NUTRI•KNOW

Meta-database after initial analyses of the OGs outcomes

D1.4

June 2024

Task 1.4 Summary meta-database

UGENT

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Technical References

Project acronym	NUTRI-KNOW
Project full title	NUTRI-KNOW - BROADENING THE IMPACT OF EIP-AGRI OPERATIONAL GROUPS IN THE FIELD OF NUTRIENT MANAGEMENT: KNOWLEDGE EXPLOITATION AND EASY-TO-UNDERSTAND MATERIAL FOR FARMERS AND PRACTITIONERS
Call	NUTRI-KNOW — HORIZON-CL6-2022-GOVERNANCE-01
Grant number	101086524
Project website	www.nutri-know.eu
Coordinator	UVIC-UCC

Deliverable No.	1.4
Deliverable nature	DATA — data sets, microdata, etc
Workpackage (WP)	WP1 Knowledge collection and analysis of main outcomes from engaged EIP-AGRI OGs related to nutrient management
Task	Task 1.4 Summary meta-database
Dissemination level [1]	PU
Due date	Status completion
Number of pages	96
Keywords	Meta-data, nutrient management, EU-FarmBook platform
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Due date of deliverable	30/06/2024
Actual submission date	28/06/2024

1 PU = Public, fully open, e.g., web (Deliverables flagged as public will be automatically published in CORDIS project's page)

SEN = Sensitive, limited under the conditions of the Grant Agreement

EU-R = EU Restricted under the Commission Decision No2015/444

EU-C = EU Confidential under the Commission Decision No2015/444

EU-S = EU Secret under the Commission Decision No2015/444

Document History

V	Date	Beneficiary	Author
V0.1	20.05.2024	UGent	Hongzhen Luo
V0.2	6.06.2024	UGent, UVIC, WE&B	Hongzhen Luo (UGENT), Anna Bagó (UVIC-UCC), Beatriz Medina, Maria Pascual Sánchez (WE&B)
V0.3	21.06.2024	NUTRI-KNOW consortium	All Partners
V1.0	30.06.2024	NUTRI-KNOW consortium	Hongzhen Luo

Summary

The primary challenge in knowledge exchange with farmers is the disconnect between the generation of innovative agricultural knowledge and its practical application. Farmers often lack awareness of the latest advancements or find the information too complex or irrelevant to their specific contexts. Additionally, existing communication channels are not always effective in conveying new practices and technologies in a way that resonates with farmers' daily experiences and needs. This gap is further exacerbated by the diversity in farming practices across different regions, making it difficult to create a one-size-fits-all approach to knowledge dissemination.

Establishing a comprehensive data matrix is crucial in addressing these challenges. The NUTRI-KNOW project contributes to bridge the knowledge gap by collecting, translating, and broadening the outcomes of the EIP-AGRI Operational Groups (OGs) to support the adoption of innovative practices across borders. Built on the on-going efforts of this project, Task (T) 1.4 aims to create a meta-database that consolidates the individual final outcomes of each of the 12 engaged OG, current farming practices, and results of different analyses in the finished and on-going tasks. Deliverable (D)1.4, as the main outcome of T1.4, consists of four chapters: **Chapter 1** introduced the significance of NUTRI-KNOW project in addressing the challenges of knowledge exchange between scientific and practical stakeholders. **Chapter 2** established the methodology to create an executive meta-database for efficient communication and knowledge use within consortium, and an practical meta-database to disseminate and communicate the obtained knowledge to a broader public. **Chapter 3** summarised the statistics of information included in the meta-databases, facilitated with showcase examples. Finally, **Chapter 4** suggested the general and continuous impact of these meta-databases**.**

Disclaimer

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Table of Abbreviation

AKIS	Agricultural Knowledge and Innovation Systems
CAP	Common Agricultural Policy
D	Deliverable
EC	European commission
EIP-AGRI	European Innovation Partnership for Agricultural Productivity and Sustainability
EU	European Union
M	Month of the project implementation
MOOC	Massive Open Online Course
OG	Operational Group
SH	Stakeholders
WP	Work Package

1. Introduction

In the rapidly evolving field of agriculture, the dissemination of innovative practices and technologies is critical for improving productivity, sustainability, and resilience. However, the journey from research to real-world application is fraught with challenges. The disconnect between researchers and farmers is a significant barrier for effective knowledge transfer. Farmers often struggle to access, interpret, and implement new agricultural knowledge due to a lack of awareness, complexity of information, or perceived irrelevance to their specific farming conditions. This situation is compounded by the diversity in farming practices, climates, and socio-economic conditions across different regions, which makes it difficult to develop a universally applicable approach to knowledge dissemination.

The NUTRI-KNOW project addresses these challenges by creating a comprehensive and dynamic system for knowledge exchange that bridges the gap between research and practice. By focusing on the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) Operational Groups (OGs), the project aims to support the adoption of innovative agricultural practices across borders. These OGs are collaborative groups that bring together farmers, advisors, researchers, businesses, and other stakeholders to develop practical solutions to agricultural challenges. The knowledge generated by these groups is valuable, but its impact is limited if it is not effectively communicated and adopted by the broader farming community.

A key component of the NUTRI-KNOW project is the establishment of a comprehensive data matrix in Task 1.4 that consolidates the outcomes of the engaged OGs. This matrix serves as a foundation for creating a meta-database that integrates the final outcomes of each OG, current farming practices, and results of various analyses conducted in finished and ongoing tasks. This meta-database is built on the ongoing efforts of Work Packages (WP) 1 and 2 of the NUTRI-KNOW project. By consolidating and translating the outcomes of the OGs, the meta-database provides a structured summary of key information, making it easier for farmers and other stakeholders to find, access, and apply the knowledge in their own contexts. By adhering to widely adopted FAIR (Findable, Accessible, Interoperable, and Reusable) standards, the meta-database ensures that the information is organized in a way that promotes easy access and reuse. This is essential for supporting the activities of other WPs and facilitating connections and knowledge sharing between projects and stakeholders. The meta-database also promotes cooperation and the implementation of innovative solutions by providing a comprehensive and user-friendly repository of agricultural knowledge.

Deliverable (D)1.4, as the main outcome of Task 1.4, summarizes the methodology used to create the meta-databases, the structure of the meta-databases, and the statistics of the metadata included in the databases. This deliverable ensures that the meta-databases are aligned and fed with the results of WP1 and WP2, and guides the production of practice-oriented material in WP3. By presenting the data with the proper level of detail, D1.4 ensures that the information is both accessible and actionable for farmers and other stakeholders. This structured approach not only enhances the usability of the information but also promotes better knowledge exchange and cooperation among stakeholders, ultimately supporting the adoption of innovative agricultural practices.

2. Methodology

Metadata means "data about data." It is defined as data providing information about one or more aspects of the data and is used to summarize basic information about data, making tracking and working with specific data easier. Examples include the means of creation, purpose, time and date

of creation, creator or author, location on a computer network, standards used, file size, data quality, source, and the process used to create the data[1].

There are several distinct types of metadata, each serving different purposes and scenarios:

- **Descriptive Metadata:** This metadata offers descriptive information about a resource, aiding in its discovery and identification. It includes elements such as title, abstract, author, and keywords, which facilitate the search and location of an object. For instance, in a library catalog, descriptive metadata helps users find books by providing titles, authors, and summaries.
- **Structural Metadata:** This type of metadata concerns the organization of data containers and explains how compound objects are assembled, such as the ordering of pages to form chapters. It details the types, versions, relationships, and other characteristics of digital materials. An example is the content table of an e-book, where structural metadata ensures that chapters are displayed in the correct order.
- **Administrative Metadata:** This metadata provides information to manage a resource, including resource type, permissions, and details on its creation and modification. It includes two sub-types:
    - **Rights Management Metadata:** Explains intellectual property rights. For example, a digital image may include metadata about copyright restrictions.
    - **Preservation Metadata:** Contains information necessary for preserving and saving a resource. In digital archives, preservation metadata records the format and storage requirements to ensure long-term accessibility.
- **Reference Metadata:** Provides information about the contents and quality of statistical data. For instance, in a statistical report, reference metadata includes details about the data collection methods and reliability of the data.
- **Statistical Metadata:** Also known as process data, it describes the processes involved in collecting, processing, or producing statistical data. For example, in a census, statistical metadata documents the procedures used for data collection and validation.
- **Legal Metadata:** Provides information about the creator, copyright holder, and any public licensing associated with the data. An example is open-access research articles, where legal metadata specifies the licensing terms for reuse.

Note that metadata is not strictly confined to these categories, as it can describe data in various other ways, depending on the context and requirements. Metadata can be stored and managed in a database (meta-database), aiming to serve distinct purposes and end-users.

Within the NUTRI-KNOW project, two types of meta-databases were created following the roadmap in Figure 1. These meta-databases consist of all the abovementioned types of metadata collected and used during the project implementation:

1) **Executive Meta-Database:** a structured summary of the main outcomes from WP1 and WP2, designed to better serve the NUTRI-KNOW consortium for the creation of practical materials in WP3 as well as the communication and dissemination activities in WP4. It also provides a comprehensive overview of the available data and accessible links for external users interested in further implementation of the OG outcomes.

[1] ISO/IEC 11179-1:2004 Information technology – Metadata registries (MDR) – Part 1: Framework". International Organization for Standardization. 18 March 2009. Archived from the original on 17 January 2012. Retrieved 23 December 2011.

2) **Practical Meta-Database:** an extension of the executive meta-database presented in the format of knowledge objects and openly published on the EU-FarmBook platform[2], this database serves as a professional and user-friendly repository, presenting the OGs and NUTRI-KNOW outcomes in easy-understanding languages and practical formats (such as practical abstracts, factsheets, videos, etc.). It aims to bridge the knowledge gaps between stakeholders and EU-funded projects like NUTRI-KNOW, facilitating broader dissemination and adoption of innovative practices.

The process of establishing the executive meta-database began with internal discussions with WP1 and WP2 task leaders including UGENT, FCAC, UVIC-UCC, and WE&B. During the discussion, the team collaboratively developed the format and structure for the metadata that would be included in the database and proceeded to fill in the existing content from each task. After the initial draft of the executive meta-database was completed, it was shared within the project consortium to collect feedback for further improvements. Finally, the meta-database was finalized and made available for use by all project partners. This final version incorporated all feedback and ensured that the meta-database was a valuable resource for ongoing and future project activities, which will be publicly available on the NUTRI-KNOW website.

Establishing the practical meta-database involved initiating cooperation with the EU-FarmBook platform. This was achieved through email and in-person communications with the scientific coordinator of the platform, laying the groundwork for collaboration. The cooperation was formally confirmed during the international advisory board (IAB) meeting held on 5th October, 2023. Then after the pre-launch of the EU-FarmBook platform on 8th February 2024, the manuals necessary for preparing and uploading metadata to the platform, i.e. EU-FarmBook metadata guide (annex 1) and Upload User Manual (annex 2), were made available. Following the instructions in the manuals and with the efforts of whole NUTRI-KNOW consortium, a summary of the metadata to be included in the practical meta-database was created. This list of metadata was screened to ensure the information met the requirements for uploading to the EU-FarmBook platform, after which, the metadata was finalized and uploaded to the EU-FarmBook platform.

Beyond the implementing period of T1.4 (i.e. submission of D1.4 Meta-database after initial analyses of the OGs outcomes in M18), there will be continuous updating of the two meta-databases with the new results obtained from WP2 analysis, additional informative materials from OGs, and newly created practical materials in WP3 and WP4.

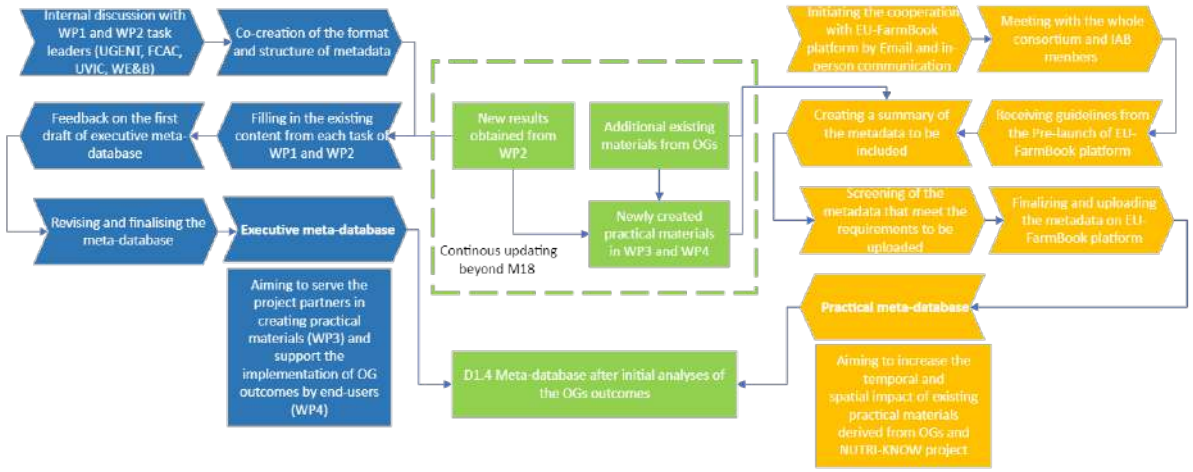

Figure 1 - Roadmap of Task 1.4 actions to create the internal and *practical meta-databases*

[2] EU-FarmBook (https://eufarmbook.eu) is an online platform developed by the EU-granted project EU-FarmBook, aiming to gather and share agriculture and forestry knowledge for farmers & foresters, granting access to the practical knowledge objects according to findable, accessible, interoperable, and reusable (FAIR) data principles.

3. Summary of the meta-databases

3.1. Executive meta-database

The executive meta-database is an EXCEL file compiling a preface (metadata) and 12 worksheets, one for each of the 12 engaged operational groups, consisting of the main results from WP1 and WP2 tasks, as summarized in Table 1. The meta-database is currently available as a working document in the project MS SharePoint folder. Annex 3 presents an example of the executive meta-database the OG "Development of a slurry concentrator with continuous total nitrogen data collection".

Table 1 - Preface of the executive meta-database

Involved NUTRI-KNOW tasks	Color code	Brief description of the data included	Linked deliverables
Task 1.1 Collection and analysis of engaged OGs outcomes on nutrient management		Basic information including title, objectives, methodology, main results, budget, responsible partner, etc.	D1.1 Inventory and analyses of selected OGs outcomes on nutrient management
Task 1.1 Collection and analysis of engaged OGs outcomes on nutrient management		Relevant agricultural supporting programmes, regulations or legislations at EU/country/region level.	D1.1 Inventory and analyses of selected OGs outcomes on nutrient management
Task 1.2 Compilation of current farming practices on nutrient management		Current farming practices related to OGs.	D1.2 Inventory of current farming practices on nutrient management
Task 1.3 Cost-benefit and sustainability analysis		Composition of OG consortium, mirror projects.	D1.3 Results of the cost-benefit and sustainability analysis
Task 1.3 Cost-benefit and sustainability analysis		Risk exposure and OG consortium evaluation on the impact of knowledge and communication, society, environment, economy, and legislation.	D1.3 Results of the cost-benefit and sustainability analysis
Task 2.1 Alignment of results to EIP-AGRI/AKIS, market and policy		Stakeholder evaluation on the awareness and effectiveness of OG outcomes, main challenges and the legislative needs at regional level.	D2.1 Matchmaking of OG outcomes with market and policy
Task 2.2 Mapping stakeholders that are relevant for the implementation and dissemination of EIP-AGRI OGs outcomes		Stakeholder database including the name of organisation and link to the SHs map on kumu.com.	D2.2 Mapping of stakeholders and target audience
Task 2.3 Identification of knowledge needs and barriers for user acceptance		Fuzzy cognitive maps co-created with stakeholders to identify the knowledge needs and barriers in implementing the OG outcomes	D2.3 Report on need and barriers for user acceptance

Note that T2.3 *Identification of knowledge needs and barriers for user acceptance* (M6-M18) is on-going in parallel with T1.4, so the results of T2.3 are not yet finalized to be included in the current version of executive meta-database. Therefore, this executive meta-database will be continuously updated by including the newly obtained results from T2.3, which will be documented in D 2.3

Report on Need and Barriers for User Acceptance (due in M18). This will include detailed insights into the needs and barriers faced by users, enhancing the database's utility in addressing specific stakeholder challenges and providing a country perspective. By incorporating these results, the executive meta-database will provide a more nuanced understanding of user acceptance issues, facilitating the creation of more targeted and effective practical materials in WP3 and informing communication strategies in WP4. To this end, the executive meta-database also supports and promotes the further development of the practical meta-database.

3.2 Practical meta-database published on EU-FarmBook Platform

Beyond the executive meta-database aiming to guide the data use within and beyond the project consortium, a public meta-database with more practical details is established under the cooperation with the EU-FarmBook team. EU-FarmBook is a Horizon Europe project whose goal is to build an online platform (i.e. EU-FarmBook Platform) to support knowledge exchange between EU projects and practitioners in the agriculture and forestry sectors. Table 2 listed the key properties of the metadata, brief instructions provided by the EU-FarmBook platform manual: the metadata guide (Annex 1) and additional remarks for NUTRI-KNOW partners.

Table 2- Summary of the key properties in the metadata and brief instructions for the expected content.

Metadata property	Expected content	Additional remarks for NUTRI-KNOW partners
Title	A short sentence or phrase being the title of the Metadata.	Suggested formulation: Project acronym_Type and content of the material
Description	A short text of up to 500 words serving the purpose of the description (summary) of the Metadata.	
Keywords	A short list of keywords or key phrases separated by a comma (“,”) or semi-colon (“;”) separator.	Suggested to highlight the involved value chain steps here; suggest limiting to maximum 6 keywords
Creator(s)	The name/names of the person/persons involved in the creation of the Metadata.	In cases of more than one creator, the names can be separated by a comma (“,”) or semi-colon (“;”) separator.
Email (s)	The email/emails of the person/persons involved in the creation of the Metadata.	It is mandatory to fill in the email address of the creators on EU-FarmBook Platform; in case the email of the original creator is not available/consented, please fill in the email of OG coordinator or the responsible partner from NUTRI-KNOW.
Language(s)	Official languages in Europe	In case materials are available in more than languages, they can be uploaded as attachments for the English version under the same metadata
Date of completion	A full date provided in the form DD/MM/YYYY.	In case a full date is not available, the year of completion, provided in the form YYYY, will suffice.

