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## **A new modeling approach for adding value to agri-food chains**

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## 1. Introduction

The globalization of food markets, end products, raw and semi-finished products, has increased pressure for farm sector and food industry re-engineering. The price decrease imposed by distributors has also accelerated the need for structural changes in agri-food chains. The most common reflex is to adapt the size of farms and industrial units: Big is better. Automatization often tends to follow close behind as another knee-jerk reaction. The increasing availability of new technologies in the farm sector, food industry and multichannel distribution with, in particular, the digital revolution, have had tremendous consequences on business organization in these three sectors.

This article shows how a new collaborative modeling approach could create value in agri-food chain, and how this value could be shared fairly via innovative contractualization. Economic literature has largely underlined the interest, modalities and risks of using contracts, defined as commitments between parties. Whereas *critical size* is commonly invoked in order to better manage price volatility, a new collaborative approach offers the further possibility of associating both consumers and producers. This article introduces a new SDSC (Sustainable Demand-Supply Chain) approach, which changes the relations between agri-food chain actors. The objective is to be more efficient from an economic, environmental and social point of view. Supply chain and demand management are combined in order to build a new collaborative modeling tool. This tool creates additive value via a new organization of the agri-food chains and day-to-day operations. It also helps economic optimization, and guarantees the attainment of the environmental and social objectives defined by the actors. Some of its components (*i.e.* impact measures) provide elements for the new contractualization between actors and fair value-sharing rules.

The aim of this article is to propose this new approach to interactions between stakeholders, using traceability and contractualization. The article first describes the SDSC approach and the two main concepts: Extended Demand and Demand-Supply Chain (DSC), and then details how a collaborative modeling tool need to be built up. This approach is currently being tested in a pork agri-food chain. The experimentation is detailed in the article, especially as regard the modeling aspect, with the different options needed to create value and how to ensure it is shared.

The results in this article indicate (1) the way to reconcile Extended Demand and (2) to provide the bases for new commitments.

(1) Extended Demand is composed of consumer demand and the demands of certain stakeholders. Such stakeholder demands can be linked with the main supply chain which brings the product or service to the consumer, but also to joint supply chains (co-product supply-chains, reverse supply chains, waste management...). Yet other stakeholders could have additional expectations (the State, local authorities, NGOs, associations, labor unions, sector representatives...). The DSC (demand-supply chain) is comprised of actors who agree on the target of Extended Demand and how to satisfy it (including by innovation).

(2) Sustainable development criteria provide the basis for the modeling process that allows the modeling tool to ensure value creation and to share it fairly. Such criteria also provide elements for building contracts between actors in order to perpetuate their relationships and to avoid the recurrence of difficult face-to-face negotiations. An

example in the pork sector, as detailed below, provides the opportunity to link the SDSC approach with structural changes.

The article presents the SDSC approach and these two main concepts: Extended Demand and Demand-Supply Chain (DSC); the background for the model, and a framework for measuring the performance of the supply chain and its role in supply chain management; DSC applied to a pork case study and discussion and limits.

## **2. From international crisis to a collective need**

Even if the most recent World Bank report (2016) estimates that the balance of risks for global growth has further tilted downward, this report seems unduly pessimistic, since vulnerability and the structural crisis condemn developing and developed economies alike. “Although global growth is projected to accelerate gradually, a wide range of risks threaten to derail the recovery, including a sharper-than-expected slowdown in major emerging markets, sudden escalation of financial market volatility, heightened geopolitical tensions, slowing activity in advanced economies, and diminished confidence in the effectiveness of policies to spur growth. These risks are compounded by the fact that for many countries policy buffers have eroded substantially, particularly in commodity exporting emerging and developing countries » (World Bank, Report<sup>1</sup>, 2016, p. XI). Producers face increasing risks of being eliminated as a result of raw material price volatility (FAO, 2015).

