Finanziato dall'Unione europea
NextGenerationEU

MUR

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)

Finanziato dall'Unione europea
NextGenerationEU

MUR

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 D22B35C5 – INFRAGRI

Il sottoscritto Matteo Lorito, nato a SALERNO il 08/03/1961, nella sua qualità di legale rappresentante (ovvero, procuratore speciale, in forza di idonea e adeguata procura speciale) del Soggetto Proponente Università degli Studi di Napoli Federico II, con sede legale in NAPOLI, alla via corso Umberto I, 40,

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 D22B35C5
- 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 ITEC0000002, 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

Finanziato dall'Unione europea
NextGenerationEU

MUR

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 D22B35C5

Soggetto proponente

- **Anagrafica Soggetto Proponente**
  - Denominazione: Università degli Studi di Napoli Federico II
  - Codice CAR: D17903H4
  - CF: 00876220633
  - Pec: ateneo@pec.unina.it
  - Tipologia soggetto: Università e Scuole Superiori a Ordinamento Speciale
  - Sede legale:
    - CAP: 80138
    - Via/Piazza: corso Umberto I
    - Civico: 40
    - Comune: NAPOLI
    - Provincia: NAPOLI
    - Regione: Campania
- **Anagrafica Rappresentante Legale**
  - Nome: Matteo
  - Cognome: Lorito
  - Codice fiscale: LRTMTT61C08H703V
  - E-mail: rettore@unina.it
  - Data di nascita: 08/03/1961
  - Comune di nascita: SALERNO
  - Sesso: Maschio
- **Anagrafica Referente del progetto**
  - Nome: Francesco
  - Cognome: Loreto
  - Telefono: 3666709893
  - Cellulare: 3666709893
  - E-mail: francesco.loreto@unina.it

Finanziato dall'Unione europea
NextGenerationEU

MUR

Dati di sintesi della proposta progettuale

Titolo del Progetto: The Innovation Infrastructure for Agro-Industrial Technologies

Acronimo del Progetto: INFRAGRI

Settori e ambiti prevalenti dell'iniziativa:

- Digitale, industria, aerospazio:

  - Transizione digitale
  - Intelligenza artificiale
  - Robotica

- Clima, energia, mobilità sostenibile:

  - Cambiamento climatico, mitigazione e adattamento
  - Transizione energetica ambientale

- Prodotti alimentari, bioeconomia, risorse naturali, agricoltura, ambiente:

  - Green Technologies
  - Tecnologie alimentari
  - Bioindustria per la bioeconomia
  - Conoscenza e gestione sostenibile dei sistemi agricoli e forestali

Keywords:

Artificial Intellige; Precision agricoltur; Agriculture; Agro-Industry; Agro-ecology; Information techno; Value chains;

Livelli di maturità tecnologica prevalente (TLR): 6; 7; 8; 9;

Data di avvio del progetto: 01/01/2023

Durata del progetto (in mesi): 35

Costo complessivo del progetto: 21.850.000,00 €

Tipologia intervento: Realizzazione/Creazione

Localizzazione

Infrastruttura distribuita: Si

Numero sedi: 7

Sede 1

- CAP: 80126
- Via/Piazza: via Cintia
- Civico: snc
- Comune: NAPOLI
- Provincia: NAPOLI
- Regione: Campania

Sede 2

- CAP: 80146
- Via/Piazza: Corso N. Protopisani
- Civico: 50
- Comune: NAPOLI
- Provincia: NAPOLI
- Regione: Campania

Sede 3

- CAP: 75026
- Via/Piazza: SS 106, Km 419,5
- Civico: snc
- Comune: ROTONDELLA
- Provincia: MATERA
- Regione: Basilicata

Sede 4

- CAP: 72100
- Via/Piazza: Cittadella della ricerca ss 7 km 706+000
- Civico: snc
- Comune: BRINDISI
- Provincia: BRINDISI
- Regione: Puglia

Sede 5

- CAP: 00187
- Via/Piazza: Via XXIV Maggio
- Civico: 43
- Comune: ROMA
- Provincia: ROMA
- Regione: Lazio

Sede 6

- CAP: 44037
- Via/Piazza: Via Cavicchini
- Civico: 2
- Comune: JOLANDA DI SAVOIA
- Provincia: FERRARA
- Regione: Emilia Romagna

Sede 7

- CAP: 67063
- Via/Piazza: Località Le Campora
- Civico: 100
- Comune: ORICOLA
- Provincia: L'AQUILA
- Regione: Abruzzo

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	12.127.000,00	803.000,00	12.930.000,00
c) Impianti tecnici generici	0,00	0,00	0,00
d) Licenze software e brevetti	5.012.000,00	288.000,00	5.300.000,00
e) Fabbricati e terreni	900.000,00	0,00	900.000,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	246.000,00	54.000,00	300.000,00
h) Costi indiretti	1.420.000,00	0,00	1.420.000,00
Totale (€)	20.705.000,00	1.145.000,00	21.850.000,00

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	2.522.000,00	554.000,00	3.076.000,00
c) Impianti tecnici generici	0,00	0,00	0,00
d) Licenze software e brevetti	410.000,00	90.000,00	500.000,00
e) Fabbricati e terreni	0,00	0,00	0,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	246.000,00	54.000,00	300.000,00
h) Costi indiretti	300.000,00	0,00	300.000,00
Totale (€)	4.478.000,00	698.000,00	5.176.000,00

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	0,00	0,00	0,00
d) Licenze software e brevetti	930.000,00	0,00	930.000,00
e) Fabbricati e terreni	0,00	0,00	0,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	0,00	0,00	0,00
h) Costi indiretti	70.000,00	0,00	70.000,00
Totale (€)	1.100.000,00	0,00	1.100.000,00

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	1.135.000,00	249.000,00	1.384.000,00
c) Impianti tecnici generici	0,00	0,00	0,00
d) Licenze software e brevetti	896.000,00	198.000,00	1.094.000,00
e) Fabbricati e terreni	0,00	0,00	0,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	0,00	0,00	0,00
h) Costi indiretti	146.000,00	0,00	146.000,00
Totale (€)	2.177.000,00	447.000,00	2.624.000,00

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	0,00	0,00	0,00
c) Impianti tecnici generici	0,00	0,00	0,00
d) Licenze software e brevetti	746.000,00	0,00	746.000,00
e) Fabbricati e terreni	0,00	0,00	0,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	0,00	0,00	0,00
h) Costi indiretti	54.000,00	0,00	54.000,00
Totale (€)	800.000,00	0,00	800.000,00

Sede/Sito 5			
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	7.084.000,00	0,00	7.084.000,00
c) Impianti tecnici generici	0,00	0,00	0,00
d) Licenze software e brevetti	1.100.000,00	0,00	1.100.000,00
e) Fabbricati e terreni	900.000,00	0,00	900.000,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	0,00	0,00	0,00
h) Costi indiretti	696.000,00	0,00	696.000,00
Totale (€)	9.780.000,00	0,00	9.780.000,00

Sede/Sito 6			
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	686.000,00	0,00	686.000,00
c) Impianti tecnici generici	0,00	0,00	0,00
d) Licenze software e brevetti	600.000,00	0,00	600.000,00
e) Fabbricati e terreni	0,00	0,00	0,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	0,00	0,00	0,00
h) Costi indiretti	84.000,00	0,00	84.000,00
Totale (€)	1.370.000,00	0,00	1.370.000,00

Sede/Sito 7			
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	600.000,00	0,00	600.000,00
c) Impianti tecnici generici	0,00	0,00	0,00
d) Licenze software e brevetti	330.000,00	0,00	330.000,00
e) Fabbricati e terreni	0,00	0,00	0,00
f) Recupero, ristrutturazione, riqualificazione e ampliamento immobili	0,00	0,00	0,00
g) Spese per progettazione e altre spese tecniche	0,00	0,00	0,00
h) Costi indiretti	70.000,00	0,00	70.000,00
Totale (€)	1.000.000,00	0,00	1.000.000,00