Metadata property	Expected content	Additional remarks for NUTRI-KNOW partners
Intended purpose	One or more of the purposes in the following list: access to data; communication; dissemination; education/training; data storage/ processing; monitoring; modelling; evaluation; decision-making support; prediction/ forecasting; experimentation	
Geographic location(s)	One or more of the countries in Europe.	The 12 engaged OGs are/were conducted in 4 NUTR-KNOW member states: Spain, Belgium, Ireland and Italy. However, the geographic locations of the outcomes may not be limited to these regions.
Metadata URL	An URL directing to the webpage from which the Metadata was initially made available.	For example, the web inventory of the project in which the Metadata has been created, or the platform in which the Metadata has been made initially available.
Category	A category from the following list. {document; slideshow presentation; dataset; video; audio; image; software application; dataset}.	
Type	One or more types from each of the listed types available per Metadata category	Please check the description and examples in Annex 1: EU-FarmBook platform manual: the metadata guide
Subject	Top-level subject(s): One or more subjects from each of the subject listed in the manual	Please check the description and examples in Annex 1: EU-FarmBook platform manual: the metadata guide
	Second-level subject(s): One or more subjects from each of the subject listed in the manual	Please check the description and examples in Annex 1: EU-FarmBook platform manual: the metadata guide
License	The URL of the license (e.g., https://creativecommons.org/licenses/by-sa/4.0/) or the license name (e.g., “Attribution-ShareAlike 4.0 International (CC BY-SA 4.0)”).	The license to be assigned to a Metadata by default is CC BY 4.0.
Format	File formats to consider for each category of Metadatas are listed in the manual	Please check the description and examples in Annex 1: EU-FarmBook platform manual: the metadata guide
File size	A numerical value followed by the file size unit (in KBs, MBs, or GBs).	
Project name	A short phrase providing the project’s name.	NUTRI-KNOW - broadening the impact of EIP-AGRI operational groups in the field of nutrient management: knowledge exploitation and easy-to-understand material for farmers and practitioners

Metadata property	Expected content	Additional remarks for NUTRI-KNOW partners
Project acronym	One or more words constituting the acronym of the project.	NUTRI-KNOW
Project URL	The URL of the project's official website or the link to the project's webpage in CORDIS (in the case of EU-funded Research and Innovation projects).	https://www.nutri-know.eu/

By 3rd June, **95** metadata has been created for the existing materials in the 12 engaged OGs. However, not all of them are suitable to be uploaded to the EU-FarmBook Platform, given that:

- The main objective of NUTRI-KNOW is to provide practical information for end-users in an easy-understanding language, and thus increasing the impact of OG outcomes;
- The EU-FarmBook platform requires the uploaded metadata to be open access with the original materials (in format of word, pdf, ppt, image, video or audio, …) and the consent of the creators.

Accordingly, the priority is given to the metadata with existing practical materials such as:

- Factsheets, practice abstracts, infographics or flyers that provide concise information in easy-understanding language;
- Short (1-2 pages) report with practical information;
- Videos to introduce the outcomes and guide the implementation;

Materials such as full records of the webinar, event, etc. that are over 2 hours, or dedicated deliverables, reports and scientific publications are not the priority at this stage, but they are valuable for a longer-term impact after project implementation, therefore it is possible to upload them at a later stage. There are also some materials that are relevant to the OG outcomes but not in the scope of the EU-FarmBook platform, such as short-term practical information including event notifications and social media posts, or individual photographs without informative descriptions.

As a result, **70** of the listed metadata have been uploaded to the EU-FarmBook platform (see Annex 4). Figure 2 provides an example of the uploaded knowledge objects for OG RENURE.

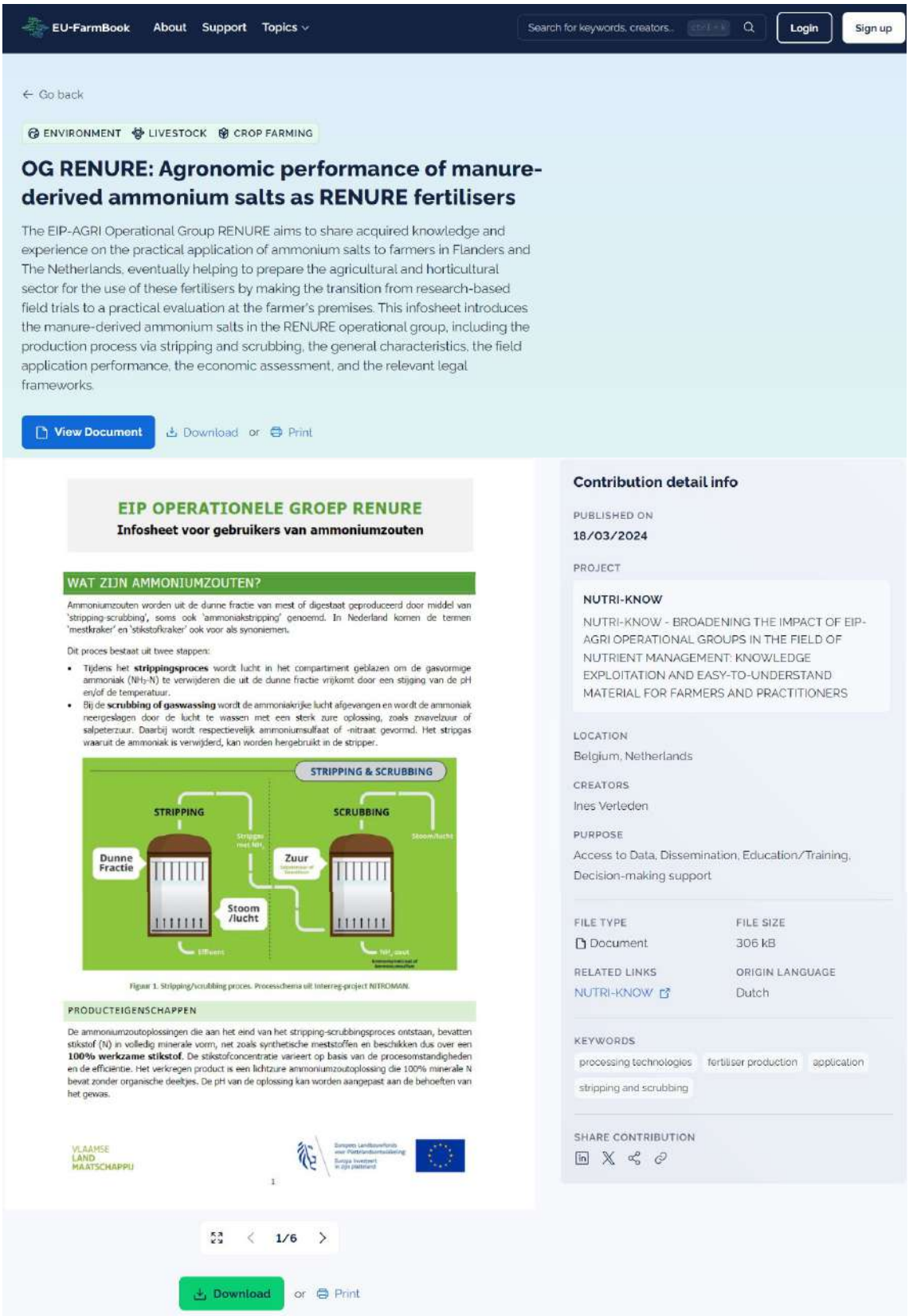

Figure 2 - An example of metadata created for OG RENURE and uploaded to EU-FarmBook platform

Figures 3-6 provide a statistical summary of the metadata uploaded to the EU-FarmBook platform in terms of the engaged OGs (Figure 3), the targeted regions (Figure 4), the official languages

(Figure 5) and the involved topics (Figure 6). In summary, the uploaded metadata covers 5 of the 6 topics (Crop farming, Livestock, Environment, Economics, Society), mainly targeting farmers and practitioners in six regions (i.e. The Netherlands, Flanders (Belgium), Ireland, Catalunya (Spain), Toledo (Spain), Emilia Romagna (Italy)). The practical materials included in this meta-database were written in five official languages (Dutch, English, Catalan, Spanish, Italian), containing a variety of easy-to-understand, practice-oriented knowledge in the formats of document, slideshow presentation, image and video, etc.

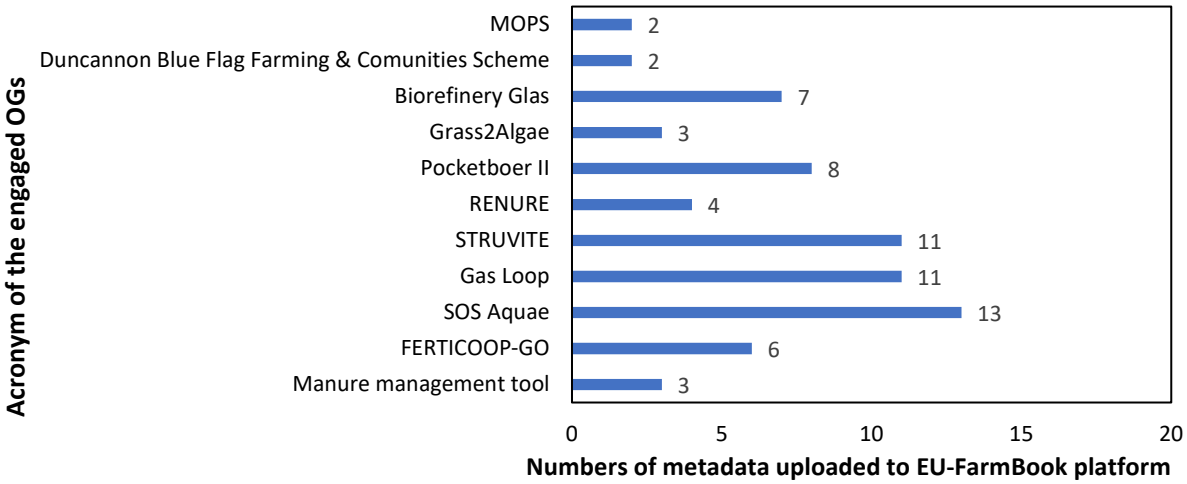

Figure 3 – Numbers of metadata provided by the engaged OGs that have been uploaded to EU-FarmBook platform

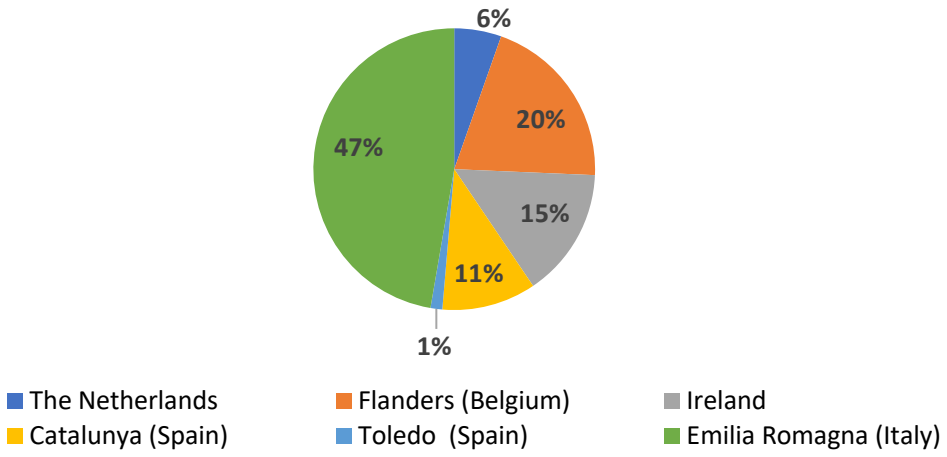

Figure 4 – Distribution of the geographic location(s) targeted by the 70 uploaded metadata that have been uploaded to EU-FarmBook platform

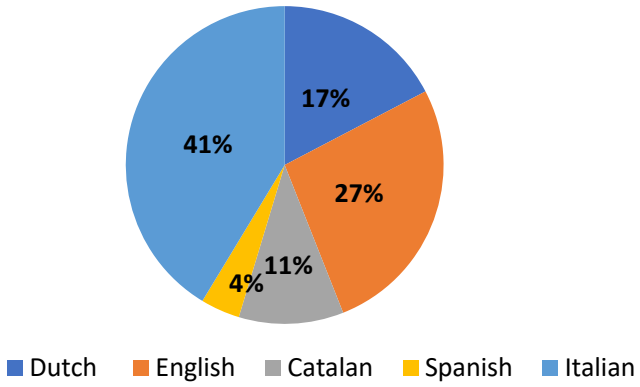

Figure 5- Usage of the official languages in the 70 uploaded metadata that have been uploaded to EU-FarmBook platform

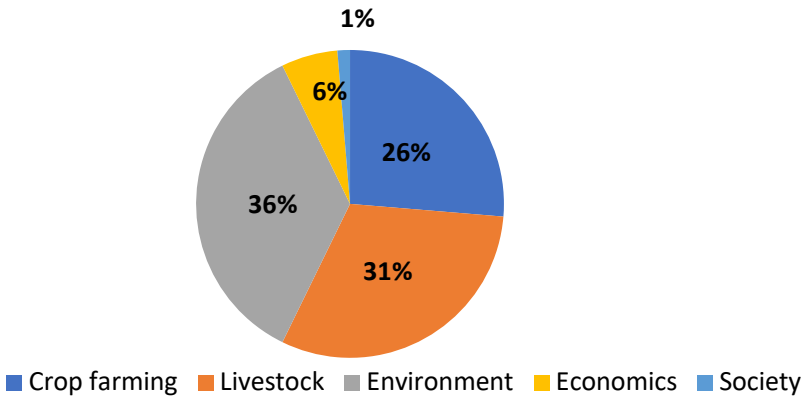

Figure 6- Involvement of the defined topics in the 70 metadata that have been uploaded to EU-FarmBook platform

The practical meta-database, presented as knowledge objects and published on the EU-FarmBook platform, serves as a professional and user-friendly repository. It will be regularly updated to ensure it remains a valuable and up-to-date resource for external stakeholders. The potential sources of materials for continuous updating includes:

- **Existing informative materials from 12 engaged OGs**: Comprehensive content from the 12 OGs that have not been uploaded to the EU-FarmBook platform, including scientific publications, deliverables, webinar recordings, and other relevant documents.
- **Including the newly created practical materials from WP3**: Practical materials such as booklets and practice abstracts created in WP3 based on the executive meta-database will be added. These materials will translate complex data into user-friendly formats, such as guides, best practice manuals, and instructional videos. Not only that, a substantial part of these materials will be translated into all the languages of the project partners to increase its diffusion given that it has emerged that linguistic barriers can limit the amplification of the OGs innovations.
- **Additional materials from WP4 activities**: including the audio-visual materials developed for Massive Open Online Courses (MOOCs), recordings and materials from the planned webinar series for each of the six steps of the nutrient value chain, journalistic articles for the stakeholder interviews, materials and reports of the six in-service short trainings as well as one train-the-trainer course to be conducted in each of the four member states (ES, IE, BE, IT).

4. Conclusions and future perspectives

This deliverable describes the establishment of two comprehensive meta-databases:

- The executive meta-database consists of the basic information of the 12 engaged OGs, current farming practices and different analytical data obtained in NUTRI-KNOW project. The information in this database can directly support the NUTRI-KNOW consortium in developing practical materials and effective communication strategies, facilitating better coordination and synergy among different WPs, ensuring that all project activities are informed by the latest data and insights.
- The practical meta-database, published on the EU-FarmBook platform, showcases the individual final outcomes related to each OG in attractive and widely accessible formats. This database aims to support stakeholders in making better-informed decisions based on comprehensive data and successful case studies, facilitating the uptake of new technologies and practices by providing clear, practical guidance and support. By cooperating with EU-FarmBook project to create an EU-wide open-source interactive database, the practical meta-database also bridges gaps between research outcomes and practical implementation, externs the outreach to a diverse stakeholder group, thus significantly enhancing knowledge exchange within and beyond NUTRI-KNOW project.

These two meta-databases will be continuously updated to maintain an up-to-date and dynamic resource for stakeholders. The executive meta-database will be updated with new results from T2.3, based on the D2.3 *Report on the need and barriers for user acceptance* finalised by M18. The practical meta-database will be further extended by incorporating existing materials from the 12 engaged OGs that have not yet been uploaded to the EU-FarmBook platform, as well as new analyses, reports, or records created during the implementation of NUTRI-KNOW activities.

In addition, the EU-FarmBook team is developing a dashboard on the platform to support projects contributing to its database, with the NUTRI-KNOW project being a significant contributor. This dashboard is anticipated to provide detailed metrics on user engagement with NUTRI-KNOW's knowledge objects, including the number of clicks and downloads, average duration of engagement, and links to other projects based on keywords or subtopics. Such a data tracking and analysis approach will facilitate a deep understanding of the impact of NUTRI-KNOW outcomes. Furthermore, the dashboard can increase the visibility of NUTRI-KNOW's contributions within the EU-FarmBook platform and foster enhanced collaboration with other projects.

Annexes

Annex 1 EU-FarmBook platform manual: the metadata guide

EU-FarmBook

Guide to EU-FarmBook metadata

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Guide to EU-FarmBook metadata

1. Preface

The EU-FarmBook platform is the point of reference for agriculture and forestry related content and information targeting the Agricultural Knowledge and Innovation Systems networks (AKIS) that exist at the regional, national, and EU levels. It provides access to outputs of Research and Innovation projects funded by EU Framework Programmes (Horizon 2020 and Horizon Europe), Operational Group projects, as well as material from national and/or regional platforms for practice. These outputs are grouped into seven (7) broad categories relating to the format into which information is being conveyed: (i) text documents; (ii) slideshow presentations; (iii) videos; (iv) audios; (v) images; (vi) software applications; and (vii) datasets. Knowledge Objects is the term used to refer to the digital (practice-oriented) material pertaining to the above categories, which is delivered from the EU-FarmBook platform.

This document presents and explains the information needed for the description of each of the Knowledge Objects hosted in the EU-FarmBook platform. This information is called metadata and is important for the efficient storage of Knowledge Objects in the platform, as well as their search and retrieval by the platform users. In the next section, accounts of what metadata is, and what it is used for, are given. Section 3 presents and explains the metadata of the EU-FarmBook platform. An illustrative example is provided in Section 4 to make clear the use of the EU-FarmBook platform metadata and details on the values of specific metadata are provided in the Annexes of the document.

2. What is metadata and what do we need it for?

Metadata is information about a Knowledge Object (document, presentation, video, etc.) that helps index it in the EU-FarmBook platform and deliver it to the platform users. It is background information that the users of the EU-FarmBook platform should be provided with to make decisions about whether the Knowledge Object is relevant to their needs and interests. Describing Knowledge Objects with the "correct" metadata is of utmost importance as it can facilitate successful searches of Knowledge Objects in the EU-FarmBook platform.

Examples of metadata include the **creator(s)** of a Knowledge Object, the Knowledge Object's **title**, as well as **keywords** or **subject labels** stating what the Knowledge Object is about. Metadata should be easily interpreted so as to efficiently categorise Knowledge Objects and make them easier to find and collect.

3. EU-FarmBook metadata for Knowledge Object description

The EU-FarmBook metadata has been identified as the minimum set of information that is considered as a "must have" for the adequate description of the Knowledge Objects hosted in the EU-FarmBook platform. All metadata have been defined using existing and well-known ontologies and vocabularies. In the following subsections, a brief explanation

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for each of the EU-FarmBook's metadata is provided. Expected values are mentioned, as well as an indication about whether each of our metadata is mandatory or optional.

3.1. Title

Explanation: A descriptive name provided to the Knowledge Object by its creator(s).

Is required: Mandatory.

Expected value(s): A short sentence or phrase being the title of the Knowledge Object.

3.2. Description

Explanation: A short textual summary of the content of a Knowledge Object, or what the Knowledge Object is about. In the case of Knowledge Objects that are documents, their description can be the abstract of the document (if there is an abstract available).

Is required: Mandatory.

Expected value(s): A short text of not more than 100 words serving the purpose of the description (summary) of the Knowledge Object.

