

Ministero dell'Università e della Ricerca
Direzione generale dell'internazionalizzazione e della comunicazione

Avviso per la *“Concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione”* da finanziare nell'ambito del PNRR

Piano Nazionale di Ripresa e Resilienza, Missione 4, *“Istruzione e Ricerca”* - Componente 2, *“Dalla ricerca all'impresa”* - Linea di investimento 3.1, *“Fondo per la realizzazione di un sistema integrato di infrastrutture di ricerca e innovazione”*, finanziato dall'Unione europea - NextGenerationEU

Proposta definitiva

Intervention field 6: Investment in digital capacities and deployment of advanced technologies

DESI dimension 4: Integration of digital technologies + ad hoc data collections

055 - Other types of ICT infrastructure(including large - scale computer resources / equipment, data centres, sensors and other wireless equipment)

Spett.le
Ministero dell'università e della ricerca
Direzione Generale dell'internazionalizzazione e della comunicazione
Via Michele Carcani, 61 – 00153 ROMA

OGGETTO: Proposta definitiva in esito alla fase negoziale per l'accesso alle agevolazioni previste dall'Avviso per la concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione, da finanziare nell'ambito del PNRR – Progetto identificato con il codice 6113A08F – FOOD METAVERSE PLATFORM

Il sottoscritto Stefano Geuna, nato a TORINO il 25/09/1965, nella sua qualità di legale rappresentante (ovvero, procuratore speciale, in forza di idonea e adeguata procura speciale) del Soggetto Proponente Università degli Studi di Torino, con sede legale in TORINO, alla via Via Verdi, 8,

DICHIARA

- che la proposta definitiva è coerente con gli esiti della fase negoziale espletata a norma dell'art. 11 dell'Avviso in parola;

DICHIARA, altresì

- di confermare tutto quanto già dichiarato in sede di presentazione della Domanda recante Codice 6113A08F
- di essere consapevole che, in caso di dichiarazioni mendaci, ovunque rilasciate nel contesto della presente proposta e nei documenti ad essa allegati, potrà incorrere nelle sanzioni penali richiamate dall'art. 76 del D.P.R. 445/2000, oltre alla decadenza dai benefici, come previsto dall'art. 75 del D.P.R. in parola, conseguenti il provvedimento emanato in base alle dichiarazioni non veritiere;
- di consentire al trattamento dei dati personali per le finalità e con le modalità di cui al decreto legislativo 30 giugno 2003, n. 196, e successive modifiche ed integrazioni.

PRESENTA

la proposta progettuale identificata nella piattaforma GEA con il codice ITEC0000025, di cui alla presente. Costituiscono parte integrante e sostanziale della proposta tutti gli allegati indicati nella Sezione Allegati, che si intendono sottoscritti in uno alla presente, nonché gli Allegati trasmessi in sede di presentazione della domanda, come modificati in questa sede.

Firmato digitalmente

Proposta definitiva

Avviso per la “Concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione” da finanziare nell’ambito del PNRR – Proposta progettuale definitiva in esito alla fase negoziale – Codice 6113A08F

Soggetto proponente

- **Anagrafica Soggetto Proponente**

- Denominazione: Università degli Studi di Torino
- Codice CAR: E1790091
- CF: 80088230018
- Pec: ateneo@pec.unito.it
- Tipologia soggetto: Università e Scuole Superiori a Ordinamento Speciale
- Sede legale:
 - CAP: 10124
 - Via/Piazza: Via Verdi
 - Civico: 8
 - Comune: TORINO
 - Provincia: TORINO
 - Regione: Piemonte

- **Anagrafica Rappresentante Legale**

- Nome: Stefano
- Cognome: Geuna
- Codice fiscale: GNESFN65P25L219B
- E-mail: rettore@unito.it
- Data di nascita: 25/09/1965
- Comune di nascita: TORINO
- Sesso: Maschio

- **Anagrafica Referente del progetto**

- Nome: Piercarlo
 - Cognome: Rossi
 - Telefono: 0116705734
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Dati di sintesi della proposta progettuale

Titolo del Progetto: A “Farm-to-Fork” digital infrastructure to enable Metaverse and Web 3.0 access for all players and stakeholders in the food & beverage value chain

Acronimo del Progetto: FOOD METAVERSE PLATFORM

Settori e ambiti prevalenti dell'iniziativa:

- Salute:

- Tecnologie per la salute

- Digitale, industria, aerospazio:

- Intelligenza artificiale
- Materiali avanzati

- Clima, energia, mobilità sostenibile:

- Transizione energetica totale

Keywords:

Web3.0; Metaverse; Explainable AI; DigitalTwin; Human Nutrition; Digital Currency; Smart Contracts; Blockchain; Open Data;

Livelli di maturità tecnologica prevalente (TLR): 7;

Data di avvio del progetto: 01/09/2022

Durata del progetto (in mesi): 36

Costo complessivo del progetto: 21.400.000,00 €

Tipologia intervento: Realizzazione/Creazione

Localizzazione

Infrastruttura distribuita: Si

Numero sedi: 4

Sede 1

- CAP: 10124
- Via/Piazza: Via Verdi
- Civico: 8
- Comune: TORINO
- Provincia: TORINO
- Regione: Piemonte

Sede 2

- CAP: 70121
- Via/Piazza: Piazza Umberto I
- Civico: 1
- Comune: BARI
- Provincia: BARI
- Regione: Puglia

Sede 3

- CAP: 07100
- Via/Piazza: Piazza Università
- Civico: 21
- Comune: SASSARI
- Provincia: SASSARI
- Regione: Sardegna

Sede 4

- CAP: 90133
- Via/Piazza: Piazza Marina
- Civico: 61
- Comune: PALERMO
- Provincia: PALERMO
- Regione: Sicilia

Piano economico

Costi complessivi di progetto

Spese ammissibili	Costi (€) (1)	IVA (€) (2)	Totale (€) (1+2)
a) Spese Manager Infrastruttura ed altre figure manageriali	1.000.000,00	0,00	1.000.000,00
b) Strumentazione scientifica, apparecchiature e macchinari	6.000.003,00	0,00	6.000.003,00
c) Impianti tecnici generici	1.999.996,00	0,00	1.999.996,00
d) Licenze software e brevetti	6.000.000,00	0,00	6.000.000,00
e) Fabbricati e terreni	2.000.001,00	0,00	2.000.001,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	2.000.001,00	0,00	2.000.001,00
g) Spese per progettazione e altre spese tecniche	1.000.001,00	0,00	1.000.001,00
h) Costi indiretti	1.399.998,00	0,00	1.399.998,00
Totale (€)	21.400.000,00	0,00	21.400.000,00

Articolazione costi di progetto per localizzazione

Sede/Sito 1			
Spese ammissibili	Costi (€) (1)	IVA (€) (2)	Totale (€) (1+2)
a) Spese Manager Infrastruttura ed altre figure manageriali	1.000.000,00	0,00	1.000.000,00
b) Strumentazione scientifica, apparecchiature e macchinari	5.700.003,00	0,00	5.700.003,00
c) Impianti tecnici generici	1.900.000,00	0,00	1.900.000,00
d) Licenze software e brevetti	5.700.000,00	0,00	5.700.000,00
e) Fabbricati e terreni	1.800.000,00	0,00	1.800.000,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	1.800.000,00	0,00	1.800.000,00
g) Spese per progettazione e altre spese tecniche	950.000,00	0,00	950.000,00
h) Costi indiretti	1.320.000,00	0,00	1.320.000,00
Totale (€)	20.170.003,00	0,00	20.170.003,00

Sede/Sito 2			
Spese ammissibili	Costi (€) (1)	IVA (€) (2)	Totale (€) (1+2)
a) Spese Manager Infrastruttura ed altre figure manageriali	0,00	0,00	0,00
b) Strumentazione scientifica, apparecchiature e macchinari	100.000,00	0,00	100.000,00
c) Impianti tecnici generici	33.332,00	0,00	33.332,00
d) Licenze software e brevetti	100.000,00	0,00	100.000,00
e) Fabbricati e terreni	66.667,00	0,00	66.667,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	66.667,00	0,00	66.667,00
g) Spese per progettazione e altre spese tecniche	16.667,00	0,00	16.667,00
h) Costi indiretti	26.666,00	0,00	26.666,00
Totale (€)	409.999,00	0,00	409.999,00

Sede/Sito 3			
Spese ammissibili	Costi (€) (1)	IVA (€) (2)	Totale (€) (1+2)
a) Spese Manager Infrastruttura ed altre figure manageriali	0,00	0,00	0,00
b) Strumentazione scientifica, apparecchiature e macchinari	100.000,00	0,00	100.000,00
c) Impianti tecnici generici	33.332,00	0,00	33.332,00
d) Licenze software e brevetti	100.000,00	0,00	100.000,00
e) Fabbricati e terreni	66.667,00	0,00	66.667,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	66.667,00	0,00	66.667,00
g) Spese per progettazione e altre spese tecniche	16.667,00	0,00	16.667,00
h) Costi indiretti	26.666,00	0,00	26.666,00
Totale (€)	409.999,00	0,00	409.999,00

Sede/Sito 4			
Spese ammissibili	Costi (€) (1)	IVA (€) (2)	Totale (€) (1+2)
a) Spese Manager Infrastruttura ed altre figure manageriali	0,00	0,00	0,00
b) Strumentazione scientifica, apparecchiature e macchinari	100.000,00	0,00	100.000,00
c) Impianti tecnici generici	33.332,00	0,00	33.332,00
d) Licenze software e brevetti	100.000,00	0,00	100.000,00
e) Fabbricati e terreni	66.667,00	0,00	66.667,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	66.667,00	0,00	66.667,00
g) Spese per progettazione e altre spese tecniche	16.667,00	0,00	16.667,00
h) Costi indiretti	26.666,00	0,00	26.666,00
Totale (€)	409.999,00	0,00	409.999,00

Cronoprogramma di attuazione

Obiettivi intermedi: una sintesi

Codice identificativo	Mese di avvio (dalla data di avvio progetto)	Durata (in mesi)	Stima dei costi (€)
2	01/09/2022	24	6.420.000,00
3	01/09/2022	24	3.210.000,00
4	01/12/2022	18	3.210.000,00
5	01/09/2022	18	3.210.000,00
6	01/09/2022	36	5.350.000,00
Totale (€)			21.400.000,00

Obiettivo intermedio: 2

• Descrizione

NFT Engine
 NFT Taxonomy of “MetaFood” Assets & Processes:
 Non Fungible vs Fungible Tokens (IPR vs Commodities) for legal and financial purpose, for both tangible assets (land, equipment, crops, products, packaging, etc.) and intangibles (DNA, biochemical structures, recipes, processes, brands, trademarks, etc.);
 Digital Twins for technical/functional scope (biochemical, agrifood engineering, etc.);
 Avatars for communication/experience (AR/VR models, sensorial analysis & simulation, etc.)
 NFT Digital Engine:
 Analog-to-Digital Converters of Tangible Assets (Land, Plants, Crops, Products, Equipment, Packaging, etc.)
 Format Standardization of Intangible Assets (DNA, biochemical structures, recipes, processes, brands, trademarks, etc.)
 Crypto-asset creation, storing, minting and wallet configuration
 NFT Marketplace:
 Definition of specifications for the primary and secondary trading of NFT on standard marketplaces
 Management of wallets and transactions
 Market volumes analytics

• Mese di Avvio

1

• Durata in Mesi

24

• Deliverables

- M1.D1: A cloud-based infrastructure, with first-class technical performances, cybersecurity and disaster recovery solutions, supported by a network of distributed edge computing systems and specialized devices for analog-to-digital conversion, installed in different locations, for the generation of NFTs and the support of the Food Metaverse functionalities.
- M1.D2: A PaaS (Platform as a Service) and SaaS (Software as a Service) middleware, under the form of licensed software, for NFT management
- M1.D3: A Taxonomy of “MetaFood” Assets & Processes, under the form of a written report and a digital library of classification and use-cases

Obiettivo intermedio: 3

- Descrizione

ESG Taxonomy & Metrics of AgriFood Assets and Processes:
Definition of a comprehensive classification of ESG-related factors for the relevant AgriFoodTech asset and processes
ESG Metrics Data Sources & Analytics:
Design and development of sensors & actuators, edge computing systems, data hub and analytics for collection and assurance of ESG Metrics applied to all relevant AgriFoodTech processes
ESG Certification Engine:
Standardization and interfacing with third-party, independent ESG Certification Authorities
Performance evaluation based on ESG criteria and certifications under environmental, social and governance categories, leading to the issuance of an ESG certificate by a certification authority

- Mese di Avvio

1

- Durata in Mesi

24

- Deliverables

- M2.D1: An “ESG Engine” on a cloud-based PaaS (Platform as a Service) and SaaS (Software as a Service) middleware, under the form of licensed software, for issuing and management of ESG certifications
- M2.D2: An “ESG Taxonomy Metrics of AgriFood Assets and Processes”, under the form of a written report and a digital library of classification and use-cases
- M2.D3: A set of industry-specific sensors and data sources for the generation of ESG certifications

Obiettivo intermedio: 4

- Descrizione

FoodCoin/CBDC Utility
Managing the issuance, transfer and redemption of a wholesale Cryptocurrency/CBDC.
Risk Management Platform
Design and development of a risk management model (inclusive of ESG Metrics) for insurances and loans

Tokenised Syndicated Loan Platform (TSL Platform)
Managing the issuance, drawdown, novation and repayment of tokenised syndicated loans.

