TRUSTyFOOD

A Blueprint for Blockchain Skills Development in the European Agri-Food Sector

Addressing Workforce Needs, Innovation Capacity, and Digital Transition

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WHITE PAPER

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Foreword

This document is the outcome of a highly constructive and efficient collaboration between the TRUSTyFOOD partners and the external experts involved throughout the process. The journey from the start of this project has been very engaging, encompassing the collection of market needs, workshops, and collaborative discussions to determine the best approach for developing this Skills Development strategy. Our thanks go to everyone who actively contributed, particularly the eight Digital Innovation Hubs (DIH Agrifood, Asturias DIH Technical Office, DIH Agrifood Croatia, DIH BioSense, DIH DATAlife, Smart Food Cluster, Transilvania Digital Innovation Hub, Reframe Food), in representation of eight EU countries, who played a key role during the workshop carried out online on 2 April 2025.

Contents

1. Scope of the document 4
2. Introduction 4
3. Methodology 4
4. Stakeholders and related needs 5
   4.1. End users (Supply chain players) 5
   4.2. Professionals 6
      4.2.1. The current approach identified in existing training courses 6
      4.2.2. The current approach identified in real use cases and related gap 7
      4.2.3. A new professional role needed 8
      4.2.4. A consensus building approach 11
   4.3. Consumer 12
   4.4. Students 13
   4.5. Lecturers 13
5. Educational and training approach: the possible routes 14
6. The main contents 15
   6.1. End users (Supply chain players) 15
   6.2. Professionals 16
      6.2.1. Formal educational route 16
      6.2.2. Non-formal professional training paths 17
   6.3. Students 19
   6.4. Consumers 20
   6.5. Lecturers 20
7. Conclusions 21
8. Recommendations 22

References 23

1. Scope of the document

The **EU Blockchain Strategy (1)**, launched by the European Commission in early 2018, sets out a clear ambition to position the European Union as a global leader and innovator in blockchain technologies. Since its adoption, blockchain has progressively expanded in experimental applications. As blockchain-enabled solutions mature and move closer to large-scale deployment, the availability of appropriate skills has emerged as a critical enabling factor for their effective uptake and sustainable impact. In this context, **skills development represents one of the most urgent strategic challenges** to be addressed in order to translate technological potential into real economic and societal value.

While the EU Blockchain Strategy provides an overarching and cross-cutting vision, it does not adopt a sector-specific perspective. This limitation is particularly relevant for complex and heterogeneous reality such as agri-food system, where needs can vary significantly from other economic sectors. The primary objective of this document is therefore to contribute to addressing existing and emerging blockchain-related skills gaps by proposing a strategic and structured approach to skills development in Europe, with a specific focus on the agri-food sector. By doing so, the document is intended to serve as a blueprint model, supporting the design and implementation of targeted, demand-driven skills development actions that can be adapted to agri-food contexts, while remaining aligned with the broader objectives of the EU Blockchain Strategy.

2. Introduction

With the overarching objective of supporting the European Union in achieving and sustaining a leading position in the blockchain domain, this report proposes a comprehensive skills strategy combining both conceptual and operational perspectives. It aims to contribute not only to the theoretical understanding of blockchain-related skills needs, but also to the practical design of effective education, training, and capacity-building actions.
To this end, the report provides structured insights into the types of blockchain-related skills required across different categories, identifies the key stakeholders involved in the design and delivery of blockchain education and training programmes, and places particular emphasis on how such programmes should be conceived and implemented to ensure relevance, accessibility, and impact. By focusing on the methods, formats, and governance of skills development—rather than solely on technical content—the report seeks to inform the development of targeted, demand-driven approaches.

3. Methodology

This document is based on consultation of existing documents on the topic (**3**), as well as surveys, in-deep analyses of different practical use cases and working group discussions with Stakeholders carried out along the period 2022-2025 by TRUSTyFOOD project.

4. Stakeholders and related needs

This chapter identifies the type of individuals or collectives that would need to develop general blockchain skills or specific skills. Thus, this section will answer the question “who” should receive blockchain education and training. Figure 1 identifies five main categories of stakeholders, according to TRUSTyFOOD vision: professionals, supply chain players, consumers, students and lecturers, analysing their respective needs.

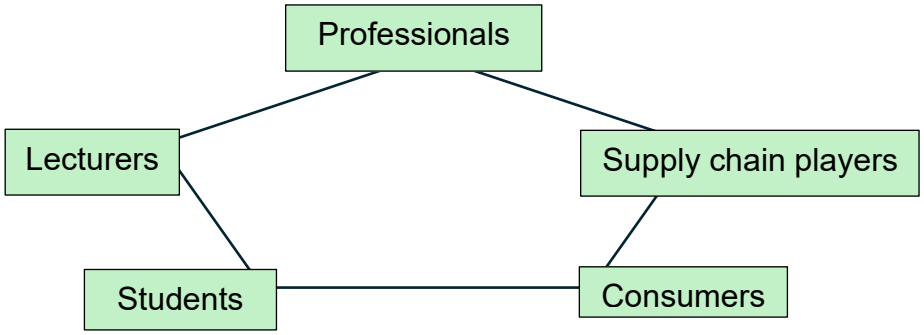


Figure 1 – Stakeholder categories in need of blockchain education and training

In line with CHAISE statement (2), identified stakeholder categories have different resources (time-money) and motivation (needs) to acquire blockchain skills. Thus, they have different interests content-wise (what to learn) and different training model preferences (how to acquire the skills). Therefore, an efficient and effective Skill Strategy model should respond to the needs of each stakeholder group adequately.