3.3. Keywords

Explanation: A list of words/phrases providing indications of what the Knowledge Object is about. They need to be indicative of the Knowledge Object's information and content, thus enabling search and findability by the EU-FarmBook platform users.

Is required: Mandatory.

Expected value(s): A short list of keywords or key phrases separated by a comma (",") or semi-colon (";") separator.

3.4. Creator(s)

Explanation: The person(s) involved in the creation of a Knowledge Object.

Is required: Mandatory.

Expected value(s): The name/names of the person/persons involved in the creation of the Knowledge Object. In cases of more than one creator, the names can be separated by a comma (",") or semi-colon (";") separator.

3.5. Language(s)

Explanation: The language in which the Knowledge Object can be accessed and used (for instance, in the case of software applications) or in which its content is available.

Is required: Mandatory.

Expected value(s): Language from the list of languages officially spoken in Europe. {Bulgarian; Croatian; Czech; Danish; Dutch; English; Estonian; Finnish; French; German; Greek; Hungarian; Irish; Italian; Latvian; Lithuanian; Maltese; Polish; Portuguese; Romanian; Slovak; Slovenian; Spanish; Swedish}.

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3.6. Date of completion

Explanation: The date on which the creation of a Knowledge Object was completed. It is a useful piece of information considering the pace at which new project results become available and how quickly they get outdated.

Is required: Mandatory.

Expected value(s): A full date provided in the form DD/MM/YYYY. In case a full date is not available, the year of completion, provided in the form YYYY, will suffice.

3.7. Intended purpose

Explanation: The purpose for which the Knowledge Object was created. Starting from the assumption that not all Knowledge Objects have the same purpose, making their purpose known can help the identification of content and information of usefulness to the EU-FarmBook platform users.

Is required: Mandatory.

Expected value(s): One or more of the purposes in the following list.
{access to data; communication; dissemination; education/training; data storage/ processing; monitoring; modelling; evaluation; decision-making support; prediction/ forecasting; experimentation}.

3.8. Geographic location(s)

Explanation: The geographic location(s) the content of a Knowledge Object relates to. Providing information on the location or locations the content of a Knowledge Object is related helps users of the platform find information of relevance to where they are being located, and thus what information and content they would be interested in accessing.

Is required: Optional.

Expected value(s): One or more of the countries in the following list.
{Åland Islands; Albania; Andorra; Austria; Belarus; Belgium; Bosnia and Herzegovina; Bulgaria; Croatia; Czech Republic; Denmark; Estonia; Faroe Islands; Finland; France; Germany; Gibraltar; Greece; Guernsey; Hungary; Iceland; Ireland; Isle of Man; Italy; Jan Mayen; Jersey; Latvia; Liechtenstein; Lithuania; Luxembourg; Malta; Moldova; Monaco; Montenegro; Netherlands; Norway; Poland; Portugal; Republic of Northern Macedonia; Romania; Russia; San Marino; Serbia; Slovakia; Slovenia; Spain; Svalbard; Sweden; Switzerland; Ukraine; United Kingdom; and Vatican City}.

3.9. Knowledge Object URL

Explanation: The link to the web location where the Knowledge Object was initially made available.

Is required: Optional.

Expected value(s): A URL directing to the webpage from which the Knowledge Object was initially made available (e.g., the web inventory of the project in which the Knowledge

Object has been created, or the platform in which the Knowledge Object has been made initially available).

3.10. Category

Explanation: The category to which the Knowledge Object belongs.

Is required: Mandatory.

Expected value: A category from the following list.
{document; slideshow presentation; dataset; video; audio; image; software application; dataset}

3.11. Type

Explanation: The type that the Knowledge Object belongs to Knowledge Objects in the EU-FarmBook platform are also associated with various types depending on the content/ information they convey. There are specific types of Knowledge Objects per Knowledge Object category.

Is required: Mandatory.

Expected value(s): One or more types from each of the following lists of types available per Knowledge Object category.

Knowledge Object Category	Associated types
Document	article in conference proceedings; book; booklet; brochure; chapter in edited volume; deliverable report; factsheet; flyer; handbook; guide; journal article; manual; milestone report; newsletter; policy brief; practice abstract; press release; review document; report/paper; technical/technology article; technical information/ specifications card; thesis; tutorial
Slideshow presentation	decision-making presentation; educational/training presentation; guide; informative presentation; motivational presentation; tutorial
Video	case study; documentary video; educational/training video; event capturing video; guide; interview video; presentation/live talk capturing video; product/feature review video; question-and-answer video; simulation video; testimonial; tutorial/how-to video; vlog; webinar
Audio	audio magazine; commentary; educational/training podcast; event capturing podcast; guide; interview; on-demand seminar; panel discussion; question-and-answer podcast; solo podcast; tutorial
Image	chart/graph; infographic; interactive figure/image; interactive map; static figure/ image; static map
Software application	AI software; business software; data repository/database; data analysis software; decision support tool; educational/training software; Farm Management Information System (FMIS); game; scientific software; simulation

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Dataset	auditory data; crop-related data; geospatial data; graph-related data; imagery data; input-related data; network-related data; temporal data; textual data; video data; weather/climate data; yield-related data

Explanations of the types of Knowledge Objects available per category are available in the Annex.

3.12. Subject

Explanation: It is the Knowledge Object's subject (topic). A Knowledge Object may have more than one subject. To capture subjects in an as detailed way as possible, we define subjects at two levels of detail (top-level subjects and second-level subjects).

Is required: Mandatory.

Expected value(s): One or more subjects from each of the following subject lists.

Level	Subjects defined
Top-level subjects	Crop farming; livestock; forestry; environment; society; economics
Second-level subjects	Agroecology; AKIS; animal husbandry and welfare; aquaculture; biodiversity and nature management; biomass production; climate and climate change; competitiveness; crop rotation/crop diversification; digitalisation; energy management; farm diversification/new business models; farming equipment and machinery; farming/forestry competitiveness; fertilisation and nutrients management; food quality/processing and nutrition; genetic resource; landscape/land management; organic farming; pest/disease control; plant production and horticulture; soil management/functionality; supply chain, management, and consumption; waste, by-products, and residues management

Explanations of the subjects available both at the top-level and second level are provided in the Annex.

The subjects defined at the second level are associated with top-level subjects as shown in the table below.

Top-level subject	Associated second-level subjects
Crop farming	Agroecology; AKIS; biodiversity and nature management; biomass production; climate and climate change; competitiveness; crop rotation/crop diversification; digitalisation; energy management; farm diversification/new business models; farming equipment and machinery; farming/forestry competitiveness; fertilisation and nutrients management; food quality processing & nutrition; genetic resource; organic farming; pest/disease control; plant production and horticulture; soil management/functionality; supply chain, marketing & consumption; waste, by-products & residues management
Livestock	Agroecology; AKIS; animal husbandry and welfare; aquaculture; biodiversity and nature management; biomass production; climate and climate change; competitiveness; digitalisation; energy management;

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	farm diversification/new business models; farming/forestry competitiveness; farming equipment and machinery; food quality processing & nutrition; genetic resource; organic farming; pest disease/ control; plant production and horticulture; supply chain, marketing & consumption; waste, by-products & residues management
Forestry	Agroecology; AKIS; biodiversity and nature management; biomass production; climate and climate change; competitiveness; digitalisation; energy management; farm diversification/new business models; farming equipment and machinery; farming/forestry competitiveness; genetic resource; landscape/land management; pest/disease control; soil management/functionality; waste, by-products & residues management.
Environment	Agroecology; AKIS; animal husbandry and welfare; aquaculture; biodiversity and nature management; biomass production; climate and climate change; competitiveness; crop rotation/crop diversification; digitalisation; energy management; farm diversification/new business models; farming/forestry competitiveness; fertilisation and nutrients management; food quality processing & nutrition; genetic resource; landscape/land management; organic farming; pest/disease control; plant production and horticulture; soil management/functionality; supply chain, marketing & consumption; waste, by-products & residues management
Society	Agroecology; AKIS; animal husbandry and welfare; biodiversity and nature management; biomass production; climate and climate change; competitiveness; digitalisation; energy management; farm diversification/new business models; farming/forestry competitiveness; food quality processing & nutrition; genetic resource; landscape/land management; organic farming; pest/disease control; plant production and horticulture; soil management/functionality; supply chain, marketing & consumption; waste, by-products & residues management
Economics	Agroecology; AKIS; animal husbandry and welfare; aquaculture; biomass production; climate and climate change; competitiveness; crop rotation/crop diversification; digitalisation; energy management; farm diversification/new business models; farming equipment and machinery; farming/forestry competitiveness; fertilisation and nutrients management; food quality processing & nutrition; genetic resource; landscape/land management; organic farming; plant production and horticulture; pest/disease control; soil management/functionality; supply chain, marketing & consumption; waste, by-products & residues management

Explanations of the types of Knowledge Objects available per category are provided in the Annex.

3.13. License

Explanation: The license under which the Knowledge Object is made available, which specifies terms and conditions of the Knowledge Object's (re-)use.

Is required: Mandatory.

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Expected value(s): The URL of the license (e.g., https://creativecommons.org/licenses/by-sa/4.0/) or the license name (e.g., "Attribution-ShareAlike 4.0 International (CC BY-SA 4.0)"). The license to be assigned to a Knowledge Object by default is CC BY. Other Creative Commons licenses to consider are:

- CC BY-SA (Attribution-ShareAlike 4.0 International)
- CC BY-NC (Attribution-NonCommercial 4.0 International)
- CC BY-NC-SA (Attribution-NonCommercial-ShareAlike 4.0 International)
- CC BY-ND (Attribution-NoDerivs 4.0 International)
- CC BY-NC-ND (Attribution-NonCommercial-NoDerivs 4.0 International)

Details are available at the website of Creative Commons (https://creativecommons.org/share-your-work/cclicenses/).

3.14. Format

Explanation: The file format in which the Knowledge Object is available.

Is required: Mandatory.

Expected value(s): File formats to consider for each category of Knowledge Objects are listed below.

Knowledge Object Category	Associated types
Document	txt; csv; htm/html; markdown; dvi; dbk; xml; epub; fb2; fbz; doc; docm; docx; odt; fodt; oxps; xps; pdf; ps
Slideshow presentation	pdf; potm; potx; ppt; pptx
Dataset	shp; shx; dbf; prj; sbx; sbn; tif; tfw; dwg; gml; mdb; mif; kml; ai; dxf; svg
Video	drc; mkv; mk3d; mka; mks; mp4; m4e; m4p; m4b; m4r; m4v; webm; ogv; ogg
Audio	m4a; caf; flac; mpc; mp+; mpp; mp3; bit; ogg; ogv; oga; ogx; ogm; spx; opus; spx; wv
Image	png; apng; flif; gbr; gif; jp2; j2k; jpf; jpg; jpx; jpm; mj2; mng; exr; pdf; png; svg; svgz; tiff; webp; xpm

3.15. File size

Explanation: The size of the digital file through which the Knowledge Object is available (e.g., in KBs, MBs, or GBs).

Is required: Mandatory.

Expected value(s): A numerical value followed by the file size unit (in KBs, MBs, or GBs).

3.16. Project name

Explanation: The name of the project that is the source of the Knowledge Object (i.e., the project in which the Knowledge Object has been created).

Is required: Mandatory.

Expected value(s): A short phrase providing the project's name.

3.17. Project acronym

Explanation: The acronym of the project that is the source of the Knowledge Object (i.e., the project in which the Knowledge Object has been created).

Is required: Mandatory.

Expected value(s): One or more words constituting the acronym of the project.

3.18. Project URL

Explanation: The URL of the official website of the project or the link to the webpage of the project in CORDIS (in the case of EU-funded Research and Innovation projects).

Is required: Mandatory.

Expected value(s): A URL.

4. An illustrative example of metadata use

In this section, we provide an example of a Knowledge Object. The Knowledge Object is a factsheet from the AFINET Thematic Network. The title of the Knowledge Object as it appears on the first page is: "Productive Use of the Tree Row Understorey". This is the value to assign to the "Title" metadata property[1].


PRODUCTIVE USE OF THE TREE ROW UNDERSTOREY
Opportunities for crop diversification
AFINET
The tree understorey – a waste of space?
Herbs, flowers, fruit, vegetables..... take your pick!

Apart from the title, we also need to provide a short textual description (a short summary) of the Knowledge Object's content. Let us assume that this summary is provided by the following piece of text: "*Planting trees into arable or vegetable fields means that land is taken out of annual production; depending on the design of the system, this could be up to 25% of the cropping area. Establishing understorey crops can provide income in the short term before the trees reach a productive stage, increase diversity and overall productivity.*" This text is the value to assign to the "Description" metadata property.

The keywords associated with the factsheet are: "diversification", "silvoarable", "tree row", "crops", and "understorey". It is important to consider the order in which the

[1] We use the term "metadata property" to refer to one of the metadata used to describe Knowledge Objects in the Eu-FarmBook platform.

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keywords will be provided, starting from the one that best indicates what the content of the Knowledge Object relates to. They can be assigned as values to the "Keyword(s)" metadata property by having then separated by a comma "," or a semi-colon ";".

The creators of the Knowledge Object are Jo Smith and Sally Westaway. These are the names to be provided as values to the "Creator(s)" metadata property. The language in which its content is available is English.

The document was created on the 1st of March 2018. Therefore, the value to assign to "Date of completion" is "01/03/2018". The factsheet has been created for communication purposes, meaning that "communication" is the value to assign to "Intended Purpose". Our Knowledge Object describes solutions related to crop diversification tested in Spain and Portugal (as made evident from the descriptions provided in the document). So, the names of these two countries should be provided as values to "Geographic Location(s)".

The URL to provide as value to the metadata property "Knowledge Object URL" is the URL from which the factsheet was initially made available:

https://euraf.isa.utl.pt/files/pub/20190529_factsheet_14_en_web.pdf

It is a document, which means that "document" is the value to assign to "Category". The value of the "Type" metadata property is "factsheet".

In the case of our example, the Knowledge Object subjects at the top level are: "Forestry" and "Environment" (more than one subject are allowed). The second-level subject of the Knowledge Object is: "Farming/forestry competitiveness".

Next, we need to provide the license under which the Knowledge Object gets available. The license makes explicit the way(s) in which the Knowledge Object can (and needs to) be (re-)used by any interested parties. In our example, the license is CC BY 4.0. This is the value to provide to the "License" metadata property.

The size of the file through which the Knowledge Object becomes available is 1.3 MBs. The file format is "pdf". The acronym of the project in which the Knowledge Object was created is "AFINET". The full name of the project is "Agroforestry Innovation Networks". The URL of the project page in CORDIS is https://cordis.europa.eu/project/id/727872 (the link to the webpage of a project in CORDIS can be provided instead of the URL of the official website of the project).

The metadata values of our example Knowledge Object are summarised in the following table.

Metadata property	Value
Title	Productive Use of the Tree Row Understorey
Description	Planting trees into arable or vegetable fields means that land is taken out of annual production; depending on the design of the system, this could be up to 25% of the cropping area. Establishing understorey crops can provide income in the short term before the trees reach a productive stage, increase diversity and overall productivity.

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Keywords	diversification; silvoarable; tree row; crops; understorey
Creator(s)	Jo Smith; Sally Westaway
Language(s)	English
Date of completion	01/03/2018
Intended purpose	Communication
Geographic location(s)	Portugal; Spain
Knowledge Object URL	https://euraf.isa.utl.pt/files/pub/20190529_factsheet_14_en_web.pdf
Category	Document
Type	Factsheet
Subject	Top-level subject(s): Forestry; Environment
	Second-level subject(s): Farming/forestry competitiveness
License	https://creativecommons.org/licenses/by/4.0/
Format	pdf
File size	1.3 MBs
Project name	Agroforestry Innovation Networks
Project acronym	AFINET
Project URL	https://cordis.europa.eu/project/id/727872

5. Annex

5.1. Knowledge Object type

5.1.1. Documents

Type	Description
Article in conference proceedings	A research paper presented in a conference by one (or more) of its authors; after the end of the conference, the paper is published in the conference proceedings (i.e., an edited volume with all the papers presented in the conference).
Book	A digital version of a book.
Booklet	A small book or group of pages.

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Brochure	A digital document (of limited size in terms of its number of pages) containing pictures and information on a product or a company (or, in our case, a Multi-Actor Project).
Chapter in edited volume	A document presenting research work, which has been included in a book (edited volume) containing chapters from various contributors. This edited volume usually addresses a specific research topic. An example of a chapter in an edited volume is provided here.
Deliverable report	A document used to report the work done in a project as part of one, or more, tasks, which has led to some results.
Factsheet	A document containing detailed information, for the public, about a product or service.
Flyer	A form of paper-based advertisement intended for wide distribution and typically distributed or posted in a public place, handed out to individuals or sent through the mail. This document type is very close to the "brochure" type.
Handbook	A book including instructions on how to use something or information about a particular subject.
Guide	A book that gives the most important information about a particular subject.
Journal article	A piece of writing documenting the process and results of a research effort, which is published in a scientific journal. An example of a journal article is available here.
Manual	A book giving instructions or information.
Milestone report	A document used to report the work undertaken in a research project, which has resulted in the achievement of a milestone (milestone = a significant stage or event in a development process).
Newsletter	A short official statement or broadcast summary of news issued periodically to the members of a society or other organisation.
Policy brief	A policy brief is a concise summary of a particular issue, the policy options to deal with it, and some recommendations on the best option. It is aimed at government policymakers and others who are interested in formulating or influencing policies.
Practice abstract	A document used to disseminate the results of the project in a concise and understandable way to the practitioners. An example of a practice abstract is available here.
Press release	A press release is an official statement delivered to members of the news media for the purpose of providing information, an official statement, or making an announcement. Press releases can be delivered to

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	members of the media physically on paper and electronically.
Review document	A document used with the aim to provide a review of some piece of work (review = a formal assessment of something with the intention of instituting change if necessary).
Report/paper	A document containing an account given on a particular matter, after thorough investigation or consideration, by a person or body. The information presented is usually supported by strong evidence.
Technical/technology article	This is usually a document presenting a technical topic, and typically the article drills down into some low-level of detail.
Technical information/ specifications card	A document presenting a list of technical information about a product or service by having the layout of a "card".
Thesis	A piece of writing involving original study of a subject, esp. for a college or university degree.
Tutorial	A document showcasing how to use a product or service in a series of steps.

5.1.2. Slideshows/presentations

Type	Description
Decision-making presentation	A presentation developed and used with the aim to facilitate decision-making purposes. In this case, however, decision-making is facilitated by the display and analysis of facts/data/results. It does not draw on the emotional factor as in the case of motivational presentations.
Educational/training presentation	A presentation developed and used for educational/training purposes in an educational/ training event/session.
Guide	A type of presentation providing information and/or instructions to help a person understand or execute something.
Informative presentation	This type of presentation is used to present specific information to specific audiences for specific goals or functions. Informative presentations are often analytical or involve the rational analysis of information. Sometimes they simply "report the facts" with no analysis at all, but still need to communicate the information in a clear and concise format.
Motivational presentation	A presentation aiming to provide its audience with the incentive to do something specific (e.g., make a decision, take an action, etc.).
Problem-solving presentation	A presentation created and used with the aim to provide help on how to solve a problem.

