower and small producers. Nowadays, the dependence on manpower may be reduced because resources are scarce, as well as the production is handmade. This is clear in Case 1, when the quality manager makes the following claim regarding cashew production: “It's a job that requires manual labour, from harvest to pack time to; I usually say it's so handy that it needs to be harvested and needs to be eaten by hand.”

The Purchasing Manager in Case 3 highlights the severe repercussions the lack of rain had on production levels: “Production fell a lot; there was a great fall, especially for lack of rain. It's a drought.” This shows that the organisational context that results from natural disaster conditions clearly impacts companies' production and, consequently, their performance. Finally, it is important to highlight that there are unexplored assets in cashew production. For instance, according to Embrapa's consultant and the quality manager in Case 2, there is a chance to use the peduncle (i.e. the part of cashew that can be used to produce juice) as an asset. However, around 90% of this raw material is disposed of as waste, thus foregoing a substantial opportunity for value generation and creating a considerable, negative environmental impact. This perspective stimulates new practices, which should be observed in both intra- and inter-organisational contexts.

#### 4.2.2. Contingency factors

Fig. 2 demonstrates three contingency factors that influence the emergence of new practices in cashew nut production. However, through the analysis, regulation also emerges as one of the contingency factors related to the sector. As can be observed, the factors came from third part requirements, which increase the sustainability performance. Table 2 highlights some information mentioned by the respondents. In addition, it is necessary to observe that there is a close relation between contingency factors and assets, which may facilitate the emergence of resources and

practices through supply chains.

As argued in the above quotes, cashew nut producers receive significant influence from third-party stakeholders, such as Embrapa and the government. Focusing on Embrapa, the data show a contradiction because both sides (i.e. processors and Embrapa) complain about the lack of communication between them, but there is no clear action to change that. Fig. 2 clarifies that a combination of assets and contingency factors may create new practices, which in this case has not happened and requires greater attention from both. According to regulations, the main point is that Brazil has a fair law, but more investments and funding to increase the economic performance of the sector are lacking. All of these aspects influence how intra- and inter-organisational practices are developed.

#### 4.2.3. Practices: intra- and inter-organisational

Practices may be developed internally (i.e. intra-organisational practices) (Table 3) or may span organisational boundaries (i.e. inter-organisational practices) (Table 4). A list of intra- and inter-organisational practices emerged in the course of the analysis, and it represents the practices developed by cashew processors. When diffusing practices throughout the supply chain, companies develop a more relational performance, which is not always true when practices remain within individual organisations. As observed in Tables 3 and 4, companies respond to natural disasters using inter-organisational practices rather than intra-organisational practices, which demonstrates the crucial importance of collaboration throughout the supply chain.

Nine inter-organisational practices were identified during the analysis. Table 3 demonstrates the shared practices performed among companies. Because all companies are suffering the impact of the natural disaster, they decided to create practices across firms, which is necessary to increase performance. For instance, to implement organic cashew production, several elements are required to change the current mind-set, both within the organisation and along the supply chain. Thus, there is a need to reorganise the internal activities related to production and supplier selection. Following these changes, this reorganisation represents a new practice. Additionally, when engaging in the practice of organic farming, several criteria must be met, as pointed out by the purchasing manager in Case 1. The changes surrounding the new practice performed demonstrate that the introduction of organic cashew production could be observed as a practice.

The practice of organic farming contributes largely to sustainability in the cashew supply chain because organic farming involves taking precautions when treating soil, groundwater and the produce itself, while simultaneously committing to human rights and engaging in practice sharing among supply chain members. In parallel, social responsibility practices were verified regarding