4.1. End users (Supply chain players)

There is a common assumption that effective blockchain uptake in the agri-food sector depends on widespread technical literacy. TRUSTyFOOD work performed in the last three years confirms that this thought is incorrect.

Before starting describing this category of stakeholders, let’s make clear the difference between “skills” and “awareness” terms.

Skills are practical, mastered abilities developed through practice to execute tasks effectively. **Awareness** is a knowledge that something exists, or understanding of a situation or subject at the present time based on information or experience. While awareness helps in making informed decisions, skills are necessary to apply that knowledge in real-world situations.

Evidence gathered across pilot cases analysis, stakeholder consultations, and implementation experiences (**7**) indicates that farmers and agri-food supply chain actors do not require in-depth technical knowledge of blockchain technologies to benefit from their adoption. Instead, their primary skills need relates to awareness, understanding of use cases, and the capacity to make informed strategic and investment decisions.

For farmers, cooperatives, SMEs, and other supply chain actors, **the relevant skills gap is not technical but cognitive and strategic**. Stakeholders need to be able to:

- Understand what blockchain-enabled solutions can and cannot do
- Recognise appropriate use cases (e.g. traceability, certification, data sharing, compliance)
- Assess costs, benefits, and risks of adoption
- Compare blockchain-based solutions with alternative digital approaches
- Engage confidently with technology providers, advisors, and investors

This level of competence can be described as **"informed awareness"** rather than technical proficiency.

From the digital perspective, blockchain operates as an enabling infrastructure, embedded within digital tools and platforms that are accessed through user-friendly interfaces. As with other digital technologies (e.g. cloud services, data platforms), **value creation does not require users to understand underlying architectures, algorithms, or protocols but having basic familiarity with its features and the aspects mentioned above.**

4.2. Professionals

The term "professionals" generally refers to working adults who design, implement, manage, advise on, or operate blockchain-enabled solutions as part of their professional role. They typically act as the bridge between technology, business, and regulation.
Usually they are technical professionals/technology providers (e.g. developers and engineers, software architects and system integrators, infrastructure specialists, etc) or actors who support adoption across organisations and sectors (consultants and technology advisors).

4.2.1. The current approach identified in existing training courses

Few years ago, the most commonly identified blockchain-related **professional roles**—such as Blockchain Developer, Blockchain Architect, and Blockchain Manager—have been **defined primarily around technical competences**. These roles typically emphasise skills related to software development, system architecture, smart contracts, cybersecurity, and infrastructure management. In recent times, some **transversal competences** (e.g. project management, communication, or basic regulatory awareness) have begun to be incorporated, but they often remain **secondary** to technical expertise.
This technical orientation reflects the **maturity stage of blockchain technologies**, where much effort has been devoted to building, testing, and stabilising core infrastructures and platforms. As a result, skills frameworks, job profiles, and training programmes have tended to prioritise **engineering and IT-centric capabilities**, sometimes at the expense of domain knowledge, business understanding, and user-centred design.

4.2.2. The current approach identified in real use cases and related gap

The figure 2 puts in evidence the players involved in an exemplary case of BCT application and actors involved:

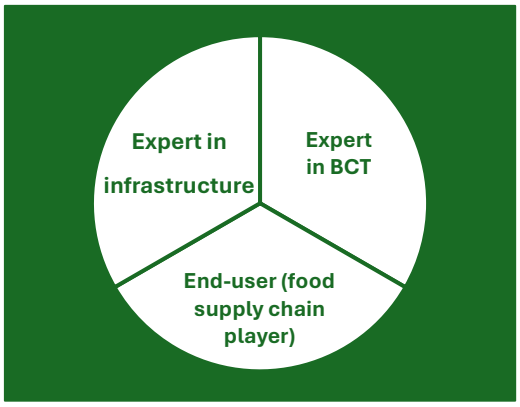


Figure 2. Actors involved in an usual BCT use case in agri-food sector

Analysing it, we can identify the following roles:

- **Expert in data infrastructure**: this figure knows about data collection, data transmission, data storage
- **Expert in blockchain technology**: is an expert in software and notarization services
- **End user**: the priority is to make business/profit (so, production is the first and main interest).

The shortcomings highlighted in applicative cases can be here simplified:

- Both experts in BCT and infrastructures do not know about food processes
- Few time and difficulties of the owner/employees in understanding and discussing about blockchain technicalities

All this translates into an overall difficulty in identifying priority areas for blockchain usefulness in the specific case, suggesting an application which is often more marketing oriented than really end-user pushed.

In particular, our surveys/interviews (**8**) put in evidence that in most of the cases, not being BCT a ready-to-use solution, it remains unclear for the end-user the immediate benefit for them. BCT is not a touchable technology with an immediate user experience. (…) Concepts explained by a technology provider are in most cases of difficult comprehension for operators in the agri-food sector, because of their different background and the use of a sector-specific language. Often, what a software developer imagines or proposes is far from the real food system practices or interests. As a consequence, most of the use cases end with the renounce to its real implementation in the routinary activities, considering the BCT application only an interesting exploration.

4.2.3. A new professional role needed

The technical role of a professional is increasingly **insufficient for real-world deployment**, especially in complex sectors such as agri-food. As blockchain solutions move from pilots to operational use, successful adoption depends less on purely technical performance and more on:

- alignment with business processes,
- regulatory compliance,
- data governance,
- usability and integration with existing systems.

Consequently, there is growing recognition that blockchain professionals must combine **technical skills with transversal and sector-specific competences**, including:

- process and domain knowledge,
- strategic and economic reasoning,
- communication skills,
- UX/UI awareness and change management.