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Tutorial (similar to guide)	A presentation type providing practical information about a specific subject.

5.1.3. Videos

Type	Description
Case study	A video providing detailed information about the development of a person, group, or thing, especially in order to show general principles. See example here.
Documentary video	A video presenting facts and information about a subject. For instance, a documentary video on animal communication. See example here.
Educational/training video	A video that has been developed for educational/training purposes. See example here.
Event capturing video	A video recording of an event. As an example, case, we may refer to the video recording of the consortium meeting of a project. See example here.
Guide	A video that gives you the most important information about a particular subject. For instance, a travel guide available as a video or a wine guide available as a video.
Interview video	A video recording of an interview event. See example here.
Presentation/live talk capturing video	A video recording of a discussion of two or more people. See example here.
Product/feature review video	A video presenting the basic features of an object/product/ device. See example here.
Question-and-answer video	A video where a person responds to a number of questions posed by a live audience or being made available in another way. See example here.
Simulation video	A video presenting a model of a real activity or phenomenon, created for training purposes or to solve a problem. See example here.
Testimonial	A video presenting a person's statement extolling the virtue of a product/service or something else. See example here.
Tutorial/how-to video	A video showing how to use or do something in a series of easy stages.
Vlog	A record of someone's thoughts, opinions, or experiences that he/she films and publishes on the internet.
Webinar	The video recording of a seminar session that has taken place online (i.e., a webinar).

5.1.4. Images

Type	Description
Chart/graph	• A chart is a sheet providing information in tabular form. Chart examples are available here.

	• A graph is a diagram (e.g., a series of one or more points, lines, line segments, curves, or areas) representing the variation of a variable in comparison to one or more other variables. Graph examples are available here.
Infographic	A collection of imagery, charts, and minimal text providing an easy-to-understand overview of a topic. Infographic examples are available here.
Interactive figure/image	A figure or image that makes use of motion-related aspects. See examples here.
Interactive map	Interactive map examples are available here.
Static figure/ image	A display of information through various illustration means (e.g., colours, lines, borders, arrows, photographs) that does not employ any motion-related aspects. Examples are available here.
Static map	A representation usually on a flat surface of the whole or a part of an area/a diagram or other visual representation that shows the relative position of the parts of something. Examples of static maps are available here.

5.1.5. Audios

Type	Description
Audio magazine	A podcast that incorporates a range of different thematic units as a magazine does.
Commentary	An audio object/podcast containing opinions or explanations of an event or situation.
Educational/training podcast	An audio object/podcast that has been developed and used for educational/training purposes in the context of an educational/training event/session.
Event capturing podcast	An audio object/podcast created with the aim to record an event. It is an audio documentary of this event.
Interview	This type of audio object/podcast is to provide the recorded interview of some person.
On-demand seminar	An audio object/podcast that has been created with the purpose to record a seminar/training session. The recorded session is then available to any interested individual on his/her demand.
Panel discussion	An audio object/podcast recording a group of people gathered together to discuss a topic in the presence of an audience. Panels usually include a moderator who coordinates the discussion and sometimes elicits audience questions, with the goal of being informative and entertaining.
Question-and-answer podcast	An audio object/podcast used to record the responses of an expert to the questions asked by another person who is in charge of the Q&A session.

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Solo podcast	This is a common type of audio object/podcast and it is often used by people who have expertise in a certain area and want to share with an audience.
Tutorial/guide	An audio object/podcast providing instructions on how to use a product, or undertake a process, in a series of easy stages.

5.1.6. Datasets

Type	Description
Auditory data	An auditory dataset contains audio-related data.
Crop-related data	Crop-related datasets contain values associated with variables of interest to the growing of crops and crop production.
Geospatial data	According to the Cambridge online dictionary, the term "geospatial" is used to denote data and information identifying where particular features are on the earth's surface, such as oceans and mountains. Thus, a set of geospatial data contains records that have locational information tied to them such as geographic data in the form of coordinates, address, city, or ZIP code.
Graph-related data	The term "graph-related data" is used to denote any dataset available in the format of a graph. There may be various sources from which a graph-based dataset may have originated from. Well known examples of such datasets are Knowledge Graphs.
Imagery data	A dataset that has images as its records. These images may show, for instance, plants infected by various diseases, which can be used for precision crop protection applications.
Input-related data	A dataset of this type contains data in various formats, which relate to the inputs applied to a crop.
Network-related data	This dataset type has similarities with the graph-related dataset type given the fact that from a mathematical perspective graphs and networks are defined upon similar theoretical foundations. Network-based data may convey information about network structures such as relationships and interactions among stakeholders in a value chain.
Temporal data	Sets of temporal data contain data that represents a state in time. Temporal data is collected and utilised for purposes such as the analysis of weather patterns and other environmental variables, monitoring traffic conditions, studying demographic trends, etc. Data relating to this type may be collected manually, by using sensors, or generated from simulation models.
Textual data	Textual data originate from plain text. It is an unstructured type of data having the potential to reveal useful insights relating to various variables of interest. Natural Language Processing (NLP) is a continuously growing research field in

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	the domain of computational linguistics that involves research in models and techniques used to process textual data.
Video data	Video data relates to data that can be potentially extracted or relating to video recordings.
Weather/climate data	In the case of this type of datasets, we are dealing with data relating to the weather and climatic conditions affecting a geographic region. This data may become available from weather stations and satellites.
Yield-related data	This type of dataset contains data about the yield of a crop. Historical yield-related data may be potentially used (together with data of other types) to proceed to yield estimations. This type of data has a temporal dimension.

5.1.7. Software applications

Type	Description
AI software	This type relates to software applications deploying Artificial Intelligence algorithms/models. As an example, we may refer to chatbots or Q&A tools the use of which allows the user to verbally pose queries (e.g., Amazon Alexa).
Business software	This type relates to software developed to support various business processes. As an example, we may refer to software applications used for storing and information about the customers of a business. This type of software is usually developed by software development vendors and made available through license purchase.
Data analysis software	Software applications used for performing various types of data analysis. WEKA is a well-known data analysis application.
Data repository/database	This software application type relates to systems used to store data/information of various types of importance to an organisation. SQL and NoSQL systems are two prominent paradigms of such applications.
Decision support tool	A Decision Support Tool or Decision Support System is an information system used with the aim to support decision-making processes. This type of software applications serve the management, operations and planning levels of an organisation and help people make decisions with regard to problems that may be rapidly changing and that cannot be easily specified in advance.
Educational/training software	Software applications that have been specifically developed for education and training purposes.
Farm Management Information System (FMIS)	The acronym FMIS stands for Farm Management Information System. A Farm Management Information System is a management information system designed to assist agricultural farmers to perform various tasks ranging

	from operational planning, implementation and documentation for assessment of performed field work.
Game	The term game is used here to refer to a video game developed with the aim to support training and educational purposes. This kind of educational/training video games are termed as serious games. The reason for not including this type into the educational/training software application category is because of their prominent role in educational/training contexts. A serious game is a game designed for a primary purpose other than pure entertainment.
Scientific software	This type includes software applications developed with the aim to support scientific purposes. As an example, we may refer to bioinformatics software.
Simulation	A simulation is a software application developed with aim to deliver an approximate imitation of the operation of a process or system that represents its operation over time.

5.2. Subject

5.2.1. Top-level subjects

Type	Description
Crop farming	The cultivation of plants for food, animal feed, or other commercial uses.
Livestock	The activity of raising domesticated animals in an agricultural setting to produce labour and commodities such as meat, eggs, milk, fur, leather, and wool.
Forestry	Managing and using trees, forests, and their associated resources for human benefit.
Environment	The natural environment encompasses all living and non-living things occurring naturally, meaning in this case not artificial.
Society	People in general thought of as living together in organized communities with shared laws, traditions, and values.
Economics	Economics focuses on the actions of human beings, based on assumptions that humans act with rational behaviour, seeking the most optimal level of benefit or utility. The building blocks of economics are the studies of labour and trade. Since there are many possible applications of human labour and many different ways to acquire resources, it is the task of economics to determine which methods yield the best results.

5.2.2. Second-level subjects

Type	Description

Agroecology	Agroecology is a holistic and integrated approach that simultaneously applies ecological and social concepts and principles to the design and management of sustainable agriculture and food systems.
AKIS	The term Agricultural Knowledge and Innovation Systems (AKIS) is used to describe the whole knowledge exchange system: the ways people and organisations interact within a country or a region. AKIS can include farming practice, businesses, authorities, research, etc. and can vary a lot, depending on the country or sector.
Animal husbandry and welfare	The branch of agriculture concerned with the production, management, and breeding of animals.
Aquaculture	Aquaculture is the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants.
Biodiversity and nature management	Management and sustainable development of nature and conservation of diversity within species, between species and of ecosystems.
Biomass production	Production of the biodegradable fraction of products, waste and residues from biological origin - from agriculture (including vegetal and animal substances), forestry and aquaculture, as well as the biodegradable fraction of industrial and municipal waste.
Climate and climate change	Climate is the average weather in a given area over a longer period of time. A description of a climate includes information on, e.g. the average temperature in different seasons, rainfall, and sunshine. Also a description of the (chance of) extremes is often included. Climate change is a long-term change in the average weather patterns that have come to define Earth's local, regional and global climates.
Competitiveness	Competitiveness is the ability of the farm to compete and be successful.
Crop rotation/crop diversification	Crop rotation is growing a different crop on a given land area every growing/planting cycle and season . Crop diversification refers to the addition of new crops or cropping systems to agricultural production on a particular farm taking into account the different returns from value-added crops with complementary marketing opportunities.
Digitalisation	Use of technology to convert precise data into actionable knowledge to drive and support complex decision-making on-farm and along the value chain.

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Energy management	All practices and measures applied for the efficient and responsible use of energy resources in agricultural production systems.
Farm diversification/new business models	Farm diversification refers to the trend towards gaining income from diverse activities (e.g. agri-tourism, processing of farm products).
Farm/forestry competitiveness and diversification	Improvement of the competitiveness of the agriculture and forestry sectors, as well as the quality of life in rural areas and encouragement of diversification of economic activities.
Farming equipment and machinery	All machines and tools that are used in the production, harvesting, transport and storage of farm products.
Fertilisation and nutrients management	Careful management, monitoring and amending of soil fertility to meet crops' needs and to maintain environmental quality.
Food quality/processing and nutrition	All aspects concerned with processing, preparing, preserving and distributing foods and beverages, their quality characteristics and nutritional value.
Genetic resource	Any genetic material of plant and animal origin of actual or potential value for food and agriculture.
Landscape/land management	Land management concerns all operations, practices and treatments used to protect the land and enhance the goods and services provided by the ecosystem that the land is part of.
Organic farming	Organic Agriculture is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects.
Plant production and horticulture	Plant production refers to the cultivation of plants for food, feed, fiber, medicinal and cosmetic purposes. Horticulture is defined as that branch of agriculture concerned with growing plants that are used by people for food, for medicinal purposes, and for aesthetic gratification.
Pest/disease control	Any measures, practices and strategies applied to prevent the appearance or spread of pests and diseases in plant production or to limit their impact on plant growth, crop yield and product quality.
Soil management/functionality	Management of soil by focusing on differences in soil types and soil characteristics to define specific interventions that are aimed to enhance the soil health and quality for the selected land use.

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Supply chain, marketing and consumption	The full chain of activities and network among the actors for the preparation of a product or service starting from the raw material production till the marketing and consumption.
Waste, by-products and residues management	Managing waste in an environmentally sound manner and making use of the secondary materials they contain.

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Annex 2 EU-FarmBook platform manual: upload user manual

EU-FarmBook

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EU-FarmBook

1. Introduction

This document is a guide to the use of the EU-FarmBook platform's upload form. Its aim is to provide a walkthrough of the Knowledge Object upload process by presenting and explaining the key features of the upload form. This step-by-step process is explained in the next sections. Using the form, the upload of a Knowledge Object is implemented as a three-step process. In the first step, the contributor provides information about the project from which the Knowledge Object is available (i.e., the source of the Knowledge Object). In the second step, key information for the Knowledge Object (i.e., the metadata of the Knowledge Object) is provided. All the information needs to be provided in English. This document shall be read together with the EU-FarmBook metadata guide to become familiar with the metadata expected by contributors for each Knowledge Object they will contribute to the EU-FarmBook platform. An illustrative example of the use of the upload form is provided to better showcase the upload process.

2. STEP 1: Project information

As illustrated in Figure 1 below, the upload of a Knowledge Object using the upload form is implemented as a three-step process. For each step, a different screen of the form is used. The step executed each time is highlighted at the top of the screen.

Figure 1: Request for information about the source project.

The upload process starts with the request for information about the project from which the Knowledge Object is available. Project information can be added either automatically or manually. To have the project information automatically filled in, one of the following pieces of information needs to be provided: (i) project acronym; (ii) project full name; (iii) Grant Agreement ID; or (iv) DOI[1]. This information shall be typed in the text field available in the "Find your project" section of the upload form. By providing one of those pieces of information and clicking the "Search" button, a list of projects becomes available.

[1] Recently, CORDIS has introduced the use of DOIs (Digital Object Identifiers) as an additional way for the unique identification of projects apart from their Grant Agreement ID. Details about what a DOI is can be found at https://www.doi.org/the-identifier/what-is-a-doi/.

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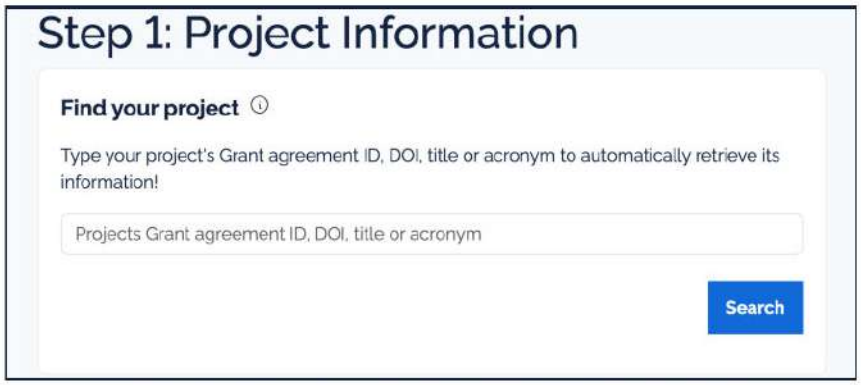

Figure 2: Search and retrieval of project-related information from the CORDIS database.

Clicking on one of the suggested projects will result in the automated completion of the fields "Project's title/full name", "Project's Acronym", and "Summary", which are shown in Figure 3. The only field that will still need to be manually completed is "Project Website".

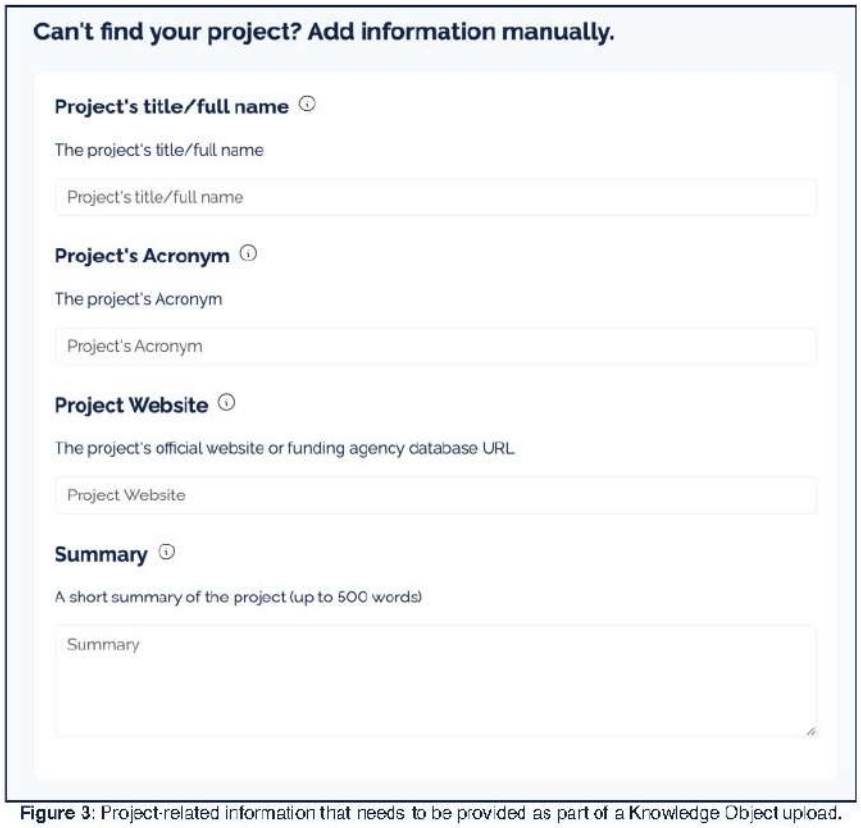

Figure 3: Project-related information that needs to be provided as part of a Knowledge Object upload.

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Alternatively, all the project-related information can be manually provided without using the automatic project information retrieval (done in the "Find your project" section) at all. After having provided the information needed as part of the 1st step of the upload process, the Knowledge Object contributor can proceed to the 2nd step or save the progress made so far by clicking the "Save draft" button (see Figure 4).

Figure 4: "Next Step" and "Save draft" buttons to proceed to the next step of the upload process or save progress.

In case there is information that has not been provided, a notification message is shown to inform about the need to fill all the required fields in (see Figure 5).

Figure 5: Notification message displayed in case not all the required information has been provided.

3. STEP 2: Knowledge Object submission

The 2nd step of the upload process is about the submission of the Knowledge Object by providing its metadata (a detailed presentation and explanation of the metadata used for Knowledge Object description is provided in the EU-FarmBook metadata guide). Before proceeding with the submission of a Knowledge Object, there is potential to change the project information provided in the 1st step. As illustrated in Figure 6, clicking the "Change project" link lets the contributor return to the previous step and provide the project-related information again.

Figure 6: The project information provided in the 1st step of the upload process can be changed by clicking on the "Change project" link.

The submission of a Knowledge Object starts with the upload of the digital file via which the Knowledge Object becomes available. This is done by either dragging and dropping the Knowledge Object file in the rectangular area, shown in Figure 7, which is framed by the dotted line, or using the dialog box that opens when clicking the "Choose a file" link.

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As indicated, there is a limit of 50 MBs (Megabytes) in the size of the Knowledge Objects to be provided.

Figure 7: Uploading the digital file of the Knowledge Object as part of the submission process.

After selecting the Knowledge Object for upload, a notification for the upload's success is provided (see Figure 8 below).

Figure 8: Successful Knowledge Object upload.

In the case that the Knowledge Object was uploaded sometime before, an upload failure message informs that the Knowledge Object upload is already done (see Figure 9).

Figure 9: Knowledge Object upload failure

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After uploading the digital file of the Knowledge Object, what needs to be done next is to provide the Knowledge Object's metadata. As illustrated in Figure 10, the first metadata piece to provide is a summary of the Knowledge Object. This is a short textual description (not more than 500 words) of what the (content of the) Knowledge Object is about.