**Table 3**  
Inter-organisational practices.

Practices	Exemplary quotes	Source
Import	Beginning in 2011, the harvest in Brazil began to decline, and the price of raw materials began to increase. Therefore, the output of the industries here in Ceará was to import cashew nuts.	Purchasing manager - Case 3
Export	When you work with export product, you have some requirements.	Purchasing manager - Case 1
Quality management	We received a load that had a very large incidence of foreign material. I take a look for the vehicle, the name of the driver and the region, then what am I going to do now? I'll notify the middleman.	Quality manager - Case 2
Food safety	We have the FSSC 22000 certification, which is food quality and safety. That certification involves ISO 22000, which is related to a food safety management system, involving the food defence part ...	Quality manager - Case 1
Organic production	In relation to organic cashew nuts, we had to visit several producers; we made the certification of these personnel.	Purchasing manager - Case 2
Social responsibility	Today we have a project called 'Atrás do Muro'; we work with the people from the surrounding area and the focus is environmental education, because here they have the Maranguapinho river, and the people have a culture of throwing everything in the river. Therefore, this work was done with the community to prevent this, so it is working well.	Quality manager - Case 1
Relationship with technological institute	We have a young cashew tree-planting project; it was developed together with Embrapa, the largest project that exists, at least the largest project in Brazil related to cashew trees is there. It started with 500 ha, but it has more than that already. Therefore, because there is an area that has control, it has research, it has younger cashew trees, it has innovation and the harvest there is good.	Quality manager - Case 2
Long term relationship with suppliers	Now this practice (anticipating part of the payment) happens to suppliers who have been with us for 18, 20 years.	Purchasing manager - Case 1
Long term relationship with consumers	For some customers with specific demands, there is this: they want a guarantee of origin, so they inspect annually, send a team, want to see if the process was being done as it should be done. Therefore, there is a lot of it. We did it for Carrefour and for Pão de Açúcar, which has its own cashew nuts brands.	Quality manager - Case 3

**Table 4**  
Intra-organisational practices.

Practices	Exemplary quotes	Source
Supplier selection	He (supplier) signs a declaration that he does not use pesticides, he does not use any type of pesticide ... We have a statement that it completes, certifying that he does not use child labour, all this before the first purchase. Therefore, our declaration for the raw materials is basically this: the commitment to supply, to the non-use of child labour, to knowledge of our company's code of ethics and to the non-use of pesticides, because it is part of food safety.	Purchasing manager - Case 2
Quality management	The second measure is that all the materials (cashew nuts) that enter our company undergo a system of sieving and exhaustion, you will see ... Then, this system of sieving and exhaustion will take away many impurities, many strange materials.	Quality manager - Case 1
Operations management	We carried out good manufacturing practice programme ... We implemented good certification practices here in the company, we trained all employees, explaining what is food, what is quality, what are the types of contamination that you can have in food, what happens if you do not wash your hands ... anyway, then we implemented good manufacturing practices.	Quality manager - Case 2
Supplier evaluation	First quality, then the agrototoxic issue, third the burning issue (burn the bush).	Purchasing manager - Case 3
Food safety	We implemented FSSC 22000, and another ISO that we call ISO TS22000.2. Therefore, the FSSC ... It is also a food safety standard, but it came to cover everything, sort of a bit of legislation and a bit of quality standards.	Quality manager - Case 2
Social responsibility	We have a partnership with SESI [a public institution], which I consider one of our main contributions, we introduced the opportunity for people to go back to school ... Very interesting, they study after 15 years, 20 years or even more.	Quality manager - Case 2
Organic production	We are ready, we are not yet certified; we are only missing the certifier's stamp so that we can start the organic activity ... but we are ready.	Quality manager - Case 1

worker and community development. The region around the companies is involved in their strategies and practices. One of the main practices is import. Facing the reduction of raw materials in Brazil, companies started to import cashew nuts from Africa. However, to develop this practice alone is highly expensive. Hence, the best strategy was to collaborate and develop agreements across firms and to import together the raw materials. By adopting this practice all companies could maintain their operations and activities in the market. However, the continuity of operations and activities depends not only on shared actions, but also on individual practices. Table 4 focuses on internal actions.

Table 4 shows that quality management and operations management are practices that may be confined within organisational boundaries or that may span organisations. The data show that these practices performed are stimulating the emergence of other practices, such as ensuring food safety. Because companies are focused on the international market, several requirements (e.g. FSSC 22000 certification) enable the performance of this practice. For instance, the quality manager of Case 2 claims it is necessary to

have the certification covering the practices of food safety, but also to attend to some of the contingency factor mentioned before. This indicates that practices complement each other and they are thus closely related.

Despite individual practices performed by the companies, there is a comprehension that cashew production is highly dependent from the organisational context in this case on the natural environment. This is clear for the purchasing manager of Case 3, who claims, "It is very complicated to work with something that needs a lot of rain, mainly depending on nature." Several behaviours and practices could be developed by these companies, but sometimes some internal barriers influence their advancement. During the last years, low productivity was one of the main problems for the sector, and it influenced operations management and led to low performance. Following that perspective and the literature, there is a need for changes internally and across firms to increase the relational performance of the sector.

