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"THE EVOLUTION OF THE BUSINESS MODEL IN THE OLIVE CULTIVATION SECTOR: THE APULIA CASE"

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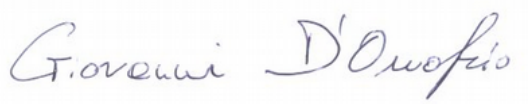

Alla mia famiglia per il costante supporto e l'incondizionata fiducia nei momenti felici ma anche e soprattutto in quelli difficili

Ai miei amici, lontani e vicini, presenti e passati, per le esperienze vissute insieme durante questa esperienza lunga sette anni

Al Collegio Universitario Don Nicola Mazza, che mi ha accolto e ospitato lungo tutto questo percorso

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Introduction

The intent of this thesis is to understand new sustainable agricultural models, and, in general terms, of the logic and dynamics behind the process of the production of olive oil. At the basis of my choice there was my will and also curiosity to investigate better a business that recover an important role in the Southern regions from an economic and even cultural point of view.

Over time this kind of production evolved in terms of technology, improved in terms of performances, but at the same time had and have to face some problems related to the treatment of the production wastes. From this point, excluding the oldest and historical production through granite millstones, all the following technologies implicate the production of residuals, that many times are not directly disposable in the environment because of their potential toxicity and, therefore, need a specific treatment.

With these premises, I organized the thesis through three chapters, in which the theme is treated from a theoretical and practical point of view.

In the Chapter 1, I outlined in broad terms the concept of sustainability and sustainable development. Related to this concept, and more specific for the focus of thesis, I faced the theme of the Circular Economy. The first and the latter represent the conceptual substratum at the basis of the evolution of the business during the years. Specifically, in a world in which the natural resources rapidly are going toward the depletion, an increasing population and more and more deep environmental impact, these themes are surely actual and important.

In the Chapter 2, after sketching out an historical background and the structure of the market of the production in Italy, I focused on the application of the general circular economy principles to the olive oil production. If the technological advances permitted during the years an higher return in term of quantity, often they involved the utilization, during the transformation process of chemical additives or specific treatment. The residual of them represented a problem, other than a cost, because of their disposal, that in any case is regulated by specific legislation.

Progressively, the adoption of new principles, and in line with the circular economy, permits companies to extract value from elements that in the past were wastes and residuals. In a certain sense we are talking about scope economy, that permits, directly and indirectly to have an impact on the whole business model of the companies, especially in reference to the cost and revenue structures.

In the Chapter 3, I focused firstly, in aggregated terms, on the Apulia region. A general overview is necessary since the Apulia represents the most important Italian area of production of olive oil and the region with the highest concentration of olive oil businesses in Italy.

In this sense, it is at the same time relevant understand the specificities of the different productions because of the presence of various production areas within the region.

Secondly, I focused on the case of Biolevante S.r.l., one of most important players in the Apulian olive oil production panorama.

At the basis of this choice surely there is the fact that the company is well structured and with a long and consolidated tradition. However, the real distinctive element of this company is represented in the way in which it declines the application of the principles of the circular economy. Beside it is treated the historical evolution and the financial results of the company in the last years.

Chapter 1

Sustainability: clarifying a concept

1.1 Sustainability and sustainable development

The concept of sustainability (and the sustainable development) is nowadays widespread.
First of all, it must be made clear that this is not a unique concept, nor immediately understandable. Although the term sustainability has its origins in the field of ecological studies and references to the «potential of an ecosystem to exist over time, without any change», it is also true that the issue of sustainability immediately brings up different fields of knowledge: environmental, ecological, economic, social and cultural (Valera, 2012). Sustainability means meeting our own needs without compromising the ability of future generations to meet their own needs. In addition to natural resources, we also need social and economic resources. Sustainability is not just environmentalism. Embedded in most definitions of sustainability we also find concerns for social equity and economic development.
Sustainability is derived from two Latin words: «*sus*» which means up and «*tenere*» which means to hold. In its modern form it is a concept born out of the desire of humanity to continue to exist on planet Earth for a very long time, perhaps the indefinite future. Sustainability is, hence, essentially and almost literally about holding up human existence. At the beginning of the 80s, the concept of «sustainability» were known only by a small group of environmentalists and environmental economists.
However, due to a serious deterioration in the human environment and natural resources, sustainable development has been placed on the international political agenda by the United Nations,

namely the Brundtland Commission. In their publication, «Our Common Future» (also called Brundtland Report), published in 1987, defined sustainable development as: «development that meets the needs of the present without compromising the ability of future generations to meet their own needs».

Although the Brundtland Report did not technically invent the term «sustainability», it was the first credible and widely-disseminated study that probed its meaning in the context of the global impacts of humans on the environment.

The report uses the terms «sustainable development,» «sustainable,» and «sustainability» interchangeably, emphasizing the connections among social equity, economic productivity, and environmental quality. The pathways for integration of these may differ nation by nation; still these pathways must share certain common traits: «the essential needs of the world's poor, to which overriding priority should be given, and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs».

This paper argues that the shift is unfortunate in that it obscures the real contradiction which exists between long-term sustainability and short-term welfare. Moreover, the distinction between three «pillars» of sustainability is conceptually fuzzy.

However, this paper does not pretend to offer a comprehensive view of the problem of sustainability. It presents a critical view of how the term is used in policy debate and in impact assessment — the set of methods used in applied research to appraise policies and projects.

Thus, environmental concerns are important, but the basic argument is one of welfare, seen in a context of inter-generational equity. «We should care for the environment not because of its intrinsic value, but in order to preserve resources for our children» (Farrington 2010).

Sustainability is a holistic approach that considers ecological, social and economic dimensions, recognizing that all must be considered together to find lasting prosperity.

The motivations behind sustainability are often complex, personal and diverse. It is unrealistic to create a list of reasons why so many individuals, groups and communities are working towards this goal. Yet, for most people, sustainability comes down to the kind of future we are leaving for the next generation. Sustainability as a value is shared by many individuals and organizations who demonstrate this value in their policies, everyday activities and behaviours. Individuals have played a major role in developing our current environmental and social circumstances.

The people of today along with future generations must create solutions and adapt.
Since the mid-80s, the popularity of the term «sustainability» has grown rapidly and today, the term sustainability has expanded even further, has become part of the global jargon, and is widely used by multiple disciplines and sectors.
Since this time, there have been two major developments in the concept of sustainability:

- one, its interpretation in terms of three dimensions, which must be in harmony: social, economic and environmental;
- Two, the distinction between «strong sustainability» and «weak sustainability».

1.2 The three pillars of the sustainability and the distinction between *strong sustainability* and *weak sustainability*

The Brundtland Report makes it clear that while sustainable development is enabled by technological advances and economic viability, it is first and foremost a social construct that seeks to improve the quality of life for the world population: physically, through the equitable supply of human and ecological goods and services; aspirationally, through making available the widespread means for advancement through access to education, systems of justice, and healthcare; and strategically, through safeguarding the interests of generations to come.
In this sense sustainability sits among a series of human social movements that have occurred throughout history: human rights, racial equality, gender equity, labor relations, and conservation, to name a few.
The intersection of social and economic elements can form the basis of social equity. In the sense of enlightened management, «viability» is formed through consideration of economic and environmental interests. Between environment and social elements lies «bearability» the recognition that the functioning of societies is dependent on environmental resources and services. At the intersection of all three of these lies sustainability.
According to the «Our Common Future» Report (also known as the Brundtland Report), which was published by the World Commission on Environment and Development (WCED) of the United Nations in 1987, sustainable development is defined as: «development that meets the needs of the present without compromising the ability of future generations to meet their own

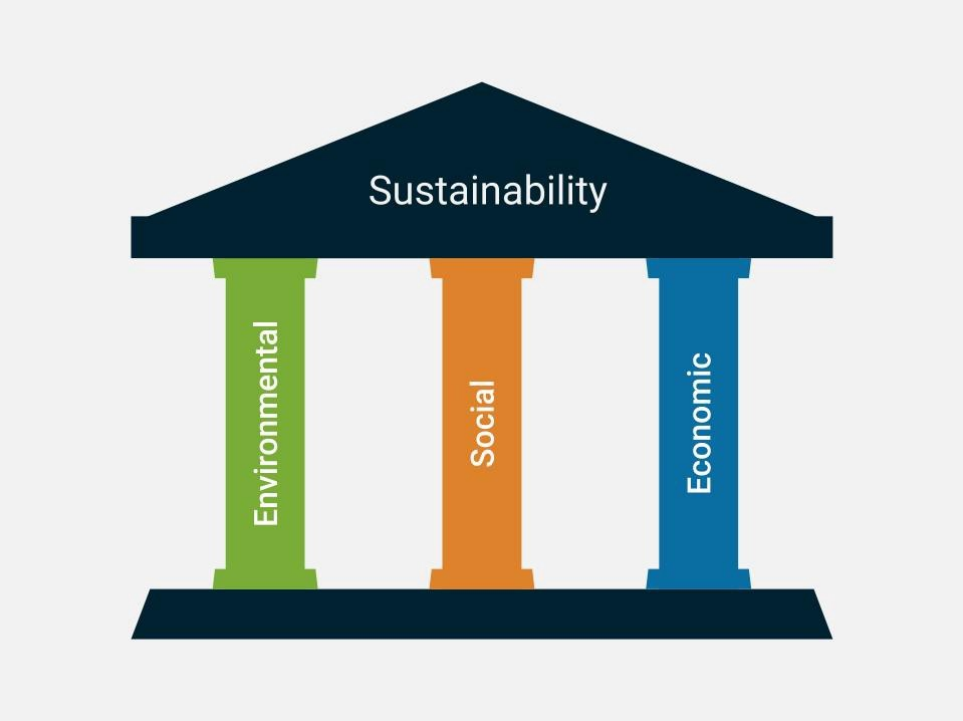

Figure 1.1: The three pillars of the sustainability. *Watson A., 2018*

needs.» In this definition, the concept of sustainability refers to three «pillars» that make the development of economic activities and the protection of the environment compatible, as illustrated in Fig. 1.1.

To explain the three pillars of sustainability, we require a system diagram. The biosphere is the largest system where we live. It is composed of the human system which is again subdivided into economic and social systems. The people from the social subsystem work together under a government to optimize the economic output of the system.

The first pillar «Environmental sustainability» must guarantee the availability and quality of natural resources. Ecological integrity is maintained, all of Earth environmental systems are kept in balance while natural resources within them are consumed by humans at a rate where they are able to replenish themselves. Environmental sustainability occupies the highest priority. If the environmental capacity lowers down, the goods delivered by the social system will also be lowered, thus affecting the economic system produced. This pillar is extremely important because having a clean environment, the other two pillars will become strong. As a result of which the level of economic development will be satisfactory and social fulfilment will be robust.

The second pillar «Social sustainability» must guarantee the quality of life, security and services to the people. Universal human rights and basic necessities are attainable by all people, who have access to enough resources in order to keep their families and communities healthy and secure. Healthy communities have just leaders who ensure personal, labour and cultural rights are respected and all people are protected from discrimination.
The last pillar «Economic sustainability» must guarantee economic efficiency and income for businesses. Human communities across the globe are able to maintain their independence and have access to the resources that they require, financial and other, to meet their needs. Economic systems are intact and activities are available to everyone, such as secure sources of livelihood.
Taking these three pillars of sustainability further if we only achieve two out of three pillars then we end up with:

- Social + Economic Sustainability = Equitable;
- Social + Environmental Sustainability = Bearable;
- Economic + Environmental Sustainability = Viable.

Only through balancing economic + social + environmental can we achieve true sustainability and a truly circular economy.
Through these pillars that assess the sustainability of a company, it is possible to identify how close or not an organization is to being sustainable. Therefore, a sustainable company is one that, at the end of its assessment, maintained its previous level of performance or promoted activities aimed at improving the level occupied in the three areas.
It is essential that the three pillars of sustainability interact with each other in a fully harmonious way, because without these three pillars sustainability cannot be sustained. Each of the pillars portrays a context in which sustainability is applied, at the same time that one depends on the other to support itself. Keeping all three pillars stable and sustainable should be the ultimate goal for all societies. However, you would be surprised at how many well respected non-profit worldwide organizations favour stabling or strengthening one pillar over the other. While it is always important to focus on certain pillars during certain times, all pillars should be focused on. pillars should be focused on.
Focusing on, say, the economic pillar is great — but if the environment or social pillar is

weakened in the process of its strengthening, it is not a great outcome. These three pillars also work hand in hand with each other. If the social pillar is incredibly weakened because of something like war, the economic and environmental pillars are, no doubt, going to be weakened as well. Through war, pillaging of land could occur — and the economy will likely falter or change as a result of the war. As you can see, the pillars all need to be as strong as possible and, quite often, one weak pillar can result in all of the pillars become weak — and then, the system as a whole is unsustainable.

It is always important to analyse the three pillars of sustainability. To find a way to make the whole system strong and as sustainable as possible, the three pillars have to be strong. Therefore, there should be more emphasis on the pillars as a whole, instead of just emphasis on certain pillars during certain times.

It is important to report the vision of environmentalists, economists and ecologists (Priyanki 2020) in relation to the three pillars of sustainability:

The Environmentalist views on nature and natural resources are different from human beings. According to the natural resources should be preserved so that humans can evolve and survive.

The Ecologist does not separate human beings from any entity of the planet nor its resources. According to them, humanity inherits the value from nature and the planet and both of them should be protected.

The Economist measures the sustainability from the viewpoint of the consumer-led culture treating finite resources of nature as an income that will result in the aversion of natural crisis. They believe the system will sort out itself through the advances in the technological section if left on its own.

The three pillars of sustainability (economic, environment and social) explicitly include the social dimension, in terms of human stakeholders, human well-being, and human rights. At times these may stand in tension with environmental and economic pillars, but the social is explicit as a dimension. Moreover, the concept of sustainable development previously defined as «development which meets the needs of the present without compromising the ability of future generations to meet their own needs», introduces the notion that development ought to aim at delivering some form of equity across and through the generations of people who presently, and who will in the future, populate our planet. As such it raises issues of inter-generational equity, between present and future generations, and intra-generational equity, between different

peoples within the current generation, i.e. the developed and developing worlds, and peoples within these worlds. Equity and social justice can be said to be at the heart of the concept of sustainability (Murray 2017).

The «three-pillar» or «triple bottom line» concept of sustainability, namely environmental protection, economic development, and social equity, should be considered simultaneously in sustainable development, which has become a consensus in academia. It is a core issue to coordinate the relationships among environment, economy and society in sustainability, the understanding of which should refer to the perspectives of «strong sustainability» and «weak sustainability» (Werner 2004). In general terms, the idea behind the paradigm of «weak sustainability» implies an economic value principle which is founded within the body of neoclassical capital theory, whereas conceptions of «strong sustainability» are based on biophysical principles. This is a result of different visions about how a sustainable world can and should look like, and how to manage change.

The main difference of the two perspectives lies in how to treat the substitutability between natural capital and human-made capital.