While it is accurate to state that current blockchain roles remain **predominantly technical**, skills strategies—particularly under Horizon Europe—should **evolve beyond this narrow framing**. Future blockchain profiles are likely to become more **hybrid**, blending technical expertise with business, regulatory, and sectoral knowledge in order to support scalable, user-centred, and impactful deployment.

The solution TRUSTyFOOD identifies to overcome such gap is **a new intermediate professional profile to be allocated to the food sector**, which we can call AGENT, who must possess three kinds of competencies:

- Food processes
- Digital knowledge
- BCT knowledge

It represents a functional intermediary between food production systems and digital/blockchain solution providers.

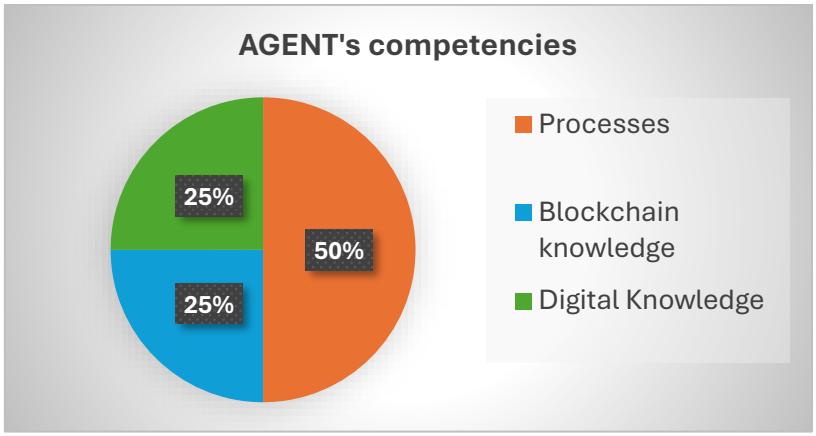


Figure 3. AGENT's suggested skills

Key characteristics:

- **Sector-first** (food processes are foundational)
- **Technology-aware but not technology-centric**
- **Facilitator and translator**, not designer or developer
- Strong focus on **use cases, governance, compliance, and dialogue**

In our view, **at least half of the required skill set should be grounded in a solid understanding of food industrial processes**. Such knowledge is essential for grasping how agri-food value chains operate in practice, from primary production and processing to logistics, distribution, and retail. The **food sector** is inherently **complex, highly regulated, and heterogeneous**, encompassing a wide range of products, production models, quality standards, and organisational structures. Without a clear understanding of these underlying processes, it is difficult to assess where and how digital technologies—including blockchain—can create real added value.

This type of domain-specific expertise enables professionals to **contextualise technological solutions within real operational constraints**, such as food safety requirements, certification schemes, traceability obligations, seasonal variability, and cost structures. It also supports more effective communication between technical experts, business managers, and supply chain actors, helping to avoid technology-driven approaches that are misaligned with sectoral needs. In this sense, strong knowledge of food industrial processes is not complementary but **foundational**, providing the necessary basis upon which digital and blockchain-related competences can be meaningfully applied in the agri-food sector.

On the other side, such AGENT must possess:

- **basic digital knowledge** (infrastructure data), being able to detect data and make everything digital, expert in data integration and in database creation;
- **basic Blockchain knowledge** (what BCT is, enabling functions of BCT, limitations of the technology and related tricks)

to communicate correctly with the technical counterpart.

Exploiting such mix of knowledge, AGENT's capability should be that to (i) **collect the needs** from the company, understand the areas and production steps where BCT could be most useful; (ii) **identify** the technology providers able to perform the technical part; (iii) **favor** the right dialogue between all the parties involved.

Such profile should not substitute him/herself to technology providers, thus is not expected to design or implement the technology, neither should substitute him/herself to the company/end user. The Agent should **facilitate the smooth flow of information, requests' understanding and reaction** between the technology layer and the production layer (see figure 4).

Such new professional figure manages and advises on blockchain-enabled solutions, and therefore needs competencies that span **technical, managerial, and operational domains**.

Key competences include the ability to:

- Understand blockchain technologies and architectures at a functional level sufficient to advise on or manage implementation, without necessarily requiring deep coding expertise for all roles;
- Translate business requirements into blockchain solutions, ensuring that technology choices align with operational, regulatory, and strategic objectives;
- Evaluate costs, benefits, and risks of blockchain adoption across organisational processes, supply chains, or product portfolios;
- Ensure regulatory compliance and data governance;
- Engage with multiple stakeholders, including IT teams, suppliers, clients, auditors, and regulators, effectively communicating technical concepts in accessible terms;
- Consider UX/UI implications, ensuring that blockchain solutions are user-friendly for both internal users and external stakeholders (customers, partners, or end consumers).

