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and Entrepreneurship**

**Valuation of Digital Technologies:
Reaching Beyond Utility and Efficiency in
Socio-Technical Systems of Provision**

**A Qualitative Comparative Case Study from the Northern
Italian Smallholder Farmers**

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ABSTRACT

The thesis examines how Northern Italian smallholder farmers evaluate digital technologies, with particular attention to blockchain, from their own perspective. The research addresses the lack of social research in supply chain literature and proposes a new analytical lens and analysis.

The study develops its conceptual framework by drawing on Anderson's expressive theory of value, Weber's concept of social action, Bayliss and Fine's idea of systems of provision, and Geels' multi-level perspective in socio-technical systems. By combining these frameworks, digital technologies are defined as objects of valuation whose meaning and relevance is determined by farmers, the valuating subjects.

The research adopts a qualitative and interpretivist approach by incorporating evidence from seven on-site semi-structured interviews with smallholder farmers in Lombardy. The data were analysed through a hybrid qualitative content analysis in NVivo, supported by a complementary R-based textual analysis including word frequency, word cloud, TF-IDF, and Zipf's law checks. The study demonstrates that farmers value digital technologies not only based on extrinsic values and instrumental benefits, but also on intrinsic ones. It argues that a continuum between extrinsic and intrinsic values persists and is influenced by the broader Socio-Technical Systems of Provision. In turn, Socio-Technical Systems of Provision also shape farmers' digital valuation. With specific reference to blockchain, the data show that it is perceived as potentially valuable but structurally irrelevant by farmers operating in direct-sales systems.

Building on the results, the study identifies a typology of three digital orientations: value-oriented, structure-oriented and resource-oriented, which explain how farmers engage with and value different technologies. This typology amplifies the proposed conceptual framework by integrating valuation and Socio-Technical Systems of Provision as active, rather than merely contextual, factors in digital orientation.

The study contributes with a new conceptual framework for understanding digital valuation, responding to the calls for people-centric research agenda, and offers practical implications for technology developers, policymakers and agricultural organisations and institutions.

ABSTRACT IN ITALIANO

La tesi esamina il modo in cui i piccoli agricoltori dell'Italia settentrionale valutano le tecnologie digitali, con particolare attenzione alla blockchain, dal loro punto di vista. La ricerca affronta la limitata presenza di studi sociali nella letteratura sulle catene di approvvigionamento e propone una nuova prospettiva analitica.

Il quadro concettuale dello studio si fonda sulla teoria espressiva del valore di Anderson, sul concetto di azione sociale di Weber, sull'approccio dei sistemi di approvvigionamento di Bayliss e Fine e sulla prospettiva multilivello di Geels applicata ai sistemi socio-tecnici. Integrando tali approcci, le tecnologie digitali vengono definite come oggetti di valutazione il cui significato e la cui rilevanza sono determinati dagli agricoltori, intesi come soggetti valutanti.

La ricerca adotta un approccio qualitativo e interpretativista, basato su sette interviste semi-strutturate condotte in presenza con piccoli agricoltori in Lombardia. I dati sono stati analizzati mediante un'analisi qualitativa ibrida del contenuto condotta con NVivo, affiancata da un'analisi testuale complementare realizzata in R, che ha incluso l'analisi della frequenza delle parole, la creazione di una word cloud, il calcolo del TF-IDF e verifiche basate sulla legge di Zipf.

Lo studio dimostra che gli agricoltori valutano le tecnologie digitali non soltanto in base ai valori estrinseci e ai benefici strumentali, ma anche in base a valori intrinseci. Sostiene inoltre l'esistenza di un continuum tra dimensione estrinseca e intrinseca, influenzato dai più ampi

Sistemi Socio-Tecnici di Approvvigionamento, i quali, a loro volta, contribuiscono a plasmare la valutazione digitale degli agricoltori. Con specifico riferimento alla blockchain, i dati mostrano che essa è percepita come potenzialmente utile, ma strutturalmente irrilevante dagli agricoltori che operano attraverso sistemi di vendita diretta.

Sulla base dei risultati, lo studio identifica una tipologia composta da tre orientamenti digitali: orientato al valore, orientato alla struttura e orientato alle risorse. Tali orientamenti spiegano come gli agricoltori interagiscono con le diverse tecnologie e le valutano. La tipologia amplia il quadro concettuale proposto e integra la valutazione e i Sistemi Socio-Tecnici di Approvvigionamento come fattori attivi, anziché meramente contestuali, nella formazione dell'orientamento digitale.

Lo studio contribuisce alla letteratura proponendo un nuovo quadro concettuale per comprendere la valutazione digitale, rispondendo alla richiesta di un'agenda di ricerca maggiormente centrata sulle persone. Offre inoltre implicazioni pratiche per sviluppatori di tecnologie, decisori pubblici, organizzazioni agricole e istituzioni.

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1. Introduction

1.1 Motivation of the Study

The global market for agricultural commodities was valued at \$ 230 billion in 2024. Little of this value, however, reached smallholders, earning less than US\$ 2.14 per day, despite their production accounting for nearly a third of the world's food requirements (IDH, 2024). The uneven distribution of economic value, that is due to a series of factors, including power asymmetries between smallholder farmers and downstream actors (exporters and retailers), which limit small farmers from producing and receiving more value (Clapp & Fuchs, 2009; Schoneveld et al., 2023).

In recent years, rapid technological innovations have transformed the world, reshaped economies, societies, and how value is created. The COVID-19 pandemic was one of the main disruptors of supply chain management (Queiroz et al. 2020). To address the uneven value distribution, research has examined how to implement digital technologies, such as blockchain, to enhance supply chain transparency and improve smallholders' working conditions (Quayson, Bai & Osei, 2020; Longo et al., 2023).

Previous empirical studies on digital technology adoption in agrifood supply chains have analysed, for instance, the implementation of digital technologies and their effect on smallholders. Research on mobile-based MIS has proven the positive effect in reducing information asymmetry between farmers and traders (Courtois & Subervie, 2014). Several studies have focused mainly on analysing blockchain and IoT as means to increase supply-chain traceability (Pang et al., 2024) and facilitate equal access to information and markets (Aristarkus, 2024). For instance, Longo et al. (2023) have designed new business models that promote collaboration and knowledge sharing; for example, the “e-Marketplace” model has

been developed to enhance collaboration among farmers, partners, and consumers through a digital platform that facilitates the exchange of information and data.

Extant literature, however, has been limited to studying technologies as isolated elements and their impact on specific factors, without examining how they collectively reshape power relations and value distribution across the supply chain (Yuan and Sun, 2024). Despite the advancements in research in developing new business models (Longo et al., 2023) and frameworks (Pothula, 2023; Acharya, Shrivastava & Padhi, 2023), Supply Chain Management (SCM) research still lacks empirical evidence of the actual benefits of digital technologies on smallholders in terms of value (Gumbi N., Gumbi L., Twinomurinzi, 2023). Pagell and Wilhelm (2025) criticized SCM literature for being *people-blind* and called for a people-centric research agenda, which has an interest in equal value distribution. This perspective is reflected in smallholders research, which is characterized by studies tailored to big companies that do not consider farmers' needs and context (Gumbi N., Gumbi L., Twinomurinzi, 2023; Yuan & Sun, 2024). Abdulai et al. (2023) discovered that despite the numerous possibilities given by new digital technologies, farmers in Africa have limited access to only simple devices, such as mobile phones.

At the beginning, the study focused how smallholders value blockchain technologies and whether its benefits were meaningful for them. However, the qualitative and abductive research process revealed that studying blockchain in isolation would not allow for a full understanding of farmers' digital valuation processes. The new direction of the research was coherent with Pagell & Wilhelm's (2025) call for people-centric research agenda, which emphasizes the importance of understanding how subjects experience and make sense of digital technologies within their context.

Therefore, it became necessary to broaden the analytical scope toward digital technologies valuation, in which blockchain was used as a focal case to verify whether its valuation changed based on the single farmer's context.

1.2 Theoretical Positioning

This thesis builds on value theory (Anderson, 1993; Weber, 1922; Lyson, Stevenson & Welsh, 2008; Leduc et al., 2023), where value is not limited to the concept of economic value; rather, value is defined as socially embedded. The study draws on literature on socio-technical systems (Geels, 2002; Trist & Bamforth, 1951; Klerkx, Jakku & Labarthe, 2019) and systems of provision (Fine & Bayliss, 2020; Wheeler, 2022) to contextualize digital technologies in supply chains.

Based on Geels (2002) and Fine & Bayliss (2020), Socio-Technical Systems of Provision are defined as the social and technical dimension that deliver goods and services, shaping how action is organized across different levels of society. Drawing on Weber (1922) and Anderson (1993), value again is defined in this thesis as the subjective meaning individuals connect to particular objects, such as technology, that can be categorized as more or less intrinsic or extrinsic depending on the context, including the broader Socio-Technical Systems of Provision.

Based on the meanings assigned to the objects of valuation, as well as the structural conditions of Socio-Technical Systems of Provision in which digital technologies are available, farmers develop different digital orientations. Therefore, the study uses the concept of *digital orientation*, which is defined as the attitude of a farmer towards one or more digital technologies.

1.3 Research Aim and Questions

The study aims to understand how farmers value digital technologies in the agricultural system of provision. While existing research has focused primarily on the potential benefits of digital technologies for enhancing transparency and efficiency in agricultural supply chains, limited attention has been paid to smallholders' viewpoint and the practical challenges they face in the digitalization of supply chains. The study seeks to answer the following research question:

How do the values that subjects assign to digital technologies and their socio-technical system of provision interact and contribute to constructing their digital orientation?

To address the research question, the study provides the following sub-research question:

- What kind of value subjects assign or connect to digital technologies within their Socio-Technical Systems of Provision?
- What are the main barriers that constrain digital adoption, and how do they interact with subjects' valuation process and contribute to the construction of their digital orientation?

1.4 Methodology

Methodologically, it adopts a qualitative, exploratory and abductive research approach to multiple case study design based on primary data gathered from on-site semi-structured interviews, which allows for more detailed insights from producers, but presents limits in the generalizability of the findings. The empirical material was analysed through a hybrid qualitative content analysis in NVivo, complemented by an R-based textual analysis including word frequency, word cloud, TF-IDF and Zipf's law checks, which served to triangulate and validate the thematic findings through a more reproducible and data-driven perspective. As highlighted in the research agenda proposed by Pagell and Wilhelm (2025), new studies need

to change their research approach and get used to smaller sample sizes to study and gather data that does not come from the firm-level.

1.5 Structure of the Thesis

The thesis first provides a theoretical framework and a review of existing literature in chapter 2, integrating value theory, socio-technical systems and systems of provision approach in a unified conceptual framework.

Chapter 3 presents the methodological approach and research design, including the multiple case study design, contextual inquiry approach, interview strategy, sampling criteria, thematic analysis in NVivo 15, and the complementary R-based textual analysis procedure. The chapter also discusses the limitations of the study and explains how rigour and trustworthiness were addressed.

Chapter 4 presents the study findings, combining the thematic findings identified through NVivo with the complementary R-based textual results and the comparison between the two analytical outputs. The chapter covers farmers' values and valuation processes, technology adoption attitudes, institutional and structural conditions, blockchain valuation, and paired case comparisons.

Chapter 5 interprets and discusses the findings with the conceptual framework and research questions drawn from the literature review.

Chapter 6 concludes the study by summarizing the main contributions, implications for research and practice and outlining future research directions, while also reflecting on how the combined use of NVivo and R strengthened the analytical robustness of the study by integrating interpretive thematic coding with complementary textual evidence.

2 Literature Review

This study aims to investigate how farmers in Northern Italy value digital technologies in their operations. To understand the farmers' needs and attitudes towards digital technologies, it is necessary to identify what value is from a social perspective and how it is constructed through farmers' goals, motivations, experiences, and socio-economic contexts.

2.1 Value Theory: A Social Definition of Value

Traditionally, value has been conceptualised and defined based on economic terms and measured through rigid metrics and standards, such as price and cost (Sánchez-Fernández & Iniesta-Bonillo, 2009). Recent research in supply chain has begun challenging the traditional concept of value, introducing approaches that identify value through individuals' beliefs, motivations, and the social contexts in which they operate (Anderson, 1993; Weber, 1922; Leduc et al., 2023).

2.1.1 Max Weber: Value in Social Action

A sociological foundation for the reconceptualization of *value* can be found in Max Weber's distinction between instrumental and value-rational action. In *Economy and Society*, Weber [(1922) 2019] introduces the concept of a sociology of *Verstehen*, which defines sociology as a science that studies and interprets social action to understand its subjective meaning. Weber defines *action* as the “meaningful and comprehensible orientation of one's own behaviour”, meaning that an action is behaviour with a meaningful orientation and is understandable (Orsini, p. 164, 2024). Weber proceeds to specify the concept of *social action*, which is an action that

has a *subjective meaning*, that is, is meaningful to the actor, and is oriented towards other individuals (Weber & Tribe, 2019).

More specifically, Weber states that, as with any form of action, social action can be determined by either (1) *Purposive Rationality*, meaning that the action is made based on the expected conduct of other individuals or objects; (2) *Value Rationality*, when oriented to conscious belief of the intrinsic worth of a specific form of behaviour; (3) *Affect*, that is, when the action is made based on emotions and feelings; (4) *Tradition*, when the action is made based on established customs (Scaff, 2014; Weber & Tribe, 2019).

Max Weber's perspective on social action provides a basis for understanding how individuals can make their decisions not only based on economic factors, following *Purposive Rationality*, but also on personal beliefs and considerations, as suggested by *Value Rationality* (Kalberg, 2012; Scaff, 2014). This perspective is particularly relevant to the present study as it provides the analytical lens to interpret farmers' technology adoption decisions beyond purely economic and instrumental reasons. More specifically, this thesis builds on this understanding on value rationality, which gives subjective meaning and manifests in social action.

2.1.2 Value Perspective in Supply Chains and Agri-Food Supply Chains

Previous literature in SCM has predominantly conceptualised value from an economic standpoint (Kähkönen & Lintukangas, 2012; Wilson, Childerhouse & McIntyre, 2025). Within this body of research, value has frequently been divided into the dichotomy of *value creation* and *value capture* along the supply chain (Lepak, Smith & Taylor, 2007). More recent contributions have attempted to integrate these dimensions into a unified framework that provides a more holistic view of how value creation and value capture occur and are intertwined across the whole supply chain and its actors (Minerbo & Brito, 2022).

Similar approaches have been adopted in the field of Agri-food Supply Chain (ASC). For instance, the design and application of the Global Value Chains (GVC) (Lee et al., 2023) framework was implemented to analyse market structures and dynamics with a value-based approach. In this kind of literature, value is primarily defined and conceptualised in economic terms and measured in terms of the distribution of benefits (i.e., price) (Sánchez-Fernández & Iniesta-Bonillo, 2009). Specifically, empirical research has demonstrated how bargaining power, market access capacity, and the role of institutions can influence farmers' conditions (Ton, 2008; Velázquez & Buffaria, 2017; Cohen et al., 2022).

More recently, a body of literature has begun to analyze the social component of SCM and ASC (Nakamba & Sharmina, 2017; Pagell & Wilhelm, 2025). Schoneveld & Weng (2023), for instance, investigated the inclusion of smallholders in the value creation process in agri-food supply chains and designed new value capture paths. Simultaneously, some contributions have analysed value creation in relation to social reproduction and informal work (Mezzadri, 2021). Specifically, Mezzadri (2021) theorized a *Value Theory of Inclusion*, which highlighted the importance of social reproduction (e.g., unpaid or informal work) in generating value and labour surplus. This approach expanded the analytical scope beyond formal market transactions.

Within the context of ASC, research has focused on the roles and conditions of smallholders and the inequalities that persist in ASC (Ma & Sexton, 2021). Susandi et al. (2025) highlighted the importance of increasing farmers' participation in value chains to enable a more inclusive and sustainable transformation of agricultural supply chains. Collectively, these contributions reflect a growing understanding of value not solely as an economic measure, but as a phenomenon embedded in social relations.

2.1.3 A new conception of value: Values-Based Supply Chains

In the context of ASC, a Weberian perspective is used to analyse agricultural entrepreneurship in constrained institutional contexts (Gittins et al., 2022). Gittins et al. (2022) present the different reactions of farmers with different backgrounds in the UK against institutional challenges and demonstrate the prevalence of purposive rationality in agricultural businesses over other types of social action presented by Weber.

The study of Gittins et al. (2022) is the only study that provides a value analysis based on the Weberian definition of value. Despite this, research has begun in recent years to theorize and experiment on developing new supply chain systems based not merely on economic elements but also including the social component (Lyson, Stevenson & Welsh, 2008; Hardesty et al., 2014; Schoneveld & Weng, 2023; Stoeva et al., 2024)

In their book *Values-Based Supply Chains: Strategies for Agrifood Enterprises of the Middle*, Lyson, Stevenson & Welsh (2008) introduced Values-Based Supply Chains in the agricultural sector. They highlighted the importance of value chains and their difference from traditional supply chains. The book analyses the conditions of Mid-Level farmers, defined as producers operating between small-scale farms and large agricultural organizations. These farmers' main issues are being "too small" for using corporate strategies and too big to use the direct marketing techniques of small farms. The authors introduce Values-Based Supply Chains (VBSCs), which are strategic partnerships between the agents located across the supply chains (producers, distributors, etc.) that prioritize mutual trust, shared information, and values.

VBSCs are based on collaboration across all agents of the supply chain, which has been proven effective when relational and collaboration mechanisms are implemented, such as shared information and information sharing (Stoeva et al., 2024). Furthermore, for VBSCs to be feasible, a combination of differentiated products and economies of scale is needed to improve

the Middle-Farmers' position and compete with larger food systems (Lyson, Stevenson & Welsh, 2008).

VBSC is currently an understudied field with few empirical studies. Despite this, Hardesty et al. (2014) conducted a series of case studies and discovered that the development and implementation of VBSCs require several resources, such as access to capital, market demand, food safety regulations, and specific infrastructure.

Fleury et al. (2016) explored VBSCs in the USA and mid-tier supply chains in France by examining six case studies and showed how both models can support small and medium-sized farms through product differentiation and collaborative partnership across the supply chain. As already anticipated in Hardesty et al. (2014), both French and American farms faced challenges because of the market competition, making it difficult to compete with bigger farms. On the other hand, farms in both countries strengthened their market position by enhancing their coordination and partnership with downstream partners, despite the structural food market competition (Fleury et al., 2016).

Peterson et al. (2022) highlighted the tendency of previous research to rely on case studies and focus mainly on the owners of the farms rather than the farmers involved in the VBSC. The study aimed to investigate the motives that drive farmers to participate in VBSCs. The study discovered that VBSCs were not intended only for small and medium farmers; on the contrary, larger farmers were the ones more inclined to perceive VBSCs' strategic benefits, while smaller ones perceived the system as a mean to increase profit. Furthermore, the research calls for a re-examination of the “agriculture of the middle” concept beyond size-based metrics, emphasizing regional variation, marketing flexibility, and relational dynamics (Peterson et al., 2022).

2.1.4 The Means-End approach and the cognitive value process

In recent years, research has started focusing on studying farmers not as “mere recipients of the value created by a business” (Schoneveld & Weng, 2023) but as active participants in the supply chain who possess motives and make decisions based not only on economic factors (Demartini, Gaviglio & Pirani, 2017; Peterson et al., 2022; Charatsari, Frangkoulis & Lioutas, 2025).

Leduc et al. (2023) applied the Means-End chain approach to compare value drivers between organic and conventional farmers across France, Ireland, and Sweden. The Means-End Approach is a theoretical framework that explains how individuals associate certain products' attributes with personal values through a hierarchical cognitive structure (Pieters, Baumgartner & Allen, 1995). The MEC was originally used to investigate consumers' buying decisions (Ha & SooCheong, 2013), but later studies began using it to study decision typologies outside the economic sphere (Richter & Bokelmann, 2018; Tey et al., 2020). Leduc et al. (2023) demonstrated that farmers' decisions are based on personal value systems that are usually not included in economic models.

Faltmann & Sotten's (2025) systematic review categorizes the values that persist in Alternative Food Systems (AFS) into four dimensions: (1) Social embeddedness values, that refer to the economic models that encompass socio-cultural context; (2) Spatial embeddedness values, which are those present in specific territorial contexts; (3) Natural embeddedness values, that are connected to the environmentally sustainable practices; (4) Economic embeddedness values, that are connected to economic value distribution models and fair pricing (see Appendix 1).

2.1.5 Elizabeth Anderson: Intrinsic and Extrinsic Value

In *Value in Ethics and Economics*, Anderson (1993) offers a different view on value that differs from traditional hedonistic or monistic approaches, such as utilitarianism (Mill, 1863) and single-system theories of value, such as Labor Theory of Value (Smith, 1776/2005; Marx, 1887).

Anderson presents two distinct conceptions of value that are directly correlated to either (1) *Intrinsic goods*, which are those valued by an individual's own sake, or to (2) *Extrinsic goods*, which are valued based on the value of something else. Intrinsic goods are direct objects of intrinsic valuation, and their worth does not depend on external elements. On the other hand, extrinsic goods, usually referred to also as instrumental goods (Moore, 1903; Driver, 2006), are valued not as goods themselves but for their relation to the value of something else.

Anderson presents her Expressive Theory of Value as a means for individuals to guide their actions. The theory defines rational action as an action that expresses an individual's rational valuation. Anderson grounds her Theory of Value in the idea that rational valuations follow universal standards. She rejects the notion that values are results to be achieved, but they explain and guide individuals' actions (Anderson, 1993).

This distinction is particularly relevant in agricultural contexts, where farmers' decisions often involve choosing between instrumental economic considerations or commitments to sustainability and other intrinsic values. Understanding digital technologies as potential intrinsic or extrinsic goods allows for a more psychological interpretation of farmers' decision-making processes.

2.1.6 Intrinsic and Extrinsic Value in the Agricultural Context

Empirical research in agricultural contexts has investigated farmers' decision-making processes and discovered that farmers' decisions are based on a combination of intrinsic and extrinsic motivations (Greiner & Gregg, 2011; Bopp et al., 2019; Swallow & Barkmeyer, 2024; Li, Liu & Chang, 2025).

Research has demonstrated that intrinsic motivations, such as personal satisfaction and stewardship ethic, can influence farmers' decisions to pursue sustainable practices more than extrinsic incentives, such as economic incentives (Greiner & Gregg, 2011; Bopp et al., 2019). For instance, Greiner and Gregg (2011), in their study in Australia, demonstrated that intrinsic and non-economic motivations significantly influence positive land quality conservation practices more than extrinsic motivations. A more recent study of Bopp et al. (2019) in Chile analyzed the underlying motivations of farmers in pursuing sustainable practices. The research proved that the intrinsic attitude of farmers towards sustainability increases the overall effectiveness of policy instruments aimed at promoting environmentally sustainable practices.

Further research in the Chinese agricultural context showed that while both extrinsic and intrinsic motivation enhance farmers' land quality protection behaviour, extrinsic incentives may diminish intrinsic motivations in the long term (Li, Liu & Chang, 2025). Similarly, Xu, Nie & Wang (2025) demonstrated that existing payments for ecosystem services focus mainly on monetary incentives and that intrinsic values, such as patriotism and public disclosure, are more efficient in enhancing farmers' sustainable behaviours.

Jambo et al. (2019) analyzed the drivers that led farmers from Tanzania and Malawi to pursue sustainable intensification practices, defined as the agricultural techniques and technologies that could foster sustainable intensification of farming. The study demonstrated that farmers

pursued sustainable intensification practices for both extrinsic and intrinsic motivations, even though intrinsic motivations were shown to be stronger than extrinsic ones.

In New Zealand, Swallow & Barkmeyer (2024) studied dairy farmers' motives in pursuing low-carbon agricultural practices. Results demonstrated that the main reasons were mainly related to intrinsic motivations, such as land and environmental stewardship. On the other hand, extrinsic motivations included financial viability, which still played an important role in the decision-making process.

In the European agricultural context, Dillegenser et al. (2025) discovered that intrinsic motivations among French organic farmers were primarily related to subjective well-being, supporting the argument that agricultural practices are rooted in broader moral and identity-based values. Also, Brown & Green (2025) demonstrated that farmers' participation in agricultural training is linked to a combination of extrinsic and personal, intrinsic motives.

2.1.7 Digital Technologies as objects of valuation

Research on digital adoption motivations has demonstrated that the decision-making process in selecting and using new technologies is not driven solely by extrinsic motives, such as profit and efficiency maximization (Lee, Falahat & Sia, 2021; Yang, Fu & Zhang, 2021), but also by intrinsic and personal motives and values (Roberts et al., 2021). Research has discovered that even historic events, such as the COVID-19 pandemic, can shape individuals' motivations for technology adoption (Sahin F. & Sahin Y.L., 2022). These findings suggest that digital technologies are not evaluated only as technical tools, but as elements whose meaning and use are shaped by broader cognitive and social values.

In recent years, Digital Transformation (DT) has been a highly researched topic, also in the agricultural context (Abbasi, Martinez & Ahmad, 2022). A relevant portion of this literature

investigated the effects of DT on supply chain processes and on how digital technologies could increase supply chain transparency (Sharma, Al Khalil & Daim, 2022; Sultan, 2026). While a significant part of the body of literature analysed digital technologies as stand-alone elements and emphasized their role in increasing competitive advantage and efficiency, more recent research suggested studying them under a broader perspective that integrated the social and human dimensions.

Several studies have demonstrated the need to study the technology adoption in agri-food supply chains, considering not only the technical aspects, but also the social and human perspective, even though the body of literature remains scattered (Klerkx, Jakku & Labarthe, 2019; Vahdanjoo, Sørensen & Nørremark, 2025). Klerkx, Jakku & Labarthe (2019) highlighted the societal impact of integrating smart farming and Agriculture 4.0 in agri-food supply chains. The study showed that farmers adopted digital technologies not only for economic purposes, such as reducing costs, but also for intrinsic reasons, such as the desire to reach the *future standard*.

Some studies were carried out in different countries to investigate on the motivations behind the technology adoption decisions in different cultural, and agricultural, contexts (Li et al., 2020; Caffaro et al., 2020; Nor Diana et al., 2024). Li et al. (2020) conducted a study on East Chinese farmers' intrinsic motivations for adopting sustainable production technologies. Findings highlighted that attitude, social pressure, and perceived technology benefits shaped farmers' technology adoption decisions.

Caffaro et al. (2020) investigated Italian farmers' motivations in adopting Smart Farming Technologies. This study explores how different information sources influence farmers' motivations, finding that the perceived usefulness of a technology, defined as the extent to which a farmer believes it will improve their job performance, is the main driver in shaping Italian farmers' decisions.

In Southeast Asia, Nor Diana et al. (2024) literature review identified two categories of factors that influenced farmers' behavioural intentions in adopting digital technologies: internal and external factors. Internal factors are those that shape farmers' behaviour, while external factors are those that include household, institutional, technological, social, and economic conditions.

The study of Nor Diana et al. (2024) provides a more comprehensive view of the decision-making process of Southeast Asian farmers' technology adoption and reinforces Anderson's Expressive Theory (1993) on intrinsic and extrinsic values. This distinction reinforces the argument that technology adoption decisions are made through the interaction of both intrinsic and extrinsic valuation, rather than from purely cost-benefit evaluations.

The study by Li et al. (2020) primarily examined farmers' intrinsic motivations, whereas Caffaro et al. (2020) examined how external factors shape extrinsic motivations. Nor Diana (2024) provided a wider perspective on how both intrinsic and extrinsic motivations shaped farmers' decision-making process.

Recent research by Cimino et al. (2024) investigated the factors influencing the adoption of digital platforms among Italian smallholders. The study demonstrated that performance expectancy, effort expectancy, social influence, network prominence, and environmental uncertainty positively influence the farmers' adoption decision-making process. Furthermore, the study highlighted how farmers see digital platforms as a means for navigating volatile market conditions.

Overall, this body of literature presents two perspectives on digital technologies' valuation. On the one hand, digital tools are evaluated based on their instrumental characteristics, performance, and expected benefits, aligning with what Anderson (1993) defines as extrinsic goods. On the other hand, adoption decisions are also influenced by intrinsic motivations such as professional identity, social belonging, and aspiration with future standards of work. In this

sense, digital technologies can be considered as intrinsic goods, which are valued not only for their economic performance and benefits, but also as an expression of farmers' beliefs and social commitments.

2.2 Socio-Technical Systems of Provision

Understanding digital technologies as objects of valuation, it is necessary to move beyond a purely technical or economic interpretation of Digital Transformation. The analysis of digital technologies adoption is constructed within broader social, institutional, and supply chain configurations.

To fully capture these dynamics, the following section situates digital technologies within the wider systems of provision that organize value creation, distribution, and governance in agri-food supply chains.

2.2.1 A New Configuration of Supply Chains and Value Chains: Systems of Provision

At the end of the 1990s, Fine and Leopold (1993) were the first to outline the Systems of Provision (SoP) approach in contrast to the traditional views on how consumption worked. The approach seeks to explain the consumption system vertically across different industries without relying on overly general factors and frameworks (Fine, Bayliss & Robertson, 2018).

First attempts originated from the critical review of consumption theory, which generalized consumers' needs to *utility maximization*, without considering the reasons behind different buying behaviours. The main characteristic of the SoP approach is that, in addition to changing how consumption is studied, it provides intra-disciplinary contributions grounded in the contexts of different commodities. This new perspective highlighted the importance of

establishing different *consumer norms* based on specific goods instead of assuming *individual decision-making* (Bayliss & Fine, 2020, Chapter 1.3.1).