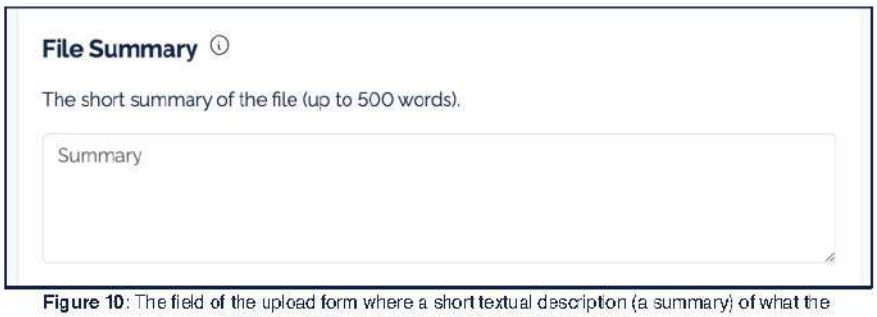

Figure 10: The field of the upload form where a short textual description (a summary) of what the Knowledge Object is about needs to be provided.

Then, the type of the digital file through via the Knowledge Object becomes available is provided. The Knowledge Object contributor can select one of the options: "Document", "Slideshow/presentation", "Podcast", "Dataset", "Video", "Image", or "Software Application" as shown in Figure 11 below.

Figure 11: Selecting the type of the digital file through which the Knowledge Object becomes available.

In case a unique identifier is available for the Knowledge Object, this can be provided as a value to the "Document Object Identifier" field of the upload form. Keywords (i.e., words or short phrases indicative of the Knowledge Object's content) are provided in the field named "Keywords". In case of adding more than one keyword, these are separated using comma signs (",") as illustrated in Figure 12.

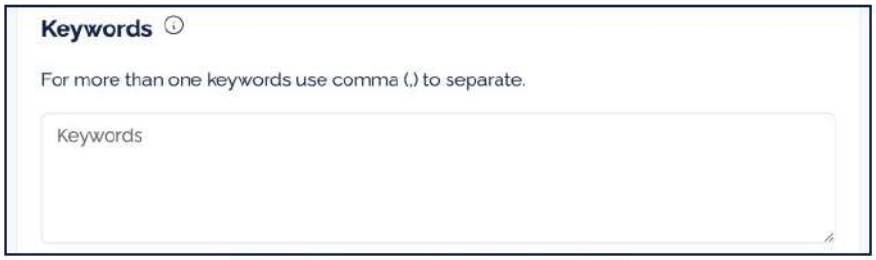

Figure 12: Upload form field to provide keywords.

The topic(s) and subtopic(s) of the Knowledge Object can be provided by clicking in the appropriate tick box(es) in the "Topics" and "Subtopics" fields. The Knowledge Object's topic(s) are provided first. As shown in Figure 13, more than one topic can be selected.

Figure 13: Selection of Knowledge Object topic(s).

After selecting the topic(s) of the Knowledge Object, its subtopic(s) will need to be added using the section of the upload form that appears on the screen. The subtopics presented are associated with the topic(s) selected earlier. Again, one or more options are allowed (see Figure 14).

Figure 14: Selection of Knowledge Object subtopic(s).

The full name and emails of the creator(s) of the Knowledge Object (the persons involved in the creation of the Knowledge Object) are provided in the "Creators" section. Providing the full name (first and last name; middle name can be provided as well in case there is one) is mandatory. The email address of the Knowledge Object's creator is optional (it is provided only in the case that this information exists). In case of a Knowledge Object that was created by more than one person, it is possible to add more names and emails by clicking the "Add creator +" button. When doing so, the creator's name and email address provided previously are added to a list of Knowledge Object creators and the details of a new creator can be made available. The "Creators" section of the upload form is shown in Figure 15.

Figure 15: Upload form section for the addition of the creator(s) of the Knowledge Object.

The Knowledge Object's language is provided in the "Languages" section of the upload form (see Figure 16).

Figure 16: Adding the language of the Knowledge Object.

As shown in Figure 17, to provide the Knowledge Object's language, a selection can be made with the help of the dropdown list appearing when clicking on the "Select..." box.

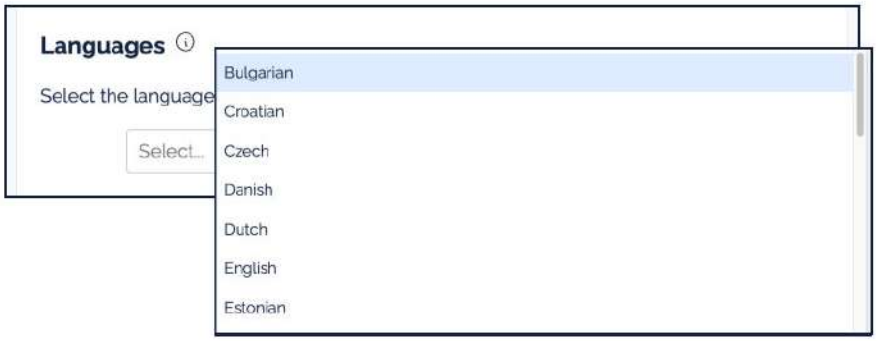

Figure 17: Selecting the Knowledge Object's language from the dropdown list made available.

The license under which the Knowledge Object will become available from the platform is selected by clicking the radio button on the left of the Creative Common license names (i.e., the small circle before the licence's name). Only one license can be selected for the Knowledge Object. Details about Knowledge Object licensing and the licenses available from Creative Commons can be found in the EU-FarmBook's metadata guide. Figure 18 below shows the "License" section of the upload form.

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Figure 18: Selecting the Knowledge Object's license.

One of the final pieces of metadata needed to be provided for a Knowledge Object is the purpose for which the Knowledge Object was created. This can be done in the "Intended Purpose" section by clicking the appropriate radio button (i.e., small circle) appearing on the left side of the intended purposes listed (see Figure 19 below). One intended purpose can be selected.

Figure 19: Selecting the "intended purpose" of the Knowledge Object.

The date when the Knowledge Object was released is provided in the section "Date of Completion" of the upload form. It can be provided using the dropdown lists illustrated in Figure 20, which enable the selection of the day, month, and year of the completion date of the Knowledge Object.

Figure 20: Section of the upload form to provide the date of completion of the Knowledge Object.

The final piece of metadata that needs to be provided is about indicating the geographic location(s) the content of the Knowledge Object relates to. This information can be made available in the "Locations" section of the upload form (see Figure 21)

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Figure 21: Selecting the geographic location(s) the content of the Knowledge Object relates to.

The indication of the geographic location(s) related to the Knowledge Object's content is made by selecting one or more countries from the dropdown list that becomes available when clicking the "Select..." box (see Figure 22).

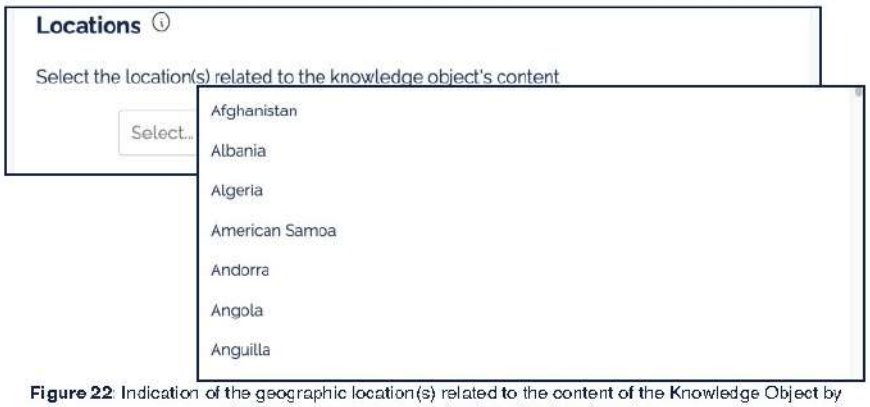

Figure 22: Indication of the geographic location(s) related to the content of the Knowledge Object by selecting one or more countries from the dropdown list.

After providing all metadata for the Knowledge Object, the "Submit" button can clicked in order to proceed with the Knowledge Object submission. Alternatively, the contributor of the Knowledge Object can click the "Save draft" button, save progress, and return later. The "Save draft" and "Submit" buttons appearing at the bottom of the screen associated with the 2nd step of the upload process are shown in Figure 23 below.

Figure 23: "Save draft" and "Submit" buttons at the bottom of the upload form's screen associated with the 2nd step of the upload process (namely, the "Knowledge Object submission")

In case not all Knowledge Object metadata is provided, a notification message ("Please fill in all required fields") will be presented. Proceeding to the next step of the process is not possible until all the required information is provided in the 2nd step (see Figure 24 below).

Figure 24: Notification presented in case of incomplete Knowledge Object metadata.

An info icon on the right side of each section's title (see Figure 25 below) provides access to a short textual explanation of what the specific piece of metadata is about and what is to be provided as a value to that.

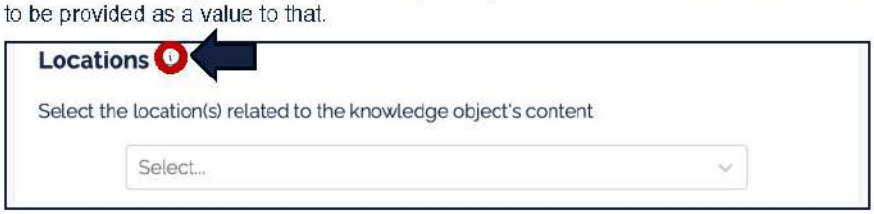

Figure 25: Info button on the right side of the title of each upload form section enabling access to a short explanation of the related piece of metadata and is expected as a value.

Before moving to the final step, an overview of the Knowledge Object metadata is made available with the help of a screen similar to the one shown in Figure 27 below. The page provides an overview of the digital file uploaded and the values provided to each of the Knowledge Object's metadata. By clicking the "Upload different file" link, there is potential to upload another file. By clicking the "Edit" link below each metadata label/section title, it is possible to change the value provided to the specific piece of metadata.

The Knowledge Object submission finishes by clicking the "Finalize Contribution" button at the bottom right corner of the screen.

Before making the submission of the Knowledge Object, it is possible to upload another one by clicking the "Add another Knowledge Object" button at the bottom of the screen. Doing so, will direct the contributor of the Knowledge Object in the beginning of Step 2. The "Add another Knowledge Object" is shown in Figure 26.

Figure 26: "Add another Knowledge Object" button.

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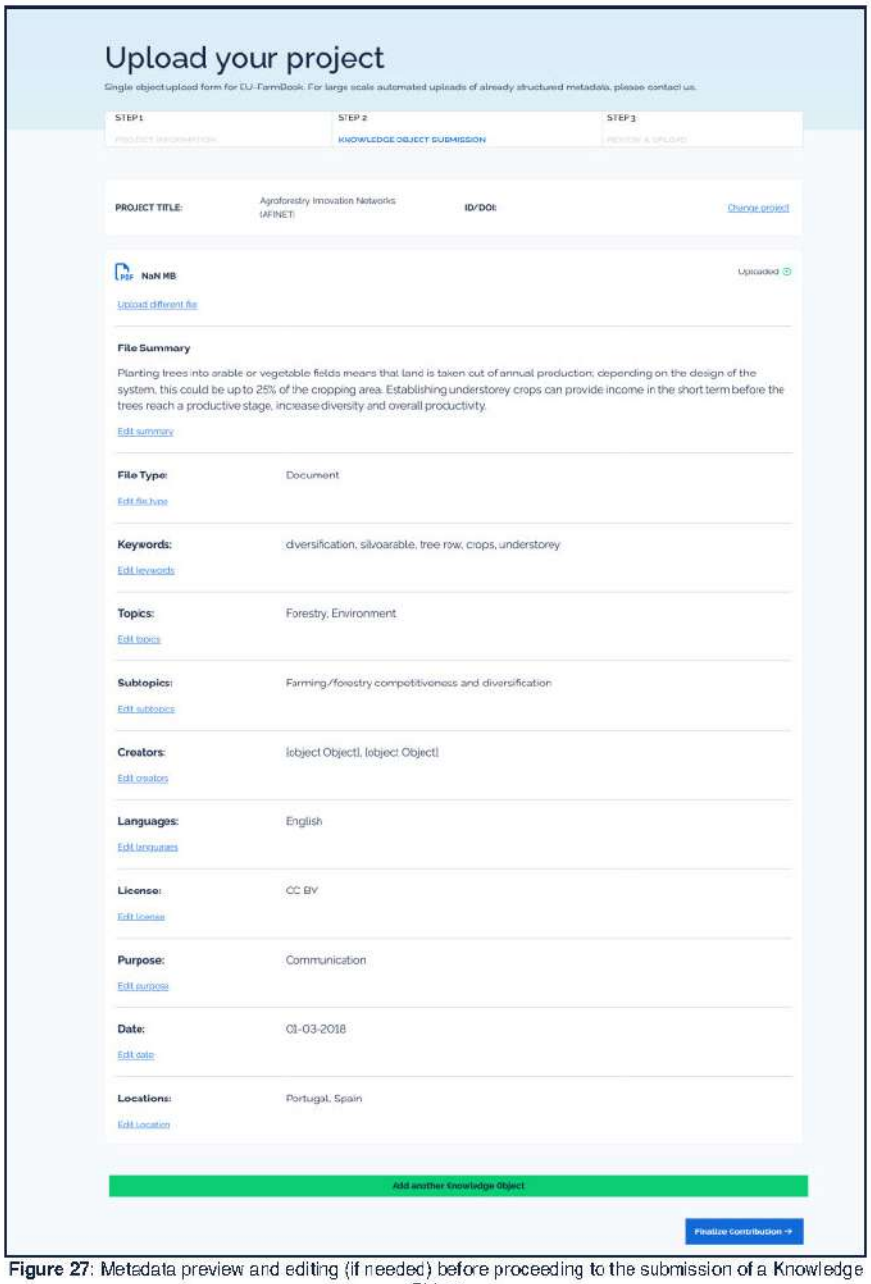

Figure 27: Metadata preview and editing (if needed) before proceeding to the submission of a Knowledge Object

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4. STEP 3: Review & upload

In the final step, a final overview of the Knowledge Object(s) already uploaded[2] becomes available. In this preview (illustrated in Figure 28), part of the metadata of the Knowledge Object is displayed. All the Knowledge Object metadata already provided can be shown by clicking the "Show all +" button. The list of metadata can be collapsed by clicking the "Hide all -" button.

It is still possible to edit the Knowledge Object's metadata by clicking the "Edit Knowledge Object" button. The project information provided during the 1st step can also be edited by clicking the "Change project" link.

The Knowledge Object(s) are submitted by clicking the "Submit Contribution" button at the bottom right corner. With this action the upload process ends.

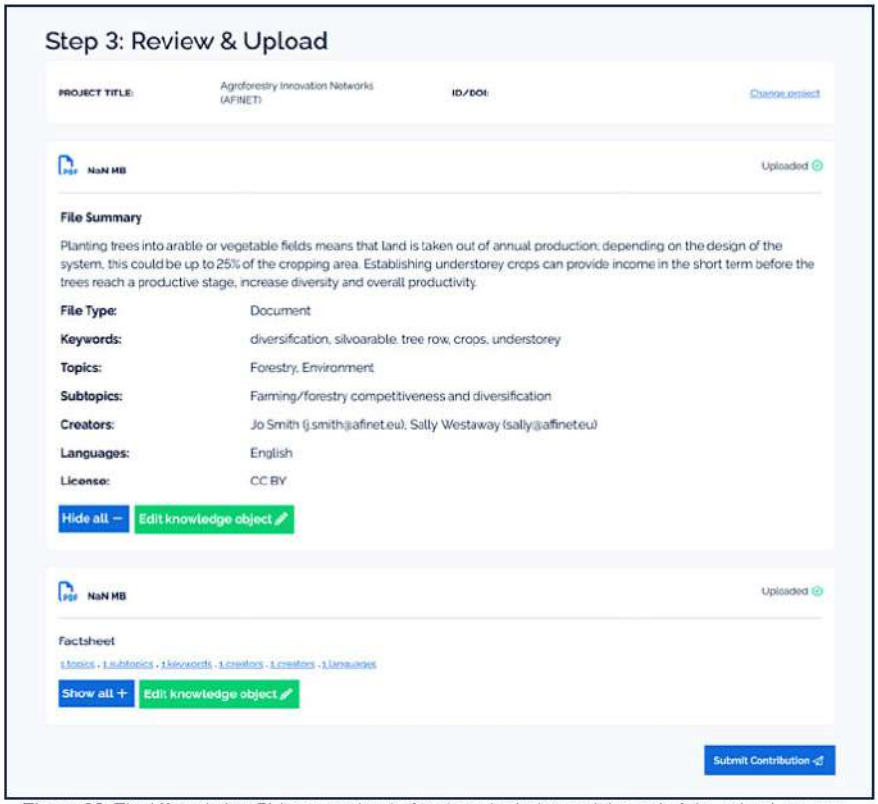

Figure 28: Final Knowledge Object overview before its submission and the end of the upload process.

[2] More than one Knowledge Objects can be uploaded, and their metadata can be added before submitting them to the EU-FarmBook platform.

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5. Example use of the upload form

In this section, we provide an example of a Knowledge Object submission by using the upload form. The Knowledge Object is a factsheet from the AFINET Thematic Network. Given the steps at which the submission of a Knowledge Objects needs to take place by using the upload form, what needs to be done first is the addition of project information. To this end, the project acronym (i.e., "AFINET") is typed into the field "Find your project". Clicking the search button will return two projects as the result of the search for project information in CORDIS (see Figure 29). The search could have been made by using the full name of the project, the Grant Agreement ID, or its DOI.

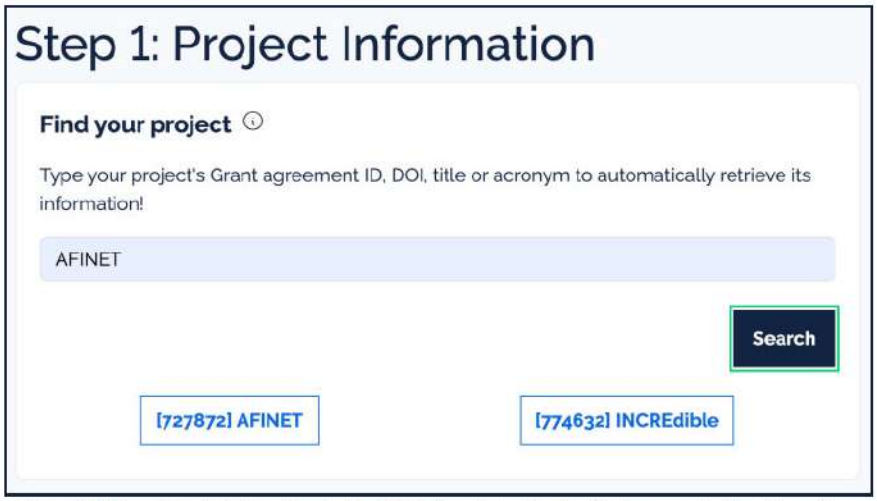

Figure 29: Searching for information for the AFINET project using the "Find your project" section of the upload form.

Clicking the box with the details for the AFINET project (bottom left corner in Figure 29) will result in having the project details automatically filled in in the rest of the upload form fields related to the 1st step of the Knowledge Object submission (see Figure 30).

