Chapter

Introductory Chapter: Technological Innovation as Tool for Products Qualification

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1. Technological innovation

In a context of increasing competitive pressure, company management that is more professional in terms of marketing is an essential condition to generate perceivable value in the olive-olive oil sector.

Technological innovation has undergone unprecedented development; this evolution can offer extraordinary opportunities for product qualification which, today, have not been adequately exploited due to a lack of vision. Understanding the needs of consumers and innovations in managing the different stages of the supply chain represent the real challenge for competitiveness of olive oil companies in the near future. It represents a challenge that is destined to produce commercial proposals that are increasingly in line with the trends of current demand.

Digital innovation in the agri-food sector can guarantee competitiveness to one of the key sectors of the Italian economy, which contributes more than 11% of GDP and 9% of exports. On the one hand, Smart AgriFood[1] can reduce production costs of high-quality products, while, on the other hand, it can increase revenues thanks to greater recognition or guarantee, for example, with anti-counterfeiting or the reduction of non-compliant exported products. However, digital innovation also makes it possible to intervene to support the entire supply chain, guaranteeing sustainability to all participants in the sector, including production in the field. The data all lead in that direction; with a population of 9.7 billion and an increase in demand of 32%, according to forecasts to 2050, there is little leeway. However, digital innovation could support the entire supply chain, encouraging players in the sector, including field production [1]. However, there are still obstacles; currently less than 1% of cultivated areas are managed with these solutions.

However, for digital technologies to fully release their potential certain conditions must be fulfilled. First of all, the extension of broadband and extra-wide bandwidth to rural areas is necessary in order to ensure supply chain interconnection. Sensitivity, skill and a propensity to invest by companies, a fact not taken for granted, considering the small average size of farms, are also required [2].

[1] The term Smart AgriFood identifies, in a nutshell, a vision of the future of the agricultural and agri-food supply chain according to which, thanks to digital technologies, the entire sector will increase its competitiveness.

It is necessary to remember that the industry 4.0[2] plan aims to have all Italian companies connected at 30 Mbps by 2020 and 50% connected at 100 Mbps by 2050 [3]. On the pulverization of our agricultural system (a long and fractioned supply chain with a proliferation of small companies), a single figure is sufficient: the average size is 12 ha (compared to 58 ha in France), with 2.5 employees which constitutes an undoubted brake on investments, even in managerial resources. It is essential that Italy focus on both quality and digital technology to compete, while the few large companies could also focus on robotics. An important figure, that has emerged from research and which should guide choices, is that 80% of consumers use smartphones for purchasing decisions.

When should planting and irrigation take place? When and how much fertilizer? When should action be taken to prevent pathologies? How can yields be maximized based on different land performance? A cross-analysis of environmental, climatic and cultural factors allows the execution of targeted actions, to improve crop yields, use less pesticides and affect product quality. In order to benefit from these opportunities, which save both time and money, it is necessary to switch from precision farming (GPS and satellite-driven tractors), which have been discussed since the 1990s, to interconnected farming, the so-called Internet of Farming, with its new instruments (drones, sensors, the Internet of Things and Big Data). A survey was conducted for 220 solutions offered in Italy by more than 70 companies: 89% support precision farming while only 11% have enabled the Internet of Farming. In particular, the majority exploits data and analytics (73%), 41% uses the Internet of Things and 57% uses processing systems and user interface software.

Data management is the key element in agriculture 4.0,[3] but it must be translated into information and be transferred to all operators in the supply chain. One of the key issues is the capacity of reading, harmonizing and standardizing data given that they come from different sources; this is the reason why researchers have warned the need to invest in training as well as to overcome obstacles to innovation. Just tractors in Italy generate over 1 million gigabytes in a year, in addition to environmental, warehouse, farm and more general data of a corporate nature; however, today this information is scarcely valued [4].

Today the perception of quality in a product has changed: taste is no longer sufficient; the complex form is a heptagon where, on each side, there are factors that influence it, such as food safety, nutrition, provenance of raw materials, social and environmental impacts of production processes (such as animal welfare), appearance, taste and aroma, and service. Based on an analysis conducted by researchers in this sector, in 57 case studies, digital innovation allows companies to improve the

[2] Industry 4.0 is a name given to the current trend of automation and data exchange in manufacturing technologies. It includes cyber-physical systems, the Internet of things, cloud computing and cognitive computing. Industry 4.0 is commonly referred to as the fourth industrial revolution. Industry 4.0 fosters what has been called a "smart factory". Within modular structured smart factories, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, cyber-physical systems communicate and cooperate with each other and with humans in real-time both internally and across organizational services offered and used by participants of the value chain.

[3] Agriculture 4.0 is therefore for cooperation and sharing in terms of data and information, between different machines, between different operators, along the entire supply chain. You look at the whole process, no longer at the single step: the tractor communicates with the harvester and perhaps sends a signal to the local supplier, for example when a component does not work. The agricultural entrepreneur can have a complete view of all the activities of the machines in the field and make sure that they are working at their best; can monitor the results and costs of operations, at every stage of the process, putting them in relation to the possible final price of its product on the market. This is, at least in theory, Agriculture 4.0.

qualities on all the dimensions of the heptagon. A total of 51% of the companies uses digital technologies to valorize qualities of origin, especially in the case of products with a high added value (such as wine, cocoa and coffee); 46% used digital innovation to improve food safety and 25% concentrated on production methods, above all for aspects linked to environmental impact, animal welfare and agri-food traditions of different territories; lastly, in 12% of the cases, the businesses used technology to improve service quality, adopting innovative solutions to communicate product information (nutritional advice) and process information (origins, traceability and environmental impact) to consumers [5].