4.2.3.1.1. The change of paradigm

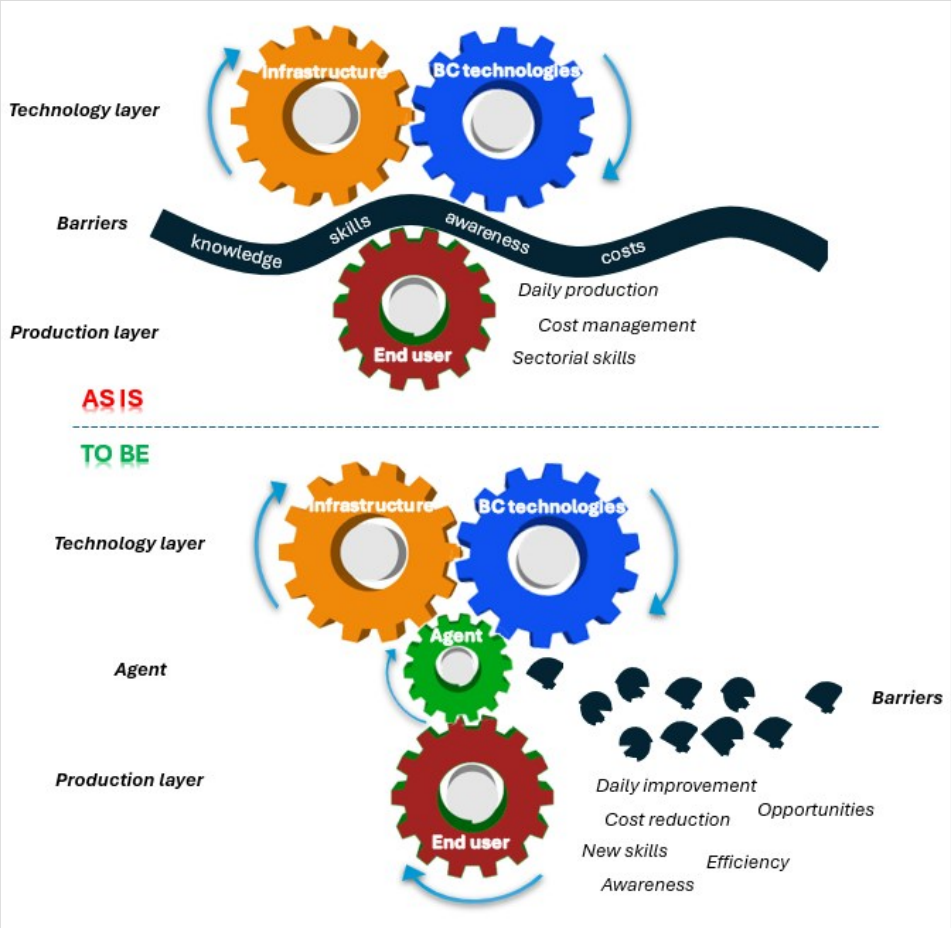


Figure 4. Example diagram of expected change

The Agent completes the “professional roles” needed. By developing these skills, it drives successful blockchain adoption, maximizes innovation impact, and reinforces the EU’s competitiveness in the global blockchain market.

4.2.4. A consensus building approach

This vision has been presented on April 2, 2025 to eight Digital Innovation Hubs (DIHs) during an online workshop organised by TRUSTyFOOD.

The following comments emerged, which have been integrated into the final conclusions and recommendations:

"I would like to see that consumers start asking for it. I think that the key is in the consumers, (…). So my idea would be to start equipping consumers with additional knowledge so that they can make informed choices"

"(…) intermediate organizations will play a key role, because the first thing is that they speak the farmer's language (…) Also, the second thing I would say is that this organization understand the regional context. So they can actually provide hands-on support for deploying all the digital tools, not only blockchain, but other tools as we mentioned in our discussion. In my view, it's not about, excluding individual farms from this digital transition. We don't want to exclude them. But I think that it's about putting an ecosystem around them. So when, for example, cooperatives, regional hubs, producer groups and all these organizations act as enablers and act as an ecosystem through the individual farms, then I think that the transition will be easier. And more practical"

"(…) we strongly believe that farmers need to be supported by, I don't know, the same way as they are now supported with accountancy. Everybody accepts the fact that you have an accountant if you want to do the tax report and so on and so on and everybody is doing these papers and you are paying for this service. In the future, probably, somebody will be paying for similar services as digital infrastructure or digital service or being able to provide exact data about your farming practices. (…) So somebody needs to take care of it. And I see agricultural advisors as a key element into providing this (…) Traditionally, at least in our societies or in our environment, the agricultural advisory is still holding the element of trust and they are working with farmers, they are trusted people. So we need to make sure that the agricultural advisory is also being digitally transformed. And this is what we are also trying to pilot and trying to investigate: how to transform digital agricultural advisors"

(…) if you go for formal education the process will be very slow so I guess the first thing to do is provide professional training but this should come with a certification because if somebody is not certified the role is not actually accepted"

"(…) end users basically don't need to be experts in technology. They need tools to make easier their life and more attractive their job. (…) Maybe this role of facilitators could be played by clusters, for example, by the digital innovation hubs, by cooperatives or other entities that are closer to the to the field. (…) the technology can be a key to retain young generation in the primary sector and foster the digitalizations. And also, these young generations can be a key player to introduce new technologies and disruptive technologies. So maybe it could be a good idea to develop this new professional figure also in the university or in the young generations. To make them able to introduce in the primary sector this rapid technology such as the blockchain"

"(…) The solution needs to be flexible in order to be able to be adapted to any realistic scenario because the food chains are extremely complex. And then if you imagine this, you need at least to have one group of people to understand this complexity and to make sure that the solution is then customized to that realistic case. And then again, on top of

this, even if you customize it, even if you adopt it, even if you implement it in a real scenario, you would need to provide them full support in any changes, in upgrades and so on and so on"

"(…) the traceability system is complex (…) So it surpasses the idea of just one agricultural advisor working with farmers and that's it. Implementing real traceability into the system is really a complex challenge that it's not only technical. It's not only implementation of technology that can be done by the solution provider and then it's finished. It's much more than that (…) So I definitely agree that you need to have intermediaries, you need to have competent multidisciplinary team of people understanding all those challenges and at the bottom I don't even see a really big need to have a blockchain expert in this. It's much more challenges that are out there if we want to do these changes"

"(…) digital tools failures happen not due to the tech, but due to lack of connection between ICT experts and real food system needs, the lack of connection between ICT and the food system. So I think that's the point that we have to look. The main constraints I see are: the need for a clear definition of the role and its recognition across countries, initial funding for training pilots, and ensuring trust from both farmers and tech actors"

"(…) who is paying for this? DIHs should transfer or should be supported by financial mechanisms under the EDIH umbrella and they need to create a kind of concepts and services for these particular cases. Like this is really a very nice ideal situation where you could provide these services like even going to the level of customizing solutions, implementing solutions, providing all this support case by case. You can work with a single farmer or a single producer or processor or you can work as a food supply chain and include those additional actors into the traceability system. So I think we would need to have more concrete support like this because (…) EDIH is definitely to be used for that".