At the European level, the agricultural crisis is usually explained by changes in public policies (like the end of dairy quotas), price volatility and increased competition (CGAAER, 2016). Various initiatives have been launched to promote sustainability, including better responses to consumer worries about food production. Extending cooperation behavior beyond the supply chain should be explored. “... Cooperation, like strategic alliances and partnerships between traditional food companies and digital technology companies ... may be huge in case the impact of digitalisation strongly increases in the next years” (ECIP, 2016, p. 23). “The European Food Sustainable Consumption and Production (SCP) Round Table is an International initiative that attempts to promote the vision of “a science-based, coherent approach to sustainable consumption and production in the food sector across Europe, while taking into account environmental interactions at all stages of the food chain. A key principle is that environmental information communicated along the food chain, including to consumers, shall be scientifically reliable and consistent, understandable and not misleading, so as to support informed choice” (Food SCP, 2013). Consequently, the quality of close interactions between stakeholders is essential for the functioning of supply chains: imbalances in bargaining power between actors can lead to the application of so-called unfair trading practices (UTPs), with strong actors imposing themselves on the weak ones (Areté, 2016; Chabault et Hulin, 2016). “UTPs can be defined as “practices that grossly deviate from good commercial conduct and are contrary to good faith and fair dealing”. The presence of UTPs can have negative implications for the competitiveness of the EU

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<sup>1</sup> Global trade prospects have been significantly downgraded for 2016 and 2017, reflecting a combination of cyclical and structural factors. WBR, 2016, p. 12.

food supply chain, which can indirectly affect final consumers. In addition to legislation, voluntary/self-regulatory approaches, involving operators and other stakeholders, are also used to tackle UTPs in the EU food supply chain. Voluntary initiatives aimed at addressing UTPs have been implemented both at EU and Member State level, and more are being developed” (Areté, 2016, p. 14).

Fostering competitiveness in agriculture and agri-food means adopting good business practices between all supply chain stakeholders in order to encourage investments and reduce economic constraints for producers. In the case of dairy, meat or cereals, supply chains are submitted to strong constraints and major economic difficulties (FranceAgriMer, 2014). It is less a matter of conjuncture than it is of structural pressure: Better organization, flexibility and efficiency need to be shared throughout all the supply chains (Gauzente et Fenneteau, 2006). It is true that, in France, cultural attachment to small family farms retards needed adaptations and creates deep crises. Other evolutions, however, have to be taken into account, such as consumer expectations for local and sustainable products. Emphasis is also placed on traceability (the Horsegate and other reprehensible practices of the last few years bear a great deal of responsibility in this respect). Critical size is not the only answer to competitiveness. These new expectations simply can not be addressed by structural changes based on productivity increases, thanks to bigger farms and the rebuilding of all production tools. Other changes in agri-food chains have to be envisaged, especially regarding the way actors interact between themselves.

Fierce competition has become very much like war, destroying value in supply chains and rural areas in terms of jobs, arable lands, productive tools and farms, as well as threatening the survival of business companies. Securing raw materials, as well as ensuring farmer income, has become a major issue. The way to organize and structure relationships inside supply chains would seem to be strategic. In this perspective, contractualization is considered as a mechanism for supply chain stability (Lessassy, 2009). Contracts need to guarantee good practices for a fair equilibrium, and to provide accurate information on prices (Masten and Saussier, 2002).

How could leaders accept to share this decision making with other stakeholders? How could producers and atomistic enterprises accept blocked commitments during a short period, thereby risking a loss of income? How could public authorities foster competition by means of contractualization, without introducing rigidity into market price mechanisms?

### **3. Background on Supply Chain: What’s new with SDSC?**

SDSC is related to research dedicated to supplier management for risks and performances. This approach is not restricted to analyzing conditions for sustainable production: It also takes into account both economic and social issues (Seuring and Muller, 2008 ; Seuring, 2013). Price is not the only signal for consumers: Quality, as well as new criteria, like animal welfare, could be an important incentive.