After redefining consumption norms, the second phase of the development of the SoP approach was to design a broader analytical framework around food system theory. Fine, Heasman & Wright (1996) reasoned that to address consumption more holistically, the SoP framework should also be developed, considering the whole consumption process from production, distribution, retailing, to the final phase of consumption (Bayliss & Fine, 2020, Chapter 1.3.2).

Fine, Heasman & Wright (1998) empirically applied the SoP framework to investigate the nation's poor diet buying decisions. Findings highlighted that, especially in the dairy and sugar systems, healthy eating campaigns often only shifted where people consumed fat and sugar, instead of reducing overall consumption. These empirical findings suggested that individual choices are influenced by how the food systems function, but also by the broader economic and social system, not only by personal preferences (Bayliss & Fine, 2020, Chapter 1.3.2).

Bayliss & Fine (2020), in their book *A Guide to the Systems of Provision Approach*, provided a series of case studies, respectively housing, water, health services, clothing, and fashion, where SoP was applied. The reviews of the case studies show that current provisioning systems are not influenced by personal preferences but rather by social relations and power structures among the end users and agents of a specific system. This further reinforces the distance of the consumers from production systems and profit-generating processes, alongside the conflicting priorities between agents in provisioning (Bayliss & Fine, 2020, Chapter 4).

Fine & Bayliss (2022) further integrated the SoP approach with diverse sectors, such as water, health, and transport, and with how neoliberalism and financialization restructured these systems. Moreover, the framework integrated the *10Cs to map material cultures*, highlighting

how the meaning of consumption varies across systems. Overall, the authors argued that *social norms* result from how specific systems, such as the food system, are organised.

Mattioli et al. (2020) used the SoP approach in the Energy Transition literature to investigate the difficulty in shifting from a car and carbon-intensive system by identifying the main political-economic factors. Findings suggested that car-dependence is embedded in a self-reinforcing system within the automotive industry, infrastructure provision, land-use patterns, and weak public transport that reinforce each other continuously. This generates a sort of socio-technical and political-economic lock-in that is further reinforced by opportunistic behaviours.

The SoP approach was also applied to investigate different power relations between consumers and agents within a specific system (Bayliss, Mattioli & Steinberger, 2020; Haines-Doran, 2022). Bayliss, Mattioli & Steinberger (2021) provided a SoP-based analysis on water, energy, and local bus sectors in Britain and the effects of privatisation and deregulation from the 1980s. Evidence showed that privatization and deregulation increased profit generation for investors from essential services and inequality among low-income users. Based on the framework proposed (Appendix 2), the authors argued that current regulation and privatization of essential services promote inequality through market-oriented systems, highlighting the need of current policy narrative to shift from technocratic regulation to one of equitable and universal provision.

Recent literature on social-ecological economics has been studying how the SoP approach can be used to investigate how provisioning systems can be organized to satisfy both individuals' needs and planetary boundaries (Wheeler, 2022; Bärnthaler & Gough, 2023; Dengler & Plank, 2024; Kreinin et al., 2024; Steinberger et al., 2024; Schneider & Miess, 2024).

Wheeler (2022) contributed to the development of the SoP approach by integrating economic and sociological theories to examine how agents and end users interact with a specific system. The author emphasizes the importance of the social component, as consumption is vertically

organized through production, distribution, exchange, and consumption, and horizontally influenced by moral norms.

While SoP may highlight the limited agency of individual consumers (Bayliss & Fine, 2020) or end users within essential service systems (Bayliss, Mattioli & Steinberger, 2021), Wheeler (2022) claims that transformative change can occur through collective action and systemic intervention rather than isolated consumer choices.

Further literature redefined the traditional view of the economy through social-ecological provisioning. Bärnthaler & Gough (2023) contributed to developing a sufficiency economy framework, defining the economic purpose as the difference between individuals' needs and the planetary boundaries. By using an *(eco-)feminist approach*, Dengler & Plank (2024) highlight the *invisible foundations* of the economy and stray from the established neoliberal view of the economy, stating that it represents only a small part of the overall economy. Similarly, Schneider & Miess (2024) question the traditional meaning of the monetary system and redefine it through a social dimension and provisioning process that can enable social-ecological transformation if democratized.

Layton & Domegan (2021) examined how global crises, such as the COVID-19 pandemic and climate change, could shape societies and the way they fulfil their needs. The authors defined provisioning systems as complex networks of both economic and social exchanges. To conceptualize how these systems evolve, the study identified four social mechanisms: *delivery processes*, *stakeholder actions*, *technological evolution*, and *shifting value fields*. The research brings to light the challenge of provision systems in maintaining the equilibrium between structural stability and innovation to ensure resilience.

Further research by Wooliscroft & Wilkes (2025) complemented this view by proposing analytical tools for evaluating supply and consumption channels through the *extended*

transvection framework. The proposed framework revealed how power asymmetries, information flows, and risk and profit distributions influence sustainability, fairness, and value creation across provisioning systems. Layton & Domegan (2021) and Wooliscroft & Wilkes (2025) confirm that provisioning systems are socio-technical and socio-economic systems whose functioning is shaped by institutions, crisis dynamics, and the organization of value production and distribution.

Building on the Systems of Provision perspective, the following section examines how provisioning structures interact with digital technologies through socio-technical system configurations.

2.2.2 Digital Adoption in Agri-food Supply Chains

The Internet of Things (IoT), defined as things or objects that are connected through a network and can interact and cooperate to reach the same goals (Atzori, Iera & Morabito, 2010), was one of the main drivers for the DT of the agricultural supply chains and laid the basis for the agriculture 4.0 (Abbasi, Martinez & Ahmad, 2022). Gilchrist (2016) introduced Industry 4.0 and anticipated that future businesses would have become interconnected with global networks and become cyber-physical systems (Gilchrist, 2016, Chapter 13).

Liu et al. (2021) investigated how Industry 4.0 shaped the agriculture industry. The study found that after the industrial revolution of Industry 4.0, the agriculture industry shifted from indigenous farming to mechanized farming. Robotics, Big Data, Artificial Intelligence, and Blockchain are the main technologies identified that contributed to shaping the agriculture industry.

A part of the literature on Agriculture 4.0 focuses on studying a specific technology and its benefits, drawbacks, and implementation in agricultural supply chains (Lezoche et al., 2020;

Yadav et al., 2022). Sheel & Nath (2019) developed a conceptual framework highlighting how blockchain positively affected the competitive advantage by reducing manufacturing lead times and increasing customer satisfaction. The study highlighted critical challenges in adopting blockchain, such as no prior experience and the absence of a legal framework. Furthermore, to achieve a successful implementation of blockchain, a tailored strategy based on the supply chain is needed, as blockchain adoption is easier in shorter supply chains. Findings indicate that companies should not only create more awareness regarding blockchain but should also actively work with IT companies that are engaged in developing blockchain-based supply chain solutions.

Pang et al. (2024) focused on developing an evaluation for Blockchain-based Agricultural Traceability and identified the main barriers to Blockchain adoption, including the lack of standardization, compliance, and adoption.

Seranmadevi, Kumar & Hariharan (2022) showed the main benefits of blockchain-based agriculture, as well as several challenges. The study demonstrated that blockchain adoption was influenced by different factors, such as perceived trust, cultural readiness, and organisational structure. Similarly, Romeo, Virglerova & Giampaola (2025) conducted qualitative research on different stakeholders from the Italian agri-food sector, confirming the perceived benefits of blockchain but also the challenges and identified cultural resistance, managerial and digital capabilities gaps, and inter-organizational coordination as the main adoption barriers.

The COVID-19 pandemic accelerated the development of new technologies in the agricultural sector, such as Artificial Intelligence and Blockchain (Queiroz et al., 2022). Research demonstrated that during the pandemic crisis, technologies such as blockchain were critical to reducing human-to-human and human-to-food contact, as well as moving towards more sustainable agri-food supply chains (Hassoun et al., 2023; Shiraishi et al., 2025).

Furthermore, blockchain technologies have been researched to assess their usability in climate-smart agriculture and food security. Specifically, Vostriakova et al. (2021) demonstrated that implementing blockchain with other climate-smart agricultural technologies could enhance transparency and traceability in agricultural supply chains. Similarly, Shiraishi et al. (2025) supported that blockchain technologies could be possible means to achieve sustainable food production because of their ability to improve supply chain transparency. On the other side, the same study presented as main adoption barriers large-scale integration and scalability of blockchain, increasing the need for coordination mechanisms among technology providers, supply chain participants, and policymakers.

A portion of the literature body in DT of agri-food supply chains focused on investigating the digitalization and DT process. This part of the literature studied the implementation of new technologies not as stand-alone events but as multi-dimensional processes that imply the interaction of several factors (Mendes et al., 2022; Dibbern, Romani & Massruhà, 2024; Vahdanjoo, Sørensen & Nørremark, 2025; Wang & Meng, 2025).

2.2.3 Socio-Technical Systems and Multi-Level Perspective in Agricultural Supply Chains

The growing body of literature studying DT and technology adoption as a process, rather than a stand-alone event, constitutes the interaction of technological, organisational, and institutional factors (Le, 2022; Mendes et al., 2022; Díaz-Arancibia et al., 2024; Vahdanjoo, Sørensen & Nørremark, 2025; Wang & Meng, 2025), which closely aligns with socio-technical systems theory. Eric Trist and Ken Bamforth (1951) studied how new mining technology increased productivity but also miners' stress because it revolutionized established work practices. The

study concluded that a new technology could be effective only if the organization optimized both the technical system (tools, methods) and the social system (people, relationships).

Socio-technical systems (STS) were first introduced to investigate organizational structures within companies. Appelbaum (1997) explored STS theory for organizational development, highlighting the need to balance technological advancements with employees' social needs to reach a joint optimization. The study proposed self-regulating work groups to manage tasks and adapt to organizational changes, alongside diagnostic tools and practical guidance to facilitate organizational change.

Building on Appelbaum (1997), research developed *design principles* of STS that promote meaningful work, decentralised decision-making, user participation, and treating technical and organizational design as interconnected rather than separated. For instance, Clegg (2000) proposed a set of sociotechnical principles to guide system design, grouping them in three categories: meta, content, and process, which are highly interconnected with each other. The study concluded by calling for a more heuristic thinking, rather than algorithmic, when designing systems, as well as a human-centred and holistic design.

More recent literature by Winby & Mohrman (2018) proposes a new framework for designing sociotechnical systems, namely Digital Sociotechnical Systems (DSTS). As digital platforms are shaping how work is managed and breaking boundaries between organizations and stakeholders, new methods of designing sociotechnical systems are needed. The study proposes a new framework that conceives organizations as part of broader ecosystems, where DSTS focuses on optimizing the entire network rather than the single firm.

Similar research focuses on the integration of Industry 4.0 with STS theory, highlighting the tendency to develop technical architectures and neglect the social component. Building from Winby & Mohrman (2018), also Sony & Naik (2020) proposed a Sociotechnical Design for the

Digital Era that includes six dimensions (People, Infrastructure, Technology, Processes, Culture, and Goals) to support vertical, horizontal, and end-to-end integration of Industry 4.0 to ensure that both technical and social dimensions are optimized.

Research on socio-technical systems transitions defined technological change as the result of the interactions among innovations, institutions, and societal dynamics (Geels, 2004; Hekkert et al., 2007). The Multi-Level Perspective (MLP) proposed by Geels (2002) analysed technological transitions through the interaction of three levels: niches, regimes, and landscapes. The MLP framework conceptualized that technological transitions began at the niche level with radical innovations, where only a few develop and challenge the established regime (Appendix 3). Building on the MLP framework, Geels (2004) conceptualised socio-technical regimes as the set of technologies, institutions, infrastructures, market structures, and user practices that stabilise existing systems.

Further research applied the MLP framework in sustainability transitions and integrated more factors to offer an integrated view (Geels, 2011; Geels, 2014). More specifically, socio-technical systems present strong path dependency and lock-in mechanisms that reinforce existing technological trajectories and make technological changes and transitions more difficult to achieve (Geels, 2011). Furthermore, transitions are influenced by power dynamics, as incumbent actors often resist disruptive innovations that could threaten existing market and governance structures (Geels, 2014).

Socio-technical transitions frameworks have been applied to agri-food systems and agricultural supply chains, even though they are not categorized as supply chain management studies. Past research on Agricultural Innovation Systems conceptualised innovation as the result of a networking process and interactive learning among different actors (Klerkx, Aarts & Leeuwis, 2010), distancing from techno-centric definitions of innovation. Simultaneously, food systems

were conceptualised as complex socio-technical systems that encompass the interactions of different actors and succession of phases, from production to consumption (Ingram, 2011).

More recently, a relevant part of the literature has implemented the socio-technical systems perspective to study food systems transitions and how to achieve sustainable food production and food security (Duncan & Pascucci, 2017; Bilali, 2020; Elsner, Herzig & Strassner, 2023). At the same time, socio-technical systems transitions have been applied to food systems to explore how technological innovations interact with institutions, market structures, and actors. Different from Digital Transformation and Digital Adoption literature, this part of the literature conceptualizes innovation as a holistic process embedded in socio-technical systems that shape farming practices and governance structures (Geels, 2002; Duncan & Pascucci, 2017; Klerkx et al., 2019).

Klerkx et al. (2019) highlighted how much of the literature on digitalization in agriculture is focused mainly on natural or technical perspectives, with only a few studies on farm production systems, value chains, and food systems.

To conclude, most of the studies on socio-technical systems focus on technology or sustainability transitions and do not investigate on how a specific subject positions in these systems. To bridge these perspectives, the socio-technical systems literature can be considered alongside the Systems of Provision approach, which offers a broader understanding of how economic and social processes shape provisioning structures. By integrating socio-technical systems with the Systems of Provision approach, it is possible to explain how provisioning structures change under technological innovations. From this perspective, agricultural supply chains can be seen as socio-technical regimes embedded in broader systems of provision, where technological innovations interact with institutions, actors, and governance mechanisms.

By considering these frameworks together, digital adoption can be interpreted not as an isolated decision but as a process embedded in provisioning systems and influenced by the interaction between technological change, institutions, and supply chain actors.

The following section develops this perspective by examining agri-food supply chains as Socio-Technical Systems of Provision.

2.2.4 An integrated view of Digital Adoption: Socio-Technical Systems of Provision

The Systems of Provision (SoP) approach, developed by Ben Fine, analyses the institutional and financial structures shaping production and consumption. On the other hand, the concept of provisioning systems in sustainability science focuses more on environmental impacts and socio-technical transitions. Although both frameworks analyse how goods and services are organised to meet social needs, they differ in the analytical focus.

The SoP approach highlights how power relations, market structures, and capital restructuring shape provisioning systems (Fine, Bayliss & Robertson, 2018; Bayliss & Fine, 2020), while sustainability-oriented provisioning systems research is more focused on studying the environmental and material dimensions of provisioning to analyse how production and consumption systems can operate with ecological limits and planetary boundaries (Fanning, O'Neill & Büchs, 2020; Schaffartzik et al., 2021; Plank et al., 2021).

Research on the SoP approach and provisioning systems has recently started to conceptualize provisioning systems through an integrated socio-metabolic and political-economic perspective (Schaffartzik et al., 2021). Plank et al. (2021) built on prior socio-metabolism research on the stock-flow-service nexus to analyse how material stocks, resource flows, and services function and interact within provisioning systems to address societal challenges.

Provisioning systems are being increasingly interpreted as the set of social, technical, and institutional elements that interact with each other, aligning with socio-technical systems theory, which emphasises the interactions between technologies, actors, institutions, and infrastructures in shaping system transformations (Geels, 2002; Geels, 2011).

As provisioning systems are being studied through socio-metabolic and political economy perspectives, their characteristics reflect socio-technical systems theory (Geels, 2002; Geels, 2011; Schaffartzik et al., 2021). Building from socio-technical systems theory, provisioning systems are conceptualised as dynamic systems that are shaped and evolve by the interactions of technological innovations, institutions, and socio-economic forces (Mattioli et al., 2020; Schaffartzik et al., 2021).

Digital technologies are part of Socio-Technical Systems of Provision that can influence coordination and governance systems and value creation processes in agri-food supply chains (Geels, 2002; Klerkx, Aarts & Leeuwis, 2010; Geels, 2011; Ingram, 2011; Klerkx, Jakku & Labarthe, 2019).

Recent literature has applied provisioning systems, including community provisioning systems, to respond to social crises (Appendix 4). For instance, Layton, Domegan & Duffy (2024) analysed evolutionary dynamics in provisioning systems and proposed a framework for designing social, economic, and environmental systems. Their study emphasized the use of a macromarketing perspective to understand how provision systems function and evolve. Renton, M., Hooper, V., & Renton, A. (2024) conducted a historical analysis of New Zealand's supply networks, reinforcing the connection between provisioning and marketing systems. Their research highlighted the role of technology and information flows in the functioning of structured markets and shaping power relations in provisioning systems. To further complement the macromarketing perspective, Wooliscroft & Wilkes (2025) introduced the *extended transvection framework* to analyse provisioning systems. The framework is particularly useful

for mapping global supply chains, which are often opaque and imbalanced, by tracing *channels*, such as risk, ownership, and environmental impact, to identify where power asymmetries, externalities, and loss of aggregate value occur.

When combined, research on provisioning systems show how including technological and institutional elements into provisioning system analysis can offer a more comprehensive view and understanding of the social and economic aspects in supply chains.

Digital technologies play a critical role in shaping provisioning systems by influencing information flows, coordination mechanisms, governance structures, and value creation (Klerkx, Jakku & Labarthe, 2019; Mendes et al., 2022; Vahdanjoo, Sørensen & Nørremark, 2025). Recent research emphasized that technology adoption in agri-food supply chains cannot be understood as an isolated decision by individual actors, but rather as embedded within socio-technical provisioning systems that organize production, distribution, and consumption processes. For instance, Klerkx, Jakku & Labarthe (2019) highlighted how smart farming technologies affected social relations, knowledge sharing, and collective decision-making across the supply chain, demonstrating that digital tools modify both technical and social dimensions of provisioning. Similarly, Mendes et al. (2022) showed that digitalization processes involve complex interactions between technological, organizational, and institutional factors. Vahdanjoo, Sørensen & Nørremark (2025) further argued that digital platforms enable new forms of coordination, allowing actors to respond to environmental and market pressures while enhancing transparency and traceability along the supply chain.

By integrating these perspectives, digital adoption can be conceptualized as a dynamic component of Socio-Technical Systems of Provision, where technologies are not only tools for efficiency but also instruments that mediate social relations and redistribute power. This approach bridges socio-technical systems theory with the Systems of Provision perspective, providing a comprehensive framework to analyse how technological innovations interact with

institutional arrangements, market structures, and social norms to shape value in agri-food supply chains.

2.3 Conceptual Framework

This section synthesizes the main findings of the previous literature review. It proposes the conceptual framework, which illustrates the main concepts identified from the literature review and the research question. The framework shows how farmers' valuation of digital adoption is shaped by multiple elements and the broader context in which they operate. By integrating these concepts into a single framework, it becomes possible to guide the research design, analysis, and interpretation of findings.

2.3.1 Theoretical logic

Based on the previous literature review and theoretical framework analysed, this study proposes a conceptual framework that brings together Expressive Value Theory, Social Action, Socio-Technical Systems, and the Systems of Provision approach to analyse how Northern Italians farmers value digital technologies. Taken together, these frameworks provide a more holistic view of digital valuation in the agricultural sector, as it is conceptualised as a socially embedded valuation process, rather than a mere technical or economic decision.

The conceptual framework positions digital technologies as objects of valuation, whose meaning and usefulness are defined by extrinsic (or instrumental) and intrinsic (expressive) values (Anderson, 1993; Scaff, 2014; Weber & Tribe, 2019). These valuations are part of of socio-technical provisioning systems that influence them through governance and market structures, institutions, and power dynamics, which in turn influence production, distribution, and consumption in agri-food supply chains (Fine & Bayliss, 2020; Wheeler, 2022). The

framework aims to connect farmers' valuation processes with their digital orientation and how their intrinsic, extrinsic values and Socio-Technical Systems of Provision influence them, providing a new analytical lens to study the interplay across technology, social action, and valuation processes.

2.3.2 Systems of Provision as socio-technical systems

Building on previous literature, agri-food supply chains can be conceptualized as socio-technical systems composed of technical, institutional, and social elements that interact with each other (Wheeler, 2022). Socio-technical systems theory (Geels, 2002) explains the structural and institutional conditions that make digital technologies available, or inaccessible, to the actors through either lock-in or path dependency, and the interaction of technical and social dimensions. The systems of provision approach add the political-economic dimension, as it analyses how power relations, market structures and social norms along the supply chains shape consumption (Fine & Bayliss, 2020).

By integrating the two frameworks, the Socio-Technical Systems of Provision include technical and social dimensions that interact with each other and collectively influence how resources and technologies are distributed and used.

By building on extant literature, factors such as institutions and market structures influence how digital technologies are understood and valued by farmers. Access to capital and digital capabilities are other critical elements that influence digital adoption and valuation processes, as they determine farmers' engagement with new technologies. Therefore, Socio-Technical Systems of Provision are defined as the interlinked social and technical arrangements that deliver goods and services, shaping how social action is organized.

Overall, Socio-Technical Systems of Provision define the structural conditions where digital technologies become available and are valued by farmers.

2.3.3 Digital Technologies as objects of valuation

In this framework, digital technologies are not conceptualized as only tools aimed to improve efficiency or transparency in the supply chain, but rather as objects of valuation (Klerkx, Jakku & Labarthe, 2019; Vahdanjoo, Sørensen & Nørremark, 2025). With this shift, it can be concluded that digital technology adoption is shaped both by functional attributes (i.e. extrinsic values) and values that are associated with them.

DT Literature highlighted that digital technologies can be evaluated based on their instrumental benefits, such as increased efficiency, productivity, traceability of the supply chain, and risk reduction (Klerkx, Jakku & Labarthe, 2019; Cimino et al., 2024). At the same time, literature has brought to light the intrinsic value and significance of digital technologies, reflected in professional identity, social legitimacy, ethical considerations, and aspirations toward the future (Roberts et al., 2021; Lee, Falahat & Sia, 2021).

It can be derived from extant literature that farmers' assessment of digital technologies is based on both functional and social dimensions, demonstrating how the same technology can be valued and assessed differently based on the context, individual beliefs, and socio-technical and SoP conditions. Adopting this new view of digital technologies as objects of valuation, it is possible to move beyond the traditional cost-benefit perspective and situate valuation within relational and cognitive processes.

2.3.4 Farmers as subjects of valuation

As Digital Technologies are conceptualized as objects of valuation, it is important to develop a new analytical lens for the valuation processes of farmers. Drawing on Anderson's Expressive theory of Value (1993), farmers' valuations can be distinguished between intrinsic and extrinsic valuations. Extrinsic valuations can be efficiency and productivity improvements, while intrinsic values are usually linked with professional identity, stewardship of land, and autonomy over farming practices (Li et al., 2020; Caffaro et al., 2020; Nor Diana et al., 2024).

The framework of this study positions these values' dimensions within social and cognitive processes. By building on Weberian social action, value processes can be situated within purposive and value-rational orientations. Farmers' decision-making processes are not driven only by economic purposes, but also by the perceived meaning and social significance of technologies. Empirical research reinforces that farmers' valuation processes are shaped by both intrinsic and extrinsic motivations. Studies in Australia, Chile, China, New Zealand, and Europe demonstrate that intrinsic considerations, such as stewardship ethics and moral responsibility, often outweigh purely economic incentives in shaping sustainable farming practices (Greiner & Gregg, 2011; Bopp et al., 2019; Li, Liu & Chang, 2025; Swallow & Barkmeyer, 2024; Dillegenser et al., 2025).

To conclude, in this thesis value is defined as the subjective meaning individuals connect to particular objects, such as technology, that can be categorized as more or less intrinsic or extrinsic depending on the context.

2.3.5 Farmers' digital orientation

The farmers' valuation process leads to specific digital responses that range from full adoption, partial use of specific functions, or resistance to digital adoption (Caffaro et al., 2020; Abdulai et al., 2023; Cimino et al., 2024).

These responses go beyond the concept of the dichotomy of adopters and non-adopters of digital technologies and reinforce the statement that farmers' digital valuation decisions are shaped not only by the potential benefit of a specific tool, but also by structural conditions, such as digital skills and resource availability (Abdulai et al., 2023; Gumbi et al., 2023; Dibbern, Romani & Massruhá, 2024).

For instance, a farmer could be interested in the potential benefits of implementing a blockchain technology, but may not possess the digital skills, infrastructure, resources, or network support to adopt it (Cimino et al., 2024; Romeo, Virglerova & Giampaola, 2025). This example further reinforces that farmers' digital valuation process is based both on personal attributes and external factors embedded in their broader context, reflecting how socio-technical systems participate in technology valuation (Wheeler, 2022).

2.3.6 What determines farmers' digital orientation: the interplay between value and Socio-Technical Systems of Provision

To synthesize the conceptual framework of this study, Figure 1 provides a visual representation of the main theories that were integrated to explain the rationale behind farmers' digital valuation.

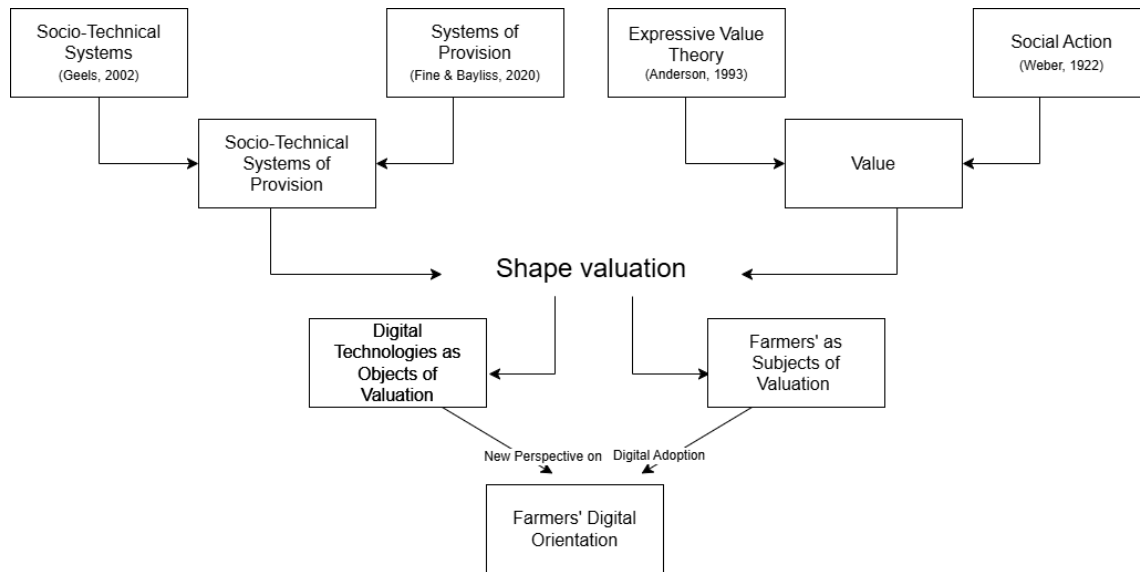


Figure 1 Conceptual framework for the study of subjects' valuation of digital technologies

As shown in Figure 1, socio-technical systems (Geels, 2002) and systems of provision (Fine & Bayliss, 2020) are integrated into a unified dimension: the *Socio-Technical Systems of Provision*, which define the institutional, market and relational conditions where digital technologies become available. At the same time, the subjects that value these technologies are not conceptualized as mere participants of socio-technical systems. Intrinsic and extrinsic dimensions of value, derived from Anderson's Expressive Value Theory (1993) and Weber's concept of social action (1922), constitute the *value* dimension through which farmers assign meaning to digital technologies.

Taken altogether, these two dimensions contribute to shaping the *valuation* process, positioning digital technologies as *objects of valuation* and farmers as *subjects of valuation*. The interaction between the structural dimension (Socio-Technical Systems of Provision) and the value dimension determines the farmer's digital orientation. A *digital orientation* is defined in the study as the attitude of a farmer towards one or a set of digital technologies and it is important to distinguish it from digital adoption. Literature defines digital adoption as the act of

implementing a specific technology (Caffaro et al., 2020). In this framework, digital orientation encapsulates how farmers evaluate, make sense of and position themselves in relation to technology, regardless of whether adoption occurs.

The framework aims to integrate the gaps in the literature that often focus only on technology adoption as a binary decision based mainly on economic and technical attributes. The model positions farmers as active participants in Socio-Technical Systems of Provision, capable of shaping it and being influenced by it.

To conclude, the conceptual framework offers a robust analytical lens to study farmers' engagement with digital technologies in Northern Italy. It emphasizes that valuation processes are driven by both intrinsic and extrinsic valuations and by socio-technical provisioning systems.

This framework lays the foundation for the methodology in Chapter 3, guiding the design of data collection, analysis of farmer considerations, and assessment of technology adoption processes.

2.4 Summary

In this chapter, the review of the literature highlighted a gap in the need for more people-centric research (Pagell & Wilhelm, 2025). To address this gap, in section 2.1 a novel conception of value was derived from Weber's (1922) concept of social action and Anderson's (1993) Expressive Value Theory. The review further highlighted that farmers' decisions and attitudes are driven not only by purposive rationality, which is associated with extrinsic values, but also by value rationality rooted in personal beliefs and social commitments, which is reflected in intrinsic values.

Empirical evidence from research in the agricultural context further reinforced the presence and interplay of both extrinsic and intrinsic values in farmers' valuation processes, extending this understanding to the context of digital technologies. Therefore, value was defined as the subjective meaning individuals connect to particular objects, such as technology, that can be categorized as more or less intrinsic or extrinsic depending on the context.

