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Creating Competitive Advantage Through Eco-innovation: a study on the Italian Agri-food Industry

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I would like to thank my family that has always been by my side along this endearing path, especially my parents and my brother. Thanks to my first supporter Andrea and to all of those who have been close to me during these years.

This big achievement is for you, my beloved Grandpa. I made it.

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INTRODUCTION

Despite the healthy and growing picture of the sector, the Italian agri-food system suffered in the first period of 2020 an unprecedented impact followed by the crisis situation linked to the COVID-19 health emergency. Quality, excellence and tradition are the main elements that Europeans and the whole world envy us. The Italian agri-food system as a whole is considered one of the leading sectors of the country respectively with a turnover of 200 billion euros in 2019, and one of the main stakeholders of sustainable development.

The apex of the concern for sustainability was reached in December 2019, when the New York Times elected the environmental activist Greta Thunberg as the most influential person of the year because of her ability to inspire a global movement against climate change. Then in March 2020 a new virus started spreading its disease and the world stopped. Governments turned their attention on containing the virus and people grew scared to leave their home, and sustainability became a secondary concern for everybody. During the lockdown period imposed both in Europe and the US, the ecological impact on earth for a short period of time started to ease, but as the main goal became slowing down the number of deaths and recovering the economic performance lost during the lockdown months, economic activity resumed as soon as possible and with it the negative impact of pollution.

Before the lockdown, the relevance of the topic of ecology had become no longer reserved to environmentalists only and widespread support for a greener planet grew among people. The attention to sustainability had become necessary also for companies, not for legal obligations but with the main goal to maintain a clean image of the firm for marketing reasons. The enormous success of ESG (Environmental Social and Corporate Governance) pushed the ecological topic and those companies considered “eco-friendly” and attentive to the well-being of their employees gained attractiveness to stakeholders’ eyes.

The deep crises caused by the lockdown, both economic and social, reversed a decade-long trend toward increased environmental sustainability. In fact, already during the 1970s scholars started to investigate the topic of sustainability, which slowly became of central importance in international debates. What emerged from these debates is

that sustainability can be seen as a structure made up of three main pillars: the environmental, the social and economic one. If previously sustainability had been seen as a whole since the outbreak of the crisis has changed the priority of each dimension in favor of economic and social sustainability.

Based on these considerations, the aim of this research is to understand if companies can both tackle the climate change and COVID-19 emergency during the recovery period and what is today the state of the relationship between sustainability and innovation.

At the international level, some steps have already been taken toward the achievement of the three dimensions of sustainability with the publication of the UN Sustainable Developments Goals 2030, which comprehends 17 objectives. Of these, the most parts relate to the dimension of sustainability which as will be seen are planet, people and profit. Therefore, goals such as “climate action”, “affordable and clean energy”, “responsible consumption and production” relate to the environmental dimension; “no poverty”, “gender equality” and “zero hunger” relate to the social dimension; lastly “decent work and economic growth”, “industry innovation and infrastructures” relate to the economic dimension.

The industry that will be taken into consideration as case study is the Italian agri-food, as an industry impacted both on the demand and on the offer side by the economic shock due to the pandemic. The analysis will be divided into four chapters that will touch both theoretical points of view and their practical aspects.

The first chapter will present an overview of the literature around the meaning of sustainability, retracing some cornerstones in this topic, also exploring the relation between sustainability and innovation from a macro point of view and at the corporate level. In the second chapter an analysis of the Italian agri-food system before the outbreak of the pandemic will lay the ground for understanding the background against which current shifts are taking place. The portrait is that of a sector characterized by low-technological rates and incremental innovation, yet the target of innovation notwithstanding the value given to traditional products and production methods.

The theoretical framework laid down in the first two chapters allows a critical analysis of the agri-food system, which will be divided in two chapters investigating

respectively the offer and demand side of the industry. The third chapter will thus explore how the agri-food system is reacting to the current crisis and in order to understand how companies are coping with the emergency a multiple case study research has been run.

The interviewees had been chosen from different sectors, in order to give a thorough picture of sustainability in the supply side of agri-food. Therefore, Casa Tironi, agricultural firm based in Veneto, is representative of sustainable innovation in the primary sector; NOVAMEAT, a Spanish startup specialized in the production of plant-based meat, is representative of the secondary sector; Scattolin Srl, a company of automatic distribution, is representative of the tertiary sector. Lastly, through the analysis of data based on a survey run on a sample of 283 individuals, the final chapter will investigate how the crisis has changed the demand and the opinion among Italian consumers concerning sustainability and innovation in the agri-food industry.

ABSTRACT

The aim of this paper is to provide an overall understanding of what is the situation of eco-innovation in the post-COVID world. In order to give a concrete example of the findings, these will be shown as applied to the agri-food industry through a case-study. One of the ways the COVID-19 crisis brought about change is the shifting attention from environmental sustainability to personal health and economic performance.

Before the outbreak of the pandemic, the prevailing view on ecology was that a collective battle that companies embraced especially as it was a strong determinant of consumers' choices. After the lockdown, environmental concerns while remaining fundamental value lost influence on consumers' choices, and as business slowly recovered it became clear that the priority was recovering business pace and adapting to the new situation. It remains to be understood whether innovation will still be directed toward environmental sustainability and – if yes- how companies will continue to allocate resources on green innovation.

The literature on eco-innovation is clear: besides ethical concerns, green innovation should still be pursued even though the market push has stalled. The first part of the research will focus on the relation between sustainability and innovation and how these themes can be applicable to the Italian agri-food industry. This will be achieved first by giving an overview of the literature on the topic so far and by the exploration of the main drivers of eco-innovation. Understanding how innovation and sustainability have coexisted until the COVID-19 outbreak allow us to build a solid background against which the current trend can be observed, focusing on similarities and differences. The second part of my research will be focus on the overview of the Italian agri-food industry with an eye open to the current situation. In this section, I will illustrate the role of the external and internal players inside the sector and the main innovation discovered throughout the years.

Finally, I will demonstrate firstly through a multiple case-study how the before-analyzed changes played out in the agri-food industry and secondly through a survey how is the consumers' perspective.

CHAPTER 1 – RELATION BETWEEN SUSTAINABILITY AND ECO-INNOVATION

Over the years, the mole of writings on the topic of sustainability has been considerable. As with any academic debate, however, contenders have been mostly developing very skillfully argued positions, but rarely a comprehensive point of view on the issue. The purpose of the present chapter, therefore, is to understand what the relationship between sustainability and innovation is, and how these two concepts can be considered key points for competitive advantage.

A special effort is required in understanding the interrelation between macro-level and micro-level concepts, as theories on sustainability usually focus on the first, while theories on innovation usually focus on the second. With the aim to avoid a dialogue-of-the-deaf kind of situation and to encourage a fruitful communication between these two areas of investigation, the environmental issue will be modeled as a system, which will serve as a coherent theoretical framework to later explored concepts.

The first part of this paper will focus on the literature regarding the multidimensional concept of sustainability by illustrating its evolution from the origins to the most recent contributions. It also aims at retracing the concept of eco-innovation with a particular attention to the drivers of innovation toward sustainable development, pointing out the importance of both internal and external forces from a corporate point view.

Environment, economy, and society are the roots of sustainability, but since the COVID-19 outbreak has led us to reconsider our priorities, my research will explore whether even in these uncertain times sustainability should be maintained as the leading direction for innovation. The answer will depend on whether eco-innovation could be considered as a means to achieving competitive advantage from a business perspective.

1.1 The paradigm of Sustainability

The social debate around the environment is the result of a greater awareness regarding the exhaustibility of natural resources of our planet and the growing need to preserve the quality of the natural heritage, promoting new economic and social models. The subject of sustainability is linked to various fields of knowledge, environmental, social, economic, and cultural, and because of its multidisciplinary nature, it requires to be approached first as a field of investigation in itself.

In addressing the study on the concept of sustainability applied to the agri-food sector, what emerged at first sight, is the lack of a consolidated and shared theoretical framework to interpret the impacts of the different models. The idea at the basis of this chapter is therefore based on providing a framework that could guide the research in the rest of the thesis.

According to Ueda et al. (2009), the concept of *sustainability* is quite vague and controversial. It is in fact a multifaceted notion with a very broad connotation (Valera 2012). Nowadays, the term sustainability is considered a buzzword, it is often adopted as a synonym for sustainable development, and it is associated by the notion of *economic development*[1] . As a consequence, the term has spread especially through marketing and communication campaigns and that is why according to Scattola (2010), sustainability assumes the connotation of good reputation but not necessarily it is accompanied by the awareness of the importance of the concept. During the next paragraphs, it will shed a light on these elements in order to comprehend better the topics of the research.

Starting from a review of the literature, the Brundtland Report written in 1987 by the World Commission of Environment and Development titled *"Our Common Future"* is still a landmark for the political and scientific world. It emphasizes the need for a new development model, defined as *"sustainable*" stating that: *"sustainable development is given by the ability to grow and continue to produce goods and services without exhausting the resources necessary for the development at the same time".*

[1] *Economic development* considers both quantitative and qualitative parameters forecasted in the long run. This notion is not to be confused with the more restricted one of *"economic growth".*

This document contains the first definition of sustainable development, from a temporal point of view, and it also adds a new concept of human well-being stating that it has: *«to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. […]. The sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs»*[2] *(WCED,1987).* According to Holden et al. (2014), this statement gives importance for the first time to the satisfaction of basic human needs, the safeguarding long-term ecological sustainability and the promotion of intragenerational and intergenerational equity by keeping in mind the scarcity of natural resources.

What emerged is that environmental problems cannot be addressed separately from economic and social development, but they need to be considered in a unitary way in order to achieve an equal level of human well-being, now and in the future. For this reason, both of these concepts are based on the balance of three different dimensions, the environmental, the economic, and the social. Starting from publication of the World Commission's Report on Environment and Development, this topic has become an issue increasingly felt by international organizations and institutions (Quental et al. 2009).

1992 has been considered the year of awareness of environmental issues, and during that year's UN Conference on Development and Environment in Rio de Janeiro the definition of sustainable development expressed in the Brundtland report was officially legitimized and empowered in the *Agenda 21*[3]. This document places sustainable development as a goal to be pursued for all people in the world at a global, national and regional level. For the first time, action programs were presented in order to achieve the economic, environmental and social dimension through the conservation and management of environmental resources, the strengthening of the role of major actors and the means of implementations.

[2] Brundtland G.H. (1987). Report of the World Commission on Environment and Development: Our Common Future. October 1984 (part 1)

[3] *Agenda 21* is an action plan of the UN approved in 1992 with regards to sustainable development.

The path toward a shared definition of the concept continued in the same year when the European Union approved the 5th Environmental Action Programme[4] in order to make operative those objectives signed in Rio. Also, in 1992, a Convention was held in New York United Nations Framework on Climate Change as well, an important meeting that formed the basis for the development of the so-called Kyoto Protocol[5]. However, according to what was reported in the Convention, human activities had increased concentrations of atmospheric greenhouse gases with the consequent warming of the earth's surface.

The concept of sustainability traces however to deeper roots than joint statements by public bodies. In fact, the *Brundtland Report*, *Agenda 21* and the *5th amendment* were the result of an intense academic debate that over the years defined the idea of sustainability.

Tracing back to the origins of this concept, some scholars argue that sustainability refers to those intermediate goals to reach in order to achieve the ultimate long-term goal of *sustainable development*. As the most agreed definition of sustainability remains that articulated by the Brundtland Commission, as the two terms refer to the same dimensions and the same policy implications (Holden et al., 2014) and as since the second half of the 1990s scientific debate has mostly focused on the identification of specific models regarding the dimensions of sustainability at the corporate level (Scattola, 2010), for the purpose of this research the two terms will be used interchangeably.

As Ettenson and Unruh (2010) pointed out in the *"Theory of Growing Green",* attention and awareness to social and environmental issues is gradually spreading and public opinion usually rewards companies that are aligned with this trend. Hence, the reference to the new concept of *Corporate Social Responsibility*, which according to Chiara Mio (2005) refers to those human activities that improve corporate reputation toward individual consumers and consumer groups, for-profit and not-for-profit organizations, governments and non-governmental organizations, public interest groups, academic world and other stakeholder groups.

[4] *The 5Th Environmental Action Programme,* approved by the Council in 1993, formed the environmental agenda for the last decade.
[5] United Nations, 1992, FCCC/INFORMAL/84 GE.05-62220 (E) 200705

Starting from this definition the research question that emerged is the following: what does it mean for a company to be sustainable? is it possible to turn sustainability into a competitive advantage? The short answer is yes, given that the primary purpose of a company is to maximize the economic return of its activities if sustainability can either reduce costs or raise gains it becomes a competitive advantage.

Every business takes actions that - be it economic, social or environmental - can have an impact outside the boundaries of the company itself. As reported in many strategic papers, they are represented in different ways. The framework that best stresses the importance of the environment in the human economy and fits with the research, is *Daly's pyramid* (Quental et al., 2011), later re-designed by Donella Meadows (2009).

First of all, at the feet of the triangle there are natural resources, called *"ultimate means"* out of which all life and all economic transactions are built and sustained. This corresponds to what the planet can offer, the sun's energy, the biosphere, and earth's materials. They are not created by human being, but it is the heritage we were born into. For this reason, they are studied and converted into the *intermediate means.* The latest consist of built capital, human capital and raw material, as for example, tools machines, factories, skilled labor, processed material and energy. The intermediate means define the productive capacity of the economy and considered as inputs. They are necessary but not sufficient and they can be created without natural resources. Above the intermediate means, there are the *intermediate ends*, which are considered by the economists the outputs. They are what governments promise to deliver: consumer goods, heath, wealth, knowledge, leisure, communication, and transportations. However, they do not guarantee satisfaction and for this reason at the top of the pyramid there are the so-called *ultimate ends*.

1.2 The interpretative framework

The first step toward building a theoretical framework for understanding how sustainability and innovation go hand in hand is modelling the relation between the economy and the environment. The model will be drafted drawing on the method

illustrated by Donella H. Meadows in *"Thinking in systems" (Figure 1)*[6], who suggests considering such interconnection as an open system, allowing the representation of links between micro and macro levels.

The system-thinking approach considers a system as an interconnection of elements organized in a coherent way, which can be applied to every situation giving a detailed graphical representation of the state of the things. Following Meadows' definition, system is made up of:

- *Stocks.* These elements are a store of material or information that can be measured at any given time. They can grow or decline;
- *Flows.* Stocks change over time through the actions of flows, and they can affect their level. They are represented as *inflows* of quantity or as *outflows* of goods. As long as the sum of all inflows exceeds the sum of all outflows, the level of the stock will rise on the other side it will fall. Moreover, the stock level will not change if the sum of all inflows equals the sum of outflows;
- *Feedback loops.* They are the interconnections that exist between all the operating units of a system. A feedback loop is formed when changes in a stock affect the flows into or out of that same stock. Feedback loops can be either *reinforcing*, meaning that the higher level of a stock increases the flow the loops is directed toward, on the contrary they can be *balancing*, when the higher level of a stock decreases the rate of a flow.

The most useful contribution of system-thinking is that of allowing the modelling of dynamic systems, so that levels of stocks rather than flows' rates vary over time, giving the best possible representation of how a system evolves overtime and highlighting unexpected links.

In order to be able to represent the system clearly, it has been used a software called STELLA (short for Systems Thinking, Experimental Learning Laboratory with Animation; also marketed as iThink), which is a visual modelling tool able to create graphical representations models. This program was designed in 1985 by Barry Richmond and it is now used in the educational field.

[6] The model has been developed through STELLA Architect's software and it is the graphic representation of Systems Thinking.

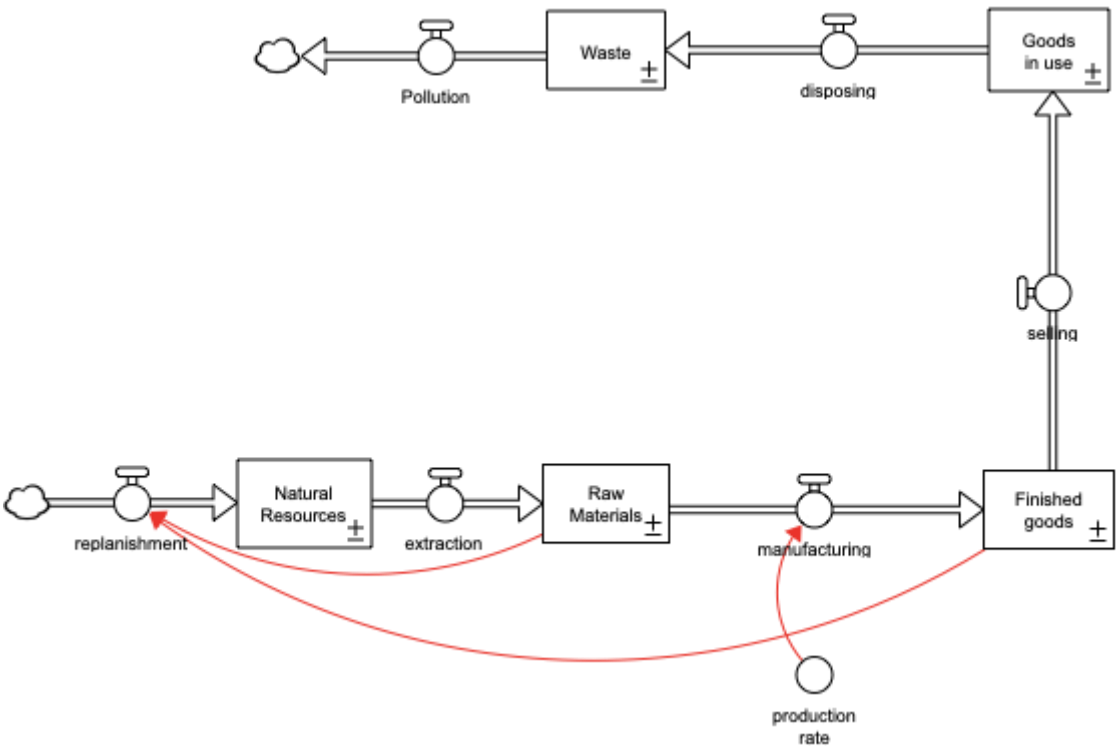

Figure 1 - Representation of the interpretative framework with STELLA Architect

As always, a model is a simplified representation of reality, and the degree of simplification is the result of a trade-off between realism and intuitiveness, measured according to what is aimed at. Here the point is understanding why natural resources are decreasing and waste is increasing day by day.

The system illustrated in *Figure 1* is quite intuitive: natural resources extracted as raw materials are transformed into finished goods, which are later disposed thus increasing pollution. Some feedback loops intervene, characterizing the behavior of the system. In fact, the more resources are extracted, the more finished goods are manufactured, and the more pollution grows, the smaller becomes the replenishment rate of natural resources.

While such a system is very simple, it is also suited for understanding how to intervene in order to transform it into a more sustainable one, which is why it will be resumed later on. Some concepts are required to be explored in order to be later hinged to our system, and these relate to the scarcity of natural resources, their value for productivity, eco-innovation and its drivers and the whole concept of sustainability.

1.3 Sustainability and its Pillars

The concept of sustainability varies according to its user, it is now important to analyze in depth this term. While for example at the corporate level, sustainability is seen as a marketing tool useful for improving a firm's image, in the academic discussion sustainability is considered as the aggregate three dimensions which are considered ‘‘fundamental objective values, not subjective individual preferences’’ (Daly H., 2007).

As reported inside the Brundtland Report (1987), sustainability is in fact to be understood not as an unchanging state or vision, but rather as a continuous process of balance between three dimensions: the economic pillar, the environmental pillar and the social pillar. Pressures coming from outside, make this concept a dynamic and continuously evolving one. Since these dimensions are closely interrelated by multiple connections, they are best analyzed as a system. However, it is essential to first examine each of these pillars separately, from a macro perspective.

Such analysis lays the foundation to understand how a sustainability framework might apply to the corporate sector. For this reason, a focus on the micro-level will later observe how the three pillars translate into corporate strategy to achieve true sustainability.

1.3.1 The Environmental Pillar

As poetically pictured by Anil Agarwal (Khan, 1995), *“Development at the cost of the environment can take place only up to a point, it will be like the foolish man who was trying to cut the very branch of a tree on which he was sitting. Development without concern for the environment can only be short-term development”,* hence meaning that the ecological cause should be considered as an ultimate goal.

Since the environment is essential for productivity and business activities as the first supplier of resources but at the same time is the first to be heated by our errors, it is fundamental not to exhaust it (Giddings et al., 2002). The persistence of the economic system in the long term is linked with the limited availability of non-renewable resources and by their limited rate of regeneration, which in turn it is affected by the environmental degradation produced by human activities. Mentioning the Brundtland

Report (WCED, 1987 P.44): *‘‘‘At a minimum, sustainable development must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils, and the living beings’’.*

This concept has been elaborated as *eco-efficiency* (Bertelè et al., 1997), meaning the awareness of participation in an ecosystem having at the same time a responsibility toward it. Eco-efficiency is pursued by aiming at the reduction of waste (optimization and rationalization of energy consumption and raw materials), monitoring of environmental risk and reduction of the ecological impact through continuous renewal of the actions undertaken and minimization of pollution. As Goodland (1995) in its work said, Environmental sustainability means that *natural capital* must be maintained both as a provider of inputs (*sources*) and as a *sink* for wastes. This means that people need to stay within the biophysical boundaries of the overall ecosystem. This definition hides behind the real goal of environmental sustainability, which is the survival of the human species.

Hence, nowadays more and more companies are trying to give more importance to the structure of the life cycle of their products in order to reduce their ecological damage. Another example in the corporate field, especially in the agri-food sector, regards the use of food miles as an indicator of environmental sustainability that indicates the distance from farm to plate.

1.3.2 The Social Pillar

Satisfying basic human needs was one of the main objectives pointed out by the Brundtland Report (WCED, 1987, p.44), stating that: *‘‘‘Sustainable development requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life’’*. That is why social sustainability became a pillar for sustainable development. One of the first documents published by the European Commission regarding the social dimension was the *“Green Paper”* [7](EU, 2001), which introduced the concept of Corporate Social Responsibility stating that: “*it is essentially*

[7] *“Green papers”* refers to those documents published by the European Commission to stimulate debate on specific topics at European level.

a concept whereby companies decide voluntarily to contribute to a better society and a cleaner environment", hence, "*This responsibility is expressed towards employees and more generally towards all the stakeholders affected by business and which in turn can influence its success"*. With this statement, the European Commission triggered the debate toward an international level.

