

## P04: METROFOOD-RI: INVENTORY OF THE FACILITIES AND ORGANIZATION OF THE PHYSICAL INFRASTRUCTURE

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**Abstract** – METROFOOD-RI is a Research Infrastructure (RI) for Promoting Metrology in Food and Nutrition composed by a Physical (P-RI) and an electronic (e-RI) infrastructure which are strictly interconnected. PRO-METROFOOD Project (H2020 INFRADEV-02-2016, GA n.739568) represents the “Early Phase” of the RI and has among its objectives the definition of the operational capacities of the P-RI, with the design of its scientific services. The facilities have been inventoried and classified in a database, which provides an organized overview of the capacities of the distributed P-RI.

**Keywords:** Research infrastructure, Food, Nutrition, Metrology, Physical facilities

### 1. INTRODUCTION

Research infrastructures (RIs) network facilities, resources and services to accomplish a platform for research, education and innovation. RI can include different facilities like: major scientific equipment, knowledge based resources, archives and scientific data, e-resources and communication networks. They can be ‘single-sited’, ‘virtual’ or ‘distributed’ and are fundamental to promote open -science and -innovation. With its broad network, RI leads to regional, national, European and global development [1].

METROFOOD-RI is a new distributed RI for promoting metrology in food and nutrition; it is constituted by a Physical-RI (P-RI) and an electronic-

RI (e-RI) strictly interconnected with each other. The P-RI consists of a network of facilities that can be classified in a ‘Metro’ side, for the development of new measurement tools, and a ‘Food’ side, for the evaluation of food practices and processes along the entire food chain (from primary production to domestic preparation). More precisely, the ‘Metro’ side includes analytical facilities and facilities for Reference Materials (RM) production, while the ‘Food’ side holds experimental fields/farms and plants & facilities for food production/storage/preparation (see Fig.1).

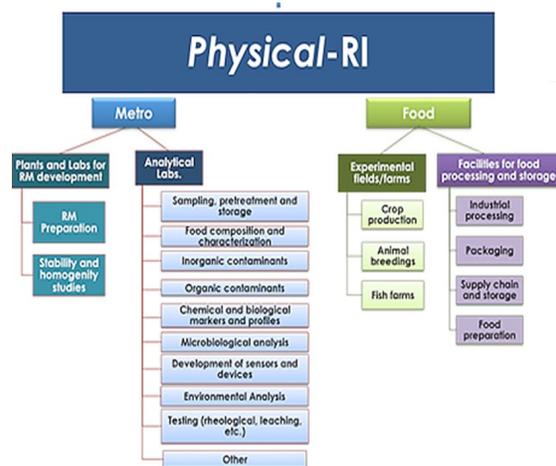


Figure 1. Representation of the Physical-RI of METROFOOD. Modified figure from: <http://www.metrofood.eu/infrastructure/infrastructure>.

METROFOOD-RI is currently undertaking its 'Early Phase', through PRO-METROFOOD H2020 INFRADEV-02 Project (GA 739568). One of the tasks was to define the operational capacities of the infrastructure and to design its scientific services. This includes the definition of a clear and complete inventory of the facilities involved in the P-RI, key services, know-how and metrology procedures to assure analyses of high quality in support of information during food production, packaging, diffusion and processing, including domestic practices. The methods used to execute this task and the obtained results are reported in this paper.

## 2. METHODS

In order to list and organise the facilities that each METROFOOD-RI Partner is networking, online surveys (Limesurvey, Version 2.62.0+170124) were created. In particular, three surveys were developed, respectively focused on:

- Analytical labs ("Metro")
- Facilities for development & production of Reference Materials ("Metro")
- Experimental fields/farms and plants & facilities for food processing/storage (kitchen labs included) ("Food")

These surveys gather, next to general information: main sectors of activity, information on delivered or potentially delivered services, a list of the facilities, plans for maintenance, plans for upgrading and available major equipment. The surveys were completed by all the METROFOOD-RI Partners (PRO-METROFOOD Beneficiaries and third parties, as well as new Partners), and the answers were exported to an Excel database and further elaborated.