From the practices presented, these and other sustainability activities are contributing to creating interesting response



strategies to the natural disaster. For instance, sustainability actions, such as social projects and the organic cashew certification, support changes in the sector towards improving sustainability performance. Furthermore, other practices that we can highlight are partnerships with research institutes to create new technology, supplier evaluation, supplier development based on sustainability requirements, and long-term partnerships with suppliers. All these practices have been shared across firms, and they may lead to improvements in economic market performance.

#### 4.2.4. Performance

In our analysis, two different trajectories were observed (1) one company faced negative performance (e.g. low productivity): and closed its operation and (2) two companies have increased production based on the adequate adoption of intra- and inter-organisational practices, such as food safety, certification, or supplier evaluation. It is important to note that several other practices are performed by companies; however, as our focus was on the drought period, several specific results were observed. Hence, in the previous analysis, the practices are related to resources (i.e. based on assets) to create an interesting overview of how to implement practices when facing natural disasters.

When considering performance, it is important to analyse the behaviour of competitors and the relation between practices. In this case, negative practices are related to the high dependence on manpower, which leads to competitive inertia. Specifically, regarding competitive inertia, it was found that during the years before the drought, Brazil has lost its position in international rankings to small countries, such as Vietnam and Nigeria. The purchasing manager of Case 3 claims, “[...] there was not any activity to renew [the cashew trees] for a long time and now we are bittering a very difficult time.” That situation demonstrates there are opportunities to develop new practices that support performances that are more positive.

During several moments throughout the drought period, the companies under study did nothing to change their results, which influenced cashew production. The Quality Manager in Case 3 stated the following: “A few years ago, the two industries that were always in first and second place it was Company X and our company [i.e. Case 3]. It was always a fight to see who sold more, who exported more, who produced more. Company X broke ... We just closed.” This is another example of competitive inertia and evidence of a negative performance.

On the other hand, a positive performance is related to sustainability performance. Through the years, companies were making decisions to maintain their profitability and operations. This demonstrates the economic performance, which was closely related to the creation of partnership with other companies to import raw materials from Africa. This practice was created to increase the relational performance across firms; however, several challenges were faced regarding the economic bottom line. Hence, the main challenges that were observed were as follows:

1. The need for more collaboration between focal companies and suppliers: The quality manager in Case 1 states, “Brazilians still nowadays are not prepared for this moment facing the drought.” This demonstrates the need for more collaboration and integration among sector members regarding a long-term perspective.
2. The need for more information sharing across multiple levels. According to the Quality Manager in Case 2, “Brazil has a great food law, but Africa, for example, India, Vietnam ... these third-world countries, they do not have much of those quality standards, these legal requirements.” This perspective could integrate mutual agreements in the sector.

3. The need for more sharing practices among all industries to develop the sector as a whole and to ensure the Brazilian cashew industry demonstrates a better and more competitive performance in the global market. Such practices are needed because, as claimed by the purchasing manager in Case 1, “there is a local industry that has a plant there [in Africa], but it is a competitor of ours.” This may serve as support for all companies in the sector.

Regarding environmental performance, behind the need for changes to the daily operations of companies, the following were identified (1) the introduction of organic cashews and (2) the introduction of certification. Related to organic production, the quality manager in Case 2 claims the following: “We started to have organic certification, because we sell organic cashew nuts today; we have farms that produce the raw material. All these farms today have organic certification, so they can sell organic cashew nuts.” To have the label of organic production and to ensure a low environmental impact, some certifications were introduced in the companies, changing both their practices and performance. Several challenges are faced to maintain this environmental concern under the natural disaster influence; however, it was found that the introduction of organic production was one of the main practices during this period. This represents the close relation among assets, contingency factors, practices and performance.

As observed thus far, several aspects have influenced the performance of cashew supply chains in relation to reducing the influence of the drought. In parallel, some actions related to sustainability occur when new practices are introduced to encourage social sustainability. The main practice found was social responsibility, which changed the dialogue between companies and their stakeholders, as well as demonstrated the possibility for genuine concern about different variables. Challenges are always faced; however, changes in these avenues can support the development of several practices and performances that create better mitigation and preparedness elements in the sector of natural disaster response, even if that occurs over several years.