The findings demonstrate how supply contracting might be considered an appropriate mechanism for supply chains’ relational structuring. As Meixell and Gargeay (2005) have suggested, research should focus on multi-tier supply chains with both internal

production sites and external suppliers, and encompass more performance criteria and a wider variety of industries. The challenge is that “A greater advance in theory development is possible if researchers adopt a process-based view of SCM, develop conceptual SCM models based on a context-practices-performance framework, and synthesize theories and research of SCM and those of related fields such as organization studies” (Ho et al., 2002). “These two objectives (taking account of all the dimensions of sustainability and jointly managing demand and supply chains) might make the SDSC approach appear overly broad and too complex to be useful in the management world” (Lassale de Salins et al., 2014, p.19). The supply contract therefore offers a dynamic vision of contracts, one which accounts for the different kinds of dependency relationships that can exist between partners.

As Chassagnon has explained, the mainstream economic theories considered the firm as an institutional and legal device rather than as an organizational and productive entity. “Contracts, property rights and authority are the main mechanisms that are used to analyze the institutional and legal perspectives of firms” (Chassagnon, 2011, p. 29). In this perspective, the literature distinguishes the firm as the:

- “organization of a bundle of some different contractual arrangements” (theory of the nexus of explicit contracts, Alchian and Demsetz (1972), Jensen and Meckling (1976), Fama (1980) and Cheung (1983));
- “collection of nonhuman assets and argues that firms arise where market contractual relationships fail” (see the theory of property rights, Grossman and Hart, 1986; Hart and Moore, 1990; Hart 1995);
- “governance structure that is coordinated by a hierarchical authority” (see transaction cost economics, Coase, 1937; Williamson, 1975, 1985, 2002).

But, in this perspective, the vision of the firm needs to integrate one that is more based on the disintegrated modern firm’s perspective than on the traditional view due to the higher degree of organizational complexity. So, the new SDSC approach to interactions between stakeholders needs to conceptualize the firm with inter-firm relationships that combine horizontal cooperation (like strategic alliances, joint ventures and technological licensing) with vertical cooperation (like outsourcing and externalization) as well as shared governance, intangible assets and specific human capital and Social Responsibility.

In order to build a collaborative modeling tool, the first step is to specify the extended demand. The consumer demand is supplemented or modified by additional demands from certain stakeholders (those that the DSC wants to take into account). This DSC does not necessarily include all the actors of the supply chain, but only those who decide to work together, and who agree on the target. The DSC actors can be members of the main supply chain (from the raw material to the product delivered to the consumer), but also actors handling co-products, wastes, energy or managing authorized data... Extended demand specifications imply choosing the specific demand components that need to be satisfied, partially satisfied or refused, and then adding the potential innovation brought by the DSC. Finally, this extended demand must be translated into functional specifications and a set of sustainable development criteria (economic, social and environmental), with the methodology required for measuring and calculating, and possibly establishing reference values or objectives (Yin, 2008).

#### **4. SDSC Approach and Pork case study**

The objective of the SDSC approach is to help sectors to work more efficiently and to create more value (economic, environmental and social) to meet the expectations of consumers and stakeholders. The approach also provides the means to share those created values fairly. This section describes the key innovative concepts of the SDSC approach and their subsequent application to a French pork sector.

##### **4.1. SDSC approach based on Two Main concepts**

The SDSC approach is based on two considerations. The first one concerns the key role of sustainable development in sectorial strategy; the second one promotes joint management of the demand and supply chain (both at inter-organizational and actor levels). Two main concepts are needed to implement this approach: “Specified Extended Demand” and the “Demand-Supply Chain” (DSC). These concepts are examined in this section, and the objectives and characteristics of SDSC modeling are then detailed.

##### **4.1.1. The “Specified Extended Demand”: the primary point to be agreed upon between actors**

The idea is to go beyond consumers’ expectations, and to take into account those of stakeholders. These expectations deal with product specifications and associated services (economic, environmental and social).

In consequence, the expectations analysis is conducted in two steps: the consumer demand and stakeholder expectations. Discussion then takes place among the actors in order to choose the various consumer and stakeholder demands to be taken into consideration and subsequently specified.