«Weak sustainability» starts from the assumption that there are no differences between the types of well-being that generate natural capital and produced capital. From a «weak sustainability» perspective, technological progress is assumed to continually generate technical solutions to the environmental problems caused by the increased production of goods and services. Different is instead «strong sustainability» because it starts from the assumption that natural capital cannot viewed as a mere stock of resources. Rather natural capital is a set of complex systems consisting of evolving biotic and abiotic elements that interact in ways that determine the ecosystem's capacity to provide human society directly and/or indirectly with a wide array of functions and services. In relation to strong sustainability there are three reasons to demonstrate the non-substitutability of natural capital:

1. There is a difference between manufactured capital and natural capital. Manufactured capital is reproducible and its destruction is rarely irreversible, whereas the consumption of natural capital is usually irreversible.

2. since manufactured capital requires natural capital for its production, it can never be a complete substitute for the biophysical structures of natural capital. The contribution of

natural capital through the delivery of services to human well-being is multidimensional.

3. an increase of future consumption is not an appropriate substitute for losses of natural capital.

   These two sub-concepts were called as «absurd strong sustainability» and strong sustainability, respectively. Apparently, the notions of strong and weak sustainability have a great impact on understanding and evaluating sustainable development (Huang 2018).

   Sustainability has become a wide-ranging term that can be applied to almost every facet of life on Earth, from local to a global scale and over various time periods. Long-lived and healthy wetlands and forests are examples of sustainable biological systems. Invisible chemical cycles redistribute water, oxygen, nitrogen and carbon through the world's living and non-living systems, and have sustained life since the beginning of time. As the Earth human population has increased, natural ecosystems have declined and changes in the balance of natural cycles has had a negative impact on both humans and other living systems. Paul Hawken has written that «Sustainability is about stabilizing the currently disruptive relationship between Earth's two most complex systems — human culture and the living world». Ways of living more sustainably can take many forms from reorganising living conditions (e.g., eco-villages, eco-municipalities and sustainable cities), reappraising economic sectors (permaculture, green building, sustainable agriculture), or work practices (sustainable architecture), using science to develop new technologies (green technologies, renewable energy), to adjustments in individual lifestyles that conserve natural resources.

1.3 From a linear economy to a circular economy

The following paragraph deals with the transition and the differences between linear and circular economy (Fig. 1.2). For a long time, our economy has been «linear». The linear economy is straight-line thinking. It is the «idea of making a box, using it, and then sending it to landfill». It is a traditional model based on "take-make-consume-waste" approach to using resources.
This means that raw materials are used to make a product, and after its use any waste (e.g. packaging) is thrown away. In an economy based on recycling, materials are reused. For example, waste glass is used to make new glass and waste paper is used to make new paper.
This system dates back to the Industrial Revolution, in which production and resources are

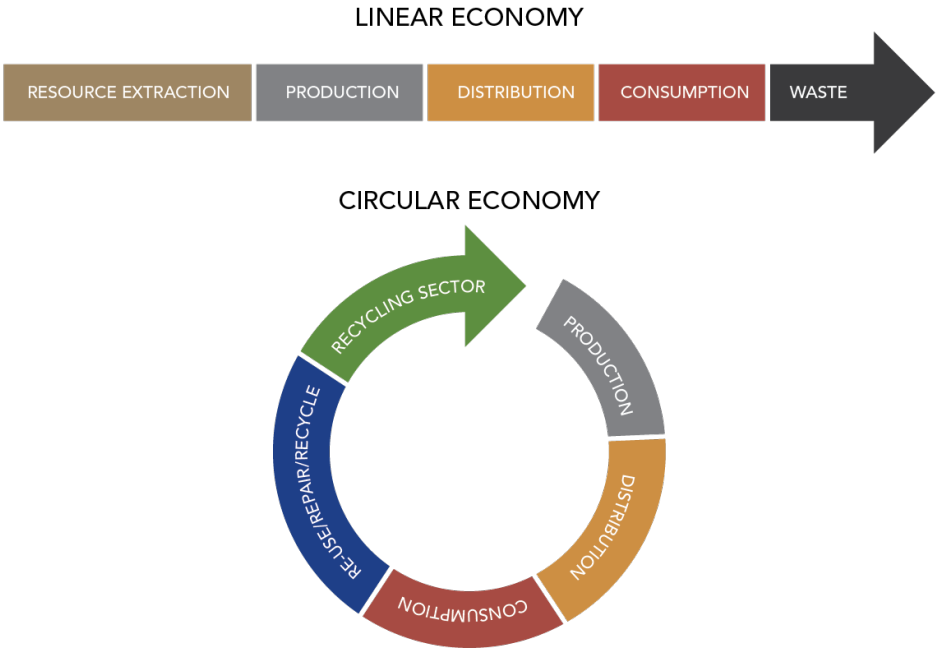

Figure 1.2: Linear vs circular economy. *RiciclaNews, 2017*

considered to be unlimited, and it has been the prevailing model in the market ever since.

But the linear economy becoming unsustainable and it presents various problems such as:

- **Overproduction**: the action of producing more of something than is needed. In fact, many products are placed on the market in large quantities and not all of the products end up being sold and this leads to excess stock;

- **Reduced life cycles**: The accelerated production and consumption rates lead to a proportional generation of waste. Likewise, the introduction of new models of a particular device and the so-called planned obsolescence, in particular in the case of technological products, means that before long the old version will have become obsolete. While this may generate short-term revenue for the company, it can have a negative impact on the users' economy;

- **Accumulation of waste**: These accelerated life cycles provoke the unbridled accumulation of waste, which in many cases can be harmful to the environment;

- **Depletion and over-exploitation of natural resources**: leading to the increased cost of said resources. This is applicable to raw materials such as minerals and fossil fuels.

The linear model has dominated since the beginning of the third industrial revolution, and it has led to growth and prosperity in many parts of the world. It is, however, also one of the reasons for our current sustainability problems because the linear model implies using resources in an unsustainable way and producing large quantities of waste that destructs the environment further.

In fact, we are moving towards a circular economy model which is a more resistant and flexible model which is capable of adapting to the market needs. In fact, to solve all these problems and ensure that in the future there are enough raw materials for food, shelter, heating and other needs, our economy must become circular. The transition of linear model to circular model means processes through which states and peoples try to achieve economic growth and development and to reach, in the sphere of social welfare, the developed world countries, generally the ones of North America and West Europe. Although the term is usually linked to the developing countries striving to realize the above mentioned goal, there is no reason why the transition as a phenomenon would refer exclusively to the underdeveloped world. Namely, rich states also try to continually achieve optimal conditions for social development and new, higher economic growth to the greatest possible extent, and thereby also a better quality, higher standard of living for their citizens. Here must be emphasized that some countries rejected transition in accordance with strict neo-liberal rules, what led to interesting results, at the same time offering an alternative as a foundation for analysis and re-evaluation of neo-liberal economic concept. In searching for alternatives to strict rules of neo-liberal economic concept, the need for faster abandonment of the neo-liberal economic concept appears first. In searching for new solutions, the fact is ever more accepted that there are significant limitations in availability of valuable material resources as well as the fact that demands for environmental protection increase all the time, and that it is not possible to ignore these facts any more. The transition regarded as an improvement process, presents abandonment of the linear economy concept on the one side, and on the other side it does not find a haven in a new concept until the last big economic, but also environmental crisis and climatic changes in 2008. At that time a new concept of the so called circular economy becomes more clearly visible. Circular economy does not represent exclusively an answer to economic crisis but requires a changed view of the social responsibility area, including sustainable development. Sustainable development is a global challenge which requires a progressive transformation of our economies, such as to satisfy the

needs and preferences of the present generation without compromising the opportunity of future generations to meet their own needs and aspirations. This does not prescribe a fixed state of harmony, or foreclose economic growth. Rather, the idea of sustainable development leads beyond the traditional, ecologically based conception of physical sustainability to the social and economic context of development. It involves concerns for environmental preservation and economic development, and correspondingly calls for an integrated approach of evaluating trade-offs between conservation and change. This is inherently dynamic and state dependent.
The term sustainable development entered general terminology in the 80-ties of the 20th century in order to point at the link between development and environmental protection. It is defined as development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. Sustainable development, environment quality and economic development became connected activities (Drljača 2015).
There are at least three important tendencies presenting the limits to growth (Drljača 2015):

1. earth as a source of food and not renewable material resources;

2. ability of the environment to absorb waste and various emissions as a negative environmental aspect of production processes;

3. the urban way of life characterized by consumerism. Disregard of these limitations endangers survival of people on Earth in the long run. In the short term it causes a series of problems of economic, environmental and political nature.

The circular economy is an economic system of closed loops in which raw materials, components and products lose their value as little as possible, renewable energy sources are used and systems thinking is at the core. So, what are the «*rules*» that govern these natural systems? And, most importantly, can we use these principles in our contemporary world?
The are 4 principles of the Circular Economy:

1. «*Waste = food*» : This principle stands for the continuous cycling of materials and products. A material or product that is no longer used, should not become "waste", but instead should be part of a new cycle of use. In nature, one specie's waste is always a source for another. For instance, birds eat berries. Bird droppings containing a berries seed and acting as a fertiliser, enable these to grow into plants. We should use the same

principle in recycling, making a former waste into materials for new products (plastic, glass, paper).

2. «*Resilience through diversity*»: Resilient means being able to face change while continuing to develop. Greater biodiversity contributes to the general health of the system. Systems with many different components prove to be more resilient. A jungle or a forest ecosystem may serve as examples of this principle in nature. In a man-made system, it may be a farm producing different foods where the production processes are interconnected.

3. «*Energy from Renewable Resources*»: Solar energy, wind power, tidal power are the major sources of renewable energy which should be used more. In a natural system, a plant uses sunlight to grow. In a man-made world, we also should make use of renewable energy instead of oil and gas.

4. «*Think in Systems*» : This principle is about numerous actors working together to create effective flows of materials and information. In nature, this is the way the food chain operates. If one species goes extinct, it can affect many other species, because they are interdependent in complex ways. In the man-made system, the changes we make may lead to unexpected and oftentimes unpredictable effects.

Intuitively, the circular economy would appear to be more sustainable than the current linear economic system. Reducing the resources used, and the waste and leakage created, conserves resources and helps to reduce environmental pollution. However, it is argued by some that these assumptions are simplistic; that they disregard the complexity of existing systems and their potential trade-offs. For example, the social dimension of sustainability seems to be only marginally addressed in many publications on the circular economy. There are cases that might require different or additional strategies, like purchasing new, more energy-efficient equipment. By reviewing the literature, a team of researchers from Cambridge and TU Delft could show that there are at least eight different relationship types between sustainability and the circular economy. In addition, it is important to underline the innovation aspect in the heart of sustained development based on circular economy components. The origins of this circular paradigm date back to 1990 by two British environmental economists called Pearce and Turner who built their theoretical framework «*Economics of Natural Resources and the Environment*» ,on previous

studies of the ecological economist Kenneth Boulding which introduced the concept of closed systems and envisaged a future economy that would operate by reproducing the limited stock of inputs and recycling waste outputs. In this theoretical framework they said that a traditional open economy was developed without the recycling trend. When considering the relationship between resource use and waste residuals the open system could be and should be converted to a circular system. This means, in another word, facing existing environmental problems and resource scarcity, they called for a need to contemplate earth as a closed economic system: one in which the economy and the environment are not regarded by linear inter-linkages, but by a circular relationship (Su 2013).

Circular economy implementation began in 1996 in Germany with a law: «*Closed Substance Cycle and Waste Management Act*». The assumption of this law is to provide a closed cycle waste management and ensure that environmentally compatible waste disposal.

Since the first formal use of the circular economy term by Pearce & Turner, there have been many definitions of circular economy which used in scientific literature and professional journals. The most important definitions and interpretation (MacArthur 2013) of circular economy are presented in Tab. 1.1.

Source	**Definition/interpretation**
Sauvé et al. (2016)	Circular economy refers to the production and consumption of goods through closed loop material flows that internalize externalities linked to virgin resource extraction and the generation of waste (including pollution)"
Preston (2012)	"Circular economy is an approach that would transform the function of resources in the economy. Waste from factories would become a valuable input to another process – and products could be repaired, reused or upgraded instead of thrown away".
EEA (2014)	Circular economy "refers mainly to physical and material resource aspects of the economy – it focuses on recycling, limiting and re-using the physical inputs to the economy, and using waste as a resource leading to reduced primary resource consumption."

Mitchell (2015)	A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extracting the maximum value from them whilst in use, then recovering and reusing products and materials.
Heck (2006)	The utilisation of sustainable energy is crucial in a circular economy. The transition to a circular economy would require addressing the challenge of establishing a sustainable energy supply as well as decisive action in several other areas such as agriculture, water, soil and biodiversity.
Su et al. (2013)	The focus of the circular economy gradually extends beyond issues related to material management and covers other aspects, such as energy efficiency and conservation, land management, soil protection and water.
EEA (2016)	"A circular economy provides opportunities to create well-being, growth and jobs, while reducing environmental pressures. The concept can, in principle, be applied to all kinds of natural resources, including biotic and abiotic materials, water and land".
Ghisellini et al. (2016)	The radical reshaping of all processes across the life cycle of products by innovative actors has the potential to not only achieve material or energy recovery but also to improve the entire living and economic model.
ADEME (2014)	The objective of the circular economy is to reduce the environmental impact resource consumption and improve social well-being.
Ellen MacArthur Foundation (2013a; 2013b; 2015a)	Circular economy is "an industrial system that is restorative or regenerative by intention and design. It replaces the "end-of-life" concept with restoration, shifts towards the use of renewable energy, eliminates the use of Foundation toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models". The overall objective is to "enable effective flows of materials, energy, labour and information so that natural and social capital can be rebuilt".

European Commission (2015a)	The circular economy is an economy "where the value of products, materials European and resources is maintained in the economy for as long as possible, and the Commission generation of waste minimised". The transition to a more circular economy (2015a) would make "an essential contribution to the EU's efforts to develop a sustainable, low-carbon, resource-efficient and competitive economy".

Table 1.1: Definitions of circular economy.
Vasileios R., Tuokko K., and Behrens A., 2017

There are so many different definitions in use, because the concept is applied by a diverse group of researchers and professionals. A philosopher of science emphasizes a different aspect of the concept than a financial analyst. The diversity of definitions also makes it more difficult to make circularity measurable.
Definitions often focus on the use of raw materials or on system change. Definitions that focus on resource use often follow the 3-R approach:

1. **«Reduce»**: Reduction refers to minimize the input of primary energy and raw materials through the improvement of production efficiency. As for consumers, a more frugal way of consumption has been encouraged. Efforts to reduce start at the innovation phase where we explore the intended use, the most efficient way to deliver the product, the materials in the packaging, its weight, and if it can be collapsible to take up less space when it does reach landfill. At this stage, it is essential to take a long hard look at the fundamental reason for the packaging itself, examining what it does for the product and for the consumer. Concentrates are a great example of the "reduced" strategy, providing concentrated formulas that require less packaging and product to ship, and a more economical and sustainable supply chain, all while delivering the same performance and often increased doses for the consumer.

2. **«Reuse»**: Beyond minimizing the packaging to reduce its end-of-life environmental impact, making the most of the product life is imperative. This means designing packaging

that has a longer life than the product initially shipped in it. And this is the second "R" in the circular economy model – Reuse. Sometimes this is as simple as refilling the packaging with the same product, but sometimes the packaging can be used for an entirely different product, perhaps one that means the packaging requires less cleaning or sterilization. It is important to ensure that the energy and shipping costs of re-using a package do not outweigh the benefit of reuse.