Cronoprogramma di attuazione

Obiettivi intermedi: una sintesi

Codice identificativo	Mese di avvio (dalla data di avvio progetto)	Durata (in mesi)	Stima dei costi (€)
1	01/01/2023	4	50.000,00
2	01/01/2023	6	100.000,00
3	01/01/2023	9	200.000,00
4	01/03/2023	6	450.000,00
5	01/03/2023	6	200.000,00
6	01/03/2023	6	300.000,00
7	01/06/2023	12	4.000.000,00
8	01/06/2023	12	8.350.000,00
9	01/09/2023	12	6.000.000,00
10	01/03/2024	9	600.000,00
11	01/12/2024	6	800.000,00
12	01/12/2023	24	250.000,00
13	01/06/2024	18	400.000,00
14	01/06/2025	6	150.000,00
		Totale (€)	21.850.000,00

Obiettivo intermedo: 1

- Descrizione

  Selection and appointment of INFRAGRI manager and staff, and finalization of legal status of INFRAGRI

- Mese di Avvio

  1

- Durata in Mesi

  4

- Deliverables

  Selection and appointment of INFRAGRI manager and staff, and finalization of legal status of INFRAGRI

Obiettivo intermedo: 2

- Descrizione

  Central hub planning

- Mese di Avvio

  1

- Durata in Mesi

  6

- Deliverables

  Central hub planned

Obiettivo intermedo: 3

- Descrizione

  Terminals planning

- Mese di Avvio

  1

- Durata in Mesi

  9

- Deliverables

  Terminals planned

Obiettivo intermedo: 4

- Descrizione

  Area 1. Analysis of digital requirements

- Mese di Avvio

  3

- Durata in Mesi

  6

- Deliverables

  Area 1. Analysis of digital requirements completed

Obiettivo intermedo: 5

- Descrizione

  Area 2. Analysis of digital requirements

- Mese di Avvio

  3

- Durata in Mesi

  6

- Deliverables

  Area 2. Analysis of digital requirements completed

Obiettivo intermedo: 6

- Descrizione

  Area 3. Analysis of digital requirements

- Mese di Avvio

  3

- Durata in Mesi

  6

- Deliverables

  Area 3. Analysis of digital requirements completed

Obiettivo intermedo: 7

- Descrizione

  Establishment of the hub-based digital equipment and informatic platform for data elaboration and use.

- Mese di Avvio

  6

- Durata in Mesi

  12

- Deliverables

Establishment of the hub-based digital equipment and informatic platform for data elaboration and use.

Obiettivo intermedo: 8

• Descrizione

Implementation of terminals' digital instrumentation and informatic platforms.

• Mese di Avvio

6

• Durata in Mesi

12

• Deliverables

Terminal digital instrumentation operating

Obiettivo intermedo: 9

• Descrizione

Creation of the web of sensors for field-based digitalized data acquisition and processing

• Mese di Avvio

9

• Durata in Mesi

12

• Deliverables

Creation of the web of sensors for field-based digitalized data acquisition and processing

Obiettivo intermedo: 10

• Descrizione

Testing and provisional activation of the platforms

• Mese di Avvio

15

• Durata in Mesi

9

• Deliverables

Testing and provisional activation of the platforms

Obiettivo intermedo: 11

• Descrizione

Infrastructure begins to provide technological innovation: running costs

• Mese di Avvio

24

• Durata in Mesi

6

• Deliverables

Infrastructure begins to provide technological innovation: running costs tested

Obiettivo intermedo: 12

• Descrizione

Communication and transfer of knowledge/training activities

• Mese di Avvio

12

• Durata in Mesi

24

• Deliverables

Communication and transfer of knowledge/training activities established

Obiettivo intermedo: 13

• Descrizione

Commercialization strategy implementation

• Mese di Avvio

18

• Durata in Mesi

18

• Deliverables

Commercialization strategy implementation established

Obiettivo intermedo: 14

• Descrizione

INFRAGRI finalization

• Mese di Avvio

30

• Durata in Mesi

6

• Deliverables

INFRAGRI finalization

Allegati

Allegato 1 - Proposal template

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

Annex 1 (technical annex)

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

(To be provided in English only)

DISCLAIMER: This document is aimed at informing potential applicants for call-PNRR funding. It serves only as an example. The actual Web forms and templates, provided in the online proposal submission system under the online proposal submission system, might differ from this example. Proposals must be prepared and submitted only via the online proposal submission system.

Part A – Strategic framework of the initiative

A.1. Objectives of the initiative

The Innovation INFrastructure dedicated to AGRo-Industrial technologies (INFRAGRI) will develop innovative and integrated technological innovations for the digitalization of the agrifood system ultimately supplying new products, processes, tools, devices, services and decision support systems to the agro-industry. INFRAGRI will be based in Southern Italy, in line with its focus on the development and reinforcement of a sustainable agricultural system in the Mediterranean area, but has important spokes all over the country, where major efforts are made with private and public engagement to implement Agriculture 4.0 technologies. INFRAGRI will bring to market innovations based on the new and multidisciplinary concept of agriculture which leverages on knowledges in fields such as life science, engineering and electronics, advanced materials and artificial intelligence, among the others. Attention will be on the implementation of technologies and applications of robotics, smart e remote sensing, Internet of Things (IoT), and artificial intelligence for phenotyping and rapidly selecting genotypes that are productive, resilient to stresses and adapted to a changing climate or for remote sensing of organisms/crops and the territory. Additional applications will span blockchain value-chains and distributed ledgers, big data analysis, use and sharing. Focus on sustainable agriculture innovations and solutions will back-up current demand towards agroecology and energetic transitions, as well as concurring to the attainment of UN Sustainable Development Goals (SDG). Besides, INFRAGRI will bring to market, and help exploitation of results of the agri-food research infrastructures included in the roadmaps ESFRI (at European level) and PNIR (at national level) on Food, Nutrition and Health (EMPHASIS, IBISBA, METROFOOD-RI, MIRRI, FNH), thus realizing an integrated ecosystem "farm-to-fork" supporting territorial stakeholders and making faster exploitation of innovations to the benefit of sustainable agro-economy and land use (see Key Figure in annex 7).

A.2. Geographical area of interest

While INFRAGRI partnership and interests span all over the national territory and even expand to international cooperation through the presence of enterprises with international business and of facilities and scientific projects funded by the European Commission, INFRAGRI infrastructures will be mainly developed in Southern Italy, where there is *a)* consistent convergence of scientific and technological expertise by public core partners and by private co-funders, users and stakeholders, *b)* remarkable infrastructural investments already in place (e.g. the ESFRI infrastructures on plant phenotyping (EMPHASIS/Phen-Italy) at CNR and Agrobios-Metaponto and on food metrology (METROFOOD) at ENEA (Trisaia Research Centre in Basilicata region) and CNR facilities, c) robust leverage on existing interests and initiatives at regional scale (e.g. in Puglia, Basilicata, Campania, also by private companies located in other regions of Italy) in the agrifood, bioeconomy, and other innovative application areas, and *d)* urgent need of developing agriculture in areas traditionally yielding high-quality productions, but that are now threatened by many constraints (e.g. overpopulation and overexploitation of the soils, pollution, climate change-exacerbated resource scarcity), and need innovation to transit to systems preserving resources and territories. Infrastructural capacity will also be enhanced in areas of Italy which are naturally vocated to agriculture and where private and public investments are meeting enduring social needs of recovery from natural disasters and development of environmentally-friendly digital agriculture (e.g. the Tiber plain in the Lazio region).

A.3. Sectors/domains

INFRAGRI will specifically develop innovations in the agrifood sector, a key segment of the bioeconomy and of the agro-ecology and energetic transitions. By mainly focusing on digitalization applied to agriculture 4.0, specifically to the development of digital agriculture, the infrastructure will also span multidisciplinary domains, from life science (including -omic sciences), to advanced materials exploitation, to ICT and artificial intelligence applications.