#### 4.3. Building a framework to respond to natural disasters through practices

Based on our analysis, we revise the initial framework used to understand how companies may effectively respond to natural disasters using resources and practices (Fig. 3). Initially, we conceptualised that companies may leverage resources and practices — adapted to contingency factors — to mitigate the potential impact of and prepare for natural disasters to ensure their production. Our analysis indicates, however, that resources are rather an important antecedent to the implementation of practices, a fact that deserves attention. Following our data, the resources can emerge from a company’s used or unexplored assets. Resources are the precondition for effective disaster mitigation and preparedness. We understand mitigation and preparedness strategies as a combination of the available resources and adoption of practices. From the disaster management literature, the idea is that mitigation and preparedness strategies will affect performance outcomes and resilience to disruption. Hence, the performance is a result of this combination, and it may be positive and negative.

Furthermore, our analysis has shown that contingency factors impact resources than intra- and inter-organisational practices, as argued earlier based on PBV theory. This is possible, as practices that are a combination of activities and contingency factors influence direct aspects, such as assets. These were found through the analysis and the literature review. Throughout the analysis, different trajectories of performance (i.e. negative and positive

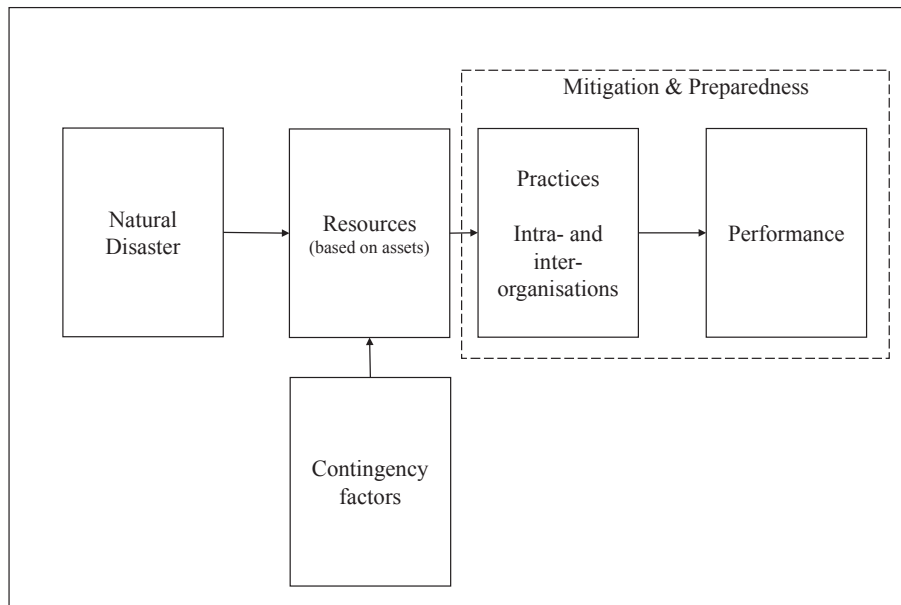


Fig. 3. Analytical framework.

performance) emerged by relating both resources and practices. These characteristics generate evidences to demonstrate under which conditions companies should organise themselves to maintain their operations in the market. The relationship between resources and practices across firms is the main argument to use PBV and increase the outcomes for supply chain members.

## 5. Discussion

Applying the PBV to supply chains allows for an understanding of how companies are responding to natural disasters, mostly in relation to sustainability. The results indicate that several practices emerge to change the sector's performance. However, there is a need for new practices, as it is not always enough to ensure the maintenance of companies' performance. With the current analysis, we respond to Carter et al.'s (2017) call to determine under which conditions inter-organisational practices emerge. In our analysis, the natural disaster is one of the conditions that can influence changing practices and achieve new performances. Additionally, we also respond to Leiras et al.'s (2014) call to conduct more in-depth research based on case studies to understand the impact of natural disasters. In our case, the focus was on what practices are performed to improve the outcomes of cashew nut production in Brazil.

According to our findings, the context influences resources and assets, which are influenced by contingency factors to stimulate new practices. This corroborates Bromiley and Rau's (2014) claim that the organisational context influences the emergence of practices. For instance, when rainfall is less than expected, there is a lack of raw materials and new decisions should be made, such as importing cashew nuts from Africa in partnership with other local Brazilian companies. The practice was not observed out of contingency factors and assets. Additionally, it is relevant to highlight that it is possible to use the PBV to assess case studies because in our research, there is homogeneity among the few companies working in the cashew sector in Ceará, Brazil.