Section 2.2. reviewed Systems of Provision approach (Fine & Bayliss, 2020) and socio-technical systems theory (Geels, 2002), which highlighted how valuation processes could not be understood by focusing only on the farmer's dimension of valuation. The section concluded by defining Socio-Technical Systems of Provision as the interlinked social and technical arrangements that deliver goods and services, shaping how social action is organized.

Ultimately, based on Geels (2002) and Fine & Bayliss (2020), socio technical systems of provision are defined as the interlinked social and technical arrangements that deliver goods and services, shaping how action is organized across different levels of society. Drawing on Weber (1920) and Anderson (1993), value again is defined in this thesis as the subjective meaning individuals connect to particular objects, such as technology, that can be categorized as more or less intrinsic or extrinsic depending on the context, including the broader Socio-Technical Systems of Provision.

3 Methodology

This chapter presents the research strategy and design, data collection and analysis and limitations of the study. The methodological framework is derived from the nature of the research question and the conceptual framework developed in the previous chapter. The section aims to provide a detailed structure on how the data was gathered and analysed to ensure the trustworthiness and quality of the study. Furthermore, the chapter presents the limitations of the study and how they were managed to reduce the potential impact on the reliability and credibility of the study.

3.1 Research Approach

The study follows an interpretivist research philosophy, which prioritizes the subjective dimension in understanding *social action*, as subjects assign meanings through their experiences and belief (Bryman, 2016). This approach reflects the aim of the present study, as it seeks to understand how farmers value digital technologies, which is a decision process embedded in personal beliefs, social relations and institutional context. Given the subjective and qualitative nature of the study, quantitative measures cannot alone capture the nature of the decision-making process.

Technology valuation is not treated as objective or a mere dichotomy, but rather as socially embedded processes that are influenced by the interaction of intrinsic and extrinsic values, supply chain structures and Socio-Technical Systems of Provision. This standpoint is coherent with the conceptual framework developed in Chapter 2, which integrates Anderson's Expressive Theory of Value (1993), Weber's concept of social action (1922), Systems of

Provision (Bayliss & Fine, 2020) and Geels' Multi-Level Perspective (2002) to conceptualise digital valuation as a process embedded in Socio-Technical Systems of Provision.

A qualitative research approach was selected as the most appropriate strategy for addressing the research question. As Creswell & Creswell (2023) argue, qualitative methods are particularly suited for exploring “how” and “why” questions and for generating contextually rich descriptions of specific phenomena. Furthermore, this choice is aligned with the research agenda proposed by Pagell and Wilhelm (2025), who calls for people-centric methods in supply chain research and explicitly advocate for smaller sample sizes when studying actors whose voices are underrepresented in the literature, such as smallholder farmers.

3.2 Research Design

3.2.1 Exploratory Design and Qualitative Analysis

This research adopts an exploratory research design, which is used in the absence of literature that presents enough empirical evidence for testing hypotheses or theories (Saunders, Lewis & Thornhill, 2016). Though the conceptual framework of this study is based on well-established and tested theories, there is no sufficient empirical literature exploring the valuations of blockchain technologies by Italian smallholders. The application of an exploratory design will ensure that this research generates conceptual insights as well as typologies that will guide future research.

A qualitative approach was chosen not only as a methodological preference, but an attempt to address the research question itself. In fact, quantitative research designs, such as those based on surveys with questions that concern measuring technology adoption rates or willingness-to-pay estimates would be insufficient to answer a question about the kind of value farmers assign

to technology as they would assume that value can be defined on a standardised and pre-defined scale. On the other hand, the research question requires accessing the subjective meanings, beliefs, and contextual reasoning through which farmers evaluate technologies, including tools they may never have encountered before. This type of study calls for methods that allow the researcher to follow the participants own logic rather than imposing analytical categories in advance (Brinkmann & Kvale, 2015; Creswell & Creswell, 2023).

Furthermore, a qualitative approach aligns with the research agenda advocated by Pagell and Wilhelm (2025), who calls for research that prioritise proximity to actors and lived experience over statistical representativeness. Smallholder farmers are a population whose perspectives are systematically underrepresented in both supply chain management and digital adoption literatures (Gumbi, Gumbi & Twinomurinzi, 2023; Yuan & Sun, 2024), and qualitative research is the most appropriate method to uncover and interpret those perspectives.

3.2.2 Abductive Reasoning

The analytical logic of the study is abductive rather than purely deductive or inductive. Abductive reasoning, as conceptualised by Peirce (1903, as cited in Bellucci & Pietarinen, 2023) and applied to qualitative business research by Dubois & Gadde (2002), involves an iterative movement between theory and data. Rather than testing pre-specified hypotheses derived from theory (deduction) or building theory entirely from raw data (induction), abductive reasoning uses theory as a sensitising lens that guides interpretation while remaining open to revision based on what the data reveals.

This approach is reflected by how the conceptual framework developed in Chapter 2 shaped the initial coding structure and the design of the interview scripts but remained open to criticism and further refinement from the emergent themes in the data. Consequently, it was selected a

hybrid thematic analysis approach, described in Section 3.4, which combines deductive and inductive coding. Abductive reasoning is particularly appropriate for studies that seek to build or refine conceptual frameworks rather than test them, as it is in this study.

The abductive logic is coherent with the evolution of the scope of the study. Initially, the research aimed to analyse farmers' valuation processes of blockchain technology specifically and if its benefits of transparency and traceability were meaningful for smallholder farmers. However, as the study moved forward, it became clear that blockchain could not be studied without taking account of the farmers' social and contextual conditions. Therefore, the research design was expanded to include digital technologies valuation processes more broadly and using blockchain technology as single focal case.

3.2.3 Multiple Case Study Design

The research uses the multiple case study method, where each farmer, the *subject of valuation*, is considered as a case (Yin, 2018). The case study design was chosen for two reasons. First, it is appropriate for studying complex and context-specific phenomena in which individual decisions, local conditions, and relational dynamics play a decisive role, all of which are central to understanding technology valuation in the Italian agricultural context. Second, by examining a set of varied cases, it becomes possible to identify patterns, contrasts, and typologies that are theoretically meaningful, even if not statistically generalisable (Yin, 2018).

This methodological choice is grounded by the aim of the study in identifying patterns and typology of farmers' digital responses, which requires a comparison across different profiles and digital adoption level. A single case study would have provided greater depth but would not have supported the cross-case analysis needed to identify how supply chain structure, value orientation, and farm characteristics interact to shape farmers' digital adoption valuation. The

seven cases were selected to maximise analytical variation along these dimensions, as described in Section 3.3.2.

The unit of analysis is the farmer in a particular socio-technical system of provision. Valuation activities performed by each farm are then analysed against its attributes using the attribute framework developed prior to the analysis of data.

It is worth mentioning that the goal of the cross-case analysis is analytical generalisation, that is, the extension of theoretical propositions to new empirical contexts, rather than statistical generalisation to a broader population (Yin, 2018). The findings of this study are intended to refine and extend the conceptual framework rather than to produce prevalence estimates or causal claims.

3.2.4 Contextual inquiry and time horizon

An essential element of the research design is its context inquiry approach, as the aim of the study is to provide a deeper and wider understanding of Italian farmers' attitudes and drivers that influence their valuation processes towards digital technologies. Building on this objective, the research used semi-structured interviews following the contextual inquiry principles, whereby participants are studied in their working environment to capture specific practices, attitudes and how decisions are made (Holtzblatt & Beyer, 2018). The design of the interview script and data collection process is described in Section 3.3.

The study adopted a blended approach combining a multiple case study structure with the contextual inquiry method, where each farmer represented an individual case. The contextual method enabled the research to capture each farmers' feelings, attitudes, beliefs and meanings towards digital valuation, while the multiple case study structure provided a comparative logic across cases. By integrating the multiple case study design, the transferability of findings was

strengthened beyond the single subject (i.e. farmer), which is usually a limitation of single case studies (Yin, 2018).

Unlike interviews conducted remotely or in neutral settings, all data collection took place on-site at the participants' farms. This choice reflects the commitment to studying farmers' valuation processes in their natural context, where the physical environment, tools, animals, crops, and infrastructure are present and observable (Holtzblatt & Beyer, 2018). The on-site interviews allows the researcher to access forms of knowledge that are tacit or embodied, such as the practical reasoning behind a specific cultivation technique or the spatial logic of a farm's commercial organisation, and that would be difficult to capture through decontextualised questioning (Holtzblatt & Beyer, 2018).

The data used for the research was collected in a single point of time, between March and April 2026, respectively when most farmers start preparing for the sowing season. The data collected provided a snapshot of farmers' valuation processes and attitudes at a specific moment in the ongoing process of technology development in the agricultural sector, as well as within a situation of fragile economic development and political tensions due to the ongoing wars and energetic crisis.

3.3 Data Collection

In this section the data collection process and rationale are presented to guarantee the coherence between the research objective and the research strategy.

3.3.1 On-site semi-structured Interviews

The study is based on the use of primary data that was collected through seven on-site semi-structured interviews conducted with Italian farmers located in the Northern area of Italy, precisely in the region of Lombardy. Given the contextual inquiry dimension of the research, the interviews were conducted on-site at the participants' farms, allowing the researcher to observe the physical context in which farmers' work and make decisions. This approach is consistent with contextual inquiry principles, which prioritise the study of phenomena in their natural setting (Holtzblatt & Beyer, 2018).

Semi-structured interviews were chosen as the primary data collection instrument because they allow a balance between thematic consistency across cases and the flexibility to pursue insights specific to each participant (Brinkmann & Kvale, 2015). Each interview was guided by a topic guide organised around five themes (Appendix 5):

- (1) *Farmer's background and work organization* explored the participants' work experience, the origins of the farm, its size and structure and the organization of daily activities. This theme provided a context for identifying the socio-technical system of provision in which the farmer was situated.
- (2) *Values* invited the participants to reflect on what motivates them and their work and what kind of principles guide their production and commercial activity. This theme was designed to generate data on both intrinsic and extrinsic value orientations, as conceptualised by Anderson (1993) and Weber (1922) in the theoretical framework.
- (3) *Experience with change* asked participants to identify and describe the most significant changes in the agricultural sector and how it affected their activity, as well as how they responded and managed these changes.

- (4) *Technology in daily activities* explored how both production and commercial technologies were used in daily operations by farmers and how they were evaluated. Within this theme, participants were asked to provide their evaluation criteria of these technologies' adoption or rejection and the main challenges they faced. Furthermore, farmers were also asked about potential technologies they would like to adopt in the future or other technologies that they value as positive or negative and to explain their reasons.
- (5) *Blockchain Technology* introduced the concept of blockchain to participants, first by asking whether they were already familiar with it, and then, regardless of prior knowledge, by providing a brief explanation of the technology and its potential applications in agricultural supply chains. Participants were then invited to evaluate its relevance, usefulness, and feasibility in their specific context. This sequential structure allowed the researcher to distinguish between informed and uninformed valuations, and to observe how farmers reason about an unfamiliar technology when given minimal framing.

These themes were derived directly from the conceptual framework and were designed to generate data across the analytical structure derived from the conceptual framework.

3.3.2 Sampling Criteria

Participants were selected through purposive sampling, which involves the deliberate selection of cases that are information-rich and relevant to the research question (Patton, 2015). The sampling criteria were designed to ensure variety across the main dimensions of the conceptual framework, including farm size, production type, supply chain structure, and degree of digital adoption. This strategy reflects the logic of maximum variation sampling (Lincoln & Guba, p.

2, 1985), which seeks to capture a broad range of perspectives rather than a statistically representative cross-section of the population.

The final sample consists of seven farmers, whose profiles are summarised in Table 1. The sample covers a range of farm types, sales channel structures (direct, mixed), ages (36–65), farm sizes (micro to medium) and digital adoption level (Low, Medium, High). This diversity is intentional, as in qualitative inquiry with small samples, analytical value derives from the richness and contrasts among cases rather than from numerical representativeness (Patton, 2015).

- (1) *Age Range* was selected as one of the attributes to highlight whether generational differences in digital literacy could influence digital valuation, as it is well discussed in the agricultural technology adoption literature (Caffaro et al., 2020). To avoid data and information fragmentation, the age criterion was divided into two cohorts, 36 to 45 and 56 to 65, as well as enable a better comparison between younger farmers who entered the sector during the digital transition and more experienced farmers who may have experienced a greater digital disruption.
- (2) *Farm Size* was divided into four-dimension, Micro, Small, Medium and Large based on the number of hectares and employees. Notably, farm size is a structural determinant for the resource availability for technology investments and the complexity of daily operations that digital technologies might address. By including this criterion, it is possible to identify whether farm size can influence farmers' technology valuation process.
- (3) *Sales Channel* was classified as Direct or Mixed, capturing the farmer's position in the supply chain and their relationship with intermediaries and power asymmetries. This criterion is directly grounded in the Systems of Provision framework (Fine & Bayliss,

2020), which supports that the structure of the provisioning system shapes the incentives and barriers associated with specific technologies.

(4) *Years Active* captures how long the farm has been operating, distinguishing the farm activity as new (0-5 years), medium (6-15 years), or historical (16 or more years). This criterion aims to enable analysing how a farm maturity influences the ability to face technological change.

(5) *Technology Adoption* evaluated farmers' current use and integration of digital tools in both production and commercial activities. This criterion was included to assess whether the current use and knowledge of digital technologies could influence the farmer's technology valuation process.

The combination of the five criteria produced a sample in which farmers present different profiles, increasing the analytical variation available for cross-case comparison.

Table 1 Farmers' Profiles

Farmer	Age Range	Farm Size	Sales Channel	Years active	Technology Adoption
F1	56-65	Small	Direct	New	Low
F2	36-45	Micro	Direct	Medium	Low
F3	36-45	Large	Mixed	Historical	High
F4	56-65	Large	Mixed	Historical	High
F5	36-45	Medium	Direct	New	Low
F6	36-45	Micro	Direct	Medium	Low
F7	36-45	Small	Direct	Medium	Medium

3.4 Data Analysis

3.4.1 Content Analysis

This section provides an overview of the two main categories of content analysis: quantitative content analysis (QtCA) and qualitative content analysis (QualCA). The two methods are discussed individually and subsequently compared in order to highlight their respective advantages, limitations, and suitability for different research designs. Finally, the section explains why one method was preferred over the other in the analysis of Italian smallholders and their digital orientation.

3.4.2 History and definition

Building on Krippendorff (2004), content analysis can be defined as a *research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use*. In other words, content analysis involves assigning meaning to words and other forms of communication according to their context and the subject of study. Content analysis was first developed and applied during World War II, when the U.S. government sponsored a project to evaluate enemy propaganda (Prasad, 2008). Harold Lasswell, who promoted the project, later wrote *Language of Politics*, where he explains how political power is deeply shaped by language use (Lasswell et al., 1949). Subsequently, content analysis became widely used in social science research and in other disciplines (Prasad, 2008).

Initially, content analysis was conducted manually on sources such as newspapers, books, and other written materials, and it emerged as a human-coded method within communication research (Neuendorf & Kumar, 2016). Human coders defined categories, selected sample texts,

specified units of analysis, and recorded frequencies, presence, space, or time measures across content items (Bass & Semetko, 2021).

With the advent of the Internet and subsequent technological innovation, content analysis no longer concerns text alone, but also audio recordings, images, video, and other media forms (Neuendorf & Kumar, 2016; Kleinheksel et al., 2020). The main shift has concerned the analytical process itself, which has moved from manual to computational analysis, driven by the increasing computational capacity required to analyse digital texts at scale (Wiedemann, 2013; Mettler, 2025).

At the same time, recent methodological frameworks have increasingly proposed hybrid approaches that combine computational techniques with interpretive refinement, rather than relying exclusively on unsupervised models (Nelson, 2020; Carlsen & Ralund, 2022).

Considering the evolution of content analysis, the following sections discuss its two main orientations before examining how the present study draws on both.

3.4.3 Quantitative Content Analysis

QtCA represents the first form of content analysis developed as a research method. Building on Berelson (1952), QtCA can be understood as a research technique for the objective, systematic, and quantitative description of the manifest content of communication. QtCA emphasises objectivity and systematicity, as it assumes that meaning can be extracted from texts through a predefined coding scheme applied across a corpus, and that the resulting counts and frequencies constitute valid empirical evidence about the phenomenon under study (Krippendorff, 2004; Neuendorf & Kumar, 2016).

Overall, QtCA systematically codes and quantifies features of written, visual, or oral communication so that they can be analysed statistically (Coe & Scacco, 2017). To achieve this,

QtCA follows a series of phases. First, researchers develop a coding framework and coding rules, usually derived from existing literature, in order to identify which features should be examined before the analysis begins (Prasad, 2008; Neuendorf & Kumar, 2016; Coe & Scacco, 2017). Measures such as *Krippendorff's alpha* and intercoder reliability are used to increase the reliability of the analysis and are calculated to ensure that different coders apply the coding scheme consistently and that the results are therefore replicable (Krippendorff, 2004).

The primary strength of QtCA lies in this replicability and its capacity to handle large volumes of textual data in a standardised way, making it particularly well-suited to hypothesis-testing designs in which existing theoretical categories need to be verified against empirical material (Neuendorf & Kumar, 2016). For instance, word frequency analysis, which consists in counting how often specific terms appear across a corpus, represents one of the most direct applications of this logic, as it reduces text to measurable, comparable units without requiring interpretive processes (Wiedemann, 2013).

The main drawbacks of QtCA concern weaknesses in application and reporting, including unclear units of analysis and an overreliance on descriptive counts without sufficient methodological justification (Rourke & Anderson, 2004). Furthermore, because the coding matrix is fixed before the analysis begins, QtCA may overlook contextual and latent dimensions of meaning that are relevant to the research question (Hsieh & Shannon, 2014). The quantification and standardisation of textual elements therefore do not automatically guarantee interpretive validity, since frequency does not necessarily correspond to analytical significance (Berelson, 1952).

3.4.4 Qualitative Content Analysis

To address the limitations of QtCA, QualCA was developed with the aim of preserving the systematic rigour of content analysis while allowing for greater contextualisation and attention to latent meaning. Existing literature defines QualCA as a systematic approach to analysing text, audio, and other recorded material through the coding of segments, the grouping of these segments into categories, and the interpretation of emerging patterns in relation to the research question (Forman & Damschroder, 2007; Hsieh & Shannon, 2014). It is widely used in fields such as nursing, education, media studies, and social science research (Lyhne, Thisted & Bjerrum, 2025).

Hsieh and Shannon (2014) identify three variants of QualCA: conventional, directed, and summative. These approaches differ according to how coding categories are derived, either inductively from the data or deductively from existing theory and literature. In conventional QualCA, coding categories are usually developed through open coding without a predefined framework. In directed QualCA, existing theory and literature guide the initial coding structure, although the framework remains open to subsequent revision. In summative QualCA, the analysis begins with the identification and quantification of specific words or content before moving towards an interpretive stage that examines the underlying meaning of their use (Schreier, 2012; Hsieh & Shannon, 2014).

QualCA differs from QtCA primarily in the role assigned to the coding framework, as in QualCA the framework is not necessarily designed and imposed before the data are analysed. Instead, coding categories may be developed, refined, and revised throughout the analytical process, allowing the researcher to capture meanings and contexts that were not anticipated during the theoretical stage of the research (Schreier, 2012; Kleinheksel et al., 2020).

The main benefit of QualCA is the degree of interpretive depth and contextual sensitivity that it offers. By attending to latent meaning, communicative intent, and the broader discursive context of the material, QualCA can capture what QtCA, by design, tends to overlook (Kleinheksel et al., 2020).

At the same time, QualCA presents some limitations. The flexibility of the method introduces risks of subjectivity and researcher bias, as the iterative development of categories depends heavily on the judgement and prior knowledge of the analyst (Schreier, 2012). Furthermore, because coding schemes evolve during the analysis, the replicability of QualCA is inherently lower than that of QtCA, which poses challenges for intercoder reliability and for the transparency of the analytical process (Krippendorff, 2004). To address the limitations of both QtCA and QualCA, recent studies have developed research frameworks that combine the two approaches (Neuendorf & Kumar, 2016).

3.4.5 Content Analysis in the present study

As illustrated in the previous sections, QtCA and QualCA differ primarily in the role assigned to the coding framework and the degree of interpretive flexibility allowed during analysis. QtCA prioritises replicability and statistical treatability, making it most appropriate for hypothesis-testing research designs; QualCA, by contrast, prioritises contextual sensitivity and interpretive depth, making it better suited to exploratory research designs where the aim is to generate a better understanding of a specific phenomenon (Hsieh & Shannon, 2014; Neuendorf & Kumar, 2016).

The present study adopts QualCA as its primary analytical approach. Given the exploratory nature of the research, which seeks to understand how Italian smallholders construct their digital orientation within a Socio-Technical System of Provision, a method that allows categories to

emerge and evolve through continuous engagement with the material is more appropriate. More specifically, the thematic coding conducted in NVivo 15 (Section 3.5.3) follows a directed QualCA logic, as defined by Hsieh and Shannon (2014): the parent nodes were derived deductively from the conceptual framework developed in Chapter 2, while sub-nodes were allowed to emerge inductively from the interview transcripts. This reflects the abductive reasoning strategy introduced in Section 3.2.2, in which theoretical sensitivity and empirical responsiveness are maintained throughout the analytical process.

At the same time, the study incorporates a complementary QtCA component in the form of a word frequency and word cloud analysis. This component follows an inherently data-driven logic and therefore contrasts with the expert-driven, theory-informed logic of the thematic coding (Schreier, 2012). Rather than replacing or contradicting the QualCA approach, the word frequency analysis serves as a form of descriptive triangulation: it provides a quantitative snapshot of the corpus that can be cross-checked against the interpretive structure produced through thematic coding, thereby strengthening the overall trustworthiness of the analysis (Patton, 2015).

Beyond the comparison of word rankings, NVivo and R differ in the broader analytical contexts within which their outputs are produced. At a conceptual level, the two tools reflect the QtCA and QualCA logics discussed previously. NVivo is designed as a qualitative data management tool, in which word frequency analysis is embedded within a broader data-flow environment. Unlike in R, the coded segment in NVivo represents the unit of analysis and can be understood as the set of words or phrases to which the researcher has assigned a specific meaning. In this context, word frequency analysis serves to orient and support the researcher's interpretive process rather than replace it. In this sense, NVivo operationalises the summative QualCA logic described by Hsieh and Shannon (2014), in which the quantification of surface-level content functions as a preliminary step toward deeper interpretive engagement with the material.

By contrast, R more closely follows a QtCA logic, as the corpus is treated as a collection of units, namely *tokens*. In this approach, meaning is not assigned directly by the researcher but is measured through the ranked distribution of tokens, which does not contain inherent interpretive content. The TF-IDF analysis follows the same logic but shifts the unit of comparison from the corpus to the individual document, identifying distinctiveness through a mathematical weighting procedure rather than through the researcher's judgement. Therefore, R produces a data-driven reading of the corpus, in which the analytical structure emerges from the empirical distribution of the material itself, while NVivo produces an expert-driven reading shaped by the theoretical framework and coding decisions of the researcher (Schreier, 2012).

At a procedural level, a further difference concerns transparency and replicability. NVivo's internal algorithms are proprietary and not fully documented, which makes exact replication by an independent researcher difficult. The R workflow, by contrast, is fully scripted and reproducible, allowing any reader to verify or replicate the analysis independently (Wiedemann, 2013). For this reason, the use of both tools supports the hybrid QualCA/QtCA strategy adopted in the study: NVivo provides theoretically informed interpretation, while R offers a complementary data-driven and reproducible check of the lexical structure of the corpus.

3.5 Data Analysis in NVivo

The analysis of the data was conducted in three sequential but iterative phases: the classification of participants through an attribute framework, the thematic coding of the interview transcripts, and the systematic querying of the coded data to identify patterns and relationships across cases. All three phases were performed using NVivo 15 and were guided by the conceptual framework developed in Chapter 2, which provided both the initial analytical categories and the interpretive

lens through which emergent themes were evaluated. Simultaneously, another content analysis was carried out on R and compared with the NVivo one.

3.5.1 Data Analysis Software: NVivo15

Data analysis was conducted using NVivo 15, a qualitative data analysis software widely used in social sciences and management research that facilitates the organisation, coding, and querying of textual data (Beekhuyzen & Bazeley, 2024). The software was selected for its capacity to handle large volumes of interview transcripts, support hierarchical node structures, and generate matrix coding queries that enable cross-case comparison, all essential for the analytical strategy of this study. Furthermore, as the interviews transcripts contained between 5.000 and 12.000 words each, it was required a more structured environment for organizing and retrieving coded segments across cases. Coding in NVivo enabled the hierarchical node structure, allowing the direct application of the analytical framework, with parent nodes corresponding to the seven main thematic areas and sub-nodes capturing the finer distinctions. Lastly, NVivo matrix coding query feature enabled the cross-comparison across farmers' attributes and thematic codes, which is essential for the comparative logic behind the multiple case study research design.

3.5.2 Attribute Classification

Before coding the interview transcripts, each of the seven farmer was classified based on a set of attributes aimed to describe their profile better after the interview. This step translated the sampling criteria developed in section 3.3.2 into a set of categorical variables that could be continuously cross-referenced with the thematic codes developed in the subsequent phase.

The attribute structure includes eight dimensions: age group, farm size, digital adoption level, sales channel, activity seniority, orientation toward change, blockchain adoption status, and prior blockchain knowledge. Each attribute was operationalised as a categorical variable with a defined set of values, as shown in table 2.

Table 2 Attributes List and Values

Farmer	Age Group	Farm Size	Activity Seniority	Digital Adoption Level	Sales Channel	Orientation Toward Change
F1	56-65	Small	New	Low	Direct	Innovative
F2	36-45	Micro	Medium	Low	Direct	Adaptive
F3	36-45	Large	Historical	High	Mixed	Innovative
F4	56-65	Large	Historical	High	Mixed	Innovative
F5	36-45	Small	New	Low	Direct	Adaptive
F6	36-45	Micro	New	Low	Direct	Resistant
F7	36-45	Small	New	Medium	Direct	Innovative

The attributes age group, farm size, activity seniority, digital adoption level and sales channel were derived from the sampling criteria, while the attribute *orientation toward change* was added after conducting the interviews and gathering a wider understanding of the farmers' attitudes.

Orientation toward change presents three dimensions: innovative, adaptive and resistant. It must be specified that orientation toward change was not derived from the farmer's level of digital adoption; rather, it was selected based on how they managed sudden changes in their

agricultural context, as well as their efforts and willingness to change and develop their farming activities on both the production and commercial side.

Once assigned, the attributes were entered into NVivo's case classification system, which allowed each farmer case to carry a set of attribute values that could be used as filters in matrix coding queries. This integration between the attribute framework and the thematic coding structure is what enables the comparative dimension of the analysis, allowing the researcher to ask not only what farmers said about a given topic, but whether what they said varies according to their farm size, supply chain position, change orientation, or level of digital adoption.

3.5.3 Thematic Coding

The main analysis method used is the thematic analysis conducted through both deductive and inductive coding (Braun & Clarke, 2006). Before beginning with the coding phase, a coding framework was developed building on the conceptual framework, resulting in the creation of seven parent nodes: (1) Farmers' Values, (2) Technology Valuation, (3) Blockchain Valuation, (4) Socio-Technical Systems of Provision, (5) Barriers to Change and Digital Adoption, (6) Changes in Agriculture, and (7) Farmers' Digital Response. Each parent node was further divided into thematic sub-nodes, reaching a total of 55 analytical codes (Appendix 6).

At the same time, inductive coding was applied to capture themes emerging directly from the data that were not captured by the deductive framework. Emergent codes were either integrated into existing sub-nodes or flagged in analytical memos for further interpretation. This dual approach, sometimes referred to as hybrid thematic analysis (Fereday & Muir-Cochrane, 2006), ensured that the analysis remained both theoretically grounded and empirically responsive.

Coding was applied across multiple passes. A first coding session assigned broad thematic labels at the parent node level. A second session refined the coding at the sub-node level. A

third session involved a coding consistency check, in which all references coded under each sub-node were reviewed across interviews to ensure uniform application of the analytical criteria. This procedure enhances the internal reliability of the coding scheme (Miles, Huberman & Saldaña, 2014).

3.5.4 Query Analysis

After coding all the interviews' transcripts, a set of matrix coding queries were made to identify potential patterns and relationships across the farmers. The selected queries were aimed to address the research questions and sub-questions. More specifically:

- (1) A general mapping query was conducted by crossing all seven parent nodes against the seven farmer cases, providing an overview of thematic structure across the sample. By conducting this query, it was possible to identify which were the most discussed topics.
- (2) A values query crossed intrinsic and extrinsic value sub-nodes against the orientation toward change attribute, testing whether innovative, adaptive, and resistant farmers showed different sets of intrinsic and extrinsic values.
- (3) A production technologies query was conducted by crossing the sub node production technologies with the size activity attribute. By crossing the two dimensions, it was possible to identify whether specific production technologies adoption differed across farms with different activity size and scope.
- (4) A commercial technologies query was conducted by crossing the sub node commercial technologies with the size activity attribute. By crossing the two dimensions, it was possible to identify whether specific production technologies adoption differed across farms with different activity size and scope.

- (5) A change in agriculture query was conducted to measure the reference count proportion of the climate change sub-node references count over the total references of the changes in agriculture parent node.
- (6) A digital adoption barriers query crossed all barrier sub-nodes against the activity seniority attribute, investigating whether newer or more established farms perceived different types of challenges.
- (7) A blockchain valuation query crossed blockchain perceived value and adoption barrier sub-nodes against the type of sales channel attribute, examining the relationship between supply chain structure and blockchain relevance.
- (8) A blockchain sentiment query crossed specific blockchain valuation sub-nodes, including transparency value, scepticism, and irrelevance for direct sales, against individual farmer cases, mapping the nature and direction of each farmer's valuation.