A.4. Keywords

Agriculture, Agro-industry, Agro-ecology, Artificial Intelligence, Precision (Digital) agriculture, Information technology, Value chains.

A.5. Prevailing levels of TRLs

TRL 5-9 (from technologies validated at industry level to competitive production of innovations).

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

INFRAGRI coherently addresses the priorities of the European Commission Farm to Fork Strategy set by the Horizon Europe 2021-2027 Framework Programme, and in particular those laying foundations of the European Green Deal thematic objectives which help transitioning toward agroecology and digital innovation, e.g. applications of digital agriculture to reduce the use of pesticides and fertilizers and to increase resource (including biodiversity and natural resources) use efficiency. The infrastructure, also is in line with the European new Common Agricultural Policy (CAP 2023-2027), endorsing transitional regulation towards funding a resilient, sustainable and digital economic recovery, also with resources from Next Generation EU recovery instrument. Finally, INFRAGRI will develop innovation that will help achieving SDG set by the UN Agenda 2030, principally contributing to meet SDG2 (Zero hunger), but also addressing SDG6 (Avoid wasting water), SDG9 (Strengthening infrastructures), SDG 12 (Responsible consumption and production), SDG13 (Climate actions) and SDG15 (Life on land).
At national and regional level, INFRAGRI will coherently uphold the National Strategic Plan of MIPAAF (Ministry of Agricultural, Food and Forestry Policies), and its eco-schemes supporting the development of sustainable and inclusive agriculture. Similarly close will be coherence of INFRAGRI with priorities set by the National Research Plan (PNR) of MUR (Ministry of the University and Research), especially those addressing the innovation challenges and focusing on major area 6) Food, bioeconomy, natural resources, agriculture and the environment and its sub-areas. There is also a strong coherence between INFRAGRI and the Research Infrastructures in the domain of Health and Food, considered of high priority in the framework of the National Research Infrastructure Plan (PNIR) of MUR. INFRAGRI will link with regional Smart Specialization Strategies (S3) that have agriculture and the bioeconomy among the priority areas throughout Italy, but specifically meeting priorities set by those regions where infrastructural digitalization will be mostly deployed (e.g. Bioeconomy in Basilicata, Green Economy in Lazio, Agrifood and Biotechnology in Campania and Puglia).

A.7. Synergies with other initiatives envisaged within Mission 4 ("Education and research"),

Component 2 ("From research to enterprise"), with particular, but not exclusive, reference to Investment 3.1 ("Fund for the creation of an integrated system of research and innovation infrastructures")

INFRAGRI will build synergies with other PNRR structures, particularly with the constituting Campione Nazionale (CN) Agritech for whose innovations INFRAGRI will cover the "last mile" to the market. Synergies will also be made with the CN Biodiversity, the Research Infrastructures and the territorial Innovation Ecosystems addressing agrifood themes. In all cases, INFRAGRI operations will be two-ways*: a)* collecting innovations made by PNRR structures (primarily Agritech) and leading the highest possible numbers of them from proof of concept to prototype and access to market stage; *b)* using own facilities and hardware and software technologies to refine innovations bringing them to maturity, to respond to the needs of public-private partnership and the market and to provide competences and services that strengthen knowledge transfer and reduce the time to market of new products, processes and services. There is also a strong coherence with the other initiatives of the PNRR Mission 4 - Component 2 "From Research to the Companies", actions under national roadmaps of the Italian Technological Cluster AgriFood (C.L.AN.).

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

INFRAGRI is linked with many international actions, especially with those of the European strategic agenda, which will be fostered further by the innovation delivered by the infrastructure. Main collaborations are with the Joint Programming Initiatives (JPIs) FACCE (Agriculture Food Security and Climate Change), HDHL (Healthy Diet for a Healthy Life), and WATERS (Water challenges for a changing world); the Technology Platforms and Initiatives ETP Food for Life, the EUREKA Initiative EuroAgri FoodChain; the EU-PRIMA programme (Partnership for Research and Innovation in the Mediterranean Area); the Joint Technology Initiative (JTI) for bio-based industries, the Safe Consortium, the EIT (European Institute Technology) FOOD, and the large EU-CSA CropBooster. Important will also be interaction with programmes and priorities of main international organizations working on agriculture (FAO) and providing/using agricultural inputs (WMO, WHO).
INFRAGRI will develop innovation in synergy and complementary with activities performed by main European research infrastructures (RI), primarily METROFOOD-RI (Infrastructure for Promoting Metrology in Food and Nutrition) and EMPHASIS (European Infrastructure for Multi-scale Plant Phenomics and Simulation), FNH-RI (Research Infrastructure for Food, Nutrition and Health), EuroFIR (European Food Information Resource), ENVRI Community (Community of the Environmental Research Infrastructures) and networks (e.g. CORBEL, InRoad, MERIL). With specific reference to the electronic-RI (e-RI), synergy with NREN (National Research and Education Networks) and the pan-EU GEANT network will be seeked, in Italy through the GARR Consortium that ensures connectivity. Finally, the project will closely back up priorities set by the EU Authorities EFSA (European Food Safety Authority), JRC Directorate F and OLAF (European Anti-Fraud Office).
Potential users will include major international networks of industries working in the bio-economy and agrifood areas (e.g. the BIC-BBI (Biobased Industries Consortium, moving to Circular Bio-based Europe Joint Undertaking (CBE JU) with more than 200 associate members, and the EIT-FOOD Knowledge and Innovation Community with more than 60 industrial partners all over Europe). In Italy, INFRAGRI will be working in tight connection with a set of > 40 potential users that have already expressed their interest in using the infrastructure capacities and expertise. These include some of the most innovative industries in the field of precision agriculture and ICT-AI applications to the agrifood system as well as the entire National Cluster CL.A.N. with its 113 associated members including 44 agrifood

companies and 14 regional governments.

A.9. Start date of the initiative

INFRAGRI will start operations on January 1, 2023.

A.10. Please choose one of the following options below:

Single-Site Infrastructure	☐
Multi-Site Infrastructure	X ☐

Part B – Initiative features

B.1. Activities

(Describe the initiative, highlighting and motivating its innovative profile. This section should also include evidence of 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)

Actions for the development of integrated and innovative digital solutions will be aimed at covering the Agriculture 4.0 sector. Based on collected surveys and expressions of interests, this is the agrifood sector where digitalization is perceived as more urgent and needed, bringing to maturity (market) innovations that have already reached industrial validation at pre-competitive level. Agriculture 4.0 also promises to deliver the most important innovations for agriculture to transit form a waste-rich and often environmentally unfriendly practice, to a sustainable activity based on ecologically and economically viable principles, and aiming at wise use of limited resources while boosting further production quality and quantity, and overall farming economy. Finally, in Italy Agriculture 4.0 has an estimated market of > 400 M€/year which makes Italy among the most important players in the field (e.g. covering around 19% of the European market). Despite such a favorable outlook, further development of Agriculture 4.0 is restrained in Italy by several problems, often exacerbated by the small average size of agricultural enterprises and by their diverse demands, e.g. *i)* difficult access to data (both gathering and analysis); *ii)* fragmentation not only limited to the demand (by farmers), but also involving the supply (by small industries and novel start-up). INFRAGRI will contribute to the rapid evolution of Agriculture 4.0, also addressing ground-breaking areas other than the classic uses of Agriculture 4.0 innovation (e.g. monitoring and mapping of soils and crops for decision support systems (DSS) helping farmers to plan their agricultural activities).
INFRAGRI will address the need of innovation for Agriculture 4.0 by operating **in three large areas**: 1**) Agricultural and forest productions and resources; 2) Bio-economy and circular economy; 3) New and ground-breaking agrifood systems.** Each area will have dedicated terminals where upgrading and strengthening of infrastructural digitalization will occur. The three areas will be accompanied by **shared (horizontal, and technical) actions** with the scope of further accelerate the development of pioneering technologies, and expedite release of their deliverables to stakeholders and to the market. These are: **a) Products development (e.g. sensors); b) Processes development (e.g. based on new machineries, or new processes to improve traceability of production); c) Services (e.g. DSS aimed at improving performances, sustainability, or defense of productions); d) Other tools (e.g. accounting and analysis of carbon credits and other assets to reach zero-emission production chains).** Overarching the three areas is the *business model* which is based on the acquisition, transmission, elaboration, analysis, and use of data to provide information for the development of appropriate toolboxes leading to innovation deployment, via personalized digital infrastructures that allow to take advantage of multisource data (e.g. collected by arrays of sensors). Activities of the four areas are elucidated below, and further represented in Figure 1.