##### ***Consumer demand and specified consumer demand***

Consumer demand, which can be either explicit or implicit, is very often difficult to define. Hence consumer demand specification constitutes a strategic step, which has to reflect both the capacity of the actors, and the innovations they want to implement. The specification of consumer demand consists in choosing the demand component to be considered, the way innovation needs to be incorporated and how to translate all that into both functional specifications and a set of sustainable development criteria (economic, social, environmental).

##### ***Associated demands***

“Associated demands” are any stakeholder demands bound up with consumer demand: supply chain actors (for main products and services or co-products, or reverse logistics), but also the State, local authorities, NGOs, associations, labor unions, sector representatives...

##### ***Specified extended demand***

Consumer demand, together with associated demand, gives extended demand. This extended demand has to be specified in the same way: choice of demand component to

take into consideration, innovation incorporation and translation into functional specifications and a set of DD indicators.

#### **4.1.2. Demand-Supply Chain: a collaborative set of actors**

We propose to call “Demand-Supply Chain” (DSC) all the collaborative actors who specify the extended demand and want to satisfy it in a more efficient and sustainable way. The DSC includes several, but not all, members of the main supply chain, as well as other actors handling co-products, wastes, energy... The DSC also includes actors who contribute to satisfying the specified extended demand (for example, by managing environmental or social information). As DSC member identification is a strategic question, it has to be established in a consensual way.

The main question a DSC has to answer after extended demand specification is how to work together (organization and governance). This question could be split into different ones:

- What value can be created, and using which levers? (Especially as regard how to organize the joint management of the demand and supply chain? Various information systems and tools have to be defined)
- How to share the created value fairly among consumers and DSC actors?
- How to share risk, profit and loss among DSC members via an actor contractualization process.

To address these points, a model must be elaborated in a consensual way. This model is described just after Figure 1, which gives a DSC example: the French pork sector application (described in Part 4.2).

In the pork sector application, the DSC is composed of several different supply chain actors belonging to different organizations (for example, Terrena, an agricultural cooperative, and Système U, a distribution cooperative).





volume and price engagements. The two actors wanted to go further and have decided to experiment the SDSC approach for PNA-U.

**Pork “nouvelle agriculture® U®” context**

Nouvelle Agriculture® is a brand of the French cooperative “Terrena”, and U® is a brand of the French distributor, “Système U”. The Pork “nouvelle agriculture® U®” is described on the Terrena website<sup>2</sup>:

*“Terrena and the Système U supermarket chain have signed a partnership involving the production and marketing of La Nouvelle Agriculture® pork. Système U will market fresh products coming from 50,000 pigs fed on Bleu-Blanc-Coeur<sup>3</sup> (omega 3) feed, without GMO and of French origin. The contracts have been signed for a three-year, renewable period. The pig producers agree to set-up a plan reducing the use of antibiotics. 24 product references will be marketed.”*

**Preparatory steps needed before the SDSC modeling phase:**

Terrena and Système U first specified the extended demand for pork “nouvelle agriculture® U®”. In addition to the product specification, the objectives to be reached with the SDSC approach have been defined, and their associated indicators used to monitor the results. The chosen indicators condition the model (especially the data model, because the model must be able to calculate these indicators).

Subsequent data analysis is then applied to the whole chain in order to find levers for creating value. These levers provide a basis for modeling interactions within the DSC.

Out of the millions of data element analyzed (daily levels for one year - 2015), the most useful are:

- For each breeder:
  - All pig births and accidental deaths (source: an official French register)
  - The pig shipments to the slaughterhouse (source: Terrena invoices from the slaughterhouse)
  - Description of each shipment: number of pigs, morphologic and quality characteristics, transfer prices (same source)
  - Production costs (mainly animal food costs), costs estimated by Terrena (farm figures could be used for the next version of the model)
- For slaughterhouses (source: central Terrena files sent by the slaughterhouse)
  - Inputs/outputs
  - Details of what is produced, for each lot, i.e. the number and weight of pieces by category, with their associated quality characteristics
  - Stock levels by category
- For plant transformation (source: central Terrena files sent by plant)
  - Inputs/outputs

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<sup>2</sup> <http://www.terrena.fr/en/la-nouvelle-agriculture-products/>

<sup>3</sup> Bleu-blanc cœur (French website) : <http://www.bleu-blanc-coeur.org/>

- Also the detail of what is produced (mainly punnets) quantity and weight
- Stock levels by category (inputs and outputs)
- For Système U platform and stores (product sales in units and tons)

Yearly forecasts are made and discussed between Terrena and Système U, but no other forecasts are exchanged during the year except figures for promotion campaigns.

