AGRI-FOOD SUPPLY CHAIN OPTIMIZATION THROUGH THE SWOT ANALYSIS

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Received 10 02 2018; accepted 16 03 2018

Over the last decade, agri-food chain has been changing rapidly in order to cope and face new global challenges. The key problem of the research is to find the possibilities to increase modern agri-food chain flexibility and adaptability to the needs and the requirements of all the stakeholders within the chain steps. *The aim* of the research is to create a conceptual agri-food supply chain optimization model and based on it define key characteristics for the selected agri-foods. A SWOT matrix has been developed in order to highlight the several aspects of four agri-food chains: wine, cereal, fruit and vegetables, and oil olive. The research results outline opportunities, strengths, weaknesses, and threats of a strategic management through the structure and characteristics of each chain by giving a deeper understanding.

Keywords: agri-food chain, supply chain reactivity, SWOT matrix. JEL Codes: Q10, Q13, Q18,

1. Introduction

According to "Agriculture, forestry and fishery statistics" (EUROSTAT, 2016), Italy gained the second position in the European agri-food trade rank with a sales volume greater than \in 55 billion. This is due to the assortment of high-quality food products, especially Protected Designation of Origin – Protected Geographical Indicators (PDO-PGI) traditional certified ones linked to specific area/region, which contribute to the increase in the exports (INEA, 2013). The availability of the raw material, the production of the high quality products, the ability to combine tradition with the process and product innovations represents the strength factors within the Italian agri-food sector (Carraresi, 2015). Nevertheless, Italian food sector is characterized by a large number of small and medium-sized enterprises (SMEs) with a small level of competitiveness due to the scarce coordination (Banterle, 2014).

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The key objective for a firm within the agricultural field is to assure the food quality throughout the chain and the added value, and food functionalities for the consumers. Successful business strategies include developing the plans to optimize and maintain the food quality according to consumer preferences, needs and acceptances (Abecassis, 2017).

The issues of managing agri-food chain are really complex due to many sources of unpredictability; and the relative solutions are not unique and replicable for the different agri-food chains located in wide geographical and economical environments. The core agri-food chain issues are inability to properly manage the uncertainties that negatively affect the agri-food supply chain (SC) performances, consumers and the economic-social context. The collaboration approach is a chance to improve or reduce these uncertainties (Esteso, 2017). Castillo-Villar (2012) presents the model that defines cost of quality across a SC. There is the tendency to increase the costs in the low-costs markets and that determines the significance of efficiency (Saruliene, 2011).

The aim of the research is to create a conceptual agri-food supply chain optimization model and based on it define key characteristics for the selected agri-foods.

The methodology of the research consists of a SWOT analysis aimed at identifying internal and external factors that are strengths and weaknesses, opportunities and threats farms face: deriving implications can give businesses insight for fitting an objective to the economic, social context in which they operate.

2. Agri-food Supply Chain Optimization Conceptual Model

Each SC is designed to perform different tasks. We aim to define the characteristics of the supply chains and to categorize them based on the influence of the efficiency and reactivity. The reactivity is the ability to respond to a wide range of demand quantities, to reduce delivery times, to manage a wide variety of products, to consider innovative products or technologies, to adopt high levels of service, and to manage the uncertainty of supply.

SC with these characteristics is more reactive. Reactivity comes at a higher cost because capacity needs to be increased for the wider range of required quantities. This increase in costs leads to the efficiency of the SC. When efficiency increases, costs are reduced. If you want to increase reactivity, you need additional costs to reduce efficiency. Companies that operate efficiently can improve both its reactivity and costs. On the contrary, efficient companies can improve its reactivity only by improving costs, thus becoming less efficient. Therefore, companies must consider the trade-off between efficiency and reactivity.