Area 1 - Agricultural and forest productions and resources**,** will focus on the development of agrifood and forest systems sustainable and resilient, supporting the agro-ecology transition, and especially promoting solutions based on the development of smart and precision farming. Main aim will be upgrading the agrifood and forest value chains to deliver healthy, environment-friendly and economically viable productions. An integrated approach will be developed to make sustainable the entire productions value chain, from primary productions to food preparation

and delivery, improving quality, safety, security and sustainability (QS3) of marketed products. Emphasis will be placed on creation of automated workflows in different blocks of the value chain, e.g. from selection of microorganisms improving crop productivity and quality and durability of products to robotics and AI applications to smart farming, and to digitalized systems for traceability of primary matters and products. **Specific activities** of this area will deal with **1a) Precision agriculture**, including digital solutions to optimize: **i) new plant breeding technologies** and rapid marketing of new genotypes**; ii) agricultural practices, iii) resource use efficiency**, and **iv) crop yield traits** (starting with quality of productions); **1b) Traceability of the value chains**, based on digital solutions to better track **i) origin of production**, supported by genomic technologies; **ii) quality of production**, including blockchain methods supported by ICT-AI technologies; **iii) sustainability of productions**, farm-to-fork, including delivery of tools helping to reduce environmental burdens of productions; and **1c) Automation and logistics**, aiming at improving rational organization of logistic infrastructures (platforms, distribution centers) around nodes to better organize networks making use of new digital forms of connectivity of the single infrastructures. Within this area, **i) new logistic systems** and **ii) new network configurations** based on physical or immaterial links among platforms and distribution centers will be identified and promoted, supporting the national agrifood industry. This will involve platforms located in the production and in transit areas, in the logistics node where merchandises are concentrated, and those from where the products are distributed to retailers and consumers. Covering the entire process, from field to fork, digitalization of operations will be multi-actor involving all actors of the production value chains (farmers, industries, wholesale and retail industries, operators of logistic nodes and transport, final consumers).
Actions of this area are primarily based on regional interest to support large, medium and small enterprises operating in Italian territories with a clear agricultural vocation, but focus will specifically be on areas that are challenged by increasing climate change-driven constraints. This specific INFRAGRI core activity will be given high visibility, as it promises to establish a unique DSS for maximizing impact and efficiency of farming practices, covering an impressive agricultural area in Italy and supplying information of paramount importance to farmers and companies (see also below). This is keyed at valorizing investments that especially focus on areas that are subjected to climate change-driven aridity, and have been left behind current agroecosystem development, such as abandoned areas of earthquake-plagued zones in central Italy (Lazio) or polluted and overexploited areas of south Italy (Campania).

Area 2 - Bio-economy and circular economy, will focus on the efficient use of bioresources and on the valorization of byproducts and wastes of the agrifood value chains, attaining circular economy principles such as improving resource use efficiency and sustainable symbiosis between the territories and the agrifood industry. Break-through digital technologies will be used to implement new tools supporting **2a) New models of systemic management**, which includes **i)** delivering and using **regional and national atlases of biomasses**; **ii) maximizing impacts of agriculture to mitigate climate change and adapt ecosystems to the changing environment** (CO_2 capture, sustainable use of soils and other natural resources); and **2b) Valorization of resources**, within and between agrifood value chains, with positive effects in terms of competitivity and sustainable growth of the territories. This includes **i) bio-product generation** for food and feed industries, such as high added value ingredients**, ii)** new processes to **use of agricultural and food wastes to generate bio-based products**; and **iii) preparation of non-food products** (e.g. cosmetics, new materials, fertilizers, bioenergy).
Actions of this area primarily focus on partnerships based in the Basilicata region, involving large, medium and small enterprises operating in a territory where the bio-economy has been largely supported as a main developmental strategy.

Area 3 - New and ground-breaking agrifood systems, will deal with new and original systems for implementing

agricultural practices where they are needed or where space is an issue - **3a) Urban farming; 3b) Indoor farming,** and will bring to life pioneering solutions to face problems such as the cultivation of plants in the space – **3c) Agrospace**. Focus in all cases will be on **i) adapted precision farming technologies**; **ii) use of new, advanced materials to sustain soilless plant growth**, and **iii) smart automation of growth infrastructures**. Common aim will be leading to intensive productions of fresh vegetables with superior nutritional value within multilayer highly-automatized vertical systems (vertical farming) or within extreme environments where plants act as key components for system bio-regeneration, as in the new, long-term space missions. Final objective is to support the environmental sustainability of agriculture, reducing soil consumption, allowing more efficient use of natural resources (water), limiting pesticides and harmful emissions caused by transportation, and valorizing under-used or marginal areas in urban or peri-urban settings.
Area 3 actions will be based on the Campania and Emilia-Romagna regions, where strong partnership with SME and large industries, as well as with scientific institutions, which have recognized scientific expertise in the agrospace sector.

INFRAGRI will span crops and ecosystems that are the backbone of agro-forestry in Italy (e.g. cereals, horticultural crops, fruit trees and forests), providing a digital infrastructure aimed at rapidly developing new sensors, instruments, services and that will make it possible to sensibly improve management of complex value chains (e.g. blockchain, or georeferencing processes and movements of persons, machines and goods). In the end, INFRAGRI will constitute the terminal of a tight network of proximity sensors of soils, meteorology, and crop phenotypes, coordinated by a robust digital platform of non-stop collection of remote-sensing data and images, which is then analyzed, organized and managed to create new knowledge that is then shared according to FAIR (findable, accessible, interoperable, reusable) principles with INFRAGRI stakeholders and users. Especially important will be the interaction with the PNRR-funded National Center on Agriculture (AGRITECH) which will supply INFRAGRI innovations to be prototyped, tested, and released to market. Beside supplying real-time data for decision support systems to users, INFRAGRI will also be interoperable and compatible with other interacting informatic systems and business sectors, to support the socio-economic development of the whole country (from citizens to institutions). Coherently with the PNRR requirements, INFRAGRI will work on innovations with TRL 5-9 (from technologies validated at industry level to competitive production of innovations). Agritech, as well the newly funded research infrastructures of PNRR (Metro-food, Itineris) and HE-IR roadmaps (Agroserv, Emphasis-GO) will provide innovations with lower TRL for INFRAGRI to pick over in a synergic way and lead to marketable products, processes or services, with specific attention to Agriculture 4.0 implementation. In order to start, sustain and manage the collaborations among the different above-described research programmes of the PNRR Mission 4 Component 2, an ad hoc committee on synergy management will be established, nominated by the scientific boards of the interacting projects, to establish a cross-fertilizing working group that will steer and support key collaborations, periodically monitor their development, and suggest novel collaboration opportunities that would further pursue cultural enrichment and synergies between initiatives and strengthen the value of the results obtained in a national as well as international dimension.

INFRAGRI ambition is to create the largest digitally interconnected experimental field in Italy, but also the most versatile platform for service provision to agrifood players, including private enterprises but also control authorities. Some of such services are: traceability integrated systems of goods, persons, and vehicles within the agri-food value chain in rural and urban areas; certification systems for consumer protection and compliance with anti-fraud and anti-fake norms; DSS that habilitate agricultural practices, farm-to-fork, to Agriculture 4.0 and Industry 4.0 protocols and tools; development of new “knowledge-on-field”-based technologies; platforms for early detection and diagnoses of adversities and prediction systems/models of consequent crop losses.