4.3. Consumer

While farmers and supply chain actors require cognitive and strategic skills, consumers primarily need awareness, understanding, and confidence to interact effectively with blockchain-enabled products and services. Beyond knowing what blockchain can achieve, consumers also need to be familiar with the user experience (UX) and user interface (UI) of blockchain-based tools, as these directly affect how they access, interpret, and trust information. Key competences for consumers include the ability to:

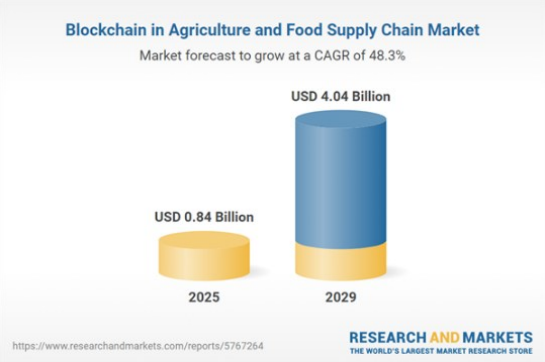
- Understand the benefits and limitations of blockchain-enabled products, such as traceability, certification, and sustainability claims;
- Navigate digital interfaces and applications designed to provide blockchain-verified information, ensuring they can access data easily and interpret it correctly;
- Critically evaluate information and claims, distinguishing credible blockchain-based assurances from misleading marketing;
- Make informed purchasing decisions based on transparent, verifiable data provided via blockchain systems;
- Build trust in digital tools and platforms, which is essential for broader adoption and meaningful engagement with the technology.

By developing these skills, consumers can engage confidently with blockchain-enabled solutions, supporting **market uptake, transparency, and accountability**. Furthermore, familiarising consumers with the **design and functionality of future blockchain tools** ensures that technology adoption is **user-friendly, inclusive, and impactful**, reinforcing the overall success of blockchain applications across the agri-food sector.

4.4. Students

Experts widely recognise that early-stage training and education play a particularly important role in skills development, as learning processes at a younger age tend to be faster, more adaptable, and more effective (**6**). Targeting students at secondary education level is therefore considered a strategic investment, as these individuals represent the next generation of professionals who are either about to enter, or are already entering, the labour market. Equipping them with relevant digital and blockchain-related competences is essential to ensure their long-term employability, adaptability, and career resilience in a rapidly evolving technological landscape.

From a broader policy perspective, supporting this stakeholder group is also clearly aligned with the strategic interests of the European Union. A pipeline of well-educated, blockchain-aware graduates would contribute to strengthening Europe's innovation capacity and entrepreneurial ecosystem, particularly in the context of start-ups and technology-driven SMEs. By fostering a workforce that is not only technically competent but also capable of understanding blockchain applications from a business, regulatory, and societal perspective, the EU can reinforce and further enhance its position in the global blockchain development and start-up market.



Available market analyses (**4**) indicate that the blockchain sector is expected to continue growing in the coming years, further increasing demand for skilled professionals across multiple industries. As a result, blockchain-related topics are likely to gain increasing prominence within academic curricula and lifelong learning pathways. An open question for education providers and policymakers, however, concerns the most appropriate curricular approach: whether to develop programmes dedicated exclusively to blockchain technologies (blockchain specialists), or to embed blockchain within broader interdisciplinary courses, where it constitutes one of several key digital enablers rather than the sole focus. Addressing this question will be critical to ensuring that education and training offerings remain flexible, future-proof, and aligned with labour market needs. Our recommendation is to broaden the curriculum to other technologies (AI, IoT), as TRUST-FOOD has already done, for example, with its online courses (**5**).

4.5. Lecturers

The shortage of blockchain-skilled candidates is not only a challenge for professionals and industry but also impacts the academic and educational sector. Lecturers across disciplines are increasingly expected to stay abreast of the latest developments in their fields, which now frequently include blockchain technologies. However, the availability of structured, high-quality resources to support lecturers in developing blockchain expertise remains limited. Many rely on recent research, self-directed learning, online courses, and professional forums, which can be fragmented and inconsistent, compromising the quality of education and training that they provide. To address this, a Skills Development strategy must propose concrete measures to support lecturers in acquiring and updating blockchain competencies. Ensuring that educators—both in the public and private sector—are well-equipped with up-to-date knowledge and practical insights is not a secondary aspect.

5. Educational and training approach: the possible routes

The educational and training approach refers to the methods and modalities through which blockchain curricula are delivered to different stakeholder groups. In general, three broad forms of education and training can be distinguished (Dip, 1987):

1. **Formal education**, which includes higher education (HE) programmes and vocational education and training (VET) courses;
2. **Non-formal education**, encompassing online courses, MOOCs, e-learning platforms, workshops, and seminars;
3. **Informal learning**, which typically involves self-directed learning, on-the-job training, and in-house company programmes.