Opportunities also exist in the repurposing of packaging, not just to store other products, but also in the production of energy or for products that deliver a completely different functional value – such as roof shingles made of recycled plastic. Some types of packaging can be converted into clean-burning energy sources. In fact, in some cases, the material is secured from landfills, isolated into the right materials and then converted into fuel. The idea that packaging can have a second life is indeed appealing.

Reuse suggests using the by-products and wastes from one firm as resources for other firms or industries. It also refers to use products to its maximum capability with frequent maintenance and reclamation to prolong its endurance.

3. **«Recycle»**: Having done all that can be done to reduce packaging and reuse all or some of it, the final part of the circular economy model is the third "R" - Recycle. To recycle the package - breaking it down through grinding or melting to secure elements that can be used in other products - requires a balanced view since the energy, environmental and financial costs of breaking it down can be substantial.

   Recycle encourages processing the recyclable materials into new products so that the consumption of virgin materials can be reduced. Recycling is a vital component of the circular economy, driving innovation in materials to create products where the maximum amount of the material used initially can be reclaimed and used again. The most successful example of this is the aluminium can where almost all the metal is available after the can have been recycled and a relatively small amount of energy is required to reclaim it. The high recycle throughput achieved in the aluminium space is the target for plastics and things are steadily improving.

The recent enacted 12th five-year plan (2011e2015) for Chinese economic and social development suggests the continuous implementation and further development of the CE. First, China

faces daunting environmental challenges due to rapid industrialization and urbanization as well as lax environmental oversight. Striking problems include land degradation, desertification, deforestation, water depletion and pollution, as well as loss of biodiversity.

This increase resulted from China's heavy dependence on energy-intensive industries and an immense consumption of coal-based energy sources. In response to serious environment problems, mitigation of carbon emission and reversal of environmental degradation have become urgent missions. Generally, the urgent environmental problems and resource shortages in China and the potential implementation benefits in the long-run are the primary reasons for the Chinese government to choose the CE as the national development strategy, aiming to improve the efficiency of materials and energy use. This strategy has been implemented and further developed in various Chinese areas. Many studies have been conducted, explaining the fundamental concepts and examining the practical implementation of the circular economy. The successful enforcement of the circular economy regulation can help tackle both environmental degradation and resource scarcity issues.

Over the years, the concept of the circular economy was criticized mainly for the different definitions attributed to it. Circular economy has achieved wide appeal among academic, political and business audiences, but its interpretation and application were very different because is also linked to the challenge of assessing the impact of the transition of the circular economy. Several studies have emerged in recent years suggesting that the circular economy has the potential to provide several benefits:

- a circular economy is one where it is not a start-to-finish process but is a continuous cycle. Instead of your box going to landfill, companies recycle it into something else – like another box! Then it is used again. It does not take an environmental scientist to understand why burying our rubbish just buries our problems. Waste buried in landfill can sit there for years.

- All the oxygen escapes as it is compacted over time. As a consequence, the microbes that remain are anaerobic. They release methane, which is one of the most potent greenhouse gases. It contributes to the unnatural warming of our planet. Therefore, if we do not stop burying our rubbish and start making something useful out of it – we will only contribute further to the climate crisis!

– You can save money by reusing old materials rather than manufacturing new ones. For example, you can take a box and process it into a brand new box. This reduced or completely irradicates the need for landfill. In addition to this, you do not need to have new materials. This reduces pressure on the land to grow trees for cardboard.

– You can also use waste to create energy instead of land-filling. Because we will always have waste – it is basically renewable! For example, burning non-biodegradable waste can heat water to produce steam that can turn a turbine — turning the turbine results in the generation of power. This saves money on energy and landfill.

The circular economy will not only benefit businesses, the environment, and the economy at large, but also the individual ranging from increased disposable income to improved. In fact, analysts show that circular paradigm could increase the disposable income of the average European household. The cost of products and services would be less unproductive time. The other benefit for the individual is greater utility felt by customers may be enhanced by the additional choice or quality that circular models provide. Customers choice increases as producers tailor products or services to better meet customer needs.
In addition to the benefits, the circular economy is also differentiated from weaknesses (Sariatli 2017) such as:

– Circular economy still requires amalgamation of the entire product life;

– Cycle from raw material provision to annihilation;

– No specific guidelines to sectors on how to implement circular economy;

– There is still no internationally recognized standards institution to regulate the sector;

– Circular Economy may omit the feature of semi-recyclability when choosing a raw material for production process;

– Public opinion about Circular Economy is yet inefficient and social marketing

– Campaigns lack to access sectoral people;

– There is still no special legal regulation about circular economy and its application;

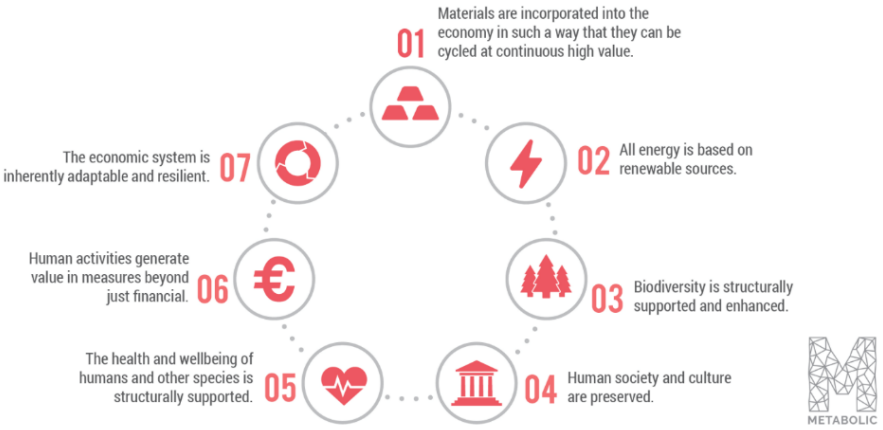

Figure 1.3: Seven pillars of the circular economy. *Gladek E., 2017*

– Investments about circular economy to introduce the system to sector are not enough.

The Circular Economy means taking an eco-design approach to solutions, it means working on the modularity, repairability and recyclability of products and services offered, as well as on consumption models based on sharing and on the product as a service. After understanding what the circular economy is about, it is time to break down the fundamentals, now those fundamentals can be visualized as pillars. The circular economy is based on seven pillars (Gladek 2017) which support the evolution of economic rules and incentive structures (Fig. 1.3). Each one of those pillars (MacArthur 2013) works separately and at the same time in coordination with the rest in order to always achieve the results needed. Circular economy bases its results to those pillars and its application needs to follow the fundamental principles of «reduce», «reuse» and «recycle». These seven pillars describe the end state of the circular economy once it has been genuinely achieved. These seven features are a way to approach problems in a systemic manner and they can be used for evaluating the circularity of products, projects, businesses and investment portfolios.

1. «Materials are cycled at continuous high value»: Materials are cycled at continuous high value. Material complexity is conserved by cascading materials in their most complex form for as long as possible. Material cycles are designed to be of appropriate lengths for human time scales and the natural cycles to which they are connected. Scarce materials are preferentially cycled at shorter intervals so they can be recovered sooner for reuse.

Materials are transported within as small a geographic range as possible. Materials are not mixed in ways which preclude separation and recovery, unless they can continue to cycle infinitely at high value in their mixed form (although this is still not ideal because it limits choice). Materials are used only when necessary: there is an inherent preference for dematerialization of products and services;

2. «All energy is based on renewable sources»: it is means that the system is designed for maximum energy efficiency without compromising performance and service output. The materials required for energy generation and storage technologies are designed for recovery into the system. Energy is intelligently preserved and cascaded when lower values of energy are available for use. Density of energy consumption is matched to density of local energy availability (energy transport is avoided). Conversion between energy types is avoided;

3. « Biodiversity is supported and enhanced through human activity» : this is the principal feature within a circular economy. Habitats, especially rare habitats, are not be encroached upon or structurally damaged through human activities. Preservation of ecological diversity is one of the core sources of resilience for the biosphere. Material and energetic losses are tolerated for the sake of preservation of biodiversity; it is a much higher priority;

4. «Human society and culture are preserved»: Human society and culture are preserved. As another form of complexity and diversity (and therefore resilience), human cultures and social cohesion are extremely important to maintain. In a circular economy, processes and organizations make use of appropriate governance and management models, and ensure they reflect the needs of affected stakeholders. Activities that structurally undermine the well- being or existence of unique human cultures are avoided even at high cost;

5. « The health and well-being of humans and other species is supported»: Toxic and hazardous substances are minimized and kept in highly controlled cycles, and should ultimately be eliminated entirely. Economic activities never threaten human health or well- being in a circular economy. For example, successfully recycling e-waste by having people burn it over open fires is not considered a "circular" activity despite the fact that it results in material recovery;

6. «Human activities generate value in measures beyond just financial»: this feature establish that materials and energy are not available in infinite measure, so their use should be intentional and make a meaningful contribution to the creation of societal value. Forms of value beyond financial include aesthetic, emotional, ecological. These cannot be brought down to a common measure and must be recognized as value categories in their own right. The choice to use resources maximizes value generation across as many categories as possible;

7. «The economic system is inherently adaptable and resilient»: The economic system has governance systems, incentives and mechanisms in place that allow it to respond to systemic shocks and crises. This refers to the distribution of power, the structure of information networks and ensuring that back-ups exist in the case of failure of parts of the system. The same principles of resilience apply on small as well as large scales. In this pillar water resources are extracted and cycled sustainably. Water is one of our most important shared resources: sufficient quantity and quality of water is essential to our economy and our survival. In a circular economy the value of water is maintained, cycling it for indefinite re- use while simultaneously recovering valuable resources from it whenever possible. Water systems and technologies minimize freshwater usage, and maximize energy and nutrient recovery from wastewater. Watershed protection is prioritized, and harmful emissions to aquatic ecosystems are avoided as a top priority.

The circular economy describes a regenerative system, whose objective is to reduce the use of resources and energy, waste production and emissions to an unavoidable minimum. To achieve this, energy and material cycles should be effectively slowed down, reduced and ultimately closed.

Catchwords such as resource shortage, climate change and carbon emissions clearly illustrate the current relevance of effective environmental management, in which the circular economy plays a significant role.

In addition to the longest possible use period of wood products, the means of choice is useful recovery. In this way, the circular economy supports active protection of valuable resources and furthermore, contributes to the reduction of carbon emissions, air, water and soil pollution as well as considerable energy savings. The circular economy therefore makes an important

contribution to ensuring we meet our far-reaching responsibility for man and the environment. The circular economy, as repeatedly stressed in the following paragraph, is an industrial system that is restorative or regenerative by intention and design. It replaces the «end-of-life» concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models. Such an economy is based on few simple principles that have been described above. These principles all drive four clear-cut sources of value creation (MacArthur 2013) that offer arbitrage opportunities in comparison with linear product design and materials usage, as shown in Fig. 1.4. These sources offer arbitrage

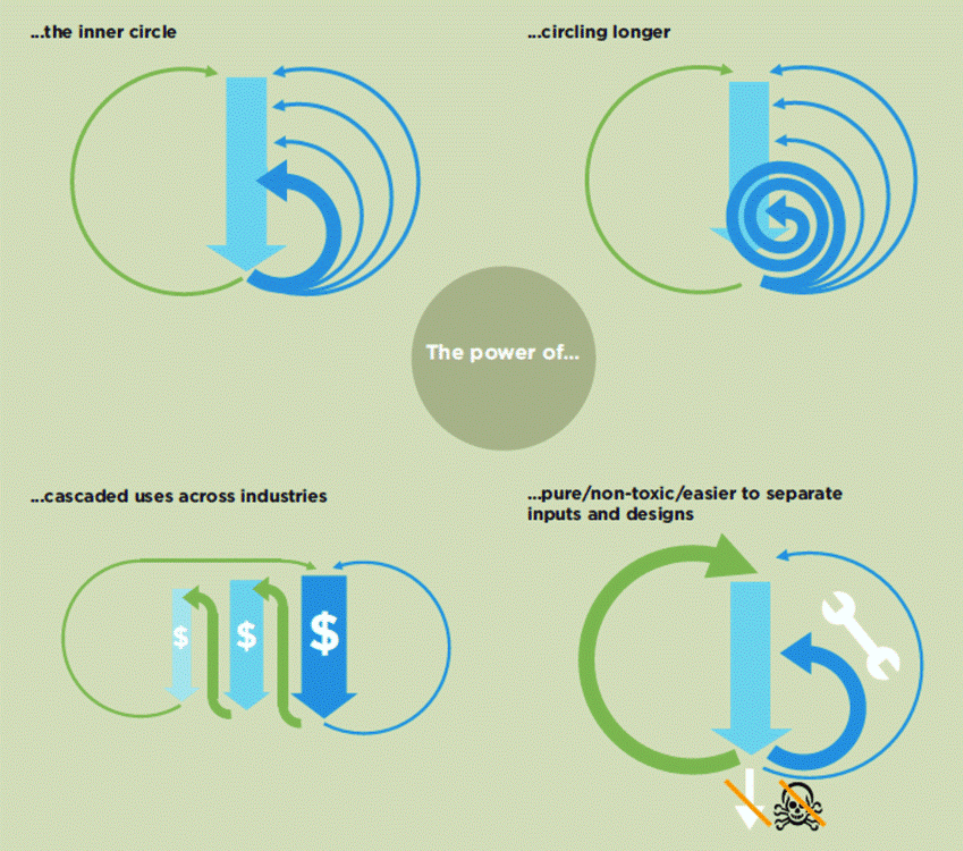

Figure 1.4: Source of value creation in the circular economy. *MacArthur, E. (2013).*

opportunities in comparison with linear product design and materials usage: the «power of the inner circle» refers to minimising comparative material usage vis-à-vis the linear production system. The tighter the circle, i.e., the less a product has to be changed in reuse, refurbishment and re-manufacturing and the faster it returns to use, the higher the potential savings on the shares of material, labour, energy, and capital embedded in the product and on the associated

rucksack of externalities (such as greenhouse gas (GHG) emissions, water, toxicity). The other powers are:

- The «power of circling longer» which refers to maximising the number of consecutive cycles (be it reuse, re-manufacturing, or recycling) and/or the time in each cycle;

- The «power of cascaded use» refers to diversifying reuse across the value chain, as when cotton clothing is reused first as second-hand apparel, then crosses to the furniture industry as fibre-fill in upholstery, and the fibre-fill is later reused in stone wool insulation for construction — in each case substituting for an inflow of virgin materials into the economy — before the cotton fibres are safely returned to the biosphere;

- The «power of pure circles», finally, lies in the fact that uncontaminated material streams increase collection and redistribution efficiency while maintaining quality, particularly of technical materials, which, in turn, extends product longevity and thus increases material productivity.