For what concerns the definition of *social sustainability,* Ruper J. et al. (2010) pointed out that this term looks at the development and well-being of people equally and in terms of health, instruction, and safety. In this regard, the already mentioned *Corporate Social Responsibility (CSR)* is a tool useful for establishing and preserving a good relation between society and business, and this linkage is even stronger if applied to small and medium-sized businesses and local communities. That is why usually companies that respect the social dimension are those which see in their working force a resource to be preserved. In other words, social sustainability aims to protect human capital, seen as an added value by the company as a whole. An example of Italian excellence in the responsible management of the company is represented by Coop[8], which was one the first company in Europe to obtain in 1998 the Social Accountability 8000, an international standard in terms of human and workers' rights, of voluntary application, which entails respect for a series of minimum requirements, and which requires their application to be verified and certified by an independent external body.

Nowadays, it is possible to see a progressive spread of new trends which have developed products or services based on *Social Innovation*, this term meaning those products that allow organizations and people to create social networks.

This aspect is strongly linked with the importance of *Cooperation* at the corporate level. In Fukuyama's view (Gray, 1995, p.10), cooperative economic behavior is stimulated by a culture of trust and he argues that cooperation is: *"the ability of people to work together for common purposes in groups and organizations".* Cooperation with stakeholders is crucial especially in terms of transparency and open relationships.

The concept of cooperation is strongly linked to the one of *social capital* that has been developed by the scholar Putnam in the early 1990s. According to the author (Putnam, 1993, p. 167), *"the features of social organization, such as trust, norms, and*

[8] Coop is a system of Italian consumers' cooperatives which operates the largest supermarket chain in Italy (https://www.e-coop.it/valori-attivita-sociali).

networks […] can improve the efficiency of the society of facilitating coordinated actions".

As already explored in the previous paragraph, the social dimension is more difficult to define compared with the environmental one.

1.3.3 The Economic Pillar

According to Quental et al. (2011), economic efficiency must be understood in an ecological sense, that is to say considering the immediate benefits associated with the use of resources and the environment, but also those in the long term. An economic system is considered efficient when it guarantees maximum production and consumption without compromising ecological balances, allowing this potential to be maintained over time.

While literature on sustainable development is abundant, over the last decades political and social debates struggled to give clear definitions of sustainable economic development, with all the above exposed concepts used as synonyms. For this reason, it is needed an exploration of the evolution of *ecological economics*, defined as the science and management of sustainability (Munda, 1997).

Historically, as the scholar Barbier (1987) pointed out, the idea that natural resources are limited and represent limits to economic growth was born in the early nineteenth century, replacing the view that *artificial capital* was the limiting factor. Neo-classical scholars such as Malthus (1798), Ricardo (1817) and Marx (1867) were the first thinkers to systematically explore the concepts of "*limits"* (Turner et al., 1993). Their theories were founded on the shared belief that infinite growth was not possible, and that sooner or later it would stall, reaching a *"steady state"* coincident with a level of mere subsistence. From this analysis, it is possible to identify in their works an awareness of the *"environmental question",* besides an interest toward the physical limits to infinite growth of economic systems and to the perpetual improvement of material living conditions (Pearce et al., 1991).

As Goodland (1995) observed *"Economic sustainability focuses on that portion of the natural resource base that provides physical inputs, both renewable (e.g. forests) and*

exhaustible (e.g. minerals), into the production process". The latter is seen as a tool for understanding the relation between benefits and costs.

According to Valera (2010), economic sustainability, therefore, aims to create added value and to assure the growth of the system. It aims to bring both the profit and the efficiency of a company to the highest level, but in order to achieve this it needs to improve the efficiency of its production processes and compensate for the negative externalities produced. It is appropriate that the company could both satisfy its shareholders by remunerating them through the distribution of the added value while adopting a business model that adapts to changes in the environment, the market and the competitive context.

Since the 1980s there has been a rather clear contrast between economists who see continuous growth as a fundamental element of economic sustainability and those who instead consider the achievement of a steady state or a zero-growth economy. The awareness of the danger of too strong anthropogenic pressure on the environment and of the existence of a physical limit became the fulcrum of the debate: pessimists argued that such pressure puts an inevitable brake on economic growth; optimists responded theorizing that it could be circumvented thanks to technological innovation.

Another debate then sparked around the conception of sustainability as *"weak"* and *"strong".* Weak sustainability assumes *"human capital"* and *"natural capital"* as substitutes. In other words, the destruction and contamination of the natural environment and the exploitation of natural resources is permitted, but what matters is to have the financial means to invest in the recovery of the environment in order to compensate for the losses suffered. Strong sustainability, on the contrary, affirms that *"human capital"* and *"natural capital*" are complementary, but not interchangeable. There is no remedy for the deterioration of natural resources and therefore they cannot be replaced even by the increase of other values, such as social or economic ones (Pearce et.al, 1992).

1.4 Corporate Sustainability: toward a “new” concept of Business Model

Starting from this background, the innovation of *business models* rose as a new discipline. While so far, the topic has been analyzed from a macro perspective, in order for these concepts to put the foundation of a sustainable corporate strategy, it must be observed how sustainability plays a role at the micro level. According to Baumgartner et al. (2010), this will happen through an exploration of what is known as *corporate sustainability*, or the orientation of the company that tries to reduce the impact of its activities on the environment. In this regard, *"sustainable business model innovation”* should be seen as an important leverage for change in a sustainable company, and for coping with emerging challenges in the context of sustainability. This is because it provides organizations with supplementary guidelines for differentiation in the marketplace in pursuit of securing long-term competitive advantage, considering the respect for the environment.

Most existing business models are based on creating, delivering and capturing economic value, with limited or no attention to environmental and social value. The recent changing business environment has raised the need for sustainable value creation, that in this case is used for strengthening the customer relationship and competitive advantage. According to Teece (2010), a *business model* is the design or architecture of the value creation, delivery and capture mechanism of a firm, how the firm delivers value, how it attracts customers, and how it converts this to profit. In other words, the business model is considered to be the DNA of a firm and basically its way of being.

From this broad definition, the concept of value is organized in three different ways:

- *Value proposition*: it is considered the secret ingredient for a company, the reason why a company exists, and what actually offers to the target customer.
- *Value creation:* it concerns the creation of perceived value and how the company is organized in order to produce it. It is characterized by flows of information, resources, capital and labor among production systems.
- *Value capture:* how the company makes money for itself.

The business model is therefore used as a management tool by companies, and it is essential for achieving a competitive advantage over competitors. The *business model innovation* is achieved through the improvement and adjustment of one or more elements of the traditional business model, developed by Osterwalder (2010). In turn, the business model may also be a source of innovation itself. In this regard, business model innovation is especially valuable in times of crisis and high competition because it provides firms with a way to avoid direct competition and discover blue oceans (Kim and Mauborgne, 2014). For this reason, the ability of a company to frequently and successfully innovate its business model can improve its resilience to environmental changes and can be a source of sustainable competitive advantage over time.

According to Porter and Kramer (2011), a *sustainable business model* is a source of competitive advantage in which value proposition, value creation and value capturing mechanisms incorporate the principles of sustainability, bringing economic benefits to the companies that adopt it.

The development of a *sustainable value creation process* is represented by implementation of the concept in each sustainability dimension:

- For what concerns the environment, the use and conversion for energy, materials, greenhouse gases;
- From the social point of view, the improvement of living standards and prosperity;
- On the economic side the management of manufacturing processes, factories, logistics.

The difference between *sustainable business model* and *sustainable business model innovation* is very subtle: the first refers to a company in which there is a logic of sustainability within its business model; the second one concerns the process by which the company innovates its current business model through the tool of sustainability (Geissdoerfer et al., 2018).

1.5 Corporate Sustainability Framework

As already depicted Valera (2010), the topic of sustainability is much more than just a marketing tool, as it is a philosophy that influences the company as a whole. As the

Growing Green approach affects corporate reputation it also affects the brand, becoming a competitive leverage among firms. One of the most well-known models is that of the *sustainable corporation*, meaning a company that funds its mission, vision, values, policies, relationships and products strongly oriented toward environmental and social sustainability (Elkington, 1994). It focuses on efficiency and rather than attempting to represent a socio-ecological system and its development processes, it highlights how the firm projects its interests and responsibilities (Barton, 2020). This accounting structure was introduced at the beginning of the eighties by Spreckley Freer (1981) and became later popular thanks to John Elkington, who in 1998 coined the so-called *"Triple Bottom Line"* (TBL) or 3P: *People, Profit, and Planet*.

The approach at the basis of the TBL model is present in the article 5 of the Declaration of the Sustainable Development in Johannesburg (UN, 2002)[9], that claims: "*we assume a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development — economic development, social development and environmental protection — at the local, national, regional and global levels".* As highlighted in the Declaration, it is not correct to consider the sustainability dimensions as closed systems, because the concept of sustainability in its integrity is based on the interdependence and the balance between the three pillars.

The TBL model was born in the sector of private enterprises and was a tool that specified what entrepreneurs should incorporate in their performance assessment. Originally, Spreckley (1981) collected five action areas which Elkington (1988) then reduced to three. The latter represents the basic categories of measurable benefits that firms can bring to society (Oertwig et al., 2017) The model assumes:

- Review of the business model: Making profit is a mandatory requirement in order for companies to survive. To pursue on an ongoing basis for the economic sustainability of the company the latter should not center only aiming at earning financial profits (*P of "Profit");*
- Review of processes and products: change of techniques and technologies that must lead to an optimization of environmental impact of production process and for what regards the development of new products and the renewal of the old ones from a

[9] «Division for Sustainable Development- WSSD Political Declaration» (2002).

perspective of "*Life Cycle Assessment"*[10]*,* hence introducing the concept of "*Circular Economy*[11]"(*P of "Planet"*). Companies responsible for the environment should measure their impacts on nature, for example using the *"Ecological Footprint*"[12] or a *Life Cycle Assessment*;

- Introduction of a social purpose: that is, inclusion of a vision based on real participation of the company as a whole to achieve a generally shared well-being among stakeholders in order to improve the performance – not only economic - of the organization (*P of "People"*). According to Uddin et.al (2008), the aspects of social responsibility are declined in three points: responsibility toward customers, responsibility toward employees and responsibility toward community.

Figure 2 - Representation of the Triple Bottom Line: Planet, People, Profit. Elkington (1998)

According to Elkington (1998), if one of these elements is missing, then the development cannot be considered "sustainable". This approach could lead an organization to perform economic prosperity, environmental quality and social justice simultaneously, which has an important effect on the concept of *capital* (Rambaud et al., 2015). Already in 1997, Elkington concluded that within the TBL philosophy, *''the concept of economic capital will need to absorb much wider concepts, such as natural*

[10] *Life Cycle Assessment* (*LCA),* is an analytical procedure for assessing the environmental impact of products that considers all stages of production, from the extraction of raw materials to the development of the final products, up to the consumption phase and the management of the waste.

[11]According to Ellen Macarthur Foundation, the term *circular economy* goes beyond the take-make-waste industrial model in favor of a new idea of growth through design out waste pollution, keep products and material in use, and regenerate natural systems.

[12] It is a complex indicator used to evaluate human consumption of natural resources with respect to the Earth ability to regenerate them.

capital and social capital'' (Elkington, 1997). From the analysis of this model, it is clear that sustainability development goes beyond an effective communication of the green aspect. This helps the direct consumers and the stakeholders, to avoid the so-called *"greenwashing".*[13]

The three-pillar approach has been widely accepted, not just by scholars but also by society and organizations. However, there are many variations on the topic, sparking a wide debate regarding the concept of sustainability, its dimensions, and the method of interaction between them. There are various representations of the TBL model with different interpretations. Much criticism has been also raised against Elkington's model, to which he himself replied twenty years later. As the literature exposed, the three most cited dimensions are the environmental, the social and the economic ones (Goodland 1995, Elkington 1998). The *"institutional" version* endorsed by the international organizations is that of three hierarchically equal, mutually interacting dimensions (Lehtonen,2004). While the importance of each pillar may vary from one situation to another, the model ideally does not give priority to any of the three dimensions (Holden et al, 2014). Some of the criticism raised by Lehtonen touches points such as that the TBL could reinforce the central role of the economic sphere by treating it as a separate entity. Another critique focuses on the relationship between the three dimensions of sustainability because each of them has its own features and logic, which will be probably in contrast with those of the others. According to Lehtonen (2004), for this reason, the TBL model does not give a clear picture of how to avoid conflicting objectives of economic rationality, social justice and ecological equilibrium; that there is a hierarchy between the three dimensions, and thus they cannot be analyzed through the same tools and frameworks.

[13] The classic definition of *"greenwashing"* identifies a behavior which presents a clear discrepancy between the real situation and the positive communication of a behavior, a performance or an environmental parameter (Delmas, Burbano, 2011). In a broader perspective, however, the concept can be translated into a positive social corporate behavior which is not reflected in the reality of the facts.

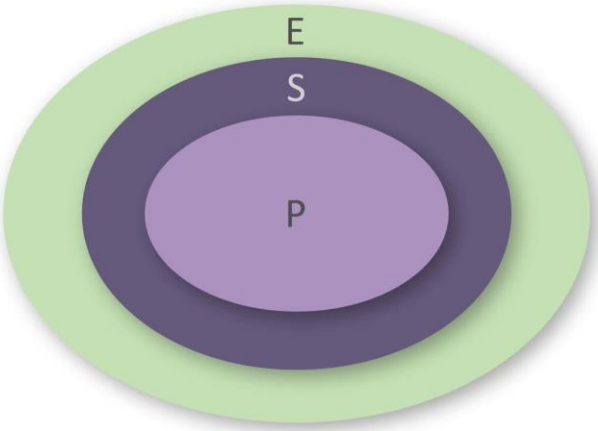

Figure 3 - The representation of the "Bio-economy model" by Lehtonen (2004)

An alternative to the TBL model has been suggested, the *"Bio-economy model"*[14], representing the three pillars as three concentric circles: the environment circumscribing the social dimension, and the economic sphere constituting the innermost circle.

Growing green takes time and efforts, investments and participation and therefore companies' vision must change from a day-by-day perspective to a long run working project.

This approach guarantees different advantages in terms of improvement of corporate efficiency, which allows impacting less on the planet but at the same time to develop economic savings. For what concerns regulatory advantages, embracing a sustainable vision allows timely adjustments to the increasingly stringent international environmental regulations. Then, it can bring competitive advantages from access to *Green Public Procurement (GPP)*[15] to the increase of corporate reputation. Though Giddings (2002) criticizes the model, he suggests the possibility that the hierarchy between dimensions depends on the perspective with which the analysis is performed.

[14] *"Bio economy"* representation of TBL model, in which the three pillars are replaced by three concentric circles, with the environmental sphere surrounding the social dimension, which in turn encloses the smallest circle of the economic dimension. This representation shows the idea that the economic activities should be at the service of society rather than guiding it all in compliance with the limits of the physical and ecological system in which the community lives (Lehtonen, 2004).

[15] *Green Public Procurement (GPP*), a process whereby public authorities seek to produce goods, services and works with reduced environmental impact.

The TBL performance indicators can be done in different ways and degrees. It is also important to emphasize that several factors can also influence the sustainable performance assessment, such as: industry, company size, local regulation, stakeholders' efforts, competitive scenario, company life cycle.

1.6 Definition of Eco-innovation: overview of the Literature

The capacity to innovate is considered a strategic tool for all of those firms that want to maintain a competitive position in the market. In order to understand how this is so, the following paragraph will briefly introduce the term "innovation", after which will explain the combination of the concept with sustainability, cornerstone of the research.

First of all, the terms "invention" and "innovation" are commonly perceived as synonyms, but these two words are slightly different in meaning and must not be confused. The meaning of invention is clearly explained by Usher (1954), who defines it as an: "act of ingenuity that goes beyond the normal exercise of technique or professional skills". Therefore, invention is the result of the combined effects of inventor's intuition, skill and ingenuity. An author who has instead studied in depth and defined innovation was Schumpeter (M. Schilling, F. Izzo, 2017). The key difference pointed out by the author is that invention does not produce by itself an economic effect. Hence, the commercialization of the invention and its economic function lay at the core of innovation. In the following decades, the definition of innovation has evolved and as Melissa Schilling (2017) explained innovation can be seen as the implementation of knowledge, inside a product, service or process through invention, which generate added value for the customer following a marketing campaign.

The literature contains multiple categorizations of innovation in different dimensions that are very connected one another. As also pointed out by Schilling (2017), starting from the objective of the innovation it is possible to distinguish between product, process, service, marketing and organizational innovation. Then, looking at the novelty of the knowledge brought by the innovation a classification can be done between incremental innovation, which refers to those types of product, process and

service that present slightly different changes while radical innovation, on the other hand, is a completely new product, process or service for the market or the company. Moreover, at the corporate level it is possible to identify two other types of innovations, *competence enhancing* innovations and *competence destroying* innovations*.* The first term refers to the ability of the company to introduce new type of innovation that are in line with the technology used for the same range of products whereas the second one regards innovations based on completely new competences also for the company itself.

Innovation has always brought an essential advantage to companies in order to compete globally. Investments in innovation are also very useful for the reduction of production costs. Innovation, however, can also bring negative effects, called negative externalities: for example, in the agriculture and fisheries sectors, improved productivity allowed by new technologies might destroy natural habitats, cause erosion, hydrogeological instability, impoverishment of the fauna and pollution, harmful not only for the community but also for the production plant. For this reason, in order to contrast this negative trend, there has been a shift toward sustainable innovation and this topic in 2011 was also discussed by the European Union through the publication of the *Eco-Innovation Action Plan (*Díaz-García et al., 2015).

Three different terms are often used interchangeably in the literature to describe innovations that reduce the negative effect on the environment*: "green- ", "eco- ",* and *"environmental" innovations* (Rabadàn et al., 2019; Diaz Garcia et al. 2015). An increasing number of companies introduce the environmental variable in their production processes, in order to contain costs, diminish waste and meet the needs of consumers, increasingly oriented toward environmental issues. According to Porter et al. (1995), companies can achieve environmental regulation and improve their competitive advantage at the same time, leading to a *"win-win" solution*.

The fundamental strategy is based on the objective of increasing resource productivity through the minimization of resources deployed in relation to the maximized output with respect to the entire lifecycle. This is commonly achieved through product and process optimization or better innovation. Nowadays, innovation is a major key for sustainability due to the fact that the future society demands innovative products, processes and services, without losing out on efficiency.

After reviewing the literature, I encountered different definitions of eco-innovation. The Oslo Manual defined it as *"the production, assimilation, or exploitation of a product, production process, service, or management or business method that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution, and other negative impacts of resource use (including energy use) compared to relevant alternatives" (OCDE, 2005).*

According to the definition made by the European Commission, eco-innovation is every kind of innovation which can be sustained by reducing its effects on the environmental damage and obtaining the use of natural resources, and which aims important and demonstrable advancement toward sustainable development.

Following Triguero et al. (2013), it is possible to classify eco-innovation as: technological eco-innovation (e.g. solar energy, wind energy); organizational eco-innovation (e.g. car-sharing); eco-innovation associated with business parks (e.g. eco-city closing cycle in Japan); social eco-innovation (alteration toward using bicycle instead of using car).

However, other classifications of eco-innovation have been suggested (O. Çoban 2012). For example, according to the *Oslo Manual*[16] it is possible distinguish between technological and non-technological eco-innovation: the former refers to the introduction of eco-products and eco-production processes, including services; the latter refers to management, marketing and business methods that can reduce the negative impact on the environment. As this last classification does not add anything new to the previous one, it is more useful to think of it as just a simplification of Triguero et al.'s (2013).

1.6.1 Corporate Environmental Management: the endogenous drivers of Eco-innovation

Some research state that there is a positive correlation between environmental business practice, financial performance and productivity (Cainelli et al., 2011). In fact,

[16] First published in 1992 by the Organization for Economic Co-operation and Development, the Oslo Manual is the international reference guide for collecting and using data on innovation.

a competitive advantage can be obtained by reducing costs, increasing benefits through customer satisfaction, corporate image and brand loyalty. *Eco-innovation* might be therefore thought of as a means to gain access to new markets, offering a higher variety of products and a company can take advantage of their eco-innovation as well, by selling or licensing the *eco-friendly technology* (Rabadàn et al., 2019).

The positive effect brought about by sustainable innovation also emerges from García-Sánchez et al. (2019). While they observe that investments in eco-innovation might have a negative impact on the business performance in the short term of the company because of high costs and risks, they also claim that eco-innovation policies might have a positive effect on the market value of the firm, making it more attractive to stakeholders and able to achieve a strategic competitive advantage in the long term.

Assumed that sustainable innovation might bring a competitive advantage, an effort must be made in order to understand what are the forces that drive companies to adopt a sustainable approach. The literature distinguishes between internal such as and external drivers.

Starting from the analysis of the internal drivers, a firm's *eco-innovation capacity* will be connected to the pool of knowledge, resources, and capabilities that is available within the company (Rabadàn et al., 2020).

As environmental stimuli are not perceived in the same way by all companies, internal drivers are different for each company (Bertelè et al., 1997), depending on:

- Characteristics of the industry and sector where the companies operate;
- Geopolitical configurations (geolocation of subsidiaries and markets served, larger companies are supposed to have higher level of external financing for eco-innovation);
- Peculiarities of their value chains (in terms of production and distribution, degree of vertical integration, methods of coordination between internal activities and with other companies in the supply chain), which entail a differentiation of the impact on balance sheets and on the competitive position;
- Role played by them, of leadership and limited sovereignty in governing the supply chain or chains;
- Nature of companies: their reactive or anticipatory attitude rather than their propensity or not for innovation;

- State of their resources: in terms of the presence or absence of environmental skills that allow a correct and timely reading of external events and financial health;
- Skilled personnel and internal R&D, high investment intensity. Eco-innovative activity depends directly on R&D activity, which is influenced by past activities (dependence on the technological trajectory) and activities of other companies in the same industry/sector. Financial resources are one of the barriers to eco-innovation;
- Organizational capabilities are considered a valuable driver of eco-innovations, especially for internal purposes because they could lead to the development of technological eco-innovations;
- Phenomena with a strong emotional impact, such as COVID-19.