- Mese di Avvio

4

- Durata in Mesi

18

- Deliverables

- M3.D1: A cryptoasset utility, enabled by a hybrid architecture of distributed ledger technology, under the form of distributed hardware resources and licensed/open software, for issuing and management of FoodCoin solutions.
- M3.D2: A data-driven Risk Management Platform, under the form of licensed software and licensed access to specialized data lakes.
- M3.D3: A Tokenised Syndicated Loan Platform (TSL Platform), under the form of licensed software and API-based connections to financial institutions, for issuance and management of credit to businesses

Obiettivo intermedio: 5

- Descrizione

IntelliFood Open Data
AgriFoodTech Open Data Taxonomy & Content Management
Definition of relevant data structures & digital ecosystem rules for privacy-preserving, identity-based, interoperable data about food & beverage consumption
Interoperability of content sources for products, territories, specialties, recipes, experiences, etc. (see E015 of Regione Lombardia)
AgriFoodTech Cloud & IoT/Edge Infrastructure
Definition, development and management of distributed and “elastic” infrastructures for data collection, processing, interoperability, security and transparency (see Gaia-X / AgriFood Data Space)
Data Governance, Audit Processes & Communications
Artificial Intelligence / Deep Learning systems for governance, audit and continuous process improvement of the AgriFood value chain
Development of an “on-demand”, customized/personalized logic of the AgriFood chain evolving towards a subscription-based model of sustainable, planned food distribution and preparation

- Mese di Avvio

1

- Durata in Mesi

18

- Deliverables

- M4.D1: A IaaS (Infrastructure as a Service) architecture, to be based on M1.D1 deliverable, with a network of distributed edge computing systems and specialized devices for the management of IntelliFood Open Data.
- M4.D2: A PaaS (Platform as a Service) and SaaS (Software as a Service) middleware, including interfaces and mobile applications for final consumers and SMEs, under the form of licensed/open software, for open data management and application of artificial intelligence to open data.
- M4.D3: A Taxonomy of IntelliFood/AgriFoodTech Open Data, under the form of a written report and a digital library of classification and use-cases

Obiettivo intermedio: 6

- Descrizione

Sensorial Ecosystem
Holistic Nutrition Taxonomy and Classification of Sensorial Experiences
Definition of the holistic taxonomy related to the complex interplay of nutrition factors between the physical and chemical, mental and emotional, as well as cognitive, behavioural and environmental aspects of consumers' life and being.
Classification of consumer experiences of selection, purchase, preparation, consumption and disposal of food & beverages.
Sensorial Systems Development & Analytics
Design and development of sensors & actuators, AR/VR devices, edge computing systems, data hub and analytics for sensorial and neuro/behavioural analysis of consumer experiences.
Sensorial Systems Distribution Network & Experiential Modules
Development of a network of distribution nodes for the “Food Metaverse enabled” products solutions to support both supply-sided circular economy and demand-sided mindful social and individual consumption.

- Mese di Avvio

1

- Durata in Mesi

36

- Deliverables

- M5.D1: A hybrid cloud & edge infrastructure, with specialized devices and specific sensors/actuators to be installed in different locations, for management of Sensorial Ecosystem., data collection and data analysis.

- M5.D2: A PaaS (Platform as a Service) and SaaS (Software as a Service) middleware, including interfaces and mobile applications for final consumers and SMEs, under the form of licensed/open software, for the management of the Sensorial Ecosystem and the distributed development of functionalities by a network of external developers.

- M5.D3: A “Taxonomy for Holistic Nutrition and Sensorial Experiences”, under the form of a written report and a digital library of classification and use-cases.

Allegati

Allegato 1 - Proposal template

Ministero dell'Università e della Ricerca
Direzione generale dell'internazionalizzazione e della comunicazione

Avviso per la “Concessione di finanziamenti destinati alla realizzazione o ammodernamento di Infrastrutture Tecnologiche di Innovazione” da finanziare nell’ambito del PNRR

Missione 4, “Istruzione e Ricerca” - Componente 2, “Dalla ricerca all’impresa” -
Linea di investimento 3.1, “Fondo per la realizzazione di un sistema integrato di infrastrutture di ricerca e innovazione”, finanziato dall’Unione europea - NextGenerationEU

REFORMS AND INVESTMENTS UNDER THE RECOVERY AND RESILIENCE PLAN

NextGenerationEU

Call for proposals

Intervention field 6: Investment in digital capacities and deployment of advanced technologies

DESI dimension 4: Integration of digital technologies + ad hoc data collections

055 - Other types of ICT infrastructure (including large-scale computer resources/equipment, data centres, sensors and other wireless equipment)

Mission 4 – “Education and Research”

Component 2: from research to business

Investment 3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures

FOOD METAVERSE PLATFORM

A “Farm-to-Fork” digital infrastructure to enable Metaverse and Web 3.0 access for all players and stakeholders in the food & beverage value chain

Annex 1 (technical annex)

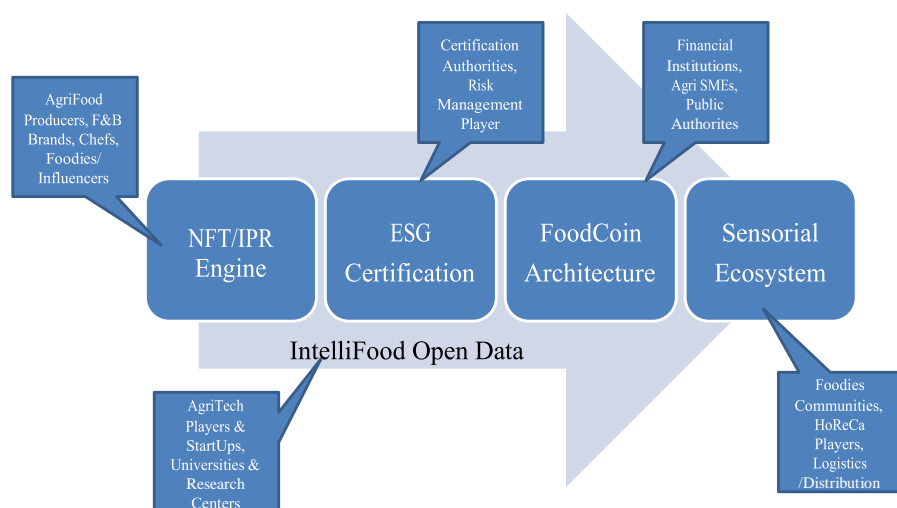
Proposal template, pursuant to Article 8 of the call for proposals

Part A – Strategic framework of the initiative

A.1. Objectives of the initiative

The objective of the project is to develop a innovative technological infrastructure to enable Metaverse and Web3.0 access for all players and stakeholders in the food & beverage value chain. In terms of social and economic impact, the Food Metaverse Platform will support the protection of intellectual property and certification of origin and environmental sustainability of European food specialties, fostering the market valorization not only of agrifood products but also of all knowledge-based professional activities related to human nutrition. Moreover, facilitating the access to financial capital and open/structured market data for SMEs and startups, especially in marginal territories with less business opportunities, it will foster competition and innovation across the entire supply chain, avoiding the risk of food & beverage commoditization and shifting the European agrifood industry towards premium segments of the global market, while improving the importance of sustainability and consciousness among final consumers. The Food Metaverse Platform will include five main technological modules, addressing all players and stakeholders of the “Farm to Fork” research agenda of the European Commission (see Graph 1 below, which will be better described and specified in paragraph B.1):

- NFT (Non Fungible Token) Engine for IPR (intellectual Property Rights) protection.
- ESG certification platform, for accountable, data-driven sustainability.
- FoodCoin Architecture, for the marketplace of financial tokens to assure access to capital for farmers, SMEs and other players.
- Sensorial Ecosystem for integrating sensorial analysis and neurosciences/behavioural approaches with biological/medical perspectives.
- IntelliFood Open Data for an open market of privacy-preserving, identity-based, interoperable data about food & beverage consumption to support AI/ML-based processes.



Graph 1 – The architecture and technological modules of Food Metaverse Platform

A.2. Geographical area of interest

The Food Metaverse Platform will be distributed at the national level, leveraging on existing and new infrastructures in different sites (see Graph 2 below), as better detailed in paragraph A.10. Given the technological nature of the platform, the ultimate target geographical scope will be global, through a virtual community of Metaverse Foodies and an international network of HoReCa and distribution partners providing physical locations where both final consumers and food & beverage professionals will be able to test the products and participate to the real-life experiences within the Food Metaverse context.



Graph 2 – The multi-site, distributed infrastructure of Food Metaverse Platform

A.3. Sectors/domains

Details are contained within the final project proposal.

A.4. Keywords

Details are contained within the final project proposal.

A.5. Prevailing levels of TRLs

Details are contained within the final project proposal.

A.6. Coherence with the priorities set in the European, National and Regional strategic agendas

The project is fully consistent with the strategic priorities of digital transformation and climate/environmental sustainability of one of the most relevant sector of the European economy and society at large. It resonates with the goals of the Digital Compass 2030 by providing digital infrastructures for innovation, new competences both at the citizen and at the professional level, full transparency and interoperability among corporations and businesses – especially SMEs in the agrifood, transformation, distribution and HoReCa industries – in digital connection with financial institutions and public authorities, as well as improving the digitalization of the services of both local and central public administrations across the entire agrifood supply chain. It provides a reliable, transparent and globally scalable architecture to support the “Farm to Fork” strategy of European Commission, while offering a powerful competitive advantage to local, national and European businesses in terms of reduction of transaction costs, access to consumer data and to financial capital, data-driven opportunities for product/process innovation at all levels of the value chain, as well as a powerful tool for citizen and consumers to improve their health and quality of life through better and more conscious nutrition.

National

The public investments for the implementation of the research and Technological Infrastructure for Innovation Food Metaverse Platform are consistent with the recommendations that the European Council, implementing the Commission's proposal, made to Italy in 2020 with respect to the content of the National Reform Program (PNR) of the previous year. The NRP focuses on support for families and businesses in order to stimulate a socially and environmentally sustainable restart. In this context, the proposed intervention, as a public investment, acts in favour of this restart both directly, moreover through a multiplier effect typical of investment in research and development, and indirectly, working in favour of the growth of technology transfer services and support for innovation and entrepreneurship.

With regard to the National Program for Research 2021-2027 which, based on the analysis of criticalities and strengths of research in Italy, intends to promote positive changes by leveraging on basic and applied research and policies that make use of the directionality of innovation, the involvement of citizens and dedicated actions of knowledge and technology transfer in favour of territories, companies and public administration, the Food Metaverse Platform appears to be totally synergic and complementary not only in its general approach, but also in the specifics of its research themes that adhere to the research area called "food, bioeconomy, natural resources, agriculture and environment".

The main sectors and domains of the initiative are strongly transversal to a very large number of sectors of interest for the competitiveness of the country and represent the synergic vision of the various technological approaches to sustainability. Therefore, are particularly strategic the following research areas:

- 2.4.5 Territories and valorization of Made in Italy where it is said that innovation in the agri-food field must be supported through research that combines technologies, humanities and fintech;
- 3.3.4 Security of services to citizens and businesses, where it is said that to defend Italian products, including in the agro-food sector, it is important to define tools and systems of traceability and transparent communication;
- 4.4.4 Robotics for the agro-food sector, where it is said that robotics can contribute significantly to achieving high standards in the cultivation and processing, transport and sale of an agri-food product.

The activities foreseen in the Food Metaverse Platform will also be based on the integration of the historical agricultural and industrial vocation of the country towards the complete realization of a sustainable, circular and synergistic industry based on the concepts of transformative agrofood. The interaction between the bioenergy industry and the agricultural, livestock and agro-industrial sectors, in addition to optimizing the use of land resources, may contribute to the containment of the exploitation of natural resources.

The National Strategy on the Bioeconomy, updated in accordance with the new strategy adopted by the EU Commission and with the priorities identified under the new European research framework program Horizon Europe 2021-2027, as well as with the new investments envisaged by the Bioindustries Joint Undertaking (BBI JU) for the development of a sustainable bio-based industrial sector in Europe, emphasizes the importance of research and innovation to increase productivity, product quality and sustainability of each sector that makes up the bioeconomy. In absolute coherence the of the Food Metaverse Platform will be a Technological Infrastructure for Innovation of excellence that can become an international reference on issues related to Environmental Sustainability and the Bioeconomy, an infrastructure for research and innovation open to and connected with the industrial system and offering services to the territory, for a smart, sustainable and inclusive growth.