These four ways to increase material productivity are not merely one-off effects that will dent resource demand for a short period of time during the initial phase of introduction of these circular setups. Their lasting power lies in changing the run rate of required material intake. They can therefore add up to substantial cumulative advantages over a classical linear business-as-usual case. The basic concepts of circular economy are already in use in many parts of the world. But the principles are already applied in:

- China since 2006, has run nationwide mandatory energy saving and pollution reduction programmes to address what Chinese researchers refer to as «low resource efficiency» and «high pollution levels». According to UNEP, in 2009, China became the third country in the world to promulgate a law pertaining to the promotion of circular economy. Through a national leadership in the last two 5-year plans, the so-called «circular economy» strategies were implemented to address the challenges raised by the limits of "linear processes", from primary resources to products and, further, to post-consumption wastes. A further strengthening of measures is expected for the upcoming 5-year plan and the measures China introduced will be of crucial significance for every other developing country with

similar policy intentions and, in many ways, a test case for a "global economy" at world level;

- Japan, the Sound Material Cycle Society (SMC) concept was central to the approach where Material Flow and these instruments are probably the most advanced examples of measures aimed at increasing in practice resource productivity and environmental impacts;

- Germany, between 1994 and 2007 a seemingly impressive level of resource decoupling has occurred even if the figures did not allow to adequately measure the impact of this decoupling;

- Netherlands, the stream of products from the metal and electrical sectors that are repaired and reused represented about 16% of the number of new products and about 81% of products from these sectors are offered for recycling suggesting that, in these two sectors at least, a certain degree of circularity has already gained acceptance.

In the United Europe circular economy principles have been gradually integrated in industrial best practices, green public procurement, use of cohesion policy funds, and in the construction and water sectors. In its 2017 report on the «Circular Economy Action Plan», the EU Commission listed the key measures taken among which steps that should be taken to inform and encourage investors and innovators to follow a circular economy model.

Chapter 2

The olive oil sector

2.1 Historical background

The production of oil was an important achievement both from an economic and also a cultural point of view.

Olive oil was already a precious product and in great demand already in the cultural exchanges of the ancient cities of Mesopotamia and Egypt. The commercial exchanges of olive oil that took place between the Phoenicians, the Mycenaeans and the Greeks allowed the ancient populations of the coastal regions that today make up Greece, Tunisia, France and Italy, to know and discover the oil with all its countless qualities.

Peoples, going hand in hand with historical periods, have marked the fundamental phases of oil production. In fact in this paragraph we will identify the phases of this evolution.

The use of oil dates back to 4000 B. C., in Armenia and Palestine, but also in India. Olive oil was used as an ointment for the skin, to power the lamps - lampante oil - and taken as a medicine. In 2500 B.C., the Babylonian code of Hammurabi regulated the production and trade of olive oil, but it was the Greeks who spread olive cultivation in the Mediterranean. In Greece the owners of the olive groves themselves produced and sold the oil: the olives were harvested while still unripe, ripening or ripe. The sale, as well as in the countryside and in the shops, was also practiced in the Agora, outdoors, thanks to the use of awnings, only later were the arcades intended for commerce built. Greece itself preserves legends relating to oil: it is said, in fact, that the first olive tree sprouted on the Acropolis of the goddess Athena during the contention of

the Attica region with the god Poseidon. Zeus gave Athena privileges for the gift of oil, useful for flavouring food, for personal care and the production of light. Another legend tells that Apollo was born under an olive branch, while his son Aristeo, after having learned the secrets of cultivating olive trees from the nymphs, taught the inhabitants how to crush olives to obtain oil.

With the Greek colonization in the Mediterranean and thanks to the Phoenician ships, which acted as an intermediary for the exchange of goods with other countries, the oil also arrived in the Italian peninsula, becoming a cornerstone of the economy, the so-called «green gold», an inextinguishable source of income.

Romans begins to use and produce oil to make scented balms, medical ointments, which were able to heal bleeding wounds, relieve itching and heal nettle plant stings, even soldiers anointed themselves with oil to protect themselves from the cold. In fact, it is said that the battle of the Carthaginians against the Romans was won by the first, since it took place on a particularly cold winter day, the Carthaginians had protected themselves with oil, unlike the Romans, who, not knowing it technique, had no practiced. Finding themselves fighting in the icy waters of the river, their legs shrivelled from the cold and gave way.

It was the Romans who popularized the plant in all the territories of the Empire and imposed the payment of taxes in the form of olive oil. Thanks to them, the process of olive cultivation and oil production improved and the spread of the product reached the territories of Northern Europe. The Romans also classified oil based on the different types of pressing:

- «*oleum ex albis ulivis*» obtained from the pressing of green olives;
- «*oleum viride*» obtained from olives in an advanced degree of ripeness;
- «*oleum maturum*» made with ripe olives;
- «*oleum caducum*» obtained from olives fallen to the ground;
- «*cibarium oleum*» made from dried olives.

This gave rise to the appearance of specialized oil sellers, who exercised their work professionally and following rules according to a regulation of the purchase and sale prices. With the fall of the Roman Empire and the arrival of the barbarian populations, agriculture and olive

growing in particular suffered serious damage and almost disappeared, giving way to woods and uncultivated lands.

The production of oil in the Middle Ages does not take a place of primary importance, because in this period agriculture dominates different, not so much engaged in trade as for the sustenance; the diffusion of the olive tree decreases to recover the better soils for producing staple grains and fats are preferred animals, which are better preserved. They are the friars, especially Benedictines, a to preserve the art of cultivating the land and its fruits and to keep long live the oil culture.

During the early Middle Ages the destruction of the countryside led to the impoverishment of the olive trees. At that time it was the religious orders, which owned the olive trees, also used in the celebration of masses, to proceed to the pressing of them, to extract oil. It was around the year 1000 that, thanks to land donations from monasteries and convents, the first signs of recovery were seen. The bourgeoisie began to increase the presence of olive groves, also in Tuscany and it was discovered that the production of this precious product was marketable and became an excellent source of income.

In the Renaissance, thanks to the Cistercian and Benedictine abbeys, guardians of plants and herbs, olive growing and viticulture were saved from abandonment.

In the 18th century, the olive tree and its fruits began to be catalogued, classifying them according to their geographical origin. Olive oil was increasingly widespread and known, within Europe, as an Italian product of excellence and it was, precisely in this flourishing period, that some Italian regions defined their olive vocation, increasing the cultivation of olive.

In the same period, some Franciscan missionaries brought the first olive trees to the New World, but it was only a hundred years later that olive oil was also marketed in America, thanks to Italian and Greek immigrants.

In the second half of the twentieth century, oil, due to the economic boom, began to be considered a poor element and was replaced by richer animal fats.

The last decades have decreed the success and redevelopment of oil, also thanks to the success of the Mediterranean diet.

Olive oil has become one of the most loved and most exported Italian food products in the world.

2.2 Legislation and regulatory bodies

In this paragraph it is important to focus on the bodies and organizations that have the possibility to legislate and to indicate directions of intervention in the field of olive oil.
The regulatory bodies are The Europe Community, the International Olive Council, the Ministry of Agricultural Policies and forestry and AGEA (Agricultural disbursement agency).
The International Olive Council (IOC) is an intergovernmental organisation of states that produce olives or products derived from olives, such as olive oil. It was set up in Madrid, Spain, in 1959, under the auspices of the United Nations.
The International Olive Council deals to increase the international trade in olive oil by providing data, research and sector studies.
The Council is a decisive player in contributing to the sustainable and responsible development of olive growing and it serves as a world forum for discussing policymaking issues and tackling present and future challenges. It does so by:

- «Encouraging international technical cooperation on research and development projects, training and the transfer of technology»;
- «Encouraging the expansion of international trade in olive oil and table olives, drawing up and updating product trade standards and improving quality»;
- «Enhancing the environmental impact of olive growing and the olive industry»;
- «Promoting world consumption of olive oil and table olives through innovative campaigns and action plans»;
- «Supplying clear, accurate information and statistics on the world olive and olive oil market»;
- «Enabling government representatives and experts to meet regularly to discuss problems and concerns and to fix priorities for IOC action»;
- «Working in close partnership with the private sector».

The IOC is made up of three figures:

1. the Council of Members and its Committees;

2. the President of the Organisation;

3. the Executive Secretariat.

The Council of Members, is principal decision-making body. The Council of Members is made up of one delegate per Member, who is assisted by alternates and advisers. It meets at least twice a year to review the work carried out by the Organisation and to approve its programme of activities and budget for the next year. The Council of Members can set up as many committees or subcommittees as it needs. The committees do a very important job in discussing and laying the groundwork for proposals and four-year action plans, which are then submitted to the Council of Members. At the moment, there are five committees: the Administrative and Financial Affairs Committee, the Chemistry and Standardisation Committee, the Technology and Environment Committee, the Economy and Promotion Committee and the Advisory Committee on Olive Oil and Table Olives. Except in the case of the Advisory Committee on Olive Oil and Table Olives, the committees are made up of one delegate per Member, plus alternates and advisers.
The President plays a vital part in the life of the Organisation and carries out a number of duties, most importantly presiding over meetings and sessions and representing the IOC legally and has legal responsibility for the organization.
Third body is the executive secretariat, a collegial body that carries out the operational activities of the board, is composed of four operational sections that carry out different but complementary activities: technical division, studies and evaluations division, promotion division, financial division.
As regards the European Union, the common agricultural policy identifies the set of rules and mechanisms with which the EU has regulated the agricultural sector in the member countries.
The Common Agricultural Policy was the first European policy that the European Economic Community, then the European Union, adopted in the agricultural sector as a strategy for the equitable and stable development of European countries. It is launched in 1962, pursuant to Article 39 of the Treaty on the Functioning of the European Union, in a context marked by the scarcity of food supplies and rural backwardness. The Common Agricultural Policy (CAP), regulates production and aid to farmers, provides quality standards, and regulates domestic trade and exports. The CAP is a dynamic policy, which pursues certain objectives such as: help farmers to produce sufficient quantities of food for Europe and to ensure them a standard of

living quo, protecting them from market crises and imbalances within the food supply chain, addressing fluctuations in global markets and price volatility , from market crises and imbalances within the food supply chain.
It also aims to provide food security to all European citizens, guaranteeing safe and quality food at affordable prices, investing in the modernization of farms, protecting the environment, animal welfare and biodiversity, and mitigating climate change. , through a sustainable exploitation of environmental resources.
The Agricultural disbursement agency was established with the legislative decree n. 165/99. It is an Italian state body that has the task of carrying out the functions of Coordination Body and Paying Body in the context of the disbursement of European Union funds to agricultural producers. The purpose of this body is to coordinate the financing of the common agricultural policy. The body acts as Italy's sole representative vis-à-vis the European Commission for all matters relating to the European Guidance and Guarantee Fund for Agriculture (EAGGF) and is responsible towards the European Union for the obligations related to the management of aid resulting from the common agricultural policy.

2.3 The structure of the market and the production in Italy

After having paid attention to the historical evolution of the crop and having analysed the regulatory framework, this paragraph analyses the structure of the olive oil market. The latter being perhaps the only product consumed and traded worldwide most closely linked to the Mediterranean, it presents a complex market: production is widespread between developed and developing countries, and is carried out through very different production systems, even in the within the same country (D'Andrea 2015).
The olive oil market is a segmented market as it needs to be considered that olive oil is produced on a regional scale but is traded worldwide; transformation activities are dispersed, while bottling is increasingly concentrated and the presence of multinationals is strong; at the same time, even the brands of small bottlers can be profitable if they operate with efficient marketing strategies; the consumption of olive oil is growing, but consumption patterns vary widely, both in terms of quantities and qualities consumed. Finally, the olive oil market is characterized by numerous conflicts of interest that develop between actors vertically and horizontally both along

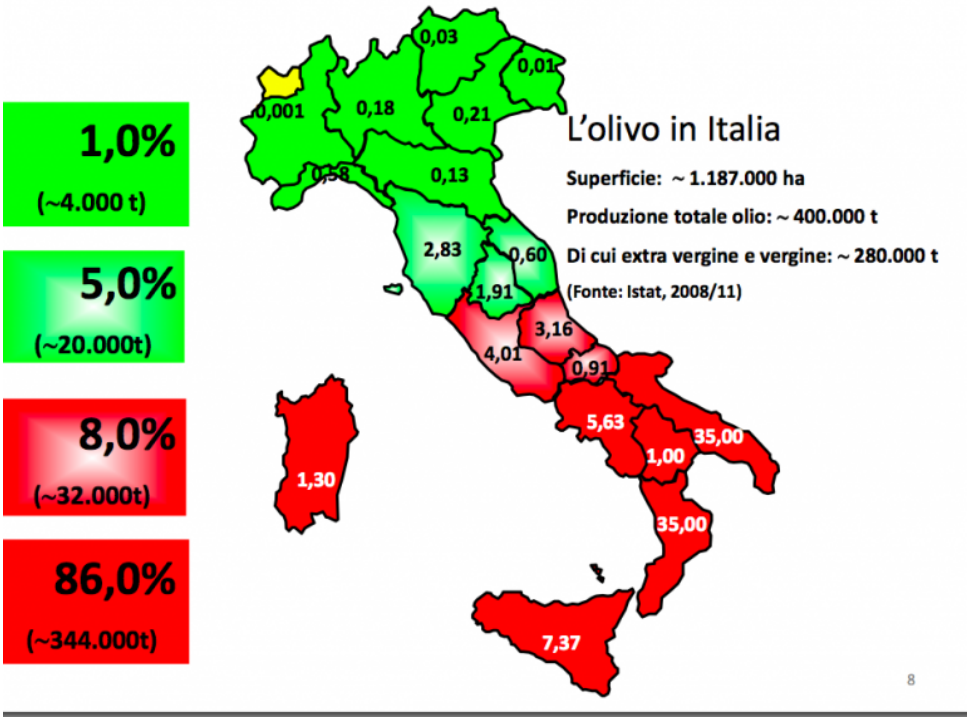

Figure 2.1: Olive oil production in Italy. *Abate V., 2018*

the «supply chain» and within the same country and between actors from different countries.

As regards the production of olive oil on the national territory, it must be taken into account that in our peninsula there is more than one million hectares used for olive growing, with the regions of the South (Calabria and Apulia in particular) which are the protagonists and for this it is a sector that has a significant impact on the national economy (see Fig. 2.1). Observing this graph, what was said above emerges: confirmation is given by the numbers that testify to the size of Italian olive growing.

The surface of hectares used for the production of oil is equal to over one million with an enormous number of plants (about 150 million) present in the area. In Italy, the «beauty» of over 5 million quintals of olive oil are produced every single year.

The southern regions play an important role in the production of oil: Apulia with over 250 thousand existing olive farms; Calabria follows (with around 130 thousand companies), Campania closes the podium with just over 110 thousand companies.

If it is true that the South rises to the top as regards quantity, other regions of the boot play a leading role in the quality of the oil. Tuscany, for example, is a region that excels from this point of view, sharing this sort of «qualitative podium» with Apulia. In addition to Tuscany,

there are also other areas of Italy that can boast a production of olive oil of considerable quality. The production of Tuscan extra virgin olive oil boasts some oils of excellence, with a protected designation of origin, such as «Franci Toscano» extra virgin olive oil, which is among the most popular not only in Italy and is one of the driving forces of the region's economy . The temperate climate, the low rainfall, the hilly and highly calcareous terrain mean that the olive tree is quite widespread here, with about 93 thousand hectares of olive growing area, 90% of which are located in hilly or low mountain areas between Florence, Grosseto, Siena and Arezzo. This is why Tuscany is among the six most virtuous Italian regions in the production of oil.

Liguria for example, where a high quality oil is obtained thanks to the pressing of Taggiasca olives, among the most renowned for the production of extra virgin olive oil.

Then there is Umbria, a region that has always been able to produce relevant oil. Umbrian oil is a true Italian excellence, with the various farms in the region able to win the interest and appreciation of professionals in the sector. In particular, in 2019 the area dedicated to the cultivation of olive trees grew by 67%, and the relative number of olive trees under control increased by approximately 44%. the quantity of certified product increased by about 30%, passing from 411,520 liters to 533,105 certified liters.