From this analysis it is possible understand the positive effects of the environment that are strongly linked to the choices taken by management, nature of the company, business culture, sink resources and, last but not least, core competencies.

The choice of a company to adopt or not a green strategy is partly due, as already highlighted above, by its *nature*, *timing*, size and *group firms* (Pereira and Vence, 2012). Moreover, firm's resources, capabilities and core competencies make a difference in fostering eco-innovation. With regards to *core competencies*[17] Bertelè et al. (1997) defined as *"green"*, the ability of the company to integrate the skills that play a key role in improving the environmental performance of the company by determining a *synergistic effect*. These competencies differ depending on the nature and vision of the company. According to Azzone et al. (1997), it is possible to distinguish between four types of *"green core competencies":* technical-scientific, communication, legal and organizational. In addition, those core competencies that foster internal development of eco-product and eco-process innovations are more complex to achieve than for those traditional innovations because of their higher degree of novelty, at least in the short term.

[17] *Core competence* (Hamel and Pahaland, 1994), a wide concept that differs from the one of "capability".

1.6.2 Corporate Environmental Management: the exogenous drivers of Eco-innovation

The spread of an environmental consciousness, fostered by external pressures, has prompted individuals but above all companies to recognize the chance to obtain and maintain competitive advantages through eco-innovation (Díaz-García et al., 2015). According to Bertelè et al. (1997), an essential role has been played by stakeholders such as consumers, political institutions, national and international governments, companies and financial institutions as regards investment, credit and the academic and scientific work.

The spread of an environmental awareness is continuous, but at the same time it has a conflicting nature due to the coexistence of different actors carrying out their interests. This greener behavior has increased lately thanks to the spread of sensitivity among individuals, by the demonstration of benefits achieved, and by the availability of innovative products and services (Bertelè et al., 1997).

Literature on this topic has been increasing and Figure X below represents graphically the main drivers that influence the production of eco-innovation respectively: the market pull, the regulatory push/pull, and the technology push.

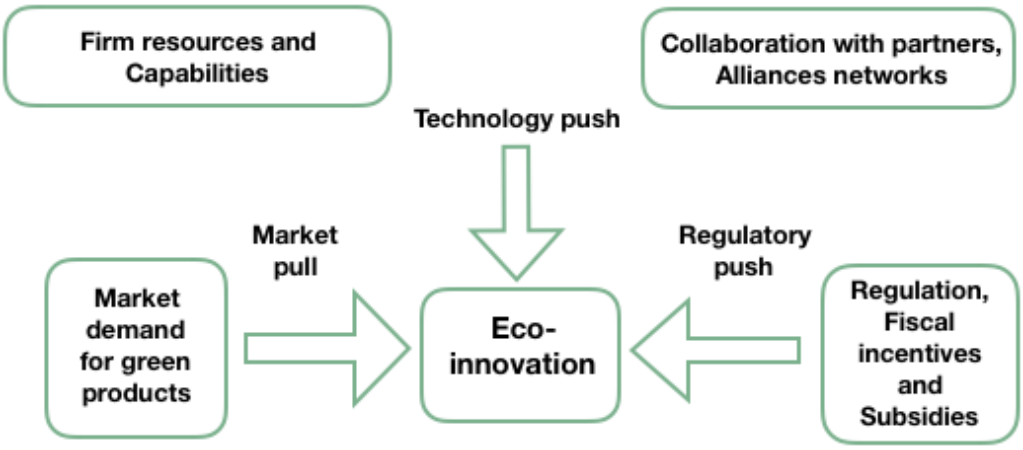

Figure 4 -Exogenous drivers of Eco-innovation. Adapted by Triguero et al. (2013)

Market pull

Over the years there has been a change on the purchasing behavior of end-users toward environment-friendly products and services. The response of the companies to the emergence of these “green” requests from the market has led to innovations of

products and services. If at first, this trend had become increasingly linked to improving a company's image, now it is a prerogative.
There is a new vision of the end-user, which is seen as an actor, and he is the one who contributes to establish the characteristics of the offer, and to modify the life cycle of products.

Regulatory push.

The legal constraints imposed by international and national institutions has in some way changed the rules in terms of competition about the compositions of products and changes in production and distribution. This phenomenon can lead to innovation, but at the same time it can push the offshoring of companies, leading them to take advantage of practices not socially tolerable. It can have a protectionist effect and might undercut global competitiveness. Voluntary agreements such as fiscal incentives and subsidies or on the contrary penalties often of a fiscal nature are taking a place (Bertelè et al., 1997).

Technology push.

This element is considered an external factor for all of those companies that do not develop the technology in-house (especially relevant for SMEs) but receive it from other actors who develop it, which might be companies or public research centers. Since, eco-innovation activities seem to require more external sources of knowledge and information, the role of technology push could also come from the creation of networks (Rabadàn et al., 2020) through which firms cooperate with stakeholder groups, as open innovation strategies (Cainelli et al., 2011; Ghisetti et al., 2015; Medeiros et al., 2016).

1.7 A new interpretative framework

Having explored the many theories on sustainability and on innovation, it is worth to take a last step and fit them together into a coherent framework. Returning to the system elaborated at the beginning of this chapter, it can be seen in *Figure 5* how rethinking it could avoid a *"tragedy of the commons"* kind of trap, which occurs when

there is a commonly shared resource whose use brings benefits, but which is subject to erosion.

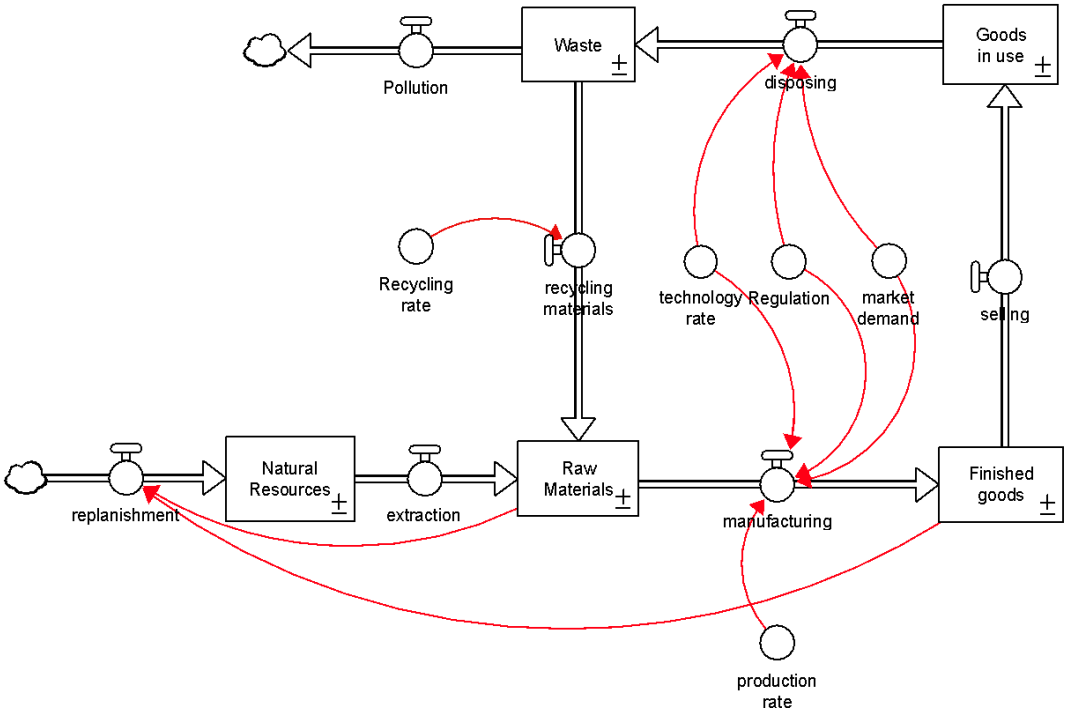

Figure 5 - Representation of the interpretative framework by STELLA Architect

In this case, the addition of the three drivers of sustainable innovation act as feedback loops that modify the behavior of the whole system. So technology improvements, organizational or product innovations might reduce the need of extracted inputs to produce a finished good, or create materials whose impact on the environment is minimal; regulation might also put a cap on the use of non-recyclable materials, rather than introduce benefits for those businesses that adopt a sustainable business model; lastly, customers, by adopting certain purchase behaviors, could force companies to become greener, thus speeding up the adoption of recycled materials or the introduction of production methods with a smaller carbon footprint.

It must also be noted that the avoidance of a “tragedy of the commons” trap should be in itself an incentive for businesses to become greener, or otherwise the resources on which they profit today might not be available tomorrow, putting at risk whole economic sectors.

For the above argued reasons it is then worth considering eco-innovation as a source of competitive advantage. Business leaders need to think forward, and only short-

sighted individuals would neglect sustainability as the basis for the economy of the future.

1.8 COVID-19 and the future of the economy

The COVID-19 crisis is still emerging and evolving, and it is not clear whether short term changes and responses will result in a new "normal" (J. Sarkis, 2020). Short-term environmental sustainability gains occur, while long-term effects are still uncertain. What is clear, however, is that the responses adopted by Governments all over the World deeply impacted their own economy, in that in order to contain the spreading of the disease lockdowns were instituted at the expense of productivity. The new hot topic today is that of economic recovery, replacing yesterdays of environmental sustainability.

While it is correct to focus on the economic aspect, it should not come at the expense of the green push that characterized the last few years. On the contrary, environmental sustainability should be included in recovery strategies as a tool to gain competitive advantage and to grow in resilience.

What COVID-19 brought to national economies all over the world is a wave of disruption, by indirectly forcing whole populations into lockdowns and, as a consequence, the closure of production plants. Only few sectors will come out untouched from this crisis; for the rest it will take years to return to the situation quo ante.

A particular role in today's economy will be played by uncertainty, which has both to do with unforeseeable external events and with the changing regulatory landscape. Companies are faced with a constantly changing business environment, and in taking decisions it must be expected that they will restra.in from daring and will opt for whatever makes them feel more secure.

As argued above, however, the economic dimension is only one of three when it comes to sustainability. To focus only on that means being short-sighted, losing all the benefits that come from adopting a sustainable approach. On the other hand, for a business to grow sustainable means investing in eco-innovation. Technology, as seen, is

in fact one of the three drivers of sustainable innovation, that coupled with regulation and market demand influence the direction of sustainability.

The following chapter will explore the possibilities offered by eco-innovation as applied to the agri-food industry. Building on the concepts laid down so far, it will be made the case for investing in eco-innovation even and especially after the disruption brought by the COVID-19. It is still worth today to believe in the idea that every crisis is also an opportunity and moving from this idea it is recommendable that wise business leaders will still base their growth strategies on green innovation.

Green innovation requires an open mind. The concept of sustainability should not be limited to energy saving and waste management, but also be extended to organizational and managerial processes, products and to the corporate vision itself. The benefits of sustainability go way beyond the simple marketing strategy. They involve thinking at the long-term feasibility of the business itself, it means staying ahead of the curve, it means growth in every sense. Therefore, businesses must face the evidence that sustainability is the future of business strategy and take the current crisis as the pretext to achieve greater sustainability.

CHAPTER 2 - THE ITALIAN AGRI-FOOD SYSTEM: BEFORE THE CRISIS

The purpose of this chapter is to give an overview of the Italian Agri-food system, all the supply chain stages will be touched upon and clarified.
The first part of this paper will focus on the Italian agri-food sector before COVID-19, and then it will go on to explore the main changes that this sector will have to face in the recovery situation. Furthermore, in order to put into practice what was explained in the previous chapter, the impact of sustainability on the agri-food supply chain will be measured.

Finally, as eco-innovation is one of the main drivers of agri-food firms' competitive advantage, the second part of this work will focus on its state of the art in this sector.

2.1 Overview of the Italian Agri-food system – 2019

The agri-food system covers an important quantitative dimension in our country in terms of production, employment, turnover and in terms of the quality of our products contributing to the success of the Made in Italy brand (Traill, 1989). One of the most interesting things regarding this topic is that the internal composition of the agri-food system continuously changes over time and the agriculture sector can be seen as an example. In fact, the agricultural firms change their boundaries with a slow opening to the market and interdependence with the other sectors of the agri-food chain.

In fact, the agri-food system spans multiple sectors (Pieri et al., 1995), ranging from agricultural production to the transformation of raw materials into refined materials, from manufacturing to distribution and sale of finished goods to consumers. Due to its heterogeneity, the agri-food system encompasses all the three economic sectors: starting from the primary with agriculture, fishing and livestock, through the secondary with the transformation of raw materials, till the tertiary characterized by distribution, transport, marketing, catering, food service and hotels.

In order to give the clearest picture of the Agri-food system, the following analysis of the supply chain will be made up of two parts. The succession of elementary

operations that make up the production process will first be outlined, distinguishing agricultural phases from industrial ones; the distinction will clear the ground from ambiguities, so that later it will be possible to identify various types of innovations that could relate to the agri-food. The data considered are those based on analysis previous to the outbreak of COVID-19.

As for its composition, while the Italian agri-food sector is mostly made up of large industrial groups with international relevance in control of most of the production, there is also a considerable number of small and medium-sized enterprises (SMEs) that mainly operate at the upstream phases of the production process (Federalimentare, 2019). According to the European Commission (2017), medium enterprises are those who have less than 250 employees and an annual turnover equal or lower than 250 mln while on the other hand small enterprises are those who have less than 50 employees with an annual turnover equal or smaller than 10 mln.

In 2017 the agri-food system, as a sum of agriculture, forestry and fisheries, food and beverage industry, retail trade and services catering - represented a total of 15% of total turnover of the economy (Itaconta 2017, CREA), a value substantially unchanged in recent years. The weight of the components of the agri-food system in the Italian economy, in fact, is very relevant, given the high number of activities involved and connected between them.

According to the European House - Ambrosetti (2019), in the last few years the agri-food sector has seen a rapid growth in terms of competitiveness and turnover compared to the other sectors inside the manufacturing industry, such as pharmaceutical, chemical and automotive. As reported in the document, the Italian agri-food sector is characterized by 1.7 billion (over 56 thousand companies of the F&B and the remain part belonging to the agriculture sector) with a turnover exceeding 200 billion euros (140 bln from the agri-food industry and 60% of the primary sector) of which 44.6 billion deriving from the exports, with an increasing trend of 5.3% in 2019 (vs 2018) and +25.2% compared to 2013a and agri-food imports also grew (+ 1.6%), after the decline in 2018, reaching 44.5 billion euros. In this picture, the DOP economy[18] holds

[18] According to Treccani, the term *"DOP economy"* refers to that segment of the production and processing of agricultural products intended for food with Geographical Indication, which constitutes an important part of the national agri-food value.

almost a third of Geographical indications and amounts to a value of 15 billion euros from the production and of 8.8 billion from exports (Federalimentare, 2019).

Boundaries between primary and secondary industries are tight (Bertelè et al., 1992). Agricultural enterprises have two options of destination for raw materials: those destined for final consumption without particular transformation, the so-called "fresh products", and those intended for industrial manufacturing.

Italy is a structurally fragmented country, and it is possible to see this fact also within the agri-food industry. Every region has different characteristics and inclination toward international trade. In the last two decades, there has been gradual improvement in the exports driven by the so-called *Made in Italy*, processed agri-food products that deliver the Mediterranean diet abroad.

Given Italy's strategic position in international trade, it is useful to analyze the contribution of the regions to the national agri-food system trying to identify models of regional specialization in terms of trade with foreign countries.

According to ISTAT (2019), in 2018 the Italian agri-food industry's added value is exceeding the importance of agriculture. Hence, in recent years, it was possible to see the appearance of the so-called *Agri-food Districts*, which are closely connected to the growing attention to food processing industries, and all of them have a common root related to a strong link with local resources and traditions. According to Brasili C. et.al. (2006), among the most interesting ones there are: the Parmigiano Reggiano system, processing of pork in the province of Modena, the tomato districts of Piacenza and Parma in one hand and of Salerno and Naples on the other, as well as the poultry production system in the provinces of Verona and Forlì. The evolution of agri-food districts was favored by the development of Italian agriculture, with gradual concentration and specialization of production in narrow areas. For this reason, Italian farm holding instead of producing multiple types of products they prefer highly specialized production. To evaluate the importance of the environmental value of the geographic area, it is essential to preserve local traditions, and their adaptation to the new market conditions represents another important contribution of the agri-food district to sustainable development of the system. Usually they are identified thanks to

location, concentration and specialization indicators. Hence, based on these metrics, other classifications have been found as for example the local systems of the dairy industries of Grana Padano, between Milan and Mantua, which hosts not only establishments for making cheese but also major meat production.

2.1.1 The COVID-19 impact

Looking at the Italian agri-food sector in the past year, it is possible to say that it was able to survive the crisis better than other industries, confirming its anti-cyclical nature (The European House - Ambrosetti 2020). The reason behind this result is that, while lockdowns forced entire populations at home, groceries and supermarkets were the only businesses that were open. The initial panic also translated into long queues outside any supermarket, with customers fearing that from the following day closure would be forced also on first necessity shops. Later in the lockdown period, staying at home became the perfect occasion for cooking together, the demand for food skyrocketed and products such as yeast went sold-out.

Hardships faced by both agriculture and the alimentary sectors have mostly related to hitched logistics and to the difficulty in finding seasonal labor. In particular, faulty logistics determined the accumulation of perishable products in warehouses and the inappropriate replenishment of supermarkets.

If the negative effects of lockdown on the agri-food were mitigated in the overall agri-food thanks to the performance of the primary and secondary sectors, that was not the case in the Restoration, Catering and Hotellerie sector. The counterpoint was in fact that of the hardship faced by the catering and Hotellerie's sector, whose forced closure prolonged.

As forced closures have been intermittently in effect over the whole 2020 and are proceeding in 2021, unprecedented economic relief funds have been granted by the EU, and every member state has been discussing its plans for investing its allocated resources. In Italy, what is already known as *"Piano nazionale di ripresa e resilienza"*, aims at strengthening the national economic fabric by investing in building the future

economy. One of the chapters of this plan involves the allocation of 68,9[19] billions of euros to the so-called *"green revolution and ecological transition",* encouraging companies to innovate in a green fashion.

Before exploring how eco-innovation applies to the agri-food supply chain, however, a more in-depth analysis of how such supply chain works is needed.

2.1.2 Exploring the Agri-system: Sectors' overview

The Italian Agri-food system as already explained above is far from constituting a homogeneous system of the economy because inside has a mix of different sectors and it is highly heterogeneous in terms of structure and geographic space.

Alongside quantitative and composition changes and changes there are two other aspects to be analyzed, the growing interdependence of markets and the internationalization of companies (Pieri et al., 1995). The first refers to the growing need for variety, a trend favored by globalization, and therefore the growing opening of national systems abroad, an example of which is the numbers relating to exports and imports. The second aspect is due to the evolution of demand which involves the relative collaboration between companies located in different phases of the system, see agriculture and processing companies.

Therefore, sectors within the industry can be distinguished in those close to agriculture and those close to consumption, with sectors that include both of the above-mentioned characteristics at the same time. The output may have significantly different features depending on the sector, so for example we move from so-called commodities to real finished products-services often differentiated through brand policy. According to Bertelè et al. (1992), within the agri-food industry there is a simultaneous presence of companies mainly engaged in transformation and conservation, companies mainly involved in marketing activities, networked companies, autonomous companies, companies attached to agricultural companies, companies controlled by distribution and catering, industrial enterprises, national and multinational private companies, state-owned enterprises, municipal enterprises and cooperative enterprises.

[19] «Il Recovery Plan è pronto: più soldi all'agricoltura e al trasporto locale».

The definition of the boundaries between the food industry and the adjacent sectors is quite ambiguous, and that can be seen within agriculture. This is due to the food industry's tendency to move toward fresh products and products treated with delicate technologies or for the inclination of agriculture to industrially manage its processes and offer. This indeterminacy is also manifest in the distribution and catering branches. Thus, the sectoral structure is very complex due to the discrepancy between companies. A brief simplification of the agri-food system could further help the understanding of its working.

The food supply chain is a set of stages represented by a sequence of physical and decision-making activities, in which different actors are involved. This definition includes production, operations and distribution, product development, marketing, finance, sale and post-sale experience, and customer relationship management. The interaction between actors is manifested in three areas: exchange of a specific output design for a particular market, information flows and associated flows of money that cross organizational boundaries.

The agri-food supply chain is organized into agricultural production, food processing, food wholesaling, food retailing, and food catering (see *Figure 6).* Depending on the number of actors involved in the implementation of products, it can be "short", referring to the direct sale of products from agricultural production to distribution, or "long", when it involves a series of steps - more or less complicated - to bring the product to the consumer. Considering the agri-food chain as a whole, the main problems that it can encounter in the management of the flows are referred to the deterioration of products and the recovery of unsold goods.

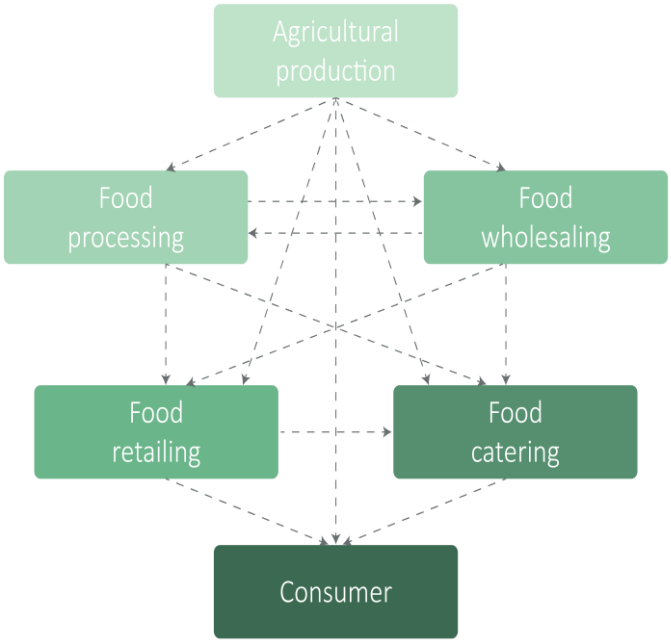

Figure 6 - Food Supply Chain. Adapted by Yakovleva (2007.)