The only piece of information that is not automatically filled in is the URL of the project's website. To have all the information provided and proceed to the next step, the project's website URL is manually added in the "Project Website" field of the form. The addition of the URL is shown in Figure 30 below.

A short summary of the Knowledge Object's content is the following: "*Planting trees into arable or vegetable fields means that land is taken out of annual production; depending on the design of the system, this could be up to 25% of the cropping area. Establishing understorey crops can provide income in the short term before the trees reach a productive stage, increase diversity and overall productivity.*"

As shown in Figure 31, this short text is added in the "File Summary" field of the upload form.

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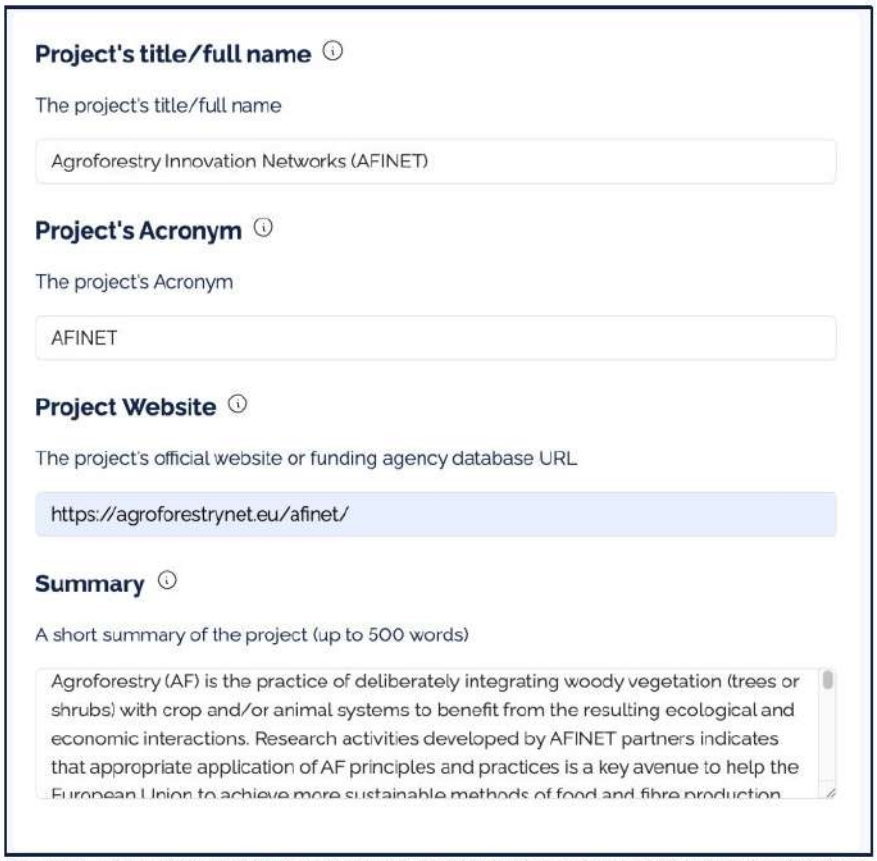

Figure 30: Details of the AFINET project added in the fields of the upload form related to the 1st step of the Knowledge Object submission.

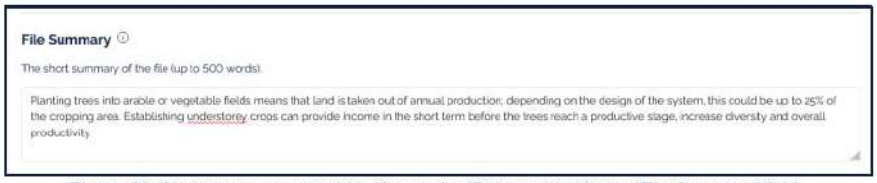

Figure 31: Short text summary of the Knowledge Object added in the "File Summary" field.

The Knowledge Object is a document; thus, the "Document" option is selected in the field "File Type" (see Figure 32).

Figure 32: The file type of the Knowledge Object is selected.

The Knowledge Object has a DOI. The DOI is retrieved from Zenodo, where all AFINET Knowledge Objects are available. As illusrated in Figure 33, the Knowledge Object's DOI is provided as value to the "Document Object Identifier" field.

Figure 33: The Knowledge Object's DOI is provided as a value to the "Document Object Identifier" field of the upload form.

The keywords associated with the Knowledge Object are: "diversification", "silvoarable", "tree row", "crops", and "understorey". As illustrated in Figure 34, these are the keywords provided in the "Keywords" field of the upload form. Commas are used to separate them from each other.

Figure 34: The Knowledge Object keywords added in the respective field of the upload form.

In our example, the topics of the Knowledge Object are "Forestry" and "Environment". The Knowledge Object's subtopic is "Farming/forestry competitiveness & diversification". The topic and subtopic selections are illustrated in Figures 35 and 36 below.

Figure 35: Selection of the topics of the Knowledge Object.

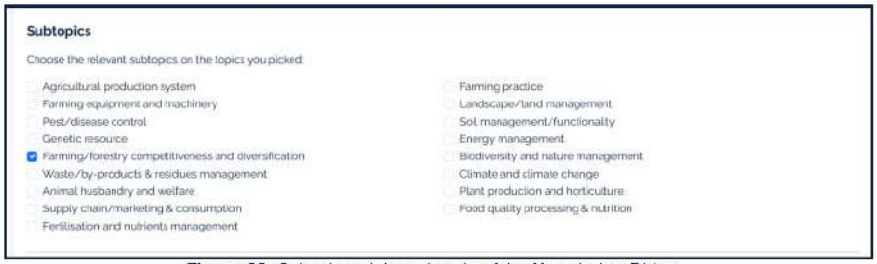

Figure 36: Selection of the subtopic of the Knowledge Object.

The creators of the Knowledge Object are Jo Smith and Sally Westaway. These are the names provided as values to the "Creators" field. The Knowledge Object creators' emails are fictitious and have been used for the sake of the example (see Figure 37).

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Figure 37: Names and email addresses of the Knowledge Object creators provided to the upload form.

The language in which the content of the Knowledge Object is available is English. This is indicated by the option "English" selected from the dropdown list of Knowledge Object languages, as shown in Figure 38.

Figure 38: Selection of the language of the Knowledge Object.

Next, we need to provide the license under which the Knowledge Object gets available.. In our example, the license is CC BY 4.0. This is the value provided to the "License" field of the upload form (see Figure 39).

Figure 39: Creative Commons license under which the Knowledge Object becomes available.

The Knowledge Object was created for communication purposes. As illustrated in Figure 40, this is the "intended purpose" option selected from the list of options in the respective field.

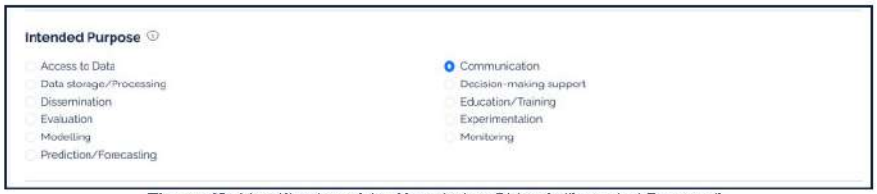

Figure 40: Identification of the Knowledge Object's "Intended Purpose".

The Knowledge Object was created on the 1st of March 2018. As shown in Figure 41, the value provided to the "Date of Completion" field is "01/03/2018" (the DD/MM/YYYY format is used to capture the Knowledge Object's date of completion).

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Figure 41: Date of completion of the Knowledge Object.

The Knowledge Object describes solutions related to crop diversification tested in Spain and Portugal (as made evident from the descriptions provided in the document). So, the names of these two countries are provided as values to the field "Locations" (see Figure 42).

Figure 42: Locations to which the content of the Knowledge Object relates.

The final preview of the Knowledge Object before its final submission is shown in Figure 44 below.

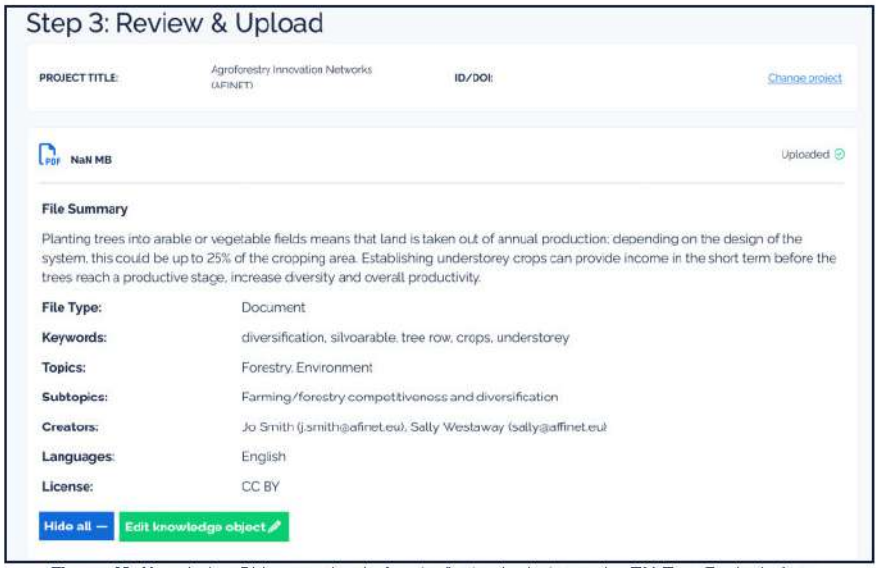

Figure 43: Knowledge Object preview before its final submission to the EU-FarmBook platform.

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Annex 3 The executive meta-database: example of the OG Slurry concentrator

Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**
Acronym used in NUTRI-KNOW	**Slurry concentrator**
Project partner	UVIC-UCC
Short description of the OG	The pilot project reduces the costs of management of livestock waste by applying a new process from which the slurry coming directly from the farm will be separated into two phases, a first semi-liquid phase with the most of the organic fraction, the nutrients and the larger particles and a second liquid phase with low nutrient concentration. The differentiated management of the two phases will allow to minimize transport costs as well as the optimization of the application of nutrients in the soil, both from an agronomic and environmental point of view.
Keyword category	Farming equipment and machinery; Fertilisation and nutrients management
Partners involved	AGRÀRIA PLANA DE VIC I SECCIÓ DE CRÈDIT; FEDERACIÓ DE COOPERATIVES AGRÀRIES DE CATALUNYA (FCAC); **FUNDACIÓ UNIVERSITÀRIA BALMES (UNIVERSITAT DE VIC - UNIVERSITAT CENTRAL DE CATALUNYA)**; GRUP SOLUCIONS MANRESA, SLUP
Region, country	Catalonia, Spain
Duration	November 2015 - September 2017
Status	Finalised
Maturity level	near to practice
Total budget	270.967 €
Main objectives	The main objective of the pilot project is to reduce the costs associated with the management of livestock waste.
Methodology	This OG implements a new process that separates the slurry into two phases: a semi-liquid phase containing the majority of the organic fraction, nutrients, and larger particles, and a liquid phase with a low nutrient concentration. The differentiated management of these two phases allows for minimized transport costs and optimized application of nutrients in the soil, benefiting both agronomic and environmental aspects.
Keyword categories	Farming equipment and machinery; Fertilisation and nutrients management

Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**		
Acronym used in NUTRI-KNOW	**Slurry concentrator**		
Tangible results categories	Technology		
Relevant value chain steps	Processing Technologies		
Main outcomes	The concentrator prototype used in the project demonstrates successful outcomes. It effectively obtains diluted and concentrated effluents from pig slurry, with the concentrated phase retaining the majority of phosphorus and nitrogen. The system enables continuous monitoring of conductivity and exhibits low energy consumption. Technologically and economically viable, it provides significant benefits to farms and cooperatives in terms of efficient manure management.		
Key performance	The innovative nutrient concentration technology employed in the project achieves impressive results. It concentrates 85-95% of total solids, 45-55% of total nitrogen, and 85-95% of phosphorus initially present in a unit volume of raw slurry, reducing the volume by 20-30% while retaining the concentrated liquid fraction. This concentration process is cost-effective, minimizes additional emissions, and requires minimal energy consumption. As a result, transport costs are reduced, and the economically viable export of nutrients to non-vulnerable areas becomes feasible while ensuring environmental sustainability.		
Communication material available (website, videos, infographs, publications, etc.)	https://ruralcat.gencat.cat/documents/20181/8594516/2015_GO_execucio_en_060/64259f91-fe5c-4f27-89a0-663eda7cdfdd https://www.youtube.com/watch?v=_TdjYEn22co (from a continuing project)		
Responsible person	Anna Bagó Mas		
Contact	anna.bago@uvic.cat		
Note	The OG Ferticoop-Go considered the concentrator as one of the best available techniques. Also, after the OG was finished, a demostration project was financed through the 01.02.01 Technology Transfer operation of the Rural Development Program of Catalonia 2014-2020 (results available upon request). IRTA will continue with a demonstration trial.		
Relevant programme, regulation or legislation at EU/country/region level	**Processing technologies and fertiliser production**	**EU**	- Regulation (EU) 2019/1009 Fertilising Products (FPR) harmonizes EU rules for products derived from recycled or organic materials and by-products, providing rules to recover nutrients into materials for use as fertilising products. - Regulation (EC) No 1069/2009 (Animal By-Product Regulation) to ensure a high level of protection of animal and public health during further usage and disposal of animal by-products; - Directive 2008/98/EC (Waste Framework Directive) regulates the standard processing for animal by-products such as manure, which

Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**		
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			have a legal status of waste. -The following regulations promote the manure treatment technologies for the animal intensity in livestock farms above the thresholds and require Integrated Environmental Authorization: - The Best Available Techniques Reference Document (BREF) for Intensive Rearing of Poultry or Pigs; -Commission Implementing Regulation (EU) 2021/1165 authorising certain products and substances for use in organic production and establishing their lists.
		Catalonia (Spain)	-Decree 153/2019 classifies the wastes and the obtained products as Fertilisers of Type 1 and type 2; - Royal Decree 999/2017 to obtain an approved fertiliser. - Annexes 2, 3 and 8 of ORDINANCE ACC/25/2023, of February 10, Decree 153/2019, of July 3, for management of soil fertilisation and livestock farming and approval of the action program for vulnerable areas in relation to nitrate contamination from agricultural sources. - Royal Decree 1051/2022 establishes standards for sustainable nutrition in agricultural soils.
Linked document	**D1.1 Inventory and analyses of selected OGs outcomes on nutrient management**		
Current practice in the region related to OG (D1.2)	Historically and to this day, the farmers spread slurry and livestock manure directly to the crops, with no treatments. This is a problem since the amount of slurry produced, compared to the hectares of crops in Catalonia; and the limits of maximum nitrogen to introduce in the soil.		
Linked document	**D1.2 Inventory of current farming practices on nutrient management**		
Members of the OGs consortium	Academia/Research	1	
	Public Administration	0	
	Private Sector/Company	3	
	Civil Society	0	

Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**	
Acronym used in NUTRI-KNOW	**Slurry concentrator**	
Nº success stories	1	
OG mirror	Treatment and management of manure in nitrogen surplus areas: adaptation of treatment to the surplus to be managed and agronomic valorisation of the resulting liquid effluents	**Challenge aimed:** Slurry management and transportation. **Type of solution provided:** Adapt existing slurry tanks on farms to carry out a process based on NDN (nitrification - denitrification) with the aim of obtaining an effluent with the required amount of nitrogen, with a minimum treatment cost and environmental impact. Search for land and manage slurry in the local area. Optimise slurry transport. **Similiarites:** Optimisation of transport (more nutrient concentrated slurry is transported, fewer trips are required). Promotion of slurry application on own land (more volume of slurry with lower N concentration is applied).
	K-EcoFeRtilizer – Development of a new potassium struvite recovery process for use as a fertiliser for pig slurry treatment	**Challenge aimed:** Eliminate potassium (K) from slurry. **Type of solution provided:** Apply a struvite potassium precipitation treatment (MgK) to obtain a slow release (organic?) fertiliser. **Similiarites:** Like the OG of the concentrator, this OG developed a pilot plant to address the challenge of slurry nutrient management. This OG proposes a solution to the problem of the inability to separate potassium from the dilute slurry fraction of the concentrator OG. Therefore it turns the problem of excess potassium in the diluted slurry fraction of the concentrator into an opportunity.
Risk exposure	**Low:** The tasks carried out in the pilot project demonstrate the technological and economic viability of the Slurry Concentrator. The slurry concentrator can be used on any pig or cow (slurry-producing) farm that meets the minimum requirements. The concentrator works by being submerged in one of the pits, concentrating the nutrients in that pit, and transferring the more diluted fraction to the other pit. The main requirement, which may not always be available, is that two separate pits are needed to store the two liquid fractions produced. The system has the potential to work perfectly well in other regions (it is not climate-dependent) and also has the potential to be used on any farm where	

Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**	
Acronym used in NUTRI-KNOW	**Slurry concentrator**	
	livestock manure is produced in the form of slurry (not manure). It is a system that does not require any support infrastructure and does not require very high energy input, so farms would already be ready to use it. The design of the equipment is perfectly defined and scalability would be possible if there was demand and production capacity could be increased. A detailed user manual is also available for use by farmers. In addition, the same equipment can be used by several farmers at the same time and its use can be shared. This requires that a safety and cleaning protocol (already in place in Catalonia, for example) is followed to ensure safe use on different farms. The equipment has been tested and validated at full scale on different farms and in different conditions. The efficiency of the equipment, electricity consumption, etc. has also been determined, facilitating the adoption of the technology by farmers and cooperatives.	
Consortium evaluation (D1.3)	Knowledge produced	**(8/10) Transformative impact** Provides in-depth and expert-level knowledge with extensive and comprehensive data. Also gives well-defined and actionable steps for implementation. The knowledge can be applied in various relevant contexts with some adaptation. The information is broadly applicable but may require adjustments to suit specific scenarios.
	Economic viability	**(6.7/10) Significant impact** The tool's technical and financial feasibility is well-supported and realistic. The technical requirements can be met, and financial resources can be secured with reasonable effort. Despite offering a transformative market opportunity for end users through its revolutionary technology and innovative business model, its market impact remains limited. This is due to the developing company's lack of resources and capacity to bring the concentrator to market.
	Alignment with law and policies	**(6.5/10) Significant impact** The technology is fully aligned with all relevant law policies and regulations. It has a minor impact on nutrient management policies. No special authorization from legal authorities is required to implement the technology.
	Social Benefits	**(5.5/10) Moderate impact** The technology has a moderate impact on society, it may contribute to notable social improvements and address certain societal challenges.