INFRAGRI components and structure

INFRAGRI's hub will be placed at the University of Naples where the central control system will be equipped with a CED (center for the elaboration of data) made by at least 10 workstations for data elaboration, 4 technical-administration stations, and two meeting rooms for demonstrations, communication and training. The hub will be home of INFRAGRI manager and her/his team made by at least two more professionals with complementary expertise (technological – business oriented). The infrastructure will be equipped with five regional terminals covering the three areas of competence. The terminals will process and where data from field sensors and other Agriculture 4.0 sensing instrumentation (e.g. satellites) placed in the fields will be collected to create the widest field web of sensors in Italy, and probably in Europe. The terminals will also host activities aiming at valorizing innovation (new products, processes, or services) for the development of Agriculture 4.0 (e.g. planning, prototyping, testing new devices and sensors based on innovation provided by AGRITECH, INFRAGRI partners, and other stakeholders). The regions mainly covered by the web and hosting the six terminals are Campania, Puglia, Basilicata, Lazio, Abruzzo and Emilia-Romagna (see Figure 2, also including details on private and public partners already formally expressing interest on INFRAGRI as initial co-funders (2a) or partners (2b, 2c)).

For activities of area 1, the value chains will cover cereals, olive tree, horticultural plants (focus on tomato), grapevine (focus on wine productions), hazelnut and other stone and flesh fruits, forest trees (focus on biomass and ecosystem services), and forage plants. Overall, the infrastructure will start covering around 10% of the agricultural area of the participating regions, with sensors placed on > 380000 hectares and on > 46000 farms provided by partners. Software platforms will connect field sensors and instrumentations with the database delivered form satellite information. Both the software platform and the dynamic database, and also programme software licenses, will be selected from commercial solutions and later customized for best fitting the infrastructure's requirements. Aside from its physical component, INFRAGRI will rely on further integration of produced outputs within the national territory via partnership with the industry for acceleration of start-up formation and for technology transfer, and with main players of the farming system (e.g. the network of Consorzi Agrari Italiani) for spreading and making rapidly usable successful outputs (new products, processes, services) among users.

The goal of activities of area 2 is to produce food, feed, bio-based products, biomaterials, fertilizers, bioenergy in a sustainable way with the aim of achieving technological/economic/environmental/social benefits. In other words, INFRAGRI will define new models of systemic management with the aim of achieving a significant increase of sustainability and circularity of agrifood value chains. In all cases, the start-point is represented by data analysis obtained from regional/territorial crops production, processing and transformation. To this end, the information available in the atlases developed and integrated so far will be implemented. The state-of-art of current development of value chains as cereals, horticultural plants, grapevine, olive tree, forest trees and forage plants will be evaluated firstly as their amount and quality as well as the territorial availability and seasonality, storage and preservation methods, logistic. In this way, through the valorization of wastes and by-products by application of KETs (Keys Enabling Technologies) and New Mild Processing Technologies, pilot scale products and processes (TRL 5-6) that promisingly minimize agricultural wastes and optimize yield of bioactive renewables will be brought to industrial scale and to marketable smart solutions for waste recovery/reuse. Precious renewables from agriculture and food include metabolites of interest for the most diverse array of sectors (e.g. pigments, antioxidants, prebiotics, fibers, among the many). Recovering and valorizing these resources will make possible to obtain ingredients for new food and feed products, cosmetics, biomaterials as food packaging, chemicals, bioenergy. To fully comply with circular economy principles, no innovation will be delivered until *ex ante* assessment of the environmental impact of the innovation (e.g. CO_2 capture, input of water and energy in production and transformation processes, sustainable use of soils) will be minimized and, in particular, a carbon neutrality will be reached, also considering compensation mechanisms. Integration of different districts and production sectors (food

and non-food) will be incentivized, in order to identify new bio-based products and innovative territorial models of industrial symbiosis.
For activities of area 3), INFRAGRI will focus on Urban Farming, Vertical Farming and Space Farming which show remarkably similar value chains. These include hydroponic/aeroponic solutions for urban, vertical and space farm, advantageous for the minimal weight and minimal resources use. This innovative way of producing plants helps to solve the main challenges in today´s horticulture due to following advantages: weather conditions have lower or no impact; less fertilisers, pesticides and water are needed to harvest the same yield, a reduced land-use footprint is achieved, less labour is required and labour conditions are better and plants are more resilient thus developing less soil-borne diseases. The aims of this Area are: 1) Ensure sustainable primary production; 2) Reduce the use and risk of chemical pesticides and fertilizers: 3) Reduce food losses and wastes; 4) Promote sustainable food consumption. Vertical farms also represent a real revolution due to the potential they can express in response to the supply demand for products coming from urban agglomerations. In the latest report published by Newbean Capital on Indoor Crop Production Feeding the Future (https://indoor.ag/whitepaper), this market sector is booming, with a growing turnover. To start from these technologies the leap to future is coming. Design of extraterrestrial greenhouses taking into account different gravity conditions is another challenging target. Plants are grown in micro-gravity but not yet on a planetary body. There are several other goals for implementing circular and sustainable food systems in planetary greenhouses. In the first place, they involve bioregenerative life support systems that minimize food waste and eventually eliminate volume and mass from Earth supplies and increase safety for humans and mission success. Integrated food production must be seen as part of the same closed loop system that assists in regeneration of air and water. Another goal is to increase the quality of food for future astronauts on extraplanetary bases. This requires nutrition, choice and variation. Food quality will have a large impact on crew morale and the success of a long-duration mission. While agrospace faces fascinating challenges, successful innovations may have multiple applications to solve everyday problems on different terrestrial analogues and on artificial conditions, e.g. applications for hydroponic cultivation in harsh environments, in contaminated areas, for HADR missions.
Among the main pieces of instrumentations to equip INFRAGRI infrastructure are sensors (proximal, on board, and remote sensing) based on optical (visible, UV, IR, multispectral), piezo, or olfactory measurements, meteo and micro-meteorological stations (based on measurements of fluxes), drones (equipped with hyperspectral cameras or devices to implement cultural cares, from precision seeding to individual plant health assessment), aboveground and belowground plant phenotyping high-throughput infrastructures, automatized greenhouses and growth chambers, AI- and robot-assisted cultivation systems, all providing digital data to be analyzed and processed by the terminals and hub informatic facilities. Facilities to carry out and optimize bioprocess and to obtain bio-based products such as Climate Control Rooms, Bioreactors, Separation Pilot Unit and Downstream Processing Units will also be included, in particular to address area 3 needs.
The infrastructure will be realized in three years, with a gradual start-up phase beginning at mo. 18 (see INFRAGRI Gantt chart, Figure 3).

B.2. Governance model

B.2.1. Infrastructure and operational management

(Describe the operational management, also highlighting the profile and the role of the "infrastructure manager")

INFRAGRI is ideated by a core group including the largest and most important University in the South of Italy (the University of Naples Federico II), ENEA, a research performing institutions whose mission is finalized to technological

innovation and to advanced services to enterprises in the energy, environment and economic development sectors, and the society MATERIAS, an Early Stage Combined Accelerator launching new start-ups and accelerating the time to market of innovation. INFRAGRI has a consolidated private partnership, represented by more than 80 companies producing innovation in the agro-industry and bio-economy fields, and that have already expressed interest in the infrastructure as co-funders, service providers, users or stakeholders, but also through participation to main international consortia such as the European Innovation Partnership (EIT-Food) and the Bio-Industry Consortium (BIC-BBI, now evolving into the Circular Bio-based Europe-Joint Undertaking, CBE-EU).
INFRAGRI governance will be fully elaborated in the agreement between private and public partners. Preliminary discussions led to consider:
1.The “Contractual” PPP agreement, which will entrust (by means of a public notice procedure) to the private parties that have already submitted an Expression of Interest, the design, financing, construction, management and maintenance of the infrastructure. The University of Naples Federico II will prepare a public notice inviting interested economic operators to submit a project, in compliance with the principles of cost-effectiveness, efficiency, timeliness and fairness. The proposals received by the indicated deadline will be evaluated by the beneficiary, responding to the public interest and in compliance with the indicated guidelines.
ESTIMATED TIME SCHEDULE: Publication of notice; Receipt of proposals, analysis and evaluation; Awarding and identification of the concessionaire; Contract and start of execution: within 5 months of the issuance of the MUR concession decree.