As a supply chain, the agri-food is a complex system that spans from the primary to the tertiary sector. For a clearer comprehension of its organization, it is worth spending a few words describing sector by sector how it takes form.

Primary sector

Primary production comes from fishing, agriculture, zootechnical productions and from extraction, and might be meant for transformations or as directly consumable after transport and storage. Some products, before reaching the consumer, can also undergo multiple transformations through the use of specific machinery and the addition of enzymes and additives. Therefore, sometimes it may be difficult to understand where the primary sector ends and where the secondary begins.

The primary sector is characterized by the nature of the companies operating in it. Especially relevant in this regard is the distinction between “industrial” and “agricultural” enterprises, which determines how they behave. In fact, industrial enterprises in order to better respond to market needs operate by setting production

goals oriented at raising production capability through the increase in size and number of internal functions. On the contrary, agricultural enterprises are organizations open to relationships with the outside, specializing only in few activities and functions, carrying out processes aimed at obtaining products of quality and in the greatest possible quantity, using the technical means in an effective and efficient manner and working with the land available (Santovito S., 2005).

The growing demand for quality food by consumers and the diffusion of innovations in the agri-economic field have improved the quality levels of the agricultural products, together with the regulatory evolution in the European context focusing on the quality of the products. According to a study conducted by Bertelè et al. (1992), the food industry and the distribution channels are the main clients of agriculture. Hence, during the last decades, the relative importance of agricultural firms has changed, and the businesses tend to take on the connotations of manufacturing firms, that is to say larger, more specialized and more internationalized.

Secondary sector.

The food collected by the primary sector is sometimes sold directly to consumers, but it is mostly directed toward enterprises that take it as input. These can be divided into enterprises that prepare fresh food, enterprises that prepare beverages, enterprises that prepare jams, enterprises that produce ingredients that are used to prepare food and enterprises that produce ready-to-eat foods.

The food industry is not self-sufficient regarding the provision of raw materials and that is why it is very difficult to identify the boundaries between primary and secondary sectors (Bertelè et al., 1992). For this reason, some Italian food companies have developed integrated upstream activities with national and foreign suppliers. However, this is more an exception, as the link between agriculture and industry in agri-industrial districts tends to become weaker and the local processing industry often relies on suppliers from outside the district.

Tertiary sector.

A last distinction of the agri-food supply chain must be made as for the tertiary sector, which in this industry consists of intermediate distribution (wholesale), large-scale distribution and hospitality industry, including hotels, restaurants and event planning.

While not formally comprehended by the definition of "agri-food", this sector contributes to the overall functioning of the supply chain and must be briefly considered as an area of eco-innovation. As an example, carbon footprint produced in agri-food is not limited to the externalities coming from production, but also from transportation. Or equally, Ho.Re.Ca. (short for "Hotellerie-Restaurant-Cafè"[20]) is a major player in driving innovation in the whole supply chain.

Therefore, while the tertiary only participates from the outside to the agri-food, it cannot be excluded by any comprehensive analysis of the supply chain.

2.1.3 Playing actors in the agri-food industry

The food supply chain involves all of the three sectors of the economic activities, respectively primary, secondary and tertiary sector. In order to understand the value of final goods attributed by consumers, it is important to understand how that value is created along the agri-food chain.

First of all, it must be identified by the set of operators who directly or indirectly are part of the agri-food chain. It is important to make a distinction between actors that operate inside the agri-food chain, known as "internal actors", and operators who have economic transactions with it even if they are not inside it, known as the "external actors" (Zaghi et al., 2011).

The first ones can be divided into the phases of the supply chain:

- The production phase, which includes agriculture and the food industry.

[20] The acronym Ho.Re.Ca. is mainly linked to food consumption and it includes all of those activities related to non- domestic food consumption.

- The distribution and commercial phase, which includes wholesale trade, retail trade, non-specialized self-service distribution and catering sector (Restaurants, bars and canteens).

On the other side, external actors through the supply of goods and services contribute to adding value to the final product. Examples of external actors in the agri-food supply chain are suppliers of machinery for agriculture, additives and other chemical ingredients for the food industry, electricity and other services (water, gas, etc.), transport and logistic services, communication and promotion, consulting activities, certification services, machineries and packaging.

Another example of external contributors to the agri-food supply chain is the public administration that represents a relevant cost for producers due to the payment of direct and indirect taxes in exchange for services.

This clarification is necessary in order to better understand how the entire value of the agri-food system is distributed.

2.1.4 Measuring the attractiveness of the Agri-food Industry

The industry environment, before the breakout of the pandemic, could be summed up by Porter's (1985) *"five-major-forces" framework* that determines the firm's competitive strategy (Jongen W.M.F. and Meulen M.T.G., 2005).

Regarding the threat of new entrants, the agri-food in its primary sector does not present many barriers to entry. In the secondary sector, however, strong brand-loyalty established through advertisements, patent protection and high product quality hinder the entrance of new players. Higher entry barriers are also due to high switching costs and absolute costs advantages because strong brand-loyalty makes it hard for customers to change to a new brand and because it is hard to compete against a firm capable of operating with lower costs and products of comparable quality. Lastly, both capital requirements and differentiation in the secondary sector are also higher than in the primary, while still not being prohibitive for new entrants.

The agri-food range of products is characterized by a large presence of close substitutes products, such as aspartame for sugar and margarine for butter, taking away

the chance for firms to raise prices and profit margins. This works both for the primary sector and for the secondary, contributing in a positive fashion to increasing the degree of rivalry in both.

As for the bargaining power of suppliers, it must be considered that in this regard the primary and the secondary sectors are interconnected, as the primary is the supplier of the secondary. It must also be stated that the primary sector does not face any big threat from suppliers, because it sells its own production. With regard to the secondary sector, as seen above, the bargaining power of suppliers is very low because their number is very high and there is very little product differentiation.

Similar consideration must be made for the bargaining power of buyers, as the secondary is the buyer of the primary. In this regard, however, both sectors potentially face threats. In the primary sector the threat is small but real, as the number of customers is relatively high and their differences are small; however, being all enterprises, the size of each customer's order, their price sensitivity and their ability to substitute is high, thus giving them, some bargaining power. In the secondary sector the bargaining power of buyers is low, determined mostly by the availability of alternatives and low switching costs; however, the number of customers is very high, and each customer's order is very small therefore lowering any bargaining power from buyers.

As a result of the above-observed forces, the degree of rivalry in the agri-food supply chain is very intense, as is usual in slow-growth markets in which it is hard to create new niches and the only way to grow is to take market share away from competitors. The bulk of agri-food is produced in a commodity market with numerous players, in which none of the competing firms has any sort of differentiation advantage over the other, and therefore competition to hold customers can become brutal.

2.2 Investments in the Agri-food Industry

Investments might be considered as fundamental leverage for the growth of an industry and the economy as a whole. The agri-food is a low-technological sector, and the COVID-19 has impacted financial choices regarding investments in business in this sector. However, according to a survey led by the European House - Ambrosetti (2020)

with reference to the areas of intervention for investments future, the responses of the companies in the agri-food supply chain provide a well-posed and interesting outlook for the development of the sector. The report based on estimations of 2019 in fact confirmed that the Italian agri-food chain is healthy and competitive also from the point of view of investments by the operating companies inside, once again positioning itself as the 1st industrial sector of the country. In 2017, the value of investments exceeded € 16.3 billion, an amount of 1.7 times higher than the investments made by the industry of production of means of transport and 4 times greater if compared to those of the textile and clothing chain.

Innovation arises from different sources, it can be generated in the minds of individuals - as it happens in the case of an inventor - or it can be the result of the research efforts of public or private universities, business incubators or private foundations (Schilling et al., 2017). A fundamental engine for innovation is represented by the companies themselves, which decide to invest in-house in R&D. However, there usually is a merge between external and internal sources.

It is also interesting to understand the role that investments in research and development have in the Italian agri-food sector. In order to explain the importance given at R&D by different industries, Pavitt (1984) built a grid of user and producer sectors of innovation based on sources of technology, requirements of users, and the appropriability regime. This classification allowed indentifying four categories:

- *Supplier dominated:* includes firms from traditional manufacturing such as textile, shoe industry, agri-food sector, paper and printing, lumber industry that rely on sources of innovation that are external to the firm;
- *Scale intensive:* characterized by large firms that are specialized on the production of basic materials and consumer durables such as automotive industry and metals. Here, the sources of innovation can be both internal or external to the firm and with a medium level of appropriability;
- *Specialized suppliers:* includes smaller specialized firms that usually produce technologies in order to be sold to other firms such as agricultural and industrial machinery, optical and medical instruments. For this reason, the appropriability level is high;

- *Science based:* inside this category there are firms which rely on R&D both in-house and from external sources such as university researchers. Firms in this sector are pharmaceuticals, electronics, chemicals and high-tech and they develop new products or processes with a high degree of appropriability.

According to Pavitt's classification (1984), in the food sector innovation is dominated by suppliers, therefore the main source of innovation comes from the outside and consists of the ability of companies to adapt and integrate externally purchased machinery to their own production processes. Most of the innovations regarding processes introduced in the agri-food sector come from the transfer of research conducted in other sectors (Lorusso S. Mellano M., 1993) and as will be seen, consist of incremental innovations.

Since innovation means "creation of new ideas from different sources" (Schilling, 2017), it is important to know how companies in the agri-food sector are investing in R&D. In order to understand the Italian expenses of R&D on the entire agri-food system it has been reproduced through ISTAT's data the amount of money intended to every sector of the food-chain, considering data collected before the outbreak of COVID-19.

Although, in recent years the R&D spending in Italy has been increasing (in 2018 it reached 0.86% of the GDP), the national level remains well below the EU average (1.41%). According to the data provided by ISTAT related to the period 2017-2019, it is estimated that, in 2017, the expenditure for intra-muros R&D (e.g. the expenditure incurred by companies with their own staff and with their own equipment) amount to almost 23.8 billion euros.

The agri-food industry allocates 8% of the turnover to research and development, part of which 15.9% to intra-muros research, 4.9% aimed at the acquisition of R&D services, 62.8% for the acquisition of machinery, equipment, software, or buildings aimed at innovation, 1.6% for the acquisition of knowledge from other companies or institutions, 3.2% for design activities technique and aesthetics of new products and services and, finally, 11.2% in other innovative activities.

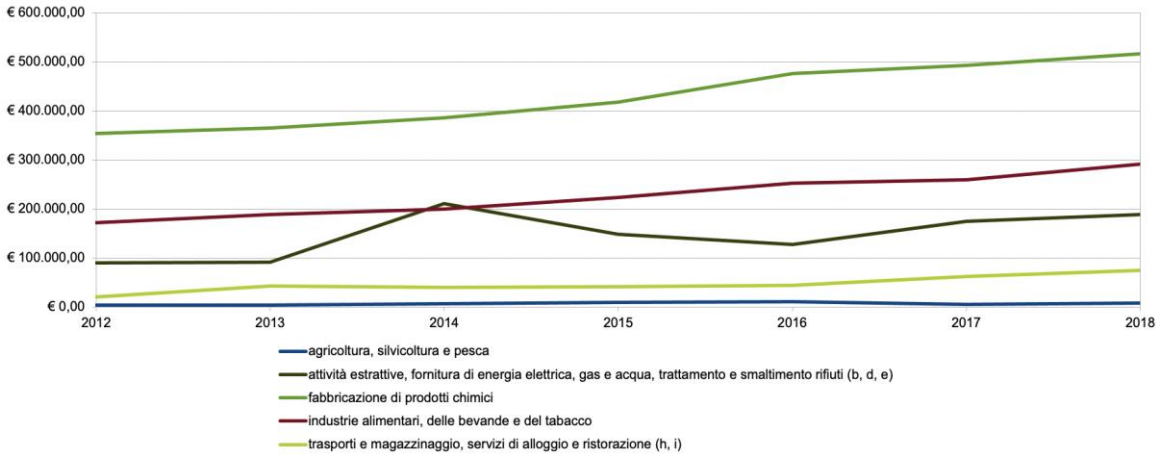

Figure 7- ISTAT data (2012-2018) on the expenses on R&D meant for the Italian agri-food sector.

The first thing to notice is that in *Figure 7* investments in agri-food are quite low, especially if compared to those in a similar sector such as chemicals which are twice the amount. However, if considered in broader terms, the agri-food comprises all three sectors of the economy and various activities, which are accounted separately by ISTAT. Thus, even if lower, investments regarding the agri-food sector should also be considered those in agriculture, forestry and fisheries; those in transportation, stocking, catering and accommodation services; those in waste disposal. This does not even account for those investments indirectly affecting the agri-food, as is the case for investments in paper and plastics used as materials for packaging, in vehicles used for harvesting and in machineries and equipment nec, only to mention some. Investment in agri-food is therefore hard to measure using current statistical categories, but much more conspicuous than is commonly thought.

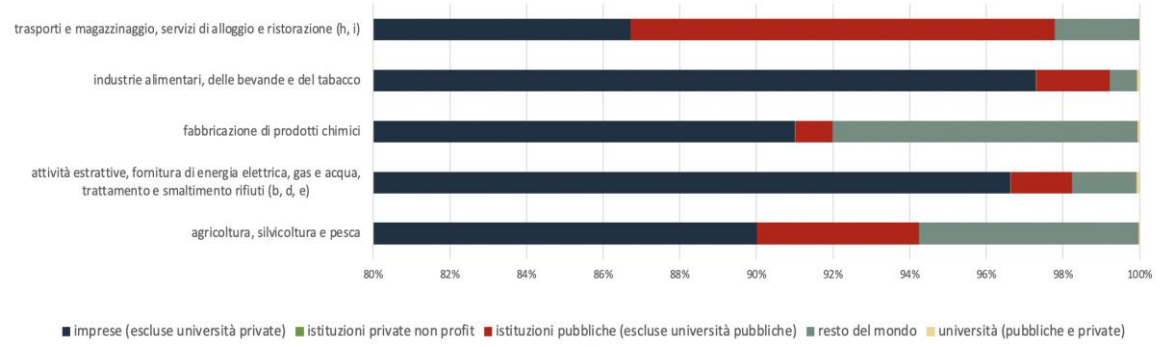

Figure 8 –ISTAT data (2012-2018) Investments in R&D per industries

The second aspect that emerges from the analysis of available data is that of the composition of investments in the agri-food sector, shown in *Figure 8*. What is striking is the predominance of private funding in all areas considered and the almost complete irrelevance of funding coming from non-profit organizations, but as explained before this result is not unexpected. More interesting is the different role played by other sources of funds, and particularly of foreign direct investment, much less invested in agri-food than in chemicals, and of public investments, which on the contrary hold a relevant influence compared to that they have in chemicals. This however is true only in relative terms, as can be seen from *Figure 9.* In fact, the amount of foreign direct investment directed toward chemicals is much higher than that toward agri-food; the amount of public investment remains higher in the agri-food, but since the volumes are very different the gap is smaller than it appeared.

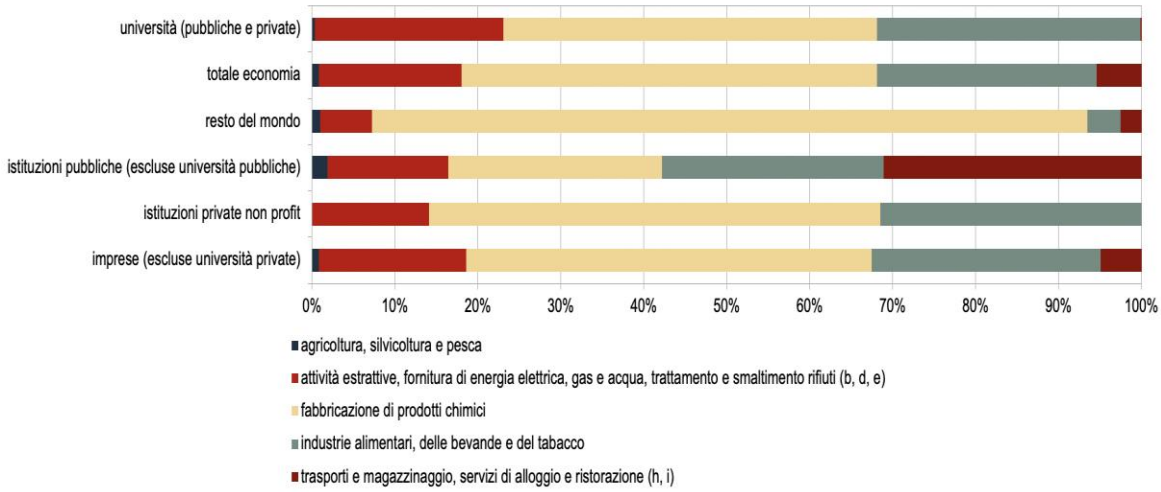

Figure 9 – ISTAT data (2012-2018). Industries per investment source

2.3 Quality and Safety policies

The protection of the quality of agri-food production represents for Italy one of the main objectives of the agri-food policy, considering that our country boasts in Europe the largest number of registered trademark products, subjects of numerous and sophisticated counterfeiting attempts, with 862 Food & Beverage products surveyed on 3,387 in total in Europe (European House - Ambrosetti, 2020).

Since the 1990s increasingly demanding consumers and a growing attention toward agri-food products especially in terms of labelling and traceability have obliged the supply chain to make significant organizational changes. Hence, investments have become a priority in developing production processes capable of offering new products and especially those with peculiar characteristics, while maintaining price competitiveness (Pieri et al., 1995).

The agri-food system has been part of the integration process between countries of the EU (Bertelè et al., 1992). Indeed, the CAP (short for "Common Agricultural Policy") was the main tool with which the EU intervened, but it was at the same time it was one of the most controversial documents. This policy, launched in 1962, has allowed the creation of a common market for agriculture, making the EU the main market for what concerns agri-food products. According to Bertelè et al. (1992), since the first phase, the CAP outlined some limitations such as a general price increase with a distrust for what concerns the quality of agri-food products. The changing behavior and needs by consumers with new eating habits, the attention to the relationship between quality and price of a product, led to a reform of the CAP at the beginning of the 1990s toward a promotion of quality products. The major changes occurred regarding the origin of products and their local typification, the production processes and the improvement of a rural development in order to reduce unfair competition, source of non-quality products. This new orientation was dictated for the purpose of decreasing surplus production and to give more importance to the creation of quality products. "Quality" regards not only the intrinsic perception of the finished food product, but also the necessary industrial processes to guarantee the qualitative outcome of the product. During the 1990s the EU has tried to harmonize the regulations with reference to the manufacture, composition and presentation on the market of food products in order to avoid the presence of conflicting national regulations.

The EU in this path toward quality improvement, has identified four regulations[21] in order to have a single integrated information system where are reported guideline principles:

[21] *https://ec.europa.eu/info/food-farming-fisheries/food-safety-and-quality_en*

- *Biological products:* organic farming was born for the respect of the environment, in this type of production is excluded the use of chemical products and is preserved biodiversity and the environmental balances;
- *Products with geographical denomination:* in this category there are PDO products (Protected Designation of Origin), PGI products (Protected Geographical Indication);
- *Traditional Specialty Guaranteed products (TSG):* this label preserves a traditional method of production of a certain good; Inside this category, there is also the Ark of Taste, a catalogue of endangered heritage foods, which is maintained by the global Slow Food movement.
- *Quality Wines Produced in Specified Regions (QWPSR):* it is a quality indicator used within EU wine regulations. In Italy, references can be made to Law 164 of 10/2/1992.

According to Henke (2007), after the reform in 2003, quality started to assume a central role in EU regulations and this theme achieved another fundamental point in 2008 with the introduction of the *health-check* inside the CAP, with which countries could use up 10% of the maximum national amount of EU funds to preserve the traditional agriculture production. Therefore, the policies implemented with the introduction of the CAP gave the chance to open a new market segment, which is constantly growing and represents an important resource for the Italian agri-food sector.

These measures are still valuable, and they are applied to all the stages of the food supply chain, while the recent *"from farm to fork"* strategy within the European Green Deal (2019) remark the relevance to make food systems fair, healthy and environmentally- friendly. The 2013 CAP reform was decided in a period of full recession and the economic and institutional context has changed since then. The COVID-19 pandemic worsened the situation postponing the reform of almost two years. According to the European Commission, the *new reform of the CAP*[22], originally 2021-2027, aims to promote a sustainable and competitive agricultural sector capable of making a significant contribution to the European Green Deal, in particular as regards the "farm to consumer" strategy and the biodiversity strategy.

[22]https://ec.europa.eu/info/food-farming-fisheries/key-policies/common-agricultural-policy/future-cap_it

2.4 Sustainability in the Agri-food supply chain

As seen, sustainability is a concept that needs to be addressed not only at the policy level but also in the business context: many companies have included sustainability in their mission, also driven by an increasing demand for sustainable products by more aware consumers (Zamagni, 2003). For this reason, over the last few decades arose a debate regarding the complexity of implementation of sustainability in the business context.

From the analytical point of view different aspects of sustainable manufacturing, such as "Supply Chain Management" (SCM), have been considered. Supply Chain Management is a relatively new concept that was introduced at the beginning of the 1980s and was developed in order to understand the *dependencies* among all the elements within a chain, from the origin of a product or service to its final stage, the consumption (Oliver and Webber, 1992).

The analysis of sustainability and its pillars is an essential framework for the following analysis. In fact, according to Krause et al. (2009), *"a company is more sustainable than its supply chain",* which is why a sustainable supply chain must become the norm, and not the exception (Seuring and Müller, 2008). Moving from this definition, it is here explored the implementation of sustainability at the supply chain level, as a source of benefits that would otherwise inhibit the long-run success of a company. Seuring and Müller (2008) define *sustainable supply chain management* (SSCM) as *"the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development into account which are derived from customer and stakeholder requirements".*

More recently the analysis of the supply chain has absorbed sustainability issues in relation to the growing concern about the related environmental impacts on the agri-food supply chain. The level of sustainability comes from measuring the probability that the organization of the supply chain will guarantee a sustainable future for the company. The key public concerns in the modern food system focus on the impact of the food system on the natural environment, with issues such as soil erosion, loss of biodiversity, inefficient land use, water degradation, escalating consumption of natural resources and

pollution, impacts of the agri-food system on human health, ethical issues of food production, and fair trade and impacts of food suppliers in developing countries.