Abruzzo can also boast a remarkable production, with a century-old history of olive cultivation carried out with due respect for nature, the territory, and its traditions.

Abruzzo is the fifth most productive region in Italy as regards the production of olive oil. About 530 mills scattered throughout the Abruzzo region are registered every year. The annual production amounts to over two hundred and fifty thousand quintals of oil, of which almost 50% is concentrated in the province of Chieti, while the other half of production is distributed in the cities of Pescara, Teramo. Abruzzo oil also represents a national heritage, a «treasure» produced by the millions of olive trees present in the area.

Italy is also the world's leading importer of olive oil. In fact, national production alone is not enough to satisfy the consumption of our country, which is thus forced to import it from abroad to compensate for the shortage: ISMEA estimates that in 2018 the consumption of olive oil in Italy was 8.9 kg per person, an increase of 4.5 percent compared to 2017. The low production had direct effects on the industrial price of extra virgin olive oil, which in December 2018 reached € 5.60 per kg, a price up 40 percent compared to last June, and twice that of oil produced in Spain.

In particular in 2018 due to torrential rains, hail, Burian with its ice storms, there was a real collapse of olive oil production.
The latter in fact fell to historic lows, reaching only 265 million kilos. However, this decline in production does not remove Italy from the podium of producers, ranking it as second in the world for the 2018/19 vintage.
The regions that have seen the most collapse in production are, as regards southern Italy, Apulia with a -58% (production of 87 million kilos), Calabria -34% (47 million kilos), Sicily -25% (39 million kilos) and Campania with -30% (11.5 million kilos).
At the center, the trend remains negative, with Abruzzo suffering a drop of -20% (11.6 million kilos of production) and Lazio -20% (14.9 million kilos). Tuscany, on the other hand, is an exception and, together with northern Italy, reserves the biggest surprises, given that the percentages are positive again with +15% for the Dante region and in general +30% for northern Italy.
One of the solutions to recover the Italian production deficit plans to increase the cultivated surface over the next 4 years from just over one million hectares to 1.8 million hectares, with a consequent increase in irrigated areas with innovative techniques for saving the water. This plan aims to strengthen a supply chain that involves more than 400,000 specialized farms and which boasts 43 PDOs and 4 PGIs, the largest number of denomination extra virgin olive oil in Europe, and the largest treasure of biodiversity in the world with 250 million plants and 533 varieties of olives. Italy produces quality olive oil, albeit in decreasing quantities. The purpose of the sector's development policies is to achieve the highest quality olive oil production and to conquer interesting foreign markets, such as China and America.
In our peninsula, the turnover of the Italian oil industry largely exceeds 3 billion in the face of a global market characterized by growing demand: between 1990 and 2019, as regards oil consumption there was an increase worldwide by 82%. Yet, despite these numbers, the Italian olive sector struggles to renew itself and keep up with competitors with more modern olive growing systems, such as Spain. all this for various reasons listed below:

- the pulverization of the production fabric;
- high costs and volatile prices;
- little innovation and insufficient generational turnover;

– the problem of the age of the plants and their extreme production variability.

Different is the situation of the olive oil market in 2020. Due to the global pandemic Coronavirus, olive oil production suffered a 2 billion euro crash.
The main causes linked to this collapse are: forced closure of bars, restaurants and farmhouses, which still have to deal with the difficult restart, obstacles to tools and the elimination of tourist presences. According to an analysis by Coldiretti, what weighed on the sector was above all the arrest «of the catering channel, which represents an important outlet for Made in Italy oil, both at home and abroad».
This has had a devastating impact on an economic, occupational and environmental level for a supply chain that counts over 400,000 specialized farms in Italy, «but also the largest number of extra virgin olive oils with denomination in Europe (43 PDO and 4 PGI)». With a heritage of 250 million plants and 533 varieties of olives, it is the largest treasure of biodiversity in the world. In addition to the global pandemic, in 2020 there was also a collapse of 44producers. «A trend caused by the presence on the world market of abundant stocks of old Spanish oil - accuses Coldiretti - often ready to be passed off as Italian due to the lack of transparency on the product on the market».
According to EU regulation 182 of 6 March 2009, it is mandatory to indicate the origin by law on the label. But, on the bottles of extra virgin olive oil obtained from foreign olives for sale in Italian supermarkets, the words «blends of community olive oils» are hardly ever read. Coldiretti, in fact, explains that «the writing is often printed in small format and, in many cases, in a position on the label that makes it difficult to see». All this has produced «A serious economic and image damage for the Italian olive grove and the only way to relaunch the sector is a plan to save olive trees with extraordinary measures to support agricultural companies and oil mills operating in a short supply chain». The plan therefore provides for the immediate release of the resources already allocated for the modernization of the olive production chain, non-repayable support for companies producing 100% tricolour oil to compensate for the reduction in sales and additional aid for PDO certified oils and PGI in stock, loose or packaged not sold on the date of the Prime Ministerial Decree of 11 March. But to restore this sector hit by this crisis, public and private investments are also needed, votes to guarantee the resumption of searches for Italian oil.

2.4 The Evolution of the Business Model in the Olive sector in the circular economy approach

The circular economy embraces sustainability with a systemic, holistic approach. The result is a new way of designing and using products and services. this is what we got to know in depth in the first chapter. in the following paragraph we will analyse how these principles apply in the olive oil sector.

The economy is by definition a dynamic system, capable of adapting and profoundly orienting the development of markets. Economic models are therefore subject to the pressure of evolutionary processes whose results may be unexpected compared to the premises, resulting in completely new and innovative scenarios. In this context of pure dynamism, the new vision of the Circular Economy is born, an economy in which the product and the process must be the result of the recovery and enhancement of wastewater and associated waste. In fact, the application of the Circular Economy model to the production of olive oil represents a great opportunity for growth and renewal for the sector, able to make a high quality product even more current through the creation of new production processes and new ones. development opportunities.

Olive oil has been obtained in Mediterranean countries for at least three thousand years by grinding olives; the processing of olives was still an artisan activity as inside the premises of the mill, in fact, there was always a fireplace and the heat of the fire was exploited to heat the water useful for processing.

Today the activity of the mills is very different; the technical and technological evolution of tools and machinery has generated new needs for producers and consumers, with a renewed attention to by-products deriving from olive processing listed below.

The systems adopted for oil extraction are essentially: «traditional pressure extraction», gradually replaced by «continuous extraction and centrifugation systems», especially in oil mills with larger volumes of transformed product.

The oil is extracted a few hours after the harvest. for the olives to be transformed in time it is essential that the working capacity of the mill is sufficient to be able to process the olives in a few hours even in the middle of the harvesting campaign. as we have specified there are two extraction systems: in the traditional extraction system, the pressing of the olives is obtained

by crushing the olives with the mill or grinder in granite stone. The olive paste is then layered on disc-shaped mats called "fiscoli" which are then stacked one on top of the other and placed under a press where the liquid part is separated, that is, the oil and water. The oil is finally separated from the water by natural decantation or better by centrifugation. it is an old method of oil extraction. Today, modern oil mills instead use a centrifugation process to extract the oil. In these plants the extraction is carried out with a crusher where the olives are ground together with the stone; from here the olive paste is gently stirred (kneading) for less than an hour in order to facilitate the subsequent separation of the oil. Finally, the pasta enters a centrifuge that instantly separates the solid part called "pomace" from the vegetable water and oil. After the extraction of the oil, a key step is that of conservation. Storage in stainless steel tanks protects the product from light, and maintaining a temperature between 12 and 18 degrees is essential to maintain the properties of the final product. Furthermore, the Bios oil is filtered before being bottled. "In other words, all impurities are eliminated, consisting of micro droplets of vegetable water and solid particles deriving from the pulp of the olives - the presence of which determines the turbidity of the oil - can trigger fermentation processes that degrade the sensory and chemical characteristics of the product.
There are three by-products deriving from the activities in oil mills:

1. the wet pomace (Fig. 2.2);
2. the olive peanut (Fig. 2.3);
3. the vegetable water (Fig. 2.4).

Wet pomace, or the residues of pressing, is a type of «sub-product» defined as virgin as it derives from the production process.
The virgin pomace is, therefore, composed of the husks, the pulp residues and the olive pits. The raw olive pomace oil is extracted from the virgin pomace, through the process of «extraction», in fact, of the lipid part. Pomace oil is mainly used, after refining, for human consumption or for the preparation of cosmetic products.
The pomace for centuries was considered a waste, thrown away or burned or dispersed in the ground, even with some benefits because it contains small quantities of potassium salts. However, especially in recent years, favouring a vision inspired by the European principle of the

Figure 2.2: Production residuals. *Gladek E., 2017*

circular economy and the bio-economy, more and more often raw olive pomace oil is destined for energy use, as a vegetable fuel. Olive peanut is a natural fuel with a high calorific value, which we use to power the entire production process, minimizing our environmental impact and producing less waste.

Vegetable waters are aqueous substances deriving from the olive oil processing processes. The vegetation waters are characterized by a dark color that can go up to black, and are characterized by a typical, really intense smell that recalls that of the drupe from which they derive.

they consist of an aqueous solution of organic and mineral substances which can contain in suspension some solid vegetable material escaped during the separation phase of the oily must. The vegetation waters consist of:

- vegetable water of oil olives;
- dilution waters of oily pastes used in continuous plants;
- soluble substances dissolved in the drupes.

These waters have a high concentration of organic substances such as sugars, pectins, fats, nitrogenous substances, sugar alcohols, poly-acids and mineral elements such as phosphorus,

Figure 2.3: Olive peanut. *https://oleificiooroantico.com*

potassium, magnesium and calcium.

The vegetation waters have a dark color, which can reach black, a very intense typical odor, have a slightly acid pH, a high electrical conductivity, and are easily fermentable due to the presence of sugars and proteins.

Before 1976, they were disposed of via the sewer system; subsequently, with the entry into force of the so-called «Merli Law», Law 319/1976 «Rules for the protection of water from pollution», the vegetation waters were classified as «waste» and the millers were forced to sustain costly disposal processes.

In fact, the organic load of vegetation water is very high: even if some components are necessary for the land for agricultural use (such as nitrogen, phosphorus, potassium, magnesium), the potential environmental alteration of these waters It is consistent. In fact, they present phenolic concentrations, capable of originating phytotoxicity to plants and pollution to the aquifer: phenols have bacteriostatic and bactericidal properties and are of poor biodegradability, therefore they have difficulty in being treated in conventional purification plants, if not with very high costs management.

For this reason, in the second half of the Eighties, the controlled spreading of oil effluents on

Figure 2.4: Vegetable water. *Bioneutra srl, 2019*

agricultural land was authorized for fertigation. It has been found that the environmental impact through fertilization from vegetation waters, if certain quantities are not exceeded, referring to time and surface, is limited and does not cause pollution to surface water and the groundwater. After a few years, positive effects on agricultural land have even been highlighted, due to their greater humification and supply of fertilizing substances, particularly phosphorus and potassium.

Disposal on agricultural land was therefore officially regulated by Law 574/1996 «New regulations on the agronomic use of vegetation water and oil mill discharges», which established the maximum quantities allowed for spreading. The limits set by law are $50 m^3/ha/year$ for water from traditional cycle mills and $80 m^3/ha/year$ for those from continuous cycle plants. The spreading is allowed only after the presentation, to the mayor, of a technical report drawn up by an agronomist or agricultural expert, agro-technician or geologist.

The subsequent discovery that the components of vegetation waters can have a high commercial value has triggered studies and research activities, to restore their economic and commercial dignity and opening up new horizons for the profitable use of this by-product.

After analysing the three by-products that derive from the extraction process, it should also be noted that the Olive wood has an excellent combustion and is known for its good heat production, embers and aroma: ideal for the wood oven , cooking on the grill and the production of wood

chips which means «flakes» and is produced, with chipping machines, by chopping the wood into flakes of variable size with a length and thickness of a few centimeters, representing an excellent alternative source of fuel that can be used in plants of domestic heating (through the use of a biomass boiler), with considerable advantages in terms of economic savings and at the same time safeguarding the environment by avoiding the use of fossil fuels. Olive wood chips, can be used not only as potential fuels. They have indeed different uses:

- «mulch for vegetable crops or gardens»: by dispersing a layer of wood chips on the worked soil, the sun's rays are prevented from hitting the ground, and this causes it to slow down the growth of unwanted «weeds» as well as counteract drought in the warmer months;

- «light the fire»: it is recognized that olive wood is an excellent fuel, the wood chips obtained from this type of wood is an excellent starter for lighting the home hearth or barbecue;

- «compost»: wood chips, if obtained from green pruning with a higher humidity rate, is an excellent base for producing compost suitable for enriching the soil of the vegetable garden or garden with organic matter. - ornamental: the wood chips represent a strong appeal to nature, it can be used to embellish nature trails, playgrounds for children, in events in the nature / agricultural sector, etc...

Olive cultivation generates a large amount of waste. The growing mass of organic material produced by the extraction activity olive oil raises the problem of their disposal. dismantling the by-products obtained from the oil extraction process is a problem in the Mediterranean countries where, during the short and often rainy harvest season, more than 30 million are produced of m^3 of oil residues, both in the liquid state (vegetation water) and solid (sanse).
With the process of extraction by centrifugation another type of residue was added, the wet pomace, which is not very accepted by the pomace mills due to its low oil content and high percentage of humidity.
The oil residues are characterized by a high polluting load precisely because there are organic complexes that are difficult to biodegrade.
Precisely because of the possible risks related to the management of oil residues with Law 574/96, containing the discipline of «New rules onagronomic use of vegetation water and oil

mill discharges oleari», allows the controlled spreading of vegetation waters on land used for agricultural purposes. Beyond and set precise quantitative limits and predict physical and environmental constraints, the standard requires that the spreading be subject to the presentation to the mayor of a technical report drawn up by a agronomist or agricultural expert, agro-technician or geologist. The provisions of the law also apply equally to wet pomace. But the norm does not provide information regarding the best time for the distribution of wastewater, nor does it provide information on the method of incorporation into the soil, or even less on possible phytotoxic effects for crops.

Anticipating the very modern concept of circular economy, the Apulian entrepreneur Vito Cesare Boccardi (1835-1878), during a trip to Germany, around 1865 became aware of the possibility of extracting fat from bones using carbon sulphide, a volatile liquid, with an unpleasant, flammable and toxic smell to breathe, but which immediately proved to be a good fat solvent. Boccardi learned that the German company Heyl, on the outskirts of Berlin, extracted oil with carbon sulphide also from the panels of various oil seeds and thought of applying the process to the olive pomace to obtain oil to be transformed into soap, in its own pomace factory in Molfetta.

Circular economy means an innovative strategy for optimizing the use of available resources according to which the end products of a phase of production become materials of starting for a subsequent stage, resulting to a cyclic system. This strategy, which tends to zero the production of waste, it can be advantageously applied in agro – industrial and food processes, using vegetable by products and wastes of production for obtaining, in a sustainable way, bioactive molecules, new products and energy (Romani 2017).

The circular economy is an economy aimed at self-reproducing. In this model, the materials of biological origin return to the biosphere, that is to say in the vital dimension where each of us works on a daily basis. While the materials that have undergone a «technical» treatment are destined to enter a «circular flow», in a path of reuse that does not compromise their quality. It is an economic model based on the use of renewable energy sources, which aims to eliminate toxic substances, waste and waste.