2.The "Institutionalized" PPP agreement, which will see the establishment of a legal entity set up ad hoc with the participation of the private entities that have already submitted the Expression of Interest: a new company (SPA, SRL or SCARL, depending on the size and heterogeneity of the partners) will be established, jointly owned by the private partner(s) and the University of Naples Federico II, allowing the latter to retain a relatively high level of control over the conduct of operations. The partners will be chosen through a public procedure and the infrastructure assets will be at the disposal of the Society.
ESTIMATED TIME SCHEDULE: Publication of notice; Receipt of applications; Analysis and evaluation of applications; Establishment of the new legal entity: within 4 months of the issuance of the MUR concession decree.

The following rules are commons for both models:
Co-financing and reimbursement: The PPP provides for the private parties to co-finance the realization of the program submitted to the MUR through the co-financing of the part not financed by the MUR (51% of the project cost).
Ownership of assets: The assets acquired and the infrastructures created with the resources financed by the MUR will be the property of the proposing party University of Naples Federico II. All the assets and infrastructures together will constitute a single distributed innovation infrastructure that will operate with a unitary governance model already defined.
Project results: The results of publicly funded research projects: (a) shall remain the exclusive property of the Party that obtained them in the performance of its own activities; (b) shall be regarded as jointly owned by the Parties having effectively collaborated in the project, if the results of the activities of different Parties are not divisible.
Duration of the agreement: The public-private partnership agreement shall have a duration of 36 months, equal to the intervention financed by MUR. By the end of this period, the participants will undertake to define the establishment of a body that will guarantee the technical and financial sustainability of the infrastructure over the following 15 years.

After careful evaluation with the applicant’s administrative offices, and considering possible integration in INFRAGRI

of private and public partnerships, and the very rapid release of the Decree, allowing enough time to complete PPP set-up operations by the start-up date of the infrastructure mandatorily set for January 1, 2023, preference goes to the Institutional PPP agreement to be carried out with timely settlement of a new company among partners (SPA, SRL or SCARL, depending on the size and heterogeneity of the partners).

The governance of the project is outlined in Figure 4. Key representatives will be the executive person appointed by the proponent/beneficiary (the University of Naples Federico II) (SP) who will be assisted by an executive person appointed by the main private co-funder (FP). The third component of this executive directorate will be the manager of INFRAGRI (MI). The governance will be integrated by a technical-scientific committee (CTS) and by a committee for the management (COREGI). CTS will include 5 members, representing both the public and private partners (2 members each), and the SP (presiding the CTS). CTS will have different functions during the start-up phase of the infrastructure and during the management of infrastructure operations at maturity. In the first case the CTS will especially pay attention that the infrastructure will use state-of-the-art scientific and technical standards for its composition. Whereas, in the operational phase the CTS will act as a steering and supervising board. COREGI will also be made by 5 members representing in pair (2+2) the private and public partnership, but with a presidency representing the FP. COREGI will assist the MI in the construction, implementation and operation of the infrastructure, and also will approve the economic and financial plans, and overlook effective attainment of INFRAGRI objectives and timetable, otherwise proposing appropriate contingency plans. Particularly important will be the activity of COREGI in assisting the MI with the commercialization strategy of the innovations to be implemented by the infrastructure. This will be based on rigorous commercialization and financial return mechanisms, identifying e.g. value propositions canvas, serviceable obtainable and available markets (SOM and SAM, respectively) or total addressable market (TAM) for the marketable innovations, and contractual bases for exploitation of key exploitable results (KER).
The MI will be selected on the basis of her/his previous experience (at least ten-year-long) as business director, preferably including expertise in the direction of research infrastructures or in the management of complex structures. The MI will be appointed by a committee of experts (at least two of which external to the applicant organization) following an public selection, on the basis of management and scientific qualifications and of specialist interviews. The MI will manage all phases of INFRAGRI from both the technical and financial parts. It will provide trimestral reports to CTS and COREGI and will prepare the annual budget and scientific and financial plant for the approval of the committees. The MI will also take care of the reporting to the funding Ministry (MUR) and of any relationship with MUR appointed officers following INFRAGRI. The MI will have the collaboration of a staff including people with scientific/technical competences (e.g. on ICT and agronomy) and with financial expertise (e.g. public tenders). The FP will assist MI with the steering and supervision of the infrastructure. The FP will draft in concert with SP and MI an executive project which will be approved by CTS and COREGI. The FP will then assist the MI in the work direction, as well as in all procedures starting with those related to the purchase and allocation of infrastructure components. In an exclusive manner, the FP will organize means, instruments and persons within the main private co-funding companies, in order to ensure the correct management and the timely execution of the infrastructure's completion. INFRAGRI will not charge fixed fees to partners that have expressed their interest in participating, nor to stakeholders that will be users of the infrastructure. However, a contribution to the expenses of the infrastructure will be charged which may take different forms depending on the output produced to respond to user's demands (e.g. leases, license fees, access to/analysis of data, etc.). This, as well as other management modalities, relationship with the beneficiary, access conditions and possible privileges to PPP partners and to public users will be comprehensively dealt with by the PPP agreement and the annexed regulations (see details below).

B.2.2. PPP operation

(Describe the PPP expected modality as to the involvement of private partners: companies, specialized private infrastructure developers, investors, etc. In case of a PPP operation launched as a private initiative, the section should also indicate the private partner)

Upon its achievement, management of INFRAGRI will be ruled by a PPP agreement, covering as much as possible the legal ground for executive persons (see above) to smoothly govern the infrastructure. The expected PPP agreement will duly valorize involvement of private partners. This includes co-sharing the risks of execution and investment, whereas the property of material and immaterial assets purchased with INFRAGRI funds will remain with the proponent/beneficiary, being fully transferred to the new company throughout its operational life. One private partner will be appointed as executive person for the private partnership (FP, see also above about FP roles). The FP will represent the industrial co-funders of INFRAGRI, contributing 51% of the infrastructural funds, and will be selected through a public call among those partners who have already sent expression of interests to participate in INFRAGRI. They predominantly include agro-industrial companies as well as companies developing tools based on applications of information technology and artificial intelligence, with a focus on agriculture applications. The PPP, represented by the SP and the FP, will guarantee for the funding across the project duration and beyond, for the 15-year-long period after INFRAGRI operations begin.
Relationships between the public proponent/beneficiary and the private partners will be ruled by a PPP accompanying granting act, which will define parts' obligations and commitments, as well as all financial agreements (see above).

