NETCHAIN INNOVATION FOR SUSTAINABLE PORK SUPPLY CHAINS IN AN EU CONTEXT

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ABSTRACT

This paper aims at providing insight in the need for innovations in the European pork sector in order to construct sustainable pork supply netchains. It provides an overview of sustainability pressures on netchain actors such as societal conformity, environmental impact, and economic sustainability. The paper shows that close relations between netchain and non-netchain actors is critical to create and adopt innovative solutions to meet these challenges. The focus is on the development of pork netchains that aim at the high quality production in regional and organic niche markets. Challenges and responses are often similar, and the paper concludes with a suggested framework for further research based on the analysis of key innovation issues from two cases: a regional niche chain in Spain and an organic niche chain in The Netherlands.

Key words: innovation, supply chain networks, sustainability, niche markets

1. INTRODUCTION

During the past two decades the agri-food sector in Europe has undergone profound changes, with specifically the pork sector being confronted with many and diverse challenges. Revolutionary advances such as innovations in products and processes at the production and processing end of the chain do not match well with differentiated market demands. Therefore, a sustainable cross-chain approach becomes a precondition to tackle such challenges.

Due to public and societal concerns there is a growing need among pork netchain actors to work towards sustainable supply chains. The paper will view a pork net chain as being sustainable when it integrates aspects related to Planet (public concerns), People (societal concerns) and Profit (commercial concerns).

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The paper will focus on those chain actors with relatively powerful positions, such as organized producers, meat processing industries and supermarkets, which will have an important role to play in anticipating and acting on new developments in pork netchains. Effective cooperation and network building between European chain actors is crucial for developing innovative approaches that answer to public and societal concerns, as well as to their own business concerns. With developments of more sustainable production coming their way, European pork netchain actors will need to work towards innovative approaches to answer to these public, societal and business concerns.

The main objective of this paper is to develop a framework which will enable the definition of critical success factors (CSFs) that support successful adoption of netchain innovations for the construction of sustainable pork supply netchains in a European context. The paper makes use of two case studies to support the development of this framework, namely The Iberian cured ham chain in Spain, and the Organic pork chain in The Netherlands. These cases derive from the "Inventory of the European pork sector", which is performed as part of the EU funded Integrated Q-Porkchains project, in the context of the 6th Framework Programme Priority Food.

The paper is divided into eight sections. In section 2 theoretical and empirical considerations in the field of sustainable netchain innovations are described. Section 3 provides a description of the conventional fresh pork meat chain in Europe, while in sections 4 and 5 a detailed description of the two selected cases in Spain and The Netherlands is given respectively.

Section 6 combines and analyzes the major innovations that are observed in both cases. In section 7, as a result of the analysis, a framework for further research is designed that will be used in additional and similar cases of niche market pork chains. Supported by this framework innovative relations between multiple netchain and non-netchain actors in these chains will be investigated and critical success factors for successful adoption of these innovations will be established.

2. THEORETICAL AND EMPIRICAL CONSIDERATIONS

This paper builds on the first results of the Work Package 4.1 'Inventory of pork chains' of the EU integrated Q-Porkchains Project. In the effort to arrive at the typology of pork chains and research agenda, extensive investigation has been performed by five European countries including The Netherlands and Spain. Expert interviews have been conducted with key players, as well as in-depth secondary material has been used. The expert interviews were structured

according to the following schemes: governance, information exchange and use, quality management and standards, regulations, performance, value chain, innovation, and social responsibility, in the pork chain, including the major chain actors, namely the breeder, feed producer, producer, veterinarian, transporter, slaughterhouse, processor / importer, and retailer. In the Netherlands there were eight semi-structured expert interviews conducted, and in Spain twenty three. Experts were chosen from the pork industry, governmental authorities, as well as research institutes. The topics of the expert interviews are included in appendix 1.