#### **4.2.1. SDSC Pork Model objectives**

The general aim is to create value and to redistribute it fairly between all stakeholders (consumers, Terrena, Système U, local authorities, French state, NGOs), with particular attention to breeder sustainability. This value embraces economic, social and environmental aspects.

From the economic point of view, the objective is to increase the margin of all DSC actors (farmers, breeders, slaughterhouses, transformation and animal feed plants, carriers, Système U platforms and stores). For information, the consumer price has been kept at market level, despite the higher quality of the product (non-GMO food, reduced use of antibiotics, Bleu-Blanc Coeur specification...)

The other main environmental and social objectives are:

- Less wasting (material wasting, downgrading ...)
- “Local” considerations (especially local employment)
- Animal welfare (breeding conditions, transport, slaughterhouse stress...)

The general objectives for SDSC modeling remain applicable:

- A transparent model, readable and acceptable by all DSC members
- A simulation tool (economic but also environmental and social) on different time scales: annual, monthly, weekly and daily data for the supply chain and demand management
- Automatic calculations of margin contributions, transfer prices for DSC actors (by using, for example, revisable fixed prices in order to fight against price volatility and speculations)
- A basis (and a reference) for business agreement between actors
- A tool to upgrade the overall organization and governance at DSC level.

#### **4.2.2. Pork SDSC model: aggregation and linkage of several BU models**

Terrena and Système U are both cooperative organizations. This means that decisions are taken at farm and store level (even if coordination is handled at cooperative level). The SDSC approach aims to help re-organize a food sector but in accordance with typical French farm sizes, for example.

The model is not meant to demonstrate that farms have to be less numerous and bigger nor that they must converge toward an ideal configuration.

On the distribution side, stores are different (they can sell only some of the NA-U pork products, order punnets or pork pieces, and do the cutting themselves...)

So the SDSC pork model (see Fig.2) is the result of an aggregation of similar business unit models (for example, farms or stores), and a linkage of these resulting aggregate models and other specific models (for example, slaughtering and transformation plants).

The linkage between models is ensured by a transformation matrix (for example, to convert animals into pieces, and pieces into punnets).

Note that “similar BU model” does not mean the same model. For example, all farms are modeled in the same way, but they could be very different from one another (some could be only fatteners). Even farms with the same activity may have different characteristics (for example, as regard well or network water, manure treatments) and have different performances (mortality rate, level of pig weight conformity). So the BU model is adapted for each unit through specific parameters (economic, environmental and social).