3.5.5 Case Comparison Analysis

Subsequently to the matrix coding queries, a series of comparison diagrams were designed in NVivo to identify common and different themes between selected pairs of farmers cases. Comparison diagrams display the coded nodes of two cases simultaneously, distinguishing between shared themes, so those coded for both farmers, and case-specific themes, those appearing exclusively in one farmer's account. This technique was applied to three pairs based on their profiles, specifically:

- (1) F6 and F7, who share the same age cohort and sales channel structure but occupy opposite ends of the digital adoption attribute.
- (2) F3 and F5, who share an innovative orientation toward change but differ substantially in activity seniority and technological capacity.

- (3) F1 and F4, who both demonstrate prior knowledge of blockchain and an informed interest in the technology but operate in very different supply chain contexts.

These pairs were chosen based on the principle of the most-similar and most-different case logic, which states that by comparing cases that are similar on some dimensions but different on others allows the isolation of those variables that may explain the differences in technology valuation (Przeworski & Teune, 1970).

3.5.6 Word Frequency Analysis

Additionally, a word frequency analysis was performed on all the interviews' transcripts after the creation of a customised stop-word list to remove functional words, discourse markers, and role identifiers present in the transcripts. By conducting a word frequency analysis, it was possible to complement the thematic coding structure to identify potential blind spots, that is, terms appearing with high frequency in the data that had not been captured by the pre-established node system.

This function is consistent with the abductive logic described in Section 3.2.2 because it allows the data to challenge the theoretical framework, rather than simply fitting into it. Second, the word frequency analysis also helps communicate the results by giving readers a quick and clear overview of the main themes in the data before the more detailed thematic analysis is presented. In this way, it acts as a form of descriptive triangulation, as it uses a different analytical approach to check that the thematic coding has not missed important patterns in the material (Patton, 2015).

3.6 Word Frequency and Word Cloud Analysis in R

The following section presents the methodology of the textual analysis conducted in R, together with its rationale and results, including a comparison with the word frequency analysis performed in NVivo 15. The aim is to assess whether the two tools, applied to the same corpus, produce similar or divergent patterns and whether these differences have implications for the validity of the findings.

As outlined in Section 3.4.5, this dual-tool strategy reflects the hybrid QtCA/QualCA logic adopted in the present study, in which quantitative frequency data serve as a form of descriptive triangulation anchoring the interpretive claims produced through thematic coding (Patton, 2015; Schreier, 2012).

3.6.1 Rationale for the cross-comparison between NVivo and R

Although NVivo 15 includes built-in functions for word frequency and word cloud analysis, both analyses were also conducted in R (R Core Team, 2024) for two distinct methodological reasons. The first reason concerns descriptive triangulation. By generating frequency counts through an independent tool, the R-based analysis makes it possible to assess whether the lexical patterns detected in the corpus are confirmed when the data are approached without any prior theoretical structure, and to cross-reference these patterns against the results produced in NVivo (Patton, 2015). The second reason concerns transparency and reproducibility. NVivo's word frequency function processes text through internal algorithms that are not fully exposed to the researcher or the reader, making the exact preprocessing steps difficult to audit or replicate independently. In R, by contrast, every step of the analytical pipeline is explicitly coded and documented, from the loading of raw transcripts to the generation of final visualisations, allowing the analysis to be reproduced by the reader (Wiedemann, 2013).

3.6.2 Procedure

This section outlines the full procedure followed for the textual analysis, including the R packages used and the main analytical phases.

3.6.3 Packages

The analysis in R used the following R packages: tidyverse (Wickham et al., 2019) for data manipulation; tidytext (Silge & Robinson, 2025) for tokenisation, stop-word removal, and TF-IDF; ggplot2 (Wickham, 2019) for frequency and TF-IDF visualisations; wordcloud2 (Lang & Chien, 2018) for word cloud generation; stopwords (Benoit et al., 2018) for access to the Italian Snowball stop-word list; and readr (Wickham et al., 2019) for loading the transcripts.

3.6.4 Transcripts loading and first data cleaning

The full corpus consisted of the seven transcripts from the semi-structured interviews with Northern Italian smallholders. The transcripts were saved in a specific folder as plain text files (.txt) and loaded into R using the `read_file()` function. The farmer identifier (n = 1–7) was extracted from each file name using `str_extract()`. Before tokenisation, all apostrophes were replaced with whitespace using `str_replace_all()`. This step was necessary to correctly separate words from articles and pronouns (for example, transforming *l'acqua* into *acqua*) and to avoid treating the same word as multiple tokens, which could have led to misinterpretation.

```
interview_files <- list.files(pattern = ".*Farmer.*\\.txt", full.names = TRUE)
interviews_raw <- tibble(farmer = str_extract(interview_files, "Farmer \\d+"),
                        text = map_chr(interview_files, read_file))
%>% mutate(text = str_replace_all(text, "'", " "))
```

Figure 2 R script for transcripts' loading

3.6.5 Tokenisation

Tokenisation was carried out using the `unnest_tokens()` function from `tidytext`, applied separately to the aggregated corpus and to each individual farmer corpus. The function splits the text, treated as a continuous variable, into single tokens while simultaneously converting all characters to lowercase and removing punctuation.

```
tokens_all <- corpus %>%  
  unnest_tokens(word, text)  
  
tokens_all <- corpus %>%  
  unnest_tokens(word, text)  
  
tokens_per_farmer <- per_farmer %>%  
  unnest_tokens(word, text)
```

Figure 3 R script for tokenisation

3.6.6 Stop-word removal

Stop words were removed in two phases. In the first phase, an Italian stop-word list was extracted directly from the Snowball list in the `stopwords` package. This list included Italian articles, prepositions, pronouns, and conjugated forms of the auxiliary verbs *essere*, *avere*, *fare*, and *stare*.

The second phase consisted of creating an additional custom stop-word list, which was updated iteratively across different trials and on the basis of the outputs generated. This custom list included words belonging to three categories: discourse fillers and expressions typical of spoken Italian that had no analytical value (e.g. *allora*, *diciamo*, *insomma*, *fondamentalmente*); interviewer and interviewee identifiers (*intervistatore* and *agricoltore*); and frequently occurring terms that did not contribute meaningfully to the analysis (e.g. *senso*, *bene*, *esempio*). Following stop-word removal, tokens shorter than three characters and purely numeric strings were also excluded.

The two lists were then merged into a single stop-word list and applied both to the full corpus and to the individual farmer corpus.

```
# Italian stop words from snowball package
italian_stopwords <- tibble(word = stopwords("it", source = "snowball"))

# Additional stopwords
custom_stopwords <- tibble(word = c(
  "allora", "quindi", "però", "infatti", "diciamo", "magari", "comunque", "cioè", "insomma", "eccetera",
  "sì", "no", "sì", "ok", "beh", "invece", "altri", "mai", "intervistatore", "agricoltore", "poi", "anche",
  "così", "già", "proprio", "tipo", "po", "un", "una", "delle", "della", "del", "dei", "degli",
  "nell", "nella", "nelle", "negli", "sul", "sulla", "sulle", "sugli", "col", "coi", "dal", "dalla", "dalle",
  "dagli", "al", "all", "alle", "agli", "quel", "neanche", "oppure", "puoi",
  "anno", "anni", "giorno", "giorni", "mese", "mesi", "perch", "cosa", "dire", "fare",
  "certo", "cio", "sempre", "essere", "adesso", "quando", "molto", "fatto", "cose", "dopo", "qua",
  "solo", "parte", "secondo", "appunto", "prima", "tanto", "cos", "qui", "avere", "ecco",
  "detto", "dico", "tutte", "vabb", "altri", "dirti", "sai", "fine", "finale", "voui",
  "tutta", "soprattutto", "esatto", "due", "meno", "punto", "devi", "quasi", "vieni", "viene", "altro",
  "andare", "devo", "ogni", "posso", "puoi", "assolutamente", "visto", "praticamente", "abbiamo", "siamo",
  "hai", "hanno", "aveva", "avevo", "avevamo", "viene", "diventa", "vuole", "voglio", "bisogna", "ovviamente",
  "fondamentalmente", "sicuramente",
  "davvero", "forse", "abbastanza", "almeno", "piuttosto", "ancora",
  "subito", "insieme", "comunque",
  "modo", "volta", "volte", "caso", "momento", "livello",
  "tutto", "tutti", "niente", "qualcosa", "roba",
  "senza", "mentre", "durante", "rispetto", "quanto",
  "tanti", "tante", "pochi", "meglio", "meno",
  "capito", "capisce", "chiaramente", "ovvio", "diciamo",
  "dici", "direi", "stiamo", "stavamo", "facendo", "esempio"))

all_stopwords <- bind_rows(italian_stopwords, custom_stopwords)

tokens_clean <- tokens_all %>%
  anti_join(all_stopwords, by = "word") %>%
  filter(nchar(word) > 2) %>%
  filter(!str_detect(word, "A\\d+$"))

tokens_clean_farmer <- tokens_per_farmer %>%
  anti_join(all_stopwords, by = "word") %>%
  filter(nchar(word) > 2) %>%
  filter(!str_detect(word, "A\\d+$"))
```

Figure 4 R script for stop-word list creation and application

3.6.7 R-Based Analytical Outputs

After the data-cleaning process, six quantitative analyses were prepared and applied to the full corpus:

- A word frequency table with the ranking of the most recorded tokens.
- A horizontal bar chart displaying the top 20 most frequent words across the aggregated corpus.
- A word cloud visualising the top 100 tokens with font size proportional to frequency.

- A per-farmer frequency bar chart displaying the top 10 words for each of the seven participants in a faceted layout.
- A TF-IDF analysis at the individual farmer level, visualised as a faceted bar chart displaying the eight most distinctive words per farmer. The results of this analysis are discussed in Chapter 4, where they are compared directly with the NVivo case comparison analysis.
- A Zipf's law plot was prepared and applied to the full interview corpus as a quality control measure. Zipf's law predicts that, in any natural language corpus, word frequency is inversely proportional to rank, producing a linear relationship on a log-log scale (Piantadosi, 2014).

3.7 Rigour and Trustworthiness

In qualitative research, the criterion of trustworthiness replaces the conventional measures of validity and credibility of quantitative research. Lincoln & Guba (1985) identifies four dimensions that compose trustworthiness: credibility, transferability, dependability and confirmability. To ensure rigour and trustworthiness, the study adopted different strategies to address these four dimensions.

Credibility was pursued through several strategies, including the continuous interaction with and analysis of the data, which increased the familiarity with the gathered material and reduced the risk of misinterpretation. At the same time, conducting all interviews on-site further strengthened credibility, allowing the researcher to observe the context and interacting with subjects directly to understand them (Fusch, Fusch & Ness, 2017). Member-checking was also used during the interviews, making it possible to check unclear or ambiguous statements with

participants in real time and ensuring their intended meaning was understood correctly (Birt et al., 2016).

Transferability refers to the extent to which the findings of a study can be applied or generalized to other contexts and situations (Drisko, 2025). In this study, transferability is strengthened by the detailed description of the sample characteristics and research context provided in this chapter, providing the readers with the information needed to assess the applicability of findings in other contexts. Furthermore, the development of the conceptual framework provides a layer of theoretical abstraction that extends the transferability of findings beyond the specific cases studied. By organising the findings around constructs that are not unique to the Italian agricultural context, the framework allows readers and future researchers to assess their relevance and applicability in other sectoral or geographical settings. As noted by Lincoln and Guba (1985), the responsibility for transferability lies primarily with the reader, as the researcher's role is to provide sufficient contextual information to enable that judgement.

Dependability was achieved through the documentation of the analysis procedure, including the full coding structure, the sequence of queries applied during the analysis, and the complementary R workflow used for word frequency, word cloud, TF-IDF, and Zipf's law analyses. At the NVivo level, query exports provide documented numerical outputs that can be inspected; at the R level, the scripted procedure makes tokenisation parameters, stop-word removal, and visualisation settings transparent and reproducible. This documentation ensures that the analytical process remains open to external audit and can be evaluated or replicated by other researchers in the future (Miles, Huberman & Saldaña, 2014; Wiedemann, 2013).

Confirmability, which is closely connected with dependability, was guaranteed by grounding the interpretations in direct evidence from the transcripts, ensuring that the findings reflected the gathered material rather than the researcher's assumptions or biases. Analytical memos were maintained throughout the coding process to document the reasoning behind specific

interpretations and to show how conclusions were reached. Confirmability was further strengthened by the cross-tool comparison between NVivo and R: the replication of dominant lexical patterns across both tools indicates that key terms and themes were not produced by a single software environment or by the researcher's interpretive preferences but reflected stable features of the corpus. In this sense, the hybrid QualCA/QtCA strategy reinforced both the interpretive richness of the NVivo analysis and the empirical grounding of the R-based textual analysis.

3.8 Ethical Considerations

All participants provided informed consent prior to the interviews. Participants were informed of the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without consequence. Audio recordings and transcripts are stored securely and will not be shared with third parties. In line with standard qualitative research practice, all farmers are referred to by anonymous identifiers (F1 through F7) throughout the thesis to protect their privacy.

3.9 Limitations

Several limitations of this study should be acknowledged, which influence both the empirical and the theoretical dimension of the research.

3.9.1 Empirical Limitations

From the empirical standpoint, the study included only seven participants. While this is suitable for an exploratory qualitative study and aligns with the people-focused research approach

suggested by Pagell and Wilhelm (2025), it limits how much the findings can be generalised. Therefore, the results should be understood as insights specific to this context rather than widely representative conclusions. Furthermore, the study focuses only on Northern Italy, particularly Lombardy. While this region is important for agriculture and provides a coherent social and institutional setting for the analysis, the findings may not apply directly to smallholders in other regions or countries with different institutions, climates, or supply chain structures.

Another limitation regarding the interviews is that were conducted at one point in time. As a result, the study captures farmers' views and attitudes only at that specific moment, rather than showing how they may change over time. A longitudinal study would be more suitable for examining how farmers' valuation of digital technologies develops through experience or changes in the wider socio-technical environment.

Despite efforts to reduce the researcher influence, the interviewer's presence and the semi-structured interview format may have encouraged socially desirable responses, especially on sensitive issues such as financial difficulties or criticism of institutions. Conducting the interviews on-site was intended to reduce this risk by placing participants in a familiar and comfortable environment.

To conclude, the analysis is based on self-reported data, which may not fully capture the complexity of the actual valuation process. Farmers' explanations for adopting or rejecting certain technologies may reflect later rationalisations rather than the exact thought processes behind their decisions.

3.9.2 Theoretical Limitations

From a theoretical perspective, the conceptual framework developed in chapter 2 integrates four theories: Anderson's (1993) Expressive Theory of Value, Weber's (1922) concept of social

action, Fine and Bayliss's (2020) Systems of Provision approach, and Geels's (2002) Multi-Level Perspective in socio-technical systems. While the integration of these frameworks provides a more holistic view on digital valuation, the study does not theorise how the individual and structural dimensions interact with each other. Furthermore, the systems of provision approach were originally developed for consumption patterns, while the multi-level perspective in socio-technical systems was designed to analyse large-scale societal transitions. By integrating and applying these frameworks into individual subjects' valuation processes, the coding categories built on them may not have captured all relevant aspects of farmers' experience, particularly those that fall outside the original scope of each theory. Lastly, the conceptual framework is applied and verified in the Northern Italian agricultural context, which may limit its applicability to other Socio-Technical Systems of Provision and subjects of valuation.

3.10 Summary

The conceptual framework developed in Chapter 2 played an active role in shaping the research design, rather than serving only as a theoretical foundation. Specifically, the framework's main components, farmers' valuation processes (Anderson, 1993; Weber, 1922) and Socio-Technical Systems of Provision in which those valuations are embedded (Geels, 2002; Fine & Bayliss, 2020), directly informed the thematic areas of the interview guide, the analytical structure used in NVivo, and the attribute classification system applied to each participant. The transparency about the relationship between theory and design is essential for ensuring the internal coherence of the study.

4 Findings

This chapter presents the findings of the research, which were derived from the thematic analysis of the seven interviews with farmers from Lombardy, Italy, and complemented by the R-based textual analysis introduced in Chapter 3. The findings are organised across thematic and comparative sections following the logic of the conceptual model developed in Chapter 2. The first section presents an overview of the sample and its contextualisation. All findings are grounded in direct evidence from the interview transcripts. Farmer identifiers (F1 through F7) are used to protect participants' anonymity while maintaining analytical traceability across the chapter.

4.1 Context Description and Sample Overview

As outlined in Chapter 3, the farmers' sample represents various profiles from Lombardy, a Region situated in the Northern part of Italy. It is worth noting that all farmers are part of either the small-size or medium-sized farmers, as larger ones are considered as full functioning companies and might have influenced the analysis output. As previously highlighted in Table 2, the sample is predominated mainly by younger farmers, reflecting the deliberate inclusion of younger entrants to the entrants alongside more established farming activities. All farmers but two (F3 and F4) operate through a direct sale system, selling through farmers' markets, GAS (*Gruppo Acquisto Solidale* – Solidarity Purchasing Groups), online platforms, on-farm shops, or a combination of these.

In Figure 2 is presented a chart that highlights the coding references count for each parent node (Query 1), divided by participants. The chart exhibits noticeable differences in the coding frequency with which farmers referred to the main themes during the interviews. *Farmers'*

Values and *Socio-Technical Systems of Provision (STS)* are the most coded parent nodes with higher references count. This suggests that participants discussed mainly of their personal values, farming practices, and the broader structural conditions influencing their agricultural activities.

On the other hand, themes such as *Blockchain Valuation* and *Farmers' Digital Response* received fewer references, showing either lower familiarity with these topics or a more limited perceived relevance among participants. The node *Changes in Agriculture* also generated a relatively high number of references, reflecting participants' awareness of ongoing transformations within the agricultural sector.

The distribution of coding references across participants further reveals that some interviews contributed more substantially to specific themes than others. For example, F1 and F2 appeared to contribute with a larger count of references within the dominant categories, while other farmers showed a more balanced but still significant engagement with these themes. Overall, the chart illustrates both the importance of certain thematic areas and the variability in participants' perspectives and experiences.

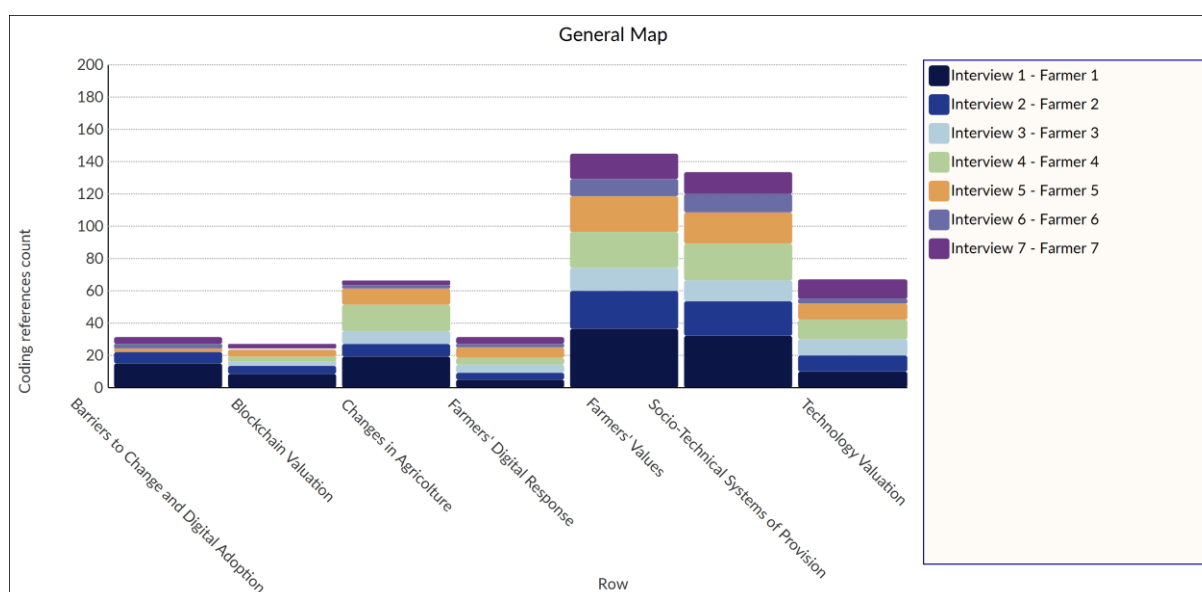


Figure 5 General Mapping Query

The word frequency analysis of the full corpus of the interviews (Figure 6), after the application of the customised stop-word list, showed that the dominant words and themes are *cliente* (client), *prodotto/prodotti* (product/products), *tecnologia/tecnologie* (technology/technologies), *cambiamento/cambiamenti* (change/changes), *lavoro* (work) and *biologico* (organic).



Figure 6 Word Frequency Analysis in Italian

The prevalence of words related to the concept of client, technology-use, and value-led terms reflects the multi-dimensional nature of farmers' and is consistent with the conceptual framework's positioning of digital technologies as objects of valuation.

Before moving further into the NVivo-based discussion of the findings, it is necessary to briefly pause the qualitative thematic analysis and introduce the complementary quantitative content analysis conducted in R. This shift allows the lexical patterns emerging from the interview corpus to be examined through a data-driven approach and subsequently compared with the NVivo outputs. After presenting and discussing the R-based results, the chapter returns to the NVivo analysis to interpret how these patterns relate to the thematic findings on technology and blockchain valuation.

4.2 R analysis results

This section discusses the outputs generated through the R-based textual analysis and subsequently compares them with the results obtained from the NVivo analysis. The aim is to examine whether the data-driven lexical patterns identified in R confirm, complement, or nuance the thematic interpretations developed through NVivo.

4.2.1 Word Frequency

The word frequency analysis of the full corpus identified *prodotto* (product) (n = 116) as the most frequent substantive term, followed by *azienda* (company) (n = 96), *lavoro* (work) (n = 95), *senso* (sense) (n = 90), *prodotti* (products) (n = 69), *bene* (good) (n = 63), *stato* (government or auxiliary) (n = 62), *cliente* (client) (n = 61), *tecnologia* (technology) (n = 59), and *riso* (rice) (n = 59) among the top ten. The full top 20 ranking is shown in Figure 7.

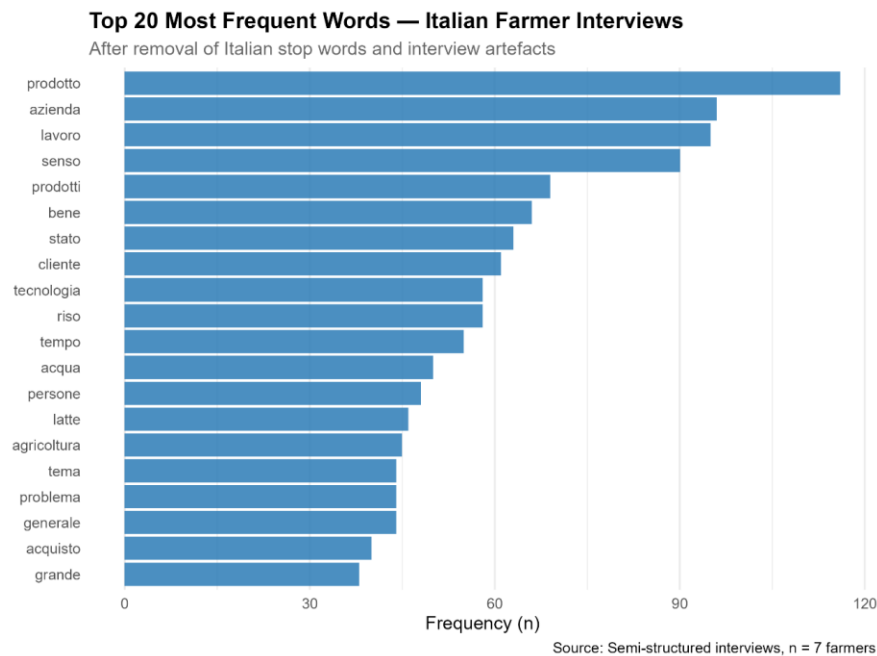


Figure 7 Top 20 most frequent words detected on all corpus

provision. These systems, together with farmers' value systems, shape how digital orientation is constructed and expressed.

To further investigate the interview corpus, additional word frequency analyses were conducted for each individual farmer interview.

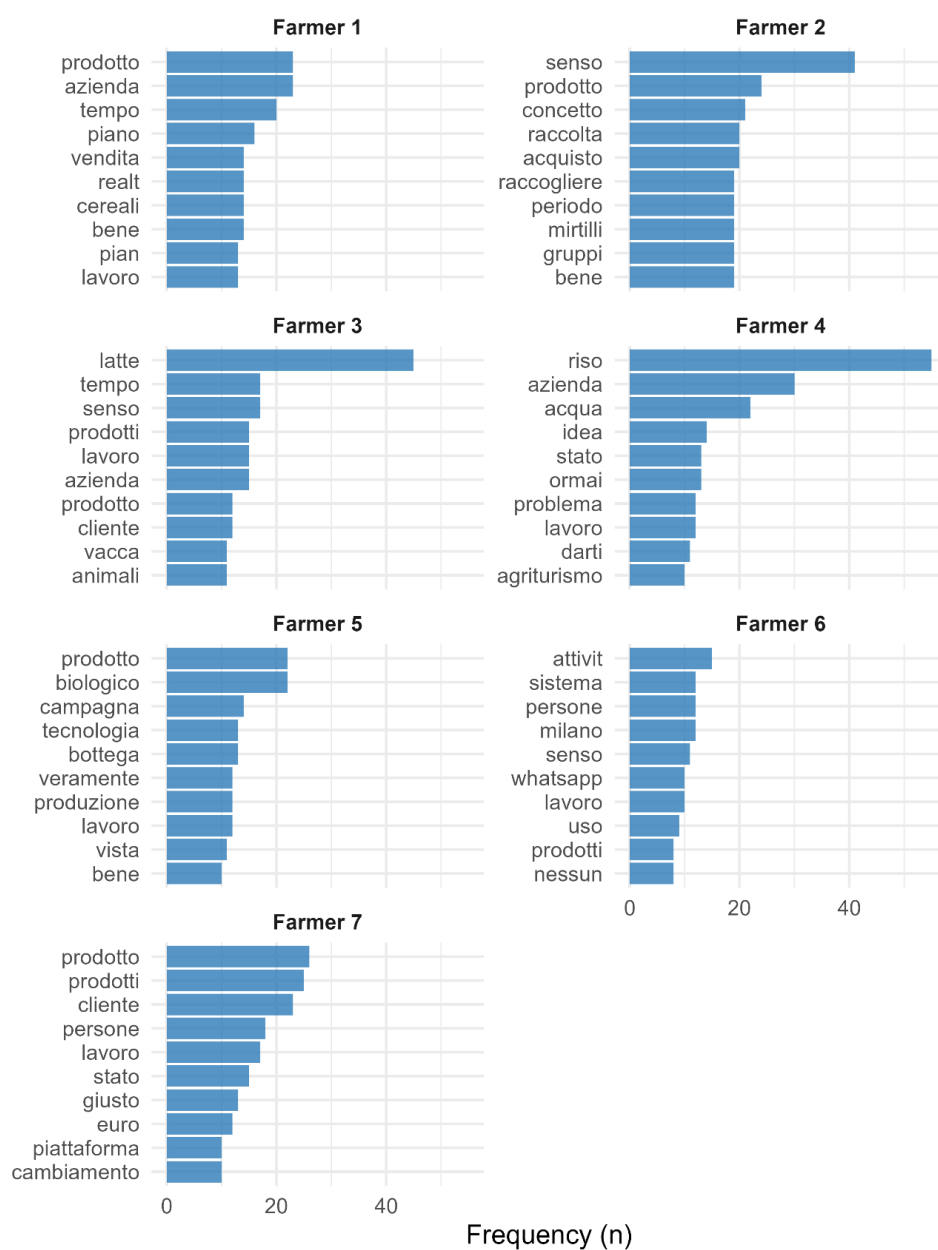
4.2.3 Individual farmer word frequency analysis

The per-farmer word frequency analysis highlights substantial differences across participants. Farmer 1's top words include *prodotto* (product), *azienda* (company), *vendita* (sale), and *cereal* (grains); Farmer 2 is characterised by *senso* (sense), *raccolta* (harvest), *acquisto* (purchase), and *mirtilli* (blueberries); Farmer 3 by *latte* (milk), *tempo* (time), and *animali* (animals); Farmer 4 by *riso* (rice), *azienda* (company), and *acqua* (water); Farmer 5 by *prodotto* (product), *biologico* (organic), and *campagna* (countryside); Farmer 6 by *attività* (business), *sistema* (system), *WhatsApp*, and *Milano*; and Farmer 7 by *prodotto* (product), *cliente* (client), *piattaforma* (platform), and *cambiamento* (change).

Overall, the word frequency analyses indicate that, while production and market relations are the most frequently discussed topics across all farmers, the specific top words reflect each farmer's commodity profile and commercial orientation.

Farmer 3 and Farmer 4 show the strongest product-specific specialisation, linked to dairy and rice respectively. By contrast, Farmer 6 and Farmer 7 display a stronger presence of distribution- and platform-related vocabulary, anticipating the differences in digital orientation that are later identified through the NVivo thematic coding.

Top 10 Words per Farmer



Source: Semi-structured interviews.

Figure 9 Top 10 most frequent words per farmer

4.2.4 TF-IDF analysis

The TF-IDF analysis (Figure 10) identifies the vocabulary that is most distinctive to each individual farmer by penalising terms that appear frequently across all interviews (Sheridan et al., 2025). TF-IDF, which stands for term frequency-inverse document frequency, measures the importance of a word within a specific document in relation to a larger collection of documents, defined here as the corpus. Words that occur frequently in one document receive a higher score, whereas words that are common across many documents receive a lower score. As a result, TF-IDF highlights terms that are particularly characteristic of an individual document rather than generally frequent across the corpus (Silge & Robinson, 2025).