Research shows that in practice long standing problems such as lack of trust, competition between chain actors, and unwillingness to co-operate often hinder a solid and integrated strategy shift. As an effect of increasing external pressures, effective cooperation and coordination between chain actors and non-chain actors becomes increasingly crucial for the pork sector to be successful. Boston argues that 'Supply chain coordination continues to be highly necessary, and effective organization and co-operation will allow for the translation of sustainability demands to actions within the chain, and for efficient product flows with the necessary information to meet these demands (BOSTON, 2004). So far supply chain management literature has a rather operational and normative focus, prescribing how to improve processes and activities by assuming that closer collaboration among supply chain actors will lead to better results. However present literature on the pork sector seems to miss to link the chain as a whole and underestimates the potential for the 'whole to be greater than the sum of its parts' (MINTZBERG, 1998). For this reason this paper takes a broader chain network-oriented perspective.

Sustainability in the pork chain

In a review which covered public concerns about modern pork production in Western Europe, it was concluded that some of the main issues among the public were food safety and health, animal welfare and animal health, environmental impact, sensory quality, and the price of pork. The report concluded that there certainly is public demand for more sustainable production, and not only for inexpensive pork. (STERN, 2005). Sustainable development is about meeting the needs of the present without compromising the ability of future generations to meet their needs. It is based on three important elements: environmental quality, social responsibility and justice, and economic viability (IGD 2007).

Such and other sustainability aspects that affect pork chains can also be categorised by making use of the 'People, Planet, Profit (3-P) approach'; by integrating the sustainability factors such as emissions and pollution (Planet), animal welfare and food safety (People), and chain efficiency (Profit). This paper will use the '3-P approach' and pays special attention to the elements of 'Societal Conformity, Environmental Impact, and Economic Sustainability' at farm level, as has been defined in the "Inventory of Sustainability Tools" Report, Work Package 2.1 of the Q-Porkchains Project. The paper views these three aspects as drivers for innovations in pork (niche) markets, requiring new relations between chain actors and non-chain actors in such niche chains.
Societal conformity refers to the degree to which the pork production system meets the requirements and expectations of the society. It comprises of two dimensions: the society side (the expression of the societal view on the conformity of the production system) and the production chain side (initiatives by the production system to reduce inconformity, or societal unease). Environmental impact considers a wide range of environmental objectives covering both local and global effects. Eutrophication, acidification, climate change, the use of non-renewable energy, terrestrial toxicity, and the use of pesticides or emissions of odors are important aspects, as well as emissions associated with the production and delivery of the feed, including the use of fertilisers for crop production. The latter is particularly important for pig farms, since are often highly dependent on imported feed, produced locally or internationally, and export large amount of manure to other farms. Economic sustainability refers to the economic health and profitability in pig production at farm level. Indicators include economic viability, economic specialisation rate, financial autonomy, reliance on direct subsidies from CAP, transferability, and efficiency. The aspect of economic sustainability is included for two reasons. First because a pork chain that answers to societal (expectations) and public (legislation) concern has to be economically sustainable to be sustainable, and second because as a result of these concerns, in combination with global developments (e.g. prices for feed), niche markets such as regional or organic high quality production may prove more economically sound than previously thought.

Niche chains in the pork sector

In this changing environment of societal pressures an economically viable and market-driven niche market is thus seen by many producers as a feasible next step. Within the context of the key concerns this paper will analyze the results of research recently carried out on two cases: that of the regional Iberian Cured Ham pork chain in Spain and of the organic pork chain in The

Netherlands. Although the latter derives from societal concerns related to a bad image of the pork sector in general, and the first is based on societal concerns related to a bad image of the quality of the pork product itself, this paper suggests that there are many similarities, and thus lessons to be learned. In both cases, societal and public concerns resulted in 'space' for a growing niche market. In The Netherlands the niche is an organic product, while in Spain the niche is a regional quality product. Both answer to societal concerns, and both aim at, from a business point of view, improving the image of the pork product within the society. At the same time, both niches show economic potential: in The Netherlands to stimulate improved social acceptance of eating pork meat in general, and in Spain to increase domestic consumption of pork meat per capita.