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		There are some efforts to engage stakeholders on the technology's social impact. However, engagement is sporadic or limited to specific groups.
	Environmental Benefits	**(5.2/10) Moderate impact** The technology makes a valuable contribution to environmental sustainability efforts, although its impact is not considered revolutionary for the environment.
Linked document	**D1.3 Results of the cost-benefit and sustainability analysis**	
Stakeholder comments (D2.1)	**Awareness**	**1.95/5 (low)** 14 of the 22 respondents to the questionnaire have little knowledge of the OG; 1 of them had heard about the OG; 3 indicated that they knew some of the OG activities; 2 knew the OG objectives and activities and another 2 knew very well about the OG (being part of the consortium)
	Effectiveness	**3.05/5 (moderate)** The 16 respondents to the questionnaire indicated the outcome of this OG is relevant and useful in some of their agricultural activities
	Challenges	- Additional investment is needed; -Lack of confirmed results/successful cases: - Lack of information on the cost structure; - Difficult to obtain the permit.
	Legslative needs	- Nutrient use and management in crop and livestock production; - Fertiliser manufacture & trade: - Treatment of animal manure and organic wastes;
Linked document	**D2.1 Matchmaking of OG outcomes with market and policy**	

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Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**	
Acronym used in NUTRI-KNOW	**Slurry concentrator**	
Relevant stakeholders (D2.2)	**Farmers Related** (Farming trade union, Farmers association, Professional association, Cluster, Expert groups, Local farmer, Farmer association, Cooperative)	Associació de Joves Agricultors i Ramaders de Catalunya (JARC): https://jarc.cat/ Unio Pagesos Catalunya (UP): https://uniopagesos.cat/ Federació d'Agricultors Viveristes de Catalunya: http://www.viveristes.cat Granges Terragrisa Agrària Plana de Vic i Secció de Crèdit, SCCL: https://www.planadevic.cat/cat/ Cluster Bioenergia de Catalunya (CBC): https://www.clusterbioenergia.cat/es/biogas/ Spanish Biogas Association (AEBIG): www.aebig.org Group of experts in the treatment of livestock waste (GETDR): https://ruralcat.gencat.cat/web/guest/oficina-de-fertilitzacio/tractaments/grup-d-experts-en-tractaments Federació de Cooperatives Agràries de Catalunya (FCAC): https://www.cooperativesagraries.cat/
	Fertilisers Related (Fertiliser company, Biobased fertilising industry, Fertiliser test lab)	-
	Technology_Providers User (Technology provider , Refinery, Biogas plant)	Grup Solucions Manresa, SLUP: https://solucions.cat/
	Financial Institutions (Bank, Public funding agency, Investor)	-
	MEDIA (Local media; Regional media, European media, Influencer, Farming specilised)	-

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Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**	
Acronym used in NUTRI-KNOW	**Slurry concentrator**	
	Short Term Actions (Project, Initiative, Collaborator)	-
	Services To Farmers (Farm advisor, Advisory platform, Agricultural contractor, Trade chamber, Capacity building institution)	Quintanes: http://www.quintanes.com/
	CSOs, Other Non Porfit (NGOs, Consumer Associations, etc.)	Grup Defensa del Ter:https://www.gdter.org/ Costa Food Meat (Grupo Costa): https://costafood.com/?lang=en Vall Companys Grup: https://vallcompanys.es/en/ Agropecuària de Guissona (BonÀrea Agrupa): https://www.bonarea-agrupa.com/ Selecció Batallé: https://www.batalle.com/en/companyia.html Grupo Jorge European Sustainable Phosphorus Platform (ESPP): https://phosphorusplatform.eu/
	Public Administration_Policy (Regional government, County office/ other territorial services, Public council, National government, National / Regional agency)	Departament d'Acció Climàtica, Alimentació i Agenda Rural de Catalunya (DACC): https://agricultura.gencat.cat/ca/inici/ | https://ruralcat.gencat.cat/oficina-de-fertilitzacio Agència de Residus de Catalunya (ARC): https://residus.gencat.cat/es/inici/ Catalan Water Agency (ACA): https://aca.gencat.cat/ca/inici Ministerio de Agricultura, Pesca y Alimentación de España (MAPA): https://www.mapa.gob.es/en/ Ministry for Ecological Transition and the Demographic Challenge of the Government of Spain (MITECO): https://www.miteco.gob.es/en/ Catalan Agency for Business Competitiveness (Acció): http://www.accio.gencat.cat/ca/inici Catalan Council of Organic Production (CCPAE): https://www.ccpae.org/

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Name of the OG	**Development of a slurry concentrator with continuous total nitrogen data collection**	
Acronym used in NUTRI-KNOW	**Slurry concentrator**	
	EU/INTERNATIONAL ORGANISATIONS (EU agencies, Networks, etc.)	-
	Academia (Research institution, University, Agricultural student)	BETA TC (UVic-UCC): https://betatechcenter.com
Linked documents	**D2.2 Mapping of stakeholders and target audience** **SHs map** https://embed.kumu.io/8ea065fc9b533a22fa02473ffdb98536	

Annex 4 Summary of the practical meta-database (data uploaded as knowledge objects to the EU-FarmBook platform)

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
2	OG RENURE: Agronomic performance of manure-derived ammonium salts as RENURE fertilisers	The EIP-AGRI Operational Group RENURE aims to share acquired knowledge and experience on the practical application of ammonium salts to farmers in Flanders and The Netherlands, eventually helping to prepare the agricultural and horticultural sector for the use of these fertilisers by making the transition from research-based field trials to a practical evaluation at the farmer's premises. This infosheet provides an introduction to the manure-derived ammonium salts in RENURE operational group, inluding the production process via stripping and scrubbing, the general characteristics, the field application performance, the economic assessment, and the relevant legal frameworks.	processing technologies, fertiliser production, application, stripping and scrubbing	IVACO cvba, Jeroen Hindryckx, Guido Lammerant, Roger Masscheleyn, Bert Hanssens, Jeroen Dejonckheere	https://eufarmbook.eu/en/contributions/65f8134d2510a16ec2047dd0	Dutch	2023	access to data; dissemination; education/training; decision-making support;	Flanders (BE), The Netherlands	OG RENURE_Infosheet toekomstige gebruikers.pdf (inagro.be)	document	Factsheet	Crop farming Livestock	Agroecology; Animal husbandry and welfare; Farming equipment and machinery; Plant production and horticulture; Waste, by-products and residues management	https://creativecommons.org/licenses/by/4.0/	pdf	299 kb
3	OG RENURE: Production of manure-derived ammonium salts through stripping and scrubbing process	The EIP-AGRI Operational Group RENURE aims to share acquired knowledge and experience on the practical application of ammonium salts to farmers in Flanders and The Netherlands, eventually helping to prepare the agricultural and horticultural sector for the use of these fertilisers by making the transition from research-based field trials to a practical evaluation at the farmer's premises. This infosheet provides an introduction to the production of ammonium salts from manure in RENURE operational group, inluding the production process via stripping and scrubbing, the general characteristics and performance of the products, the economic assessment, and the relevant legal frameworks.	processing technologies, fertiliser production, application, stripping and scrubbing	IVACO cvba, Jeroen Hindryckx, Guido Lammerant, Roger Masscheleyn, Bert Hanssens, Jeroen Dejonckheere	https://eufarmbook.eu/en/contributions/660e6291c1ef7c16f62503a9	Dutch	2023	access to data; dissemination; education/training; decision-making support;	Flanders (BE), The Netherlands	OG RENURE_Infosheet toekomstige producenten.pdf (inagro.be)	document	Factsheet	Crop farming Livestock	Agroecology; Animal husbandry and welfare; Farming equipment and machinery; Plant production and horticulture; Waste, by-products and residues management	https://creativecommons.org/licenses/by/4.0/	pdf	421kb
4	OG RENURE: Meta-analysis on the economic viability of stripping and scrubbing process for production of manure-derived ammonium salts	The EIP-AGRI Operational Group RENURE aims to share acquired knowledge and experience on the practical application of ammonium salts to farmers in Flanders and The Netherlands, eventually helping to prepare the agricultural and horticultural sector for the use of these fertilisers by making the transition from research-based field trials to a practical evaluation at the farmer's premises. Within the OG RENURE, a meta-analysis was done to evaluate the economic viability of implementing a stripper-scrubber unit to recover ammoniacal nitrogen from (fermented) manure, i.e. ammonium nitrate as a fertilizer substitute.	processing technologies, fertiliser production, application, stripping and scrubbing	IVACO cvba, Jeroen Hindryckx, Guido Lammerant, Roger Masscheleyn, Bert Hanssens, Jeroen Dejonckheere	https://eufarmbook.eu/en/contributions/660e643d97edc795f662a85b	Dutch	2023	dissemination; data storage/ processing; modelling; evaluation; decision-making support	Flanders (BE), The Netherlands	OG RENURE_Meta-analyserapport.pdf (inagro.be)	document	Report/paper	Crop farming Livestock	Agroecology; Animal husbandry and welfare; Farming equipment and machinery; Plant production and horticulture; Waste, by-products and residues management	https://creativecommons.org/licenses/by/4.0/	pdf	1223kb

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
5	OG RENURE: Production and agronomic assessment of the manure-derived ammoniun salts as RENURE fertilisers	The EIP-AGRI Operational Group RENURE aims to share acquired knowledge and experience on the practical application of ammonium salts to farmers in Flanders and The Netherlands, eventually helping to prepare the agricultural and horticultural sector for the use of these fertilisers by making the transition from research-based field trials to a practical evaluation at the farmer's premises. This report summerized the results of five field trials set up in 2022 and 2023 within the OG RENURE to evaluate ammonium nitrate (AN) recovered from animal manure. Accordingly an exemption application was submitted and granted to use ammonium nitrate as a fertilizer substitute.	processing technologies, fertiliser production, application, stripping and scrubbing	IVACO cvba, Jeroen Hindryckx, Guido Lammerant, Roger Masscheleyn, Bert Hanssens, Jeroen Dejonckheere	https://eufarmbook.eu/en/contributions/660e652bc1ef7c16f6250468	Dutch	2023	dessimination; data storage/ processing; evaluation; decision-making support	Flanders (BE), The Netherlands	Proefverslag (inagro.be)	document	Report/paper	Crop farming Livestock	Agroecology; Animal husbandry and welfare; Farming equipment and machinery; Plant production and horticulture; Waste, by-products and residues management	https://creativecommons.org/licenses/by/4.0/	pdf	1166kb
8	OG_Grass2Algae: Microalgae cultivation as a key enabling technology for circular green biorefineries	Farmers are facing challenges in valorising the large quantities of surplus grass from mown field edges and mown grass with too low a nutritional value for livestock. The OG Grass2Algae assesses the extent to which grass juices can be used as nutrition for the cultivation of microalgae, with the aims to broaden income on Flemish agricultural companies through the circular economy. The poster presentation entitled "Microalgae cultivation as a key enabling technology for circular green biorefineries" introduced the results obtained in the operational group (OG) Grass2Algae. It was presented at the AlgaEurope conference in Rome (Italy) from 13 - 15 December 2022	processing technologies, fertiliser production, grass juice, microalgae, alternative protein	Marcella Fernandes de Souza, Schoeters, F., Thoré , E.S.J., De Cuyper, A., Noyens , I., Goossens, S., Van Miert, S., Meers, E	https://eufarmbook.eu/en/contributions/660e69959be5d266a07b1fb7	English	13-15/12/2022	communication; dessimination; evaluation;	Flanders (BE)		document	Technical information/ specifications card	Crop farming Livestock	Agroecology; biomass production; Supply chain, marketing and consumption; Waste, by-products and residues management	https://creativecommons.org/licenses/by/4.0/	pdf	1265kb
9	OG_Grass2Algae: Creating value from residual grass for feed applications through microalgal cultivation on grass juice	Farmers are facing challenges in valorising the large quantities of surplus grass from mown field edges and mown grass with too low a nutritional value for livestock. The OG Grass2Algae assesses the extent to which grass juices can be used as nutrition for the cultivation of microalgae, with the aims to broaden income on Flemish agricultural companies through the circular economy. The oral presentation entitled "Creating value from residual grass for feed applications through microalgal cultivation on grass juice" was presented for the OG Grass2Algae at the 18th International Conference on Renewable Resources and Biorefineries (1 - 3 June 2022, Bruge, Belgium) with the topic of Biobased Solutions for Climate Change.	processing technologies, fertiliser production, grass juice, microalgae, alternative protein	Marcella Fernandes de Souza	https://eufarmbook.eu/en/contributions/660e6a6b9be5d266a07b1feb	English	1-3/06/2022	communication; dessimination; evaluation;	Flanders (BE)		Slideshow presentation	Informative presentation	Crop farming Livestock	Agroecology; biomass production; Supply chain, marketing and consumption; Waste, by-products and residues management	https://creativecommons.org/licenses/by/4.0/	pdf	1950kb

Metadata No.	Title	escription (up to 00 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
10	OG_Grass2Algae: valorisation of grass juice for growing microalgae as an additional source of income for farmers	Farmers are facing challenges in valorising the large quantities of surplus grass from mown field edges and mown grass with too low a nutritional value for livestock. The OG Grass2Algae assesses the extent to which grass juices can be used as nutrition for the cultivation of microalgae, with the aims to broaden income on Flemish agricultural companies through the circular economy. The factsheet provides an introduction to the operational group Grass2Algae with the following sections: - introduction of the background and objectives; -pre-treatment of the grass juice; -why microalgae; - microalgae cultivation on grass juice; - economic viability of algae growth	processing technologies, fertiliser production, grass juice, microalgae, alternative protein	Ghent University, RADIUS at Thomas More, AnKo Projects, United experts and 3 partner farmers: Kris Heirbaut, Koen Apers, Leo De Grave	https://eufarmbook.eu/en/contributions/660e6b46c1ef7c16f625058a	Dutch	27/06/2022	access to data; communication; dissemination; decision-making support	Flanders (BE)	https://nutricycle.vlaanderen/2022/06/27/factsheet-grass2algae/	image	factsheet	Crop farming Livestock	Agroecology; biomass production; Supply chain, marketing and consumption; Waste, by-products and residues management	https://creativecommons.org/licenses/by/4.0/	jpg	2546kb
16	OG_Biorefinery_Glas: valorisation of grass into different products using a biorefiery approach to increase farmers income.	This brochure describes the Biorefinery Glas project overview, objective and approach to grass biorefinery. Biorefinery Glas is a first demonstration of a small-scale biorefinery in Ireland, supportingthe development of new business models and farmer diversification into the circular bioeconomy. Biorefinery Glas is a first step towards changing the role of farmers in the bioeconomy, from suppliers of biomass to producers of finished and semifinished products. The project will demonstrate a replicable smallscale biorefinery with farmers in the West Cork Region. Through biorefining, perennial ryegrass is fractionated into a variety of new products in a process which improves the protein efficiency, value and sustainability of our grasslands. This brochure intends to inform stakeholders about the Biorefinery Glas project.	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass	James Gaffey; Biorefinery Glas	https://eufarmbook.eu/en/contributions/662269aa6711e677db513d35	English	2023	communication; dissemination	Ireland	https://biorefineryglas.eu/wp-content/uploads/2019/12/Biorefinery-Glas-Brochure.pdf	document	brochure	Crop farming Livestock	Agroecology; biomass production; farm diversification/ new business models; fertilisation and nutrients management	default (CC BY 4.0)	PDF	2,436 KB

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
31	Biorefinery Glas - Small-scale Farmer-led Green Biorefineries Practice Abstract	A practice abstract describing the project duration, funding and lead partner details. The project aims to improve the overall sustainability, value and resource efficiency of Ireland's agriculture sector through diversification into the bioeconomy, using a widely replicable small-scale farmer-operable grass biorefinery. The project activities included: •Demonstrate a small-scale mobile grass biorefinery on multiple farms in South West Ireland. • Ensure that each component of grass is used at its highest value, with the simultaneous production of multiple products from grass, including an improved fodder press-cake fibre for cattle, protein concentrate feed for monogastrics, high value prebiotic sugars (for the food and feed markets) and recovery of nutrients for use as fertilizer. • Promote farm-to-farm symbiosis and cooperation. • Facilitate several knowledge exchange activities, including training of farmers on the operation of small-scale biorefineries in the South West and nationally. • Deliver a dissemination package with farmers playing a central role, sharing their experiences with other farmers and relevant multi-actors through a digital storytelling initiative	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass; Biorefinery Glas	https://eufarmbook.eu/en/contributions/662a1de867e5de074520b249	English	2019	communication; dissemination;	Ireland	https://biorefineryglas.eu/wp-content/uploads/2019/12/EIP-Agri-Practice-Abstract.pdf	Document	practice abstract	Crop farming Livestock	Agroecology; biomass production; farm diversification/ new business models; fertilisation and nutrients management; Animal husbandry and welfare	default (CC BY 4.0)	PDF	3,131 KB
32	OG_Biorefinery_Glas_A factsheet on Biorefinery Glas	A fact sheet informing the background to biorefinery and the biorefinery glas project. Biorefinery Glas focuses on the demonstration of a small-scale grass biorefinery with farmers in South West Ireland with the aim of diversifying farmer produce, while resolving significant challenges in traditional agriculture. The project aims to improve the sustainability, value and resource efficiency of Ireland's livestock sector by supporting farmer diversification into the bioeconomy. During the project the partners have demonstrated the GRASSA small-scale biorefinery with farmers in the West Cork Region.	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass	James Gaffey; Biorefinery Glas	https://eufarmbook.eu/en/contributions/662a2daf537a79380b7d65cf	English	2019	communication; dissemination; education/training	Ireland	https://biorefineryglas.eu/wp-content/uploads/2020/02/factsheet-1.pdf	Document	factsheet	Crop farming Livestock	Agroecology; biomass production; farm diversification/ new business models; fertilisation and nutrients management; Animal husbandry and welfare	default (CC BY 4.0)	PDF	812 KB

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33	OG_Biorefinery_ Glas_A factsheet on the potential of press cake as a fodder source for dairy cows	A fact sheet on the potential use of grass press cake as a fodder source for dairy cows. Press cake silage can partially replace grass silage in dairy cows' diet. Milk yield and milk quality were not affected by replacing grass silage with press cake silage in the diet of dairy cows. Reduction in nitrogen and phosphorus excretion by dairy cows was observed by replacing grass silage with press cake silage compared to grass silage only. Reduction in in vitro methane production was observed by replacing grass silage with press cake silage compared to grass silage only.	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass	James Gaffey; Biorefinery Glas	https://eufarmbook.eu/en/contributions/662a479d537a79380b7d6a53	English	2019	communication; dissemination; education/training	Ireland	https://biorefineryglas.eu/wp-content/uploads/2021/03/Fact-Sheet-2-Presscake-Dairy-Trials.pdf	Document	factsheet	Crop farming Livestock	Agroecology; biomass production; farm diversification/ new business models; fertilisation and nutrients management; Animal husbandry and welfare	default (CC BY 4.0)	PDF	19,194 KB
34	OG_Biorefinery_ Glas_ A factsheet on the comercially viability of the prebiotic fructo-oligosaccharids from grass	A fact sheet on the potential use of fructo-oligosaccharides extracted form grass as a commercially viable prebiotic. Prebiotics are type of long chain fibres that human body cannot digest but serve as food for probiotics which are helpful bacteria because they help keep your gut flora healthy. A healthy gut contributes to a strong immune system, heart health, brain health, effective digestion, and it may help prevent some cancers and autoimmune diseases. Fructooligosaccharides are considered to be a gold standard in prebiotic market. FOS extracted from grass whey (byproducts of biorefining process) represents a working circular bio economy model. Prebiotic activity of Grass FOS were noted to be efficacious and results from trials were comparable to that of commercial FOS market standards. The residual grass whey can remain on the farm as a fertilizer.	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass	James Gaffey; Biorefinery Glas	https://eufarmbook.eu/en/contributions/662a48fbbc8b0380dfee3da2	English	2019	communication; dissemination; education/training	Ireland	https://biorefineryglas.eu/wp-content/uploads/2021/03/Fact-Sheet-3-Grass-based-Prebiotics-FOS.pdf	Document	factsheet	Crop farming Livestock	Agroecology; biomass production; farm diversification/ new business models; fertilisation and nutrients management; Animal husbandry and welfare	default (CC BY 4.0)	PDF	7,831 KB