Farmer 1's most distinctive terms are *cereal* (grains), *pianino* (slowly), and *istituzioni* (institutions); Farmer 2's are *mirtilli* (blueberries), *concetto* (concept), and *lamponi* (raspberries); Farmer 3's are *latte* (milk), *vacca* (cow), and *animali* (animals); Farmer 4's are *riso* (rice), *darti* (to give you), and *agriturismo* (farm stay); Farmer 5's are *bottega* (farm shop), *tunnel*, and *biologico* (organic); Farmer 6's are *disponibilità* (availability), *liberare* (to free), and *commerciali* (commercial); and Farmer 7's are *piattaforma* (platform), *utilizzo* (use), and *Shopify*.

The results confirm that the lexical variation observed in the frequency analysis reflects substantive differences in productive context and digital orientation. Farmer 6's most frequent terms, such as *liberare* (to free), *infrastruttura* (infrastructure), *commerciali* (commercial), and *Google*, indicate a connection between digital technologies and resource management. Farmer 7's terms, including *piattaforma* (platform), *Shopify*, *utilizzo* (use), and *integrate* (integrated), instead point to a more digitally integrated commercial strategy.

At the other end of the spectrum, the distinctive vocabulary of Farmer 3 and Farmer 4 remains more closely anchored in production and land management, with limited digital vocabulary

emerging as distinctive. These patterns are discussed in direct comparison with the NVivo case comparison analysis in Chapter 4.

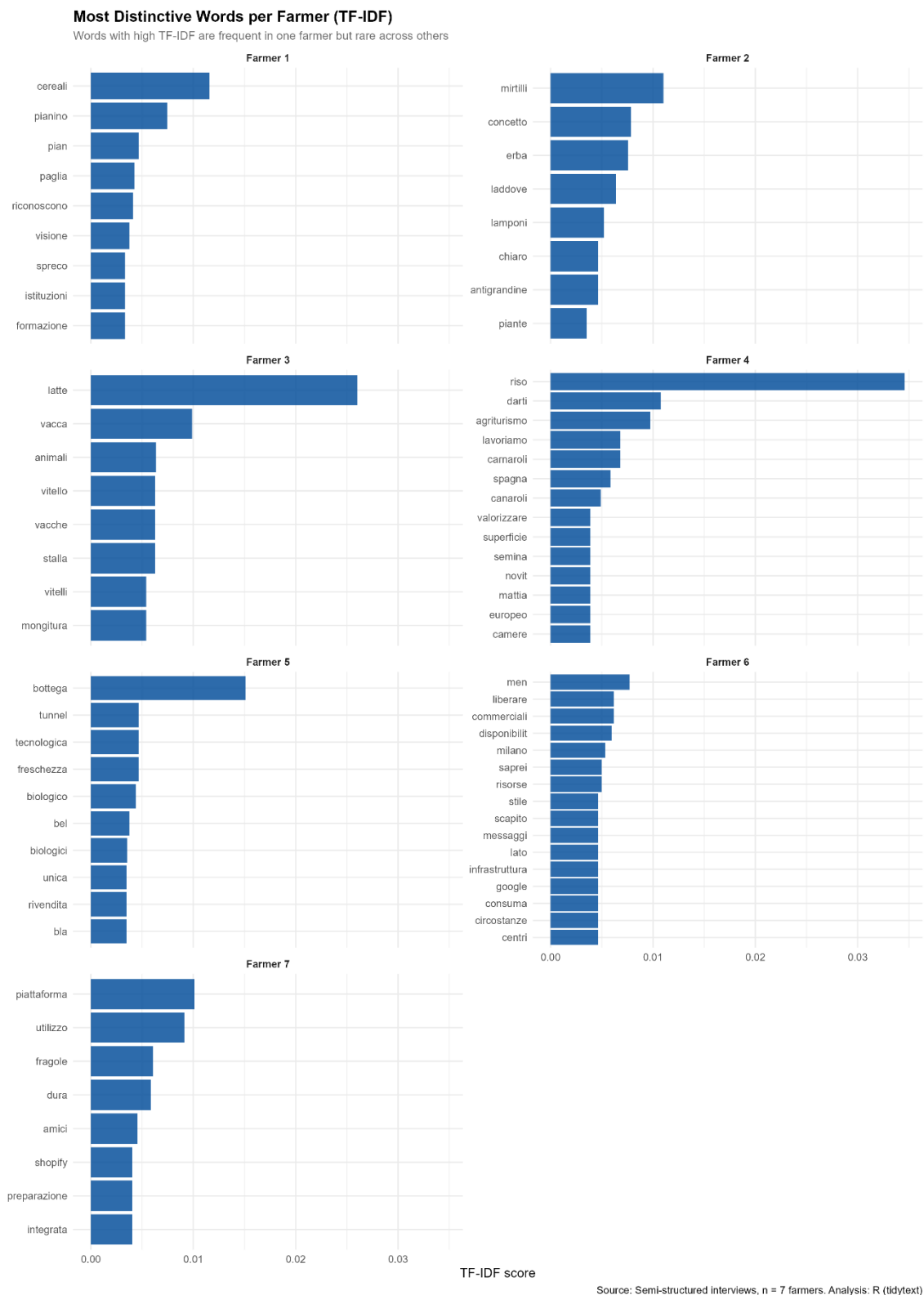


Figure 10 Most distinctive words per farmer based on TF-IDF

4.2.5 Zipf's Law check

To conclude the analysis, a Zipf's law plot was generated to validate the quality of the preprocessing procedure. Zipf's law predicts that, in any natural language corpus, word frequency is inversely proportional to rank (Piantadosi, 2014; Silge & Robinson, 2025).

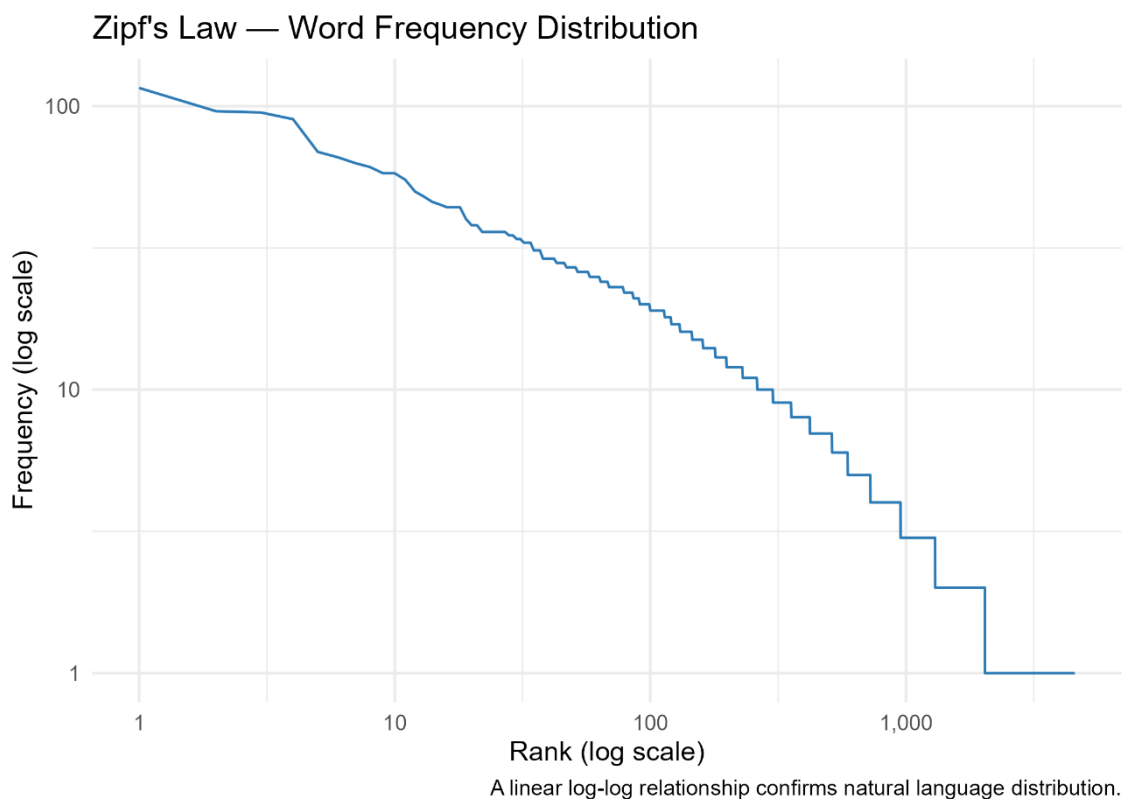


Figure 11 Zipf's Law word frequency distribution

The resulting plot confirmed that the preprocessed corpus follows the expected distribution, indicating that the stop-word removal procedure did not distort the natural frequency structure of the data.

4.3 Comparison between R and NVivo

Building on the R-based results presented in the previous section, this section compares the quantitative content analysis conducted in R with the qualitative content analysis conducted in NVivo. The aim of this comparison is not to treat QtCA and QualCA as competing standalone approaches, but to show how they operate as complementary analytical strategies. While R provides a data-driven reading of the corpus, NVivo offers an expert-driven interpretation grounded in the theoretical framework of the study.

The chapter therefore first examines the similarities and differences between the top words generated by the two tools, before discussing the broader methodological implications of combining R and NVivo for the assessment of validity and trustworthiness.

This distinction directly affects how the two outputs should be interpreted in relation to one another. The NVivo analysis addresses what the farmers' discourse means within the theoretical framework of the study, including the patterns of value orientation, resource use, and structural positioning identified through systematic interpretive coding. The R analysis addresses the complementary question of what the corpus reveals when examined without prior theoretical assumptions.

The convergence between these two readings represents a stronger form of validation than the simple replication of the same procedure in two different software environments. It shows that an expert-driven interpretation and a data-driven computation arrive at structurally similar conclusions through distinct analytical procedures.

4.3.1 Similarities and differences in top words

The first point of comparison concerns the top 20 words identified by each analysis, as shown in Table 3. The table presents the top-word list from each tool and indicates whether there is a match between the two lists. Specifically, in the match column, the symbol “✓” indicates that the term is present in both analyses at the same or an adjacent rank (+/-1); “✓*” indicates that the term is present in both analyses but at different ranks; while “✕” indicates that the word appears only in either the NVivo or the R analysis.

Table 3 Comparison of top 20 most frequent words between NVivo and R

Rank	R – Word	Occurrence (R)	Match	Nvivo – Word	Occurrence (NVivo)
1	prodotto	116	✓	prodotto	113
2	azienda	96	✓*	lavoro	95
3	lavoro	95	✓	senso	90
4	senso	90	✓	prodotti	69
5	prodotti	69	✓	bene	66
6	bene	66	✓	stato	63
7	stato	63	✓	cliente	60
8	cliente	61	✓	riso	58
9	riso	58	✓	tecnologia	58
10	tecnologia	58	✓	tempo	55
11	tempo	55	✓	persone	48
12	acqua	50	✕	latte	46
13	persone	48	✓*	generale	44

14	latte	46	✓*	tema	44
15	agricoltura	45	✕	problema	43
16	generale	44	✓*	azienda	39
17	problema	44	✓*	grande	39
18	tema	44	✓*	produzione	38
19	acquisto	40	✕	cambiamenti	36
20	grande	38	✓*	piano	36

The two analyses show a high degree of similarity: 18 out of the 20 words in the R top-20 list also appear in the NVivo top-20 list. Furthermore, several frequencies are identical across the two tools, including *lavoro* [work] (R: 95, NVivo: 95), *senso* [sense] (R: 90, NVivo: 90), *riso* [rice] (R: 58, NVivo: 58), and *tecnologia* [technology] (R: 58, NVivo: 58). This exact replication of key word frequencies suggests that the two tools apply almost equivalent tokenisation and counting logics, and that the dominant words are therefore legitimate rather than tool-dependent.

Some differences can be observed in the mid-frequency range and among the lower-ranked terms. For instance, *azienda* [company] appears at rank 2 in R, where it was detected 96 times, but at rank 16 in NVivo, with 39 detections. This divergence can be explained by the way NVivo handles contracted forms such as *l'azienda* and *un'azienda*, which may be treated as separate tokens from the base word *azienda*. By contrast, R's apostrophe replacement procedure consolidates these forms into a single *azienda* token. This represents a procedural difference in preprocessing rather than a substantive difference in the corpus, and it illustrates the transparency advantage offered by the R workflow. Indeed, because every preprocessing step is explicitly coded, such differences are traceable and explainable.

The two genuine divergences at the word level concern *acqua* (rank 12 in R, absent from the NVivo top 20) and *acquisto* (rank 19 in R), alongside *cambiamenti* (rank 19 in NVivo) and *piano* (rank 20 in NVivo). These divergences are likely linked to minor differences in stop-word handling rather than to analytical discrepancies, and they do not affect the overall interpretive conclusions.

4.4 Farmers' Orientation: Intrinsic and Extrinsic Values

Farmers' Values is the second most coded node among all, proving that farmers' accounts are mainly value-based; in fact, when asked about their work, commercial choices and relationship with technology, participants consistently contextualized their choices within their personal beliefs, ethical choices and professional identity.

Table 4 Farmers' Values coding density per farmer

Node	F1	F2	F3	F4	F5	F6	F7	Total
Farmers' Values (Total)	36	24	14	22	22	11	16	145
Extrinsic Values	17	9	9	15	13	4	10	77
Intrinsic Values	25	21	9	11	15	8	15	104

Across all profiles, intrinsic values outnumber extrinsic ones, considering that some codes contain overlapping values, as some were coded as both extrinsic and intrinsic values given their dual nature.

A matrix query was made by intersecting Farmers' Values and Orientation Toward Change to identify what kind of values prevail based on the selected attribute. The result of the query is showed in Table 5 and Figure 12.

The matrix coding query crossing intrinsic and extrinsic value sub-nodes against the orientation toward change attribute reveals that innovative farmers generate both the highest intrinsic (60) and the highest extrinsic (51) coding density, while resistant farmers generate the lowest on both dimensions (8 and 4 respectively).

Table 5 Coding Matrix - Values and Attitude Towards Change Coding Matrix

	Resistant	Adaptive	Innovative
Extrinsic Values	4	22	51
Intrinsic Values	8	36	60

Because the sample presented 2 resistant farmers, 2 adaptive farmers and 3 innovative farmers, it is logical that the innovative attribute presents a higher number of references counts. On the other hand, the difference in reference count between the resistant farmers with both the adaptive and innovative ones reflects the presence of a more articulated value-system in innovative farmers than resistant ones.

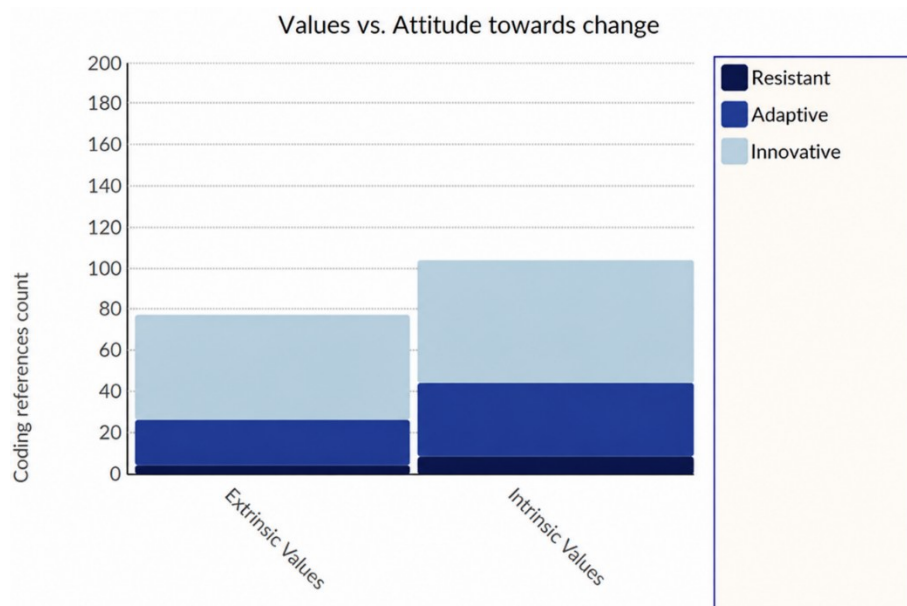


Figure 12 Values and Attitude Towards Change Chart

4.4.1 Intrinsic Values

Five intrinsic values sub-nodes emerge as analytically significant across the sample: *passion and professional identity*, *land stewardship*, *environmental sustainability*, *community and human relations*, and *autonomy and independence*.

Passion and professional identity is the most pervasive intrinsic value, as it is present across all seven farmers. Farming is described not as an occupation but as a vocation and a life choice grounded in a deep sense of belonging to the land and to a way of producing food that is perceived as genuinely different from industrial agriculture. F1 articulates this most explicitly, having transitioned from conventional cultivation to fully certified organic production, describing the transformation as a process of alignment between personal values and professional practice. F6, despite representing the most resistant profile in the sample on digital adoption, expresses one of the strongest professional identity statements, framing the economic viability of a farm without subsidies as a mark of authenticity and legitimacy. F4, despite leading the most commercially complex and technologically integrated farm in the sample, frames his principles in a very passionate way:

“What makes you overcome difficult moments, economic or otherwise, is the passion you put into your work, you don’t feel the fatigue, if you love the work, you can even work 12 hours a day.” (F4)

Land Stewardship is particularly discussed among farmers with organic production or orientation (F1, F2, F5), and manifests in concrete production and operational choices rather than general statements. For instance, F2 management of fungal spores through anti-weed fabric and seasonal cleaning of crop residues, described in detail during the interview, is an example of land stewardship and a way of caring for the soil in the long term and not only for production

efficiency. Similarly, F1 choice to use pine needle mulch instead of synthetic plastic sheeting reflects a stewardship logic that permeates even the most routine operational decisions.

“This fabric allows me during the harvest season, those I clearly don’t collect and discard and throw to the ground, then I pass and can sweep and take away precisely what is also the source of eventual proliferation through the spores of that fungus that could worsen year after year.” (F2)

Autonomy and Independence represent the most political intrinsic value in the sample. Six out of seven farmers express through different choices, the desire to maintain control over their production decisions, pricing, and commercial relationships. F6 articulates in the most radical way, criticizing the Italian agricultural model as dependent on public subsidies and therefore, in his view, not genuinely economically autonomous. F3 expresses this value in a more selective form of autonomy, choosing her clients based on their alignment with her product philosophy and explicitly refusing to adapt her offering to the expectations of customers accustomed to industrial standards.

“If someone asks me, someone who produces milk, for soy milk, we are not the right fit.” (F3)

4.4.2 Extrinsic Values

The extrinsic value node was divided into the following sub-nodes: *economic efficiency, market access and revenue, product quality and freshness, and time and labour optimisation*. Unlike intrinsic values, extrinsic values present an unbalanced references count values across the sample, as they are more prominent in the accounts of innovative and adaptive farmers and almost absent in resistant ones. In F6 interview, the farmer states that the economic return should be reframed as a by product of correct practice rather than a primary goal.

Product Quality and Freshness represent a peculiar case of extrinsic value, as it bridges between the intrinsic and extrinsic dimensions; in fact, farmers describe quality simultaneously as an expression of personal values and as a commercial differentiator. F3's description of the dairy farm's non-standardised, full-fat milk, bottled directly as it comes from the cow, without skimming or homogenisation, exemplifies this double valuation. F5 makes this distinction explicit by stating:

"The quality of the product is its freshness, not because it is organic." (F5)

This message configures the difference of quality from certification, representing a critique of the certification system. This statement challenges the assumption that organic certification is a reliable warranty for food quality.

4.5 Technology Adoption and Valuation in Daily Routines

The *Technology Valuation* parent node present a consistent density of codes and references across six out of the seven farmers, except for F6, who generated only 3 references in this node. This uniformity in coding density constitutes a common reference point for all farmers, regardless of their digital adoption level or orientation towards change. The main difference across farmers lies not in the presence of technology in farmers' statements, but the nature of the valuation they attach to it. During the coding phase, it emerged from farmers' statements that they tend to separate digital technologies into *Production Technologies* and *Commercial Technologies*. The first ones are those destined to increase the efficiency of the production or the safeguard of the soil, while the second ones are mainly destined to the sales management of the activity or community management.

4.5.1 Production Technologies

When asked about the use and knowledge of digital technologies, farmers mentioned *mechanical tools*, precision agriculture equipment, animal monitoring systems, and water and energy management systems as part of their daily routines, with differences in the degree of sophistication and digitalization. This distinction is evident between micro farmers (F2, F6) and larger and more established ones (F3, F4), as shown in Table 6.

Table 6. Coding Matrix - Production Technologies and Activity Size Attributes Coding Matrix

	Micro	Small	Large
Production Technologies (Total)	6	13	11
Animal Monitoring Systems	0	0	2
Mechanical Tools & Machinery	3	5	6
Precision Agriculture	0	0	3
Water & Energy Management	3	3	3
Weather & Climate Tools	1	3	0

F4 represents the most technological integrated production profile, as it combines satellite-guided machinery with centimetric RTK precision system, and a developed infrastructure that

allows rice storage and processing for both the direct and indirect channel. F3 has a similar profile with F4 within the dairy sector, especially in the automated calf feeding system, which highlights how production technology is evaluated mainly through the lens of animal welfare and operational efficiency:

“All calves have a collar with a chip: we associate the calf number with this chip, we set a feeding curve: when the calf enters, the machine recognises it, prepares the milk a little at a time and the calf feeds itself. The operator only needs to check there is no problem, otherwise the calves eat autonomously multiple meals a day.” (F3)

On the other side of the digital adoption spectrum of production technologies, the other farmers do not use advanced digital technologies for the production. It is worth mentioning how F5 has a traditional production system but would introduce a weather station if he had funds, demonstrating how some digital technologies are not adopted due to the lack of financial resources. At the very far hand of this spectrum, F6 uses exclusively manual and traditional mechanical tools, having grounded this choice in the willingness to avoid digitalisation in its production.

4.5.2 Commercial Technologies

The commercial technology node is more varied than the production one, and several patterns emerge from the coding. During the interviews the main discussed technologies were *Administration and Accounting Tools, Automatic and Vending Machines, Communication, WhatsApp and Instant Messaging, E-commerce and Online Platforms, Social Media and Digital Marketing, Website.*

The coding matrix query chart in Figure 4 highlights how *e-commerce and platforms* is the most coded sub-node, as it is widely used, especially by F7. *WhatsApp Messaging* is the digital

tools adopted by almost the entirety of the sample, specifically by six out of seven farmers. Whatsapp is used especially for order management, client communication, and delivery coordination. The adoption of WhatsApp is typically undiscussed and unremarked in the interviews, it is simply assumed as part of the daily activities, proving its deep embedding in farmers' practice.

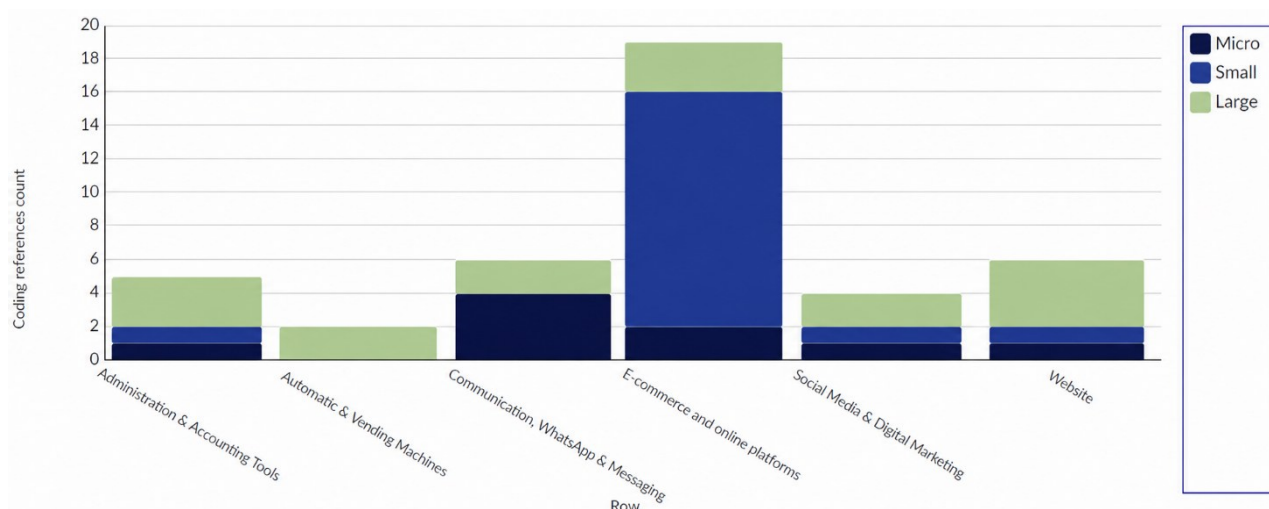


Figure 13 Commercial Technologies against Size Activity Attribute

E-commerce is operational in two cases (F4 and F7) and aspirational in one (F5). F7's case is the most significant, as the farmers had built an autonomous Shopify store with integrated AI features. F7 is the only farmer for whom digital technology is not an add-on to an existing commercial model but the constitutive foundation of the model itself. The platform generates detailed analytics, such as purchase history and frequency, seasonal patterns, revenue comparison across periods, that F7 uses for active commercial decision-making. F4's e-commerce experience is more ambivalent, as it has an active e-commerce that generates revenue, but is characterised by persistent logistical friction related to the delivery management:

“We don’t work 24 hours a day: if the order arrives at 11 in the morning, you ship it the next day. That’s what it is - but I see that we don’t manage it well - because everyone is now used to Amazon delivering on Saturday, Sunday, the next day.” (F4)

his difficulty highlights the operational gap between smallholders' capacity and the delivery expectations shaped by large e-commerce players.

4.5.3 Perceived Utility: Conditional and Selective Valuation

During the interviews with the participants a recurring pattern emerged during the discussion of digital technology adoption and valuation: farmers did not evaluate technologies as completely good, or useful, or bad, or useless, but as more or less appropriate given their specific scale and scope of their farming activity, along with the supply chain structure and personal value system. This conditionality was coded into the node *Perceived Utility* as the sub-node *Conditional Utility*.

F5’s evaluation of hydroponic technology illustrates this pattern clearly. F5 acknowledges that hydroponic systems have reached a level of sophistication that makes them productive and economically viable but identifies three conditions that make adoption impossible: the technology conflicts with the organic certification, its cost exceeds the current capital availability, and it would be difficult to communicate to his clients without generating suspicion. The technology is not rejected, but rather it is excluded given a specific configuration of values, resources, and market conditions.

4.6 Socio-Technical Systems of Provision

Socio-Technical Systems of Provision is the most frequently coded parent node across the entire corpus. This finding indicates that when farmers describe their work, their challenges, and their relationship with digital technologies, the dominant reference frame is not only their own individual characteristics but the structural environment in which they operate: the supply chain relationships, the institutional actors, the market dynamics, and the power asymmetries that shape what is possible and what is not. This parent code was used to identify whether the integration between socio-technical systems (Geels, 2002) and systems of provision (Fine & Bayliss, 2020) was reflected in the data.

4.6.1 Supply Chain Structure and Power Asymmetries

The most consistent theme across the supply chain sub-nodes is the perceived asymmetry of power between smallholder farmers and the downstream actors in their provisioning systems. Six out of seven farmers describe, with tone of urgency and frustration, a structural condition in which the terms of exchange are set by actors other than themselves, whether the *grande distribuzione organizzata* (GDO – Large Scale Retail Distribution), industrial processors, or institutional intermediaries. F3's account of dairy pricing articulates this asymmetry with clarity:

“To be remunerated the correct price for what we produce and sell to the industry, to the large retail chains: the price of milk is falling vertiginously from a more or less decent level, but the supermarket maintains its prices and the industry pays us less and less.” (F3)

F3 further contextualises this within the broader structural dynamics of farm concentration, describing a sector in which the race to scale, from 160 dairy cows, now considered small, to

operations of one thousand or more, is producing a logic of industrial management that the farmers comments as incompatible with genuine agricultural practice. F4 articulates the same asymmetry at the level of European agricultural policy, identifying the exchange of technology for agricultural commodities in trade agreements with Asian countries as a mechanism that structurally disadvantages Italian smallholders by introducing lower-standard competition that they cannot match.

On the other hand, the participants that built direct sales systems describe a different power dynamic. For instance, F1 explains the decision for choosing direct sales channel for emancipation reasons:

“It allows you to be free in terms of pricing, whereas when you go to sell to a wholesaler you accept the price he dictates, in this case instead you are free to set the price based on your costs.” (F1)

The price-setting autonomy is often mentioned by the participants when discussing about the benefits of the direct sale system and the greater control it provides over their farming activities and organization.

4.6.2 Institutional Context: Bureaucracy, Certifications and Critiques

The main themes that were addressed covered administrative and bureaucratic burdens, certifications policy systems, public subsidies and general policy critique. The most discussed concept regarded the conception of the farmers that institutions tend to favour large-scale and industrialised agricultural companies at the expenses of the smaller producers and their activities.