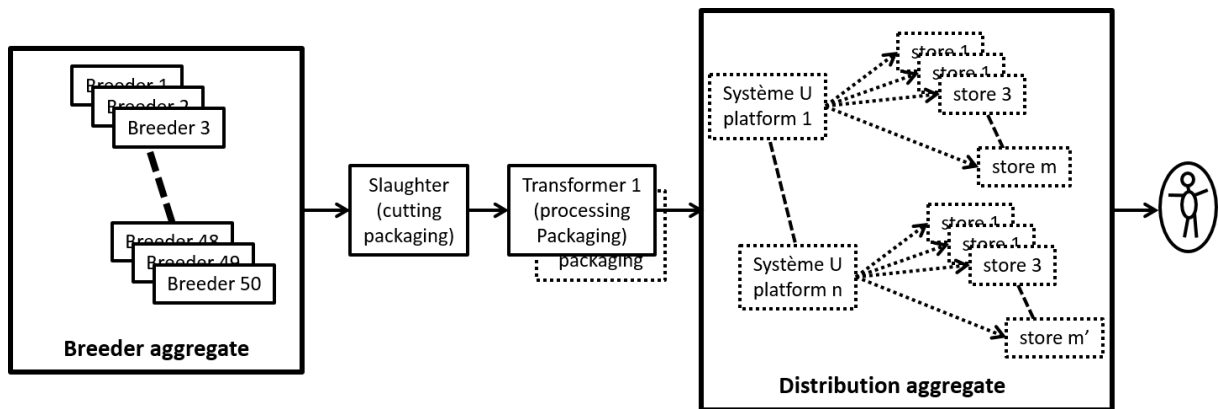


Figure 2 – Global structure Pork SDSC model

In this figure, some models have dotted lines (especially platforms and store models), which indicates that only the aggregate model, not the detailed one, has been developed and used. Detailed modes can be developed in a second phase, but they are not useful at this stage.

Modeling at store level could allow the demand and supply chain to be managed at a local level. This means organizing the production and distribution of pork between farms and stores located in the same area. The overall management of the demand and supply chain between Terrena and Système U could be split into several management units at this grouping level, with overall coordination.

Pig and pork production has been modeled in detail because it was complex, and because no global tool existed to manage it at cooperative level.

#### 4.2.3. Model creative-value levers and Governance

The first creative-value lever to be considered (strategic choice of Terrena and Système U) aims to decrease wasting. Some wasting depends only on the performance of certain actors (mortality rate in farms, cutting performance in slaughterhouses, unsold rates in stores), but other wasting depend on joint management of supply chain and demand, for example, to decrease downgrading all along the chain. This could be done collectively by a better balance between supply and demand, at pig level, but also by material balance at piece or product level. This balance has a temporal aspect (seasonal or weekly fluctuation), but also a structural aspect (stores do not sell all pork parts and some products are sold in bigger quantities than others).

The principal levers identified in the model to decrease wasting concern different actors:

- Breeders
  - Number of farms authorized to produce NA pigs (some farms can be added if the demand increases (more than 6 months horizon))
  - Number of pigs for each farm (there is flexibility for some farms which are able to rear more pigs (impact 6 months later))
  - Possibility to downgrade pigs on a specific farm for some weeks (to cut the cost of production; downgrading at this level costs less money than at the slaughterhouse)
  - Advance or delay the delivery of pigs to the slaughterhouse (to adjust for daily or weekly demand variations); the effect is immediate, but this lever works for temporal, not structural, adaption (the pig weight conformity is affected)
- Slaughterhouse/ plant transformation
  - Additional contracts with other clients to sell NA pork or pieces of NA pork that are not ordered by Système U.

Note that other NA pork (sides, pieces or punnets) are sold daily, by Slaughterhouse and plant transformations, as regular pork with downgrading.
- Distribution
  - Changes in ordered volume, sides, pieces, punnets; by product listing in store, pricing, promotions
  - Better material balance for pieces and punnets (idem)
  - Better balance in temporal aspect (advance or delay of a promotion campaign)

All these levers could be used in parallel. Governance must define who operates the different levers and how compromises are to be found.

In our case, breeder information is handled by a Terrena manager in collaboration with breeders; another Terrena manager handles Slaughterhouse and plant transformation information; and a Système U manager handles distribution information in collaboration with platforms and stores.

The model contributes to defining the economic impact of SDSC. In addition to the calculation of downgrading and wasting in kilograms, the model also indicates each actor's specific revenue. Equally, price transfer calculations are also up for discussion between actors. Other indicators (manure treatment, employment level, etc.), are calculated from the model and can be used, like the wasting and economic indicators, for decision making.

## **5. Discussion on new modeling approach for adding value to agri-food chains**

Building a collaborative modeling tool in the SDSC approach requires specifying the extended demand and conceptualizing the firm with both horizontal and vertical cooperation under shared governance. The SDSC approach raises two questions: How could the collaborative modeling approach create value in the agri-food Sustainable Supply Chain? How could this value be shared fairly through an innovative model?