The circular economy addresses precisely these problems. It is a «new» way of conceiving goods and services simply by giving them new life. Products can be made into new things or used as resources to make other products.

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«In the sector under analysis, the energy destination of oil by-products, especially if accompanied by innovative technologies that optimize extraction yields and improve oil quality, can represent an effective increase in value for the entire supply chain, thanks to their use in biogas and bio-methane plants ».

In the circular economy, products are designed to have a new life thanks to repair and reconstruction. They can even be made into new things or used as new assets for other products. Furthermore, circularity means being aware of the water and energy consumption required in production.

The circular economy, on the other hand, is inspired by the model that nature imposes, in which matter and energy are continuously exchanged between the various systems according to closed-cycle dynamics where waste does not exist. Imitating nature also means designing a product from the start so that at the end of its life it can be converted into something else (including the product of origin).

This type of economy is self-generative and also the life cycle of vegetable oil (various types of seed oil and olive oil), if properly differentiated, reflects this model. In fact, used vegetable oil, if collected in the appropriate containers, can be sent for recovery and transformed into very useful products including biodiesel, a fuel for traction that is not of fossil origin.

In addition to having a fuel that does not contribute to the consumption of oil, an exhaustible and highly polluting source, biodiesel generated from exhausted vegetable oils destined for disposal does not subtract crops destined for food, fighting deforestation and poverty. The life cycle of

the oils is therefore completely circular and sustainable, having the double benefit of removing a waste destined to return to earth and that of creating from this waste very useful resources for the community.

The central theme of this circular renewal is in itself simple to understand and has long been known to operators. The production of extra virgin olive oil is associated with the production of wastewater (solid and liquid) characterized by a high concentration of organic substances produced by the secondary metabolism of the plant. These organic substances are largely chemically stable and recalcitrant to biodegradation, and therefore are able to cause non- negligible pollution if spilled and released into the environment without adequate treatment.

For a long time all this has meant, and partly still means, a regulatory limitation for the management of oil wastewater according to their organic load, associated with the presence of additional costs for treatment operations. An expense that often has an important impact on the economic management of engineering companies and consequently on the cost of the final product, which is destined to face an aggressive and highly competitive market. The Circular Economy considers this scenario, apparently characterized by a strong negative connotation, as a new economic resource. Everything that determines the additional costs, and in particular the presence of recalcitrant organic compounds in the processing waste, becomes a resource with high added value in the Circular Economy model.

Chapter 3

The production of olive oil in Apulia

3.1 Historical background and evolution of the cultivation in Apulia

The second European producer of olive oil is Italy having a production national media of over 6 million quintals, two thirds of which are extra virgin. There are about 250 million plants (of Italian olive groves), many are secular or are located in areas where they contribute to landscape and the environment. In our peninsula there are different types of olive trees in cultivation. There are more than 500 varieties, each with different characteristics that vary from region to region, but more precisely, from place to place. The main classification criterion of variety («Cultivar») of olive tree is the transformation to which the olives are destined, referring to the shape, size and different ratio between stone and pulp and therefore to the content average oil variable from 18 to 27distinguish oil cultivars, table cultivars, Dual purpose cultivar. Other countries such as Spain and France have a lot of them minus: 50-70 maximum, of which only 6-10 are the most common. Apulia is the olive region par excellence with its over 50 million olive trees, it ranks first in terms of the production of olives and oil and for this it can be said that it is certainly the most important Italian olive region. it is both for the region's economy, but it is also a promotional tool for the development of the territory.

The approval of regional law no. 14 of 4 June 2007 «Protection and enhancement of the landscape of monumental olive trees of Apulia» represents an important step in terms of safeguarding not only the territory, but also of the agricultural productions linked to it. Before

going to identify the Apulian oil production areas and dwell on the characteristics, it is advisable to take a few steps back, referring to the history.

The history of olive oil most likely begins in Asia Minor. The reference to the olive tree is already contained in the Old Testament, in fact, the dove brings an olive branch to Noah from Mount Ararat, but how was olive oil used in ancient times?

The olive tree was considered a sacred tree, a symbol of peace and strength.

In Apulia, olive oil was used not only to heal the skin but also to power lamps. The first evidence of the presence of the olive tree in the Apulian area dates back to several millennia ago; the findings of olive pits from the excavations of Torre Canne, embedded in the Neolithic rock, would give us the testimony that the first populations settled there already fed on olives 8-10 thousand years ago. It was the first Phoenician and Greek navigators, and later the Arabs and Romans to spread its cultivation along the plains and sunny hills of the Italian peninsula. The intensification of maritime traffic along the coasts of Southern Italy by the Phoenicians, Greeks and Romans was the basis of the development of olive growing in Apulia, whose millenary civilization has deep roots in the presence of the olive tree, a tree with great sobriety and resistance, which is also suitable for barren and stony soils such as those characterizing the region.

The pressing of olives to obtain oil was a well-known practice many centuries before the coming of Christ: the testimonies of primitive millstones are preserved in museums on the island of Crete, in Haifa in Israel and in Egypt. In the national museum of Taranto there are three ancient amphorae and a sarcophagus of an athlete who had participated in the Panatanee of Athens and was rewarded with richly decorated vases containing olive oil, obtained from the olive trees planted by Solon. With the birth of the Roman Empire, olive oil assumed a strategic function in the field of trade and exchange activities between different peoples, and studies on good olive cultivation also intensified. The early Middle Ages was a period of scarce diffusion for olive growing in the region, isolated olive trees among the cultivated fields or among the grazing expanses mainly affected areas under direct noble management. However, Apulian oil was not a rich commodity and its trade was also conditioned by the bulky containers with which it was transported.

With the advent of Byzantine civilization in southern Italy there is a new cultural framework that leads to the restoration of plants such as olive trees and vines. In the era of municipalities and

monasteries following the fall of the Roman Empire, there was a new impetus for development and renewal for olive growing and olive oil production. The Apulian oil trade resumed by Venetian navigators.

The ports of Brindisi, Gallipoli, Otranto and Taranto became the destination of ships carrying enormous quantities of oil; as well as Venetian warehouses, Tuscan, Genoese, Russian, English and German warehouses are also installed. The Apulian oil trade assumed such importance that in 1559, the Spanish viceroy Parafran De Rivera ordered the construction of a road that connected Naples to Apulia, with bifurcations for Calabria and Abruzzo to allow faster transport of the oil of olive. The history of Apulian olive oil evolves over time; in particular, the first decades of the seventeenth century mark, even in the Terra d'Otranto, the culminating moment of that phase of prosperity that had characterized the entire sixteenth century, but also record the beginning of a long crisis, which will then become irreversible for the whole Twelve o'clock. The deterioration of climatic conditions certainly contributes to this result, and in particular the long cycle of low temperatures that hit Europe after 1600, causes that determine the crop crisis and exceptional famines.

This crisis that reaches up to the eighties of the seventeenth century and then leads to a clear turnaround with a strong recovery of the agricultural economy, with the olive grove that once again dominated the general framework of the agricultural landscape.

In this time different types of olives arrive which find in this region a microclimate favourable to quality productions and for this reason Apulian oil is in demand all over the world. It was precisely the abundance of production in the area that led the Basilian monks to increase cultivation in Apulia.

The royal authorizations of 1371 for the docking of ships that had to transport olive oil in goatskin skins are still available. In the face of growing demand from European countries, crops are also growing. In the fifteenth century, in fact, the Cistercian and Olivetan friars began to cultivate and graft the spontaneously grown olive trees. Apulia continues over time to distinguish itself for quality, to the point that as early as 1700 the Apulian oil was distinguished from other oils, the oil produced in Apulia was used for food purposes, while the other oils called «di Levante» were used for lighting, for lubricating the first machines and for washing wool. After having retraced the salient features that characterize the history of the Apulian oil sector, it must be remembered that:

– Apulia is in the network for the development of the Circular Economy. The Italian Charter for the Circular Economy was signed in Rome on 31 May 2018. The latter was promoted by ENEA, the National Agency for New Technologies, Energy and Economic Development.

  The objective of the Italian Charter for the circular economy is as follows: to connect administrations, civil society, businesses, research, engaged in projects and initiatives on the circular economy, in order to foster synergies and raise awareness at national level and European good Italian practices. Apulia is among the first regions to sign this document, which is a manifesto in which issues related to the circular economy of common interest are defined. The circular economy, as repeatedly reiterated in the previous paragraphs, crosses various economic sectors and faces various problems, such as the transition to renewable energy, the management of the waste cycle, the fight against food waste, the use of resources natural. Apulia has equipped itself with rules and tools that allow it to address these issues and the critical issues related to them in a systemic way, considering each of them as an integral part of a modern and sustainable development policy. The Region was the first Italian region to have grasped the usefulness of this network, confirming its environmental vocation.

  Being part of the network for the circular economy allows on the one hand to raise awareness of the good practices implemented in Apulia; on the other hand, to participate in the most recent and promising initiatives on a European scale, enhancing technology transfer, the birth of new businesses, the dissemination of cultural approaches and diversified consumption styles.

– Again in 2018, with a view to the circular economy, in which everything is recovered and comes back to new life, the Apulian Production District of Renewable Energy «La Nuova Energia» and the Association of the Frantoiani di Puglia (AFP), reference point regional olive oil supply chain, has signed an agreement to produce green energy from the waste from the oil industry. The purpose of this agreement is to enhance the opportunities of mutual interests and enhance new and competitive business models of the by-products of the extra virgin olive oil production industry and also provides for the adhesion and operational involvement of the Frantoiani Puglia Association in the Regional District.

In this regard, «In the oil sector - comments the President of the District, Beppe Bratta - the energy destination of oil by-products, especially if accompanied by innovative technologies that optimize extraction yields and improve oil quality, can represent an effective increase of value for the entire supply chain, thanks to their use in biogas and bio-methane plants. The technological and scientific support for the recovery and enhancement of waste that will reach the oil mills of Puglia through this agreement will be an opportunity to give a more sustainable footprint to our business».

Furthermore, the agreement allows the energy supply chain to become a natural completion of the agro-food chain and offer interesting development opportunities, allowing to realize that circular economy, a source of inspiration, and make the Region increasingly green and sustainable (Tautonico 2018).

– The Apulian oil in 2019 obtained, from the European Union, the designation of Protected Geographical Indication. This is an acknowledgement that is also an extra protection for the consumer, given that thanks to the symbol he will be able to buy a quality oil that respects the local supply chain of the territory.

  «The PGI Olio di Puglia brand is a transparency and enhancement project which, as the disciplinary demonstrates, definitely focuses on quality and distinctiveness in a region that produces over 50% of Italian extra virgin olive oil. An answer has been given to the historic lack of programming with a true supply chain system that has brought to the attention of the public an entirely Apulian paradox, i.e. strong in production, weak on the market, an axiom that is not at all decipherable and understandable that says a lot about the complexity of the production system weakened by adventurers», comments with satisfaction the president of Coldiretti Puglia, Savino Muraglia.

  It also adds that «The PGI brand will guarantee that the extra virgin olive oil is of high quality - adds the president Muraglia - with chemical-physical and organoleptic parameters of absolute value, it is good for health, because the disciplinary provides that only oils with a high level of polyphenols - the most important natural antioxidants - can become PGI, certifying the properties with a specific health claim on the label provided by the EU is an oil that is always fresh, because it must be bottled within the year of production and is of absolute regional origin, an oil certainly «Made in Puglia» both for

the production of olives and for the transformation into oil, but also for the packaging that must be carried out at a defined distance from the place of production».

PGI Olio Puglia is an important instrument of transparency when there is a record growth in world consumption of extra virgin olive oil in the world - concludes Coldiretti Puglia - which in a single generation have made a leap of almost 49% in the last 25 years by changing the diet of citizens in many countries, from Japan to Brazil, from Russia to the United States, from Great Britain to Germany, in the wake of the success of the Mediterranean Diet declared a World Heritage Site by UNESCO.

As evidence of the ancient olive-growing tradition of Puglia, the logo of the new PGI Olio di Puglia is precisely the ancient Tarantine coin, symbol of a territory that has always been dedicated to the cultivation of high quality olives. A strict disciplinary supervises the creation of a product of excellence guaranteed by a land that has always had ideal soil and climatic conditions for the development of fruits with unique characteristics. Only the best olives from the cultivars of Cellina di Nardò, Cima di Bitonto (or Ogliarola Barese or Garganica), Cima di Melfi, Frantoio, Ogliarola salentina (or Cima di Mola), Coratina, Favolosa (or Fs-17), Leccino, Peranzana , present in the Apulian olive groves alone or jointly in a measure of not less than 70% are destined to become fragrant Olio di Puglia IGP and the result is a nectar with excellent organoleptic characteristics. Its beautiful color that varies from green to straw yellow is accompanied by a pleasantly fruity olive scent with evident vegetal notes of freshly cut grass, leaf, fresh almond, artichoke and a taste with vegetal hints, with notes of bitter and spicy intensity variable to which notes of green almond and / or thistle can be associated, with an aftertaste of grass, artichoke, other vegetables and light hints of fresh almond. The polyphenols give spicy and bitter notes and make this oil extremely healthy. The new IGP Olio di Puglia is, therefore, the emblem of the excellence of the olive tradition that is born in the Apulian territory.

3.2 The Apulian olive oil production areas

Apulia is to be considered the leading region for national olive growing as from North to South, the Apulian territory is dotted with olive groves.

Traditional olive groves on rocky and very poor soils, without irrigation, alternate with regal

and irrigated olive groves. For greater uniformity of crop parameters, the entire region has been divided into nine areas: the parameters used relate to climatic conditions, the average number of plants per hectare, their variety and productivity. The lack of water in the areas of the olive groves is compensated by the presence of hollows, caverns, caves, which absorb rainwater, which in turn feeds a complex underground water network.

Puglia, together with Calabria and Sicily, produces about 85% of all national olive oil production. Various associations guarantee the authenticity of Apulian oil: an oil that, from the olive grove to the mill, up to bottling, is compulsorily produced within the territorial boundaries of the region. This region is the undisputed land of the olive tree, that is the tree with which the «heel of Italy» has a real visceral lawyer. From pruning to harvesting, from grinding to consumption, olive cultivation in Puglia has always been surrounded by an age-old dedication that has made oil the «green gold» of Puglia. Although the crop in the various Apulian provinces are quite diversified, in the region there are about 50 million olive trees, which allow the production of high quality oils every year, of which four types have obtained the recognition of Protected Designation of Origin (PDO: Dauno, Terra of Bari, Colline di Brindisi, Terra D'Otranto, Terre Tarantine) (see Fig. 3.1). The Protected Designation of Origin is a recognition that has been assigned to 4 types of oil produced in as many areas of the region.