2.4.1 Sustainability dimensions in the agri-food Industry

The industrialization of the food system with the consequent creation of preserved and packaged food products on a large scale and distributed globally to the detriment of small local shops, the standardization of food products as well as tastes and nutritional habits which jeopardizes agri-food biodiversity, the delocalization of food products can be produced regardless of the geographical context and the weather conditions and the increase on waste has therefore contributed to create a non-sustainable agri-food system (Pieri et al., 1995).

As previously explained, because of its wide range of applications it is not straightforward to give a unique definition of sustainability, thus applying such definition to the agri-food sector presents some difficulties. For this reason, the purpose is to draft an analysis of the three dimensions - environment, society and economy - as applied to the agri-food sector from a macro point of view.

The *environmental dimension* (Peano et al., 2014; Sgarbossa et al., 2015.) considers the need to consume fewer resources and energy from the environment itself and the ability to reduce the amount of organic and inorganic waste placed in our planet. Pollution emissions are another problem to be considered and are the result of the activities of production, transformation and distribution processes. In this regard, the *Life Cycle Assessment (LCA)* has been identified as a basic tool for the identification of significant environmental aspects of the supply chain. The LCA was introduced in 1999 by the *Society of Environmental Toxicology and Chemistry (SETAC)* and it is a systematic methodology for the qualification and evaluation of the environmental loads connected to a product. While it is a good framework, it is not sufficient to measure all three dimensions because of its environmental focus. For this reason, the use of *Life Cycle Costing (LCC)* and *Social Life Cycle Assessment (S-LCA)* have also emerged in order to

cover the other two pillars of sustainability throughout a product life cycle (Notarnicola et al., 2016).

Besides, environmental sustainability is also linked to the ability to adapt the production process toward ecological causes also by disposing waste with the smallest impact on the environment. Waste management policies must be considered as part of a firm's environmental dimension even though they are usually enacted by municipalities. In fact, to some degree it is up to firms to fully support these policies through active encouragement of a correct waste collection within the firm itself and from its customers.

The *social dimension* relates to the ability of different actors - producers, sellers, and consumers - to cooperate with each other. This relates to the ability to create alliances between partners and trying to identify what distinguishes a territory and a community from another because competition is not an individualistic game. The concerns related to the social issues also refers to preservation of workers' conditions (Santos et al, 2018).

The degree of *economic sustainability* translates into the ability to contribute to the generation of well-being as an output of the economic system while ensuring equal distribution and a certain degree of autonomy from the outside in terms of input of raw materials and resources. In the context of the economic dimension, the bioeconomic approach of Georgescu-Roegen (1971) claims that economic sustainability is linked with the system's ability to remain autonomous even if there are limited and irreplaceable resources. At the operational level, a measurement of it could refer to a fair distribution among all members of the supply chain of the wealth flow generated.

2.4.2 Going green: concrete applications

After these considerations, that of the *short food supply chain* (Giarè et al., 2012; Malak-Rawlikowska A. et al. 2019) has been considered the optimal sustainable model

for the future, due to the significant reduction of *food miles*[23] compared to that of mass production. The purpose of the "Short Food Supply Chain" is to reduce the number of steps between production and consumption of the food products. According to UNIDO (2020), this type of initiative has different kinds of benefits from the economic ones both for producers and consumers, to the strengthening of social relationships, the preservation of biodiversity and the planet, the improvement of nutritional aspects and the enhancement of local development.

After the spread of the pandemic, starting from March 2020, the Global supply chain (Sarkis J. 2020) faltered in delivering needed goods and its lack of operational agility became conspicuous. For this reason, lockdowns have resulted in an encouragement to more sustainable behaviors, improving community trust and promoting "buy local" movements. Right now, the sustainable supply chain focuses on the triple bottom-line perspective with economics and environment playing predominant roles and social concerns receiving increased attention. Localized production capability can support sustainable supply chains by producing only what is needed. Less waste, less transportation and less need for inventory storage due to shorter supply chains. The reduction of employee commuting and business travels contributed to reduced organizational carbon footprint; shelter in place and social distancing mandates forced consumers to turn to online sources of goods and services. In recent years, there has been an increasing growth of the so-called Farmer's Markets, which are direct sale channels. They give producers the chance to have direct contact with consumers, a good relationship that allows both to benefit from it.

Due to the pandemic, however, environmental sustainability efforts may face a crisis rebound effect – slowing down or losing general public interest because recovery activities have exclusively been focusing on economic and social sustainability. Moreover, on one side the COVID-19 crisis showed the risk coming from global supply chains focusing solely on efficiency and brought incentives for social innovations such as the circular and the sharing economy (Farrell P. et.al 2020). On the other side, however, a major concern is whether because of hygienic issues will emerge negative perceptions regarding reuse and recycling. In fact, reuse and recycling – core circular economy

[23] The approved definition given to the term *"food miles"* by Lang et.al (2001) is the following "distance food travels from the farm to consumer".

practices – imply that a material or good has been previously used, thus the risk is that they will be perceived by part of the population as contaminated and unsafe.

2.4.3 Examples of Sustainable Business Model in the Agri-food sector

Traditionally, agri-food companies have used conventional business models but in recent years are developing them toward sustainability. In response to the United Nations' program and development goals, a sustainable business model can create environmental and social as well as economic value. Many businesses in the agri-food sector feel the need to adapt to more sustainable approaches in order to become more profitable and at the same time reply to internal and external pressures. However, as claimed by Matopoulos (2008), there are some forces that can work on the opposite side, contributing to the "un-sustainability" of the system such as the phenomenon of the Globalization that increased the imports and exports, consumer changes in consumption, resulting in a larger demand of food products often that are not seasonal, and changes in delivery patterns especially with the large-scale-distribution.

Sustainability is the key driver for innovation and almost every company is taking into consideration its competitive advantage at the national and international level. According to Bocken et al. (2014), sustainable business models consider a wide range of stakeholders' interests, including environment and society, and they are essential in helping to embed sustainability into business purposes and processes. However, developing a sustainable business model is still not well developed and the empirical evidence on its use in the agri-food industry is scarce especially for smaller firms. In fact, there are few successful examples of large firms that have switched toward a brand-new business model, such as Starbucks and McDonalds.

As of today, the COVID-19 emergency has caused enormous problems in the supply chain and for this reason businesses are rethinking their business models. First, the use of digital technologies and the establishment of partnerships allow us to sustain a low-impact system of production and distribution, as it was possible to see with the emergence of delivery platforms that use electric transport or bikes. Regarding the

resources and activities, the use of fresh, national and seasonal raw materials such as DOP ingredients helps in ensuring low impact and high-quality products.

2.5 Innovation in the Agri-food sector

As the agri-food industry has traditionally been viewed as a low-technology industry, with low rates of innovation and generally characterized by incremental innovations, it usually presents a slightly lower margin of change than other sectors.

While in the previous chapter the topic of innovation was addressed through an overview of the literature, now it will be deepened through general distinctions on different categories of innovation in the agri-food sector.

As Schilling (2017) pointed out, innovation has different objectives and degrees that can affect the performance of the organization itself, namely the introduction of new products or services but also the structure of how the service is delivered. It is also interesting to analyze the degree of novelty of the innovation under consideration meaning that it might be new for the company, for the market or industry or even for the whole world and they can also be classified based on their extent of change. Such innovation, according to OECD and Eurostat (2005) can be categorized in product, process, marketing and organizational innovations and might be:

- Introduction of new production processes based on new technology, therefore a radical innovation of process;
- Improvements in existing production processes, therefore an incremental process innovation;
- Introduction of a new product or service using new technologies;
- Improvement of existing products or services.
- Introduction of new organizational innovation, which affects the process and organizational structure (integration of renewable energy plants in farms, use of e-commerce to purchase inputs from suppliers)
- Marketing innovations regard the management of the website of the company or the e-commerce platform from which it is possible to sell products.

The profound changes that have taken place in the way of life and work of consumers, socio-economic changes resulting from an increase in per capita income, as well as the succession of numerous events that have made the history of agri-food in recent years, have stimulated new consumer behaviors compared to traditional customs, marking a decisive turning point in the approach of consumers to the services and products of the food supply. The increased attention to dietary-health aspects, the destructuring of meals, are just some of the terms that nowadays unequivocally qualify the demand for food products and of which they do not may take into account in any approach to the system.

However, agri-food products involve highly complex production processes, thus innovation in this sector also ranges from the selection of raw materials to the use of new technologies, influencing aspects that are collateral to the product itself such as its image, presentation, packaging or - in more recent times - the addition of time saving features.

The agri-food sector also presents some characteristics that in some way slow down the innovative activities (Lorusso et al., 1993; Santovito S., 2005; Pieri et al., 1995). First of all, the presence of a large number of companies of small and medium size implies that the overall amount of capital allocated for R&D in this sector is smaller than that in sectors dominated by large enterprises. Secondly, little product differentiation discourages companies to invest, because marginal achievements would be rapidly reaped also by competitors applying the same improvements to their products.

The strategic importance of procurement of food also plays a role in innovation, as the rush to secure the best suppliers draws more importance and thus a bigger role on funds allocation than R&D. Another factor is played by regulation, as quality and food safety standards imposed by law limit the range of innovations allowed, making the industry a very strict one in this regard.

The agri-food is also a very traditional sector, both in terms of production and in terms of consumption habits, which also puts a cap on innovation efforts. In fact, particularly regarding consumption habits, it is hardly thinkable that any agri-food company could influence how its product will be consumed, least thinking that human nutrition is a variable dependent on business strategies.

Lastly, one way of breaking the dependence from suppliers could be that of innovating the products from an organoleptic point of view. However, the risk associated with investing in such developments is much higher than the expected return, particularly keeping in mind the last point about agri-food being a traditional sector. Therefore, it is likely that innovation efforts in this field will be discarded in the earliest stages.

Notwithstanding the observed limits to innovation in the agri-food, as for any other sector developments remain crucial for business. In choosing the development of innovative products and processes, companies face make-or-buy choices. Firms relying on internally organized R&D activities tend to go for “make choices”, while companies outsourcing the identification of innovative solutions are more likely to resort to “buy choices”.

Firms are involved in innovation activities in order to capture the benefits of their innovation. The profitability of an innovation depends on the degree to which firms can secure rents generated by their innovations is called the *“appropriability regime”* (Teece, 2006). As a consequence, the strength of the appropriability regime of an industry is related to patent strength, the value of first-mover advantage, and the ability to maintain the secrecy of an innovation (Karantininis K. et.al 2010).

Different studies point to the relative low degree of appropriateness in the food, beverages and tobacco industry compared to other industries. Besides, concluded that the appropriability conditions for the food industry are relatively weak and the cumulativeness of knowledge is rather low leading to an intermediate-to-low innovation intensity (Peneder, 2010).

In Italy what emerges is the highly fragmented structure as well as a vert dispersed territoriality and it is not easy to trace back to a system framework. For this reason, it is crucial the joint integration and production of knowledge through the collaboration between academic researchers. For what concerns the agri-food sector, the innovation of processes and products comes from a multidisciplinary activity that employs different skills: chemical, economic, engineering, nutritional etc.

SMEs often lack essential resources and capabilities to successfully innovate exclusively by means of in-house activities, making inter-organizational networks essential for SMEs that desire to innovate. Nevertheless, when they want to establish

and benefit from innovation networks, SMEs face several obstacles. For this reason, has been introduced for the first time an important new figure in the second pillar of CAP, the *"innovation broker"* (Batterink M.H. et al., 2010). The latter has the task of facilitating the process of identifying the needs for innovation, aggregation of stakeholders, drafting the innovation transfer project and building a network of networks.

If we focus on the general environment of the agri-food industry, several trends can be identified. The most obvious trend is the fact that the agri-food industry has extremely become consumer-driven. The variety of food products has increased tremendously, more and more types of food products, which differ in type of packaging, taste, and color. New types of packages (e.g. enabling easier use, or use in different places), new sorts of outlets, and ready-to-eat and ready-to-cook products are developed at an ever-increasing pace.

On one hand, there are industry characteristics that produce continual changes in commercial opportunities for specific categories of innovation; on the other, there are the forces of progress at the technological and scientific frontiers that provide the possibilities for fashioning new products, or improving the performance of old ones, or producing those products at a lower cost.

2.5.1 Process Innovation in the Agri-food industry

Italian firms are mainly process innovation-oriented and as pointed out above, the food industry is a low-tech and mature sector, therefore, the adoption of eco-processes is more recurrent than the introduction of eco-products. Moreover, when a company decides to implement eco-innovative production processes will of course produce final products with an eco-innovative product.

Process innovations in the agri-food sector can be addressed to aspects such as (Lorusso S. and Mellano M., 1993) the use of new raw materials, the application of new technical machineries and new transformation systems, like chemical transformation, biological and new conservation systems. Process innovations thus allow a reduction of production costs or an increase of productivity, while decreasing the cost per single unit

of output. These innovations are particularly interesting for companies that operate with a high rate of mechanization of internal processes, therefore, they are more interested in increasing the level of production by reducing costs.

According to Lorusso et.al (1993), these types of process innovations can be classified as follows: mechanical innovations, energy innovations, organizational innovations, biological innovations, innovations in the field of food preservation, agronomic innovations and chemical innovations. These categories span from the use of new plows or machinery for packaging to the introduction of new pesticides and fertilizers, from the use of alternative sources of energy to new cultural techniques and irrigation systems, from the adoption of automated systems in business management to deep-freezing, also accounting for genetic improvement of microorganisms.

2.5.2 Product Innovation in the Agri-food Industry

Some products are completely new, but others are updated products that usually are already in the market, through incremental characteristics or with a repositioning. For this reason, academic literature subdivides innovation according to the similarity with existing products into four categories: radical innovation produces outputs that are new both to producers and to consumers; incremental innovation produces outputs that have added improvements over the previous version; imitative innovation produces outputs that are new for the company, but with similar characteristics to other products already on the market; market placement does not aim at new products, but at presenting new products differently on the market (Sanvito, 2005).

In this regard, the development of the so-called *convenience food* becomes increasingly interesting. These, in fact, are known as ready-to-use products that incorporate a time-saving service component, which is offered by the food processing industry in order to allow the reduction of time spent in preparation. Since timesaving is a prerogative for the modern consumer, these products have become increasingly attractive.

Radical innovations within the sector are quite rare, given the enormous variety of products in the market and given that raw materials do not present differentiation and can only be transformed in a limited number of ways.

Compared to other manufacturing sectors, the agri-food sector has unique characteristics such as the presence of a very high quantity of raw materials; a high need for variety expressed by consumers in relation to the different needs of food during the day; a high quality of products that rapidly saturates the market. For this reason, R&Ds in this sector are usually financed by public resources.

Following Carlo Meo (2019), there is an overview of the major product innovations:

1 *Convenience products*: these are goods with a recurring purchase at low prices, and in which the consumption of certain brands rather than others does not produce any effects e.g. products of the IV range.

2 *Products with a new formula:* in which some chemical nutrients are added or removed from the initial product e.g. health and protein-based products, light foods and functional foods.

3 *New external design:* they communicate the message more effectively and efficient through new images and new text;

4 *New packaging:* new way to pack the product to respond to special needs, as in the case of aseptic packaging;

5 *Imitative product:* new products for the firm but with characteristics similar to other products already present in the market e.g. sub-brand products;

6 *New format:* products are presented in a different way for example single-dose or in little packs.

7 *Expansion of the range:* products that consist of an extension of the range compared to those already existing, able to respond to variety needs in demand;

8 *Repositioning:* inside this group there are those products that are not innovative in itself, but the innovation stands in the identification of a new way to use an existing product on the market;

9 *Quality products:* products that are preserved at European level for their characteristics of quality and safety such as PDOs, PGIs, TGSs;

10 *New products for the market:* this category include products that come from foreign markets and that find a positive response also in the new market such as the ethnic products e.g. sushi and tofu;

11 *Functional foods:* all foods prepared in such a way as to preserve their nutritional characteristics; in this sense, a food enriches our body with a supply of vitamins, fats, proteins, carbohydrates, etc. necessary for healthy survival. The subset of this category is known as *"nutraceutical products",* contributes to the prevention or intervenes in the treatment of certain diseases and / or disorders.

12 *Plant- based food innovation:* according to the Food and Agricultural Organization (FAO), adopting *sustainable diets*[24] at a global level is urgently needed. Sustainable diets should include a large share of ecologically based, local and minimally processed products and limited consumption of animal products. Sustainable diets are also healthy in terms of both nutrition and sanitary quality. Regarding the environmental aspects of sustainable diet, a shift from current dietary patterns toward more environmentally friendly habits appears necessary.

Novel plant-based meat alternatives such as the Impossible™ Burger and Beyond Burger® are becoming increasingly popular among consumers and have attracted considerable financial popularity, media coverage and research attention. In comparison to *meat-based diets (*J.Sabaté S. Soret 2014) these innovative products are more sustainable

2.5.3 Eco-innovation in the Agri-food Industry

In the "new" normal, consumers have faced empty shelves and limited choices and the shopping mindset is best described as "grab and go" rather than experience centered. New product sample stations, common in stores before the pandemic, now are gone. Since the beginning of the pandemic consumer behavior has been changing, and the agri-food sector has also been approaching innovation in a new way, toward a

[24] *World Agriculture: Towards 2015/2030 A FAO PERSPECTIVE* (2017). Available from: http://www.fao.org/3/a-y4252e.pdf

sustainable footprint. However, changes in the food and agriculture system have been occurring even since before the crisis. Thus, the competitive pressure in that field became considerable when new food consumption habits and the increasing role of large retailers within the food market chain took place. With the increase in competition in the industry, innovating has become the priority for businesses, so as to be able to be the first to grab the opportunity to exploit a competitive advantage. For this reason, now more than ever, strategic decision-makers must look out for ways to prosper in this new business environment (O. Omta et al., 2010).

An outstanding example in this regard in the Italian panorama is Ferrero, in the confectionery industry. Its success is mainly due to its ability to create new market segments by continuously introducing new products while maintaining the traditional line. Among the strategic activities for the company, it is possible find the organoleptic and sensorial evaluation of the products and monitoring of the food industry sector, for seeking and apply new principles from other productive sectors, useful for the transformation of raw materials and the realization of production cycles that guarantee greater quality and efficiency at a lower cost[25].

However, especially in the food sector, rarely new products are introduced with particular innovative features. Innovations only concern the format, the size, the product line, the variety or the design, while considerable work still must be done in considering the ability of companies to adapt and integrate technologies from other productive sectors as a source of innovation (Pieri et al., 1995; Schilling, 2017).

2.5.4 Protection Mechanism of Agri-food Innovation

Enhancement and protection of innovation are the keys to ensure the strategic positioning of the companies. The adoption of a system of strict proprietary control (so-called *wholly proprietary strategy*) or a complete opening (so-called *wholly open strategy*) depends on the will of the company, the characteristics of the sector and of the territory (Schilling, 2017).

[25] Ferrero Website

The Italian agri-food sector is characterized by the use of different forms of protection of Industrial Property, from the patent for invention to the utility model, from registration relating to the design of the packaging to that of all types of distinctive sign, such as individual, collective, quality trademarks, in addition to the most well-known protected and geographic denominations, new plant varieties and domain names (WIPO, 2015).

All these measures are used in order to fight the Italian Sounding Phenomenon and to protect the Made in Italy exportations. Industrial property protection comes in the following forms: patents, industrial designs, trademarks and domain names.

According to Schilling (2017), invention patents are used to block the free use by third parties conferring a regime of exclusivity and they are usually categorized based on the objective that has to be protected. This tool is useful for greater earning possibilities linked to one's business and due to exclusive rights, that confer the patent; or in order to increase the prestige and value of the company and for the possibility of obtaining royalties through use licenses. In the agri-food sector, patent protection can be applicable to processes and methods for example of production, cooking, vinification, etc. Patents last 20 years from the filing date.

Besides patents, another way to communicate the value of a product is through the packaging of the product or its aesthetic form because they are the first elements with which the consumer comes into contact. Industrial designs last 5 years from date of deposit, extendable up to one maximum of 25 years.

Industrial property protection also comes under the form of trademarks, which consists of a single word, a sentence or a specific symbol (Schilling, 2017). According to WIPO (2015), trademarks are the first factor of attractiveness to consumers and constitute a fundamental tool for protecting, enhancing and promoting agri-food products. Inside the agri-food sector there are different types of trademarks such as individual, collective and certification trademarks. They could be visual, olfactory, auditory and more. Trademarks last 10 years from the filing date and are renewable indefinitely for equal periods.

Since e-commerce is experiencing a growing trend, especially after the outbreak of COVID-19, it is also important to address the legal aspects that this tool brings. According to WIPO (2015), the first step to be tackled in order to protect industrial

property online is undoubtedly that of identifying inside the network a domain name which corresponds to the trademark or name of the company, with the relative extensions (such as .com, .biz, .net, .it, .eu, .shop, .restaurant etc.). It is then necessary to monitor the proper use and validity of the domain, through constant checks on eventual abuses, in order to maintain the web reputation of the company.

2.6 Closing remarks

Recovering from the economic crisis caused by the COVID-19 pandemic will be tough, as its consequences still have to be fully dealt with. What is already sure is that many industries will be changed by the recent events, causing hardship for established players but also opportunities for new ones, sending a shock that will endure in the next future.

Even though the agri-food supply chain has been less hit than other sectors, the crisis has opened a window for far-sighted companies to gain competitive advantage by adopting sustainable innovations. As seen in this chapter, the opportunity is not only due to the availability of resources coming from the Recovery Plan, which makes becoming greener more palatable; the real opportunity lays on the benefits that adopting and developing sustainable innovations bring to the economic performance of the company.

CHAPTER 3 - SUSTAINABILITY AND INNOVATION: PILLARS FOR THE RECOVERY

One of the main research questions of this study is to find out how the relation between innovation and sustainability can influence the performance of agri-food businesses.