CHAISE project (**2**) indicates that there is currently no clear consensus on the most effective approach for blockchain-related education and training. Experts remain divided: certain roles, particularly those requiring deep technical expertise in computer science or informatics, benefit from formal academic training, while many employers consider non-formal programmes sufficient, recognising the value of targeted courses offered via online platforms. This diversity highlights the need for a **flexible, multi-modal skills strategy that can accommodate the varying educational requirements of different roles and contexts** within the blockchain ecosystem.

Category	Educational and training approach
End user	**Non-formal education**—such as online courses, MOOCs, short training programmes, workshops, and seminars—is generally **the most appropriate and efficient way** to build informed awareness among supply chain actors. Why it works well: • Flexible and time-efficient (compatible with operational workloads) • Focused on practical understanding, not theory • Easily tailored to sector-specific use cases (e.g. traceability, certification) **Informal learning**—such as peer learning, in-house training, demonstrations, pilot participation, and self-learning—plays a **crucial complementary role.** Why it matters: • Anchors knowledge in real operational contexts • Builds trust through experience • Encourages adoption through practical exposure • Lowers resistance to innovation **Formal education** (HE or VET programmes) is **usually not suitable** for supply chain players seeking informed awareness, due to: • Long duration and high commitment • Technical or academic orientation However, it can be relevant for younger professionals entering agri-food management roles
Professional	For professionals, the most effective skills development model is a **structured combination of formal and non-formal education**, supported by continuous informal learning.
Consumer	For consumers, blockchain-related skills are acquired mainly through **informal learning**, embedded in everyday interactions with products, services, and digital tools. Typical channels include:

	• Using blockchain-enabled apps (e.g. QR codes on food products) • In-app guidance and explanations • Media, campaigns, and peer-to-peer information **Non-formal education** plays a complementary role by **raising awareness and improving digital confidence**. Examples include: • Public information campaigns • Short explainer videos or online materials • Consumer workshops or awareness initiatives • Educational content developed by consumer organisations or public authorities
Student	Referring to the digital literacy, traditional lecture-based teaching can be enough for 16-18 age candidates. However, for reaching young adults (20-30 age) and trying to support the growth of blockchain start-ups, traditional lecture-based teaching alone is unlikely to provide students with the practical skills and critical understanding needed to thrive in a rapidly evolving digital sector. **Modern educational approaches that combine conceptual knowledge with hands-on, project-oriented learning are recommended.**
Lecturer and trainers	They **require a structured, continuous, and multi-layered learning approach**, because they are not only learners but also multipliers of knowledge. For lecturers, **formal and non-formal education should jointly form the core** of blockchain skills development, supported by continuous informal learning.

6. The main contents

6.1. End users (Supply chain players)

Blockchain skills development for supply chain players should **prioritise functional understanding over technical training**. Training programmes aimed at farmers and supply chain actors should therefore focus on:

- Conceptual understanding of blockchain as a trust-enabling and data-governance tool
- Practical examples and case studies relevant to specific agri-food contexts (success stories, digital twins, demos, sand boxes, experimental spaces)
- Decision-support knowledge, including investment readiness and procurement considerations
- Regulatory and data governance implications, including ownership, access, and compliance
- Long-term sustainability and scalability considerations

Increasing awareness enables farmers and supply chain actors to become informed and empowered decision-makers, capable of:

- Avoiding inappropriate or over-engineered technological solutions
- Reducing dependency on vendor-driven narratives which often bring to failures in use cases
- Making proportionate and economically sound investment decisions
- Aligning digital adoption with business objectives and sustainability goals

In this sense, blockchain awareness functions as a risk-mitigation and value-maximisation skill, rather than a purely digital competence.

6.2. Professionals

6.2.1. Formal educational route

Once demonstrated the market's need of this kind of profiles and confirmed it along the time, one option is to activate an ad hoc degree course at the universities.

6.2.1.1. Academic study plan structure

A 3-layer study plan is recommended, reflecting the functional nature of the role.

Layer 1 – Core foundation - Food industrial processes and value chains

This is the non-negotiable backbone of the AGENT profile.

Key learning areas:

- Agri-food value chains (farm → fork)
- Food processing technologies
- Quality, safety, and certification systems
- Traceability and compliance requirements
- Logistics, storage, and distribution
- Cost structures and operational constraints
- Sector-specific regulations (EU food law, sustainability standards)

Layer 2 – Digital foundation

Key competences:

- Digitalisation of processes and data flows
- Data collection and data quality principles
- Databases and data integration (conceptual level)
- Integration of physical sensors (IoT) with the digital ledge
- Interoperability between systems (ERP, IoT, platforms)
- Basics of cloud infrastructure and APIs
- Understanding data ownership and governance

Layer 3 – Blockchain (BCT) knowledge

Key competences:

- What blockchain is and how it works (conceptual level)
- Enabling functions (immutability, decentralisation, trust)
- Limitations and trade-offs (costs, scalability, governance)
- Blockchain vs alternative technologies
- Smart contracts (logic and implications, not coding)
- Blockchain for traceability, certification, compliance
- UX/UI implications for end users and consumers

Explicit exclusions:

- No smart contract coding
- No protocol design
- No infrastructure deployment

Transversal competences
These are critical for the AGENT's facilitation role and should be **embedded throughout the study plan**:

- Requirements analysis and needs assessment
- Stakeholder engagement and mediation
- Communication between technical and non-technical actors
- Cost–benefit and risk analysis
- Regulatory and data governance awareness
- Project coordination and basic change management
- UX/UI awareness for adoption and usability

Capstone and experiential learning (essential)
To fully embody the AGENT role, the study plan should include:

- Real agri-food company case
- Identification of a blockchain-relevant use case
- Mapping of processes, data, and stakeholders
- Interaction with a **technology provider**
- Co-supervision:
    - One supervisor from academia (food/digital)
    - One from industry or tech provider

6.2.1.2. Limits

Even if this can be a medium-long term perspective, is important to act now. Academic courses imply lengthy bureaucratic procedures and approvals that can slow down the process.