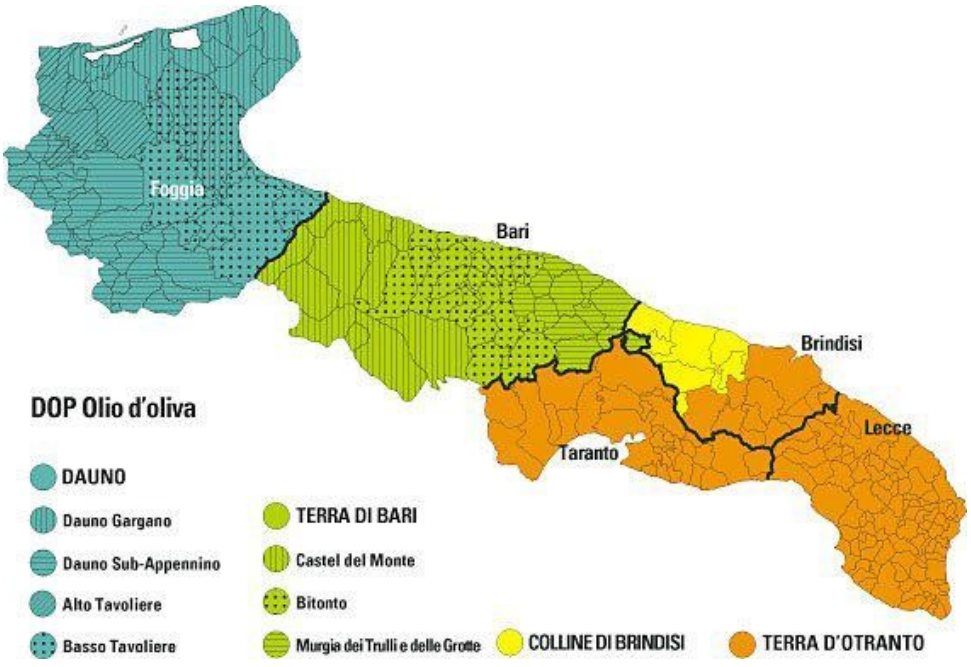

Figure 3.1: Production area of PDO olive oil in Apulia. *https://tipica.serandp.com*

1. Collina di Brindisi PDO extra virgin olive oil is produced in the province of Brindisi and in the municipalities of Carovigno, Ceglie, Messapica, Cisternino, Fasano, Ostuni, San Michele Salentino, San Vito dei Normanni and Villa Castelli.

   Extra virgin olive oil is extracted by simple pressing of the olives, that is, with the exclusive use of physical means such as pressing, pressing and separation. From the milling, through discontinuous extraction by pressure, the oil must be obtained which by centrifugation is transformed into olive oil. This oil, if characterized by the presence of a maximum acidity of 1% and an organoleptic score equal to or greater than 6.5, takes the wording of extra virgin.

   The olives that produce it are approximately 70% Ogliarola, Cellina di Nardò, Coratina, Frantoio, Leccino, and other varieties for the remainder.

   The organoleptic characteristics of the oil produced in this sub-area combine the scent of grass and legumes with a taste tending to sweet which makes it ideal for raw seasoning of first courses, fried foods and fish.

2. Dauno PDO extra virgin olive oil is produced in the entire territory of the Province of Foggia and is produced for 70% from different varieties of olives such as Peranzana, Coratina, Ogliarola, Garganica, Rotondella. It includes four categories of oil:

   – the Dauno Gargano, within which Ogliarola is the prevalent cultivar. It gives the oil a fruity and light taste that is enhanced by the aromas of sweet tomatoes. The oil obtained from Ogliarola is ideal for cold seasoning vegetables, legumes and soups;

   – the Dauno Sub Appennino, the Dauno Basso Tavoliere, in this area, the olive of reference is Coratina, which allows the production of an oil with a fruity taste, letting the aromas of the artichoke emerge. this type of oil is characterized by a sweet but also bitter taste, and is recommended for dressing bruschetta, salads, boiled meats and vegetables;

   – the Dauno Alto Tavoliere, in this area, on the other hand, the typical cultivar is the Peranzana which allows the production of a fruity oil with a sweet taste and is therefore ideal for fish, seafood appetizers.

3. Terra D'Otranto PDO extra virgin olive oil is produced in the entire administrative territory

of the Province of Lecce and many municipalities in the Province of Taranto. It is obtained from different varieties of olives such as Cellina di Nardò and Ogliarola for at least 60%. For the rest, other varieties present in the olive groves concur.
Terra d'Otranto extra virgin olive oil is characterized by a green or yellow color with a slight green reflection, a medium fluidity, an odor with a slight sensation of leaf, a fruity flavour with a medium bitter sensation and a slight spicy sensation. It can be an excellent condiment on first courses based on durum wheat pasta, boiled vegetables and legumes, but also on main courses of meat and fish.

4. Terra di Bari PDO extra virgin olive oil is produced in the Province of Bari and it is obtained from different varieties of olives including Coratina, Cima di Bitonto, Cima di Mola, and others varieties present in olive groves. It includes oil from:

   – Castel del Monte, is the northern area of Bari where the typical cultivar is the Coratina which allows to obtain an oil with a spicy and bitter taste, but with an intense aroma as it is characterized by flavours of almond and artichoke. this type of oil is used to dress salads, bruschetta, boiled meats and vegetables;

   – Bitonto, area characterized by the production of Cima di Bitonto or Ogliarola, olives ideal for the preparation of a fruity, balanced and harmonious olive oil that is perfect for grilled and roasted dishes;

   – Murgia dei Trulli and Grotte, Southern area of Bari, characterized by the olive variety La Cima di Mola, which allows the production of oil with the scent of grass and legumes. Sweet and fluid, the oil produced in this sub-area is perfect for dressing raw fish, risotto, pasta, roasts and fried foods.

The olive tree is a typical plant of the province of Bari, both as an arboreal species that thrives in a particularly favourable habitat, and from a naturalistic, landscape and historical point of view, as it is closely linked to the history and cultural and commercial tradition of the Apulian territory. Olive growing has been practiced in the Bari area since the Neolithic age (5000 BC). Its economic and commercial importance was recognized during the Roman Empire, when imports and exports were regulated by the central administration. Further incentives for the cultivation of the olive tree arose from the Middle Ages, thanks to the work of the religious

orders present in the area. Bari oil spread to Venice, from where it was also sent to various cities in continental Europe. Considered the large production area of the province of Bari, today this PDO is one of the first in terms of quantity.
As regards the production of oil in the four PDO areas of Apulia, Tab. 3.1 shows a comparison between 2014 and 2015 of the territory dedicated to olive cultivation in Apulia.

Area	**Recognition**	**Surface 2014**	**Surface 2015**	**Variation%**
Collina di Brindisi	PDO	484	1.581,13	+226,68%
Dauno	PDO	652,89	646,62	-0,96%
Terra d'Otranto	PDO	691,44	2.238,08	+223,68%
Terra di Bari	PDO	18.099,04	19.631,21	+8,47%
Terre Tarentine	PDO	679,60	579,01	-14.80%
TOTAL		**20.606,97**	**24.676,05**	**+19,75%**

Table 3.1: Data Apulian PDO areas. *Valore Olio Pugliese, dati Istat 2015*

Through this table it can be seen that in Puglia compared to 2014 there was an average growth of:

- 19.56% of the number of producers;
- 19.75% of the surface;
- 8.57% of transformers.

The data of the Colline di Brindisi PDO had the greatest growth (at a percentage level) in all of Puglia with an increase in oil producers from 42 to 111 (+ 152.27%), a significant increase in the area of production from 484 hectares to 1581.13 (+ 226.68%) and an increase in the number of processors from 9 to 15 (+ 66.57%) surpassing the PDO Daunia in numbers.
There are negative data of PDO Daunia on all fronts, albeit of a minor entity. Terra d'Otranto together with Colline di Brindisi has grown considerably on the number of olive oil producers and on the surface, respectively + 183.78% and + 223.68%, decreasing the number of processors from 26 to 17 (-34 , 62%).

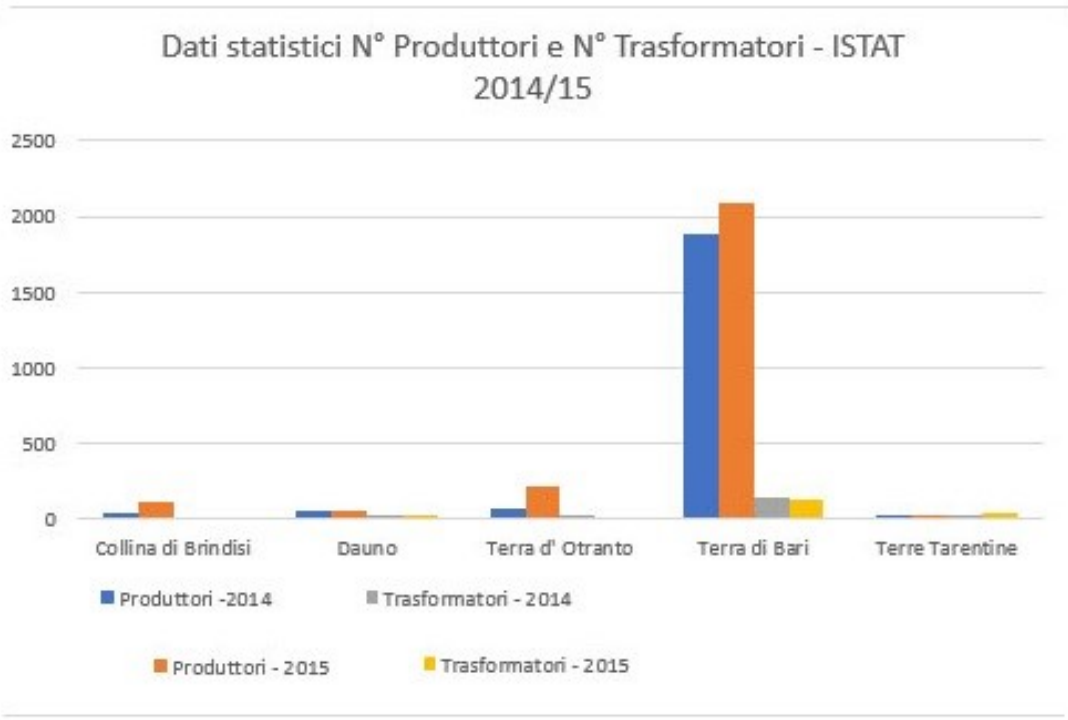

Figure 3.2: Data Apulian PDO areas. *Valore Olio Pugliese, dati Istat 2015*

Small growth for the production of PDO Terra di Bari oil with an increase in the number of producers and in the area, holding the Apulian record with 19,631.21 with a growth of + 8.47% and a slight decrease in transformers compared to 2014.

While for the PDO Terre Tarentine, there is a slightly negative trend for the number of olive oil producers and the surface area, which decreased by -14.80% from 679.6 in 2014 to 579.01 in 2015. The number is increasing of transformers from 18 to 46 (+ 155.56%).

The histograms data from ISTAT plotted in Fig. 3.2 summarise the production evolution between 2014 and 2015. 2016 seems to be marked by a dizzying decline in total production compared to other years due to the discharge year. The climate also strongly influenced the production of this adverse year, with alternations of heat, cold and rain that favoured the oil fly, lowering the quality of the oil. From the ISTAT data relating to olives in Apulia, there is an increase in the production of table olives, basically in the province of Taranto there are 550 q compared to 7,000 q of the previous year. There was also a slight increase in the provinces of Bari and Brindisi.

In the field of oil olives, there is a depression of data due to the vintage, characterized by an average yield of 14 l / q, reaching the lowest in the province of Taranto.

The production of pressure oil indicated by ISTAT data, on the other hand, shows a depression of data throughout Puglia. However, a general substantial drop in pressure oil production can be highlighted in Bari and Taranto, registering respectively: -71.55% in Taranto and -68.00due to a drop in production yield from 16.7 (2015) to 13.4 (2016) for Bari and 10.9 (2015) to 9.3 (2016) for Taranto.

The 2017 vintage was equally different as due to drought and heat record numbers were recorded in the summer period, it seems that a lower olive production will be obtained than last year. The forecast of Apulian oil production, at the risk of a decrease, could raise the value of quality extra virgin olive oil, due to the small amount of value.

What is worrying in this year of production is that the value of quality extra virgin olive oil from Puglia can be influenced by producers and sellers who can counterfeit or adulterate the Apulian extra virgin olive oil, taking advantage of the growing wave of exports; all this to the detriment of the image and prestige of the Apulian extra virgin olive oil.

In 2018 Puglia could reach a production below 100 thousand tons, even lower than that already particularly low in 2016.

The problems related to the March frosts were felt most in the province of Barletta-Andria-Trani. Andria is, in fact, among the most affected areas, but also the municipalities of Corato and Ruvo di Puglia suffered major losses. Milder, but still significant, the problems of snow and frost in the province of Bari. Similar situation in Foggia, where the problems of cold and frost were however more limited than to the province of Barletta-Andria-Trani.

In Salento, without considering the unresolved Xylella problem, the cultivation situation of olive groves appears better than in the North. The conspicuous have made it luxuriant olive trees even if humidity has favoured the proliferation of olive parasites, triggering significant attacks by fly and moth, mostly contained with special ones interventions. Here it is above all the alternation that delineates a situation of production reduction.

Leading the recovery of Italian olive growing are above all the Southern Regions. It will be an excellent year for Puglia (+ 175%), which alone will produce almost 60% of the national extra virgin olive oil: the heel of Italy will be driven by the provinces with the greatest olive growing, Bari, Bat and Foggia, areas that last year had recorded the most important drops due to the damage of the February 2018 frost. In Puglia, however, the negative trend of Salento destroyed by Xylella is confirmed, with the drastic reduction, compared to the already terrible past year,

of 50% of production which will amount to less than 3,000 tons.

3.3 Company profile of an exception: the Biolevante S.r.l. case

Biolevante S.r.l is an Apulian olive oil producer company, deeply rooted in the regional olive oil production panorama. From this point of view, the company represents one of the most historical company of the sector since it was born in 1902, when the Cassetta family decided to transform love for the land and extra virgin olive oil into work.

More than a century ago, in fact, the Cassetta family started in Andria, where the superb mass of Castel del Monte rises, in Apulia, the activity of milling olives, obtaining an olive oil that immediately gained the attention of consumers for its excellence and balance of taste, for the fragrance of perfumes, for the harmony of flavours, for the high digestibility and for the extraordinary lightness. The first years were challenging, yet Biolevante S.r.l. still managed to become a reference point for those wishing to consume a product of excellence, with a balanced and strong flavour at the same time. The olive oil radiated an earthy scent and a passion for quality. Since then, Biolevante S.r.l., in full respect of the ancient tradition of its oil masters and making use of the most recent technologies, continues to receive the unconditional appreciation of the most refined palates both in Italy and abroad.

Since then the company has grown a lot, maintaining the right mix of tradition and new technology with the passion for healthy, sincere and genuine things as well as the awareness of handing down this centuries-old experience in perfect harmony with nature. Even today ancient methods are used during olive harvesting, such as the use of ladders and the combing method, which requires the use of a large wooden tool to gently comb the twig, thus harvesting the olives without damaging the leaves.

The oil mills of Biolevante S.r.l are now equipped with modern systems capable of ensuring procedures that guarantee absolute quality standards and maximum hygiene. The organizational structure is extremely flexible, and the marketing strategies have been devised always keeping in mind the centuries-old culture linked to the cultivation and production of oil.

Biolevante S.r.l. has equipped itself with the latest generation of electronically controlled con-

tinuous cycle systems. However, it maintains the Carrara granite mills for the pressing of the olives in a conscious synthesis between tradition and modernity. Alongside the sorters, the defoliators, the troughs with three millstones, the malaxers, the decanters, there is, however, always the wise hand of man and the experience of oil masters careful to enforce tradition.