By recognizing the practices that respond to a natural disaster, it was possible to identify the performance. Usually, performance indicators are related to profit or operational outcomes; however,

by using a practice approach, the some performances were derived from singular practices. For instance, social performance came from the social responsibility practice. Thus, focusing on the TBL dimension, because different practices were figured out from each dimension, their performances are direct related to that. The practices are performed, and they support the final performance of a company or a sector. Therefore, in our research, we found that the negative performance should be considered to create new practices also related to sustainability in the sector. This result facilitates an understanding of why different trajectories are possible in the same sector. According to Bromiley and Rau (2014, p. 3), "if we want to explain variation in performance, knowing what not to do may be quite valuable." Hence, because negative performance (i.e. competitive inertia, companies closing, high cost) are being observed, companies must reorganise themselves to attain better results.

Results presented in this paper highlights the need to pay greater attention to the use of practices in the disaster management and humanitarian operations (HO) literature. Balcick et al. (2010) stress the importance of coordination among different stakeholders to respond better to disruption and for disaster relief, especially because humanitarian response and relief involves a variety of stakeholders. However, these authors claim that coordination mechanisms are well studied in commercial supply chain and lack research in the HO literature. Thus, as we are suggesting that resources should be exploited and practices adopted across firms to improve performance, coordination among actors, such as Embrapa and the government, might influence the development of strategies for mitigation and preparedness, not only responses to disasters.

To understand sustainability in supply chains, we should assume sustainability as a practice (Silva and Figueiredo, 2017). That perspective claims that the use of a practice-based approach can facilitate the comprehension of the logic of sustainability, and it is aligned with Montabon et al.'s (2016) claim of bringing a new logic and making sustainability sustainable. According to these authors, sustainability only exist if companies change their practices in a strategic way. Following that viewpoint, in cashew production, two main actions were found: organic cashew production (i.e.

environmental dimension) and corporate social responsibility (i.e. social dimension), which were performed via intra- and inter-organisational practices. This demonstrates that the PBV may help explain why supply chains achieve performance on the TBL to varying degrees.

These results differ from those of other research on emerging economies, which still ignore the social sustainability debate. For instance, studying enterprise performances in China, [Hong et al. \(2018\)](#) indicated that SSCM practices mostly address environmental issues. In a similar way, [Esfahdodi et al.'s \(2016\)](#) study on China and Iran found only economic and environmental practices applied to supply chains. With this paper, we contribute to the literature by demonstrating that other performances are possible because the focus is on practices, and not only companies' results. Following that viewpoint, the findings show there is an avenue towards supply chain sustainability engagement that represents a positive performance for the sector in another dimension that is not only economic ([Cagliano et al., 2016](#)). As an emergent approach, the PBV demonstrates several new steps to be taken to clarify the debate on sustainability, natural disasters and companies' response.

Finally, the paper indicates that the PBV and SCPV represent fertile perspectives for analysing practices that lead to firm and supply chain performance. Our analysis underlines in particular that the SCPV that concentrates on value derived from supply chain wide collaboration ([Carter et al., 2017](#)) is a strong tool for predicting an effective supply chain response to natural disasters, such as droughts, in an emerging country context. By taking up the PBV as a new conceptual lens for understanding how companies and whole industries may become more sustainable, we contribute to increasing debates about practices and highlighting a stronger manner to develop research on supply chain sustainability.

## 6. Conclusion

In addition to theoretical contributions to the research streams on sustainable SCM practices and natural disasters discussed above, our study also has managerial implications. Exceptional circumstances, such as natural disasters that require strategic response by businesses make joint action between different supply chain members and sector-wide agreements particularly necessary. Companies may use their absorptive capacity in order to identify, adopt and effectively implement practices from direct competitors (best-in-class practices) and from other sectors as benchmarks. Practices performed across firms demonstrate better outcomes than the individual approach toward competitive advantage.