B.3. Budget plan

Eligible cost (Art. 7 of the call for proposal)	Costs (€)		
	Not to be located in Mezzogiorno Regions	To be located in Mezzogiorno Regions	**Total**
a. Expenses, even if not accounted for as tangible and intangible investments, related to one highly qualified infrastructure manager and other executive personnel (managers) in charge of the services offered by the Infrastructure	0	1.000.000	1.000.000
b. Scientific instrumentation, research equipment and machinery and relative accessories, turnkey	7.770.000	5.060.000	12.830.000
c. Technical installations strictly connected to the functionality of equipment and machinery			
d. Software licences and patents	1.700.000	3.600.000	5.300.000
e. Buildings and land (including built land) not exceeding 10% of the total cost of the project. For sites in a state of decay and for those previously used for industrial purposes that include buildings, this limit is increased to 15%	900.000	0	900.000
f. Rehabilitation, renovation, redevelopment and expansion of buildings if strictly necessary as to the functionality of the Infrastructure			
g. Design cost and other related technical expenses	0	300.000	300.000
h. Indirect costs, forfeit (up to a maximum of 7% of the other project costs)	780.000	740.000	1.520.000
Total	11.150.000	10.700.000	21.850.000

B.4. Project time schedule

(In addiction to sections B.4.1 and B.4.2, please provide a general description as to the execution of the interventions)

The project will have a tightly scheduled time frame, due to its rapid development. It is envisioned that the PPP will be operative already at the beginning of the project (see below), and therefore this will not be reported as a project objective. Project phases (objectives) are defined as it follows: **1) Selection and appointment of MI and infrastructure's staff**, and finalization of legal status of INFRAGRI (Deliverable (D) 1 – mo. 4). **2) Central hub planning.** This includes the rapid physical preparation (location preparation at University of Naples, recruitment of staff) of the central office working as data analysis, elaboration, and use center, but also office to the staff appointed to help the PPP satisfy legal requirements and issues about e.g. tenders or IPR of innovations. (D2- 6 mo). **3) Terminals planning**. This involves physical preparation of the six regional terminals where activities of the infrastructure will be based. (D3- 9 mo). **4) Area 1. Analysis of digital requirements**. This plans the physical web that will allow Agriculture 4.0 information delivery throughout the large sensor-served areas in the farms of the regions (Campania, Puglia, Lazio and Emilia-Romagna) where area 1 activities of INFRAGRI will be concentrated, and also include acquisition of main softwares (D4- 9 mo). **5) Area 2. Analysis of digital requirements**. Similar to objective 4, this will concentrate on needs to digitalize the infrastructural terminal of area 2 activity, mainly based in Basilicata and Puglia (D5- 9 mo). **6) Area 3. Analysis of digital requirements**. Similar to objectives 4-5, this will take care of providing final background to digitalize facilities for working on area 3, primarily in Campania and Abruzzi (D6- 9 mo). **7) Establishment of the hub-based digital equipment and informatic platform for data elaboration and use**. This creates the digital infrastructure (hardware) for data delivery, share and use for Agriculture 4.0 applications in the participating farms (Area 1, mainly – not exclusively - aiming at delivery of services and models), as well as for any other envisaged operation of the infrastructure (Area 2 and 3, mainly targeting delivery of new products and processes). (D7-18 mo). **8) Establishment of terminals' digital instrumentation and informatic platforms**. This complements objective (7) at the level of the six regional terminals across the territory. (D8-18 mo). **9) Creation of the web of sensors for field-based digitalized data acquisition and processing.** This complements phases (4) and (5) at the level of single unit (farm, company). It mainly involves area 1, with possible applications also in area 2. (D9-21 mo). **10) Testing and provisional activation of the platforms** for production and distribution of the main infrastructure's deliverables accomplishing to FAIR principles (D10-24 mo). **11) Infrastructure begins to provide technological innovation** to selected users, in the form of assistance to the development of new products, processes, services, and DSS tools, through partner facilities or in response to demands and needs of key stakeholders (e.g. the National Center AGRITECH). (D11-30 mo). **12) Communication and transfer of knowledge/training objectives to be met**. Key indicators for these tasks are expansion of the PPP by at least 50% with respect to partners signing the original agreement, organization of at least two training school (TS, targeted at trainers (train-the-trainer) and young innovators) and participation to national and international innovation events (from hackathons to fairs) to disseminate INFRAGRI potential and capacity. (D12 – 36 mo). **13) Commercialization strategy to be implemented and finalized.** This will include fixing credible indicators for financial return mechanisms, clearly defining vital performance indicators such as key exploitable results and minimum return on investments (D13-36 mo). **14) INFRAGRI grand-opening (GO),** and infrastructure's services fully available to users and stakeholders. This represents finalization of the fine-tuning of infrastructure working capacity toward all users, and especially final positive assessment of INFRAGRI capacity to test and deliver innovation as new products, processes, services, tools, for successful implementation of Agriculture 4.0 practices. (D 13 – 36 mo).

INFRAGRI timetable

Objective	Mo				Y1				Y2				Y3
1	1-4												
2	1-6												
3	1-9												
4	3-9												
5	3-9												
6	3-9												
7	6-18												
8	6-18												
9	9-21												
10	15-24												
11	24-30												
12	12-36												
13	18-36												
14	30-36												
Deliverables (D) ToK events (TS) INFRAGRI GO		D1	D2	D3 D4 D5 D6			D7 D8	D9 TS	D10		D11 TS		D12 D13 D14 GO

B.4.1. Intermediate objectives

(For each intermediate objective, using the below template. Please notice that the aforementioned objectives must be scheduled in a time period of at least four months and will be defined according to the specific nature of the intervention)

Intermediate objectives are given the project time schedule (see above), in the information entered in the portal, as well as in project timetable (see Gantt chart in Figure 3 of Annex 7). In brief, title, start month and duration (in months) are also given here:

Obj 1: Selection and appointment of INFRAGRI manager and staff, and finalization of legal status of INFRAGRI, start month 1, last months 4. **Obj 2**: Central hub planning, start month 1, last months 6. **Obj 3:** Terminals planning, start month 1, last months 9. **Obj 4: Area 1.** Analysis of digital requirements, start month 3, last months

6. **Obj 5:** Area 2. Analysis of digital requirements, start month 3, last months 6. **Obj 6**: Area 3. Analysis of digital requirements, start month 3, last months 6. **Obj 7**: Implementation of the hub-based digital equipment and informatic platform for data elaboration and use., start month 6, last months 12. **Obj 8**: Implementation of terminals' digital instrumentation and informatic platforms, start month 6, last months 12. **Obj 9**: Creation of the web of sensors for field-based digitalized data acquisition and processing, start month 9, last months 12. **Obj 10**: Testing and provisional activation of the platforms, start month 15, last months 9. **Obj 11**: Infrastructure begins to provide technological innovation, start month 24, last months 6. **Obj 12**: Communication and transfer of knowledge/training activities, start month 12, last months 24. **Obj 13**: Commercialization strategy implementation, start month 18, last months 18. **Obj 14**: INFRAGRI finalization, start month 30, last months 6.

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

INFRAGRI SP, upon successful completion of the negotiation phase, will elaborate an executive project for the implementation of the infrastructure aimed to achieve INFRAGRI activities' objectives. Within 30 days from executive project's realization, the SP will invite public and private partners who have sent expression of interest to join the partnership in order to select those who will confirm co-funding and enter the PPP. The PPP composition should be finalized by October 31, 2022, and FP, CTS and COREGI nominations should be finalized by the end of year 2022.

B.5. Promotion of knowledge transfer and business creation activities.

(Describe the activities envisaged or the expected impact of the Infrastructure in terms of knowledge transfer and setting-up new businesses)

INFRAGRI will develop integrated innovations for the digitalization of the agrifood system ultimately supplying new products, processes, tools, devices, services, and decision support systems. One of the key challenges is the understanding of the ongoing transition processes, especially the shifts from the traditional research-oriented infrastructures towards those ones based on the innovation as central objective. An increased attention needs to be paid at improving the knowledge flows, based on the knowledge transfer, exchange and co-creation.
INFRAGRI will create innovation that can be made usable from the production sector. INFRAGRI digital infrastructure will be shared, unbounded, heterogeneous, open, and evolving socio-technical systems comprising an installed base of diverse information technology capabilities and their users, operations, and design communities. In a more cultural perspective, INFRAGRI will be the structure that allows people to go beyond their own capacity to know and to do, thus increasing their potential.
INFRAGRI looks beyond research communities by identifying flows of knowledge for co-creation, knowledge exchange, transfer and learning between multiple actors. Tools and facilities (the technological and technical elements of infrastructures) are components of a larger mechanism, which include the generation, capture, preservation, and diffusion of resources (knowledge management). Innovation comes often from the encounter between the academic world, and the industry at large. The approach is based on: 1. Co-creation, the process in which multiple actors search together when there is uncertainty about the direction of development, in a co-decisive process ('multiactor'); 2. Knowledge exchange, that refers to commonly seeking certainty through sharing and combining existing knowledge, but the aim of the solution is (still) unknown 3. Knowledge transfer, which

occurs when the solution is decided and known but may still need to be adapted to its intended use. Transfer refers to the communication of explicit knowledge in terms of innovation, for the sustainable transformation of agri-food systems and the agribusiness sector. In this context, the development and adoption of new technologies, as well as innovative business models and practices, all of which aiming at setting Agriculture 4.0 standards, will play a central role in expediting the transition to enhanced business practices that can enable greater competitiveness and sustainability of agri-food systems in the longer term. A set of activities has been planned to leverage the innovation potential, and to support new market opportunities, boosted by the direct engagement of businesses in the co-creation approach, which will enable meeting the actual requirements of the production sector. A co-creation open support ecosystem to address the challenges of innovation, with expected outcomes in the knowledge, business, and social domains will be set up. Iterative innovation processes will be implemented, covering design thinking, brainstorming and discussion sessions, seminars and workshops, training sessions and courses, open science info days, Minimum Viable Products (MVP) delivery, etc.; these activities will be run both in presence and using dedicated on-line tools, to ensure a wider participation of users and businesses.