F1 is the one that best expresses this concept by addressing her experience with the southern metropolitan agricultural park of Milan, which wanted to consolidate landholdings into large enterprises. This kind of operation represent an example of institutional priorities that are harmful to the farmer's activity:

“In their regulations they state it - the goal is to consolidate land and create mega-enterprises — and the farm that, according to the institutions, should be my development model has no respect for the soil.” (F1)

Another issue encountered and discussed by the participants is the organic production and certification system, from which emerged both economic and philosophical reasons. F5 encapsulates this by explaining how a farm organic certified in the field loses that certification status when its produce enters an uncertified retail space, requiring a separate organic certification for the shop that he regards as unreasonable:

“When a crate (of produce) enters the shop, it is no longer organic because you also need to certify the shop as organic, so you have to pay the additional fee - which seems truly absurd to me - it is simply a matter of making a living and making money.” (F5)

A relevant example of institutional critique is given by F6, who also supports its resistance to digital adoption. The argument suggests that publicly subsidised agriculture is not genuinely economically efficient, and that his own subsidy-free operation is therefore the more truly economic model and represents a direct challenge to the dominant institutional framing of agricultural modernisation:

“This is also a form of predatory agriculture, in the sense that it increasingly tends to deplete the resources it depends on. It is not economic, in the true sense of the word. My farm is a business that stands on its own feet, without receiving money from elsewhere, and is therefore

fully self-sustaining and, in that sense, more economic than most agricultural activities in the area, which are heavily subsidised.” (F6)

4.6.3 Consumer Awareness and Market Evolution

A third thematic cluster within the STS node captures what farmers perceive as a gradual but meaningful shift in consumer behaviour toward quality and direct producer relationships. This emerging consumer awareness is identified by five out of seven farmers as a structural opportunity that partially offsets the competitive disadvantage of small-scale direct sales relative to the GDO.

Specifically, F5 contextualizes this shift by mentioning how the price convergence between large retail and direct sales, driven by retail inflation and double marginalization, has reduced one of the principal competitive advantages of GDO against smaller producers:

“A place like this (shop) is in high demand — people notice the quality of the produce — and prices in large-scale retail have increased significantly, so the disadvantage of being perceived as the most expensive shop in the area is gradually decreasing.” (F5)

Similarly, F7 connects the same customer awareness shift to his digital-first commercial strategy, arguing that the combination of home delivery, product freshness, and personalised service creates a value proposition that the GDO cannot replicate regardless of price:

“The products you find here are not the same as those available on the market — my aim is precisely to source that specific kind of product — you must trust that I choose the right ones, not the biggest or the most visually perfect, not the so called ‘showcase apples’.” (F7)

This kind of trust- and quality-based system is defined by participants as the most durable and strongest competitive advantage of smallholders, and it is one that is not mediated only by digital technologies.

4.7 Changes in Agriculture: Climate Change

In the interviewing process, almost all participants spontaneously accounted for *climate change* as a central theme regarding changes in agriculture. Five out of seven farmers, except for F6 and F7, identified climate change as the most radical change they had experienced in their professional lives, without any specific question from the interviewer. This topic was not accounted for in the first design of the interview guide, which framed the change theme broadly to allow participants to define it on their own terms. The simultaneous accounting of climate change demonstrates the importance of environmental disruption in the everyday life of smallholders in Northern Italy. The critical role of climate change is confirmed by the density coding of the parent node, as shown in table 7.

Table 7 Coding Matrix - Changes in Agriculture and Climate Change coding references

	F1	F2	F3	F4	F5	F6	F7
Changes in Agriculture (Total)	20	9	9	13	10	2	3
Climate Change	15	3	4	6	2	1	1

The coding density on the Changes in Agriculture parent node, and the prevalence of the climate change sub-node reference counts, confirms this pattern, with F1 (20 references) and F4 (13 references) generating the highest volumes, followed by F5 (10), F3 (9) and F2 (9) each. F6 and F7 represent the two exceptions of the sample, as F7 minimises the human contribution to

climate change and expresses a more sceptical position on the urgency of adaptation; F6's narrative is dominated mainly by an institutional and economic critique that climate change appears as one element among many rather than as a primary concern.

4.7.1 Experienced Events

Participants were invited to provide some examples about their perceptions on climate change and how it shaped their agricultural activities. Farmers described a range of extreme weather disasters that directly affected their operations and harvest. By providing real examples, farmers demonstrated how even small, unexpected weather changes, can generate relevant losses, additional costs and other disruptions to the seasonal schedule and operations (e.g. harvesting time) on which smallholder agriculture is based on. F5 describes this change as:

“Last week it was two degrees in the morning and 24 in the afternoon. A 22-degree thermal jump in a single day, twenty years ago this didn't happen.” (F5)

F4 provided the example of the 2022 drought as the most damaging event in his farming activity, along with institutional failure that worsened F4's financial stability and survival:

“We had a crazy drought, we produced 60 to 70% less, and we still had to pay for water in 2022, even though we had 90% less water than our allocation. Usually, in cases of water scarcity, they should distribute it equitably, which they (water management institutions) did not do.” (F4)

F3 describes climate change not as a sudden disruption but rather as a more gradual one, though with similar disruptive effects, such as the compression of the agricultural calendar, which has shortened the transition time between seasons, resulting in the loss of the temporal buffers that previously allowed for slower and more careful land management practices.

4.7.2 Adaptation Strategies

Participants were asked to discuss how they faced and what kind of measures they adopted to minimize the disruptions caused by climate change. Farmers' responses to climate changes were mainly agronomic, technological and commercial, and in several cases they overlapped. F1's first adoption of regenerative agriculture and drip irrigation are both examples of agronomic and technological adaptation strategies. F4's investment in an emergency irrigation well following the 2022 drought is a more explicitly technological response, framed in explicitly economic terms as a necessary insurance against future revenue loss.

The most evident finding in this topic is that climate adaptation strategies and digital adoption strategies tend to co-occur among the more innovative and technologically active farmers in the sample (F3, F4).

4.8 Barriers to Digital Adoption

The matrix coding query that crossed all sub-nodes of the parent node *Barriers to Change and Digital Adoption* against the activity seniority attribute, produced relevant results for the study, as illustrated in Table 8.

Table 8 Coding Matrix – Barriers to Change and Digital Adoption and Activity Seniority

	New	Medium	Historical
Barriers to Change and Digital Adoption (Total)	24	7	0
Cultural and Relational Barriers	15	5	0
Economic Barriers	6	2	0
Structural Barriers	9	2	0

Newer farms (0-5 years) generated 24 references on barriers to change and digital adoption, medium farms (6-15 years) generated 7, and historical farms (16+ years) generated 0. This distribution reflects a structural reality of Italian smallholder agriculture, in which the early years of operations are characterised by capital scarcity and financial fragility, all of which compete with the resources required for digital investment.

4.8.1 Economic Barriers

High investments costs and low initial margin are the main cited barriers in the sample, especially among the younger farms. For instance, F5 describes a situation in which the capital invested in the on-farm shop and butchery has absorbed the resources that would otherwise be available for a potential technological investment:

“We don’t start with significant capital: between the butchery and the shop it required a lot of investment. If I could, I would definitely invest more.” (F5)

On the other hand, F1 identifies the scale mismatch as one of the main barriers, framing it not as a price issue, but rather as the absence of tailored solutions for smaller producers:

“Many technologies are designed for realities much larger than mine. It’s not just a question of cost they are simply not designed for me.” (F1)

4.8.2 Structural Barriers

Infrastructure gaps, such as inadequate rural connectivity, lack of cold-chain logistics, and the lack of shared processing facilities are identified by F1, F4 and F5 as significant constraints. F4’s difficulties in the e-commerce logistics and delivery management exhibit how infrastructure deficits at the systemic level influence the smallholders’ activity.

Labour shortage and time constraints also appear as structural constraints in digital adoption. It is important to note that participants described themselves as farmers that filled more than one role simultaneously: farmer, salesperson, administrator, etc... F5 describes himself as a jolly that covers all functions, which captures the time scarcity that prevents the sustained attention required to evaluate, implement, and integrate new digital tools into an already dense operational schedule.

4.8.3 Cultural and Relational Barriers

Along with economic and structural barriers, farmers also expressed more human-related barriers; for instance, distrust among farmers and the consequent difficulty of coordinating and collective action is identified by F1, F4 and F7 as barriers to the adoption of network-based technologies. Technologies like blockchain create much of their value from collective adoption within a supply, as individual adoption in isolation generates limited benefit and requires a huge and disproportionate investment. Yet the social conditions for collective adoption, such as mutual trust, shared governance, coordinated investment, are precisely what is perceived as absent or fragile in the local agricultural context. F1 articulates this most explicitly:

“It is difficult to network, partly due to old mentalities, where neighbours looked at each other with suspicion, as if they were competitors, whereas my competitor should be whoever does things badly, not my neighbour.” (F1)

F6’s resistance to digital adoption represents a qualitatively different type of cultural barrier, because it does not represent a failure of trust or capacity, but an ideological refusal grounded in his critique of the dominant agricultural model. This position, which can be defined as an active resistance rather than passive inertia, is the most distinctive barrier profile in the sample.

Similarly to F6, also F2 mentions traditional principles as a reason to avoid digital adoption:

“Technology is certainly changing a lot. I neither have the means, nor the need, nor any particular interest in introducing this change into my farm, in the sense that it is still very much connected to traditional practices and classic ways of working.” (F2)

4.9 Blockchain Valuation

Blockchain was used as a focal case to validate the conceptual framework in chapter 2 and to address the high amount of blockchain literature that defines it as the solution to smallholders' incomes (Quayson, Bai & Osei, 2020; Longo et al., 2023). To identify patterns and relationship across farmers, one parent node was named *Blockchain Valuation*, and three sub-nodes were further created: *prior knowledge*, *perceived value*, and *adoption barriers*, as well as a coding matrix query between blockchain valuation and sales channel attribute.

4.9.1 Prior Knowledge

Only three out of seven farmers (F1, F3, F4) demonstrated prior knowledge of blockchain technology before the researcher's explanation was provided. This represent a relevant consideration, as it highlights how blockchain technology is widely discussed in academic literature, but remains largely unfamiliar to this sample's smallholders. Even among those who knew the term, depth of understanding varied considerably. F4's knowledge is practical and experiential, grounded in active participation in a regional blockchain pilot for rice origin and production traceability; F1's knowledge is theoretical and informed, derived from personal interest in food supply chain issues; F3 had heard the term but required clarification to connect it to his context.

Among the four farmers who didn't have any knowledge about blockchain and received the interviewer's explanation (F2, F5, F6, F7), the reactions ranged from genuine curiosity (F5, F7)

to polite scepticism (F2) to explicit dismissal (F6). Remarkably, F5 and F7, despite not having prior knowledge about blockchain technology, expressed two of the most precise and critical evaluations of blockchain, applying the concept immediately to their own supply chain logic and identifying with precision the conditions under which it would and would not be useful.

4.9.2 Perceived Value: The Role of The Supply Chain Structure

The matrix coding queries crossing blockchain perceived value and adoption barriers against the type of sales channel attribute (Figure 14 and Table 9) produce significant results. Farmers operating through direct sales channels generated 17 references on blockchain perceived value and 8 on adoption barriers. Farmers operating through mixed channels generated only 3 and 2 respectively. It needs to be clarified that the higher coding density among direct-sales farmers does not reflect greater enthusiasm, but a more elaborate and articulated argument for why blockchain is structurally unnecessary in their context.

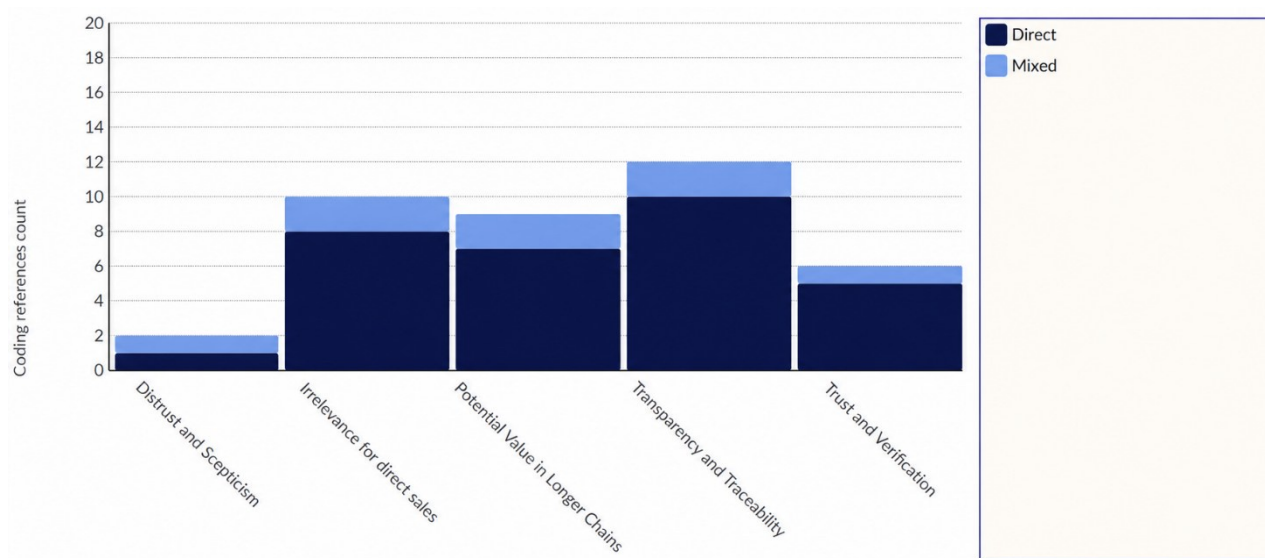


Figure 14 Coding Matrix – Blockchain Perceived Value

Table 9 Coding Matrix – Blockchain Adaptation Barriers sub-nodes and Sales Channel

Attribute

	Direct	Mixed
No Intermediaries Barrier	6	2
Scale Barrier	4	2
Institutions Distrust	1	0

The main argument presented by F1, F2, F3, F5 and F6 is that the potential benefits of the blockchain technology, especially transparency and traceability, are unnecessary in direct sales systems, where producers and consumers already have a direct contact and established trust relationship. When a farmer sells at a market, through a GAS (Buying Group), or manages a customer relationship through WhatsApp or E-commerce, the transparency that blockchain would provide is already guaranteed by the physical proximity and personal trust. F5 articulates this logic as:

“If we are very direct, from here it (product) goes either to the client or to the restaurant, we don’t have many intermediaries. I understand blockchain if you’re getting something from far away.” (F5)

F1 adds a further reason, stating the value of blockchain would be more suitable in contexts of multiple producers operating collectively, which is a condition that her farm has not yet achieved:

“I don’t need to certify where it comes from and how it is cultivated, because I do it directly. But yes, I have heard of it, because when you try to bring together a group of farms, then it becomes important.” (F1)

According to F4, the only farmer with an active blockchain pilot project, provides an interesting insight. For F4, blockchain is not an abstract possibility but an operational experiment with a specific product (Carnaroli historical rice) and a specific institutional partner (a regional consortium). The motivation is explicitly linked to the intermediary-facing dimension of his commercial activity.

4.9.3 Scepticism and Adoption Barriers

Beyond the blockchain irrelevance for direct sales systems argument, three further issues emerge from the corpus. The first one is *Institutional Distrust*, which is brought up by F4 and express a mixed and uncertain opinion that is particularly important because it comes from someone who is using the technology, rather than from someone who has chosen not to adopt it:

“I don’t really believe in blockchain either, to be honest, nor in organic certifications, because looking around me at what has happened to several organic farms, it’s often unclear how things actually ended up.” (F4)

F4 represent a case of blockchain adoption despite scepticism, driven by the funded pilot by institutions rather than a personal stance.

The second form of scepticism is *Economic*; in fact, even farmers who see potential value in blockchain express doubt about whether the cost, complexity, and coordination requirements of implementation are proportionate to the benefits for a small producer. F2 extends this scepticism to the broader information infrastructure, questioning whether the proliferation of data serves consumers or primarily serves those who commercialise the data:

“Who profits from information, if it is useful and legitimate information, everyone profits, but if it is information just to fill databases, that is a negative deviation of human behaviour.”

(F2)

The third form of scepticism lies within the *relational* dimension. Specifically, F7 acknowledges the structural logic of blockchain data flows but reframes the question as one of commercial power rather than transparency:

“Who profits are first the blockchain developer and then what he does with those data. The world is currently based on data and money flows for that reason.” (F7)

Taken together, these patterns suggest that blockchain adoption barriers in this sample are not primarily attitudinal, but structural and relational, as they are rooted in the specific supply chain position of the farmer, the availability of institutional support for collective adoption, and the presence of partner networks that make coordinated implementation possible.

4.10 Case Comparison Analysis

To further investigate the factors shaping farmers’ digital responses, three paired comparison diagrams were analysed across the sample. Each pair was selected according to a “most-similar / most-different” logic to isolate specific explanatory dimensions, as explained in Chapter 3.

4.10.1 F6 and F7: Values as Drivers in Digital Adoption (VALUE-ORIENTED)

F6 and F7 represent the clearest most-similar structurally, but most-different digitally pair in the sample. Both belong to the same age cohort, operate in small farms, and rely primarily on direct sales. However, they occupy opposite ends of the digital adoption spectrum.

The main difference between the two farmers emergence in the technology-related nodes. F7's coded nodes are concentrated around the digital commercialisation and administration, including e-commerce platforms, accounting tools, AI service and a positive sentiment on technology usefulness.

On the other hand, F6's coded nodes are more condensed around traditional practices, mechanical tools, institutional critique and technology avoidance and minimal use. Notably, F6's low level of digital adoption is not caused by lack of digital skills, but from a strong, ideological position grounded on self-sufficiency and attachment to traditional farming practices.

By comparing these profiles, it emerges that even when structural conditions are very similar, personal value system and orientation is a strong driver in digital adoption differences.

4.10.2 F3 and F5: Attitude Toward Change and Farm Seniority (RESOURCE-ORIENTED)

Compared to the other pairs, F3 and F5 present the highest nodes overlapping; in fact, both farmers demonstrated the same innovation-oriented mindset, strong environmental sustainability values and commitment to their direct sale system. Specifically, the two farmers share the same coding density in the nodes of environmental sustainability, land stewardship, product quality, climate change adaptation, institutional critique, and selective evaluations of blockchain technology. Notably, both farmers frame innovation as compatible with ecological farming values rather than opposed to them.

However, the different nodes highlight marked differences in technology use and adoption. F3's profile includes animal monitoring systems, vending machines, administrative software, and a

more structured commercial diversification, reflecting a mature and economically consolidated farm.

F5's presents a higher code references count in other nodes, namely aspirational adoption of digital technology, infrastructure gaps, high investment costs and unmet requirements needed for innovation projects. Although F5 expressed strong interest in advanced technologies, these ambitions remained largely unrealised due to resource constraints and the limited organisational capacity of a recently founded farm.

This comparison proves that innovation-based values and positive attitude towards change alone are insufficient to achieve the same level of digital adoption. Farm seniority and resource availability appear to mediate the extent to which technological aspirations can be translated into concrete implementation.

4.10.3 F1 and F4: Blockchain Valuation and Supply Chain Structure (STRUCTURE-ORIENTED)

F1 and F4 were the only farmers in demonstrating a deeper understanding of blockchain technology and expressed positive remarks on its potential applications in agriculture. The comparison diagram shows substantial overlap in intrinsic and extrinsic values, awareness of blockchain-related transparency issues, institutional critique, and support for environmentally sustainable farming practices.

Despite these similarities, only F4 had an active blockchain pilot project and could provide more concrete statements. F4 operates within a mixed supply chain that includes intermediaries, e-commerce infrastructure, precision agriculture technologies, and collaborative territorial networks. These conditions increase the perceived usefulness of blockchain as a traceability and coordination tool.

By contrast, F1 bases its activity on direct sales through farmers' market and GAS - solidarity purchasing groups. In this case, trust is generated through physical proximity and a having a direct connection with the clients, rather than digital verification systems. Furthermore, F1 reports critical structural, economic, and infrastructural barriers that limit the farm's blockchain experimentation capacity.

This comparison suggests that blockchain adoption is not primarily determined by awareness or positive attitudes toward the technology. Rather, its perceived relevance depends on supply chain structure and complexity and on the resources required to support blockchain implementation.

4.11 Summary

This chapter presented the empirical findings from the thematic and case comparison analysis of the seven semi-structured interviews conducted with the seven farmers in Lombardy. The analysis was structured around the conceptual framework developed in Chapter 2, integrating Expressive Value Theory, Social Action, Socio-Technical Systems, and the Systems of Provision approach to examine how farmers value digital technologies, with a specific focus on blockchain.

By combining both deductive and inductive coding in Nvivo 15, seven thematic areas emerged: farmers' values, barriers to change and digital adoption, blockchain valuation, changes in agriculture, farmers' digital responses, Socio-Technical Systems of Provision and technology valuation (Appendix 6). The thematic findings were integrated with the case comparison analysis, from which emerged three digital orientations: value, resource and structure oriented.

Together, the findings reveal that farmers' digital valuation is a socially embedded process, shaped by the interaction of extrinsic and intrinsic values and the structural conditions of the

Socio-Technical Systems of Provision in which they operate. This interaction, in turn, originates the digital orientations.

Farmers' values are mainly intrinsic and personality based. Across all farmers' profiles, intrinsic values represented most farmers' values, with passion and professional identity, land stewardship, environmental sustainability, autonomy and independence, and community relations emerging as the most significant sub-nodes. The critical aspect is that these values were not only mentioned by farmers as abstract principles, but they were also reflected in concrete actions and decisions.

Technology adoption is selective, conditional and scale dependent. Farmers continuously differentiated between production technologies, used mainly for operational efficiency and soil care, and commercial technologies, primarily destined to the sales and client relationship management. The level of digital integration was strongly correlated with farm size and activity seniority. Furthermore, technologies were not evaluated as completely good or bad, but as more or less appropriate given each farm's specific characteristics.

Socio-Technical Systems of Provision influence farmers' decisions and daily operations. The STS parent node generated the highest count of references coded, indicating that farmers primarily contextualise their decisions, including digital valuation, within the environment and context they operate rather than making isolated decisions.

Climate change is a common disruption in farmers' operations. Five out of seven farmers spontaneously cited climate change as the most significant transformation in their professional experience. Severe temperature excursion, droughts and shortened agricultural calendars are some of the events that generated economic losses and operational disruptions.

Barriers to digital adoption are structural and relation, not merely attitudinal. Newer farms generated significantly higher coding references on barriers compared to medium and historical

ones, confirming that early-stage capital scarcity and organisational fragility are the primary constraints to digital investment.

Blockchain is perceived as irrelevant for direct sales systems. The main findings in Blockchain valuation are that direct sales farmers did not reject blockchain technology for negative attitudes, but rather because their sales system is based on a direct producer-consumer relationship. This aspect makes the transparency, and traceability benefits that blockchain provides are already guaranteed by physical proximity and personal trust. Some forms of scepticism were identified, including institutional distrust, doubts about the amount of blockchain implementation costs, and concerns about who ultimately benefits from data flows in blockchain-based supply chains.

The three comparison cases reinforced the main findings. The comparison between F6 and F7 demonstrated that structural similarity does not always determine the same digital orientation. Personal value systems and ideological orientations can produce completely different outcomes even across farmers operating in similar conditions. The comparison between F3 and F5 showed that a shared innovation orientation is insufficient without the resource availability and farm maturity necessary to translate aspirations into actual digital implementation. The comparison between F1 and F4 confirmed that blockchain adoption is not primarily determined by awareness or positive attitudes, but by supply chain structure, access to institutional support, and the presence of coordination networks that make collective implementation viable. In table 10 is presented a summary of the three digital orientations.

Table 10 Digital Orientations

Digital Orientation	Main driver	Mechanism	Theoretical Implication
Value Oriented	Value systems	Same size activity, but different personal values	Anderson (1993) and Weber (1922) value rationality and intrinsic value shape digital orientation
Resource Oriented	Resource availability and activity seniority	Same value orientations but resources availability	Anderson (1993) and Weber (1922) value rationality and intrinsic value have relevant role, but purposive rationality and extrinsic values shape final digital orientation
Structure Oriented	Position and configuration of the supply chain	Supply chain configuration and sale channel determines technology valuation	Structural conditions as in Fine & Bayliss (2020) and Geels (2002) shape digital orientation

When considered collectively, the results indicate that digital orientation is not determined by a single factor in isolation but rather by a continuous interaction between personal values and the structural conditions of the socio-technical system of provision. When structural conditions are constant, personal values become the main digital valuation driver, resources act as a moderating factor, and the socio-technical system of provision constitutes the broader structural conditions. Chapter 5 further discusses and interprets the findings in relation to the conceptual framework developed in chapter 2 and the theoretical implications that emerge from the findings.

5 Discussion

In this chapter the findings will be interpreted in relation to the conceptual framework developed in Chapter 2 and the literature reviewed in Chapter 1, with the aim to answer the research question and the three sub-questions of the study. The chapter discusses about the findings following the main dimensions of the theoretical framework: farmers' values and their relationship with technology valuation and the role of Socio-Technical Systems of Provision in shaping digital valuation. The chapter closes with a reflection on the main contributions of the research and the theoretical and practical implications.

5.1 Farmers as value-led subjects

The most evident finding of the research is that farmers' valuation processes of digital technologies are mainly shaped and influenced by their set of values, in which intrinsic orientations tend to outnumber and outweigh extrinsic, or instrumental, ones.

This finding confirms the Weberian perspective on value included in the theoretical framework. Weber's distinction between *Purposive Rationality* (action oriented toward expected outcomes and conduct of other people or objects) and *Value Rationality* (action oriented toward personal beliefs considered intrinsically worthy) (Weber & Tribe, 2019) is reflected in the pattern that emerged from the data. Specifically, the farmers involved did not weigh only the return on investment or the efficiency level of a given technology, but also its alignment with their moral values.

The prevalence of value rationality across farmers in Northern Italy is an important finding that extends the findings of Gittins, McElwee & Lever (2022), where purposive rationality was identified as the dominant orientation among UK agricultural entrepreneurs facing institutional

constraints. This divergence in findings may lie within the different supply chain positions of the two samples: UK farmers face structural and institutional pressures due to their embedded position in conventional supply chains, which may put in survival logic first and demonstrate an attitude that follows purposive rationality. By contrast, Italian farmers have deliberately exited or avoided mainstream market channels and intermediaries, as their value commitments were strong enough to motivate an alternative commercial model in the first place.

Findings were consistent also with Anderson's Expressive Theory of Value (1993). Italian farmers proved to evaluate digital technologies not only as neutral instruments whose adoption is determined on expected benefits, rather they asked themselves whether a given tool is compatible with what they stand for as farmers. Digital tools are evaluated as objects that carry social and moral meaning, as they are, in Anderson's terms, capable of being either intrinsic goods (valued as expressions of identity and values) or extrinsic goods (valued instrumentally for what they produce).

The research further contributes to the literature on the Means-End Chain approach in agricultural contexts (Leduc et al., 2023). The results from the research prove that Italian farmers translate technological characteristics not just through cognitive hierarchies of consequences and values, as MEC proposes, but through a more holistic process in which technology is evaluated through its compatibility with the way of farming and living. This dimension is not fully captured by MEC models, which assume that value comes at the end of an attribute-consequence chain. By contrast, this study proves that individuals' values also work from the start, because they act like a filter when deciding which features are noticed and considered important in the first place.

To conclude, the study proposed a new digital valuation analysis drawing the concept of value from a more social viewpoint (Weber, 1922; Anderson, 1993) instead of the conventional economic perspective where value is divided between value creation and value capture (Lepak,

Smith & Taylor, 2007). At the same time, findings proved that both intrinsic and extrinsic values interact with the socio-technical system of provision of each farmer. This interaction is proved in the case comparison analysis, where it showed that in one case, farmers' values were the main driver in digital orientation (value-oriented); on another comparison, despite two farmers presented the same values towards digital innovation, only the one with more resources presented a stronger digital orientation (resource oriented). The following section discusses on how the Socio-Technical Systems of Provision shape digital orientation.

5.2 Socio-Technical Systems of Provision as the Structural Context

One important finding of this study is that farmers continuously contextualize their decisions, whether they be about digital adoption or organic certification conversion, within the context in which they operate. This is backed up by the high number of codes generated in the STS parent across all parent nodes, confirming that power asymmetries, institutional dynamics and market structures influence farmers' decision-making processes in digital adoption, instead of individual attitude or digital skills level.

This finding is consistent with the Systems of Provision approach (Fine & Bayliss, 2020), which argues that consumption and adoption decisions cannot be adequately explained at the individual level because they are embedded in vertically integrated provisioning systems that distribute incentives, resources, and information unevenly across actors. Despite the Systems of Provision approach was developed for consumption decisions, the findings from the study proved its applicability also in production contexts.

The findings are consistent with the SoP approach especially in the case of blockchain; in this case, the relevance of the blockchain is determined based on the structure of the supply chain

in which the farmer is positioned, rather than only attitude toward innovation or digital skills level.

These results extend and operationalise the SoP approach in a new empirical context. Previous applications of the SoP approach have focused primarily on consumption patterns (Bayliss & Fine, 2020), infrastructure privatisation (Bayliss, Mattioli & Steinberger, 2021), or energy systems (Mattioli et al., 2020). This study demonstrates that the SoP framework can be applied to the analysis of technology valuation among smallholder producers, offering a new analytical dimension to the predominantly individual-level models that dominate the technology adoption literature (Caffaro et al., 2020; Nor Diana et al., 2024).

At the same time, the findings highlight the tendency of the SoP approach to emphasise the limited agency of individual actors within provisioning systems (Bayliss & Fine, 2020). In comparison, several farmers in the sample, especially F1, F6 and F3, have actively built alternative sales models to escape the structural constraints of conventional provisioning systems. These actors have, in effect, redesigned their own provisioning position by choosing direct sales and trust-based market relationships. This aligns with Wheeler's (2022) argument that transformative agency within provisioning systems can occur through collective action and deliberate exit from dominant provisioning logics and suggests that the boundary between structural constraint and individual agency is not as clear than the SoP approach sometimes implies.