At the same time, with the pork sector facing increasingly high costs of production (e.g. as a result of higher costs of feed and other inputs, as well as due to stricter legislation), the niche of regional and/or organic pork production may show improved business opportunities. For example, producers that are active in these niches often use different (local/regional) types of feed and other production inputs than conventional pork producers do, making them less dependent on global increases. While being less dependent on fluctuating input costs and/or increasingly strict legislation, regional and/or organic high-quality producers will at the same time target the growing demand for such produce.

This paper aims at analyzing key innovation issues related to producing regional high-quality pork meat in Spain and organic pork meat in The Netherlands, and to analyze where the two business strategies (resulting from similar societal concerns) show overlap. Lessons can be learned on cooperation between chain actors and non-chain actors on adoption of such innovations from these seemingly different cases. Based on the analysis of these two cases the paper will suggest a framework for further research in order to compare key issues and derive at critical success factors.

Netchain Innovation in the pork chain

Looking at sustainable production from the chain perspective, some argue (BINNEKAMP AND INGEBLEEK, 2006) that it is the supermarket that should be the leading chain actor. In research related to the societal issue of animal welfare for example, a constructive attitude of retailers is seen as crucial due to the hourglass shape of the pork supply chains. (BRACKE , 2004). Although much literature agrees with this idea, this paper argues that in niche chains other key chain actors

are just as crucial, such as slaughterhouses and producers; and that only through joined anticipation chain actors can prepare for cross-chain innovative measures. This perspective demands a better appreciation of how firms and innovation work, and highlights the need to better understand all the organizations involved – the policy makers, consumers, firms, institutions, and other stakeholders that can influence the rate and direction of innovation.

Theory recognises a number of different types of innovations including product, process, organisational, business model, and marketing innovations. Schumpeter (1934) defined innovation as "the creation of new combinations". These innovations can be new products, new methods of production, new sources of supply, the exploitation of new markets, or new ways to organise business (SCHUMPETER, 1934; BATTERINK, ET AL, 2006). Innovation is not a solo act but a multiplayer game, which raises questions between organisations that have to develop and make use of increasingly wide networks. As the innovation becomes more complex, so the networks have to involve more different players, many of whom may lie outside the firm (BESSANT-TIDD, 2007). This paper will analyze different types of innovations at the product, process, market and organizational level within each of the two niche chain cases. It shows that innovations take place at multi-actor level, both chain and non-chain actors, and that relations between the two are important. A framework is presented that will introduce the 'netchains: a set of networks comprised of horizontal ties between firms within a particular industry or group, such that these networks (or layers) are sequentially arranged based on the vertical ties between firms in different layers' (LAZARRINI ET AL. 2001). The goal of the paper is to contribute to identifying netchain innovations, between chain and non-chain actors, that contribute to effective sustainability initiatives in the pork sector while balancing public, societal and commercial concerns.

National versus Regional Innovation

In formulating and executing their innovation strategies, organisations cannot ignore the national systems of innovation in which they are embedded. (TIDD ET AL, 2006). Through their strong influences on demand and competitive conditions, the provision of human resources, and forms of corporate governance, national systems of innovation both open opportunities and impose constraints on what organisations can do. However, a far-reaching consensus can be seen, whereby analogue to the two interdependent processes of globalisation and regionalisation, regional innovation systems (STERNBERG, 2000, BRACZYK ET AL, 1997) exist next to national