## 3. RESULTS AND DISCUSSION

### 3.1. Survey participants

The Institutes involved in the P-RI, are listed in Table 1. Their contribution to either the 'Metro' and/or 'Food' side is also indicated. The list includes both PRO-METROFOOD Partners and the new Institutes that joined the METROFOOD-RI Consortium during the last year. The resulting database must be seen as a "living" instrument, to be upgraded and updated along time with information on new facilities or upgrading of the existing facilities of the already involved Partners, as

well as with the inclusion of new facilities if any new Institute should join the Consortium.

Table 1. Participating Countries and institutes

| Country         | Institutes  | Side   |
|-----------------|---|--|
| Italy           | ENEA<br>ISS<br>INRIM<br>CNR<br>CREA<br>University of Brescia<br>FEM<br>University of Udine<br>ICQRF<br>University of Parma<br>University of Napoli<br>Federico II | Metro & Food<br>Metro<br>Metro<br>Metro & Food<br>Metro & Food<br>Metro<br>Metro<br>Metro<br>Metro<br>Metro & Food<br>Metro & Food |
| Romania         | IBA   | Metro & Food   |
| Spain           | CIDETEC   | Metro  |
| France          | LNE<br>ANDERA<br>ANSES<br>UPPA  | Metro<br>Metro<br>Metro & Food<br>Metro  |
| Greece          | AUA<br>AUTH<br>EIM<br>HHF<br>MAICH<br>UOI   | Metro<br>Metro<br>Metro<br>Metro<br>Metro<br>Metro   |
| Czech Republic  | CZU/CULS  | Metro  |
| Hungary         | USZ<br>SZTE   | Metro<br>Metro   |
| Finland         | EVIRA   | Metro  |
| The Netherlands | RIKILT  | Metro  |
| Germany         | TUM   | Metro  |
| Slovenia        | JSI<br>NIB  | Metro<br>Metro   |
| FYROM           | IJZRM<br>FASF   | Metro<br>Metro   |
| Belgium         | WIV-ISP<br>CODA-CERVA   | Metro<br>Metro   |
| Turkey          | TÜBITAK   | Metro & Food   |
| Moldova         | SPIHFT  | Metro  |

|          |  |                |
|----------|--|----------------|
|          | SAUM<br>Center for Applied<br>Metrology and<br>Certification | Metro<br>Metro |
| Portugal | INSA   | Metro          |
| Norway   | NTNU   | Metro          |

So far, the total amount of submitted and analyzed surveys is 160 (*Update: August 7<sup>th</sup> 2017*): 122 for analytical labs, 13 for facilities for the production of Reference Materials and 25 for food production facilities, with a different distribution among the Countries.

A critical point in this paragraph is that the received surveys have a different degree of detail. In some cases, one survey contains the information of one facility within the institute, while in the other cases different facilities of one institute are included. This requires a further examination and homogenization.

### 3.2. Food sectors, categories and instrument %

In order to organise the facilities partaking in the P-RI, a classification in food sectors and their categories is made for the analytical facilities, RM facilities and experimental fields/farms and plants & facilities for food production/storage/preparation.

The majority of the analytical facilities is active in the food safety (88), -quality (82) and –authenticity/traceability (63) sector. Three other sectors are less represented currently 35 labs in nutrition, 38 in characterization of materials sectors and 27 in agroecosystem characterization.

For the RM facilities, the sectors and the respective amount of facilities contributing are: Matrix–RMs (ten facilities active, one potentially), Process Intermediate RMs (two active and one potentially), Pure substances and calibrated solutions (five active), Spiked-RMs (seven active) and Participation in the certification of reference materials (one active).