Socio-technical systems theory (Geels, 2002; Geels, 2011) further support the findings of the study. Farmers' statements suggested that digital adoption in Italian agricultural contexts is strongly characterised by path dependency. Farmers who have already invested in digital infrastructure and developed digital competencies continue to expand their technological capacity, while those without this foundation face economic and structural barriers. This mirrors Geels' (2002) account of lock-in mechanisms within socio-technical regimes that reinforce

existing technological trajectories and make transition more difficult. The identification of climate change for most farmers as the primary disruption in the agricultural context that led them to adapt and develop different adaptation strategies, such as implementing new technologies or changing the farming activity organization, can also be defined as landscape force in socio-technical systems (Geels, 2002; 2011). Notably, farmers who already presented a higher digitalization level were better positioned to respond to climate disruptions through digital technologies, highlighting how differences in digital adoption can reinforce inequalities among farmers. This finding is consistent with Layton & Domegan's (2021) argument that provisioning systems face the challenge of balancing structural stability and innovation to ensure resilience during global crises, whether they be more immediate and disruptive, such as the pandemic, or slower but with clear effects on provisioning systems, such as climate change. The integration of socio-technical systems (Geels, 2002) and systems of provision (Bayliss & Fine) is coherent as the two theories address different dimensions of the same issue. The systems of provision approach explain why farmers in different supply chain positions value digital technologies differently, while socio-technical systems theory explains why digital valuation is uneven across farmers and how landscape-forces, such as climate change, shape farmers' digital orientations. Specifically, farmers who have already invested in digital tools continue to develop their capacity, while those who have not face growing barriers over time, influencing their digital orientation. The findings demonstrated how the two theories coexist in the agricultural context and enable to provide a wider understanding of digital valuation.

5.3 The role of the supply chain structure in Blockchain valuation and adoption

The dominant pattern in the data is that blockchain is perceived as structurally irrelevant for direct-sales smallholders and potentially useful for those embedded in multi-tier supply chains

and not because of differences in knowledge, attitude, or innovativeness, but because of the structural conditions that determine whether blockchain's main benefits (transparency, traceability, trust at a distance) address a real problem in the farmer's provisioning system.

This finding is significant in several aspects. First, it challenges a dominant assumption in the blockchain adoption literature, which typically treats awareness, perceived usefulness, and attitude as the primary predictors of adoption intent (Pang et al., 2024; Seranmadevi, Kumar & Hariharan, 2022; Romeo, Virglerova & Giampaola, 2025). The present study suggests that these variables are influenced by a more structural condition, which is the actor's position within the supply chain. In contexts where direct trust relationships already perform the transparency function, blockchain adoption would represent an unnecessary and costly investment, rather than something avoided due to lack of knowledge or negative attitudes towards it.

This result challenges Sheel & Nath (2019), who found that blockchain is more easily adopted in shorter supply chains. However, for small producers who sell directly, the supply chains are so short that the main benefit of blockchain no longer applies.

Furthermore, the study highlights an important mismatch between the research agendas of blockchain literature and the realities of smallholder agriculture. The academic and policy literature on blockchain in agricultural supply chains has been predominantly focused on long-chain, multi-actor, globally integrated systems (Pang et al., 2024; Vostriakova et al., 2021; Shiraishi et al., 2025). The assumption underlying much of this literature is that transparency and traceability are universally valued, but this study demonstrates that this assumption does not hold for direct-sales smallholders, for whom transparency is already embedded in the farmer-client direct relationship and does not require digital verification. This has direct implications for technology developers and policymakers who seek to encourage blockchain adoption in agricultural contexts; in fact, the question to be posed is not how to increase

awareness or reduce adoption barriers in general, but which supply chain structures create the conditions under which blockchain adoption generates real value for smallholders.

At the same time, the scepticism expressed by farmers who are otherwise open to innovation, including F4, who is actively engaged in a blockchain pilot project, introduces an important nuance to any linear and overly positive narrative about blockchain adoption. F4's mixed sentiment, combined with institutional distrust, suggests that blockchain adoption driven by external institutional incentives (funded pilots, consortium partnerships) may not translate into genuine internalised valuation. This is coherent with Li, Liu & Chang's (2025) finding that extrinsic incentives can weaken intrinsic motivations over time, raising questions about whether blockchain initiatives funded from outside can remain sustainable in contexts where the underlying conditions for natural adoption are not met.

Lastly, F7's concern about who benefits from blockchain-generated data introduces a political economy dimension that is absent from the existing blockchain adoption literature. The question of data ownership, data monetisation, and the distribution of value generated by blockchain infrastructure is not only a technical or regulatory matter, but also a question of power. This concern reflects a broader awareness of how digital platforms can reproduce or amplify the power asymmetries of the provisioning systems they are embedded in (Wooliscroft & Wilkes, 2025) and suggests that smallholders' reluctance to adopt blockchain may sometimes represent a rational and politically informed response to the risk of digital re-intermediation.

5.4 Barriers to digital adoption and their effect on digital orientations

The results concerning the analysis of barriers to digital adoption reveal a set of constraints that go beyond the economic, attitudinal and demographic characteristics that are usually identified in the existing literature on digital adoption (Dibbern, Romani & Massruhá, 2024; Gumbi,

Gumbi & Twinomurinzi, 2023). The analysis highlighted economic barriers (capital scarcity, scale mismatch and absence of tailored solutions for smaller producers), structural barriers (infrastructure gaps, logistics issues and workforce shortage) and cultural and relational barriers (distrust, ideological resistance, attachment to tradition) as distinct factors that interact altogether on digital valuation and adoption, which are reflected in farmers' digital orientations.

Newer farmers generated a significantly higher coding references on barriers than medium and historical ones, proving that early-stage capital scarcity is the main constraint for investing in new digital technologies among Northern Italian smallholders. This result is coherent with Hardesty et al. (2014), who identified capital access as one of the critical conditions for the development of values-based supply chains. The finding is also consistent with Cimino et al. (2024), who demonstrated that expected performance and benefits need to be manageable for smallholders for them to consider adopting a specific technology. On one hand, the study confirms that economic barriers persist even in the Northern Italian ASC; on the other hand, the barriers experienced by newer farms are not only financial. These barriers are combined with organisational and workforce fragility, which is conceptualized by the farmer that covers multiple roles (farmer, seller, administrator, deliverer, etc...), and the absence of a relational network with other farms that more established ones have built over time.

The cultural and relational barriers highlighted a particular kind of constraint in digital adoption, which is identified in this study as *ideological resistance*. This kind of constraint differs from the technology avoidance mechanism, such as inertia or lack of knowledge or digital skills that most technology adoption frameworks address (Caffaro et al., 2020; Díaz-Arancibia et al., 2024; Dibbern et al., 2024; Nor Diana et al., 2024), which tend to focus on mainly technical barriers rather than the social and interpersonal dynamics (Stoeva et al., 2024). This type of resistance cannot be faced through trainings, awareness campaigns, subsidy programs or user experience improvements, which are typically proposed in technology adoption literature

(Caffaro et al., 2020; Dibbern et al., 2024; Nor Diana et al., 2024). This kind of rejection is coherent with the Weberian perspective on value, as F6's position reflects an example of value rationality (Weber & tribe, 2019). The rejection of digital technologies is not induced by negative expectations, lack of resources or digital skills, but rather by a personal, intrinsic value system, as described by Anderson (1993) in her Value Theory. Recent literature of the Italian ASC has partially acknowledged this ideological resistance (Romeo et al., 2025), even though it remains understudied and undertheorized in digital adoption literature.

Digital adoption barriers contributed to defining the digital orientations identified after the case comparison analysis. Cultural and relational barriers were critical for value-oriented farmers, as personal values, whether they were in favour or opposed to digital technologies, played the main role. In the resource-oriented farmers, despite having the same attitude to digital innovation, economic barriers influenced their digital orientation. Similarly, structural barriers influenced structure-oriented farmers in digital valuation, especially in the blockchain case.

5.5 Digital orientations as the result of digital valuation

In chapter 2, the study developed the conceptual framework integrating socio-technical systems theory (Geels, 2002) and systems of provision (Fine & Bayliss, 2020) with Expressive Value Theory (Anderson, 1993) and Social Action (Weber, 1922) to explain how digital valuation occurred.

The study identified three digital orientations: value-oriented, resource-oriented and structure-oriented, which represent the result from farmers' digital valuation processes. Based on the discussion of the findings, the identified digital orientations were integrated into the framework, as shown in figure 7. This section explains how the proposed digital orientations emerge from the interaction between the value and Socio-Technical Systems of Provision dimensions.

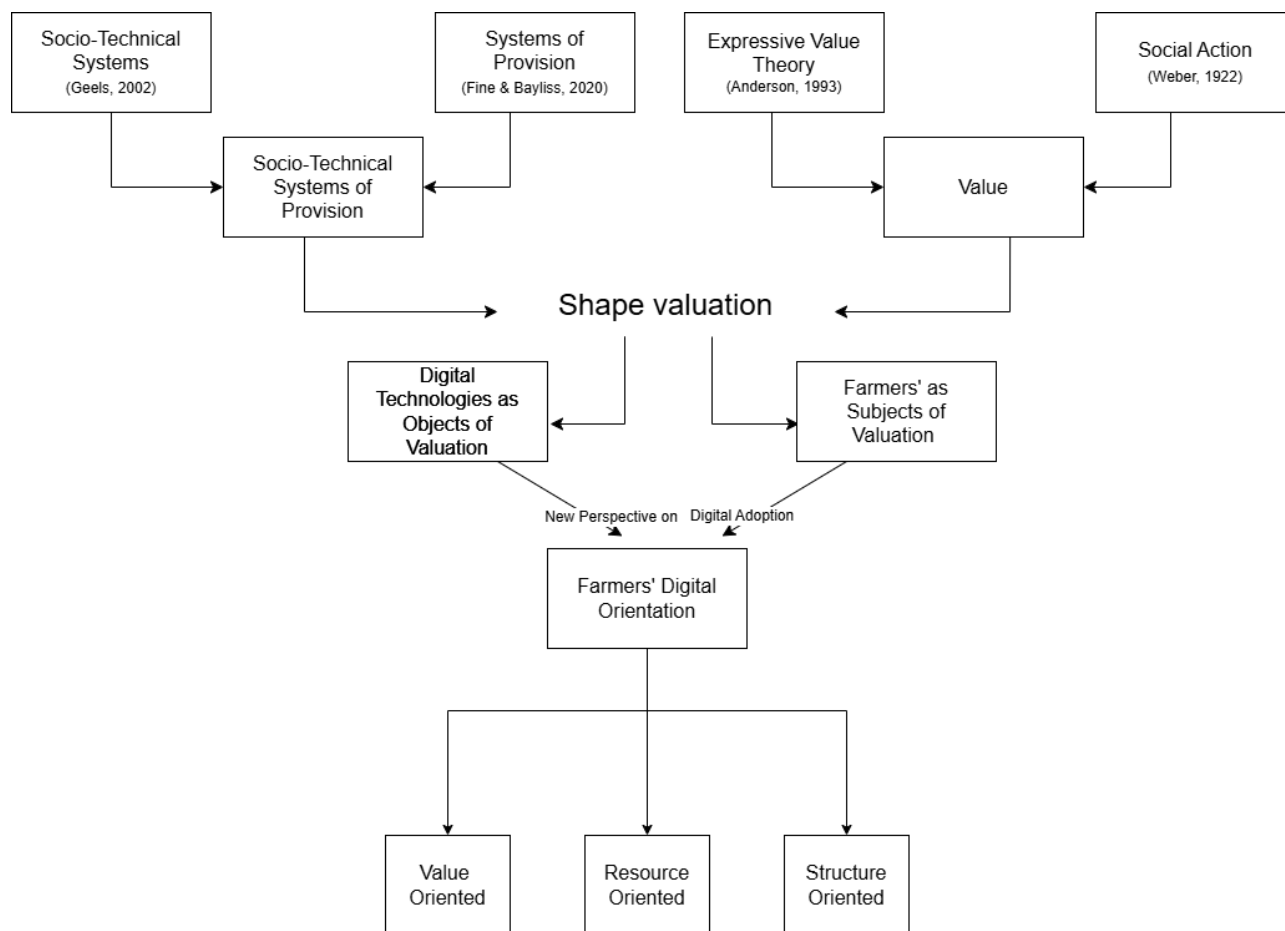


Figure 15 Integrated framework with digital orientations

The framework positions digital technologies as objects of valuation and farmers as subjects of valuation, highlighting the subjective meaning of digital technologies that farmers assign to them. In this valuation process, the Socio-Technical Systems of Provision and value dimension contribute simultaneously to the digital valuation process. On one side, farmers value digital technologies based on their personal value systems, which are a combination of both intrinsic and extrinsic values. On the other side, the socio-technical system of provision in which the farmer operates, that is, supply chain structure, power asymmetries, market access, resource availability and technological trajectories, determines what technology is relevant and possible.

The digital orientation is determined by the interaction of these two dimensions and from which one of them is prevalent in a farmer's context. When the Socio-Technical Systems of Provision are the prevalent element, the farmer develops a structure orientation. When the two dimensions are aligned, the resource availability represents the main force, which determines the resource orientation. Lastly, when the value dimension prevails over the Socio-Technical Systems of Provision one, the personal value system constitutes the decisive factor in digital valuation, developing a value orientation.

This logic represents the study main theoretical contribution, as the framework does not treat value and structural conditions as separate digital valuation variables; rather, the framework integrates them and highlight how the prevalence of a dimension over another shape farmers' digital valuation.

5.6 Addressing the research questions

In this section the findings will be addressed in relation to the research questions to provide a final synthesis on how the study contributes to the existing research. To answer the main research question, the study identified two main sub-research questions that focus on the main dimensions of the research: value and Socio-Technical Systems of Provision.

SRQ1: What kind of value subjects assign or connect to digital technologies within their Socio-Technical Systems of Provision?

The findings of the study show that Northern Italian farmers a complex and socially embedded form of value to digital technologies. This kind of valuation presents two dimensions, one at the intrinsic level and the other at the extrinsic level. At the intrinsic level, farmers evaluate technologies based on the compatibility with their professional identity, land stewardship and autonomy commitments and considering not only the benefits and what a technology does, but

also what it means for them. At the extrinsic level, farmers evaluate technologies for their instrumental benefits, such as cost savings, quality and efficiency improvements. It is worth noting that these two dimensions are intertwined between each other, as intrinsic values act as filters that determine which instrumental benefits are considered relevant to pursue.

The study demonstrated that this valuation process does not occur in isolation but is also influenced by the Socio-Technical Systems of Provision in which each farmer operates. The supply chain structure determines whether a digital tool is useful and addresses a real need, the availability of resources determines whether digital innovation aspirations can be translated into actual digital technologies implementation, and the value system determines if a digital technology is coherent with the farmers' beliefs and farming practices.

SRQ2: What are the main barriers that constrain digital adoption, and how do they interact with subjects' valuation process and contribute to the construction of their digital orientation?

The study identified three different barriers that limited the subjects' digital adoption: economic, structural and cultural and relational barriers. The identified barriers contributed to defining the digital orientations identified after the case comparison analysis. Cultural and relational barriers were critical for value-oriented farmers, as personal values, whether they were in favour or opposed to digital technologies, played the main role. In the resource-oriented farmers, despite having the same attitude to digital innovation, economic barriers influenced their digital orientation. Similarly, structural barriers influenced structure-oriented farmers in digital valuation, especially in the blockchain case.

RQ: How do the values that subjects assign to digital technologies and their socio-technical system of provision interact and contribute to constructing their digital orientation?

Overall, there are many elements and factors in play in the process when farmers connect subjective preferences to technology. It especially depends on the digital orientation of the

farmers. This study found three generic orientations, which are value-orientation, resource-orientation and structure-orientation. Each orientation reflects which factor is dominant in each farmer's context.

The digital orientation of a farmer emerges from the interaction of its value system and the structural conditions of Socio-Technical Systems of Provision in which he operates. The digital orientation of a farmer changes based on which element was dominant. Structure orientation is determined when the supply chain structure is the dominant driver in valuating which digital technologies are relevant, regardless of the value system. Resource orientation is prevalent when, regardless digital technologies are coherent with a farmer's structural conditions and values, the resource availability is the critical driver in valuating digital technologies. Value-orientation, by contrast, is determined by a farmer's personal value system, regardless of the structural and resource conditions that would enable digital adoption. In this case, digital technologies are adopted or rejected based on their compatibility with the farmer's identity and beliefs.

5.7 Contributions to the literature

The study provides contributions to the following bodies of literature: digital and blockchain adoption, value theory in supply chain research, socio-technical systems literature and systems of provision.

The primary aim of the research was to demonstrate how shifting the analytical lens, both in terms of value and supply chain perspectives, could generate new insights and provide new directions for future research. This shift led to the development of a new framework, which was further expanded based on the empirical results.

The study provides empirical evidence of the conceptual framework that integrates Anderson's Expressive Theory of Value (1993), Weber's social action typology (1922), the Systems of Provision approach (Fine & Bayliss, 2020), and Socio-technical systems (Geels, 2002) in the northern Italian agricultural context. By providing empirical validation of the integration of these theories and demonstrating how they complement each other, this research supports Pagell and Wilhelm (2025) call for theoretical pluralism in supply chain research, despite the study focus on digital valuation.

Within the digital adoption literature, the study challenges the conventional assumption that adoption is determined primarily by subjective variables, such as digital awareness, digital skills level and attitude toward innovation (Caffaro et al., 2020; Nor Diana et al., 2024; Dibbern et al., 2024). The findings demonstrate that along individual variables, also the farmer's position within the socio-technical system of provision shape digital valuation, leading to different attitudes. The study, in fact, introduces three different digital orientations (value, resource and structure) that capture how personal values and structural conditions shape the farmers' digital valuation and orientation. This typology expands the existing individual models within digital adoption, addressing directly the critique posed by Pagell and Wilhelm (2025) and posing farmers at the center of digital valuation, rather than the technology itself.

These findings contribute to extending the blockchain adoption literature by demonstrating how supply chain structure is a critical element, instead than awareness, digital skills or innovativeness (Pang et al., 2024; Seranmadevi, Kumar & Hariharan, 2022; Romeo, Virglerova & Giampaola, 2025). The difference between blockchain barriers of the study and previous research, poses a new question from “how do we increase blockchain adoption?” to “in which supply chain configurations is blockchain adoption positively valued and useful by the participants.

Within value theory in supply chain literature, the study provides empirical evidence of the applicability of Anderson's Expressive Theory of Value (1993) and Weber's social action (1922) in an agricultural context. The findings confirm that farmers value digital technologies not only for their technical characteristics but through a valuation process in which intrinsic values act as filters that determine which extrinsic values are worth pursuing. Furthermore, in Northern Italian smallholders prevails value rationality in digital valuation, contrasting with the study conducted in UK, which registered a prevalence of purposive rationality (Gittins et al., 2022). The difference between the two studies and empirical results suggest that further research to explore how geographical and institutional contexts shape different forms of rationality.

The study contributed to the Systems of provision literature by extending the SoP approach in the smallholder technology adoption context, which was previously used on consumption (Bayliss & Fine, 2020), infrastructure (Bayliss, Mattioli & Steinberger, 2021) and energy systems (Mattioli et al., 2020). The study demonstrated that provisioning structures determines a farmer's relevance toward a specific technology, introducing the SoP framework to a new empirical context. At the same time, the study proved the lack of individual agency in SoP approach, as several farmers in the sample actively left conventional supply chain structures to create their own direct-sale system, confirming the argument proposed by Wheeler (2022), who stated that transformative change could occur through collective action and systemic intervention rather than isolated choices. As farmers redesigned their position in the supply chain and developed their own direct-sale system, the emergent characteristics of such systems are coherent with the values-based supply chains ones, such as mutual trust, product differentiation and value alignment (Hardesty et al., 2014; Peterson et al., 2022). The only difference is that Italian farmers did not participate in any formal program, suggesting that these

principles can emerge spontaneously when there is a sufficient level of autonomy and market access.

To conclude, the study presents a pluralistic and people-centred understanding of digital adoption in ASC by integrating value theory, socio-technical systems, and provisioning perspectives within a single empirical context. The findings supports that digital technologies are not valued, and adopted, uniformly, but are influenced by the specific provisioning system and personal value systems. In doing so, the research challenges the dominant firm centric and technocratic approaches and confirms the importance of the context and human action and beliefs. Collectively, these contributions open new directions for future research on how different socio-technical provisioning systems affect the value assigned to digital technologies.

5.8 Practical Implications

The study presents results that are relevant for technology developers, policymakers and agricultural organizations, cooperatives and institutions that support digital adoption among smallholder farmers.

For technology developers, specifically those specialized in blockchain solutions, the main implication is that supply chain structures and configurations represent the critical element in blockchain valuation and adoption. The principal benefit of blockchain lies in its ability to ensure transparency and traceability across multiple intermediaries and geographically distant actors. However, this study found that such advantages are not relevant for direct-sales farmers, whose activity rely on physical proximity and established trust between farmer and client, making blockchain's added value largely redundant. Developers should take this aspect into account when designing blockchain solutions to avoid designing solutions that fail to address concrete needs. Instead, developers should consider the general supply chain configuration,

geographical and institutional context, as well as the specific characteristics, practices, and needs of farmers themselves, ensuring that solutions are developed from a farmer perspective rather than a technology-first perspective.

For policymakers, the findings demonstrate that digital valuation and digital adoption are mainly structural, relational and value-based, rather than only attitudinal. Policy interventions that promote only digital awareness initiatives or digital upskilling are unlikely to increase, and improve, digital valuation and adoption without addressing the external and structural conditions. Policy efforts should therefore promote the development of tailored digital solutions for smaller farmers, while also supporting the institutional, infrastructural, and collaborative conditions necessary for these technologies to be positively valued and actively used in agricultural contexts. It is also important for policymakers to avoid framing digital adoption as an unconditional imperative. Pressure to adopt digital technologies may place unnecessary burdens on farmers whose practices do not require such tools. Instead, policy interventions should respect farmers' autonomy and recognize that digital technologies are not inherently beneficial in all contexts but should be encouraged only where they respond to concrete needs and are meaningfully valued.

The same logic can also be applied for the blockchain context. Results highlight institutional distrust as another important reason that limits blockchain adoption. Policymakers that aim to increase blockchain adoption should focus on designing and implementing credible and transparent governance structures for blockchain initiatives that highlight and address farmers' needs. Likewise, blockchain policy initiatives should respect and recognize the importance of the individual farmer values and activity and encourage blockchain adoption only when it addresses specific needs.

For agricultural organizations and cooperatives, the study highlights the potential of how collective adoption can increase trust and blockchain implementation among farmers within a

specific area and blockchain adoption. By building on existing organizations and cooperatives characterized by solidarity relationships, such as GAS buying groups and regional agricultural consortia, trust-building and coordination processes could be facilitated, thereby encouraging blockchain adoption in contexts where individual adoption would otherwise be costly and irrelevant.

5.9 Limitations and future research direction

In chapter 3 are presented the limitations of the study, which should also be acknowledged in the discussion of the study. The sample of seven farmers from a single region of Italy (Lombardy), while being diverse and provided several viewpoints, does not allow a high degree of generalisation to other regional, national or cultural contexts. The findings are directly relevant to the Northern Italian context; therefore, caution should be paid when generalising the results and interpretations to other settings.

The data collection occurred at a single point of time, between March and April 2026, during a period of considerable national, and international, political and economic instability. Farmers' attitudes towards digital valuation and institutional trust are likely shaped by broader economic and political conditions, which themselves may change over time. Future research could adopt a longitudinal design to analyse how valuation processes and considerations shift as political and economic conditions change. A similar logic could be applied to farmers' experiences with digital technologies; for instance, future research could involve trials in which farmers are exposed to new technologies to examine how their valuation processes and attitudes develop.

The interpretative lens applied to this chapter refer both to the conceptual framework developed in chapter 2 and the results obtained in chapter 4. While the study remained open to new findings, the conceptual framework inevitably shaped and influenced the interpretation of the

results. Alternative theories could be applied and integrated altogether, such as institutional theory or political ecology, to emphasise different dimension of the same empirical context.

To conclude, the limitations of the study are mainly concerned with its contextual specificity and interpretative framing. While these constraints limit the generalisability of the findings, they reflect the qualitative and in-depth nature of the research objectives. At the same time, the research design and approach contributed to providing new analytical and theoretical lenses and future research directions, particularly through longitudinal and comparative studies and the integration of alternative theoretical frameworks to further explore how valuation processes and digital technology adoption evolve across diverse institutional contexts.

6 Conclusion

With empirical focus on Northern Italian farmers, this study examined how the subjects' value digital technologies within their Socio-Technical Systems of Provision by conducting a qualitative comparative case analysis. The research analysed the interplay that occurs between the farmers' value systems and the structural conditions, highlighting how digital valuation is not a simple evaluation of a specific technology's technical and instrumental benefits. On the other hand, digital valuation was identified in the study as the process in which the objects of valuation, that is, digital technologies, are assigned different subjective meaning based on the subjects of valuation's value system, which, in turn, is shaped and interacts within the subject's system of provision.

By integrating value theory, socio-technical systems theory and systems of provision approach, the study complemented technocratic perspectives with a viewpoint on digital adoption as a socially embedded valuation process shaped by subjects' realities, beliefs, and structural contexts.

The robustness of these findings is also supported by the combined analytical approaches adopted in the study. The hybrid qualitative content analysis conducted in NVivo enabled an interpretive coding of themes and relationships across cases, while the complementary R-based textual analysis provided a reproducible and data-driven layer of evidence through word frequency, word cloud, TF-IDF and Zipf's law checks. This combination allowed the thematic interpretation to be cross-checked against broader lexical patterns emerging from the interview corpus.

As its main theoretical contribution, this thesis demonstrates that digital transformation in agriculture is both a technical change and a social one. Digital transformation does not require

only the availability of cutting-edge technologies, but also the structural and personal conditions that make those technologies meaningful for the subjects that use them. In answering the main research question, the study demonstrates that subjects assign a complex form of value to digital technologies, in which both intrinsic and extrinsic values interact, that cannot be reduced to a mere economic definition of value. At the same time, the subjects' value dimension interacts with the structural conditions established by the socio-technical system of provision in which the single subject operates. The interaction between these two dimensions manifest through three different digital orientations: value-oriented, resource-oriented and structure-oriented. These orientations highlighted how the adoption or rejection of one or more digital technologies is influenced by both social and structural factors than only the potential benefits that a technology can offer.

As practical implications, policymakers, technology developers, and agricultural organizations are encouraged to move beyond technology-first approaches. Digital solutions should be designed collaboratively with their users and adapted to local realities, relational contexts, and existing capabilities. Effective digital transformation in agriculture, for example, requires not only more technological innovation, but also institutional support, trust-building and coordination mechanisms. The adoption of technologies like blockchain depends not only on its effectiveness and expected benefits, but also on whether it aligns with the value system, and with the Socio-Technical Systems of Provision that shape subject's everyday life. Understanding this valuation process is essential for building a digital future that is not only efficient, but also fair and meaningful for smallholder farmers and other practitioners alike.

To conclude, the study provided a deeper understanding how subjects' values and their Socio-Technical System of Provision co-construct their digital orientation. The derived answer is not a straightforward process or a formula with specific inputs. The subject's digital orientation is shaped and constructed through the continuous interaction across the subject's value dimension,

which is formed by the interplay of both intrinsic and extrinsic values, and the structural conditions of the Socio-technical System of Provision that make digital technologies necessary, accessible, or irrelevant based on the specific context. It is worth noting that neither dimension determines one's digital orientation; rather, it is the specific combination of these elements, and which one becomes dominant in a subject's reality. The three digital orientations proposed and identified by the study (value, resource and structure oriented) should not be understood as fixed categories, but as interpretative patterns that frame how the interaction between the value and structural conditions lead to different digital valuation processes. Digital valuation must not thus be framed as a mere economic decision, but it needs to be interpreted through subjective meaning emerging in conjoint with the broader Socio-Technical Systems of Provision.