Regional

The research and innovation system has been analyzed by the OECD, and what emerges from the Organization for Economic Cooperation and Development's survey contains undisputed strengths and areas where improvement is needed. Piemonte, for example, has a particularly positive performance in terms of private investment in research and development, which in 2018 represented 2.2% of the regional gross domestic product and 80% of total investment in the specific sector. Although, therefore, the potential for innovation in businesses is strong, stronger systemic action by the Regions is needed to fully unfold. The recommendations proposed by the OECD have already been incorporated into the revision of the different S3 - Smart Specialization Strategy and will be a source of inspiration for their implementation throughout the 2021-27 programming period.

The realization of the activities of the Food Metaverse Platform leverage on the strengths already existing in the territory to create the capacity specifically needed by the driving productive and economic sectors, the public sector and the world of education and research for a gradual but radical change in interdisciplinary areas, such as Agrofood, Health, Digital, Industry and Aerospace, Sustainable Energy Transition, Materials Science, Bioeconomy in view of a unitary concept that correlates human, animal, and environmental health.

Pillar of the Smart Specialization Strategy 2021-2027 of the Piemonte Region is the centrality of the cross-cutting innovation components of "digital transition", "ecological transition", "social and territorial impact". The second pillar of the S3 2021-2027 is the review of the previous Areas of Specialization (AdS), in favour of Priority Systems of Innovation (SPI). In the new Smart Specialization Strategy, sectoral specializations maintain an important place, but within them only projects, programs and solutions connected to at least one of the Transversal Components for Innovation (CTI) will be supported. The first CTI focuses on the goal of technological growth and product and process innovation in the territory's industrial and service systems. The technological solutions in progress and soon to be diffused will give a general transformative thrust to the productive fabric, with repercussions that go beyond the simple increase in productivity, orienting innovation towards the demand for new solutions, efficiency and sustainability expressed by society as a whole. It is appropriate, within this CTI, to identify the objectives (and corresponding technological domains) most relevant to the territory. Among these, based on the first comparison with stakeholders, we can indicate: Connectivity, AI/Machine Learning; Robotics; Blockchain; IOT, Cyber-Security, Data analysis, High Performance Computing, quantum computing, advanced Human Machine Interface (physical, virtual, voice); edge computing. The novelty, compared to the S3 2014-2020, is represented by the significant opening towards a cross-sectoral approach that includes not only the companies of automation, machine production and related software development, which constituted the Mechatronics AdS, but all the supply chains of the region with distinctive characteristics and not represented in the other SPI. The SPI is to be understood as a transversal sphere to the manufacturing sector, with the objective of an enhancement of paradigms related to digitization

(for speed, enterprise 4.0) and ecological transition and an increasing orientation towards products with positive social impact, explicitly supporting research and innovation aimed at the transformation and renewal of the offer of products/services.

In this context, the proposed intervention stands not only as fully coherent but also as a complement to territorial cooperation interventions. Strong coherence is thus discernible with respect to the national and regional guidelines for European cohesion policy 2021-2027 as outlined, respectively, in the draft Partnership Agreement and the Unified Strategic Document (UD) that will define the ERDF and ESF+ Operational Programs. Both of these documents identify as priority areas of intervention research and innovation (OP1), energy efficiency and support for the transition to the circular economy (OP3), and the strengthening of tertiary education and enhanced professionalization (OP4).

The Food Metaverse Platform project is closely related to the Lombardy Region's strategy to support and develop the regional agricultural sector. In particular, the Lombardy Region's S3 strategy refers to what has been provided by the Regional Government's Resolution XI/4155 of 12/30/2020 entitled "APPROVAL OF THE INTELLIGENT SPECIALIZATION STRATEGY FOR RESEARCH AND INNOVATION OF REGIONE LOMBARDIA - S3 2021-2027". In this regard, it shows all the possible relationships between the Food Metaverse Platform project and the Lombardy Region S3, with the necessary aim of integrating the different initiatives, in order to optimize the interventions in terms of resources, objectives to be achieved, monitoring of results and affirmation of the Ecosystem model, with regard to the agri-food tech sector of interest. The Lombardy Region confirms this coherence through its commitment to grant its experimental agricultural estate called Riccagioia, endowed with more than 50 hectares of land and located in the municipality of Torrazza Coste in Oltrepo Pavese, on loan for use to the Riccagioia Foundation, through an agreement that will be formalized by June 2022, in order to activate the AGRI 5.0 project along the entire Farm2Fork supply chain, in support and reference of its regional RDP plan and S3 strategy and in synergy with the Food Metaverse Platform project.

A.7. Synergies with other initiatives envisaged within Mission 4

The project has clear synergies with many other initiatives encompassed in M4C2 of PNRR. In particular, the following research themes are directly correlated:

Extended Partnership (Partnerariato Esteso)

Directly related themes:

1. Artificial Intelligence: foundational aspects
7. Cybersecurity, new technologies and right protections
8. Consequences and challenges of aging
9. Economic and financial sustainability of systems and territories
10. Models for sustainable nutrition
11. Made-in-Italy circular and sustainable
12. Neurosciences & neuropharma

Indirectly related themes

- 3. Environmental, Natural and Antropic Risks
- 14. Telecommunications of the future

National Centers (Centri Nazionali)

Directly related themes:

- 2. Tecnologie dell'Agricoltura (Agritech)
- 5. Bio-diversità

Indirectly related themes

- 1. Simulazioni, calcolo e analisi dei dati ad alte prestazioni

Innovation infrastructures

As regards the references to Investment 3.1 ("Fund for the creation of an integrated system of research and innovation infrastructures"), the infrastructures will be financed by exploiting a public-private partnership, capable of attracting financing and expertise from institutional investors and private entities.

Regarding PNRR "Mission 4 Component 2":

- **The Food Metaverse Platform appears to be totally synergic and complementary to the National Centers program (Centri Nazionali) dedicated to the "Frontier research related to technological areas" which promotes technology transfer and digital transformation of the production processes of companies with a view to economic and environmental sustainability and social impact on the territory. In particular, the following activities involves UniTo as a scientific partner and have been funded:**
 - **"Agricultural Technologies (Agritech)," proposed by the University of Naples Federico II**
The synergy of the Food Metaverse Platform with CN Agritech, run by University of Naples as proponent with major Italian universities as spoke (Na, To, Mi, Pd, Si, Tuscia, Cnr, Bo, Ba) is evident.
The value proposition of the Food Metaverse Platform project, through the Riccagioia Foundation in its role as a Smart Innovation Hub enabler of the technological transformation of the National territory, aims to enable the future development of several target services (Agri-Food Tech Academy, Precision & Internet Farming Solutions, Project Financing, Business Accelerator, European E-Commerce Platform, Twin Consumer Experience, thus covering the entire "Farm-2-Fork" supply chain. The qualification has in the various spoke mandates a contribution focus that responds to the Foundation's service capacity: 6 of the 9 available spokes have been identified where the Food Metaverse Platform project, through the direct and indirect role of the Riccagioia Foundation and its partners, can offer its contributions. The company Bonifiche Ferraresi (Founding Partner of the Riccagioia Foundation) is on the list of the Hub's proponents and therefore the bearer of some of the offering components that are part of the Food Metaverse Platform's value proposition.
 - **"Bio-diversity," proposed by the National Research Council (CNR)**

The synergy of the Food Metaverse Platform with the National Biodiversity Center, Managed by CNR as a hub, is also evident. Through ERSAF, which entered as an affiliate of Bicocca's spoke 5 representing the Riccagioia Foundation, a technological partnership on innovation projects is aimed at.

The goal is to accelerate the transformation, to improve the quality of life of citizens, facilitate the development of activities in the area with possible with a paradigm shift, combining digitization and sustainability, beyond the Industry 4.0 paradigm towards the concepts of Society 5.0.

The value of the contribution comes through the recognition that data and its processing are at the heart of any digital innovation. Relevant opportunities can be seized through the ability to collect, structure, store data, extract information useful for planning, delivery, maintenance and improvement processes, applying concepts, treatments and technologies of data analytics, machine learning and artificial intelligence.

The technological architecture envisaged by Ersaf/Riccagioia for the CN Biodiversity has characteristics of robustness, to support the activities of the entire supply chain; openness, to ensure interoperability at national and European level; and persistence and usability of information, the fundamental core of the entire system and a central element to feed Artificial Intelligence processes.

Technological support for the entire project realized in the form of a set of enabling services, harmoniously integrated with each other, allows all information and results of research and experimentation to be exploited at the highest level.

All this information can be used to implement typical processes of a Digital Twin aimed at the fruition of a Sensory Ecosystem, to enable a Phygital Experience also for the user of the final product (citizen) : in addition to the physical fruition, also a digital experience of accompaniment and deepening through the own functions typically applied in Metaverse platforms.

- Research Infrastructures (Infrastrutture di Ricerca) UniTo is main applicant in the project "Microbial resources for a green, healthy and sustainable future MIRRI" which aims to preserve and exploit the microbial diversity and making available all data associated with microbial resources currently dispersed in different databases;
- Innovation Ecosystem (Ecosistemi dell'Innovazione):

NODES: UniTo is spoke in the topic "Green Technologies" and affiliated in the topics "Primary Agroindustry" and "Secondary Agroindustry". In the topic "Primary Agroindustry" as part of its activities Ersaf will engage the Riccagioia Foundation, one of its regional service offices, reference point in the territory for research and experiments in viticulture, fruit, wine-making and environment. The thematic research area of the spoke "Primary Agroindustry" is the sustainable development of heavily agricultural territories, by employing an interdisciplinary and specialized approach bringing together competences and expertises from various disciplines, ranging from biosensing, data collection and management, AI, and ICT, to omics and exposomics. The development of new services and new business models for the agricultural industry is the project primary expected outcome. Its flagship project is Vineyard management for vine production undergoing a strong transformation due to the closely connected processes of automation and digitization. Amongst the specific aims of the topic "Secondary Agroindustry" there are: to promote the entrepreneurial mindset development and competitiveness skills improvement; to develop and promote a sustainable food education and culture able to increase the ecological thinking that can contribute to the adoption of sustainable lifestyles and consumption.

MUSA: The synergy with MUSA - Ecosystem of Innovation is ensured by the focus on agrifood sustainability and traceability and the Foundation's role as a private partner in the hub led by Bicocca University with the University of Milan, Bocconi and Politecnico di Milano as well as the City of Milan and the Lombardy Region with the aim of creating an innovative eco-sustainable model of a metropolitan city.

In this project context, the Foundation has applied to provide all the digital infrastructure to cover the project implementation processes (planning, development, delivery, management and maintenance). The Riccagioia location was declared available to become a secondary location of the Hub of the Musa Innovation Ecosystem as well as Digital Lab shared with an external area as a field of experimentation of new technologies applied to the newly developed models.

A.8. International profile and reach of potential users (with particular reference to SMEs)

The project is an initiative of University of Turin Italian in joint with other Research Centers & Universities (e.g., CNR, University of Pavia, Bari, Palermo, Sassari) specialized on research and development of digital solutions for food and nutrition, and Fondazione Riccagioia 5.0, a public-private partnership focused on agrifood research and innovation, together with xFarm, a Milan-based company specialized on agritech platform of asset mapping with IoT technologies involving thousands of SMEs and farmers in Italy and Europe.

The founders of Fondazione Riccagioia 5.0 include global/international leaders in their respective fields of competences, with direct access to many thousands of potential user and SMEs at international level, such as:

- Bayer AG for genetic research, through its subsidiary Bayer Crop Science, serving many thousands of SMEs in Italy, Europe and worldwide;
- TIM/Telecom Italia group (including Olivetti Spa) for digital infrastructures & IoT technologies, with hundreds of thousands customers among businesses and SMEs in particular
- ESRI, global leader in software applications for geographical information systems and digital-twin models of fields and agritech assets
- Al maviva for the development of digital solutions for the agrifood industry, based on blockchain, smart contracts and NFTs on a cloud-based safe architecture;
- Bonifiche Ferraresi and Coldiretti for digital agriculture, precision agriculture and field testing of agrifood innovations, involving thousands of Italian SMEs in the agricultural sector.
- Defendini Logistic Group, through its Cerea subsidiary, for digital engagement and food distribution, with many SME customers for logistic services.

Among the potential project and research partner, contacts have been initiated with:

- Smart Sensory Box, an innovative startup focusing on food testing through sensors will provide the knowledge domain for experiential testing and sensorial analysis, with many important references among many international leaders in the food & beverage sector.
- CRIF, an international partner for AI/ML/blockchain applications and risk management technologies, will provide the linkage with European financial institutions and monetary authorities.
- Intesa San Paolo, the largest bank in Italy, who plays the role of project partner for Fondazione Riccagioia through its AgriBusiness Financial Division.
- The involvement of local SMEs Consortia in the wine supply chain (such as Consorzio Vini Oltrepo Pavese and Consorzio Buttafuoco) and the network of local agrifood players associated in Coldiretti will ensure the inclusion of the relevant issues for small businesses.

Through the partnership between University of Turin and the team of “EIT Food” in Turin, the project will ensure full research coordination with the food-related research agenda at European level.