### **5.1. SDSC as governance model to create more added-value**

Accepting to delegate to a central organization, integrating the different parts of the supply chain, i.e. the arrangement of transactions and decisions, is reflected according to the equilibrium of cost / benefit (Williamson, 1975). In this sense, the need is to include direct production costs with the related transactions of cost information and negotiation control. Producers thus operate a choice based on the reduction of transaction costs in relation to any additional costs bound up with organizing the links (Verhaelgen and Van Huylenbroeck 2001). This, however, is not sufficient for understanding the complexity of modern economic organizations (Chassagnon, 2011).

SDSC combines vertically organized transactions, which represent the successive stages of creating value along the supply chain, with horizontal cooperation to provide information for actors on policy in food chains. The literature on supply chain management emphasizes the role of managerial discretion in coordinating the flow of products, information, and decision making in the supply chain. Interorganizational collaboration is focused on the development of social links in which the activities are regularly adjusted to each other and not just planned. All this supports managerial initiatives aimed at pursuing flexibility in positioning the company in value networks, thereby benefitting from new information and knowledge (Lazzarini et al., 2001).

Governance becomes a hybrid affair, no longer based on a single authority as in the firm (Williamson, 1985). In hybrid forms, the SDSC appears as a device in which governance is shared among voluntary members. It is not a matter of a central collective mechanism designed to balance transaction and coordination costs, but rather a means of sharing governance. The governance of the demand and supply chain between Terrena and Système U could be diffused to the other stakeholders. This change of mode of governance is related to the diversity of organization of the food system model (Raynaud and Sauvé, 2005). This hybrid mode of governance is either based on incomplete contracts, or each party retains ownership of its residual rights of control over its own part in the creation of a collective signal (Hart, 1995).

The model helps to create supplementary additional value (environmental, social and economic). The new governance of the DSC allows a consensual scenario to be defined, one which provides additional value when compared to the standard organization. Regarding additional economic value, the model can also propose how it could be redistributed. For example, a part of the additional “DSC” margin could be given to breeders. This redistribution could also be used as a reward or to incite virtuous behavior (for example, breeders who develop better manure management). These specific redistribution mechanisms could be captured in the model after discussion within the DSC, and updated periodically. “Thus, the emergence of the network-firm, particularly in what concerns the modern firm, appears to be based on legal incompleteness, as this complex organization goes beyond the legal rights and duties that result from equity ownership and employment contracts” (Chassagnon, 2011, p. 45).

« In France<sup>4</sup>, ... The regulation most directly covering UTPs is a specific B2B legislation, the *Droit de Pratiques Restrictives* (contained in the Commercial Code), which is expressly targeted at vertical relationships between suppliers and retailers. Besides the Commercial Code, French Competition Law deals with the issue of UTPs, with reference to the concepts of economic dependence and abuse of dominant position.... France represents a significant example also for what concerns the enforcement of the above regulations » (Arete, 2016, p. 78).

## **5.2. SDSC: A solution for the extreme environment? The challenge of instability**

The end of milk quotas illustrated the end of sustainable market public policies, and a complex and unstable environment (CGAAER, 2015a, 2015b). Opening the door to instability and price volatility due to international competition took the actors even deeper into the crisis in the agricultural and agrifood sector (Ancey et al., 2013; Le Roy et Sanou, 2014). It is not only the fact of falling into a risky environment, however, but more the need to change the existing model, in order to confront the “extreme environment”, defined as an environment with strong instability and non-predictable risks (Lièvre, 2016; Godé et al., 2016). Unpredictability is, then, a new issue for all food supply actors.

So, the solutions will need to be specific, in order to create mobilizing multi-scales and multi-dimensions. The actors need to construct sense, develop flexible capabilities and broaden their knowledge (Chabaut et Hulin, 2016). In this perspective, thinking in terms of SDSC justifies the cooperative spirit, thereby reinforcing the need for collaborative partnerships. SDSC, as a dispositive designed to generate stability in a competitive market, manages dependence vis-à-vis other organizations (Porter, 1998). Ensuring stable partnerships will be a strategic issue in order to confront the increase in economic risk and instability (prices, but also norms and legislation).