Our qualitative empirical approach does not go without limitations. First, our research focuses on the focal companies' point, which may have created bias, as motives, actions and performance are seen through the focal company's lens only. Another limitation is the narrow focus of this study on one region in Brazil and one segment of the food sector (i.e. cashew nut production). Future research should analyse other types of natural disasters, as well as other organisational contexts that influence how supply chain practices based on resources and assets lead to varying degrees of sustainability. Moreover, cross-country and/or cross-sector studies based on larger samples and analysed statistically may help test the relationship among resources, practices and performance, as well as interaction effects with a variety of contingency factors. Therefore, it would also be of particular interest to determine how individual practices contribute to the various TBL performance dimensions and how effects are reinforced or alleviated by combining bundles of practices.

## Acknowledgment

The research in this paper was funded by the Fundação Edson Queiroz, through grant number DPDI/FEQ 06/2016.

## Appendix A

1. Contact information
2. What is the role of Embrapa in increasing cashew production?
3. What is the process of introducing new technologies to the cashew sector?
4. Can you explain how is the Embrapa relation with sustainability?
5. How are companies facing the current drought period?
6. Are there any specific practices performed by cashew producers?

## Appendix B

Structure part of the interview - Questions:

1. Contact information

Natural Disaster.

2. How are companies facing the current drought period?
3. What are the changes required to face the drought period?

Contingency factors.

4. What is the role of Embrapa in increasing cashew production?
5. What is the process of introducing new technologies to the cashew sector?
6. Can you explain how is the Embrapa relation with sustainability?

Practice/Resources.

7. Are there any specific practices performed by cashew producers?
8. Facing the current drought period, what practices is the company performing?
9. Do you have direct contact with all suppliers regarding sustainability?

Performance.

10. Can you explain how is the company relation with sustainability?
11. How does the company spread sustainability along the supply chain?
12. Can you provide some factual examples (information) of sustainability in the company?
13. What are the outcomes of changes developed during the last years?

Open part of the interview - Questions:

1. How do you perceive the behaviour of suppliers regarding sustainability?
2. Was the drought period a motivation to change internal and external practices?
  - a. Which practices can you mention related to each level?