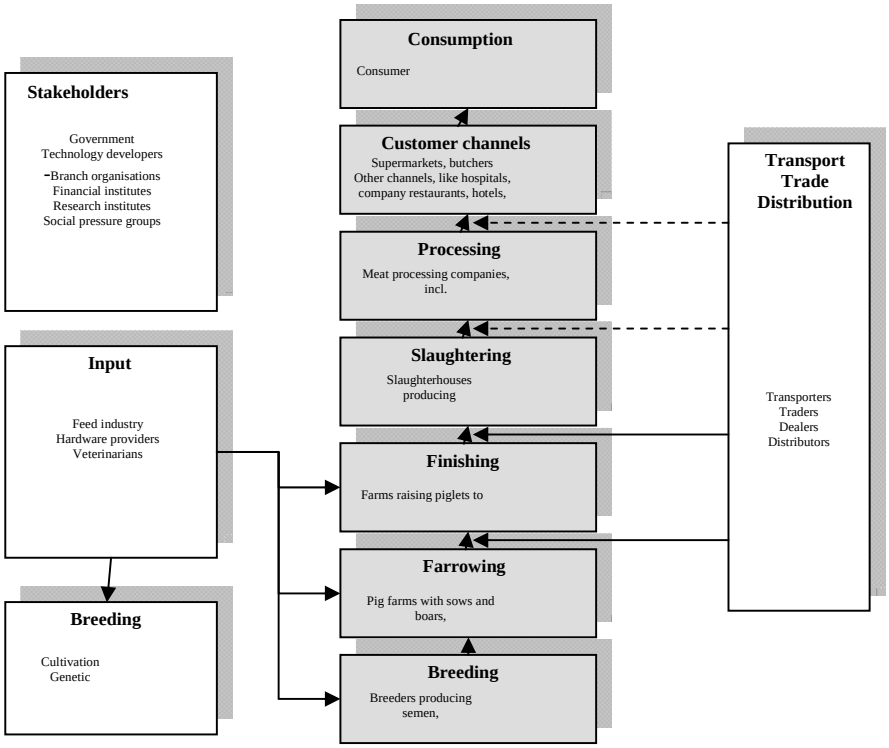
innovation systems (NELSON 1993, LUNDVALL 1992). The regional innovation systems require region-specific policies in innovation in order to achieve "collective learning" among the participants in innovation (STERNBERG, 2000, LUNDVALL, 1997). Although it is argued that the "local production-local consumption" model is no longer reality, there is currently strong political desire observed at both European and national scales to "re-localise" food production and supply. Less than a decade ago, a new kind of European agro-food geography started to emerge with a topography shaped by the "quality turn" in food production and typified by various strategies to valorise local and/or regional food products (MAYE, 2006, MURDOCH, 2000, MARDSEN, 2002, GOODMAN, 2004, ILBERY, 2005). A representative illustration of this new vision is Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) quality status awarded to dedicated regional foods and, various efforts to encourage economic growth through the production of specialty / niche market foods (MAYE 2006, PARROTT, 2002, ILBERY, 2000). This implies that local businesses in a region can turn from producing standard products to producing specialised products and can construct suitable food supply chains to pass this quality products to dedicated (niche) markets inside and outside the region (MAYE, ILBERY, 2006). This assumes a new kind of regional economic space, built around specialist dimensions of the food economy, including organic, local and regionally branded food products.

3. FRESH MEAT PORK CHAIN

Although the focus of this paper is on the similarities between innovations in the niches of high quality organic and regional pork chains, it is important to first explain the nature of the conventional fresh pork meat chain in Europe.

The fresh pork meat chain is lengthy and involves a number of actors and types of processes. Production commences with the production of piglets, flows through fattening and finishing, slaughterhouses and meat processors, to retailers and consumers during a time period of six months, as it is illustrated in Figure 1.

Figure 1: The Fresh Pork Meat Chain



Source: Q-Porkchains Project – Inventory of European pork chains

The chain of activities in the process from farm to fork, including governance, quality management, regulations, and information exchange, differs from one country to another and from one stage of the pork chain to another. Actors involved in the fresh pork meat chain are pig producers, slaughterhouses, processors, distributors, sales channels, consumers and various non chain actors such as transport and trade, veterinarians, feed industry, and government. Moreover differences in consumer demands lead to differences in organizing and managing the supply chain.

The fresh pork meat chain has experienced a number of developments. Professionalism in the chain has increased, and while the size of chain actors is increasing, the number of pigs in the chain is not allowed to grow. Scaling-up of the primary production has occurred, due to the rigid cost structure in the chain. Production intensification has contributed to a critical attitude of society towards the pork sector. Specialization has been observed of the primary production process of farrowing and finishing. Mixed cattle breeding has moved into specialized pig breeding. Production control has increased, especially in the areas of hygiene and animal disease,

leading to higher productivity within limits set by environmental requirements. Changes in consumer behavior have led to pork products sold mainly through the retail channel. In addition, product diversity has increased with a growing contribution of convenience products. Genetic improvements have led to healthier and more efficient animals (amongst others with regard to food-conversion). Moreover consolidation in the retail channel has led to further consolidation in the pork sector, such as up-scaling of slaughterhouses has occurred to counterbalance retail power.