A number stakeholders among which local government entities, Enterprises, research centers, Universities and other highly qualified and internationally recognized public and private entity aligned with the goals and objectives of the Food Metaverse Platform will join the network since the project start having already signed letters of interest to support the project activities. The various players in the Project, the University of Turin, Research Centers and Universities (e.g., CNR, University of Pavia, Bari, Palermo, Sassari) specializing in research and development of digital solutions for food and nutrition, Riccagioia Foundation 5.0, a public-private partnership focused on agri-food research and innovation, xFarm, a Milan-based company specializing in agri-tech platforms for asset mapping with IoT technologies involving tens of thousands of SMEs and farmers in Italy and Europe, represent an infrastructure and relationship network for innovation intended for the premiumization of SME products.

The initial composition of this network will be increased further during the project by including additional members, with the aim of widening the impacts of the project results and strengthening the cooperation across the stakeholders. Starting with its partners and the stakeholders and entities that have already expressed interest in the platform, Food Metaverse will engage and activate further contacts (from the government, the industry and the civil society) and specific collaborations to promote and strength the collaboration between the research system, the production system and local institutions tackling areas of technological specialization and fostering and exploiting research and innovation results by facilitating technology transfer and accelerating the digital transformation of business production processes with a view to economic and environmental sustainability and social impact on the territory. Thus the platform will be built as a multistakeholder and transdisciplinary platform where, through co-design and co-creation, appropriate actions will be developed. To develop effective and relevant innovation actions, in a view of continuous improvement and potential application on a large scale, an active and constant involvement and participation of both the stakeholders and enterprises of the food sector in the co-design and co-creation of new knowledge will be guaranteed by the implementation of Food Metaverse Platform. In particular, the utilizer-driven (driven by enterprises for the development and testing of products and services) and provider-driven (driven mainly by universities) types will be essential methodologies applied, because the agrifood supply chain is typically very complex: starting from the farm, it involves various actors and technical figures such as agronomists, processors, brokers, transporters, chemists, climatologists, meteorologists etc.

The need for accurate, reliable and certified information is constantly growing, to improve and optimize data-driven business processes with specific reference about automation and production. Digital technologies support the innovation of food transformations both in terms of communication and in terms of assessing the quality, safety and healthiness of food.

Through the Food Metaverse Platform, the following topics will be exploited:

- origin, tracking and authenticity of production (also through the development of the blockchain);
- use of Artificial Intelligence and Machine Learning for data elaboration and extraction of information, useful for controlling production and food processing, but also for building models as support to the decisions of farmers and stakeholders;

- use of Big Data tools for the processing of long-term information, spread on many seasons, allowing the development of predictive models that will give important information for the preparation of the new seasons;
- development of easy tools, based on mobile devices, for accessing information and management, implementing user-friendly interfaces;
- mapping of consumption and its diffusion (also through NFC technology);
- food education through scientific dissemination through social channels;
- education to the benefits and the use of the new technologies for improving their acceptance.

The industry representatives that Food Metaverse Platform intends to involve includes:

- End users | demand of innovation: companies (Large Enterprises and SMEs) working on the application domains and traditional industries;
- End users | offer of innovation: technology companies (mainly SMEs and start-ups) with competences to further develop innovative solutions;
- Other companies not directly focused on the farm2fork thematic but interested in finding potential cross-sectoral solutions on in approaching new markets for the first time.

The engagement of the companies, especially SMEs, will be led by the Research and Innovation Manager who will also leverage on other associations, such as chamber of commerce, entrepreneurship organisations and National Technology Clusters, etc. to scout and disseminate the opportunities, to promote and engage companies related to Agrofood, Health, Digital, Sustainable Energy Transition, Materials Science, Bioeconomy. In order to support the industrial actors, Food Metaverse foresees the involvement of Large Companies since the beginning, and the support to SMEs and start-ups. In particular, Large Enterprises will be involved throughout the project for different purposes. Some have already endorsed the project when it was submitted while the project partners will continue to activate and involve more companies during the project activities.

The civil society and organizations focused on achieving wider social, environmental or community objectives that believe in digital innovation to reinforce quality of life will be also included. The civil society and these organizations will contribute on the collection and validation of issues related to innovation, economic and social sustainability, technical skills and scientific culture linked to the activities. Their engagement will be carried out through dissemination activities within events linked to the topics of interest and open to everyone, workshops to allow the interaction and sharing of opinions, and opening the laboratories and infrastructures and presenting the research and innovation results for a more tangible involvement and awareness on the opportunities that the territory makes available for everyone.

The scouting and engagement of new interested parties within the territory, but also at national level, will be a continuous activity throughout the project. A database of the entities already involved will be created and updated during the project. Further actions will be also proposed with the aim of expanding the database of interested targets, promoting the Food Metaverse Platform at national and international level.

The mapping of companies will be active throughout and above the project lifetime as a structured action aimed to seek out, collect information, systematically analyse, assess, and classify potential new participants as well as the entities already involved. The activities that will be carried out are: (i) initial contact and analysis of potential companies aligned to the Food Metaverse topics; (ii) preliminary grouping of entities according to different criteria (type, technology, sector, target market, etc.); (iii) analysis of the company in terms of business potential (criticalities, opportunities, relevant development elements), market positioning, internal competences, innovative solutions, innovation capacities and positioning within its value chain; (iv) identification of needs and

potential measures of intervention and compliance with the main development topics; and (v) analysis of potentials paths of development, and monitor of any emerging needs.

This action will scout and analyse European and international contacts, initiatives, projects and organizations. UniTo and the other potential partner have many contacts at European and international level (related to European projects, collaborations, MoUs, etc.) that will be the starting point of the international activities. For example, the participation of UniTo in the EIT Food is strategic since they are partnerships of excellence on issues of international relevance with a leading role in promoting innovation and entrepreneurship in Europe. The involvement in these partnerships allows, not only to access the funding that the EIT makes available through annual calls reserved for KIC partners, but also to encourage the creation and strengthening of partnerships of excellence and long-term between the participants in the KIC, as well as the integration of different existing knowledge and the pooling of skills and infrastructure.

A.9. Start date of the initiative

Details are contained within the final project proposal.

A.10. Multi-Site Infrastructure

Details are contained within the final project proposal.

Part B – Initiative features

B.1. Activities

The Food Metaverse Platform is constituted by a set of technological modules forming a highly innovative technological infrastructure enabling a fully-digital, end-to-end integration of all agri-food-tech value-added processes, in an original and distinctive “Farm to Fork” approach, in line with the strategy set forth by the European Commission.

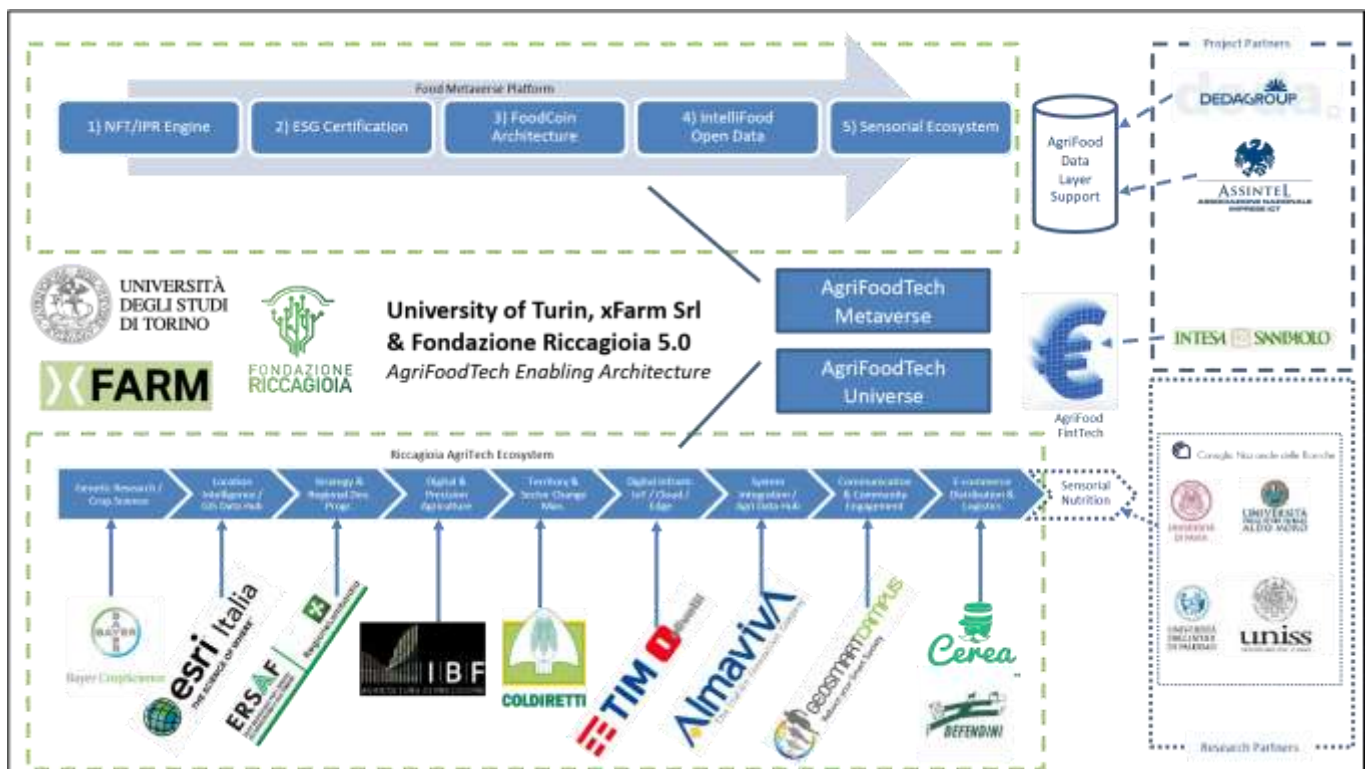
The Graph 3 below illustrates the two levels of value-added processes involved in the project: the lower level (AgriFoodTech Universe) is based on the physical value chain already covered by the current activities of the project partners:

- Genetic Research/ Crop Science (Bayer)
- Location Intelligence / GIS Data Hub (ESRI)
- Strategy & Regional Dev. Progr. (ERSAF- Regione Lombardia)
- Digital & Precision Agriculture (Bonifiche Ferraresi/IBF)
- Territory & Sector Change Man. (Coldiretti)
- Digital Infrastr. & IoT / Cloud / Edge (TIM/Olivetti)

- System Integration / Agri Data Hub (Almaviva)
- Communication & Community Engagement (GeoSmartCampus)
- E-commerce Distribution & Logistics (Cerea/Defendini Logistics)
- Sensorial Nutrition (Cardano Research Center at Pavia, Research Partners & Universities)

Other supporting activities are:

- AgriFood Fintech Services (in collaboration with Intesa San Paolo Agribusiness Division)
- AgriFood Data Layer (in collaboration with DedaGroup and Assintel)



Graph 3 – The “Farm to Fork” digital value chain enabled by Food Metaverse Platform

In the upper layer, above the physical value chain, the Food Metaverse Platform provides a digital value chain for capturing, protecting and delivering all the economic and social value of intangibles, through five technological modules:

1. NFT/IPR ENGINE – The engine is aimed at developing a full-service NFT/blockchain/digital twin architecture (creation, tokenization, trading, etc.) for all Agri/Food&Beverage players and stakeholders, physical and intangible assets, IP-based agrifood products, food transformation and preparation processes, including

2. traditional cuisine's plates and chef's innovative recipes, with the double aim of protecting and promoting local, territory-bound specialties and of providing a secure context for experimenting new research in food preparation and consumption, both at home and through the HoReCa/Away-From-Home channels.
3. ESG CERTIFICATION - ESG certification includes a detailed collection of ESG-related hard & soft data, through IoT, sensors, and other digital sources, followed by an assessment of ESG risks, using selected environmental, social and governance certification standards. Performance evaluation based on ESG criteria and certifications under environmental, social and governance categories, leading to the possible issuance of an ESG certificate by independent certification authorities.
4. FOODCOIN ARCHITECTURE - Developing the infrastructure for a digital currency/ cryptoasset dedicated to the agrifood supply chain, based on smart contracts, for the management of financial and commercial transactions, while incorporating all factors of ESG taxonomy for both risk management and consumer accountability. The Food Metaverse digital currency shall be designed as a transparent and legal stablecoin, fully convertible to official currencies, and managed by financial institution as a vertical case of forthcoming CBDCs (Central Bank Digital Currency).
5. SENSORIAL ECOSYSTEM - Providing an ecosystem for food & beverage innovation/ education/ promotion, at all levels of aggregation and components (single ingredients, F&B products, advanced packaging materials, recipes/plates, full menus, diets, etc.) through the engagement of virtual testers and communities of Foodies, integrating sensorial analysis and neurosciences/behavioural approaches with biological/medical perspectives, through a cloud-based, phygital hub coordinating a network of HoReCa partners offering distributed testing locations and facilities and providing feedback and engagement to the community members.
6. INTELLIFOOD OPEN DATA - Creating the rules and the infrastructures for an open market of privacypreserving, identity-based, interoperable data about food & beverage consumption to support AI/MLbased processes aimed at sustainable, healthy and conscious nutrition, to support both supply-sided circular economy and demand-sided mindful social and individual consumption, and to foster the development of an "on-demand", customized/personalized logic of the agrifood chain, possibly evolving towards a subscriptionbased model of sustainable, planned food distribution and preparation.