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<sup>4</sup> « In France, ... The regulation more directly covering UTPs is a specific B2B legislation, the *Droit de Pratiques Restrictives* (contained in the Commercial Code), which is expressly targeted at vertical relationships between suppliers and retailers. In particular, articles 441- 6, 441-7 and 442-6 of the Commercial Code were modified twice in the last years, first by Law 17/3/2014 (“Loi Hamon”) n° 2014-344 and then by Law 6/8/2015 (“croissance, l’activité et l’égalité des chances économiques”) n° 2015-990, in order to provide clearer obligations for payment terms between suppliers and purchasers. New administrative sanctions were also introduced through Law 17/3/2014 in case of abusive late payments and imposed by the Autorité de la Concurrence (ADLC - French antitrust authority), whose investigation powers were substantially widened under the new regulation. Besides the Commercial Code, also French Competition Law deals with the issue of UTPs, with reference to the concepts of economic dependence and abuse of dominant position. ... France represents a significant example also for what concerns the enforcement of the above regulations. The Commission d’Examen des Pratiques Commerciales (CEPC) is in charge of enforcement of the *Droit de Pratiques Restrictives*: it has no sanctioning powers, but provides advice and recommendations; it can investigate ex officio and receive confidential complaints. In addition, CEPC recommendations are generally taken in great consideration before courts. Another central enforcement authority is the Direction Générale de la Concurrence, de la Consommation et de la Répression des Fraudes (DGCCRF). DGCCRF has the role of investigating for the benefit of CEPC, of ADLC and of the Ministry of Economy; DGCCRF also has sanctioning powers on behalf of the Ministry (imposition of monetary penalties and injunctions) » (ARETE, 2016, p. 78).

Based on mutual commitments, actors build confidence with ethical and stable relationships, like the social exchange of Blau (Blau, 1964). In this case, equity is a key factor for success (Ring and Van de Ven, 1994; Gauzente et Fenneteau, 2006). Dwyer et al. (1987) underline that justice is an important step at the exploration phase, before developing inter-enterprise relationships, even if certain disequilibria still exist. What is at stake is to create and share added-value between stakeholders. Spender develops the idea that “empirical research shows that private sector businesses pursue new value within multi-dimensioned “opportunity spaces” of around a dozen different “modes of business knowing” (Spender, 2016, p. 63). Uncertainties become the incentive for cooperative behaviors due to their limited knowledge, and the necessity to react immediately to new situations. While property rivalry is a precondition of economic analysis, the processes of creating property also lie at the core of economics. These are often shaped by ideas from science and technology, as well as by the social, political, religious, and psychological aspects of human action and effort. But when property is considered as “material”, unambiguous, and certain, business leadership reaches beyond the application of science’s truths to property” (Spender, 2016, p. 65). To be smart requires creativity and flexibility, which together provide a strong motivation for competitors to cooperate as Axelrod (1984) indicated in his famous book, *The Evolution of Cooperation*.

## 6. Conclusion

In this paper, we propose SDSC as an innovative approach of the Sustainable Supply Chain because it: (1) includes extended demand, (2) creates and shares added-value between independent units. This is the key point, which avoids conflicts and the destruction of added-value by yardstick competition. The SDSC model is described in a French pork sector application. We use the model to illustrate how created-value is shared fairly between DSC members.

The competitiveness of SDSC is based on the idea that this collective organization contributes to creating better and sustainable added-value for all members, as well as customers. Our results underline that SDSC modeling needs to improve coordination between stakeholders, as well as incorporating both information technology and indicators to share value and new contracts. In this contribution, the model focused on is related to the idea that independent units and firms work together in order to create and share added-value, thereby avoiding conflicts or creating common/collective goals. Commitments are guaranteed by information and contracts.

Future research should focus on the legal risks (competition restrictions) which can occur with that kind of contractualization (volume engagement, price engagement - calculation and revision aspects, circular flows...). This contractualization can be considered as a limit to the commitment of stakeholders (CGAAER, 2012 ; LMA, 2010).



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