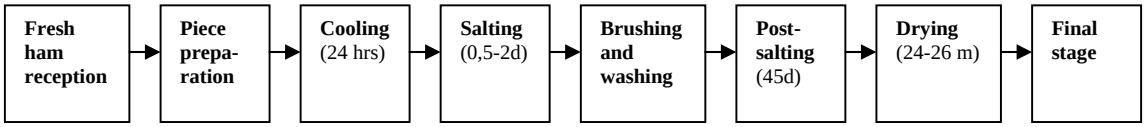
4. SPAIN: REGIONAL NICHE OF IBERIAN CURED HAM CHAIN

The Iberian pork sector is a very important and traditional regional production chain in Spain. One obvious difference with the chain of fresh pork meat is the breed of the animal; usually in intensive farms the animals used are crossbreeds of Pietrain, Large white, Landrace or Duroc. In the case of the Iberian sector the breed is the Iberian pig among which there are different indigenous breeds.

The production cycle has several differences compared with fresh pork meat production. The weaning period counts since the birth of the piglet until weaning. Feeding is based on milk and concentrates. The farrowing period takes eight weeks and weaning period takes ninety days. There are three modalities of breeding Iberian pig: camping, the functional system with boxes in a building and small yards, and modern system similar to production system of fresh pork meat. The growing period takes about ten months. Feeding is based on concentrate and organic resources of the farm if available. The fattening and finishing period is the last stage of the animal. Its length depends on the fattening program, whether is intensive or extensive. This is a crucial stage for the final quality of meat. Fattening modalities are varied, pigs can be fattened in closed buildings with concentrates, or they can be fattened in yards where animals can freely move or they are fattened by using the resources of a “dehesa” (an open ecosystem). There are four classifications for the pork products based on the regulations on quality for Iberian meat and Iberian cured meat products. Weight plays in important factor as well, and in this case the animal reaches 160kg live weight. The cured ham process can take from 6 to 26 months, as it may be seen in Figure 2, depending on the type of meat whether is Iberian or other breed and the weight.

Depending on the length of the process as well as environmental conditions of temperature and humidity in the warehouse the ham will develop the characteristic flavour and aroma of cured ham.

Figure 2: The Spanish Cured Ham Chain



Source: Q-Porkchains Project – The Inventory of European pork chains

In Spain a number of Protected Designations of Origin (PDO) exist for cured ham - for Iberian pig: Huelva, Dehesa de Extremadura, Guijuelo and Valle de los Pedroches, as well as two for non Iberian pig, namely Jamón de Teruel and Trévelez. These PDOs play a role of control and certification for the respective quality. They provide cattle certification for the farms and cured ham certification for the processing industries.

However it has been argued that PDOs are not the main focus of leading industries as they prefer to create their own well known brands and quality standards. This is the case of Navidul, one of the most important industries in production of cured ham or Sanchez Romero Carvajal one of the most famous brands of Iberian cured ham of high quality.

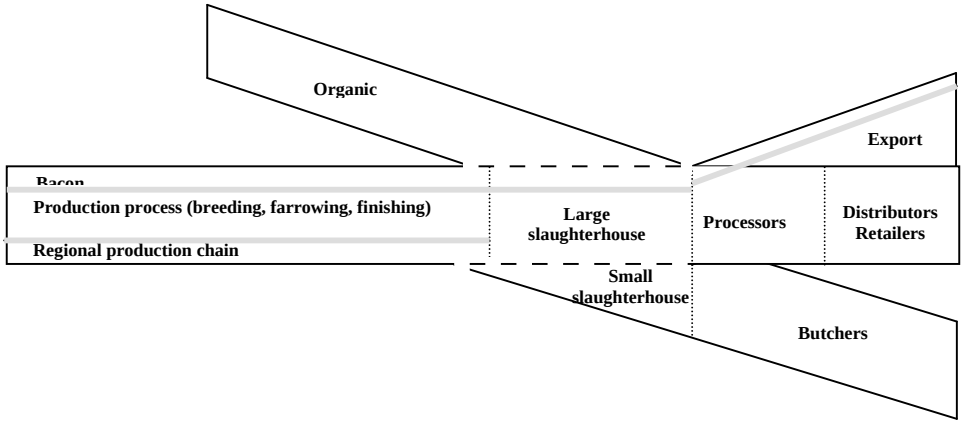
5. THE NETHERLANDS: NATIONAL NICHE OF THE ORGANIC PORK CHAIN