The technologies employed to implement the Innovation Infrastructure will be in full compliance with constraint 055 "Other types of ICT infrastructure (including large-scale IT resources/facilities, data centers, sensors and other wireless devices)" in Annex VII of Reg. (EU) 2021/241. In particular, both high-performance cloud & edge computing facilities will be utilized for the Module 1 (NFT engine), Module 2 (ESG Certification), Module 3 (FoodCoin architecture), and Module 5 (IntelliFood Open Data). In addition, specifically developed devices, sensors and actuators, enabled via both wired and wireless connectivity in a distributed, open-field environment, will be employed for Module 4 (Sensorial Ecosystem) as well as for Module 1 (NFT Engine).

The private partners that have expressed interest in the project are already using (and providing to final customers) such large-scale IT resources, data centers, IoT-enabled sensors and actuators, with many industry-specific devices connected with wired and wireless networks. The participating private companies will have the role of co-financiers and, on the basis of their distinctive skills, contributors to the development and dissemination of new ad-hoc infrastructure services

for industry or services, with the direct advantage of participating in the implementation of pilot lines, advanced services for open data, prototypes, test campaigns for solutions of strategic interest. The prevalent open use will be ensured according to the procedures defined in the infrastructure project. The participation of private capital in the capital of innovation infrastructures will offer a competitive advantage, facilitating and maximizing the effectiveness of any proprietary paid access in the pre-production and production phase.

The Food Metaverse Platform infrastructure targets strategic objectives, shared by all the partners involved:

- Support “premium” Agrifood for global consumers: to avoid commoditization and to protect the perceived value of specialties, the Food Metaverse Platform provides a context for protection of intangibles/intellectual property and valorization of Food&Beverage experiences in a distributed & hybrid context (real and virtual) for a potentially global network of affiliated HoReCa and retail nodes.
- Establish a standard data format for “holistic nutrition” profiling: the platform develops a taxonomy of empirical phenomena that will be able to improve the description of a holistic approach to human nutrition, through a combined approach of biology & behavioural/neuro-sciences.
- Attract international capital, both financial and human: scalability of economic drivers will trigger international attention and capital investments, as well as attracting talents.
- Develop new market potential and new business model for all private partners and for SMEs: the digitalization of all the relevant processes of the agrifood supply chain will foster the innovation of industrial and logistic processes at all stages of the value chain.

Why building a technological infrastructure supporting the “Metaverse”?

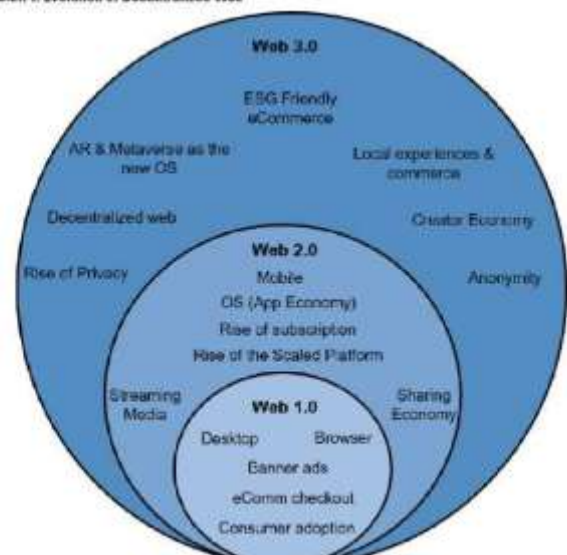
The word Metaverse was first coined in a dystopian 1992 novel. It is now defined in the Oxford English Dictionary as a “virtual-reality space in which users can interact with a computer-generated environment and other users”. A recent research by Goldman Sachs has positioned the Metaverse concept within the broader space of the Web 3.0, which represent the natural evolution of the current Web 2.0 context, as described in the Box 1 below:

METaverse – Framing the Transition to Web 3.0

The global Internet is in the middle to late innings of the innovation curve of Web 2.0 (the shift from desktop to mobile computing & from local to cloud storage) and the “leaders” of this wave of the Internet are now firmly established. The defining characteristics of a Web 2.0 “leader” are scale of users, utility-like nature of mobile/desktop applications/services & low to no distribution costs. As seen in the figure, we see dramatic shifts in the industry trends in Web 3.0 (decentralized, more local/niche/targeted, etc) that could impact current investor perceptions of platform moat/strength, industry input costs, possible headwinds to monetization driven by personalization and potential for shifting media and commerce trends as we transition to Web 3.0.

A few key principles for Web 3.0:

Exhibit 1: Evolution of Decentralized Web



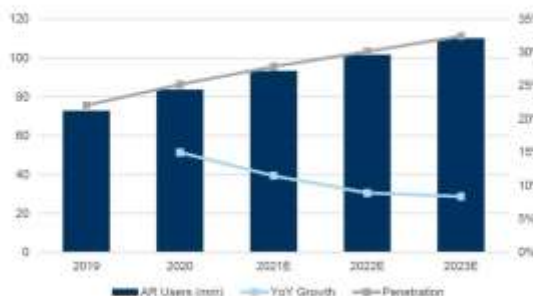
Source: Company data, Data compiled by Goldman Sachs Global Investment Research

- Likely more control by the user of their data (including data residing on device);
 - Likely a more micro focus - a mean reversion on scale (either in end market being tackled or in relationship between the platform and the user);
 - The rise of individual as creator & creator monetizing their content more directly with "fans";
 - Increasingly decentralized (with the possible breakdown of the mobile operating system/app store distribution model over the next 5-10 years);
 - Flexibility (if not innovation) on payment mechanisms aimed at a mix of themes, including decentralized privacy and anti-establishment.
- (Source: Goldman Sachs, December 2021)

Box 1 – The transition to Web 3.0 and the technological trend supporting the Metaverse concept

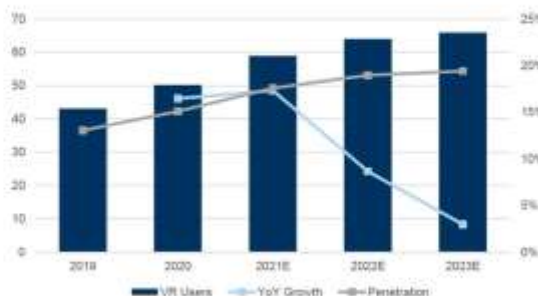
In order to better understand the timeline around the Metaverse opportunity, one can look at eMarketer data (see Graph 4 below) to assess what current penetration rates are and forward growth assumptions for both AR and VR. While AR represents a larger opportunity when compared to VR, penetration rates still remain low with AR users expected to be ~28% of the US population and VR users at ~18% in 2021. With the pandemic removing a lot of physical experiences, the AR and VR market saw strong growth in 2020. Going forward, technological advances (such as 5G, edge computing) coupled with more use cases (beyond gaming, social media, entertainment) are likely to drive consumer adoption.

Exhibit 3: US Augmented Reality Users
(mm, 2019-2023E)



Source: eMarketer, Data compiled by Goldman Sachs Global Investment Research

Exhibit 4: US Virtual Reality Users
(mm, 2019-2023E)



Source: eMarketer, Data compiled by Goldman Sachs Global Investment Research

Graph 4 – Worldwide users of AR/VR solutions for the digital Metaverse

The Table 1 below outlines the Total Addressable Market (TAM), existing and potential use cases of Web 3.0 / Metaverse Platforms for music, retail, education, and advertising as well as the existing market opportunity and digital penetration in an effort to better understand what the potential opportunity is by segment. Advertising and music have seen the highest levels of digital penetration while retail and education are still lagging behind. While the existing cases of Metaverse application in the entertainment industry are typically viewed simply through the lens of video games, all of the aforementioned examples across fashion, music, & education highlight the convergence of virtual and physical experiences in a Web 2.0 world, which gives us confidence in continued adoption of virtual experiences as well as the expansion into other categories (such as food & beverage, fitness, enterprise, and more). Currently, these use cases only represent a small minority of their respective total addressable market.

	Music	Retail	Education	Advertising
TAM	~\$68	~\$16,614	~\$5,500	~\$1,138
Digital Penetration	31%	17%	5%	37%
Use Cases	<ul style="list-style-type: none"> Streaming Music Virtual concerts Virtual Awards Meet & Greet Virtual Studios 	<ul style="list-style-type: none"> Virtual clothes Virtual stores Virtual fashion shows Ability to purchase physical items in virtual worlds 	<ul style="list-style-type: none"> Virtual labs Virtual field trips Virtual classrooms Virtual clubs 	<ul style="list-style-type: none"> Virtual billboards Branded worlds Branded stores Branded clothing Branded games

Source: Goldman Sachs Global Investment Research, eMarketer, Euromonitor, IFPI Global Music Report 2021, Music & Copyright, OMDIA, PWC

Table 1 – Use cases of the Metaverse and Total Addressable Market, by segment

In the Table 2 below, Goldman Sachs provides an illustrative scenario analysis around what percentage of the global digital market will shift towards the virtual world and also apply a range of how the Metaverse may expand the total addressable market. According to the United Nations, the global digital economy represented 15.5% of total GDP in 2018 – Goldman Sachs forecasts the digital economy's share growing ~125bps to 16.8% by 2021, representing ~\$15tn. In the most bearish case with ~15% of the digital economy shifting towards the virtual world and ~2.5% market expansion from current estimated levels, GS arrives at a ~\$2.6tn total market opportunity and in the most bullish scenario of ~33% of the digital economy shifting to the Metaverse and ~25% market expansion, forecasts target a ~\$12.5tn opportunity. While the range is quite broad, analysts acknowledge that we are still 20 years into web 2.0 and expect the timing of web 3.0 will be similar, if not longer.

		% of Digital Economy Shifting to Metaverse									
		15.0%	17.0%	19.0%	21.0%	23.0%	25.0%	27.0%	29.0%	31.0%	33.0%
% of TAM Expansion	10.0%	\$ 3.75	\$ 4.05	\$ 4.35	\$ 4.66	\$ 4.96	\$ 5.28	\$ 5.56	\$ 5.86	\$ 6.16	\$ 6.46
	15.0%	\$ 4.51	\$ 4.81	\$ 5.11	\$ 5.41	\$ 5.71	\$ 6.01	\$ 6.31	\$ 6.61	\$ 6.91	\$ 7.21
	20.0%	\$ 5.26	\$ 5.56	\$ 5.86	\$ 6.16	\$ 6.46	\$ 6.76	\$ 7.06	\$ 7.36	\$ 7.66	\$ 7.96
	25.0%	\$ 6.01	\$ 6.31	\$ 6.61	\$ 6.91	\$ 7.21	\$ 7.51	\$ 7.81	\$ 8.11	\$ 8.41	\$ 8.71
	30.0%	\$ 6.76	\$ 7.06	\$ 7.36	\$ 7.66	\$ 7.96	\$ 8.26	\$ 8.56	\$ 8.86	\$ 9.16	\$ 9.46
	35.0%	\$ 7.51	\$ 7.81	\$ 8.11	\$ 8.41	\$ 8.71	\$ 9.01	\$ 9.31	\$ 9.61	\$ 9.91	\$ 10.21
	40.0%	\$ 8.26	\$ 8.56	\$ 8.86	\$ 9.16	\$ 9.46	\$ 9.76	\$ 10.06	\$ 10.36	\$ 10.66	\$ 10.96
	45.0%	\$ 9.01	\$ 9.31	\$ 9.61	\$ 9.91	\$ 10.21	\$ 10.51	\$ 10.81	\$ 11.11	\$ 11.41	\$ 11.71
	50.0%	\$ 9.76	\$ 10.06	\$ 10.36	\$ 10.66	\$ 10.96	\$ 11.26	\$ 11.56	\$ 11.86	\$ 12.16	\$ 12.46

Source: Goldman Sachs Global Investment Research, World Bank, United Nations

Table 2 – Potential Metaverse Market Opportunity (in trillion US\$)

Why developing a specific Metaverse Platform dedicated to Food & Beverage?

Food is a universal language transcending all barriers - age, gender & geography. Everyone from the age of 2 to 102, has an opinion on food, and they're not afraid to share it. Everyone wants to know better about food and wine specialties, and to learn news and stories about recipes and new culinary experiences.

The Global Food industry is proof to that. With an estimated market size of more than 6 trillion US\$ in 2021, Food has grown from an item of consumption to an active conversation. We now have Food trends based on the consumer's

changing mindset and lifestyle. We have Food workshops not just for cooking recipes, but for understanding food palates & finding other foodies. We have Food Styling & photography as people begin to eat with their eyes first. Over the past decade, Food has also grown as one of the largest content drivers on Television/OTT and social media networks. The rousing success of cooking competitions like Masterchef & Top Chef, specialised Food channels and Food influencers have spurred extremely loyal fan followings.