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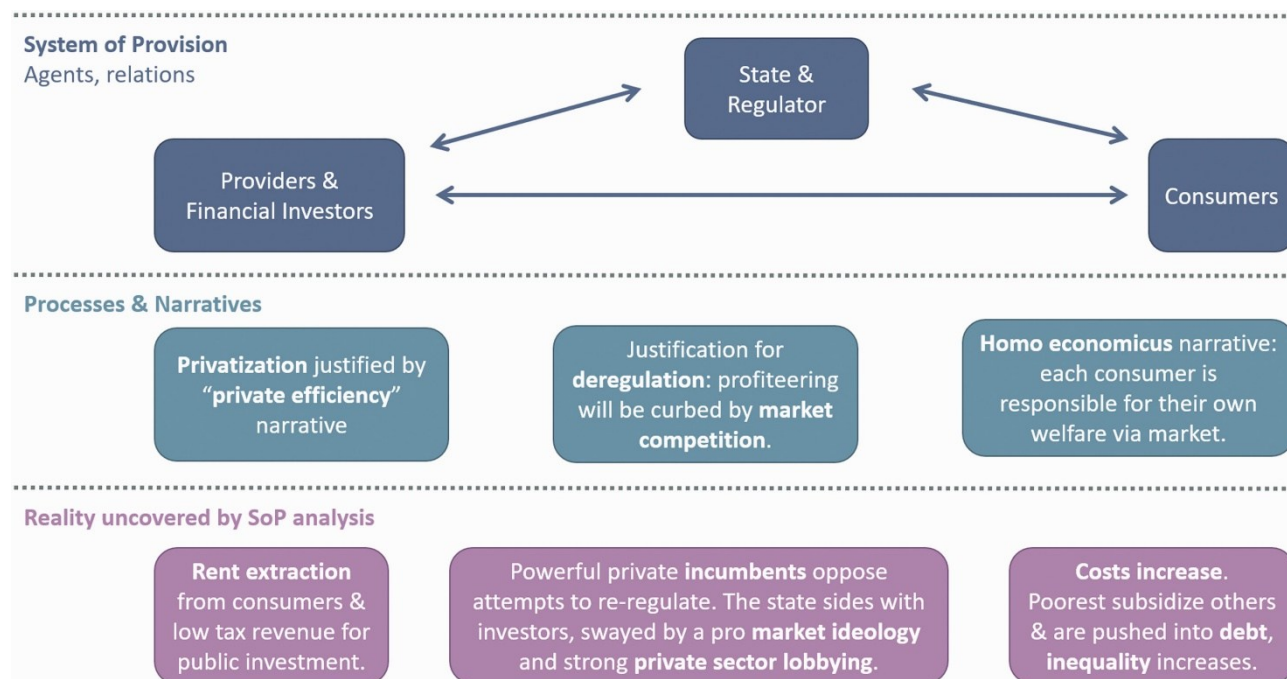
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Appendices

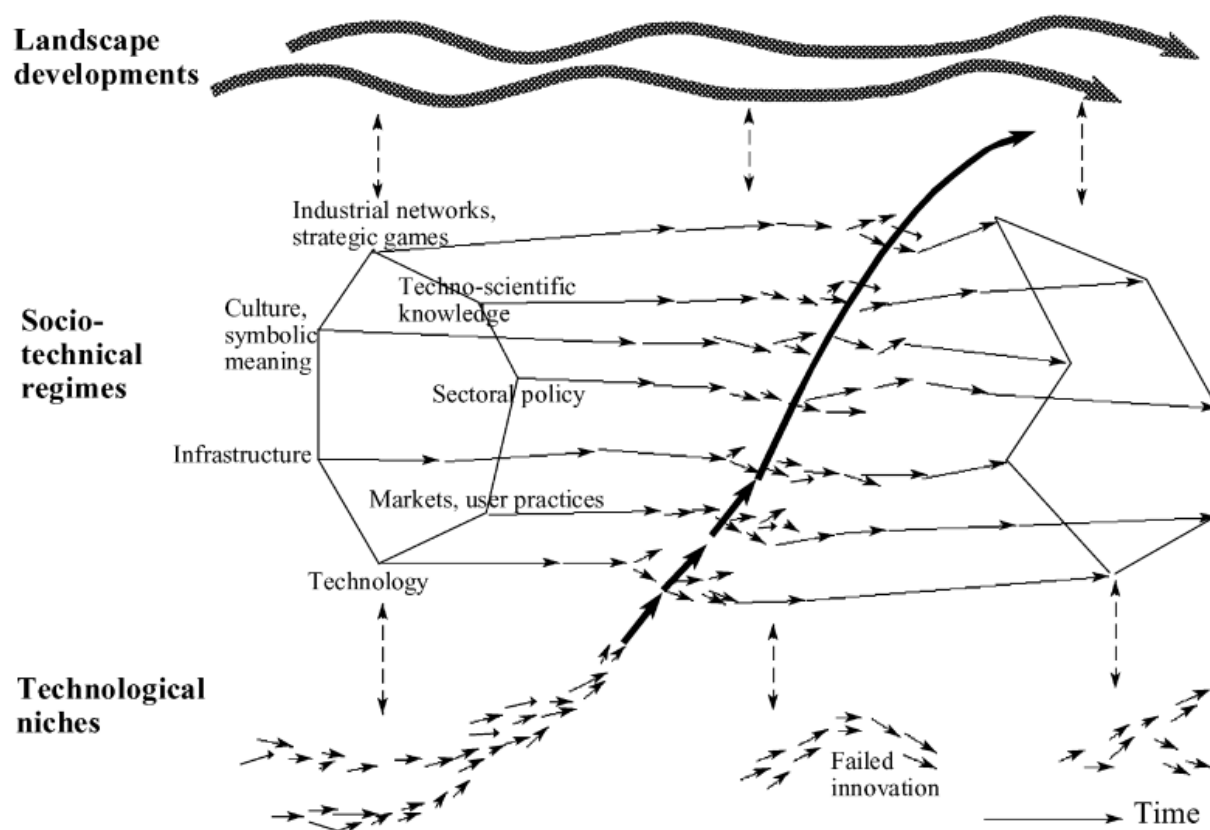
Appendix 1. Values in Alternative Food Systems (Faltmann & Stotten, 2025)

Social embeddedness values	
<i>Community and social relations, inter-personal ties</i>	Allaby et al. 2021; Baldi et al. 2019; Cembalo et al. 2012; Feenstra et al. 2011; Fernandez-Wulff 2019; Follett 2009; Fourat et al. 2020; Gruvaeus and Dahlin 2021; Hooks et al. 2017b; Kallio 2020; Kessari et al. 2020; Klein and Michas 2014; Klimek et al. 2021; Leung 2021; Morgan et al. 2018; Neulinger et al. 2020; Ostrom et al. 2018; Peterson et al. 2022; Pozelli Sabio and Spers 2022; Pullman and Dillard 2010; Saulters et al. 2018; Sumner 2018
<i>Civic values (democratic values, egalitarianism, equality, equity, justice, shared power)</i>	Alkon 2008; Brinkley 2018; Delibas 2021; Feenstra and Hardesty 2016; Fernandez-Wulff 2019; Follett 2009; Forney and Häberli 2017; Fourat et al. 2020; Gaitán-Cremaschi et al. 2020; Hooks et al. 2017a; Kaiser et al. 2020; Klein 2015; Klein and Micas 2014; Kloppenburg et al. 2000; Morgan et al. 2018; Nakandala et al. 2020; Nemes et al. 2023; Pullman and Dillard 2010; Reckinger 2022; Saulters et al. 2018; Schiller-Merkens and Machin 2023; Smith 2023; Stella et al. 2022; Sumner 2018; Zollet 2023
<i>Solidarity</i>	Forney and Häberli 2017; Fourat et al. 2020; Hooks et al. 2017a; Letelier et al. 2021; Maestripietri 2017; Shawki and Hunter 2022; Stella et al. 2022; Stephens and Barbier 2021; Smith 2023; Sumner 2018; Zollet 2023
<i>Fairness</i>	Cleveland et al. 2015; Klimek et al. 2021; Nakandala et al. 2020; Rico Mendez et al. 2021; Smith 2023
<i>Worker rights and welfare</i>	Akram-Lodhi 2015; Feenstra and Hardesty 2016; Thottathil 2022
<i>Cultural values</i>	Hooks et al. 2017b; Moschitz and Oehen 2020; Soini et al. 2019; Stephens and Barbier 2021; Yang et al. 2021
<i>Supporting small-scale farming</i>	Chen et al. 2022; Kessari et al. 2020; Klimek et al. 2021; (Pullman and Dillard 2010; Stephens and Barbier 2021; Zollet 2023
<i>Cooperation</i>	Blanc and Kledal 2012; Feenstra and Hardesty 2016; Fourat et al. 2020; Jarosz 2008; Smith 2023; Stella et al. 2022
<i>Autonomy, self-help, self-responsibility</i>	Forney and Häberli 2017; Hooks et al. 2017a; Kessari et al. 2020; Sumner 2018
<i>Trust</i>	Baldi et al. 2019; Blanc and Kledal 2012; Chen et al. 2022; Gugereil et al. 2021; Jarosz 2008; Klein and Michas 2014; Klimek et al. 2021; Nakandala et al. 2020; Pullman and Dillard 2010; Stella et al. 2022; Sumner 2018
<i>Transparency</i>	Chen et al. 2022; Fourat et al. 2020; Hooks et al. 2017a; Kaiser et al. 2020; Stella et al. 2022; Stephens and Barbier 2021
<i>Social values (broadly)</i>	Carlisle 2015; Cody 2015; Hardesty et al. 2014; Klein and Michas 2014; Klimek et al. 2021; Kondo 2021; Kröger and Schäfer 2014; Lavin et al. 2015; Leung 2021; MacKay 2023; Nemes et al. 2023; Reckinger 2022; Sarmiento 2017; Savarese et al. 2020; Sinker et al. 2020
Spatial embeddedness values	
<i>Spatial links between producers and consumers</i>	Allaby et al. 2021; Holloway et al. 2006
<i>Supporting local agriculture</i>	Brinkley 2018; Forsell and Lankoski 2018; Kajzer Mitchell et al. 2017; Moschitz and Oehen 2020; Neulinger et al. 2020; Tookes et al. 2018
<i>Supporting rural ways of living</i>	Delibas 2021; Holloway et al. 2006; Pullman and Dillard 2010
<i>Local food sourcing</i>	Feagan and Morris 2009; Feenstra and Hardesty 2016; Forsell and Lankoski 2018; Kessari et al. 2020; Lavin et al. 2015; Leung 2021; Pilař et al. 2019; Seyfang 2008; Smith 2023
<i>Valuing a specific place, environment, or terroir</i>	Klein and Michas 2014; Kondo 2021; Letelier et al. 2021; Ostrom et al. 2018; Peterson et al. 2022; Sarmiento 2017; Morgan et al. 2018; Soini et al. 2019
<i>Re-localization, re-territorialization of food systems</i>	Klimek et al. 2021; Maticena and Corvo 2020; Zollet 2022
<i>Value of local (broadly)</i>	Bean and Sharp 2011; Cleveland et al. 2015; Feenstra et al. 2011; Goszczyński and Śpiewak 2023; Savarese et al. 2020; Sumner 2018; van Vlaanderen et al. 2021
Natural embeddedness values	
<i>Environmentally friendly food production</i>	Alroe et al. 2017; Bernardi and Tirabeni 2018; Chen et al. 2022; Cody 2015; Delibas 2021; Edelmann et al. 2022; Feenstra and Hardesty 2016; Jarosz 2008; Feenstra et al. 2011; Kaiser et al. 2020; Klein and Michas 2014; Maticena and Corvo 2020; Milestad et al. 2023; Moschitz and Oehen 2020; Seyfang 2008; Neulinger et al. 2020; Valchuis et al. 2015; Rico Mendez et al. 2021; Sumner 2018; Zollet 2023
<i>Health</i>	Alroe et al. 2017; Baldi et al. 2019; Baumann et al. 2023; Cleveland et al. 2015; Feenstra and Hardesty 2016; Goszczyński and Śpiewak 2023; Klein 2015; Ostrom et al. 2018; Smith 2023; Souza 2020; Watson and Ekici 2017
<i>Quality food</i>	Baldi et al. 2019; Bean and Sharp 2011; Feenstra and Hardesty 2016; Kallio 2020; Pilař et al. 2019; Savarese et al. 2020; Souza 2020; Valchuis et al. 2015
<i>Relations to nature</i>	Forsell and Lankoski 2018; Gaitán-Cremaschi et al. 2020; Kondo 2021; Morgan et al. 2018; Morris and Kirwan 2011; Ostrom et al. 2018; Stephens and Barbier 2021
<i>Animal well-being</i>	Alroe et al. 2017; Baumann et al. 2023; Hilimire 2012; Hooks et al. 2017; Valchuis et al. 2015
<i>Ecological, environmental, sustainability values (broadly)</i>	Alkon 2008; Allaby et al. 2021; Baldi et al. 2019; Barnett et al. 2016; Baumann et al. 2023; Blanc and Kledal 2012; Carlisle 2014; Carlisle 2015; Diekmann and Theuvsen 2019; Feenstra et al. 2011; Fernandez-Wulff 2019; Hardesty et al. 2014; Hayden and Buck 2012; Holloway et al. 2006; Hooks et al. 2017; Kajzer Mitchell et al. 2017; Klein 2015; Leung 2021; Milestad et al. 2023; Morgan et al. 2018; Morris and Kirwan 2011; Nemes et al. 2023; Peterson et al. 2022; Pozelli Sabio and Spers 2022; Pullman and Dillard 2010; Reckinger 2022; Saulters et al. 2018; Savarese et al. 2020; Schiller-Merkens and Machin 2023; Sinker et al. 2020; Smith 2023; Soini et al. 2019; Stella et al. 2022; Thottathil 2022; Valchuis et al. 2015
Economic embeddedness values	
<i>Economic support for local economies</i>	Alkon 2008 ; Brinkley 2018; Feenstra et al. 2011; Hooks et al. 2017b; Jarosz 2009; Moschitz and Oehen 2020; Saulters et al. 2018; Valchuis et al. 2015
<i>(More) even distribution of economic value</i>	Blanc and Kledal 2012; Carlisle 2015; Clark et al. 2021; Kajzer Mitchell et al. 2017; Kessari et al. 2020; Klein 2015; Tookes et al. 2018
<i>Economic fairness</i>	Blanc and Kledal 2012; Carlisle 2014; Hooks et al. 2017a; Lavin et al. 2015; Nemes et al. 2023; Sinker et al. 2020; Stella et al. 2022
<i>Economic values (broadly)</i>	Cody 2015; Hardesty et al. 2014; Holloway et al. 2006; Klimek et al. 2021; Letelier et al. 2021; Reckinger 2022; Savarese et al. 2020; Sumner 2018

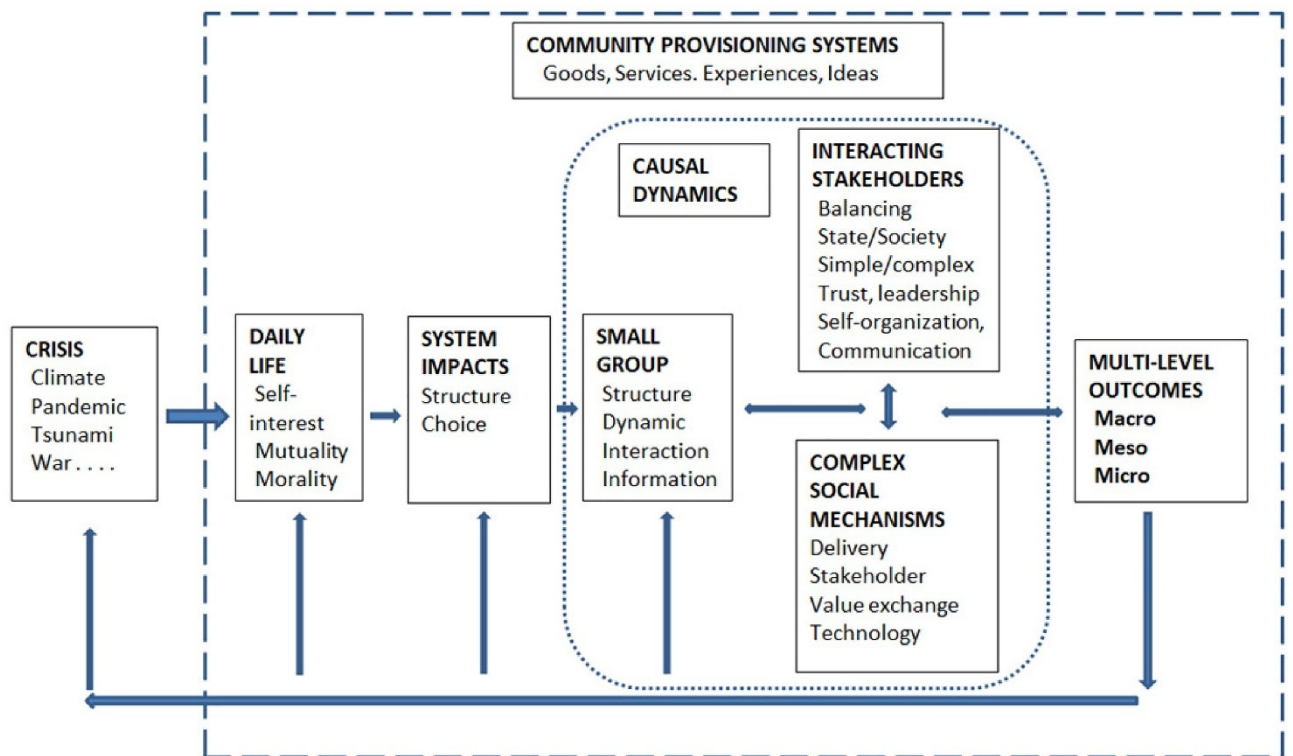
Appendix 2. Agents and relations with end users through SoP in the UK (Bayliss, Mattioli & Steinberger, 2021)



Appendix 3. Multi-Level Perspective on Technological Transitions (Geels, 2002)



Appendix 4. Impact of crisis in reshaping community provisioning systems (Layton & Domegan, 2024)



Appendix 5. Translated Interview Script from Italian to English

Before we begin, I'd like to briefly explain the purpose of this interview.

I am conducting this interview as part of my master's thesis at the University of Pavia. The goal of the research is to better understand how farmers experience changes in the agricultural sector, particularly in relation to digital technologies and daily work.

Your participation is entirely voluntary. You may stop the interview at any time, choose not to answer certain questions, or withdraw without any consequences.

With your consent, I will take notes during the interview and, if you agree, I may also record the conversation for research purposes only, so that I can analyze it more accurately afterward. All information collected will be treated confidentially and used exclusively for academic purposes. If you prefer, your name and references to your farm will not appear in the thesis, and the interview may be reported anonymously.

Do you agree to participate under these conditions?

And, if you are comfortable with it, do you also agree to a possible audio recording of the interview?

TOPIC 1: THE FARM AND DAILY WORK

- Could you tell me a bit about your farm and what a typical day looks like for you?
- Could you walk me through a typical day?
- Could you show me the main activities or tools you use?
- What usually takes up most of your time?

Possible follow-up questions:

- What is the farm's main focus?
- Who usually works with you?
- What are the most important activities during the day or week?
- What are the busiest times of the year?

TOPIC 2: WHAT MATTERS IN YOUR WORK - PERSONAL AND FARM VALUES

What matters most to you in your work as a farmer?

- If you had to describe what makes a farmer "good," what would you say?

Possible follow-up questions:

- What gives you the most satisfaction?
- What makes you feel that your work is worthwhile?
- What are you most proud of?
- What do you try to protect or preserve in your work?

TOPIC 3: CHANGES IN AGRICULTURE

In your experience, what has changed most in agricultural work in recent years?

- Could you tell me about a specific moment when you had to change the way you work?
- What happened and how did you adapt?

Possible follow-up questions:

- Has the climate affected your work?
- Have costs or prices changed the way you work?
- Have regulations, bureaucracy, or certifications become more important?
- Have customers or buyers changed their demands?
- Has working become harder or easier today?
- Which changes have been positive?
- Which have been difficult?
- What has been the hardest thing to adapt to?
- What helps you cope with change?

TOPIC 4: TECHNOLOGY IN DAILY PRACTICE

Do you use digital tools or technologies in your daily work?

- If possible, could you show me one of the tools you use?
- At what point in the day do you use it?
- Is there anything you still prefer to do "your own way" rather than digitally?

IF YES:

- How do they concretely help you?
- Do they save you time?
- Do they help you make better decisions?
- Do they help with costs, quality, traceability, or organization?
- Who introduced them to you?

- Did someone help you learn how to use them?

IF NO / LIMITED USE:

- Have you ever considered using them?
- What has held you back?
- Cost? Time? Complexity? Lack of trust? Lack of usefulness?
- What would make them more useful for you?

TOPIC 5: BLOCKCHAIN

Have you ever used, or been asked to use, digital systems for traceability or for sharing product information along the supply chain? Some people connect these systems to technologies like blockchain. Have you ever heard of it?

IF FAMILIAR WITH BLOCKCHAIN:

- In practice, what does it mean to you?
- Can you think of a specific case where traceability helped you — or created more work?
- Have you seen any concrete benefits?
- What are the limitations?
- In your opinion, who really benefits from these systems?

IF NOT FAMILIAR WITH BLOCKCHAIN:

- If there were a system that helped show where a product comes from and what happens along the supply chain, could it be useful to you?
- Under what conditions would you consider it?

POSSIBLE CLOSING QUESTIONS

- Looking back at everything we've discussed, what is the biggest challenge for farmers today?
- What kind of support would genuinely help farmers the most?
- Is there something about technology in agriculture that, in your opinion, people outside the sector don't understand?
- Is there anything important we haven't talked about?

Appendix 6. NVivo Coding Structure

The table below presents the complete thematic coding structure applied in NVivo 15 during the analysis of the seven semi-structured interviews. The structure consists of seven parent nodes and 55 analytical codes organised in a three-level hierarchy: parent node, sub-node, and sub-sub-node. The coding framework was developed deductively from the conceptual framework presented in Chapter 2 and refined inductively through engagement with the data, following a hybrid thematic analysis approach (Fereday & Muir-Cochrane, 2006).

Parent Node	Sub-Node	Sub-Sub-Node
Barriers to Change and Digital Adoption	Cultural and Relational Barriers	Distrust and Individualism
		Fear of Dependency
		Resistance to Change
	Economic Barriers	High Investment Costs
		Low Margins and Financial Fragility
		Scale Mismatch
		Infrastructure Gaps
	Structural Barriers	Labour Shortage and Time Constraints
		Lack of Tailored Solutions

Blockchain Valuation	Adaptation Barriers	No Intermediaries Barrier (No Need)
		Scale Barrier
		System and Institutions Distrust
	Perceived Value of Blockchain	Distrust and Scepticism
		Irrelevance for Direct Sales
		Potential Value in Longer Chains
		Transparency and Traceability
		Trust and Verification
	Prior Knowledge	Known Before Interview
		Partial Knowledge
		Unknown Before Interview
Changes in Agriculture	Bureaucracy and Regulations	
	Climate Change	Adaptation Strategies
		Agronomic Adaptation
		Crop & Production Diversification
		Network Creation

		Resilience Through Direct Sales
		Technological Adaptation
		Climate Change Perception
		Experienced Climate Events
		Invasive Species & Pests
		Seasonal Unpredictability
	Product Demand	
	Production	
	Technology	
Farmers' Digital Response	Aspirational Adoption	
	Full Adoption	
	Imposed Adoption	
	No Adoption	
	Partial or Selective Adoption	
Farmers' Values	Extrinsic Values	Economic Efficiency
		Market Access & Revenue
		Product Quality & Freshness

		Time & Labour Optimisation
	Intrinsic Values	Autonomy & Independence
		Community & Human Relations
		Environmental Sustainability
		Land Stewardship
		Passion and Professional Identity
		Tradition
Socio-Technical Systems of Provision	Institutional Context	Bureaucracy & Regulation
		Certifications & Compliance
		Institutional Critique
		Public Support & Subsidies
	Market Structures	B2B Clients
		Diversification
		Farmers' Market
		GAS and Buying Groups
		GDO and Large Retail
		Other Direct Sale

	Relational & Network Dynamics	Networking
		Word of Mouth
	Supply Chain Structure	Long Supply Chain
		Mixed Supply Chain
		Power Asymmetries
		Price Setting and Bargaining Power
		Short Supply Chain
Technology Valuation	Commercial and Digital Technologies	Administration & Accounting Tools
		Automatic & Vending Machines
		Communication, WhatsApp & Messaging
		E-commerce and Online Platforms
		Social Media & Digital Marketing
		Website
	Perceived Ease of Use	Difficulty and Complexity

		Easy to Use
	Perceived Usefulness	Conditional Utility
		Negative Perceived Utility
		Positive Perceived Utility
	Production Technologies	Animal Monitoring Systems
		Mechanical Tools & Machinery
		Precision Agriculture
		Water & Energy Management
		Weather & Climate Tools

Summary

Total parent nodes: 7 | Total sub-nodes: 22 | Total sub-sub-nodes: 55 | Grand total codes:

55

Appendix 7. Interviews' Excerpts in original language (Italian)

“Quello che ti fa sorpassare momenti difficili, economici o con altri motivi, è la passione che ci metti nel tuo lavoro, non senti la fatica, se il lavoro ti piace, puoi lavorare anche 12 ore al giorno.” (F4-Q1)

“Questo tessuto qua mi permette durante la stagione di raccolta, quelli che io chiaramente non raccolgo e scarto e butto a terra, poi passo, posso scopare e portare via proprio quello che anche la sorgente dell’eventuale proliferazione attraverso le spore di quel fungo che potrebbe peggiorare poi di anno in anno. “(F2-Q1)

“Se a me che produco latte chiedono il latte di soia, non ci siamo per me.” (F3-Q1)

“La qualità del prodotto è la freschezza, non perché è biologico.” (F5-Q1)

“Tutti i vitelli hanno un collare con un chip: associamo il numero del vitello a questo chip, impostiamo una curva di alimentazione e quando il vitello entra, la macchina lo riconosce, gli prepara il latte poco alla volta e il vitello si autoalimenta. L’operatore deve solo controllare che non ci sia un problema, altrimenti i vitelli mangiano in autonomia più pasti al giorno.”

(F3)

“Non lavoriamo 24 ore su 24: se ti arriva l’ordine alle 11 di mattina lo spedisce il giorno dopo.

Un po’ quello è - però vedo che non riusciamo a gestirla bene - perchè tutti ormai sono abituati ad Amazon che consegna il sabato la domenica, il giorno dopo.” (F4)

“Di essere remunerati il prezzo corretto per quello che produciamo e vendiamo all’industria, praticamente, alla grande distribuzione: il prezzo del latte che da una quota più o meno decorosa stiamo scendendo vertiginosamente, però il supermercato mantiene i suoi prezzi e a noi invece l’industria paga sempre meno.” (F3)

“Ti permette di essere libero dal punto di vista dei prezzi, mentre quando tu vai a vendere a un grossista stai al prezzo che ti dice lui, in questo caso invece sei libero tu di fare il prezzo in base ai tuoi costi.” (F1)

“Nel loro regolamento lo dicono - la finalità è di accorpare i terreni e di fare delle mega aziende - e l’azienda che, secondo le istituzioni, dovrebbe essere il mio modello di sviluppo non ha rispetto per il terreno.” (F1)

“Quando una cassetta (di prodotto) entra in bottega non è più biologica perchè devi fare anche la bottega biologica, quindi devi pagare un costo aggiuntivo - che a me sembra una cosa veramente assurda - è solo una questione per guadagnarsi la vita e i soldi.” (F5)

“Questa è un’agricoltura, tra l’altro, predatoria, nel senso che è sempre più orientata a impoverire le risorse di cui si nutre. Non è economica, nel vero senso della parola. La mia è un’impresa che vive sulle proprie gambe, senza prendere soldi da nessun’altra parte; quindi, è perfettamente economica rispetto a quasi tutte le attività agricole presenti sul territorio, che sono invece piene di agevolazioni.” (F6)

“Un posto come questo (negozio) è molto richiesto — la gente si accorge della qualità della merce — e il livello dei prezzi della grande distribuzione è aumentato notevolmente; quindi, il fatto che questo negozio fosse percepito come il più costoso qui intorno sta venendo un po’ meno.” (F5)

“I prodotti che trovi da me non sono quelli che trovi sul mercato — la mia ricerca è proprio di quel tipo di prodotto — devi fidarti del fatto che io scelgo la cosa giusta, non i più grossi, non quelli più belli, non le ‘mele da esposizione’.” (F7)

“La settimana scorsa di mattina c’erano due gradi e di pomeriggio ce ne erano 24. Un salto termico di 22 gradi in un giorno solo, vent’anni fa non c’erano.” (F5)

“Abbiamo avuto una siccità pazzesca, abbiamo prodotto se dai 60 al 70% in meno, e l’acqua noi nel 2022 l’abbiamo dovuta pagare lo stesso, anche se avevamo il 90% d’acqua in meno di dotazione. In caso di scarsità d’acqua loro dovrebbero distribuirla equamente, che è quello che non hanno fatto (istituzioni di gestione dell’acqua).” (F4)

“Non partiamo con un capitale di chissà che cosa: tra la macelleria e la bottega ci ha richiesto un bel po’ di investimenti; se potessi, investirei sicuramente.” (F5)

“Molte tecnologie sono pensate per realtà molto più grandi della mia. Non è solo una questione di costo, è che non sono pensate per me.” (F1)

“Si fa un po’ fatica a fare rete, un po’ per le vecchie mentalità di un tempo, perché tra vicini si guardavano male, sembrava che fossero i competitors; invece, il mio competitor deve essere quello che fa le cose non fatte bene, non il mio vicino.” (F1)

“Sicuramente la tecnologia sta cambiando molto. Io non ho modo, neanche esigenze, neanche particolari interessi a che questo cambiamento si inserisca all'interno di questa mia azienda agricola, nel senso che comunque è ancora molto legata a quelli che sono gesti e movimenti classici, tradizionali” (F2)

“Se noi siamo molto diretti, da qui passa (prodotto) o al cliente o al ristorante, non abbiamo molti intermediari. La blockchain la capisco se prendi una cosa da molto lontano.” (F5)

“Non ho bisogno di dover certificare da dove viene e come viene coltivato, perché lo faccio direttamente. Però sì, ne ho sentito parlare, perché quando si cerca di mettere insieme una serie di aziende, allora lì diventa importante.” (F1)

“Io non credo neanche tanto alla blockchain, ti dico la verità, anche le certificazioni nel biologico, perchè vedendo qua attorno a me quello che è successo a parecchie aziende agricole biologiche, poi non si sa bene com’è andata a finire.” (F4)

“Chi ci guadagna nelle informazioni, se sono informazioni utili e sacrosante, ci guadagnano tutti, ma se sono informazioni soltanto per riempire, quella invece è una devianza negativa del comportamento umano.” (F2)

“Chi ci guadagna è ovviamente in prima battuta lo sviluppatore della blockchain e poi cosa va a farci con quei dati. Il mondo è basato sui dati attualmente e i soldi girano per quello.” (F7)