The organic chain differs from the fresh pork meat chain in particular with respect to the primary process of farrowing and finishing, as shown in Figure 3.

In organic agriculture no chemical-synthetic fertilizers or pesticides or herbicides are being used. Pastures, for grazing or production of organic feed, may not be fertilized with chemical fertilizers. Instead, animal fertilizers, natural fertilizers, compost and minerals are used. In general, the focus is on prevention of diseases by using disease-resistant plant material and by ensuring crop rotation which results in organically produced meat containing lower levels of pesticides and herbicides. In organic pig production animals lead a natural way of life. Yet the organic production also results in problems. For instance, more piglets die directly after birth than in non-organic production, because the mother sow is not placed between metal bars resulting in more sows laying on top of their piglets. Another problem is that organic sows have a higher risk of lung and liver disease as a result of breathing-in dust and straw particles.

The organic pork sector encompasses about 5% of total pork meat production, and there is an intension to grow to about 10%. In general, organic pork products are 40 to 50% more expensive than fresh meat products. Reasons for this price premium are : animals live longer, they get more space, they get more expensive organic feed, while organic farming is labour intensive. Sector growth depends to a large extent also on willingness of consumers to pay the higher price for organic products. While in general the market share of the retail organic sales is increasing (in the UK has exceeded the 80%), in the rest of Europe accounts to 51%. The supply of organic meat is highly concentrated in Europe, with about 15 companies having a significance presence – European market share 50%. (*source: Biological Monitor, 2007*).

Figure 3: The Dutch Organic Pork Chain



Source: Q-Porkchains Project – The Inventory of European pork chains

The major player in organic pork meat in the Netherlands is The Groene Weg, fully owned by the Dutch-German Vion Food Group. The concept De Groene Weg is, since 1981, the only franchising formula in the organic slaughtering sector in The Netherlands, with a substantial growth and strong position in supplying supermarkets and export. Tasty, honest and natural meat are the most important pillars of its formula. This is translated into the concept “Meat from a Healthy Source”. The Groene Weg sells a variety of organic fresh products through their own brand Bio+ , as well as developing private label concepts together with large retail partners nationally and internationally.

6. KEY INNOVATION ISSUES OBSERVED PER CHAIN ACTOR IN BOTH NICHE MARKETS

When analyzing the regional high-quality pork case in Spain and organic pork case in The Netherlands, a number of similar key innovation issues are observed. In both countries, the main chain actors in both niche pork chains adapt their business strategies according to societal and/or public concerns (product innovations in accordance to People and Planet issues), while also professionalizing the efficiency of the chain according to economic sustainability (the Profit issue). The similarities between the seemingly different niche market chain actors are summarized below.

Breeding: Among chain actors involved in breeding, in both cases innovations in genetics were identified which focus on producing improved breeds. Within such programs, the focus is on further professionalizing the market-oriented production of the high-quality niche pork products while at the same time adapting to the societal and public concerns.

Feeding: Also among the chain actors involved in the feeding sector certain innovations can be found. Here, the main focus is on the sourcing of the feed, thereby reducing the costs of all purchasing activities, and by developing strategic relationships with key suppliers. In the production of the feed, health, quality and social responsibility aspects are gaining in importance, like transition in the feed concept for sows in these niche markets, to reduce the occurrence of stillborn piglets, and to reduce piglet mortality.