6.2.2. Non-formal professional training paths

In this case, people who have already graduated (bachelor level) could reinforce their own competencies, integrating them with the missing ones. The advantage of such a courses is related to flexibility (learners can adapt training to their schedule without disrupting full-time work or study), accessibility (from anywhere, reducing geographic barriers), cost-effectiveness and targeted learning (focus on specific skill gaps rather than taking a full degree program).

In terms of entry background, the AGENT should ideally start from a **food-sector-oriented bachelor degree**, such as:

- Food Science and Technology
- Agricultural Sciences
- Agri-food Engineering
- Food Quality and Safety
- Agri-business (with strong technical exposure)

This ensures that **~50% of the competence base is firmly rooted in food processes**.

An ICT-oriented entry background (e.g. computer science, information systems, software engineering, data science) can be considered a valid access pathway to the AGENT profile, provided that it is complemented by substantial and structured training in agri-food systems and food industrial processes.

Given that the AGENT's primary function is not the design or implementation of technology, but rather the translation between production needs and digital solutions, an ICT background alone is insufficient. Without a solid understanding of food value chains, regulatory constraints, and operational realities, there is a risk of adopting technology-driven approaches that are misaligned with sector-specific needs.

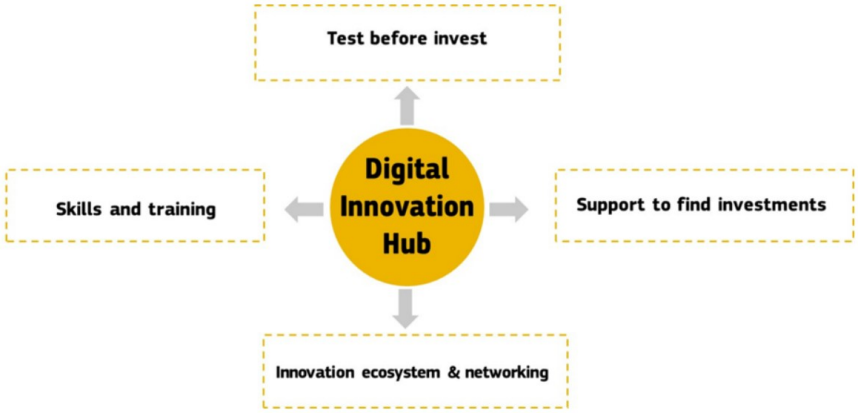
6.2.2.1. The role of online courses, MOOCs, e-learning platforms

As said, a new trend, closer to the need to speed up the process and exploit modern educational approaches, is represented by Modular "Micro-Credentials". Instead of long university degrees, use short, certified modules (ECTS-compatible). This allows a professionist to take a 4-week course on Blockchain without major repercussions or sacrifices.
Certifications from reputable providers are increasingly recognized by employers internationally. This helps professionals demonstrate functional knowledge without formal degrees.

→ Key Projects to watch: TRUST-FOOD (**5**) or CHAISE, which offer specialized e-learning for agrifood SMEs.

6.2.2.2. The role of Digital Innovation Hubs (DIHs) in territorial operational contexts

DIHs have been created to facilitate the adoption of advanced digital technologies by businesses, particularly SMEs, and to support regional innovation ecosystems. They act as one-stop-shops, providing access to expertise, testing facilities, training, and networking opportunities. Their role is not limited to technical support; they also help companies understand business models, evaluate investments, and navigate regulatory and market challenges.

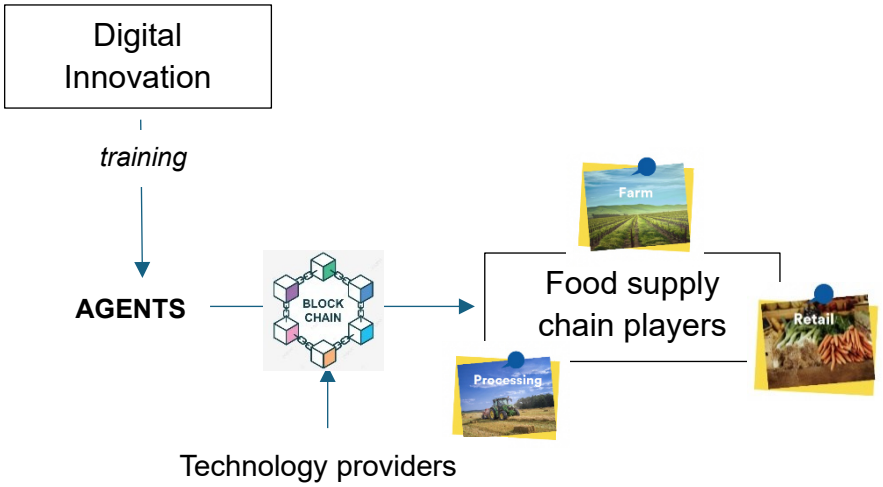


They are well positioned in the local context, as they connect universities, research centres, technology providers, incubators, and local businesses, ensuring that digital innovation is aligned with territorial strengths, sectoral priorities, and local needs. By doing so, DIHs can accelerate the uptake of technologies such as blockchain, IoT, AI, and data analytics, fostering value creation and competitiveness at a regional level. Their proximity to local stakeholders allows DIHs to tailor training, demonstration projects, and advisory services, ensuring that knowledge transfer is practical, relevant, and context-sensitive.