The SC can reach a given level of reactivity by making each phase reactive and allowing the next phase to focus on efficiency. The best combination of roles depends on the efficiency and flexibility available for each phase. The agri-food chain is a set of administrative and political economic activities, which are distributed with a logical sequence and self-regulated at the same time (La Sala, 2017; Contò, 2013). A typical SC can involve different actors (Verdouw, 2011): suppliers (raw material); man-

Management Theory and Studies for Rural Business and Infrastructure Development eISSN 2345-0355. 2018. Vol. 40. No. 1: 28–36. Article DOI: https://doi.org/10.15544/mts.2018.03

ufacturers; wholesalers/exporters-importers; logistics companies; retailers; clients. V. Skulskis and V. Girgždienė (2016) claim that multi-perspective analysis allows to examine the enterprise activities both on the level of individual stakeholder and on the level of medium organic dairy supply chain.

The agro-food industry has been evolving towards complex and distinct organizational forms characterized by a higher degree of coordination. Four main coordination mechanisms have been defined in the scientific literature (Arshinder, 2008): contracts, information sharing, joint decision-making and the collective learning. We developed the Agri-food Supply Chain optimization conceptual model in order to explain SC optimization through the coordination mechanisms (see figure below). Agrifood SC is optimized through the six-step process: the selection and measurement of efficient key performance indicators (KPIs), benchmarking, defining improvement actions and opportunities, calculating the impact of the improvement actions, and implementing improvement strategies.



Fig. Agri-food Supply Chain optimization conceptual model

Contracts between buyer and supplier who fulfills the order establish several parameters such as quantity, quality, price, order time, delivery time (Burer, 2008). The contracts are principally aimed to increase the total SC profit as well as customer service quality of the deliveries (Stringer, 2009). Furthermore, contracts reduce over-stock/under-stock costs and the risk of errors among distribution (sharing the risks among the SC actors) partners (Arshinder, 2008).

Information sharing is targeted to avoid any SC distortions and to reduce the inventory (Denolf, 2015; Reddy, 2005). In SC coordination, information and communication technology (ICT) enables information sharing among actors. ICT allows increasing the productivity and competitiveness performances within the SC (Rijp-kema, 2012). ICT supports the integration of production and distribution processes, management of information flows, quality, traceability, food safety, flow management, logistics management and increasing sustainability. In addition ICT systems allows the transfer of the knowledge (technology in agricultural and agro-industrial processes) to operators, thus constituting a support mechanism for policy makers for the implementation of training and training activities in line with company operations (Rijpkema, 2012).

Joint decision-making is needed to avoid the perceptual conflict due to the differences between SC actors' goals and objectives, disagreements over the decision domains and differences in the reality perceptions (Arshinder, 2008). The joint decision making process could affect replenishment, inventory, forecasting and the logistics management (Zhao, 2002). Collective learning enables to fill up the knowledge gap of farmers in the implementation of the good agricultural practices (Sawhney, 2000).

3. Research Methodology

The present work makes use of the SWOT (Strengths, Weaknesses Opportunities, Threats) analysis (Hill, 1997) applied to four Italian agri-food chains: wine, cereal, fruit and vegetables, and oil olive.

In order to collect the necessary data, the methodology of the research triangulation that combines primary data (observations and personal random interviews) and secondary data (analysis of previous research, government publications and firms' documents as business plans, financial or marketing reports) was carried out to exploit the positive effects of conjoining investigative techniques (Eisenhardt, 2002).

The random interviews were conducted for a little pool of Apulian experts in the related selected agri-food chains, from June to August 2017, using a random sampling technique. A structured questionnaire was developed for data collection also with inserting a control question for monitoring the reliability. The questionnaire was divided into two sections: the first one includes the characteristics of the sample; the second contains the main characteristics of the selected agri-food chains.

This phase represented the initial exploratory phase aimed at analyzing the territorial context by means of the economic indicators and the identification of the main trends of the selected agri-food chains; therefore, a detailed phase of analysis of collected data led to elaborate the SWOT matrix and to draw conclusions and implications. This matrix can deliver suggestions to identify a TOWS matrix (Threats, Opportunities in the environment), Weaknesses, Strengths (of the business) using a rational approach toward anticipating problems and responding to world challenges (Weihrich, 1982).