### 3. Do you think that your changes are supporting your performance in the market?

## References

- Agyemang, M., Zhu, Q., Tian, Y., 2016. Analysis of opportunities for greenhouse emission reduction in the global supply chains of cashew industry in West Africa. *J. Clean. Prod.* 115, 149–161.
- Alexander, B., Chan-Halbrecht, C., 2006. Sustainable livelihood considerations for disaster risk management. *Disaster Prev. Manag.* 15 (1), 31–50.
- AliceWeb, 2018. Available at: <http://aliceweb.mdic.gov.br/>. Access: May 2018.
- Altay, N., Green III, W.G., 2006. OR/MS research in disaster operations management. *Eur. J. Oper. Res.* 175 (1), 475–493.
- Altay, M., Ramirez, A., 2010. Impact of disasters on firms in different sectors: implications for supply chains. *J. Supply Chain Manag.* 46 (4), 56–80.
- Basnet, C., Corner, J., Wisner, J., Tan, K.-C., 2003. Benchmarking supply chain management practice in New Zealand. *Supply Chain Manag.* 8 (1), 57–64.
- Balcik, B., Beamon, B.M., Krejci, C.C., Muramatsu, K.M., Ramirez, M., 2010. Coordination in humanitarian relief chains: Practices, challenges and opportunities. *Int. J. Prod. Econ.* 126 (1), 22–34.
- Bromiley, P., Rau, D., 2014. Toward a practice-based view of strategy. *Strat. Manag. J.* 35 (8), 1249–1256.
- Bromiley, P., Rau, D., 2016a. Operations management and the resource based view: another view. *J. Oper. Manag.* 41, 95–106.
- Bromiley, P., Rau, D., 2016b. Missing the point of the practice-based view. *Strat. Organ.* 14 (3), 260–269.
- Burgess, K., Singh, P.J., Koroglu, R., 2006. Supply chain management: a structured literature review and implications for future research. *Int. J. Oper. Prod. Manag.* 26 (7), 703–729.
- Cagliano, R., Caniato, F.F.A., Worley, C.G., 2016. A pathway towards truly sustainable food supply chains: balancing motivation, strategy, and impact. In: *Organizing Supply Chain Processes for Sustainable Innovation in the Agri-food Industry*, pp. 287–318.
- Carrarese, L., Berg, S., Bröring, S., 2018. Emerging value chains within the bio-economy: structural changes in the case of phosphate recovery. *J. Clean. Prod.* 183, 87–101.
- Carter, C.R., Kosmol, T., Kaufmann, L., 2017. Towards a supply chain practice view. *J. Supply Chain Manag.* 53 (1), 114–122.
- Dasaklis, T.K., Pappis, C.P., 2013. Supply chain management in view of climate change: an overview of possible impacts and the road ahead. *J. Ind. Eng. Manag.* 4 (4), 1124–1138.
- Dela Cruz, R.S., 2007. Accessing the global market for cashew kernel by rural-based processors: the Philippine experience. *Acta Hort.* 23, 91–98.
- Dyllick, T., Hockerts, K., 2002. Beyond the business case for corporate sustainability. *Bus. Strat. Environ.* 11 (2), 130–141.
- Eisenhardt, K.M., Graebner, M.E., 2007. Theory building from cases: opportunities and challenges. *Acad. Manag. J.* 50 (1), 25–32.
- Elkington, J., 1997. *Cannibals with Forks—The Triple Bottom Line of 21st Century Business*. Capstone, Oxford, UK.
- Esfahbodi, A., Zhang, Y., Watson, G., 2016. Sustainable supply chain management in emerging economies: trade-offs between environmental and cost performance. *Int. J. Prod. Econ.* 181, 350–366.
- Falkenmark, M., Rockstrom, J., 2008. Building resilience to drought in desertification-prone savannas in Sub-Saharan Africa: the water perspective. *Nat. Resour. Forum* 32, 93–102.
- Gibbert, M., Ruigrok, W., Wicki, B., 2008. What passes as a rigorous case study? *Strat. Manag. J.* 29 (13), 1465–1474.
- Gioia, D.A., Corley, K.G., Hamilton, A.L., 2013. Seeking qualitative rigor in inductive research: notes on the Gioia methodology. *Organ. Res. Meth.* 16 (1), 15–31.
- Gold, S., Seuring, S., Beske, P., 2010. Sustainable supply chain management and inter-organizational resources: a literature review. *Corp. Soc. Responsib. Environ. Manag.* 17 (4), 230–245.
- Hahn, T., Figge, F., Pinkse, J., Preuss, L., 2010. Editorial: trade-offs in corporate sustainability: you can't have your cake and eat it. *Bus. Strat. Environ.* 19 (4), 217–229.
- Heaslip, G., Barber, E., 2014. Using the military in disaster relief: systemising challenges and opportunities. *J. Humanit. Logist. Supply Chain Manag.* 4 (1), 60–81.
- Hitt, M.A., Carnes, C.M., Xu, K., 2016. A current view of resource based theory in operations management: a response to Bromiley and Rau. *J. Oper. Manag.* 41, 107–109.
- Hong, J., Zhang, Y., Ding, M., 2018. Sustainable supply chain management practices, supply chain dynamic capabilities, and enterprise performance. *J. Clean. Prod.* 172, 3508–3519.