Health management: Related to chain actors involved in the aspects of health management, and especially within the strict Dutch organic sector, continues adaptations in the processes to meet changing legislative requirements regarding animal welfare and health can be found (such as new guidelines and methods for tapping blood and monitoring of salmonella). Also a broadening of scope of activities of the cooperative purchase organization of veterinarians is seen, now also including distribution, marketing, and consultancy for its members.

Producers: Among producers of regional and organic pigs innovations in the organization of farms due to the regulations on animal welfare and/or high product quality standards can be observed. These are mainly technical innovations related to housing quality standards, as well as to meeting changing legislative requirements regarding quality, animal welfare, health & environmental demands.

Transporters: Also the transportation sector within the niche chains shows similar innovations, with improvements mainly focusing on animal well-being regulations, such as trucks with mechanical ventilation, automatic drinking-water installations, mechanical refrigeration to maintain constant temperature, with airlocks to optimize the circulation of air. In both cases – countries chain transportation is improving by a focus on obtaining HACCP and relevant ISO certificates to meet market (and legislative) requirements for health and quality management.

Processors: The processing actors in both chains shows continuous innovating activities on adapting installations to meet international safety requirements as well as for convenient and healthy food consumption. In the Dutch sector there is a growing focus on benchmarking of plants, internal information flows and decision making processes to secure food safety. The Dutch organic sector also shows a trend towards a reduction of market concepts to just a few key concepts with critical mass. In both countries, there is an increased focus on markets with a stable demand, both national and international export markets.

Retailers: In the retail segment of the chain, where major players dominate the market by offering homogeneous, easy-to-consume products, major players in the niche sectors are engaging in selling through own brand. This includes developing private label concepts together with large retail partners (Netherlands) and improved logistical platforms towards these retailers (Spain). Here also regional associations are established that protect and promote regional products; for example one association established a meat school where butchers can attend in order to improve and/or learn relevant techniques.

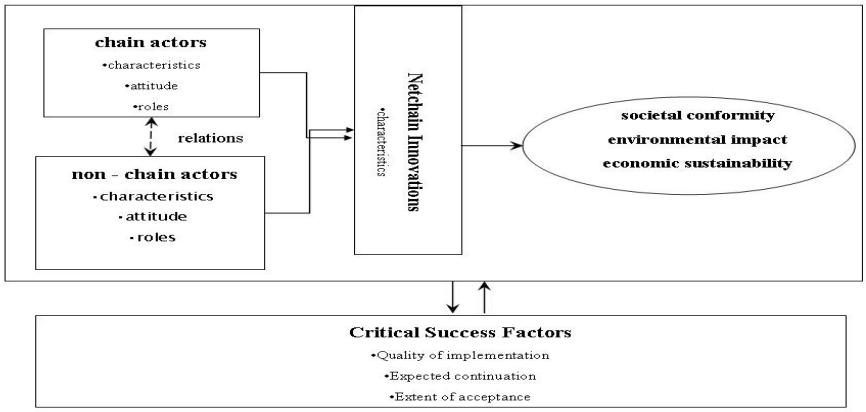
Government: In the Netherlands, the government, as a non-chain actor, considers organic production as a major issue and provides financial support to large scale (and exporting) organic producers, to those that produce specialty products, and to organic farmers that produce for local markets. Its support especially aims at promoting the organic sector to the consumers, with media campaigns, in the context of stimulating demand and chain linkages. It also financially supports integrating sustainability aspects in logistics and energy consumption.

7. RESULTS - FRAMEWORK FOR FURTHER RESEARCH

This paper argues that these seemingly different niche chain cases are built on similar challenges. Both are driven by societal and public concerns, and in answering to these concerns, both face similar technical and financial challenges. As has been described in this paper, chain actors in

both niche markets are involved in similar innovative activities. Lessons can be learned by comparing challenges and innovative responses per chain actor in such niche markets, and critical success factors for successful implementation of such innovative responses can be developed. This paper therefore suggests further and more detailed research on innovations in regional and organic niche chains to derive at these critical success factors. We have designed the following research framework to support this research, which is depicted in Figure 4.