4. Results

The authors provide the SWOT matrix of the main Italian agri-food chains consisting wine, olive oil, fruit and vegetables and cereals in order to compare their strengths, weaknesses, opportunities and threats. It has been complex to present SWOT matrix for the four agri-chains in a table; therefore, the authors present it in the paragraphs below.

The strengths of the wine supply chains are the suitability, the high quality of the raw material and wine, consolidated know-how, close relationship with the territory, the increment of farm size as well as the industry consolidation, increasing employability, increasing vertical coordination, increasing internationalization, presence of large number of cooperatives, traditional certified PDO-PGI production, presence in the international markets, innovation in production and processing phases, wine tasting valorisation tours, and the by-products recovery.

The strengths of the olive oil supply chains include the presence of large areas dedicated to the production of high quality olive oils, consolidated know-how, high level of differentiation, traditional certified PDO-PGI production, adequate level of the product differentiation, importance of the historical and social landscape of olives and the olive oil production, high number of olive mills, presence of the regional districts with high concentration of production, availability of product and process innovations, by-products recovery, export to the international markets, new market penetration, presence of Research & Development (R&D) organisations at national and international scale.

The strengths of the fruit and vegetables supply chains are high production volume, high product assortment, presence of the agro food districts and high level of SC organization in certain areas, export in the international markets, local traditional-certified food products, several companies considering food and health organic products, good entrepreneurial skills in the agri-food sector (business model), and the wellness culture. *The strengths of the cereals supply chains* consist of the suitability, consolidated know-how, presence of the vertical coordination (mill and pasta factory), high production volume, presence of the cooperatives, and presence of the R&D organisms at the national and international scale.

The opportunities of the wine supply chains include horizontal coordination, production and processing investments, use of the precision agriculture in the production and processing phases, use of ICT, logistics optimization and reorganization of information and physical flows to reduce SC costs, new distribution channel LD, new market penetration, and the increasing wine tasting tourism. *The opportunities of the olive oil supply chains* include producer income stabilization, farm modernization measure by Rural Development Programme (2014–2020), programs sustaining producer organizations (POs) increasing consumer awareness of extra virgin olive oil (EVOO) high healthy value, increasing international EVOO consumption, and increasing consumption in HoReCa (Hotel/Restaurant/Café)

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The opportunities of the fruit and vegetables supply chains include reconversion of geographic area with lower suitability, made in Italy valorisation, educational programmes for healthy product consumption, boosting SC organization, presence of regional agro food districts, link between the consumption and tourism. *The opportunities of the cereals supply chains* consist of the measures by Rural Development Programme (2014–2020), SC contracts, and the increasing price.

The weaknesses of the wine supply chains include fragmented SMEs, low level of mechanization, large production volume with lower quality, insufficient level of the coordination, low proportion of processing centres, scarce presence of consortia in the South Italy, scarce coordination among the SC actors (distributions, R&D, training), no joint decision making, export of un-bottled wine, difficulty in the market dynamic understanding as well as direct national and international relationship.

The weaknesses of the olive oil supply chains include small size farms, secular olive growing system with a scarce level of mechanization, difficulty in agricultural investments to improve productivity and sustainability, low financial capacity for the investments, high production and waste disposal costs, low processing capacity by olive mills, scarce presence of cooperative mills, insufficient role of POs in joint decision making, increasing production concentration and increasing negotiation power, production fluctuation, insufficient logistics management, storage and transport services, insufficient work of cooperatives and consortia in marketing activities, difficulty accessing finance, limited vertical integration, insufficient aggregation of SC actors, and scarce perception of product high quality.

The weaknesses of the fruit and vegetables supply chains consist of high production costs with high production standards, fragmented SMEs, insufficient organization of the production control systems, insufficient logistics and distributions network (not to internationalize), limited presence of the distribution centres, fragmented distribution (retails), inadequate national and international markets networks, lack of port facilities, and lack of national brand. *The weaknesses of the cereals supply chains* include fragmented SMEs, lack in the supply organization, and lack in the storage optimization considering different product qualities, inhomogeneous products, and inadequate prices.