It took a disaster such as 'mad cow' disease to accelerate the traceability plan; today, 36% of the analyzed agri-food companies, thanks to digital solutions, achieved a reduction in the times and costs connected with harvest processes, data management and transmission [6]. Digital solutions permit interventions aimed at food safety along the food chain thus avoiding financial damage. But they can also be used to combat counterfeiting to protect the protected designation of origin (PDO) and protected geographical indication (PGI) systems, for greater information for the consumer. The sectors most involved in technological innovation for traceability are the fruit and vegetable sector (30%), the meat supply chain (23%), dairy products (14%) and coffee-cocoa (12%). The instruments used to improve traceability are barcodes (39%), RFIds (Radio-Frequency Identification, 32%) management systems (32%), Big Data (30%) and mobile technologies (21%), while innovative technologies such as the IoT and blockchains have yet to be explored [7].

From 2011 until today, 481 international start-ups have been created, of which 12% are Italian. Of these start-ups, 218 regard e-commerce and the area with the greatest presence is the United States. The most important sectors include the fruit and vegetable sector, with 17% of international start-ups. Precision agriculture and food quality are the most explored and most interesting application areas for investors. Also in Italy, the most important sector is the fruit and vegetable sector (14% of Italian start-ups), followed by wine (9%) and cereal (7%). Quality and environmental sustainability are the areas in which they are most active, with 50% of the funds raised, followed by precision agriculture (35%) and food quality (29%) [8].

How is the health of Italian extra virgin olive oil, one of the flags of the Made in Italy brand? One might say it has its ups and downs; quality oil in circulation, for which demand is increasing, constitutes less than half, 39.2% to be precise. This has been confirmed by a study conducted by Symbola (Foundation for Italian Qualities), CREA (Council for Agricultural Research and Analysis of Agricultural Economics) in collaboration with Coldiretti and Unaprol (National Union of Olive Producers Associations). The report (called Poq, quality internal product) was presented in the Coldiretti pavilion at Milan Expo; it evaluated not only the organoleptic qualities, but also the entire chain including 102 indicators, the soil, grinding, respect for the environment, the use of pesticides, water consumption, human capital management as well as distribution.

The results say that a segment of producers invests in quality while about 60% do not. Yet, that is the winning path. Even in times of crisis, in contrast with the overall trend of the sector, in Italy, it is precisely the consumption of quality that continues to record growth. It would therefore need a turning point, the same that in the past affected the wine sector, where, thanks also to the methanol wine scandal (23 deaths), quantity has been abandoned for quality. Today, numbers justify that change with a value that has risen by six, seven times, despite the fact that production has fallen by 50%. The Piq, therefore, may prove to be a useful database not only for institutions, but also for consumers, who are often poorly informed and do not understand what lies behind such marked price differences, from €2.50 to over €9 for a liter bottle of olive oil [8].

Italian oil, with a turnover of €3 billion, has important numbers. It would be enough to say that our country with 43 products holds the record of oils certified by the European brand (PDO or PGI) [7].

Italy is the second largest global producer of olive oil and constitutes a fifth of European production. It is, furthermore, the third producer of table olives and, on the topic of biodiversity, it is unbeatable due to 538 diverse cultivar types [9]. Also in terms of label transparency, Italy is second to none, having the largest network of olive traceability and monitoring on a European level [10].

Yet, in recent years, negative signals have appeared: in 2014, the national harvest fell by 35% due to a 38% increase in imported oil. The year 2015 recorded the peak of imports of foreign olive oil, in particular of Tunisian olive oil which increased by 681% in the first trimester of the year. Poor quality oil is often at risk of counterfeiting and alteration. Seizures by NAS (Nuclei Anti-Sophysation and health of the Italian Army) grew by 483% in 7 years. Extra virgin olive oil (which must be obtained exclusively with mechanical models and whose acidity must not exceed 0.8%) has been found to have altered with the addition of refined oils and those extracted with solvents, or poor-quality oils, such as hazelnut [11]. A useful step in this direction was the entrance into force of a community regulation, last November, which made the anti-topping cap for the extra virgin olive oil and the virgin compulsory in restaurants and bars. This measure seeks to prevent the empty bottle being refilled, which carries a fine from €1000 to €8000 euros to be paid by the operator.

A positive step forward comes from the go-ahead by the House to the agriculture legal decree which allocates €32 million for the national olive oil plan with important structural measures for the Italian supply chain.

Finally, from a nutritional point of view, it should be remembered that extra virgin olive oil is one of the components of the Mediterranean diet, registered by UNESCO as world heritage. According to the tables of the CREA Research Centre for Food and Nutrition, an extra virgin olive oil has only about 14% saturated fats (whose intake levels should be kept low). Just to give an idea, coconut oil has 86% and the infamous palm oil 47% [12].

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Conflict of interest

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