Figure 4: Research Framework



The framework suggests that due to societal, public and economic concerns, there are both chain actors and non-chain actors that (intend to) operate in niche chains. Both groups of actors have certain characteristics, attitudes and roles in relation to the niche chains, and based on that, crucial relations between (sets of) actors can be defined to determine ways to promote synergetic netchain innovations. The focus of these joint innovations is on meeting societal conformity, reducing environmental impact, and improving economic sustainability (People, Planet, Profit). Based on the analysis of a number of relevant cases (such as the ones described in this paper) in both niche markets, critical success factors can be established around three categories: that of quality of implementation, expected continuation, and extent of acceptance.

This paper suggests to further refine this research framework through additional research on specific issues related to the Spanish regional chain and Dutch organic chain. Once the framework and its elements are further refined and tested, the framework will be used in additional and similar cases in order to derive at a set of preliminary critical success factors for netchain innovation in niche pork chains.

The purpose of such research is to create a good understanding of how firms and innovations work in their efforts of meeting societal conformity, reducing environmental impact, and improving economic sustainability (People, Planet, Profit). The more complex innovations become, the more actors (both chain and non-chain) will need to be involved in order for the innovation to be successful. Further research will therefore investigate innovative relations of multiple netchain and non-netchain actors in pork chains and networks. In further research this will be defined as 'netchain innovations'.

8. CONCLUSIONS

Sustainability in European pork supply chains is an increasingly important issue for its chain actors. Dynamic public and societal concerns and economic pressures require from chain actors to continuously predict changes and to innovate. As a result, chain and non-chain actors increasingly create long-term relations to enable development and adoption of netchain innovations. Within the pork sector, niche chains such as regional or organic pork production are increasingly viewed as a sustainable business model. Both niches are a reaction to identical societal and public demands and face similar economic challenges. Especially the development of new methodologies to identify critical success factors for adoption of innovative responses by niche netchain actors is seen as a crucial element in creating sustainable pork supply chains.

ACKNOWLEDGEMENTS:

This work has evolved from the results of the Work Packages 4.1 and partly from 4.2, of the EU funded Integrated Q-Porkchains project. We wish to acknowledge our appreciation to the project partners for the data collection.

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APPENDIX 1

In-Depth Interview Topics

Chain Links: Breeder-Producer, Breeder – Veterinarian, Feed Producer – Producer, Producer – Veterinarian, Producer – Transporter, Transporter – Slaughterhouse, Slaughterhouse – Processor, Processor – Retail, Slaughterhouse - Retail

Governance in the chain:

- Purpose of the exchange
  - Single transaction vs long term relationship
- Nature of communication
  - Anonymous vs firm to firm
- Formality of exchange
  - Formal vs informal
- Type of contract
  - Classic (closed) vs relational (open)

Information Exchange

- Product information exchange
  - Provenance, mortality, identification, quality data
- Process information exchange
  - Laboratory results, vaccination, feeding, hygiene
- Planning information
  - Forecasts, delivery time, pricing, quantity, quality
- Information system used
  - Fax, phone, internet, EDI, email.

Performance in the chain

- Changes in the last ten years
  - Financial efficiency, responsiveness, quality, flexibility
- Expected changes in the next five years
  - Financial efficiency, responsiveness, quality, flexibility
- Measurement of performance
  - What data, what goal, what system
- Key performance indicators
  - Piglets per year, speed of processing, etc.

Quality Management and Standards

- Quality programs – standards
- What kind of quality management are used?
- Inspection and audit tasks of public authorities (e.g. meat inspection)

Regulations in the chain

- Quality and safety
- Traceability
- Animal health and animal welfare
- Environment

Social Responsibility and Sustainability

- Material inputs
- Energy and water use
- Other inputs
- Outputs
- Treatment of wastewater and other waste
- Tools applied for environmental issues

Value Chain

- Input costs/unit
- Cost of production means/unit
- Cost of labour/unit
- Price/unit
- Margin/unit and profitability

Innovations in the chain

- **Product innovations**
- **Process innovations**
- **Market innovations**
- **Organizational innovations**