The threats foo the wine supply chains include efficiency and effectiveness of distribution, production costs reduction introducing innovation, product valorisation, decrease in consumption, competitive pressure, and the presence of the multinational enterprises. *The threats of the olive oil supply chains* include erosion of olive culture (for example, xilella fastidiosa), large presence of the competitors in the international markets with a lower production costs (Spain, Turkey, Greece, Morocco, Tunisia, Argentina, Australia, Chile). In addition, it can be noticed increasing investments for high quality production, economic and financial crisis affecting the consumption, decision making by few distributors, and dumping by the Spanish enterprises.

The threats of the fruit and vegetables supply chains consist of low investments for the production stabilization and seasonality, lower competitiveness in the international markets, lower negotiation power with large distribution, economic and finan-

Management Theory and Studies for Rural Business and Infrastructure Development eISSN 2345-0355. 2018. Vol. 40. No. 1: 28–36. Article DOI: https://doi.org/10.15544/mts.2018.03

cial crisis affect the consumption, many emerging economies have the access to the international markets. *The threats of the cereals supply chains* include price instability, emerging economies reducing competitiveness, outsourcing, and new investments for the energy crops, difficult R&D collaboration, and counterfeit food products.

5. Conclusions

SWOT matrix analysis enabled the authors to define and compare Italian agrifood chains and draw below conclusions.

1. Strengths of the Italian agri-food chains are characterized by the high quality of raw material/final products due to high degree of suitability and very high gastronomic/cultural level. In addition, Italian farms have good entrepreneurial skills in the agri-food sector. Increased number of companies choose to produce traditional certified (PDO-PGI production), local, healthy and organic food products.

2. It has been determined that there are limits in the organization and supply concentration. The Italian agri-food sector is characterized by fragmented SMEs with a low financial capacity for the investments in innovation. The relationship between producers and their organization are still not consolidated, consequently they gain less negotiation power. Italian producers still face difficulties in achieving adequate competitiveness levels for the highest production costs and moderate innovation degree.

3. The economic crisis and stagnation affect the trend in consumption, reducing the profit of enterprises that face difficulties in new markets penetration. Results also highlight resistance to innovation by agri-food Italian enterprises considering their average size. The availability of the investments in ICT technologies by few firms represents an opportunity to improve their productivity and competitiveness.

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ŽEMĖS ŪKIO MAISTO GRANDINĖS OPTIMIZAVIMAS NAUDOJANT SSGG MATRICĄ

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Pateikta2018 02 10; priimta 2018 03 16

Santrauka

Per pastarąjį dešimtmetį žemės ūkio maisto produktų tiekimo grandinė sparčiai keitėsi, kad prisitaikytų prie naujų globalių iššūkių pasaulyje. Pagrindinė mokslinių tyrimų problema – rasti galimybes padidinti šiuolaikinės žemės ūkio maisto produktų tiekimo grandinės lankstumą ir gebėjimą prisitaikyti prie suinteresuotųjų šalių poreikių bei reikalavimų skirtinguose tiekimo grandinės etapuose. Tyrimo tikslas – sukūrus žemės ūkio maisto produktų tiekimo grandinės optimizavimo koncepcinį modelį, apibrėžti atrinktų žemės ūkio produktų pagrindines charakteristikas. SSGG matrica sudaroma siekiant pabrėžti keturių produktų tiekimo grandinių svarbiausius aspektus: vyno, javų, vaisių ir daržovių bei alyvuogių aliejaus. Tyrimo rezultatai rodo strateginio valdymo galimybes, stiprybes, silpnybes ir grėsmes, atsižvelgiant į kiekvieno produkto tiekimo grandinės struktūrą ir ypatybes, galimybes.

Raktiniai žodžiai: žemės ūkio maisto grandinė, tiekimo grandinės reaktyvumas, SSGG matrica. JEL kodai: Q10, Q13, Q18,