- IBGE - Instituto Brasileiro de Geografia e Estatística, 2017. Levantamento sistemático da produção agrícola. Available in: [ftp://ftp.ibge.gov.br/Producao\\_Agricola/Levantamento\\_Sistematico\\_da\\_Producao\\_Agricola\\_\[mensal\]/Fasciculo/lspa\\_201701.pdf](ftp://ftp.ibge.gov.br/Producao_Agricola/Levantamento_Sistematico_da_Producao_Agricola_[mensal]/Fasciculo/lspa_201701.pdf). Access Jul 2017.
- Kovács, G., Spens, K.M., 2007. Humanitarian logistics in disaster relief operations. *Int. J. Phys. Distr. Log.* 37 (2), 99–114.
- Leiras, A., Brito Jr, I., Peres, E.Q., Bertazzo, T.R., Yoshida, H.T., 2014. Literature review of humanitarian logistics research: trends and challenges. *J. Humanit. Logist. Supply Chain Manag.* 4 (1), 95–130.
- Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S., Rao, S.S., 2006. The impact of supply chain management practices on competitive advantage and organizational performance. *Omega* 34 (2), 107–124.
- Loayza, N.V., Olaberria, E., Rigolini, J., Christiaensen, L., 2012. Natural disasters and growth: going beyond the averages. *World Dev.* 40 (7), 1317–1336.
- Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D., Zacharia, Z.G., 2001. Defining supply chain management. *J. Bus. Logist.* 22 (2), 1–25.
- Miles, M.B., Huberman, A.M., 1994. *Qualitative Data Analysis*, 2. ed., Sage, Thousand Oaks.
- Montabon, F., Pagell, M., Wu, Z., 2016. Making sustainability sustainable. *J. Supply Chain Manag.* 52, 11–27.
- Oliveira, L.G.L., Ipiranga, A.S.R., 2011. Evidences of the sustainable innovation in the cashew agribusiness context in Ceará - Brazil. *Revista de Administração Mackenzie* 122–150.
- Oliveira, V.H., Miranda, F.R., Lima, R.N., Cavalcante, R.R.R., 2006. Effect of irrigation frequency on cashew nut yield in Northeast Brazil. *Sci. Hortic.* 108 (4), 403–407.
- Oh, C.H., Oetzel, J., 2011. Multinational's response to major disasters: how does subsidiary investment vary in response to the type of disaster and the quality of country governance. *Strat. Manag. J.* 32, 658–681.
- Pagell, M., Wu, Z., 2009. Building a more complete theory of sustainable supply chain management using case studies of 10 exemplars. *J. Supply Chain Manag.* 45 (2), 37–56.
- Pekic, V., 2015. Drought Hits Cashew Orchards in Rio Grande do Norte. *Foodnews*, 27 November 2015. <https://www.agra-net.com/agra/foodnews/dfn/nuts/cashews/drought-hits-cashew-orchards-in-rio-grande-do-norte-499363.htm>. (Accessed 12 May 2017).
- Piekkari, R., Welch, C., Paavilainen, E., 2009. The case study as disciplinary convention: evidence from international business journals. *Organ. Res. Meth.* 12 (3), 567–589.
- Rosenzweig, C., Parry, M.L., 1994. Potential impact of climate change on world food supply. *Nature* 367, 133–138.
- Sancha, C., Gimenez, C., Sierra, V., 2016. Achieving a socially responsible supply chain through assessment and collaboration. *J. Clean. Prod.* 112, 1934–1947.
- Seuring, S., Müller, M., 2008. From a literature review to a conceptual framework for sustainable supply chain management. *J. Clean. Prod.* 16 (15), 1699–1710.
- Shepherd, C., Günter, H., 2006. Measuring supply chain performance: current research and future directions. *Int. J. Prod. Perform. Manag.* 55 (3/4), 242–258.
- Silva, M.E., Figueiredo, M.D., 2017. Sustainability as practice: reflections on the creation of an institutional logic. *Sustainability* 9 (10), 1839.
- Starr, M.K., Van Wassenhove, L.N., 2014. Introduction to the special issue on humanitarian operations and crisis management. *Prod. Oper. Manag.* 23 (6), 925–937.
- Strömberg, D., 2007. Natural disasters, economic development, and humanitarian aid. *J. Econ. Perspect.* 21 (3), 199–222.
- Stuart, I., McCutcheon, D., Handfield, R., McLachlin, R., Samson, D., 2002. Effective case research in operations management: a process perspective. *J. Oper. Manag.* 20 (5), 419–433.
- Van Wassenhove, L.N., 2006. Blackett Memorial Lecture Humanitarian aid logistics: supply chain management in high gear. *J. Oper. Res. Soc.* 57 (5), 475–489.
- Vidal, M.F., 2016. Situação da cajucultura nordestina após a seca. *Caderno Setorial ETENE*. Banco do Nordeste, Brazil.
- Walker, H., Di Sisto, L., McBain, D., 2008. Drivers and barriers to environmental supply chain management practices: lessons from the public and private sectors. *J. Purch. Supply Manag.* 14 (1), 69–85.
- WCED (World Commission on Environment and Development), 1987. *Our Common Future*. Oxford University Press, Oxford, UK.
- Yawar, S.A., Seuring, S., 2018. The role of supplier development in managing social and societal issues in supply chains. *J. Clean. Prod.* 182, 227–237.
- Yin, R.K., 2014. *Case Study Research: Design and Methods*, fifth ed. SAGE Publications.
- Zhu, Q., Sarkis, J., Lai, K.-H., 2008. Confirmation of a measurement model for green supply chain management practices implementation. *Int. J. Prod. Econ.* 111 (2), 261–273.