Along this chapter there will be an empirical analysis through business interviews of different realities inside the agri-food system. The first part of the chapter will focus on the review of agri-food's sectors during the pandemic, while the second part will take an empirical approach. The analysis was conducted through interviews, which will apply the theoretical framework developed in the previous chapters to the current scenario of the agri-food to analyze in practice how companies reacted to the shock and what changed due to this pandemic according to them.

3.1 The agri-food system in the post-COVID world

Over the last few years, the Italian agri-food system has repeatedly confirmed its importance, becoming in 2019 one the leading industry of the country thanks to the positive performance of the economy, and set new records for many of the main economic indicators: 200 billion euros of turnover earned by agri-food companies, 44.6 billion euros of exports, plus 1.4 million employees involved in 1.6 million companies (The European House Ambrosetti, 2020).

Despite this apparently healthy and growing industry, even these sectors suffered in the first period of 2020. For this reason, it is required an assessment of how the sectors of the agri-food system are reacting to the current crisis. The following paragraphs will analyze the supply-side effect of the shock, and the demand-side will be delved into the next chapter.

As for the supply side, everything started with interruptions of productive activities in different sectors and the following slowdowns along the supply chain, both downstream with the procurement of raw materials and upstream with distribution channels.

As reported in the annual report of the European House - Ambrosetti (2020), the Italian agri-food industry, as any other sector of manufacturing, was faced with a crisis even though over time it had shown resilience to shocks such as the Financial crisis occurred in 2008, that represented a turning point in consumers' behavior.

Primary sector

According to the European House - Ambrosetti (2020), agriculture contributes to 53.6% of the total value generated by the extended supply chain, providing to be a highly competitive activity (however slightly slowing down compared to the previous year – 1.6%). The Italian primary sector is indeed in the first place in Europe for Added Value (+1.6% and + 19.5% respectively compared to France and Spain, which are positioned in second and third place). According to Coldiretti's estimates (2020) the shock caused a manpower shortage in the Italian agriculture, which is a labor-intensive sector and is fundamental for the entire agri-food chain, stealing about 370 thousand laborers in the national agricultural sector (Coldiretti, Confagricultura 2020). In order to cope with this critical situation, through the Relaunch Decree the government has identified online recruitment as the solution, activating online platforms aimed at bridging the gap between labor supply and demand.

The focus on sustainability today is also particularly high, as negative effects brought about by pollution on agricultural production are increasingly being recognized as the results of unsustainable economies and an added cost in itself. Moreover, this year more than ever, health has proved to be a key variable and consumers turned to products that display quality features beyond traditional ones, and whether a product is sustainable or not is now a discriminating factor of consumers' choices, as will be noted in the next chapter. Sustainability is also recognized as a factor improving the resilience of the current agricultural production, highlighting issues such as the importance of guaranteeing the protection of biodiversity, which supports food production and security both internally and globally.

While agriculture is a sector mostly based on traditional products and traditional production processes, it is increasingly benefiting from the introduction of digital tools.

This is leading the sector toward what is described as “Farming 4.0”, which the Smart Agri-food Observatory of Milan defines as “a gradual evolution of agricultural businesses toward digitalization systems, achieved by the automatic collection, integration and analysis of the data directly from the field”.

According to the Report of USB (2020), the magnitude of technological innovation in agriculture is growing day by day and it is improving the performance of companies also by cutting costs. As reported in the guide, the major tools used in this field are self-driving tractors, Big Data, satellite-enabled systems and drones that keep monitoring crops giving information useful to farmers.

Lastly, today more than ever the promotion of short food supply-chains is of central importance, and it could bring about a new agricultural revolution (UN, 2020). In order to reduce all of those functions and operations needed to satisfy consumers, farmers might sell using different distribution approaches such as direct sales, off-farm, cooperative shops or in a perspective of “new normality” with the gradual re-opening of the activities, they can sell directly to restaurants, hotels or private catering companies (UNIDO, 2020).

For all these reasons, sustainable agriculture answers the need for a newfound respect toward natural resources while providing an economic rationale for its adoption as a sustainable business model by companies. In a world faced with population growth and climate change, making the best use of scarce resources is increasingly crucial, and sustainable innovation in this regard is bringing agriculture to a new level.

While SARS, MERS and the aviary flu directly affected livestock sectors, COVID-19 has had an indirect impact on the primary sector, mostly through the disruption of the food supply chain. Differently than the previous diseases, however, the current pandemic spread also in the most developed countries, affecting both demand and supply of products (Erokhin et al. 2020).

Secondary sector

Unlike the first and tertiary sectors, the secondary faced less changes, which demonstrates strength and capability. According to the European House – Ambrosetti

(2020), the added value of the Italian agri-food industry reached 30 billion euros in 2019, growing 2.7% compared to the previous year. According to Coldiretti (2020), the industrial production in the Food and Beverage sector had no significant impact and compared to the chemical-pharmaceutical industry it achieved the second-best performance. The agri-food industry was therefore able to increase its industrial production by 17,2% in the last 20 years. The power of Made in Italy and Agri-food's products stands for the success of exports. According to Coldiretti (2020), in 2019, agri-food exports stood at 44.6 billion euros but of course this period caused a stall. The projections for 2020 indicate however a possible contraction of up to 4 billion euros due to the downturn in trade.

However, the agri-food industry has been able to prove that it is the driving industry of our country so far. According to the European House - Ambrosetti (2020), the introduction of process innovation such as the development of 3D printing and the application of biotechnologies combined with the need of a new management organization, represent a priority for the recovery of the industry. The latest changes brought companies to redefine their organizational structure with the improvement of efficiency of the production process and its optimization. Among the measures that companies are considering there are new professional skills in digitalization and security field and the implementation of agile organizational work models such as work from home.

Lastly, as already explained in the previous paragraph, the Internet Of Things is changing the agri-food supply chain starting from downstream innovation and moving on with all the other sectors. According to the Report of USB (2020), smart thermostats represent the real revolution in the agri-food industry because they have been created in order to reduce the risk of breakdowns in the cold chain during transport and delivery, and inventory sensors for warehouse management.

For this reason, the agri-food industry will slowly convert itself to a smart way of production and processing.

Tertiary sector

According to the Report of the European House – Ambrosetti (2020), Modern distribution's sector had a significant weight on the economy of the country. As a matter of fact, in 2019 had an annual turnover of 240 billion euros, 203,356 enterprises employ 912,712 individuals and generate 33.4 billion euros of Added Value. During COVID-19, the role played by this sector was of fundamental importance but has been strongly affected by this period. A report of Federdistribuzione (2020), highlighted that the emergency pointed out some key factors that could be seen as tools of strategic success.

For this reason, it might be useful to go back over these past months in order to understand what happened and how the distribution sector tried to cope with the pandemic. First of all, the impossibility for most individuals to move during lockdown has pushed many Italians to rediscover small neighborhood shops and local producers, as well as stores closest to their residence. Hence, the centrality of the local dimension, both in terms of product and producers, is supposed to guide the strategic choice of the distribution sector in the next future, for example by decentralizing more the procurement of food in order to be closer to consumers. Notable is also the surge of online delivery. Huge requests of online deliveries have faced retailers with some limitations of their distribution plant, as they were used to handle much smaller orders. This points to the need to develop in the next future a more dynamic and integrated model in which physical and digital can co-exist.

In 2020 health played a central role in guiding purchase choices of consumers. Food safety and quality turned to be crucial determinants in the definition of consumers' behavior, aspects that will be later analyzed in detail. One of the main problems that arose during the emergency was the difficulty to cope with overstressed suppliers at the bottom of the agri-food supply chain. This highlighted the need for a more flexible agri-food supply chain, able to manage exogenous and unpredictable risks. As for other sectors, modern distribution had to face the reorganization of the labor force, thus being pushed toward more organizational agility within all the supply chain.

In conclusion, distribution channels had a high impact over the past months ensuring the supply of essential goods to all the country, hence transforming the emergency into new opportunities for the tertiary sector.

HO.RE.CA.

The restricting measures implemented by the Government in order to avoid contact between people, has put a strain on the HO.RE.CA. channel.
According to the Report of ISMEA (2020) then confirmed by Fipe Confcommercio (2020), the perspective for the next year is tragic. The institute has estimated a loss of 37.7 billion euros for extra-domestic consumption with a consequent decline of 40% compared to 2019. On the other hand, the changed behavior of consumers influenced the performance of domestic consumption, which increased by approximately 6% compared to 2019. During these months, especially restaurants and bars tried to use new approaches modifying their traditional business model. Hence, according to the B2C e-commerce Observatory of the Politecnico of Milan and Netcomm, during 2020 companies have strengthened their e-commerce platforms with the introduction of food delivery. In accordance with the estimates, the value of the food delivery market is approximately 706 million with a growth rate of 19% compared with 2019.

3.2 Elaboration of the Interviews

Before moving on with the empirical analysis of the study, it is worth having a look at the main objectives of the research, which are the understanding the notions contained in the literature and the critical analysis of the current state of the Italian agri-food system, of its functioning, of its internal dynamics and of sustainable innovation in it. These objectives are connected to one another and it is interesting to understand how entrepreneurs are experiencing this emergency situation and how they are facing challenges and opportunities to survive.

The research methodology adopted for the empirical analysis is that of the multiple case study, as it is best posed to test the observations exposed in the previous paragraphs. The literature regarding this investigation technique is broad but the definition that could be applied to this study is that theorized by Cousin (2005), which says that this method it is useful for understanding a theoretical concept or for exploring a particular field in order to better understand how it works and not only to analyze single cases by themselves.

The multiple case study technique is a qualitative analysis that can be compared to a scientific one in as much as it intends to carry out experiments to test the initial hypothesis.

The interviews submitted to the companies under investigation were organized in different sections:

- An introductory part aimed at understanding the history of the company, its size, its main characteristics (such as company's philosophy). This part was intended to find more detailed information about their personal vision on sustainability and innovation's topics.
- A part relating to the introduction of sustainability within the business model of the company. The questions submitted have the main purpose of investigating what the main sustainable tools are used by companies and whether they have always been sustainable sensitive, or they adapted themselves along the way in order to operate in a more sustainable perspective. Then, following sustainability's theme how in terms of performance of the company anything changed and whether it improved its ability over time.
- A generic section aimed at understanding the opinion of the entrepreneurs regarding sustainability within the Italian agri-food industry.
- The last part of the interviews regarded the current situation linked to the COVID-19 emergency. The questions submitted had the purpose of obtaining real feedback and investigating the practices adopted in order to face the crisis.

It is important to say that during the interviews, in addition to the questions elaborated in advance, a space was also given to the personal opinion of the interviewees. Moreover, the questions submitted to the companies were personalized ad hoc, since all the businesses taken into account were part of different sectors of the agri-food system.

3.2.1 Criteria and selection of the Case Studies

In order to find these companies, a probationary search on the Internet and through word of mouth was made. Then, once the survey had been drafted, the search for businesses was carried out.

It was not easy to reach out to companies because of hardships due to special measures to contain the spread of the virus, and therefore the research was long and difficult. Companies were approached via email and the request consisted in the possibility of carrying out an interview through videoconference with the theme “Investigation on the relation between sustainability and innovation in the agri-food industry”. Each interview lasted one hour, and it was possible to touch all the main topics.
Due to the different nature of the businesses considered, it was decided to follow and develop different tracks of interviews in relation to the specificity of the company. As all the companies under consideration are part of different operational contexts, they will be analyzed in their reference market.

3.3 Relation between Sustainability and Innovation: practical examples

To better understand the analysis that will be carried out in this chapter, this paragraph will briefly report the background of the companies and this part will allow comprehending their business model. Moving on with the research, it will be analyzed the sustainable strategies used in each company and the concrete initiatives to support these strategies.

Three companies with different backgrounds have been considered in the study: Casa Tironi from Villorba (Italy), Scattolin Srl from Noale (Italy) and lastly NOVAMEAT from Barcelona (Spain).

Each interview was very useful to understand how sustainability and innovation should go hand in hand and contribute to bringing about positive performance and other economic incentives for companies.

3.4 Casa Tironi’s profile: toward Agriculture 4.0

Casa Tironi, an agricultural firm dedicated to the cultivation of organic food products, was born in 2004. At that time Gianni Pozzobon decided to leave his previous career in a completely different field to run the family business with his wife, and the Barchessa of the former warehouse became the first point of sale. Starting from scratch,

selling potatoes and tomatoes, they became increasingly productive. Over the years, and especially thanks to the wonderful relationship they established with their customers, their business grew, and they were able to renew the physical store.

The idea behind their work ethic relates to the importance given to the connection with nature and the community. Casa Tironi applies this philosophy in every aspect of the company, aiming not only to offer high quality organic products but also to educate their customers to sustainability through their example. While the initial production process was intensive, the founder decided to move toward a production method more conscious of and attentive to the biodiversity of the environment, which will be soon illustrated.

The company is considered of small dimensions and now its area is extended into ten acres. Their major revenues come from the physical store, but they have also developed a delivery system able to reach out to other realities. In fact, they offer a delivery service for those local companies that want to join a fresh and ready-to-eat snack during their lunch break.

3.4.1 Main findings and Sustainable Strategy adopted

Casa Tironi's corporate philosophy is based on the following aspects: production process, plastic recycling, waste management, social sustainability and innovation.

Casa Tironi's production process is based on the referring market of organic agriculture and on the fact that their catchment area are end-users interested in organic products. At the beginning of the activity, they used to embrace an Integrated Pest Management (IPM)[26] approach, but after a few years they switched toward an organic certification. The aim is to respect both consumers ensuring quality products and the

[26]IPM is one of the tools for low-pesticide-input pest management that discourage the development of populations of harmful organisms and keep the use of plant protection products and other forms of intervention to levels that are economically and ecologically justified (Romeh et al., 2019).

planet by maintaining unchanged the biodiversity of the harvest, while powering the whole process by solar energy.

In order to avoid the use of plastic Casa Tironi's philosophy is to encourage the customer to bring from home the reusable bags or the company can provide old pellet boxes where they can put the products. Another thing to add regards the supply of eco-friendly containers provided by an external firm that are then used to pack vegetables and fruit ready-to-eat and ready-to-cook.

Casa Tironi also pays attention to the management of waste resulting from the production process by optimizing the use of storages. Another sustainable practice adopted in this regard is the use of a cutting-edge water system able to preserve the limited water resources. This topic is in fact very sensitive, and according to the European House - Ambrosetti (2020) the italian agricultural sector is 1st for water withdrawals, but with a considerable share returning in the cycle and in the aquifer (29 percentage points more than the average European). The data analyzed by the authors also underlined how important in this regard is the agronomic practice of irrigation. In Italy, 85% of food crops are irrigated and the availability of safe and quality water is crucial for supporting the competitiveness of Made in Italy agri-food.

One other aspect that captures the attention is Casa Tironi's social care cause by which every year they integrate disabled people into their working environment, helping them to establish connections. The firm is also committed to its local community where they usually cooperate with the Proloco, local association of the municipality, born with the aim of promoting the territory. Their farm is seen as a meeting place for the community. Especially during this period Casa Tironi also tried to encourage their clients through social platforms, presenting their products also from a different perspective such as that of live cooking. Thanks to these practices they have become always connected with customers and immediately able to satisfy customers' needs.

One of the major innovations inside the company regards machinery introduced in order to help the production process and the water system. Casa Tironi is going forward with the ultimate trend in terms of the digitalization of the business, classifying itself as Agriculture 4.0' s farm. In fact, they adopted the so-called *"Quaderno di Campagna"*, a management tool that allows managing the farm by filling in the register of treatments in accordance with the provisions of current legislations. The program is

equipped with automatic controls for each treatment thanks to the connection with constantly updated integrated databases, dedicated to pesticides and fertilizers. This software supports the farmer in all phases of the production, including forecasts and weather history, warehouse management and traceability.

Two more adopted strategies must be pointed out. First, over the last year Casa Tironi has intensified the delivery but with an eye always open to sustainability, grouping together online orders in order to prevent pollution and to limit the cost of fuel. Secondly, going against the process of homologation of crops which is reducing the variety of natural products guaranteed by biodiversity, Casa Tironi is refusing intensive production, and for this reason Gianni Pozzobon has decided to include in its production abandoned varieties of products, such as ancient grains.

As the agri-food system is the main contributor to the loss of world biodiversity, and in a context in which resources are consumed at an increasingly high pace, the adoption of sustainable strategies and practices becomes fundamental to ensure the resilience of the ecosystem, and Casa Tironi in this regard is an example of virtuous practices.

3.5 NOVAMEAT's profile: example of radical Innovation

Novameat is an agri-food start-up based in Barcelona. The inventor of the radical innovation is an Italian excellence, Dr. Giuseppe Scionti, born in Milan and Spanish adopted. According to the European House – Ambrosetti (2020), two of the main pillars discovered in 2020 regard the importance of sustainability and innovation. Hence, Novameat could be considered the perfect example of relation between these two elements. In 2015, after he studied abroad for a period of time, he came back to Europe where he continued studying as researcher and professor of biomaterials and a new technology called bioprinting. In 2018, he invented and patented a new product, unique in the world which allows producing vegetable meat with the same texture and nutritional properties of an animal meat, using only natural ingredients and cutting-edge gastronomy techniques molecular and bioprinting.

Now the company has a small team made of employees with different responsibilities and capabilities such as engineers, business developer manager and researchers.

3.5.1 Main findings and Sustainable Strategy adopted

The next part of the research will analyze the sustainable strategies used by NOVAMEAT and it will start with the explanation of the main distinctive features of the company. The production process is based on the real actor of this product, the 3D printer. The important thing to say is that laboratory production implies in this case the use of vegetable molecules, thus not producing waste and reducing the use of plastic.
The purpose of the startup is to reduce the Life-Cycle-Assessment of products, thus having a positive impact on the environment by using less water, less land and generating less Greenhouse Gas Emissions (GHGE).

What emerged from the interview is that Foodtech (that mixed universe created by the connection between technology and food) is the new frontier of the market and according to Davide Dottoli, CEO of Talent Garden, this sector will grow constantly and will attract a lot of investments. Suffice it to say that Beyond Meat®[27]is considered one of the biggest IPO occurred in 2018 in the agri-tech sector. According to UBS (Bloomberg's data of 2019), the food innovation industry is mostly represented by startups, business units that are part of major food companies, and recently listed companies in fast growing industries like food delivery and plant-based meat. As reported by USB, the plant-base meat market is growing with an annual percentage rate of 28%.

[27] Beyond Meat is a Los Angeles-based producer of plant-based meat substitutes founded in 2009 by Ethan Brown.

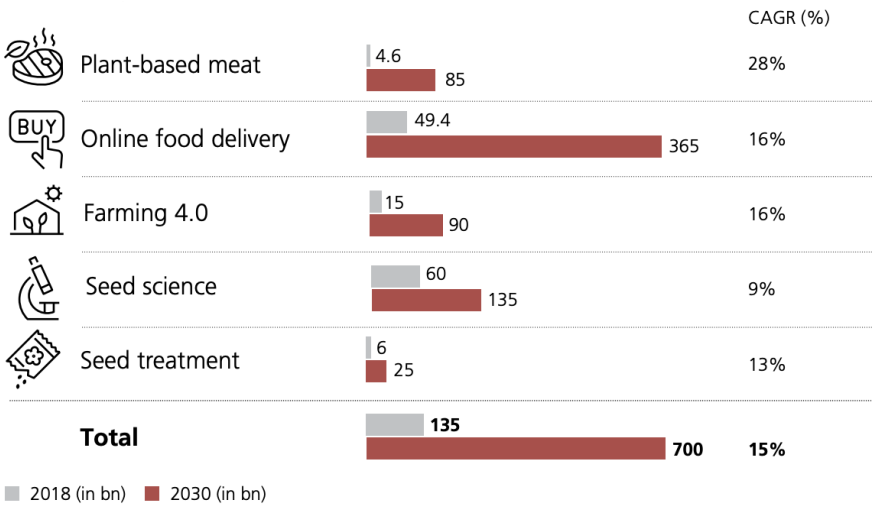

Figure 10 - Future investments trends. USB estimates (2019)

NOVAMEAT, in particular, is a start-up part of the Next-generation food and drinks sector and has the goal of filling the gap in the plant-based meat market by creating a product that has the same texture, the same nutritional properties and the same appearance of the animal meat.

NOVAMEAT 3D printed plant-based meat, is now considered a niche product because it has only been experimented by Spanish chefs in their starred restaurants. However, according to the founder Giuseppe Scionti, they have big plans for the future of the product and the planet itself and the real goal is to put the products in the great distribution within 3 years starting from Spain and Italy, with a low cost which is around 1,50 euros.

3.6 Scattolin's profile: Social Sustainability inside the Vending sector

Vending is a combination of machine, manufacturers, product suppliers, vending operators and market demand. According to CONFIDA (short for "Associazione Italiana Distribuzione Automatica"), Italy is first in Europe for the number of vending machines with over 3000 firms. In 2019, the sector provided over 6 billion drinks per year (of which almost 5 billion in the automatic market alone) but during COVID-19 suffered a deep crisis. What emerged from the estimates is that it loses 70% of its turnover in April with a sharp drop in consumption in the first six months of 2020 (-33.79%). These data are

the results of months of digital education, working from home and government provisions.

According to Giorgia Scattolin, CEO of Scattolin Srl together with her brother Massimo, the current year will not be easy as well. Estimates will be slightly better only if there will occur progressive change in managing the pandemic emergency. Scattolin Srl, a small sized family-run business based in Noale, has operated in this sector since 1972 serving the provinces of Treviso, Belluno, Rovigo, Padua and Venice both on the mainland and on the island.

Their value proposition is based on customer satisfaction with the delivery of high-quality products and also the excellent service, which has always been the center of the company's priorities since its birth. Over the years, Scattolin Srl has been converted toward a sustainable approach based on health and innovation.