The facilities for food production are active in the following sectors: primary production (9 facilities), food processing (17), food storage (3), food packaging (8), food preparation/ Kitchen labs (3), treatment/reduction of food waste (5), production of aids in food production/storage (5) and valorisation of food waste (3).

### 3.3. Offered services

The current offered services from the METROFOOD Partners and their third parties are classified in different categories for the ‘Metro’ side and can be seen in Fig.2. For the ‘Food’ side of the P-RI, no classification was made because of the lower amount of expected participants. A classification can be made in the future.

The services offered to third parties and stakeholders gives a first view on the possible services that can be exchanged within the METROFOOD-RI Consortium and delivered to external users.

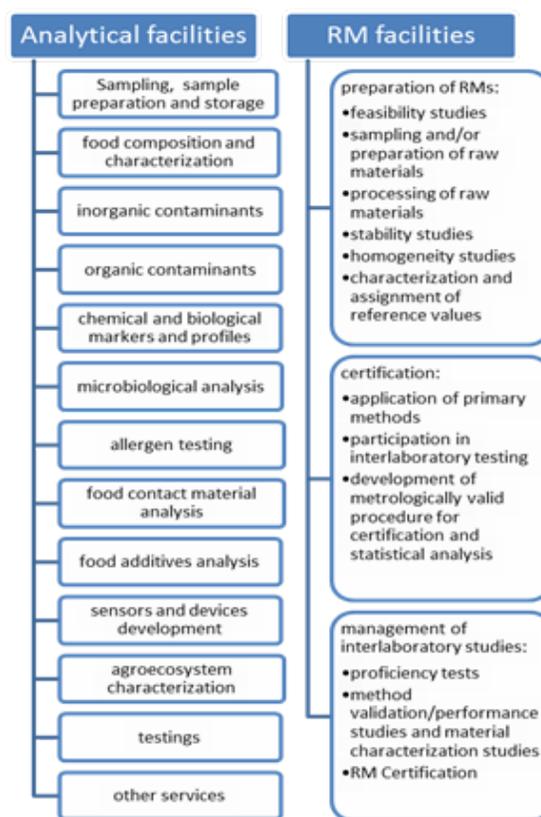


Figure 2. Presentation of the services categories for the “Metro” side.

### 3.4. Quality systems and Reference Laboratories

In order to support the activities on quality management, information about the currently used quality systems (QS) and the presence of reference laboratories (RL) has been analysed. 52% of the participating analytical facilities and 47% of the facilities for RM production have QS (one or more) in place. The percentage of the facilities that are

planning on obtaining QS is 5% and 20% respectively for analytical- and RM production facilities. Considering the RL, 42% of the analytical facilities and 29% of the RM production facilities are RL.

### 3.5. Instrumentation

An in-depth inventory of the major equipment available to the METROFOOD-RI has been made and categorised based on the type of analysis or handling the instruments are used for. With this information, estimation can be made of the value of the P-RI and the possibilities for future analysis. Maintenance programs and plans for upgrading were included in the inventory as well.

## 4. CONCLUSIONS

The information gathered from the three surveys, gives an overview of the research facilities and delivered services from the METROFOOD-RI Consortium. Insight in the infrastructure and the availability of major equipment is also obtained. Due to the complexity of the inventory and the many available facilities, together with the need to inventor them in an appropriate, structured and well-organized way, as well as to the fact that new Partners joined the Consortium, further elaboration of data will be necessary. The resulting database should be seen as a “living” document, to be further improved with the update of the ones already included and the inclusion of the (eventual) new ones.

In the future, the same approach could be applied in an extended and improved way for realizing a global map of physical facilities, also externally to METROFOOD-RI.

## ACKNOWLEDGMENTS

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## REFERENCES

- [1] European Commission, European Charter for Access to Research Infrastructures: Principles and Guidelines for Access and Related Services. European Union, Brussels, 2016, ISBN: 978-92-79-45600-8.