COVID-19 has further spurred interest in Food as a global conversation and activity. Locked down in the pandemic, everyone ended up in their kitchens - whether cooking basic meals for survival, or recreating culinary gems they miss from restaurants. As millions scoured the internet for recipes and hacks, food posts emerged as the largest category on social media. The Food Metaverse Platform brings these passions and conversations to Web 3.0. This new "Foodverse" constructs the first road for Foodies to interact with the blockchain, engage with their favorite foods, try immersive experiences both in virtual and physical environments, and build a strong global community around Food.

While people "can't eat digitally", the channels of engagement that are expected to be opened up by the metaverse – and already created by the growth of the direct-to-consumer business model – means food companies need to adapt and resolve how they can create consistency of brand experience between the digital and physical. By way of an example, the US supermarket Kroger in 2020 launched Chef Bot, an AI-powered Twitter recipe tool that helps users pair the groceries in their fridge and reduce food waste by providing mealtime inspiration and personalized recommendations. Ingredients companies too are using AI and feedback loops to develop new flavourings. Food brands are also scraping social media to identify emerging flavours to guide their product development. The best-case end result here would be the so-called Baader-Meinhof phenomenon, where food trends quickly accelerate, seemingly out of nowhere -- think salted caramel, pulled pork or brioche buns -- and enter mainstream consciousness.

Technological investments require both money and knowledge, however, which could prove potential roadblocks for adoption for companies. Data is also key. Without owning that brands won't truly understand their consumers. That makes things like the personalization of products and engagement difficult.

EY's Future Consumer Index 2021 identified a renewed focus on health and wellness as another of current megatrends. EY is seeing a lot of companies introducing 'veg by stealth' to make their products more plant-based without undermining the fact that they do have meat content. This move will appeal to "flexitarians" looking to cut down on their meat consumption and may help reduce the negative health impact of the product. Perceptions of health have also shifted much more to mental health. In the beverage industry ingredients like adaptogens, nootropics and Cannabidiol (CBD) which were buzzwords a few years ago are now moving into the mainstream, albeit with many warnings by health authorities.

The rising prominence of ESG and sustainability is another emerging trend. Some 43% of consumers, according to EY's Future Consumer Index 2021, will not purchase from an organization if it does something socially or environmentally inappropriate. Meanwhile, 38% of consumer feel that 'responsible production and consumption of goods and services' should be the top priority for businesses.

The biggest challenge for food companies from a sustainability perspective as we approach COP26's 2030 targets is around how they can secure and develop transparency in their supply chains. Companies will look to make that part of their value proposition as a differentiating factor so that people can see and understand the products that they're consuming.

A big challenge here for food companies of course is communicating these efforts – which may involve the installation of innovative cloud-based platforms or blockchain technology throughout complex supply chains -- in a way that's easily and quickly understandable for their customers.

The sustainability trend may further find itself at odds with an environment of rising inflation. The FAO Food Price Index has just for example hit a 10-year high in 2021. But consumers seemingly don't want to pay for sustainability. In the EY survey, only around 17% of consumers were willing to pay a premium for generic sustainability, although many said they were willing to pay more for sustainability in the products they consume.

Food companies, regardless, need to adapt to the shift towards consuming at home. EY's Future Consumer Index revealed that 43% of consumers say they plan to cook more for themselves and their family in the future. Some 45% of consumers expect to change how they eat out in the long term. Scratch cooking is not a realistic and convenient option for most shoppers though. Food companies can therefore expect to toy with the challenge of making products containing the optimal level of processing. Consumers are not seeking fully processed foods to bung in a microwave. Nor do they want to spend valuable time grating their own turmeric. They will instead increasingly seek hybrid options that can offer convenience and speed as well as the pleasure of a home-cooked meal.

The vision behind the Food Metaverse Platform is to provide a unique experience for the community of Foodies, while creating a new platform for customer engagement and education on sustainable and conscious food preparation and consumption, as well as a new marketing channel, for the global AgriFood Industry.

The Food Metaverse Platform shall acknowledge the growing movement of Dietary choices as people look to eat healthy and consciously. Our menu will feature the most popular dishes from various cultures and countries, foods loved by locals, traditional recipes, & Chef specials. The main business goals are:

- Attract and educate global F&B consumers with the simplicity of Food : Creating the next wave of Blockchain adoption within an attractive and engaging digital & physical experience, that appeals to men & women, digital natives & oldtimers.
- Create Global Reach for F&B Industry : Bringing Celebrity Chefs, Restaurants, popular Cooking Shows & Food Brands to Web 3.0 audiences for the first time through NFTs - giving them a global platform to engage & monetize.
- Food Partner for Web 3.0 Projects : Curating a Food experience for Web 3.0 projects in the form of special menus for digital channels, and creative F&B catering for Web 3.0 events & parties.
- Bring NFTs to Life : Application of NFTs in real life, allowing users to swap Food Metaverse NFTs for meals & deals in restaurants worldwide.
- Circular Economy & Action Against Hunger : Work towards the cause of eliminating world hunger and evolving towards a Circular Economy for the agrifood sector by partnering with the F&B industry & Web 3.0 projects to raise funds & awareness.

Since the Technological Infrastructure for Innovation project is focused on high TRLs (6-7-8-9), no specific investment is planned on basic scientific research activities, but rather on applied and technology transfer-oriented research.

The main areas of scientific scope, for which the involvement of research teams from different universities across the country is planned, can be summarized in the following elements of integrated innovation:

1. genetic mapping and physical/chemical description of agricultural products (CNR+ Riccagioia Foundation and industrial partners)
2. agritech methods of digital agriculture and precision agriculture for field and process data collection (CNR + Ersaf/Riccagioia)
3. methods for determining the carbon footprint of agricultural production (UniTO) and ESG measurement and certification methods (UniBA)
4. methods for defining and managing cryptoassets (NFT, cryptomonets for supply chain financing) (UniPA, Riccagioia Foundation and project partners)
5. scientific models and tools for sensory analysis and nutritional/experiential profiling of consumers (UniSS + UniPV)

About point 1, we plan to apply plant genome analysis and carry out metabolomic and transcriptomic studies. For example, with regard to the wine supply chain, resequencing the genome of grape varieties, studying grapes at harvest, analyzing all chemical compounds present, thus defining the compositional "identity card," with instrumentation capable of searching for even elements present in minute quantities. With transcriptomic studies, moreover, it is planned to analyze genetic regulation and genotype-environment interaction, highlighting phenotypic plasticity, that is, how a single grape variety expresses itself when grown in different soil and climate environments. Through such a detailed study of the chemical composition of grapes at harvest, the particular characteristics of each grape variety and, consequently, of each wine are defined. This can form the basis for selecting grape varieties that resist disease better and thus require less chemical intervention, reducing environmental impact, including through the future application of CRISPR-Cas9 genome editing technologies, known as "Assisted Evolution Technologies," which can effectively improve crop varieties, making them resistant to pests or drought and resilient to climate change. In this, TEAs differ markedly from transgenic GMOs, as reaffirmed by the scientific community and the European Union. In addition, compared to GMOs and traditional genetic improvement, TEAs allow for lower production costs, making them economically viable. Finally, they offer much more precise results, making only the desired changes to the crop plants and avoiding problematic side effects. According to the European Union, Assisted Evolution Technologies can contribute to the creation of a more sustainable food system that can achieve the goals of the European Green Deal and the Farm to Fork strategy.

About point 2, it is planned to apply scientific methods related to precision agriculture ("precision agriculture," or PA), an approach that uses information technology (IT) to ensure that crops and soil receive exactly what they need for optimal health and productivity. Precision agriculture relies on specialized equipment, software and IT services. The scientific approach provided includes access to real-time data on crop, soil and ambient air conditions, along with other relevant information such as hyperlocal weather forecasts, labor costs and equipment availability. Predictive analytics software uses the data to provide guidance on crop rotation, optimal planting times, harvest times, and soil management.

Sensors in the fields measure moisture content and temperature of the soil and surrounding air. Satellites and robotic drones provide real-time images of individual plants. Information from these images can be processed and integrated with sensor and other data to provide insights for immediate and future decisions, such as precisely which fields to irrigate and when or where to plant a particular crop.

Agricultural control centers integrate sensor data and imaging input with other data, providing farmers with the ability to identify fields that require treatment and determine the optimal amount of water, fertilizer and pesticides to apply. This helps avoid wasting resources and prevent runoff, ensuring that the soil has the right amount of additives for optimal health while reducing costs and controlling environmental impact.

About point 3, the growing interest in greenhouse gas mitigation in agriculture stimulates the assessment of the carbon footprint (CF) of different agricultural productions to make the environmental impact of individual products transparent and "accountable" to the end consumer. The scientific approach to CF calculation in agriculture identifies the contributions of agricultural production to climate change and the components of emission sources. A methodology to calculate the CF of agricultural production (crop and livestock) according to the official definition and taxonomies related to CF and according to the life cycle assessment method will be studied and developed. In addition, in order to provide full transparency to the end consumer and all stakeholders in the agrifood supply chain, methodological approaches for measuring ESG (Environment, Social, Governance) factors of relevant agricultural and industrial processes will be defined.

About point 4, the use of a scientific methodology for the definition, generation and management of cryptoassets associated with food products makes it possible to protect intellectual property, unassailably protect the designation of origin, and support the process of "premiumization" of agrifood production. The project involves the definition of a specific methodology for the creation and management of NFTs associated with agri-food products, for example, a bottle of wine. NFT means non-fungible token. "Non-fungible" implies that something cannot be manipulated, fractionated or exchanged for something of identical value. NFTs are usually defined within blockchain specifications, which are distributed, incorruptible digital records of transactions. NFTs come with certificates of ownership and authenticity that, because they exist on the blockchain, cannot be hacked or cloned.

The NFT platform will require the establishment of a scientific methodology to associate each valuable food product with a unique NFT: in the case of wine, it represents a real bottle for consumption, with all its genetic, physicochemical and ESG certification attributes. Given their digital nature, NFTs allow for ease and efficiency in trading transparently. A consumer can then purchase fine wine without any uncertainty or risk regarding individual bottle selection, authentication, provenance control, or even storage and logistics. All while reducing the associated trading fees. In addition to cryptoassets related to physical agrifood products, there are also plans to define a scientific methodology for the eventual issuance of closed-loop cryptoassets, in the form of a "digital supply chain currency," to be used to innovate risk management processes and thus facilitate access to credit for SMEs that will use the Food Metaverse Platform, improving transparency to lending institutions and financial and process supervisors.

About point 5, different technological solutions and scientific methodologies for mapping sensory effects, as well as nutritional effects, of agri-food products will be evaluated and integrated. For example, again with reference to the wine supply chain, high-resolution NMR (nuclear magnetic resonance) spectroscopy combined with multivariate statistical chemometrics can provide an effective scientific basis for testing the authenticity and quality of wine. Through technologies equipped with specific sensors, several hundred compounds can be detected in a wine sample simultaneously, which can be used to characterize the wine through a comprehensive database of reference wines. The database of compounds and their sensory effects will have to be regularly

updated with the variants as and when they are detected for wine and geographic verification, providing a reliable and up-to-date reference library, to be later combined with the behavioral and sensory profile of the final consumer, also to be obtained through the application of specific biological and neuronal analysis technologies. Also with reference to wine, it will be possible to analyze its composition and verify the consistency of its origin: country, region, appellation, as well as the varietal consistency of monovarietal wines.

B.2. Governance model

B.2.1. Infrastructure and operational management

The governance model for infrastructure and operational management will be based on the following roles:

- Leadership accountabilities and responsibilities
- Alignment and stakeholder engagement
- Risk and issue management
- Assurance: monitoring and controlling processes

The components of the governance model are:

- Proponents & Project Leaders
- Steering committee
- Project manager
- Infrastructure's Operational Management

Proponents & Project Leaders

The proponents, as Project Leaders, provide strategic direction and oversight to ensure cohesion between all project stakeholders. Their role is to:

- Champion the project at the highest institutional and organizational levels
- Approve the business case and project charter
- Owns the outcome throughout the lifespan of the program
- Prioritizes the project among the involved organizations

Steering committee

A steering committee, composed by delegates of the Proponents & Project Leaders, provides operational direction. This supervisory board is accountable for managing and addressing business issues, monitoring risk, quality, and project timelines. The committee will include key individuals from the Proponents and implementation partner and will meet on a routine basis for updates from the project managers. This committee:

- Determines how project goals are measured
- Approves the project management plans
- Ensures project aligns with charter
- Determines escalation point for any project deviations
- Applies best practices and captures lessons learned

- Manages interdependencies (projects, resources, etc.)

Project manager

The Steering Committee will appoint one or more project manager(s), providing tactical direction and executing the project in accordance with the objectives set by the project proponents & leaders and the steering committee, through the project management office. This role:

- Executes in accordance with the established governance plan
- Monitors and reports on the project milestones
- Executes the communication Plan
- Manages project stakeholders based on established scope

Infrastructure's Operational Management

The Steering Committee will identify an Operational Management Team with the task of managing the day-to-day operations of the Infrastructure, being responsible for its income statement and cost structure, and with the right to negotiate with key technology partner and suppliers and to define the appropriate organizational processes required for regular operations.