3.6.1 Main findings and Sustainable Strategy adopted

What emerged from the interview is that the corporate vision started to change in 2008 when they decided to include in their range products those of organic composition. Since then, the company began to get closer to the ecological cause until winning the prize in 2019 as best sustainable service of Veneto Region with *the "Eco Divide Compactor".* Then, adding value to the company there are also three other initiatives such as *"Break Sostenibile",* which exploits this potential for social communication, using various tools - from posters and information brochures to the graphic customization of distributors and spaces - to promote awareness in consumption, attention to well-being and health, virtuous behavior for the environment and alternative choices such as organic and fair trade, and "Green Break", which is the innovative service dedicated to large companies and public bodies, especially if ISO 14000 certified, for the complete management of waste in the dining area. Innovative compactors reduce waste's volume and prepare them to be collected by the operators, at no cost for the customer. For what concerns users, they just have to differentiate the packaging, aided by the graphics and display of the compactors. Lastly, "Blue Break's project", a water dispenser able to reduce plastic and pollution.

Moreover, Scattolin has always created relationships of sharing, collaboration, trust and support with the Institutions and Associations of the Municipality of Noale for the development of projects in the area aimed at creating social value for citizens, such as the sponsorship of Noale's Football team, support "Talentree Association'' created to promote and disseminate the development of the talent of children and young people and the support disable people from the Parents Association "La nostra famiglia". Moreover, they cooperate with Bee.4, a social company inside Bollate's jail, which offers specific services to B2B such as the regeneration of old machines in order to make them productive for a further life cycle. Another green project based on circular economy and waste management regards the recovery of coffee grounds, which are sent to the biogas production plants, one of the most used alternative sources for the production of renewable energy.

Scattolin is also very attentive for the people that work for them in order to create a climate of confidence and collaboration. Hence, Scattolin Srl applies a social responsibility management system in compliance with the international standard SA 8000. The management team of the company is made up of professional experts with training gained over decades of work in the complex sector of food delivery by means of vending machines and semiautomatic. The company employs highly specialized personnel with experience in the sector or personnel trained in internal through specific training and professional training courses.

Scattolin Srl is committed to promoting environmental awareness by raising customers' awareness of ecologically advanced products and vending machines, identifying suppliers who are attentive to respect for the environment and involving collaborators in the company's environmental impact. They adopted separate collection system; LED lights installed throughout the company and proximity sensors in the warehouse and corridors; the digital version of documents is preferred instead of paper; the company fleet is organized by territorial areas and the study of the shortest journeys; the vehicles of the company fleet are of the latest generation and guarantee a low environmental impact.

Moreover, Scattolin Srl is committed to satisfy all the needs of companies which adhere to the plastic free movement with the distribution of Hybrid 4.0 cup made of organic material, substitute of plastic. To further limit the impact, it was decided to

equip the fleet with methane vehicles; some collaborators prefer the bicycle for the commute from home to work.

Moreover, Scattolin propose and install technologically advanced vending machines designed for low environmental impact, with energy-saving operation in Energy Saving mode; energy saving with the use of LEDs instead of neon; use of distributors in Class A or higher; compatibility with the use of biodegradable paper cups and wooden pallets and also they propose, to medium and large customers, the separate collection through the compactor for plastic and cans, which allows to substantially reduce the volume of waste (90%) and contribute decisively to differentiation of famous brands such as EVOCA and Sandenvendo.

Scattolin Srl is able to deliver high quality and safety products (ISO, HACCP[28] certifications) and install top service and relationship both with clients and suppliers toward ecological and social sustainability.

3.7 Discussion of the Interviews' results

From the descriptions of the companies, it was possible to broadly understand their configuration and especially how they integrate sustainability within their business model. Thanks to the contribution of the interviewees, interesting evidence emerged confirming the central role given to sustainability by Casa Tironi, Scattolin Srl and NOVAMEAT. However, in all cases it is not possible to talk about sustainability without mentioning the fundamental role played by technological innovation in the transition toward an agri-food system protective of the ecosystem, the economy and people.

Notable is the fact that these three companies conceive innovation quite differently, with Casa Tironi working exclusively on process innovation, Scattolin Srl working especially toward social innovation and NOVAMEAT working mostly on product innovation. This can be easily explained, as Casa Tironi operates in a market in which demand for product innovation is almost nonexistent, and on the contrary as NOVAMEAT is a player betting on the creation of a market segment through the introduction of a new product. On the other hand, Scattolin Srl has worked on the

[28] Hazard Analysis and Critical Control Points, short for HACPP. It regards the regulation of production process (Federalimenare, 2019).

transformation of its traditional business model toward a sustainable one where there are both innovation of products and processes but especially there is the enhancement of its working force and the community in which the company has grown so far.
As regards the sustainable business model tool, it was possible to note its importance in terms of creating a competitive advantage and consequently a greater creation and appropriation of value by the company.

In Casa Tironi's case, the drastic acceleration of purchasing behavior due to changes in working habits and in the way of living has not necessarily led to the distancing of the consumer from the physical retail store. This period of emergency has provided them the opportunity to provide a different experience more fit to customer's needs, demonstrating the ability to stay ahead of the curve. Especially during this period of little human contact, grocery shopping in physical stores might become a way to go outside and to establish a more empathic relation with the sales staff of a trusted place. Casa Tironi's keystone regards their gradual move toward digitalization, a cornerstone for Farming 4.0 and with their consequent classification as a "smart farm", with which the farmer's approach implements the various technologies available to produce more with fewer resources, guaranteeing sustainability and traceability of production. Moreover, over this difficult period they managed to grab the opportunity of introducing new products such as fruits and vegetables bouquets. Casa Tironi represents a good example of a farm in step with the times, able to survive during this period of restrictions.

Innovation today is a prerequisite to remain competitive in the market. An effective product strategy also assumes the ability of the company to predict consumers' preferences and expertise to read the social and economic developments that characterize its own time. In this regard, NOVAMEAT's is an exemplary attempt to decipher and anticipate future developments, hence innovation and sustainability need to be at the same level in order to preserve our planet and survive unpredictable shocks.

Looking at Scattolin Srl, their experience is an example of business model innovation where a gradual shift toward sustainability occurred with a comprehensive approach. The purpose was not only related to the increase in performance, but often to the desire to achieve certain objectives other than profit. Moreover, it is possible to say that Scattolin has embraced innovation in different ways, through its service, its

products (high quality organic and fair-trade products, cutting-edge machines) and its social commitment.

What emerged from this interview is that they are close to their community and they are trying to do their best during these tough times. Scattolin Srl in this regard is an example of how human connections might be the key in developing a sustainable business while surviving the COVID-19 crisis. Along the same social innovation trend, goes Casa Tironi that is really committed to its community.

CHAPTER 4 - CONSUMER'S PERSPECTIVE

The COVID-19 pandemic broke into our life in a completely unpredictable way and required an immediate reaction. While outside the whole world was crashing, people were forced to stay at home and the only thing allowed was going to groceries, considered as primary needs.

The following section will focus on consumers, looking at their reaction toward the pandemic, how things changed for them since the outbreak of the virus and how they perceive the topic of innovation in the agri-food sector.

4.1 Objectives of the consumer survey

The historical moment that the whole world is experiencing has greatly accelerated what was already taking place. The world is becoming more and more digitized, and most daily operations can be now carried out on computers.

This step was also inevitable for the agri-food system. Little by little, efforts are being made to educate consumers about digitalization, and plenty of marketing and sales tools such as e-commerce and click and collect are growing in importance.

This work aims to analyze how the impact of the COVID-19 has been perceived and whether all the effective measures taken in recent months in response to the crises will remain the same or they will be abandoned. Similarly, to the food offer side, the food demand had to adapt to new changes.

Therefore, the title of the survey is "The new consumer's profile" and it investigates how consumers are reacting and how companies can take this particular situation as an opportunity. Before proceeding with the explanation of the results, it is necessary to make a brief introduction to the concept of food demand itself and above all on the role played by the determinants that influence its performance.

According to Bertelè et al. (1992) and Pieri et.al (1995), the determinants of food demand are the following: demographic evolution, socio-economic evolution, evolution of habits and ways of life, technological evolution, the pressure exerted on consumers by producers and distributors. Hence, in order to understand how the pandemic

affected the food consumption of Italians, a survey looking at the factors pointed out by the authors was developed.

According to the European House – Ambrosetti (2020), the main critical changes caused by the pandemic affecting the agri-food system concern: the worsening of the national self-supply capacity of raw material, the reduction of the market space of domestic products on foreign markets, especially for what concerns Made in Italy, the downsizing of demand linked to services connected to tourism, the expansion of the digital channel and lastly the modification of the demand for agri-food products. This part of the work will focus on the analysis of the current state of the things that would help to identify strategies for the relaunch of the agri-food sector.

The lack of accurate statistics on domestic consumption of food innovative products as well as the changes in behavior during the pandemic highlighted the need for an overview of our country.

In light of all of this, a quantitative analysis was carried out in order to deepen the research on the demand side. Getting to know the consumers' behavior means paying attention to the reasons that guide their purchasing behavior. For this reason, this investigation allows us to determine the attributes held by products for which the consumer is willing to pay more for goods, and to understand how firms should shape innovation and sustainability strategies in the future.

Among the attributes to consider, one on which it is necessary to pay attention is the control and certification system, an element that theoretically should be decisive in guiding purchasing decisions but which on the other hand, plays a secondary role. Investigating what pushes consumers to buy a product instead of another is therefore a very interesting theme. The identification of the place (Specialized channels, Small local shops, Great distribution channels) follows the analysis of the most purchased organic products preferred by every consumer and mostly how changed the habits before and after the pandemic.

The empirical analysis involves those responsible for the purchase of food on the desire to avoid interviewing subjects which do not play a decisive role.

It should be noted that within the family it is not always the one who makes the decision physically deals with the purchase. If in the past the role of food purchasing manager was reserved exclusively to women, with the spread of "new types" of family,

men also played this role but still reduced. The analysis of the reasons behind the purchase regards only domestic consumption, and therefore it is not extended to the one made in restaurants, farmhouses and canteens.

4.1.1 The structure of the survey

The survey carried out refers to a sample type, as it is impossible to observe all the units of the target population. It was carried out via Internet and then disseminated through Social Networks (Facebook, Instagram, Food Blog) and collected a list of contacts from the 26th of February to the 21st of March. The observed sample is non-probabilistic, as it is impossible to define a priori, for each unit, the probability of joining the sample itself.

The survey was created with Google Moduli, which allowed us to view the progress in real time and extract the database with all of the answers, which have been subsequently processed with Excel.

The survey is organized into three different thematic areas and contains 31 structured questions (mostly with closed answers), in order to avoid mistakes especially when processing data.

The types of questions used are the following:

- Dichotomous questions;
- Multiple choice questions;
- Questions that use response scales or scales of importance.

In order to receive feedback that was as accurate and precise as possible, users were allowed in some questions to add an alternative that best represented their personal experience.

Each area investigates a different aspect of the research, useful for elaborating an overall scenario of the phenomenon under consideration. After having collected the personal data of the sample, the following part will briefly analyze the content of each section:

- Purchasing behavior before the outbreak of the pandemic: This part of the survey investigates how shopping habits and places of purchase were before the spread of

the virus and whether the sample has been purchased online or not and the possible frequency.

- Changes after the spread of the virus: On the other side, this section tests what are the most significant changes after the pandemic.
- Innovation in the agri-food sector: The last part of the survey concerns the predisposition of users toward the presence of new products and how they perceive innovation in this field.
- Personal data of the interviewed: The data on the household are very important. Since the answers are provided by those within the family who deal with the purchase of products, it can evaluate a profile of the modern consumer, especially in qualitative and descriptive terms. The data allow us to get an idea of what is the average income of subjects.

4.1.2 Description of the sample

The survey allowed us to collect a total of 283 interviews. This sample describes a population of Italian nationality spread all over the country, but particularly concentrated in the north of Italy. In particular, many respondents live in Padua, followed by many livings in Venice, Treviso, Verona and Vicenza.

From the elaboration of the answers, it emerges that the sample is made up mostly by women (75%) and most of the respondents belong to the age group 41-60 (41%) and to the age group 25-40 (36%), with interviewees under 25 being just 14% of the sample and interviewees over 60 being the remaining 9%. It must be observed that the means through which the interview was conducted slightly biases the results, as it is harder to reach many of the older generations through the Internet. That considered, the sample's composition is varied enough to offer a clear and diversified view of the phenomenon under investigation.

Lastly, the educational background of the sample is that of a population of consumers of which the most part hold an academic degree (51%, of which 19% holding a bachelor's degree, 25% holding a Two-year Master's Degree and 7% holding a Master's

Degree or a Doctorate). Considerable, however, is the presence of consumers with a college degree (40%) and those with a middle school degree (8%).

4.2 Analysis of the results of the survey

The first result of the survey is a portrait of consumers before the pandemic. As Pieri and Venturini (1995) explained in their study, in recent decades consumers have been more selective and clearly perceive the relationship between the characteristics of food products and their health. In addition, the threshold of attention toward pesticide residues for plant productions and hormone and antibiotic residues for animals has increased.

By analyzing the data, it emerged that before the spread of the virus the most important features attracting final consumers were quality and freshness, price and special offers, followed closely by product's origin. These results are not surprising, since agri-food is a traditional sector, in which raw products' quality plays a crucial role. What is surprising, on the other end, is consumers' declared indifference toward packaging, in that it might be assumed that packaging plays a subliminal role in marketing the product.

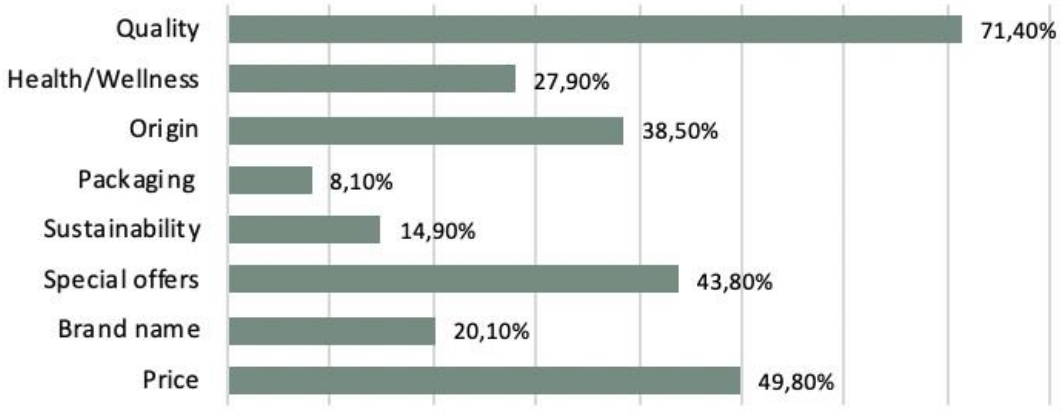

Figure 11 - Determinants of consumer's choice before the outbreak of the pandemic

Before the outbreak of COVID-19, the most part of the sample under consideration preferred going to the supermarket, hypermarket or discount, while only a tiny percentage would most often choose smaller retailers usually situated nearby their domestic premises. Only one person of the 283 interviewed declared to prefer

grocery shopping online. That is not to say that only one person tried online shopping for food, as 26% of the sample at least once before tried shopping online, but most of them only used it “sometimes”.

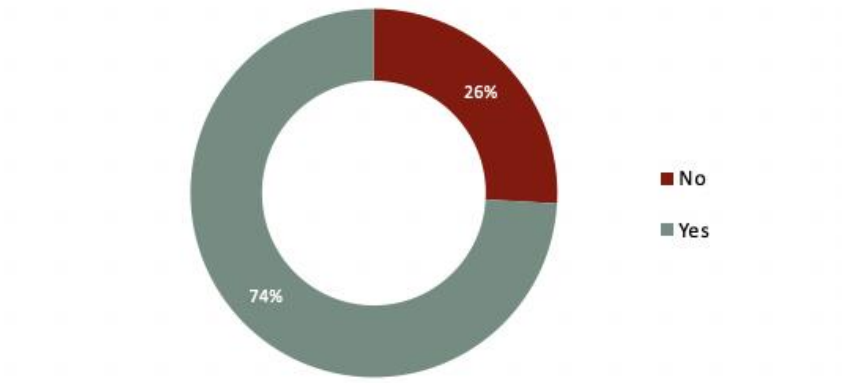

Figure 12 – Online Grocery shopping

The reasons brought by the interviewees for choosing online shopping were mostly that it allowed the comfort of choosing directly from home and it spared wastes of time, with some declaring that it was a source of bargains, also giving the chance of clearly comparing prices.

Of those who never tried online shopping, the majority declared that it was mostly because they preferred to choose in person what they bought (86%), while a small part answered that their home area is unreached by delivery services (7%) and very few that they never took into consideration online grocery shopping at all (3%).

When looking into the channels through which online grocery shopping is carried out, services operated directly by supermarket chains stand out as the preferred choice (63%). Other platforms emerged over the last few years and operated by third parties however have a relevant part of the market, with 26% of the respondents indicating that as their go-to form of service, and others declaring using both forms.

What it is also interesting to analyze regards the preferences of the shopper between delivery service and click-and collect practice[29]. The research shows that click-and-collect is not widespread (31%) and is mostly chosen to avoid any additional delivery

[29] Click-and-collect practice is considered the new approach to retail. It consists of the possibility of ordering a product online and collecting it in the store.

cost and delay in shipping. As collected during the survey, 69% of the respondents chose the delivery service, which is consistent with what were declared as the benefits of online shopping, as comfort and time-savings are characteristics of delivery but not of click-and-collect.

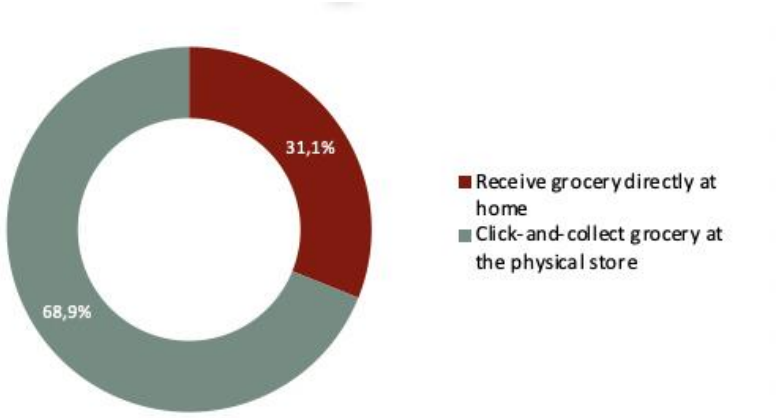

Figure 13 - Investigation between grocery delivery and click-and-collect practices.

When inquired about the changes supervening since the outbreak of the pandemic, 32% of the interviewees declared that as for their shopping habits at least something has changed. To these, it was asked what they now considered to be the most relevant aspects in the choice of a food product. Similarly, to before the spread of the virus, quality, followed by price and convenience are considered the major features considered.

However, it is interesting that the aspect of sustainability has grown in importance: looking at the sustainability criteria, in fact, it represents now 32% of the total impact against the 14% answered before, surpassing health and wellness and the origin of products. Today more than ever, health represents one of the most important features and that is why in the post-Covid world for almost 30% of the respondent's nutritional values and health are essentials.

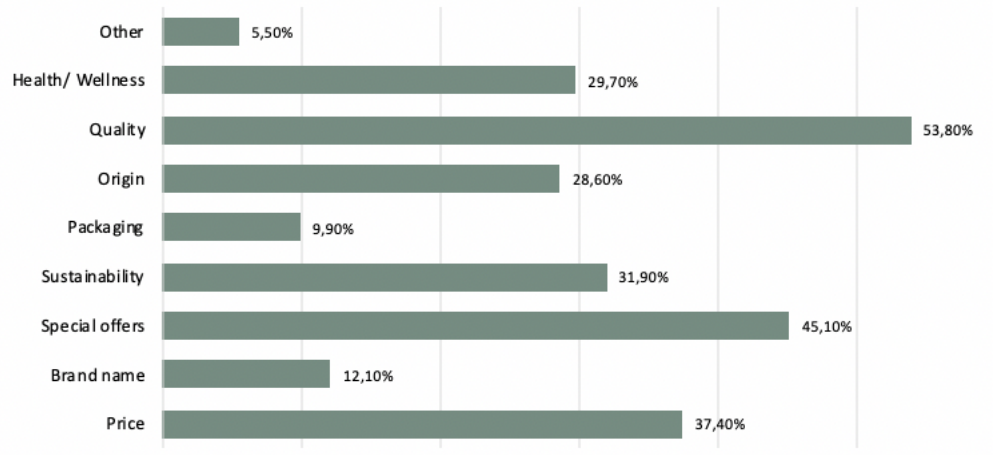

Figure 14 - Determinants of consumer's choice after the outbreak of the pandemic

In order to more clearly understand what the discriminants of consumers' choice are today; it was asked to indicate what parameter tilts the choice between two similar products. The result is that trust in the brand, followed by known geographic origin, cheaper price and special offers, while on a smaller scale also by sustainability.

After a deeper analysis, it emerged that the influence of some discriminants varies by age category. Thus, while the trust in the brand is quite uniformly agreed as relevant for the choice, known geographic origin is much more relevant for interviewees over 40 than for those under, for which cheaper cost is more important. Sustainability is particular in this regard, as it is more considered by those under 25 and those over 60 than by those in between.

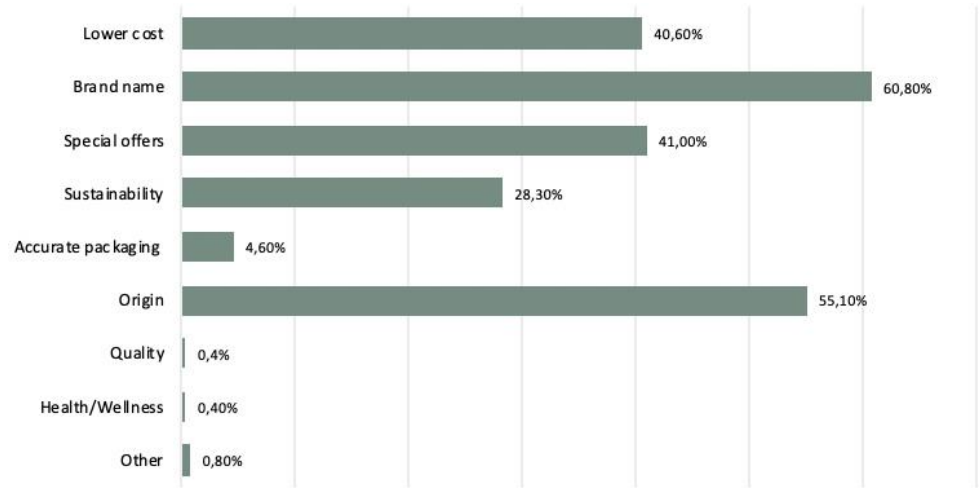

Figure 15 - Determinants between two similar food products

What changed for most respondents (62%) after the pandemic is their preferred shop for groceries. While the choice used to be heavily in favor of supermarkets, hypermarkets and discounts, today it is much more diversified. Today, in fact, many choose small shops for buying food, which in many cases could be due to the presence of human contacts and the need of empathic connection with people that smaller shops better satisfy, other options being the proximity to the supermarket, the importance of the short supply chain and the expiry date of the product.