Building on this model, European Digital Innovation Hubs (EDIHs) extend the scope to a pan-European level, providing cross-border services and benchmarking opportunities, while maintaining local anchorage. The European Union has indeed dedicated financial resources to support EDIHs, mainly through: (i) Digital Europe Programme funds targeted at building, consolidating, and expanding the hub network, and (ii) annual operational financing helping hubs to deliver services to businesses, including skills development and adoption of digital technologies.
These funding streams not only enable EDIHs to operate and provide services, but also to **reduce financial barriers**, encourage experimentation, and enable SMEs, cooperatives, and other local actors to adopt digital technologies—including blockchain—without bearing the full risk or cost alone.

TRUSTyFOOD envisages in current DIHs an under-exploited strategic role which can be reinforced in making these new skills available on the territory for BCT wide application.
In our model, the role of DIHs could be played at two levels:

- organisation of training professional courses to complete the profile of people interested in pursuing this profession,
- engage these outgoing profiles as their own experts to be used on the territory to support the companies' needs and act as "BCT facilitator".



6.3. Students

At secondary level, the content can be limited to basic information. As you progress through the ranks, the complexity must be proportionate to the course of study. Further considerations are omitted here, leaving the assessment to be made on a case-by-case basis. For sure, in such more advanced learning process, the close partnership education – industry should be guaranteed, to ensure that students gain both theoretical grounding and real-world/ applied experience, preparing them to contribute effectively to innovation, start-up development, and the wider blockchain ecosystem.

6.4. Consumers

Consumers primarily need awareness, understanding, and confidence to interact effectively with blockchain-enabled products and services. Beyond knowing what blockchain can achieve, consumers also need to be familiar with the user experience (UX) and user interface (UI) of blockchain-based tools, as these directly affect how they access, interpret, and trust information

6.5. Lecturers

The courses should combine theoretical knowledge, practical skills, and teaching methodologies. These could be part of university programs, professional certifications, or structured workshops and contain the following arguments:

a) Foundations of Blockchain
b) Technical Skills
c) Applications of Blockchain
d) Research & Critical Thinking
e) Pedagogical Approaches
f) Latest blockchain news and case studies
g) Understanding emerging technologies like NFTs, DeFi, and Web3
h) Networking & Knowledge Sharing (joining blockchain communities and forums, Participating in hackathons or International Conferences), Collaborative projects with industry partners
i) Lifelong Learning Resources

7. Conclusions

Developing a blockchain skills strategy for the European agri-food sector requires bridging the gap between high-level technology and the day-to-day realities of farming and food processing.

TRUSTyFOOD work confirmed that the effective blockchain uptake in the agri-food sector depends on (i) supply chain players informed awareness, (ii) widespread availability of experts which can act as advisors.

Blockchain skills development for supply chain players should prioritise functional understanding over technical training. By contrast, deep technical skills should remain concentrated among technology providers, integrators, and specialised intermediaries (AGENT).

Concentrating on professionals, in the last years numerous courses (mainly on-line) have made their appearance on the scene to strengthen blockchain skills. Such courses were mainly addressed to train future blockchain managers, blockchain architects, and blockchain developers, and were addressed to professionals, students, managers, digital innovation specialists, and technical staff.

However, lessons learned along the sectoral working groups carried out in the last three years in the context of TRUSTyFOOD project confirm the current trend that blockchain skills development in the agrifood sector cannot focus only on the technological part.

In agreement with other funded projects statements (**2**), TRUSTyFOOD confirms that to address the complexity of current labour market needs in this specific sector, it is essential to put the emphasis on **three pillars of skills development: technological, transversal, and business/ industry-specific skills**. Hence, focusing only on the development of technological skills would be a mistake in this emerging complex environment which blockchain represents.

As shown presenting the AGENT profile, **food-sector-oriented** competencies need to represent a big part of the curricula of new experts in the field. Understanding the food processes, as well as the complexity of the supply chain is of paramount importance to properly play this role of intermediator between the “pure” ICT professionists and the end user (farmer, food industry).

The role of **digital literacy** remains another strategic asset to be stressed: an efficient Skills Strategy should place particular emphasis on educating producers & SMEs (farmers don't need to code; they need to understand how to interact with decentralized interfaces and why data integrity at the "first mile" - the farm - is critical), the younger generation (which can support the growth of blockchain start-ups in the future), but also the consumers in being more familiar with concepts strictly related to the application of blockchain technology in the agri-food sector. Consumers primarily need awareness, understanding, and confidence to interact effectively with blockchain-enabled products and services. Beyond knowing what blockchain can achieve, consumers also need to be familiar with the user experience (UX) and user interface (UI) of blockchain-based tools, as these directly affect how they access, interpret, and trust information.

8. Recommendations

Rather than promoting technical blockchain training indiscriminately, future actions should:

- Embed blockchain awareness within **broader digital and innovation skills frameworks**
- Target training content according to **stakeholder roles along the value chain**
- Support advisory services, demonstration activities, and peer learning
- Foster **trusted intermediaries** capable of translating technical complexity into practical guidance

Such an approach aligns with Horizon Europe's objectives to strengthen **innovation uptake, inclusiveness, and impact**, while ensuring that digital technologies serve the real needs of the European agri-food sector.

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