Risk & Assurance

The Proponents will select, among independent roles, a separate Risk & Assurance Team, with the goal of addressing project risks and to control and assure the outcomes, monitoring the processes against the institutional rules and addressing in advance possible critical issues.

Ownership and other rights

The resulting infrastructure's ownership rights will be allocated according to the specifications set forth in the call, while being given in concession and/or license of use – through appropriate agreements – to the network of public and private partners.

B.2.2. PPP operations

The Proponents, according to Art. 4, comma 1, of the “Avviso per (...) Infrastrutture Tecnologiche di Innovazione”, will negotiate an agreement with Fondazione Riccagioia 5.0, xFarm Srl and other private companies and constitute a PPP with a wider base of partners.

The different roles of the possible partners involved are envisaged as follows:

Partner	Role	Contributions to the PPP and to the project
Regione Lombardia - ERSAF	Public Administration	Provides physical infrastructures (building, plants, machinery, equipment, fields, license rights, etc.), allocates other regional assets and specific research/implementation funds

University of Turin with other universities (Pavia, Bari, Palermo, Sassari)	Public Institutions of Research	University of Turin, as the project main coordinator, provides the research infrastructures and organizational capabilities for the project design, development, test and implementation. University of Pavia will provide access to the Cardano Research center, where a module of the Infrastructure will be located, as well as in the other partner universities
TIM	Private Corporation	TIM owns the largest cloud infrastructure in Italy, though its NOOVLE subsidiary. TIM will provide a specific module of the cloud infrastructure, as well as sw development capabilities and system integration
Almaviva	Private Corporation	Software development, system integration
Coldiretti	Industry Consortium	Land, know-how, products for testing, market access
Bonifiche Ferraresi	Private Corporation	Land, equipments and agritech infrastructures, market access
Cerea – Defendini Group	Private Corporations	Logistics services, market access
Consorzio Oltrepo	Industry Consortium	Products and field test
xFarm	Private Corporation	Technological platform for agritech asset mapping and data-driven ESG certification
CNR	Public Research Institution	Taxonomy definition, technology and sw development. Operation of modules of the final infrastructure
ESRI	Private Corporation	Technology and sw development for asset mapping
Bayer Crop Science	Private Corporation	Genetic Research and Mapping
GeoSmartCampus	Private Corporation	Knowledge & Technology Transfer, managerial and scientific education and training for farmers, agrifood operators, and HoReCa players, communication and marketing support for the agritech platform.

As stated in point B.2.2. of the proposal, the project plans to "establish a PPP" with a broad partner base, as indicated in Art. 4, paragraph 1 of the "Notice for (...) Technological Infrastructure for Innovation."

It is therefore the intention of the proponent to pursue the establishment of a form of PPP according to the contractual model under art. 180 et seq. Legislative Decree No. 50/2016.

Then the Technological Infrastructure for Innovation Food Metaverse Platform will be implemented by an experienced and motivated infrastructure manager able to implement the business development and fundraising strategy so to assure the long-term sustainability of the innovation infrastructure.

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It is therefore the intention of the proponent to pursue the establishment of a form of PPP according to the contractual model under art. 180 et seq. Legislative Decree No. 50/2016. In particular, reference is made to the competitive dialogue under Articles 64 and 181 paragraph 1 of the Code and the so-called private initiative procedure under Article 183 paragraph 15 of the same Code.

B.3 Budget plan

Details are contained within the final project proposal.

Consistency of costs

The Food Metaverse Platform project will be able to take advantage of the technological and physical infrastructure of the Riccagioia System, owned by ERSAF/Regione Lombardia, which over the years has attracted various public infrastructure investments aimed at upgrading in functional terms, which is still continuing.

Within the Riccagioia System subsists the Riccagioietta facility, which is in need of a redevelopment plan. Seizing the planning opportunity for functional regeneration means ensuring an ethical and responsible vision of the public heritage and enhancing the archaeo-agricultural soul that distinguishes the area.

Restoration activities can start immediately, given the overall situation of Riccagioia.

It is important to remember that the Riccagioia System will obtain in the immediate future the role of an attractive pole of projects promoted by Integrated Territorial Investments (I.T.I.), a strategic key to success in fostering the growth of extra-metropolitan areas, in preparing European funding programs (including PNRR) and in attracting resources in partnership.

The intervention is configured as a pure regeneration and redevelopment of an architectural asset and as such reflects the parameters of the reference regional norm, namely Regional Law No. 18 of November 26, 2019, whose primary objective is to "facilitate and make more convenient urban and territorial regeneration interventions and the rehabilitation of the existing built heritage, completing the regional strategy for the reduction of land consumption."

The regenerative project is based on three Milestones:

1. The archaeo-historical recovery of the basic structure, materials and architectural lines of Riccagioia;
2. The use of the latest construction and plant technologies in energy efficient management and digital accessibility;

3. The respect of landscape values and the adoption of infrastructure.

All of which will allow the Riccagioietta facility to be used to create a hub for information, sensory experiences and access and support for food and wine tourism services provided by the area's agricultural and hospitality facilities.

In particular, the following are envisaged: a customer experience area for the promotion of tourism and food and wine of Oltrepò Pavese equipped with cutting-edge digital solutions in terms of immersive and metavisual reality, an area dedicated to the living lab to host mid-term initiatives also related to Riccagioia's training activities, the same area, being modular, will host both co-working activities and especially the space (business incubator) intended for agriculture 5.0 and agritourism.

B.4 Project time schedule

B.4.1. Intermediate objectives

Details are contained within the final project proposal.

B.4.2. Timeframe envisaged for the implementation of the procedure aimed at setting up a PPP

The Food Metaverse Platform project can start immediately after making the selection of the existing PPP in which to have the proposing entity participate, and after the selection of the infrastructure manager, following the appropriate public procurement rules.

This means that the concrete implementation of the activities presented in the proposal could start at least six months later the signature of the grant agreement between the central administration responsible for the PNRR intervention and the University of Turin.

Due to this administrative constraint can be necessary to extend the duration of the project to 36 months, starting from September the 1st, 2022.

The main partner of University of Turin, Fondazione Riccagioia 5.0, is already officially established as a permanent non-profit PPP since August 2021, and includes, along with Regione Lombardia /ERSAF, some of the leading national and international private corporations and technology players in the field. In order to implement a broader base of partner, within 9 months from the start date of the project, Fondazione Riccagioia will open its equity structure to include other private corporation to be involved in the project the proposing universities and research institutions, as for the management and long-term operations of the project. Alternatively, a separate PPP agreement will be defined and signed between University of Turin and other public and private partners, including Fondazione Riccagioia, within 2 months from the inception of the project.

B.5 Promotion of knowledge transfer and business creation activities

The Food Metaverse Platform represents a Technological Infrastructure of Innovation, designed and built to offer advanced technological tools, solutions and services aimed at the academic and business world, in order to increase their competitiveness. The platform, while organized across distributed infrastructures, operates with statutory uniqueness and scientific and technical management, guaranteeing a single interface with users, with complementary characteristics, distributed throughout the Italian territory.

With a specific focus on the Oltrepo territory, where Fondazione Riccagioia is located, agreements for knowledge transfer, education of local operators and business creation activities have already been arranged with Intesa San Paolo Agribusiness Division, through “Colline e Oltre” Spa, an organizational vehicle constituted by the bank itself and by a local banking foundation, with the goal of attracting international investors in the local agrifood sector, offering education, training and technology transfer to farmers, agrifood operators, hospitality and HoReCa players of the territory, through the technological resources provided by the partners of Fondazione Riccagioia. Thanks to the partnership with Coldiretti, the largest association of small and medium farmers in Italy, a calendar of knowledge & technology transfer initiatives will be defined, in order to disseminate the scientific results achieved by the project and to replicate and scale-up the best practices identified, while fostering the attractiveness for new ventures and investments by private equity firms. The initiatives for knowledge transfer will also be oriented to school and institutions of education, in order to provide the necessary set of competences, skills and human capital to support the innovation process. Initiatives of promotion towards students, local and national institutions, local companies in the agricultural sector have already been organized by Fondazione Riccagioia in collaboration with one of the oldest education institution for agricultural sciences in Italy, the “Istituto Tecnico Agrario Carlo Gallini”, operating in Voghera (Pavia) since 1894.

The promotion of knowledge transfer and business creation is consistent with the priorities established in the PNR 2021-2027 or in the Smart Specialization Strategies at national or regional level; they support as a priority the development of the phases of closest proximity to the market, characterized by levels of technological maturity identifiable with medium-high TRL values.

Description of expected user base

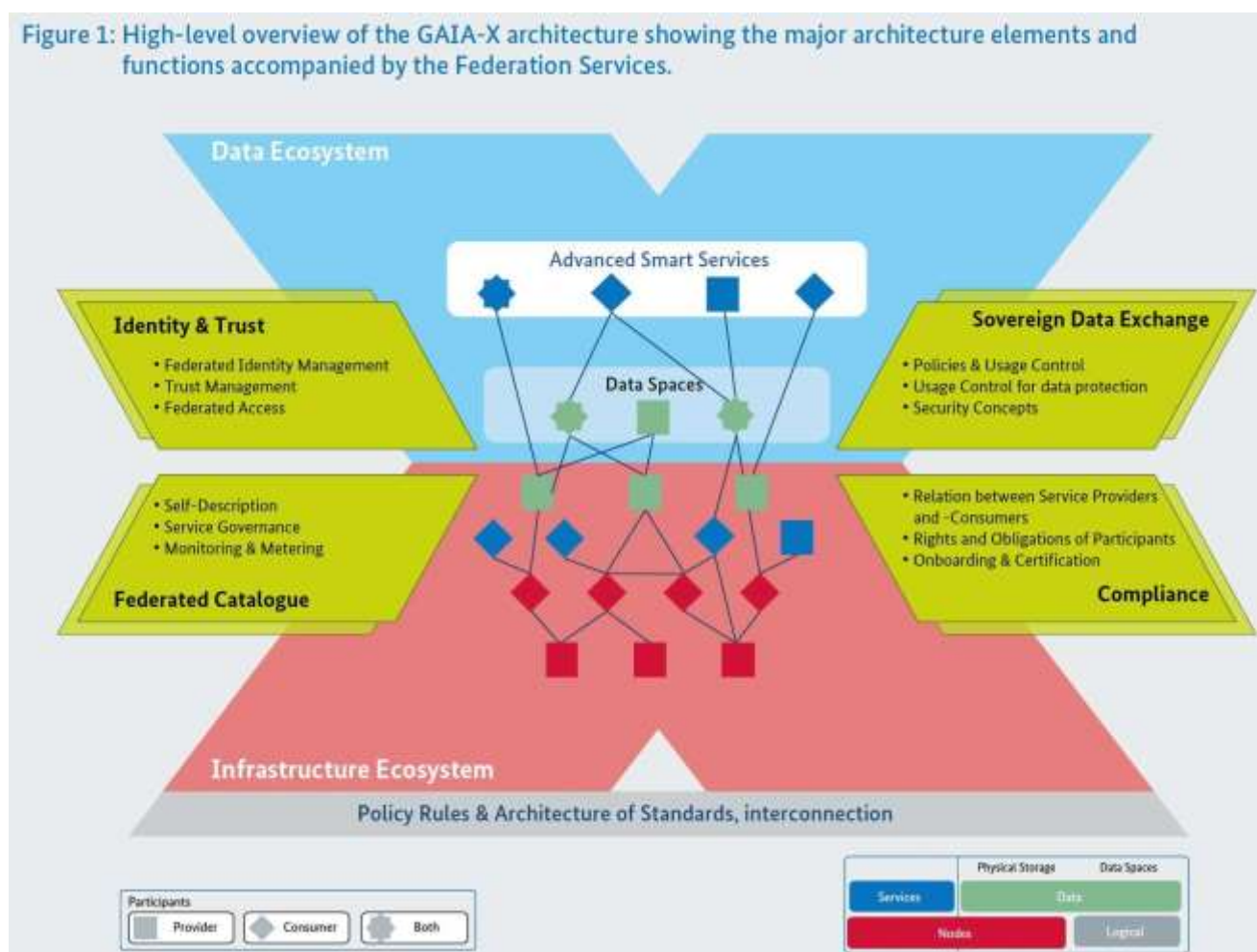
The expected user base will be constituted by the following customer segments:

- Upstream players (farmers, food processors, provider of technology, biologic material and other raw material) It is expected to represent approximately 30-40% of the B2B user base, while contributing more than proportionally (60-70%) to the revenues streams, due to the purchasing of transaction based services (NFT issuing, ESG certifications, etc.)
- Downstream players (packagers, distributors, logistic operators, HoReCa players, etc.). They are expected to represent the majority of the B2B users, given the greater dispersion especially at the HoReCa level. They will represent 60-70% of the paying professional users, but only 30-40% of revenues.
- Research Institutions (universities, research centers, scientific/non profit organizations). These players will add value in terms of innovation and continuous improvement, but they will not be charged, enjoying access to the open side of the platform, with normalized/anonymized data, within an open data /open innovation logic.
- Consumers & Communities (food preparation, food consumption, food discussion and sharing, etc.). Consumers will enjoy free access to the platform, and will be able to purchase digital assets (such as NFTs) from the providers operating on the platform. The volume of traffic, based on engagement and loyalty, will be critical to sustain the revenues deriving from Marketing and Advertising commissions.