INFRAGRI will also foster the training and formation of young innovators, in continuity and collaboration with other strategic national initiatives in the field of digital technologies, primarily with the National Ph. Doctorate on artificial intelligence, specialization area agri-food and environment, coordinated by the University of Naples Federico II (https://www.phd-ai.it/).

Part C – Expected impact

C.1. Expected outcomes of the intervention

(Describe the impact in terms of a) employment and research spin-off, b) synergy with other productive and research domains)

INFRAGRI foresees the realization of an employment forecast deriving from the economic and dimensional growth of the companies indicated as target groups and from research spin-offs. As for the former, for the purpose of a realistic mapping, it must be considered that producers/farmers with employees operating in the agricultural sector have an average number of employees in Italy equal to 2. For all the others (processors and manufacturers, retailers, post-retail/food service providers, industry and SMEs as solution providers) always a micro-enterprise dimension (average of 9 employees) is typical of the Italian landscape. The goal is to make the companies that will collaborate with INFRAGRI across its 15-y-long minimal lifecycle, high-growth companies, that is, capable of reaching an annual average of 20 percent in terms of employees. Regarding research spin-offs, the establishment of 15 spin-offs is assumed, for which the statistics confirm an average of 2.5 employees in the first 5 years. In light of these considerations, it may be assumed as deliverable outcomes: a) Collaboration with 640+ companies with an increase in employment deriving from the supply of services and involvement in projects and financing instruments equal to 1.8 employees per company; b) Collaboration with academy and research institutions leading to activation of 45 spin-offs with an employment increase of 0.5 employees per spin-off/newco. As a whole, INFRAGRI, therefore envisages the enforcement of employment estimated in a between 1100 and 1200 new jobs by highly skilled professionals working on Agriculture 4.0 applications, and with effective impacts on political and societal objectives, being aligned with agroecology principles, and taking into account circular economy and bioeconomy and the societal dimension. The circular bio-based economy is at the heart of the Farm to Fork (F2F) European strategy for a sustainable food chain. The infrastructure will make a unique contribution towards 2 major F2F outcomes, namely: i) to accelerate the deployment of transparency innovations and solutions in EU food systems, especially among micro-enterprises and SMEs, boosting health, sustainability, and safety of products, processes and diets, and driving climate action; ii) to ensure that future transparency innovations and solutions are demand-driven, systemic and cost-effective, and support the objectives of the EU Green Deal (EGD).

The scale of impact is large and affects several community-shared areas, such as sustainability, circular economy/industrial symbiosis, food safety, traceability, monitoring of performances of processes/parts of the food system. Main target groups are primary producers/farmers, processors and manufacturers, retailers, post-retail/food service providers, industry and SMEs as solution providers, as well as citizens.

By rapidly bringing to market main innovations INFRAGRI will support the implementation of agroecology practices and enhance economic profitability of the entire stakeholders of the agrifood value chain. Agroecology's economic viability is often indirect, and difficult to capitalize without considering economic impact of ecosystems services., e.g. manifested as saving in external inputs, increasing eco-efficiency by optimizing processes, differentiating products by their properties (e.g., tasteful, healthy, eco-friendly). Nevertheless INFRAGRI customisation of smart farming and implementation of ICT for production and processing technologies (e.g., IoT and big data solutions, blockchain and AI), will help digitalize the agrifood system, thus leveraging eco-efficiency and optimising gains when considering also ecological costs, and will boost synergies with the agroecology principles and practices, which will enhance the profitability of the agroecology model for different types of farmers and businesses models.

Cross-cutting and wide impacts of the infrastructure results are concrete, and represent a new approach to the

agrifood supply chain, embracing the concept of competitive success of the agri-food industry on the main markets should come together with positive effects on the quality of life. INFRAGRI partnership, including some of the main agro-industry enterprises in Italy, promotes the transition from a “product economy” to a “system economy”, creating a cultural leap towards economic and environmental sustainability, thus impacting the whole society. Applying both a systemic vision and an integrated industrial and scientific strategy will rapidly enable new technologies, valorising the specificity of territories, and including the entire community of supply chain actors and stakeholders. Furthermore, the infrastructure will enable citizens to build confidence in the agrifood sector, creating trust on agro-industry new vision about promoting access to healthier food products, with lower environmental and climate impact.
In summary, INFRAGRI set-up and implementation allow to foresee the following employment impacts:
-Direct, for the implementing companies, based on the implementation of new/innovative production solutions and new market perspectives, with increases of turnover and company size.
-Direct, through the creation of new businesses as a result of the promotion of academic spin-offs and newco/start-ups in relation to the use of the results and knowledge and technology transfer.
-Indirect, through training of new qualified resources, to be then employed by agrifood and ICT companies.
-Indirect, through the development of a system of advanced and ICT-based services for the supply chain, and with the creation of job opportunities for graduates as qualified resources for companies supplying processes, services and technologies.

C.2. Long-term sustainability profile

(Provide a detailed description of the profitability of the intervention, including and adequately motivating the expected revenues per year over a period of at least 15 years)

In the long-term, INFRAGRI will accelerate industrial and commercial exploitation of innovations, both directly by the companies involved in the infrastructure, and indirectly for prototypes needing additional work to reach the market and for those innovations hitting different supply chains and having even wider impacts.
INFRAGRI large critical mass will also encourage (re-)aggregation of companies and overcome dimensional barriers that are often fatal for innovation. INFRAGRI will raise the technological level of business systems at local and national level, with improved perspective of internationalization, and developing externalities favourable to the dissemination and implementation of innovations as competitive tools in an open economy. The integrated management of production cycles allows for a higher environmental sustainability and a reduction in costs and dependence on "global" markets. In the same way, the integrated management of logistics and commercial channels allows the targeted use - for each channel - of the entire range of productions of the supply chains and/or local systems, enabling the reduction of costs in the production, logistics and retail phases.
INFRAGRI innovations and solutions will be key tools to develop decision support models and systems for the integrated management of supply chains *from field to consumers*, which can combine the needs linked to the “modernization of the agrifood sector” with a “multifunctionality of the agriculture” generated by the recovery of the “vocation” of the territories.

The Innovation Infrastructure dedicated to agro-industrial technologies (INFRAGRI) will be a long-term structure within which it will be possible to use facilities, services and skills necessary to meet the needs of companies and develop new ideas, with particular reference to the improvement or the implementation of new processes, the

introduction of new products/services, the creation and evolution of academic spin-offs and companies' start-ups into sustainable realities. The profitability of the interventions will derive from the supply of resources and services essential to the development of new business projects. The interventions hypothesized with a return in terms of revenue are detailed in Table 1 (see annex 7). Estimated management costs will be around 40% of estimated revenues, at infrastructure maturity, that is around 800 KE/y in total, with a substantial (>80%) contribution of activity 1 (R&D Services).