In a perspective of a more complete value proposition in terms of products, the company provides to the market a wide range of olive oils that can be packaged in different formats and types of packaging. They can also pack private labels and are very flexible, allowing to meet the needs of our customers.

In particular the olive oil obtained from the first pressing of the olives, left to decant naturally in stainless steel containers, is sent to the packaging lines where the bottling machines, automatically and in sequence, fill and cap the glass bottles, in PET and cans, after a powerful jet of air has eliminated any impurities present inside the containers. The olive oil, packaged and labelled in this way, is packed in cartons or blister packs and placed on pallets to be transported to warehouses away from light, in a cool and dry place.

In particular, the Biolevante S.r.l. olive oil is obtained with full respect for tradition, with care and patience. For many generations Biolevante S.r.l. has committed the same processing systems with a passion for healthy, sincere and genuine things and with the awareness of handing down the experience in perfect harmony with nature.

The Biolevante S.r.l extra virgin olive oil, with a fruity aroma and a fragrant and persistent flavour, combines very low acidity and high resistance to oxidation. It is indicated both raw and in cooking all preparations of Mediterranean cuisine and in diets with a reduced cholesterol content.

The company, since its foundation, was inserted in an entrepreneurial panorama extremely fractionated. This characteristic remained unchanged until today, with the difference that Biolevante S.r.l. during the years reached an important dimension and operate in the international markets, differently from the majority of the other Apulian company, that maintain the form of family business and that are considered therefore as micro enterprises, with the number of workers inferior to 10 and a total turnover of maximum 2 million of €.

The company can be inserted in the cluster of the province of B.A.T. Even though the concentration of olive oil business in this area is lower in terms of number of businesses, arriving to 11,4% of the total Apulian companies, they have an important weight in terms of aggregate

turnover with respect to the other areas of productions.

3.4 Circular economy applications in Biolevante S.r.l.

Since its foundation, the company tried to maintain a right balance between efficiency and effectiveness of the production and the safeguard of the environment.
From this point of view, the value of the sustainability, both from an economic and environmental point of view, represents the key value driver of company. The attempt to conciliate both the aspect has accompanied Biolevante S.r.l. during its entire life and through the subsequent steps of the technical evolution in the olive transformation process. In Fig. 3.3 is presented a sketch of the production processes.
Given the characteristics of the company, it is not a surprise that it can be considered surely a pioneer in the introduction and the concrete application of the concepts of the circular economy in the industry of the olive oil processing, at least in the Apulia area. It is important to note the fact that this transition towards the circularity in the production process in the olive oil sector is in the last years became more and more widespread. In this perspective can be inserted the utilization of the main by-products deriving by the olive transformation in new and subsequent transforming processes able to create different products with an economic value.
Vegetable water (liquid effluent), pomace (solid effluent), peanut and wood chips, through a specific treatment, are possible to be sold in the market or employed internally/externally. to extract. If we consider only these sub-products, the company does not substantially differentiate from other Apulian businesses employed in the industry, that, in this sense, extract extra value from elements that in the past were considered wastes to dispose. However, in Biolevante S.r.l., the concept of sustainability and the application of the circular economy principles are broader and more pervasive.
In the following list are highlighted some elements that for various reasons represent a differentiation of the company with respect to the main competitors and in a perspective of circularity of production and sustainability.

1. A first application experimented by the company was the complete shift toward renewable energy sources. Specifically, the whole plant was reconverted from an alimentation from

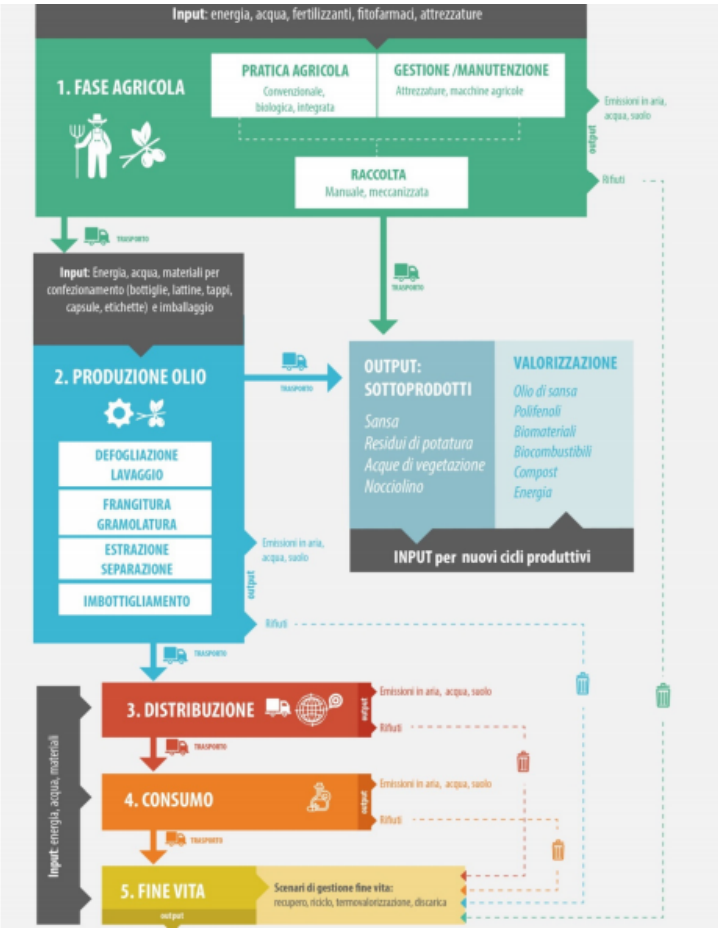

Figure 3.3: Biolevante S.r.l. production process. *ENEA, 2018*

fossil fuel to renewable sources. From this point of view, the energy is derived from double sources: a solar power system at high efficiency and a series of biomass boilers powered by peanut and wood chips, produced by the company itself. By means of this combined alimentation the company became totally emissions free, achieving, at the same time, great cost savings.

The element that it is important to underline is that the introduction of this new types of alimentation was introduced since the beginning of the 90s, representing at the time, at least for the specific industry, an innovation. From this point of view in fact, if the energetic potential of the solar power systems were already known, the application of the peanut and wood chips for energy creation purpose represented at the time an breakthrough.

2. Biolevante S.r.l., after the gradual embracement introduction of a circular economy logic internally and its related advantages, declined in various forms and applications, started

to push the adoption of them, in term of standard to maintain, to its complete supply chain. In the practice, this refers to create a «positive influence» towards small businesses that directly deal with Biolevante S.r.l.

Most of them are family businesses, with from on one hand expertise and experience, but on the other hand without the strength and knowledge to start and pursue an effective transition toward circularity.

The situation created can be reconnected and associated to the so called «communities of practice» (Peri 2017). They refer to systems, involving a discrete number of companies, based on the sharing of knowledge, integrated systems and strict communication capable to generate relevant supply chain synergies. In the specific case, the large majority of the benefits derived from the extension of the application of the circular economy logic in the whole supply chain.

3. The production process, in the last 20 years, remained basically unchanged. Given that, Biolevante S.r.l. focused on the reduction of time of production, the increase of the return of the olive oil and, finally, on the quality of the oil.

   From this point of view, Biolevante S.r.l. employed the PEF technology (Pulsed Electric Field): it substantially employed electrical impulses of various intensity in order to weaken the cellular membranes, permitting the improvement of the olive oil from a nutritional point of view. Clearly the introduction of this innovation entails basically two major consequences:

   – It avoids the utilization of additives in the transformation process. It implicates, from one hand, the complete elimination of elements that present some degree of toxicity; on the other hand, it permits a direct reutilization of the residual of the transformation process in the subsequent cycle of production;

   – Important savings in terms of waste of raw material, other than electricity;

   – In a perspective of further exploitation of the circular economy concepts, the company is trying to perfectionate other two products that could enforce and improve the whole value proposition of the company. Specifically, Biolevante S.r.l. is trying to develop a high-yield biofuel for the alimentation of the tractors and some products at basis of olive pulp employed in the beauty industry.

4. In a perspective of further exploitation of the circular economy concepts, the company is trying to perfectionate other two products that could enforce and improve the whole value proposition of the company. Specifically, Biolevante S.r.l. is trying to develop a high-yield biofuel for the alimentation of the tractors and some products at basis of olive pulp employed in the beauty industry.

   The recall to one of the value creation sources of the circular economy is clear and refers to «power of the inner circle».

   In other terms, Biolevante S.r.l. tried to realize it by means of two products which do not necessitate of a specific transformation process but that derived directly from the normal one, with a potential faster return to the market as final product.

3.5 Evolution of Financial results of Biolevante S.r.l.

The constant application of the principle of the circular economy clearly impacted in an important way on the results of the company, especially in the last years. The advantages deriving from it are present both on the revenue side, since the extension of the products offers, and on the cost side, given the fact that it is possible to undertake an important activity of cost cutting. The growth of Biolevante S.r.l. was continuous in the last 20 years, with an even acceleration during the last five years, as presented by the plots in Fig. 3.5. The total turnover of the company achieved the second place considering all the companies in the whole region, only behind Casa Olearia Italiana S.p.A., although, it is important to specify, it represents a business diversified in different sector.

More specifically, as shown in the graphs below, it is possible to note that the company presented a CAGR of the 11,4% in the last five years. Moreover, also the profitability improves substantially during the years.

These financial results obtained by the company are relevant considering two elements:

1. Characteristics of the business itself distinguished by high fixed costs, especially for the manpower, seasonality and uncertainty related to the weather conditions during the phase of growing and harvesting of olives;

2. In comparison with the average results and returns in the food industry in Italy.

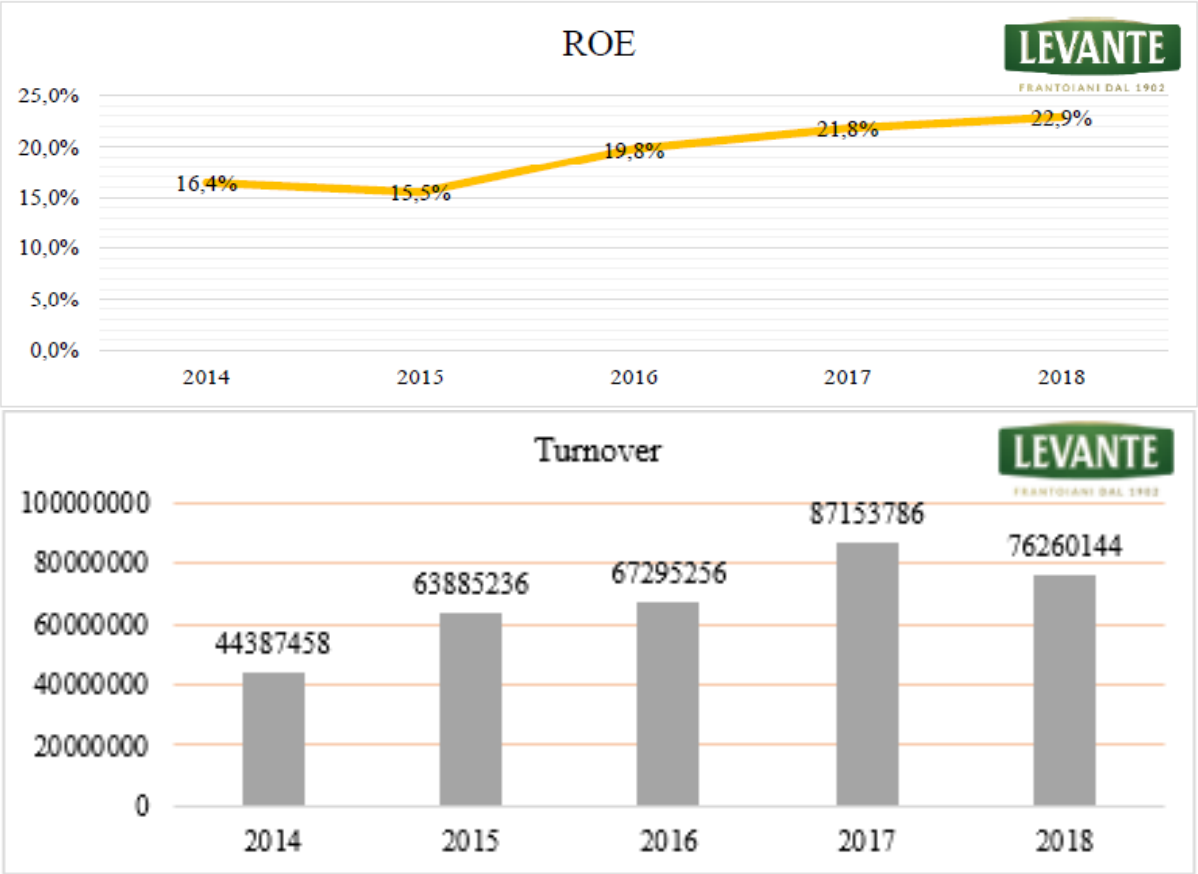

Figure 3.4: Financial data Biolevante S.r.l. *Personal elaboration from AIDA database data*

Conclusions

The thesis investigates the relationship between the theme of the sustainable development in a broad sense and the production in agriculture, through the implementation of new sustainable models for the olive oil sector.

In this respect, it is central the role of the transition from linear to circular economy. Specifically, the first one represents the historical model employed where the life of each product is essentially marked by four steps: extraction of raw materials, production, consumption and disposal On the other hand, the circular economy model is different, applying the opposite logic. It is an economic system designed to be able to regenerate itself, based on three principles: reduce, reuse and recycle. They are three aspects around which building a new paradigm of sustainability, innovation and competitiveness, in a scenario in which even waste is transformed from a problem into a resource. Differently from other industries, in the agriculture the transition from one economic model to another is slower, but presents in the same way great economic and environmental opportunities.

Probably it will be necessary a more comprehensive transformations in the regulatory, economic, social and educational fields.

The olive oil production panorama in Italy is diversified, with peculiarities on territorial basis. In any case, Italy is one of the most important producers and consumers of olive oil. Besides being a typical product of the Mediterranean diet, it recovers an important role from a cultural and social point of view. During the years, although technological improvements have allowed a greater return in terms of quantity, often they involve the use, during the transformation process, of chemical additives or specific non-natural treatments. The residuals represents a problem, as well as a cost, due to their disposal, which in any case are regulated by specific legislation. Progressively, the adoption of new principles in line with the circular economy, allows companies to extract value from elements that in the past were waste and residues.

We could refer to a scope economy, which allows, directly and indirectly, to have a positive impact on the company results.

In this macro context, a particular relevance is recovered by the Apulia region. It is an interesting case because of the importance of the olive oil production in economic terms. From this point of view, the presence of four production areas of PDO oils certifies the attention that this territory gives to this production. Even though some difficulties occurred in the past years, the regional olive oil industry reacted in a vigorous way succeeding to return the leading area of production in Italy in terms of quantity and quality.

The case of Biolevante S.r.l is emblematic from this point of view: it was able to conjugate tradition and innovation, through a particular declination of the circular economy principles.

The application of them, other than reduce the environmental impact, give the possibility to access to a substantial value creation, acting both on the revenues and costs structure.

Finally, and more generally, in a world in which where the natural resources are constantly depleting and in which environmental issues became really dangerous, an extensive application of the circular economy concepts could represent surely a solution and an aspiration.

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