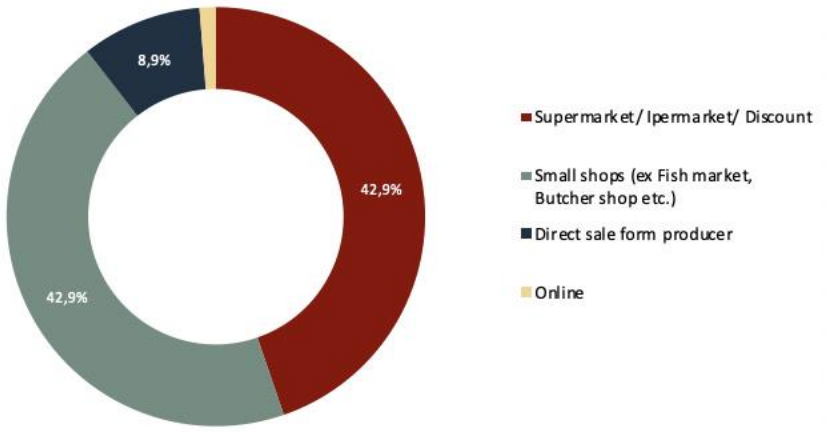

Figure 16 - Place of purchase after the outbreak of the pandemic

According to the Politecnico of Milan Observatory on online Food and Grocery (2020), the online buying practice has grown 70% compared to 2019. These numbers are very clear about this tendency, as in 2020 the online Food and Grocery market is worth 2.7 billion euros. Thus, confirming widespread consensus especially among those who after the outbreak of the pandemic prefer to stay home and avoid human contact.

The following section investigates how innovation in this sector is perceived. As seen in the previous chapters most innovations in the agri-food industry are incremental, meaning that new products in the market are usually upgrades from previous versions. Moreover, the low-innovation rate of this sector makes it difficult to introduce new products.

The aim of this research is to analyze how customers see an innovative product and in order to investigate it the first question pointed out was, “how long do you usually take when you go groceries shopping?”. More than half of the respondents answered the question with an average of 30 minutes and 1 hour, while almost 25% of the

interviewee takes less than 30 minutes to go to the supermarket. As seen from the data, it depends on the composition of the family members and also it could vary if people live on their own or with a group of other people. Time is an important variable and that it is why it could also be helpful for the study to know if people make or not a shopping list.

Consumers have a different approach to innovation in the agri-food field, because usually products considered "new" inside the range product are a better version of the previous one.

Basically, it is difficult to take into account intangible changes made by companies starting from its production process up to the communication and marketing campaign. For this reason, knowing how consumers perceive an innovative product could be useful at the corporate level.

From the answers of the interviewee emerged that most of them consider an innovative product as a product that improves the well-being, followed by the protection of our planet and then by the fact that it is a better version of the product. Only a tiny percentage of the respondents replied that a new product is the one that should save time during meal's preparation.

Even if research in terms of packaging has grown in the past few years, people have a confused idea of it because this is not perceived as part of the innovation process of a product. What we mean by packaging goes beyond the external cover of products because researchers took a step forward in this field, also studying the way with which a product can last longer thanks to biodegradable filler[30].

[30] https://www.foodhubmagazine.com/2020/08/28/food-innovation-nuove-applicazioni-per-unalimentazione-sostenibile/

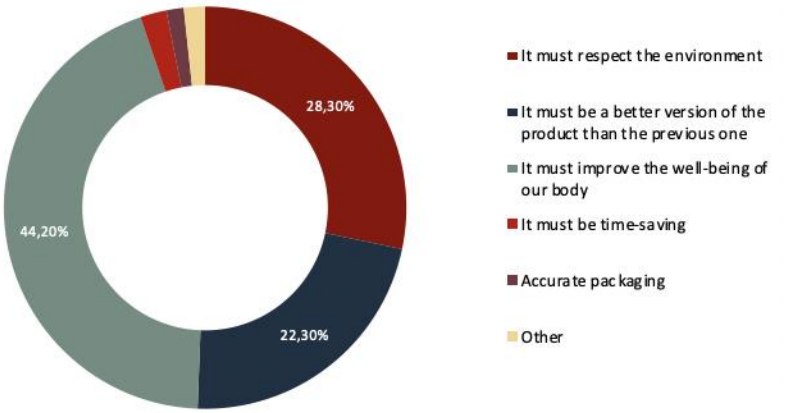

Figure 17 - Food product innovation determinants

During this survey, the interviewees were presented questions about their sentiment regarding two different kinds of products. The first one is an extremely radical product, 3D printed artificial meat, while the other kind is that of fruits and vegetables incorporating a high serving content, being packed and ready to eat, and are known as "Fourth range products".

As for the first question, most of the respondents refused to take into account a possible substitute of natural beef because they didn't see this product as natural (77,8%), others are skeptical regarding taste and consistency (8,4%) and the remaining proportion (5,4%) is skeptical regarding its nutritional values. This result is significant in that it highlights the fundamental belief that food is best when "natural" but does not consider that 3D printed meat is produced with *plant-based* ingredients[31]. Disinformation in this regard still plays a relevant role, but there is no reason why a good marketing campaign from producers of 3D printed food should not find numerous customers and open a new segment in the agri-food industry.

[31] https://www.foodhubmagazine.com/2020/08/28/food-innovation-nuove-applicazioni-per-unalimentazione-sostenibile/

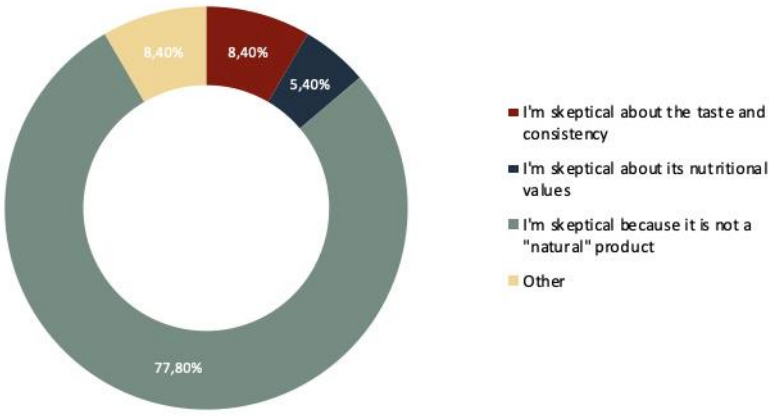

Figure 18 - Determinants of non-choice of 3D printed plant- based meat

The time factor is an important element for the consumer especially during this changing period. This certainly leads to the need to save time both in the purchase phase, in the choice of the store and in finding information about products. For this reason, convenience products are considered important for a part of respondents corresponding to 85.5 % of the total.

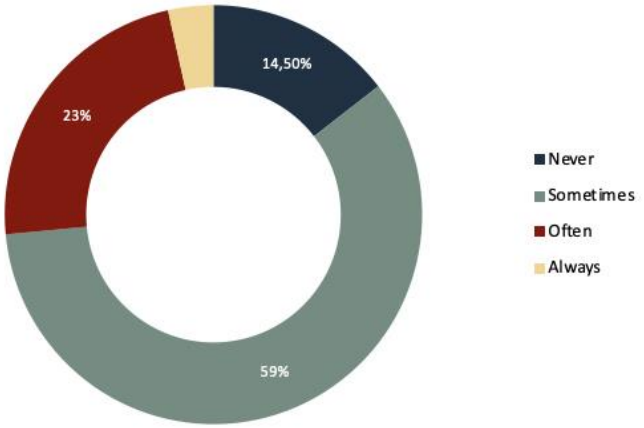

Figure 19 - Purchase trend of convenience food

When the consumer has to buy a good or a service, he is called to make numerous decisions that often have to do with the nature of the good itself. It is therefore essential for the company to create opportunities for contact with its customers in order to understand and study their needs to be satisfied.

While before the pandemic going to the grocery shopping also meant to have an experience and the purpose of the supermarket was to accompany the customer throughout shelfs, the outbreak of the virus has limited this practice. Those corners with tasters of new products are just a memory. However, according to the survey for most of the interviewee, the physical store remains the main channel of knowledge of a new product. The chart also depicts the importance of advertising brochures (13,1%), Internet and Social Networks (19%), word of mouth (11%), with a remaining portion of those who came up with the new product from Television, Radio, Journal and Magazines.

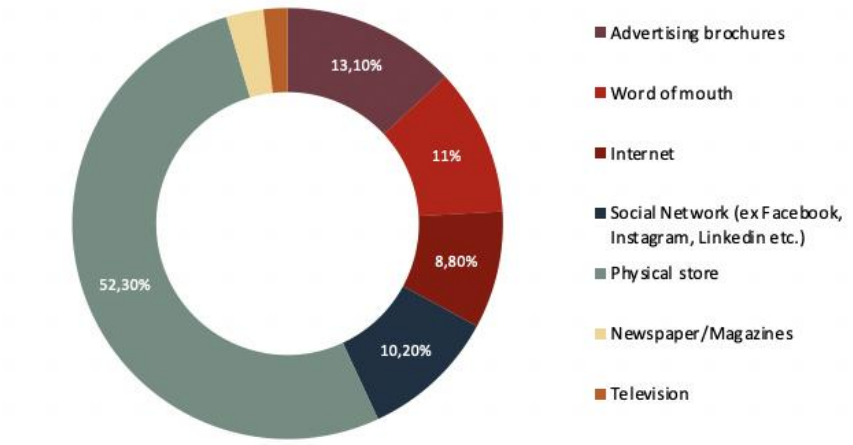

Figure 20 – Communication channel of food product innovation

4.3 Final considerations

Data obtained with the survey, provide an interesting picture of what are the characteristics of the current situation in Italy.

2020 is also seen as the year in which digital has become predominant in daily life, even for food purchases. What came up with this survey is that there is still a skepticism on this practice because people prefer to see what they are purchasing. Among the trends emerged during the research, the local dimension should not to be underestimated in the view of the recovery. Hence, people might rediscover the preference toward the direct sale, where empathy and high degree of specialization are key elements for the satisfaction of the consumers.

The year of the health emergency will be remembered as the year in which digital has become predominant in daily life, even for food purchases. The survey revealed the initial skepticism among consumers toward the online grocery shopping and also the inability by the operators to properly satisfy them. On the other hand, these data have highlighted the opportunity to rebuild or develop from scratch and e-commerce strategy in the Food and Grocery sector.

To improve the performance of the agri-food industry, there is the need to educate the consumers starting from the update of the customer journey. Some strategic levers that appear to be of potential success concern the management of the offer of quality products (DOP, IGP, DOC, DOCG, IGT), diversification of commercial strategies (e.g. development of the digital channel) and the promotion of a sustainable and traceable supply chain thanks to the application of process and product innovations.

CONCLUSION

The contribution of this research to the literature lies in the elements of analysis that have been developed here, which consist in a theoretical framework which can serve as the basis of future studies on this topic, and a case study of the Italian agri-food system before and after the COVID-19 crisis.

Several considerations have emerged from the comparison between literature and empirical evidence. Although the Italian agri-food system represents a sector of excellence for the country there are some weaknesses that still need to be addressed in order to completely adapt to the new normal. The shock caused by the COVID-19 emergency has strengthened the need to initiate structural interventions to enhance the competitiveness of the sector and prepare it for a restart. Thus, it becomes even more important today for businesses to think in terms of economic, social and environmental sustainability with a long-term perspective to cope with uncertainty, as sustainability translates into resilience to new shocks.

In particular, the evolution of the Italian agri-food system must have both sustainability and innovation as its main drivers toward competitive success, thus improving the performance of the companies. In order to survive, firms have to rethink the way they are doing business starting from the production process and moving toward their traditional range of products.

The small size of the industrial players could represent an obstacle to this effort, which is why cooperation between firms can be considered as a solution for promoting innovation. Cooperation toward sustainability might bring benefits from a broader perspective and therefore have a greater ability to recognize the importance of sustainability and manage the investments to achieve higher innovation rates.

The implementation of an agri-food sustainable chain through the promotion of a Circular Economy approach would have the advantage of avoiding constraints regarding the procurement of resources and reducing the pressure that the sector exerts on the ecosystem.

What emerged from the research is that ever since the outbreak of the pandemic the economic sustainability dimension prevailed over the social and the environmental one. Today recovery is the priority, but as seen in this research the recovery of economic

performance should not be considered as separate from the recovery of ecological and social sustainability. Companies should aim to invest wisely in building what will give them competitiveness in tomorrow's markets, which can only be realized through investments in sustainability, innovation and digitalization.

From the analysis of the practical cases emerged that sustainability is the solution being adopted but remains important also to understand consumers' perceptions of it.

On one side, sustainable innovation are perceived as increasing the "naturalness" of the product and associated with health. As the customers survey has confirmed, never as during this period health has been a priority. Clear air and water, unprocessed and fresh food without toxic ingredients is most likely at the top of consumers' list. On the other side, however, this was not true in the case of other sustainable innovations in agri-food. In fact, what emerged from the customers survey is that artificial meat is perceived as less healthy, even though the producers claim that it is as nutrient as animal meat. This suggests that, as for sustainable product innovation, companies should consider the adaptation of the offer toward healthy and sustainable products as a priority.

Another thing to add is that COVID-19 emergency has raised the influence of international boundaries on trade, leading to a rediscovery of the local dimension. According to ISMEA (2020), Italian exports of agri-food products achieved a new record in 2019 reaching 44.6 billion euros, against a more contained increase in imports, 1.4% compared with the previous year.

As analyzed in the research, the agri-food system must be considered as a whole and for this reason the aim for the next future should be to improve sustainable innovation along all the agri-food supply chain. National and local production is the sector upon which the whole agri-food system depends that is why further investments should be done in order to move toward the digital revolution.

The emergency has radically changed human relations and never as much as today it is important to develop a corporate social sustainability, as Casa Tironi and Scattolin Srl shown with their experience. This practice could represent an added value for both companies and society.

To conclude with an optimistic observation, while the initial concern was that the COVID-19 crisis could have stalled efforts toward sustainability and in particular eco-innovation, this research showed that it is not the case. What should be expected, on the contrary, is a newfound momentum for investments in sustainable innovation as, after the shock, investment opportunities have been made available by the Italian Government. To remain competitive companies will have no choice but to invest, and as seen in the case study it seems that they will not invest only for the sake of economic recovery, but also to become more sustainable companies in the market.

After all, it looks like instead of stopping the green effort the COVID-19 cleared many doubts about the exact importance of sustainability, showing that investing in sustainability means investing in resilience.

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APPENDIX A

INTERVIEWS WITH COMPANIES

1. INTRODUCTION
    a. Can you describe the current organization of your business perhaps focusing on the turning points you have faced over time?
    b. What is your current corporate philosophy?
    c. How do you think your drivers have evolved over time? And in particular following the outbreak of the pandemic?

2. TOWARD SUSTAINABILITY
    a. Was your business already born with the idea of being sustainable or this option has been implemented later?
    b. Do you believe that today sustainability is a fundamental asset for a business and its success? What values does sustainability have for you? How has your approach changed over the years?
    c. What measures have you decided to adopt in order to be more sustainable? (e.g. waste management, use of solar panels)
    d. What projects are you working on?
    e. Do you adopt socially sustainable behaviors? Was it an obligatory choice from a reputational point of view or for other reasons?
    f. Is there a commitment on your part to educate the customer toward sustainability? (e.g. Choices of organic products, choices of specific suppliers)

3. INNOVATION
    a. What are the main sustainable innovation trends in your sector? In your opinion what future developments will occur?
    b. What kind of innovation you are using in order to overcome the current emergency? (e.g. Electric vehicles, Recyclable packaging)

c. Health is one of the main drivers and never as much as today has been at the center of every debate. Do you think this exceptional moment can be seen as a competitive advantage?

APPENDIX B

SURVEY - "THE NEW CONSUMER'S PROFILE"

1. GENERAL DATA
    - Sex:
        - M
        - F
    - Age:
        - …
    - Province of residence
        - …
    - Qualification
        - Middle-School Diploma
        - High-School Diploma
        - Bachelor's Degree
        - Master's Degree
        - PHD
        - Other:
    - Who do you live with?
        - With your family
        - With your partner
        - With roommates
        - Alone
        - Other:

2. PURCHASING CHOICES BEFORE THE OUTBREAK OF THE PANDEMIC
    - Before the outbreak of the pandemic, what were the most important characteristics for you when choosing a food product? (Indicates max 3 answers).
        - Price

    - Brand name
    - Convenience (e.g. Special offers, Promotions)
    - Sustainability (e.g. Production process with less impact on the environment)
    - Packaging (e.g. Appearance and convenience of the package)
    - Origin (e.g. DOC, DOCG, IGP, IGT, Organic Certification)
    - Quality (e.g. Freshness, Safety etc.)
    - Health/Wellness (e.g. Nutritional values)
    - Other:
- Before the outbreak of the pandemic, where did you go groceries shopping most often?
    - Supermarket/Hypermarket/Discount
    - Small shops (e.g. Fishmonger, Butcher, Diary etc.)
    - Direct sale
    - Online
- Had you ever used online grocery shopping?
    - Yes
    - No
- If no, Why?
    - Additional costs
    - My area of residence is not reachable
    - I prefer to choose food products in person
    - The delivery times do not satisfy me
- If yes, why? (max 3 answers)
    - Economic saving
    - Time savings
    - Comfort
    - Wide range of products compared to the physical store (e.g. hard to find foods)
    - Ability to compare food products prices
    - Other:
- How often did you shop online?

    - Sometimes
    - Often
    - Always
- What type of service did you use?
    - Directly from the supermarket (e.g. EasyCoop, Esselunga, Despar etc.)
    - By third parties (e.g. Supermercato24, Everli, Cortilia etc)
    - Other:
- What do you prefer?
    - Receive the shopping directly from home
    - Go to collect the shopping at the store
- How satisfied were you with the home delivery service?
    - Not at all
    - A little
    - Enough
    - A lot
- If you answered, “not at all” or “a little”, why?
    - I have not received everything reported on the list
    - The products I ordered arrived in poor condition
    - The delivery was not on time
    - The cost of delivery was high
    - Other:
- In the face of the outbreak of the pandemic, have your shopping habits changed (e.g. Choice of food products, choice of the store) compared to before?
    - Yes
    - No

3. CHANGES IN PURCHASING BEHAVIOR AFTER THE PANDEMIC

- Compared to before, which of the following aspects have greater importance in the choice of purchasing of food product? (3 max answers)
    - Price
    - Brand name
    - Convenience (e.g. Special offers, Promotions)

- Sustainability (e.g. Production process with less impact on the environment)
- Packaging (e.g. Appearance and convenience of the package)
- Origin (e.g. DOC, DOCG, IGP, IGT, Organic Certification)
- Quality (e.g. Freshness, Safety etc.)
- Health/Wellness (e.g. Nutritional values)
- Other:

- Has your preference for the store where you go shopping changed since the outbreak of the pandemic?
  - Yes
  - No
- If yes, now where do you go shopping most often?
  - Supermarket/Hypermarket/Discount
  - Small shops (e.g. Fishmonger, Butcher, Diary etc.)
  - Direct sale
  - Online

4. INNOVATION IN THE AGRI-FOOD SECTOR

- How long do you usually spend grocery shopping?
  - Less than 30 minutes
  - 30 minutes – 1 hour
  - More than an hour
  - Other:
- Between two similar food products, which of the following characteristics determine the final choice most for you? (Indicates a max of 3 answers)
  - Lower cost
  - Trust in the brand
  - Special offers
  - The product contributes in some way to environmental sustainability
  - A more accurate packaging
  - Geographical origin
  - Other:

- Would you be willing to buy food of artificial origin to reduce environmental impact? (e.g. steak created in the laboratory as an alternative to animal meat)
    - Yes
    - No
- If no, why?
    - I am skeptical of the taste and texture of the product
    - I am skeptical about nutritional values
    - I am skeptical because it is not a natural product
    - Other:
- What features should an innovative food product have for you?
    - Careful packaging
    - It must be time saving
    - It must respect the environment
    - It must be a better version of the product than the previous one
    - It must improve the well-being of our body
    - Other:
- In your opinion, since the outbreak of the pandemic, the introduction on the market of new food products is:
    - Decreased
    - Unchanged
    - Increased
    - I didn’t pay attention to it
- When you go shopping, how willing are you to try new food products compared to the ones you usually buy?
    - I never try new products
    - I try few new products
    - I often take new products
- While you are doing grocery shopping, do you just stick to a list or are you also looking for products that appeal to you in the moment?
    - I follow the list
    - I follow the list and look for new products to try

    - I don’t make a list
    - I take what I find
    - Other:
- How do you generally find out about a new food product?
    - Through advertising brochures
    - Through word of mouth
    - Through the Internet
    - At the physical store
    - In newspapers/magazines
    - From social networks (Facebook or others)
    - Other:
- How often do you buy ready-to-eat and ready-to-cook food products? (e.g. salads in bags, ready-to-eat chopped fruit, vegetables for soup etc.)
    - Never
    - Sometimes
    - Often
    - Always
- Why do you buy these products?
    - Practicality of consumption
    - Quality
    - Availability in stores
    - Time savings
    - Other:
- Why don’t you buy these products?
    - High cost
    - Uncertainty about the quality of raw materials
    - Preference for fresh unprocessed products
    - Other: