

# Innovation Against Gender Inequalities in Agri-Food Industry

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**Abstract:** In recent years, industrialization and globalization have prompted small and medium-sized enterprises (SMEs) to implement a significant technological and managerial innovation process. In Italy, it leads to new entrepreneurial pathways, such as innovative start-ups. The new solutions' implementation becomes even more crucial for a company's sustainability during crises since it improves the organization's flexibility and encourages the development of new tools and techniques. Previous research recognized the intangible assets' relevance in the innovation's creation process, mainly referring to Intellectual Capital (IC) and its components. In particular, Relational Capital (RC) fosters reactive firms' resilience, whereas Structural Capital (SC) helps SMEs respond to challenges proactively. Focusing on the agri-food sector, it has recently reached considerable results in terms of innovation, but it still appears insufficient to stimulate female entrepreneurship. Recent data confirm a remarkable gender gap: for 107 innovative agri-food start-ups in Italy, only 14 are led by women. Given all this, the paper aims to answer the following Research Questions (RQ). RQ1: How could RC and SC promote women innovative start-ups in agri-food? RQ2: How did these factors foster proactive and reactive firms' resilience during the pandemic? The work uses an exploratory, descriptive qualitative analysis performed during the pandemic emergency and applies the CAOS model, an interpretative model widely used in SMEs' studies since it allows a deep analysis of relational capital. Moreover, the CAOS model can be helpful to observe the SC's innovation. From a theoretical point of view, the research contributes to gender studies, identifying critical, innovative elements that similar women start-ups could implement. From a managerial perspective, findings could increase the firms' competitiveness in the current crisis period and reduce gender inequality. The application of a single case study could represent a research's limit. Thus, in the future, the authors aim at replicating the analysis considering a more comprehensive sample.

**Keywords:** innovative start-ups, female enterprises, CAOS model, resilience, relational capital, woman entrepreneurship

## 1. Introduction

Small and medium-sized Italian enterprises (SMEs), which have always constituted the Italian entrepreneurial skeleton, have seen their competitiveness strongly threatened by the markets' evolution and multiplication in recent years. Therefore, it became necessary to survive on this scenario to find new solutions that would diversify the product compared to other bigger enterprises (Capozza, Salomone, and Somma, 2020; Escribano, Fosfuri, and Tribò, 2009). The Italian legislator has taken specific measures to reduce the entrepreneurial gap, including regulating a new entrepreneurial configuration: the innovative start-up, which also benefits from tax advantages (Law Decree 179/2012).

The requirements established to identify innovative start-ups confirm what stated in the literature: the companies' innovative capacity is strongly linked to Intellectual Capital (IC) and its components, which play a fundamental role in the companies' ability to overcome obstacles in crisis' periods (Ali et al., 2021; Li et al., 2019). In particular, previous studies recognized the role of Relational Capital (RC) and Structural Capital (SC) as reactive and proactive elements to overcome crises (Jia et al., 2020).

Of course, all SMEs have not taken up these measures with reactivity and readiness. Data confirms that the sector that most profitably perceived the possibility of development through innovation was the service sector, while agri-food still has difficulty following in the wake of innovation. In addition, a marginal female entrepreneurial phenomenon can be observed since there is still a strong predominance of innovative enterprises run by men (Modaffari and Della Corte, 2021). Although the gender gap has been widely debated, literature has not deepened women innovative start-ups, especially in agri-food, as a possible means of empowerment. In light of this, the study aims at answering the following questions.

*RQ1: How RC and SC could promote women innovative start-ups in agri-food?*

*RQ2: How did these factors foster proactive and reactive firms' resilience during the pandemic?*

This research can enrich the literature on gender studies, specifically concerning women innovative start-ups operating in agri-food, and it can also enrich the literature that analyses the companies' resilience, offering an

experience focused on agri-food women enterprises. The work can also constitute a helpful demonstration of which strategic variables can be considered to implement innovative solutions in a broad sense, reducing the entrepreneurial gender gap.

The work uses an exploratory, descriptive qualitative analysis performed during the pandemic emergency and applies the CAOS model (Paoloni, 2021), an interpretative model used in SMEs' studies to analyze RC. The paper is structured as follows. In Section 2, the literature review is analyzed. In section 3, the methodology is defined. section 4 applies the CAOS model to the case study. Finally, in section 5, discussions and conclusions are exposed.

## **2. Literature review**

Innovation can be defined as modifying specific variables in enterprises' practices to better performance (Curristine, 2006) in terms of competitiveness, profit, strategic goals, or other outcomes (Chittithaworn, Islam, and Keawchana, 2011). Hence, it is a broad concept that can interest much different company profile's fields. Literature recognizes that innovation in SMEs can consist of new products, processes, or management systems (Maldonado-Guzman, Marin-Aguilar, and Garcia-Vidales, 2018), arguing which kind of innovation has a more profound impact on SMEs performance, either the new technology (Caballero and Morales, 2021) or new management practices (Lin and Chen, 2007). If previously, innovating was a prerogative of the most foresighted enterprises, it has become necessary for all the companies to survive on a more fluid and intelligent and demanding market (Adam and Alarifi, 2021), contributing to increasing change and resilience (Porter, 1990; Ortiz-Villajos, 2014). To tackle the current crisis, due to the spread of the COVID-19, Italy chooses to allocate part of the European funding<sup>1</sup> to stimulate entrepreneurial innovation (NRRP, Mission 1: digitalization, innovation, competitiveness, culture and tourism, p.83), focusing on a specific business form called innovative start-ups, namely new companies whose business purpose is to develop, produce, and commercialize products and services of high technological value (Law Decree 179/2012). The innovative start-ups status results from compliance with formal and substantial requirements. The formers require: to be founded as a corporation, including a cooperative; not to be listed; to be no more than five years old; not to derive from special operations; to be resident in Italy (or within the European Economic Area but with production headquarters in Italy); not to have an annual turnover exceeding 5 million euros; to have never distributed profits.

Furthermore, innovative start-ups have to spend R&D and Innovation at least 15% of the higher value between turnover and cost of production. This requirement explains the SMEs' need to recombine their internal knowledge with new ideas to implement innovative solutions (Singh and Del Giudice, 2019; Teece et al., 1997). Secondly, they have to employ highly qualified personnel of at least 1/3 represented by PhDs, PhD students or researchers, or at least 2/3 with a master's degree, as these qualified figures have a crucial role in enriching the company's know-how, leading the R&D investments and generating higher returns (Leiponen, 2005). Finally, the firm has to be the owner, depositary, or licensee of at least one patent or a registered software owner. These tools are crucial to track the R&D improvements (Matricano, Candelo, and Sorrentino, 2021). Hence, it emerges that innovative capacity is significantly linked to IC (Ali et al., 2021; Li et al., 2019), namely the knowledge-based resources and capabilities that allow a company to create value (Bueno, Merino, and Murcia, 2016). According to some scholars (Bontis et al., 1999; Stewart, 1997), IC includes Human Capital, which refers to employees' capabilities (Andrikopoulos, 2010); SC, definable as a set of company's material and financial resources (Aramburu and Saenz, 2011); and RC, configured as the company's bonds set up to carry out the business activity (Paoloni, 2021). In particular, SC and RC can have a relevant impact on a company's capacity to implement innovative solutions and develop resilience in crisis periods. Mainly, RC guarantees a solid network, improving the enterprise's information and anticipating changes and disruptions through appropriate monitoring systems and implementing solutions (Prasad et al., 2015). On the other hand, SC provides the company with the flexibility and ability to move towards other networks that have emerged during the crisis (Nilakant et al., 2014; Jia et al., 2020).

All this given, it emerges that intangible resources could play a key role in developing the socio-economic context even in difficult times. Nevertheless, in recent years, even these realities have been negatively affected by the pandemic crisis, and, once again, SMEs and the retail sector were hit hardest.

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<sup>1</sup> NextGenerationEU is an €800 billion temporary recovery tool that will help repair the immediate economic and social damage caused by the coronavirus pandemic to create a post-COVID-19 Europe that is greener, digital, resilient and fit for the challenges of today and tomorrow.

ISMEA data suggest that agri-food is one of the most affected by the pandemic (ISMEA 2020), but it still maintains its stability showing remarkable resilience (De Maria, Solazzo, and Zezza, 2021). Moreover, it has recently reached considerable results in terms of innovation, but it still remains a low-level research sector (counting only 0.76% of innovative Italian start-ups). Concerning gender issues, a marginal female entrepreneurial phenomenon can be observed since there is still a strong predominance of innovative enterprises run by men, and only 13% of the innovative start-ups operating in agri-food are led by women (Modaffari and Della Corte, 2021). Although numerous studies attest to the correlation between the IC's components and the ability to implement innovative solutions in times of crisis, only a few foci specifically on agri-food and even fewer on women innovative start-ups operating in this sector.

Previous research (Popović-Pantić, Semenčenko, and Vasilić, 2020) recognized a gap in innovation between female and male companies, which is variable and depends on the economy's development level.

According to literature, women enterprises are considered less appealing to investors, mainly because of three reasons:

- structural characteristics, as women enterprises are usually smaller, younger, and have less capital stock (Alesina, Lotti and Mistrulli, 2013; Cesaroni and Sentuti 2014);
- personal choices, indeed women have a lower risk aversion which could hinder them from undertaking new businesses or innovating existing ones (Watson, 2006; Dohmen and Falk, 2011);
- stricter attitude of credit institute since banks' willingness to grant financing is more remarkable for bigger and older companies (Coleman and Robb, 2009; Cesaroni and Sentuti, 2016).

Access to credit is key to sustaining the entrepreneurial drive to create a new business or implement a process of innovation. This is especially true if the innovative elements consist of new technologies, which require significant R&D investment to understand and efficiently implement them. Hence, it is easy to understand why generally, women enterprises are less technologically innovative (Strohmeyer, Tonoyan, and Jennings, 2017).

On the other hand, women have a personal attitude to create added value through bringing new ideas (Burgess and Tharenou 2002) and cooperating more easily (Kuhn and Villeval 2015), and it fosters a solid network with external stakeholders (Nadeem, Farooq, and Ahmed, 2019). RC can multiply the available information making the company more aware and ready to react to possible changes in the market (Jia et al., 2020) and encouraging the implementation of innovative elements in the organization's structure (Di Fatta, Caputo, and Dominici, 2018).

### **3. Research method**

The present work uses an exploratory, descriptive qualitative approach, analyzing a single case study (Benbasat, Goldstein, and Mead, 1987; Yin, 2009). The research is performed during the pandemic emergency and applies the CAOS model (Paoloni, 2021), an interpretative model used in SMEs' studies since it allows a deep analysis of RC. Data are acquired through a structured interview (Yin, 1984) directly placed by the company's owners. It lasted two hours and was performed on an online platform (Zoom). The selected company is "Magila Società Agricola SRL", a female innovative Italian start-up whose core business is microgreens' cultivation through the aquaponics technique.

#### **3.1 Methodological background**

The CAOS model (an Italian acronym for "Caratteristiche personali, Ambiente, Organizzazione, Start-up") was born in 2011 to measure RC's strategic role in female SMEs (Paoloni, 2011), but it is currently used also in wider scenarios (Paoloni and Modaffari, 2021; Paoloni et al., 2021; Dal Mas and Paoloni, 2019). It is based on four variables: the entrepreneur's characteristics (C); the external environment (A); the organizational aspect (O); the start-up phase (S).

The CAOS model then focuses on the relationship between these variables. Entrepreneurs activate first cardinal links (S-C/C-S) because of their personal characteristics, needs, personal goals. Second cardinal links (S-O/O-S) are created to define the organization's functions, roles, and responsibilities. Third cardinal links (S-A/A-S) are established because of external necessities and link the company to its surrounding environment.

Moreover, the CAOS model analyses the duration and nature of these relationships. Formal relationships are based on an obligation with a legal, managerial, or economic nature, whereas informal relationships originate from personal or family choices. Concerning the duration, permanent relationships are consolidated by trust and mutual economic benefit, making them lasting. Temporary relationships, instead, consist of occasional exchanges.

#### **4. The case study**

"Magila società agricola SRL" is a female innovative start-up operating in the agri-food. It was born in 2019, and it is composed of three partners: the company administrator is Laura, a 29-year-old woman who holds 20% of the shareholding, whereas the remaining 80% is shared between her parents, Marzia and Marco. The innovative element that differentiates this start-up on the market is its core business: aquaponics farming. Since this agricultural method does not require soil, Magila cannot be legally defined as an agricultural enterprise, and it decides to assume the legal form of SRL, which allows greater flexibility in terms of corporate purpose. The business idea consists of microgreens' indoor cultivation. Microgreens are not yet fully developed vegetables but contain up to 20% more nutrients than ordinary vegetables. Their cultivation is based on a technique known as aquaponics, a combination of aquaculture and hydroponic cultivation to achieve a symbiotic environment. The water in which the fish are reared is deprived of solid waste through a filtering system and transmitted to the tanks where the plants absorb the nutrients they need. Finally, it comes back to tanks containing fish, and the solid part, thrown away, is turned into compost. This process perfectly represents the idea of a circular economy. It creates a circuit where the company does not consume water, except for evaporated water; the business contributes to industrial warehouses' recovery, where tanks are placed; and products are entirely natural. Furthermore, no pesticides can be used on the plants; otherwise, they would harm the fish, and, vice versa, no antibiotics or hormones can be used on the fish as they would harm the plants.

"These treatments are not possible because they would hurt the aquaponic system, which requires a perfect balance of operation, in a symbiosis between the farming and cultivation systems".

The following paragraph analyses the company's RC by applying the CAOS model.

##### **4.1 Personal characteristics (C)**

Laura is a young entrepreneur from Lombardy who started her first and only company three years ago. After scientific studies, Laura takes a three-year degree in environmental sciences, which will be helpful to her to conceive and implement her business idea. Laura's role is to take care of the research and the relationships with university researchers, biologists and nutritionists, who can collaborate in the business development. The courage to start a new business is significantly due to his family, especially to his father, who has already had experience as an entrepreneur in the health sector. The management style is participatory since all decisions are taken in family consultation. The assets invested in this company are predominantly family-owned; Magila has never asked banks for financing. The only form of external funding the company has drawn on is a European grant obtained after winning a call for innovative start-ups.

##### **4.2 Enterprise environment (A)**

The company was founded in Biassono, in northern Italy.

"Biassono is the perfect place to run this business, because the city assure us clients and also disused warehouses for reuse".

The city environment is perfect for aquaponics. Indeed, it makes it easy to find convertible warehouses where placing tanks. The activity takes place in a two-storey warehouse: the lower part is used for aquaculture, i.e. fish breeding, while the upper floor houses the tanks with the plants. Secondly, it is easy to find restaurants interested in buying both fish and microgreens. The microgreens' market is not yet developed in Italy, and these semi-vegetables are still almost unknown. Also, the socio-economic context does not seem ready to welcome Magila's business, and the disappointing and marginal support proves that Magila received from category associations. Coldiretti<sup>2</sup>, suggest Magila sign to the innovative start-up special section, while Assolombarda<sup>3</sup> pushes Laura to participate in the European call for funding for innovative start-ups.

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<sup>2</sup> Coldiretti is the largest association representing and assisting Italian agriculture.

<sup>3</sup> Assolombarda includes all the major companies in the Lombardy region.

#### 4.3 Organizational aspects (O)

Magila is a family business. Laura and her parents have a managerial role and an operational one. Hence, it has no other employees. The company goal is to develop an Italian microgreen market, creating a system that can attract investors to support a natural product.

"We believe that aquaponics is one of the breeding and cultivation systems that can meet the highest demands of the environmental economy".

Fish is a diversion to obtain revenues that can keep the company alive, especially in this initial phase when the microgreen business is not mature and would not support the company's costs. Indeed, unlike other international companies that do aquaponic, the fish raised by Magila are not only functional to water fertilization but are eatable to be sold in the surrounding restaurants.

All this allows the company to differentiate itself for its sustainable, non-polluting and circular activity and for its products' quality.

*"We aim at creating a highly sustainable production chain for excellent agri-food products with our providers and clients".*

Among Magila's goals, profit is significant but subordinate to the project's circularity.

#### 4.4 Temporal element (S)

The enterprise is observed during the current pandemic crisis, when the business development is severely hampered, especially for SMEs. Together with the tourism sector, Agri-food is among the most affected by the restrictive measures to limit the virus spread. This observation moment consists of the company's start-up phase when Magila has tested the aquaponics' efficacy and looks for new clients.

#### 4.5 Analysis of relationships

The qualitative analysis of Magila's relationships is helpful since it can be a pilot case study to understand the RC characterizing women innovative start-ups in agri-food to overcome the current pandemic crisis.

First Cardinal links (S-C). They are characterized by informal and permanent relationships involving the founder and her parents. During the start-up phase, starting from the company's establishment, Laura was supported by her parents, who invested in the first capital injection and satisfied the company operational needs.

Second cardinal links (S-O). Informal and permanent relationships characterize them. The organization is limited to Laura's family. Indeed, they have a managerial role and an operational one. Each of the parents has specialized in a specific field: Marco takes care of the technical aspects, and Marzia cares about the microgreens.

Third cardinal links (S-A). Formal and temporary relationships characterize them. They concern both the relationships with the institutional environment and with potential buyers. The formers refer to universities, trade associations (Coldiretti and Assolombarda) and European public entities. Universities and Coldiretti, after initial interest, dropped the start-up since they have provided neither a contribution of knowledge and managerial skills nor a contribution to tracing possible sources of financing. Conversely, Assolombarda allowed the company to connect with the European public entity that gave small financing to Magila. Regarding the potential buyers, collaborative activities are underway to build a product supply chain regarding micro-greens and freshwater fish delivery.

### 5. Discussion and conclusion

Innovative start-ups are a tool to encourage the recovery of Italian enterprises (Porter, 1990). It has different expressions concerning activity sectors and gender issues. From the managerial point of view, innovative start-ups prefer the service sector to the detriment of other traditional sectors, such as agri-food. Moreover, innovative start-ups appear to replicate the same problems already discussed in the literature for SMEs, and, in Italy, innovative female start-ups represent a clear minority compared to the total (Modaffari and Della Corte, 2021). *On the other hand, innovation* has a more profound impact on SMEs performance. Hence it is relevant to identify its drivers in crisis periods, like the current one. The literature consistently recognizes IC as a factor of resilience and development, especially concerning RC and SC (Jia et al., 2020).

To promote the literature on gender studies, this research presents a case study related to an innovative female start-up in the agri-food context, investigating:

*RQ1: How RC and SC could promote women innovative start-ups in the agri-food industry?*

*RQ2: How did these factors foster proactive and reactive firms' resilience during the pandemic?*

Answering RQ1, the RC and SC's positive impacts are confirmed. These two IC's components promote female innovative start-ups establishment. Especially, as literature states (Cesaroni and Sentuti, 2014), the cardinal links S-C and S-O with parents, crucially contribute to the enterprise's birth, providing the initial capital and all the organizational profiles required to implement an innovative business, that make Magila the first mover in aquaponics in Italy. Furthermore, this research contributes to the studies concerning gender issues and female enterprises complex development, affirming that innovation, considered as SC, can help WE emerge through sustainable growth paths.

Concerning RQ2, the analysis confirms the SC and RC's proactive and reactive role in overcoming crises. A proactive role is related to innovation: the circular project enables Magila to mitigate the adverse economic effects of the pandemic. The reactive role is related to Magila's network: the relationships established in the business start-up phase (cardinal links) enables Laura and her start-up to survive the crisis. As it is typical of SMEs (Paoloni, 2021), the most relevant relationships are informal and permanent. They help Laura sustain the investments and manage the enterprise during the pandemic.

The present work contributes to the expansion of literature in intangible resources and gender studies and confirms that RC and SC can help female entrepreneurs overcome the difficulties of an unplanned event, as the current one. The managerial implication is to demonstrate that RC and SC can reduce the entrepreneurial gender gap.

The application of a single case study could represent a research's limit. Thus, in the future, the authors aim at replicating the analysis considering a more comprehensive sample. Moreover, data's analysis has been available only through direct interviews with female entrepreneurship.

Future research perspectives could focus on the study of other firms to acquire more data on the topic of innovation in the agri-food sector and how intangible resources could contribute to start-up resilience. Focusing on gender studies, the authors will compare any differences between female start-ups and male entrepreneurs.

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