Access methods for users

All user shall benefit from the same access logic, via digital devices such as desktop and mobiles, with user-friendly interfaces and full interoperability of data. The architecture of the platform will be shaped around the pillars defined by the GAIA-X European consortium, built around a federated structure of distributed resources, founded on “Data Spaces” and shared services of identity, security, compliance, applying the principles of data sovereignty.

The Graph 5 below illustrates the architecture of GAIA-X, which will be the blueprint for the technological design of the Food Metaverse Platform.



Graph 5 – The GAIA-X architecture for federated, distributed digital services within data sovereignty

Share of access granted to open research vs private access

The Open Data/Open Innovation approach adopted by the Food Metaverse Platform Project will provide full access to normalized and anonymized data for research purposes. A part from data that will be explicitly excluded from access and/or sharing by the data owner itself, all the sections of the Metaverse Platform will be accessible for research

purposes. Research institutions are not expected to pay a license for accessing, while still receiving controlled permissions for access in order to guarantee the necessary level of cybersecurity.

With the contribution of partners, the infrastructure aims at disseminating the scientific results achieved by research and attracting initiatives and investments from private equity firms for businesses.

Initiatives are planned to provide skills and human capital to support the innovation process with the objective of:

- **to improve knowledge of the main agri-food chains from which typical products originate**
- **to apply analytical technologies to the detection and measurement of organic substances of particular nutritional, nutraceutical, and safety-relevant interest (toxic, allergenic substances, etc.)**
- **to ensure certified professionalism of operators and stakeholders;**
- **to enhance Quality guarantees (PDO, PGI, DOCG, DOC, IGT marks) with the possibility of analytically determining particularly significant parameters;**
- **to act with information and dissemination measures for the safety of operators on food safety, hygiene and sanitary standards for the production, storage, processing, distribution, sale and marketing of agricultural products.**

To this end, the Food Metaverse Platform project intends to leverage the initiatives of the Riccagioia Foundation, which has initiated the establishment of an innovation training center to bridge the existing digital skills gap in the area of AgriTech- FoodTech 5.0.

A training team among members is being established to create the "Riccagioia Academy" platform based on a digital social learning infrastructure that supports service, communication, interaction and user integration processes in a participatory logic.

In addition to the Academy and through the Founding Partner of the Geosmartcampus Foundation (Business Accelerator Company), projects will be activated to identify innovative projects from the market and engage start-ups interested in complementing digital platform services and supporting new engagement and service initiatives of various platform stakeholders. These new actors will be accompanied and supported in the development of their project and supported in the integration of the Go to Market process to the target market.

Part C – Expected impact

C.1. Expected outcomes of the intervention

The expected outcomes of the project can be summarized as follows:

a) Employment creation

The project will create the need for new professional roles across the entire agri-food-tech value chain. A preliminary list of the new competence profiles that will be fostered among existing and new organization will be the following:

- Data Scientists

- ESG experts
- IoT specialists
- AI/ML Programmers
- Innovation Project Managers
- ICT Specialists
- Programmers for sensors/actuators
- Digital Marketing Specialists
- Analytics & Business Intelligence Experts
- Genetic/Biotech Researchers
- Engineers of Wireless Devices
- Cloud & Edge Infrastructures Engineers
- Drone Engineers
- GIS Specialists
- Blockchain & Smart Contracts Experts
- Digital Currency Experts
- IPR Legal Specialists

The project is expected to create the need of at least 800-1.000 new specialized jobs within 2 years by the end of the project's schedule, on top of the development of new positions among the traditional professional skills and competences in existing agriculture, industry, distribution, and HoReCa/hospitality jobs. The new jobs will be created mainly around the locations of the different modules of the technology infrastructure, with a higher concentration in Turin, Milan, Oltrepo Region, Bari, Palermo, Sassari.

b) Improved productivity and growth potential of existing firms

The project targets the involvement of many existing and new players of the agrifood industry, which will be offered the access and the usage of the Metaverse Platform for improving, qualifying and promoting their products and services, thus increasing their productivity, as well as their revenues. Within 5 years, the project aims at involving some hundreds firms and operators (200-500) in the upstream part of the value chain (agriculture and food & beverage processing) and to bring onboard of the platform at least 600-800 players in the downstream part of the value chain (distributors, logistic operators, HoReCa and hospitality players, marketeers and communication services, sales and service networks, etc.). The benefits in terms of productivity gains and/or premiumization of food & beverage products can be estimated around 10% across a 5 year period.

Creation of start-ups and research spin-offs

With the existing support of financial institutions, accelerators and incubators, and available public funding, the development of business creation activities will target the birth of several start-ups and/or spin-offs of existing companies, not only in the main territories of Lombardy and Piedmont but also in the Mezzogiorno regions. The project aims at triggering the foundation of at least 10 new start-ups and/or research spin-offs by the end of the project schedule. This results will be achieved thanks to the attraction of national and international investments in the context

of Metaverse Platform which can be estimated in the tens of millions euro (20-40 ml) in the financing of new innovation projects, startups and/or spin-offs, across a period of 5 years

Knowledge and technology transfer

Given the existing customer base of the private partners involved in the project, the knowledge transfer activities, both with physical meetings and via digital channels for education and training, will reach many thousands (2.000-5.000) of SMEs, farmers, professional operators across all the agri-food-tech value chain. Also in terms of formal education and scientific diffusion, it is expected to reach many hundreds of students (500-800) with contributions proposed to secondary and tertiary schools, and with post graduate / executive courses.

Synergies with other productive and research domains

The project is expected to deliver significant synergies with other relevant production sectors and research domains:

Fashion, Furniture, Leisure & Lifestyle

The Food Metaverse Platform can be extended to similar & adjacent markets, such as fashion, furniture and design, lifestyle and leisure. Both branded products, such as garment and personal accessories, and branded experiences (such as hospitality and wellness) can benefit from the same architecture of technology and value-added processes, sharing customer bases around similar needs.

Entertainment & Gaming

Virtual Reality and Augmented Reality, within graphic and real-time experiences of gaming and entertainment represent the mainstream market for the Metaverse, according to the vast majority of financial analysts. Combining the preparation and the consumption of food with social experiences, based on communities, will reinforce loyalty and traffic, and raise the multiplier of premiumization for food & beverage specialties. Moreover, given the already significant volume of e-games users of digital/virtual gaming platform and their proven propensity to spend money for their digital passions, combination of user bases and cross-selling activities, as well as improved social profiling can be achieved by guaranteeing the openness and interoperability of the Platform.

Biotech, medicine and science of nutrition

The natural extension of the Platform is towards the sciences of life and nutrition, where the research on sensors, devices, bio/neural reactions shall provide a shared data lake for research and innovation, as well as for improving the products and in general all the upstream processes of the agri-food value chain.

C.2. Long-term sustainability profile

The expected revenue structure of the future vehicle that will be in charge of permanently managing the infrastructure after the end of the project will be based on the following revenue streams:

- License fees (number of subscribers, annual subscription fee)
- Transaction fees (number of certifications/NFTs issued, unit value)

- Marketing and Advertising Commissions (volumes of contacts/engagement with final consumers per year, CPM/cost per thousands)

The relative volumes and prices are estimated to evolve according to the growth rate derived from the forecasts of financial analysts.

The costs are essentially related to the headcount of internal personnel and the involvement of external services, in order to maintain a balance between insourcing and outsourcing of professional roles. Other costs are here grossly estimated.

The table below shows a 15-year projection of a simplified income statement, by which the result is that the vehicle needs financing the first 3-4 years because of continuous investments in the development of the platform. But the profitability will be reached at the net profit level by the third year of operations. The breakeven at EBITDA level is expected to be reached in the second year of operations. Given the scalability of the platform, the profitability in the medium and long term is projected to be attractive for private investments, in a context of continuously evolving technological scenario.

		Baseline	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
REVENUES																	
License fees																	
	Volumes	600	800	1.000	1.250	1.500	1.750	2.000	2.400	3.000	3.500	4.000	4.500	5.000	5.500	6.000	6.500
	Unit Values (K€)	0,3 €	0,4 €	0,5 €	0,6 €	0,7 €	0,8 €	0,9 €	1,0 €	1,1 €	1,2 €	1,2 €	1,3 €	1,3 €	1,4 €	1,4 €	1,5 €
	Revenues (K€)	180 €	320 €	500 €	750 €	1.050 €	1.400 €	1.800 €	2.400 €	3.300 €	4.200 €	4.800 €	5.850 €	6.500 €	7.700 €	8.400 €	9.750 €
Transaction Fees																	
	Volumes (K/yr)	500	1.000	1.500	2.000	2.500	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	5.500	6.000	6.500
	Unit Values (K€)	0,2 €	0,3 €	0,4 €	0,5 €	0,5 €	0,5 €	0,6 €	0,6 €	0,6 €	0,7 €	0,7 €	0,7 €	0,8 €	0,8 €	0,8 €	0,8 €
	Revenues (K€)	100 €	300 €	600 €	1.000 €	1.250 €	1.500 €	2.400 €	3.000 €	3.600 €	4.900 €	5.600 €	6.300 €	8.000 €	4.400 €	4.800 €	5.200 €
Marketing & Adv Commissions																	
	Volumes (Ml/yr)	200	300	400	500	600	700	900	1.200	1.500	2.000	2.500	3.000	3.500	4.000	4.500	5.000
	CPM Values (€)	2,0 €	2,5 €	2,5 €	3,0 €	3,0 €	3,5 €	3,5 €	4,0 €	4,0 €	4,5 €	4,5 €	5,0 €	5,0 €	5,5 €	5,5 €	6,0 €
	Revenues (K€)	400 €	750 €	1.000 €	1.500 €	1.800 €	2.450 €	3.150 €	4.800 €	6.000 €	9.000 €	11.250 €	15.000 €	17.500 €	22.000 €	24.750 €	30.000 €
TOTAL REVENUES (K€)		680 €	1.370 €	2.100 €	3.250 €	4.100 €	5.350 €	7.350 €	10.200 €	12.900 €	18.100 €	21.650 €	27.150 €	32.000 €	34.100 €	37.950 €	44.950 €

COSTS																	
Personnel																	
	Volumes	6	10	12	15	20	25	35	50	60	70	80	90	100	110	120	130
	Unit Values (K€)	45 €	48 €	50 €	54 €	56 €	58 €	60 €	61 €	62 €	63 €	64 €	65 €	66 €	67 €	68 €	69 €
	Costs (K€)	270 €	480 €	600 €	810 €	1.120 €	1.450 €	2.100 €	3.050 €	3.720 €	4.410 €	5.120 €	5.850 €	6.600 €	7.370 €	8.160 €	8.970 €
Services & Outsourcing																	
	Volumes	8	10	10	12	18	25	25	30	35	40	45	50	55	60	65	70
	Unit Values (K€)	60 €	62 €	64 €	66 €	68 €	69 €	70 €	71 €	72 €	73 €	74 €	75 €	76 €	77 €	78 €	80 €
	Costs (K€)	480 €	620 €	640 €	792 €	1.224 €	1.725 €	1.750 €	2.130 €	2.520 €	2.920 €	3.330 €	3.750 €	4.180 €	4.620 €	5.070 €	5.600 €
Utilities (K€/yr)		150 €	150 €	155 €	160 €	165 €	170 €	175 €	180 €	185 €	190 €	195 €	200 €	210 €	220 €	230 €	240 €
Other costs (K€/yr)		200 €	240 €	250 €	260 €	300 €	310 €	320 €	330 €	340 €	350 €	360 €	370 €	380 €	390 €	400 €	410 €
EBITDA		- 420 €	- 120 €	455 €	1.228 €	1.291 €	1.695 €	3.005 €	4.510 €	6.135 €	10.230 €	12.645 €	16.980 €	20.630 €	21.500 €	24.090 €	29.730 €
Deprec. & Amortiz.		300 €	600 €	700 €	800 €	900 €	1.200 €	1.400 €	1.500 €	1.500 €	1.500 €	1.500 €	1.500 €	1.800 €	1.800 €	1.800 €	2.000 €
Financial Costs		80 €	100 €	100 €	80 €	60 €	40 €	30 €	20 €	10 €	10 €	10 €	10 €	10 €	10 €	10 €	10 €
EBT		- 800 €	- 820 €	- 345 €	348 €	331 €	455 €	1.575 €	2.990 €	4.625 €	8.720 €	11.135 €	15.470 €	18.820 €	19.690 €	22.280 €	27.720 €
Taxes & Social Contrib.		100 €	100 €	100 €	100 €	100 €	150 €	480 €	900 €	1.400 €	2.500 €	3.000 €	4.300 €	5.200 €	5.800 €	6.800 €	7.500 €
NET PROFIT		- 900 €	- 920 €	- 445 €	248 €	231 €	305 €	1.095 €	2.090 €	3.225 €	6.220 €	8.135 €	11.170 €	13.620 €	13.890 €	15.480 €	20.220 €