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
35	OG_Biorefinery_ Glas_A factsheet on the production of grass whey and its suitability for fertiliser and bioenergy applications.	A fact sheet on the potential use of grass whey as a biofertiliser and used to produce bioenergy. Biorefinery process fresh grass can be processed to produce a presscake fibre feed for ruminants, and a protein concentrate which can serve as monograstric feed. A high value sugar stream, rich in fructo-oligosaccharides, a prebiotic, can be extracted from the remaining liquid, leaving a residual stream called “whey” which contains many nutrients, minerals and sugars. In the sections below we will detail the potential of using this whey as a bio-fertilizer or for the production of bioenergy through anerobic digestion. Overall, four product streams were evaluated. Presscake fibre was produced as cattle feed. Green protein concentrate was produced for monogastrics. A prebiotic, fructo-oligosaccharides was extracted. The residual grass whey can remain on the farm as fertilizer. Grass whey process residues can also be used for the production of biogas through anaerobic digestion.	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass	James Gaffey; Biorefinery Glas	https://eufarmbook.eu/en/contributions/662a4a18bc8b0380dfee3e00	English	2019	communication; dissemination; education/training	Ireland	https://biorefineryglas.eu/wp-content/uploads/2021/03/Fact-Sheet-3-Grass-based-Prebiotics-FOS.pdf	Document	factsheet	Crop farming Livestock	Agroecology; biomass production; farm diversification/ new business models; fertilisation and nutrients management; Animal husbandry and welfare	default (CC BY 4.0)	PDF	7,933KB
36	OG_Biorefinery_ Glas_ A factsheet on the Use of Grass Protein Concentrate as Novel Monogastric Feed for Pigs	A factsheet on the suitability of using grass protein concentrate as monogastric feed for pigs. As Ireland imports over 3 million tonnes of animal feed annually, there is a major opportunity to offset some of these imports if we can use grass in a more resource efficient way using the biorefinery approach. The majority of these imports are GMO and emission intensive and are often associated with negative land-use effects such as soil degradation, and the decline in forest areas and subtropical savannahs. During the Biorefinery Glas project grass protein concentrate was trialed as a protein source in pig feed diets. Overall, 800 kgCO2-e released per tonne of soya meal produced. 1.7 million tonnes of soya and maize genetically modified (GM) products imported into Ireland annual out of a total of 3.47 million feed imports. 90% of soyabean and maize feed products imported from Argentina, Brazil and the USA. Approximately two thirds of the feed materials marketed in Ireland are imported, compared to 37% in the UK, 27% in France, and 26% in Germany.	Livestock farming; Fertiliser production; Processing technologies; Application: Green biorefinery; Grass	James Gaffey; Biorefinery Glas	https://eufarmbook.eu/en/contributions/662a4b6d67e5de074520b9c6	English	2019	communication; dissemination; education/training	Ireland	https://biorefineryglas.eu/wp-content/uploads/2021/03/Fact-Sheet-3-Grass-based-Prebiotics-FOS.pdf	Document	factsheet	Crop farming Livestock	Agroecology; biomass production; farm diversification/ new business models; fertilisation and nutrients management; Animal husbandry and welfare	default (CC BY 4.0)	PDF	8,145KB

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38	OG_Duncannon Blue Flag Farming & Comunities Scheme_ Aims and Objectives of the Duncannon Blue Flag Farming & Comunities Scheme	A flyer produced to intoduce the project, it's aims and activities, and highligh the innovative aspects of the project. This project aims to sustainably restore, protect and enhance the quality of the bathing and river waters at Duncannon by reducing pollution from rural agricultural and domestic sources whilst also protecting farm incomes. They also aim to develop an effective model for future sustainable managment of similar catchments and to foster positive relations between the farmers and householders in the catchment area. The activities included creating farm specific "Pollution Potential Zone" (PPZ) plan for each farm, monitoring farm practice change and water quality in the wider catchment area and developing community wide engagement. The innovative nature of this project was highlighted in a simple visual way with PPZ maps, results based reward scheme and using a holistic approach to improving water quality by woring with farmers and the wider community.	Livestock farming; Catchments; Application; Water quality, Nitrates	Duncannon Blue Flag Project	https://eufarmbook.eu/en/contributions/662a506c0b4d5b2ea1b27686	English	2020	communication; dissemination	Ireland		Document	flyer	Crop farming; livestock; environment; society;	Agroecology; biodiversity and nature management; fertilisation and nutrients management; landscape/land management; soil management/ functionality; waste, by-products, and residues management	default (CC BY 4.0)	PDF	885KB
39	OG_Duncannon Blue Flag Farming & Comunities Scheme_ Duncannon Blue Flag Farming & Comunities Scheme Practice Abstract	A practice abstract describing the project duration, funding and lead partner details. It also details the projects aims, objectives and activities. This project began in March 2018 and finished in May 2021. The project rational is due to the elevated bacteria levels of bathing water quality at Duncannon beach together with its loss of its Blue Flag status of environmental excellence in 2007 have a major impact on the tourism potential of the area. It aims to contribute to the recovery and long-term retention of the Blue Flag status at Duncannon beach by improving the bacterial quality of the two coastal streams that flow onto the beach.	Livestock farming; Catchments; Application; Water quality, Nitrates	Brendan Cooney, Wexford County Council; Duncannon Blue Flag Project	https://eufarmbook.eu/en/contributions/662a51b0b77296f6fbf1b5ea	English	01/03/2018	communication; dissemination	Ireland	https://www.nationalruralnetwork.ie/wp-content/uploads/2019/02/The-Duncannon-Blue-Flag-Farming-and-Communities-Scheme-NRN-Website.pdf	Document	practice abstract	Crop farming; livestock; environment; society;	Agroecology; biodiversity and nature management; fertilisation and nutrients management; landscape/land management; soil management/ functionality; waste, by-products, and residues management	default (CC BY 4.0)	PDF	644KB
41	OG_Pocketboer II: Nieuwsartikels	The document includes a list of publications/articles related to the OG Pocketboer II.	processing technologies, anaerobic digestion, pocket digestion, biogas	Inagro, Boerenbond, Biogas-E	https://eufarmbook.eu/en/contributions/66018e0c1835ca2c51a1acc8	Dutch	2021	communication; dissemination	Flanders (BE)		document	articles	Pocket digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	pdf	159 kB

Metadata No.	Title	Description (up to 100 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
42	OG_Pocketboer II: Tips & tricks van en voor pocketboeren	In 2016 and 2017, various problems were identified when operating small-scale biogas plants on agricultural companies. Through the OG Pocketboer and Pocketboer 2, ideas and experiences were brought together to look for solutions. As a result, the poster with tips and tricks from and for farmers was created in 2019 and updated in 2021.	processing technologies, anaerobic digestion, pocket digestion, biogas	Boerenbond, Inagro, Innovatiesteunpunt, Provincie Antwerpen, Innolab, Biogas-E, Patrick Devreese, Marc Gailliaert, Paul Leenaerts, Dries Matthys, Kris Muys, Paul Van der Schoot, Bart Vanderstraeten, Stefan Wyers	https://eufarmbook.eu/en/contributions/65f976e8137e1cd60be193df	Dutch	2021	communication; dissemination; education/training	Flanders (BE)	https://www.biogas-e.be/sites/default/files/2019-07/Tips%20%26%20Tricks%20van%20en%20voor%20pocketboeren.pdf	document	poster	Pocket digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	pdf	297 kB
43	OG_Pocketboer II: Schriftelijke vraag Vlaams Parlement - Lerend Netwerk Pocketboer	This note specifies questions about pocket digestion and Pocketboer II that the Flemish Parliament addressed to the Flemish Energy and Climate Agency (VEKA).	processing technologies, anaerobic digestion, pocket digestion, biogas	Boerenbond, Inagro, Biogas-E, Kim Winternitz	https://eufarmbook.eu/en/contributions/660190ca1835ca2c51a1ad4c	Dutch	06/02/2020	communication; dissemination; decision-making support	Flanders (BE)		document	parliamentary question	Pocket digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	pdf	259 kB
44	Kleinschalige vergisting - Mogelijkheden en kansen voor de landbouw	The brochure consists of various modules, in which each time a different aspect of pocket digestion is highlighted. MODULE1: Wat is vergisting? MODULE2: Praktische tips voor een goede uitbating MODULE3: Wetgeving & steunmaatregelen MODULE4: Businessmodel MODULE5: Nieuwe concepten MODULE6: Praktijkvoorbeelden MODULE7: Nutriëntenstromen	processing technologies, anaerobic digestion, pocket digestion, small-scale digestion, biogas, digestate, nutrients	Anke De Dobbelaere, Jan Leenknegt, Sander Vandendriessche, Inès Verleden, Mieke Decorte, Kim Winternitz, Erik Meers, Tine Vergote, Lies Bamelis, Emilie Snauwaert, Nutricycle Vlaanderen	https://eufarmbook.eu/en/contributions/660196c4b1522f5a27c7b295	Dutch	2020	communication; dissemination; education/training	Flanders (BE)	https://inagro.be/sites/default/files/media/files/2022-04/BrochureKleinschaligeVergisting.pdf	document	Brochure	Small-scale digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	pdf	14.2 MB

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Metadata No.	Title	escription (up to 00 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
45	OG_Pocketboer II: Eindverslag	The final publication of OG Pocketboer II provides an overview of the most important findings during the OG Pocketboer (I) and OG Pocketboer II.	processing technologies, anaerobic digestion, pocket digestion, small-scale digestion, biogas	Boerenbond, Inagro, Innolab, Biogas-E, Kris Muys, Dries Matthys, Paul Van der Schoot, Patrick Devreese, Stefan Wyers	https://eufarmbook.eu/en/contributions/66019a3cb1522f5a27c7b332	Dutch	2021	communication; dissemination;	Flanders (BE)		document	Report	Pocket digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	pdf	37,6 kB
46	PocketPower: Webinar kleinschalige vergisting - groentesector 2020	Informative webinar (in the context of the PocketPower project) that maps out the opportunities for agricultural digestion in Flanders for the vegetable sector. PocketPower (2016-2020) is a project linked to Pocketboer I and II where pocket digestion is intended to be expanded to various agricultural and horticultural sectors.	processing technologies, anaerobic digestion, pocket digestion, small-scale digestion, biogas	Inagro	https://eufarmbook.eu/en/contributions/66704977eae64a688c6e520a	Dutch	29/09/2020	communication; dissemination; education/training	Flanders (BE)	https://www.youtube.com/watch?v=CRLVDebhGVs	video	webinar	Pocket digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	mp4	204 MB
47	PocketPower: Webinar kleinschalige vergisting - melkveesector 2020	Informative webinar (in the context of the PocketPower project) that maps out the opportunities for agricultural digestion in Flanders for the dairy sector. PocketPower (2016-2020) is a project linked to Pocketboer I and II where pocket digestion is intended to be expanded to various agricultural and horticultural sectors.	processing technologies, anaerobic digestion, pocket digestion, small-scale digestion, biogas	Inagro	https://eufarmbook.eu/en/contributions/662712dc5fa87c702256d0a1	Dutch	29/09/2020	communication; dissemination; education/training	Flanders (BE)	https://www.youtube.com/watch?v=s77PHI_HQww	video	webinar	Pocket digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	mp4	124 MB
48	PocketPower: Webinar kleinschalige vergisting - varkenssector 2020	Informative webinar (in the context of the PocketPower project) that maps out the opportunities for agricultural digestion in Flanders for the pig sector. PocketPower (2016-2020) is a project linked to Pocketboer I and II where pocket digestion is intended to be expanded to various agricultural and horticultural sectors.	processing technologies, anaerobic digestion, pocket digestion, small-scale digestion, biogas	Inagro	https://eufarmbook.eu/en/contributions/6627218209ab01702bcaae5a	Dutch	29/09/2020	communication; dissemination; education/training	Flanders (BE)	https://www.youtube.com/watch?v=AGzlar20gB0	video	webinar	Pocket digestion	Nutrient recycling, manure valorisation, digestate, energy production, anaerobic digestion	default (CC BY 4.0)	mp4	128 MB
49	Eines per a la milora eficient del maneig de dejecciosn ramaderes, fertilització i qualitat del cultiu	The objective of this Operational Group is to develop innovative tools for more efficient manure and fertilisation management, in order to value manure and technologique tools to give the most accurate advice to the farmers. This document is a slideshow presentation describing the project, detailing the activities, methodology and results and explaining how to replicate it, used in different seminars.	manure management efficiency manure valorisation BAT Agri-cooperatives	IRTA	https://eufarmbook.eu/en/contributions/661f7e0dad7afadbfd522d34	Catalan	01/07/2019	communication; dissemination; education/training	Catalunya (Spain)	https://www.cooperativesagraries.cat/pujades/files/PRES%20FCAC%20GO%20dejeccions%202019-07-4%20Jornada%20UAB.pdf	Presentation / slideshow	Informative presentation	Crop farming Livestock	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF	1,78 Kb

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
50	Cooperation for innovation: Operational Group to optimise manure management, soil fertilisation, crop quality and environmental protection	The objective of this Operational Group is to develop innovative tools for more efficient manure and fertilisation management, in order to value manure and technologique tools to give the most accurate advice to the farmers. This document is a factsheet with preliminar information about the project and the expect results. With this information, technicians were able to advice farmers specifically for them.	manure management efficiency manure valorisation BAT Agri-cooperatives	FCAC	https://eufarmbook.eu/en/contributions/661f7fe40beeac6e7e381784	Catalan, English and Spanish	01/11/2018	communication; dissemination; education/training	Catalunya (Spain)	https://ruralcat.gencat.cat/documents/20181/8633778/grups_operatius_en_121/ed4c17af-c348-47c3-8005-fb66464f3860	Document	Factsheet	Crop farming Livestock	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF	76 KB
51	Applipur: Phone app for the best manure management	In the OG manure management tools, a digital tool was studied for the best and more efficient manure management. This document is a flyer to explain this app (digital tool): what is it, its objectives, and how it works depending on which step of the value chain the user works in (farmer, rancher, transporting, technician)	Digital tool Better manure management Slurry traceability	Applipur	https://eufarmbook.eu/en/contributions/661f830fad7afadbfd52305d	Catalan	16/03/2020	communication; dissemination; education/training	Catalunya (Spain)		Document	Tool Presentation	Farming Livestock and fertiliser application	Management of manure and application as a feriliser		PDF	2,31 KB
52	Cooperation for innovation. Operational Group to adapt to the Best Available Techniques at agri-cooperative sector in Catalonia	FERTICOOP-GO is a project that aims to develop innovative tools for better management of livestock manure and agricultural fertilisation with an environmental approach in a collaborative framework, achieving enhanced agricultural management of manure and thus making better use of the production and quality of the extensive crops which are produced. This document is a factsheet with final information about the project the activities, the methodology and the results in order to make possible the replication of the project.	Innovative tools (BAT) Manure management Valorisation	FCAC	https://eufarmbook.eu/en/contributions/661f7fe40beeac6e7e381784	English Catalan	01/09/2022	communication; dissemination	Catalunya (Spain)	https://ruralcat.gencat.cat/documents/20181/117530/CAT+INICIAL+pilot+2019_002_Agraria+plana+de+vic_CA_EN_ACC.pdf/e1a7182a-5420-4eb4-b0b4-17cd0fe1759b	Document	Factsheet	Farming Livestock and fertiliser application	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF	258 KB
53	La FCAC ha coordinat FerticoopGO per aconseguir una fertilització més sostenible	FERTICOOP-GO is a project that aims to develop innovative tools for better management of livestock manure and agricultural fertilisation with an environmental approach in a collaborative framework, achieving enhanced agricultural management of manure and thus making better use of the production and quality of the extensive crops which are produced. This document is a newsletter about the project, some of the results (50% of ammonium emissions reduction) and its participants.	Cooperatives Agricultural advice Efficient fertilisation Phosphorus reduction Biogas	FCAC	https://eufarmbook.eu/en/contributions/6630ed7c18e32d8866b97443	Catalan	17/04/2023	communication; dissemination	Catalunya (Spain)	https://www.cooperativesagraries.cat/ca/noticies/2836-la-fcac-ha-coordinat-ferticoopgo-per-aconsegu.html	Document web	Newsletter	Farming Livestock and fertiliser application	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF / web	232 KB

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54	Resultats finals del grup operatiu Ferticoop_GO sobrefertilització i gestió de les dejeccions	FERTICOOP-GO is a project that aims to develop innovative tools for better management of livestock manure and agricultural fertilisation with an environmental approach in a collaborative framework, achieving enhanced agricultural management of manure and thus making better use of the production and quality of the extensive crops which are produced. This document is a newsletter from local newspaper, about the project, its activities and methodologies, some results and its participants.	Cooperatives Innovation Fertilisation GHG reduction Sustainability	SEGRE Lleida	https://eufarmbook.eu/en/contributions/6630fca60b4d5b2ea1b309f9	Catalan	18/04/2023	communication; dissemination	Catalunya (Spain)	https://acceso360.acceso.com/fcac/ca-ES/?mod=TrackingPressViewer&task=default&companyNewsId=848476220&newsDate=1681768800&external=1&sig=1ad69aa76ce871a95d6daaf6186383873b8b16762e5c6c0ad6e7ac57c1d7c19a	Document web	Newsletter	Farming Livestock and fertiliser application	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF / web	167 KB
55	Estudi per reduir l'amoníac als purins	FERTICOOP-GO is a project that aims to develop innovative tools for better management of livestock manure and agricultural fertilisation with an environmental approach in a collaborative framework, achieving enhanced agricultural management of manure and thus making better use of the production and quality of the extensive crops which are produced. This is a newsletter about the final seminar of the project to disseminate the results, with a roundtable with all the participants to explain their experience during the project.	Cooperatives Innovation Fertilisation GHG reduction	FCAC	https://eufarmbook.eu/en/contributions/6630f3140b4d5b2ea1b307f9	Catalan	13/03/2023	communication; dissemination	Catalunya (Spain)	https://www.cooperativesagraries.cat/ca/noticies/2812-resultats-finals-del-grup-operatiu-ferticoopg.html	Document web	Newsletter	Farming Livestock and fertiliser application	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF / web	227 KB
56	FERTICOOP-GO-Innovacions per adaptar-se a les millors tècniques disponibles (MTD's)	FERTICOOP-GO is a project that aims to develop innovative tools for better management of livestock manure and agricultural fertilisation with an environmental approach in a collaborative framework, achieving enhanced agricultural management of manure and thus making better use of the production and quality of the extensive crops which are produced. This is a flyer to expose the project in a national congress.	Innovative tools (BAT) Manure management Valorisation Cooperatives	FCAC + CAE	https://eufarmbook.eu/en/contributions/6630febf18e32d8866b977ac	Spanish	14/03/2022	communication; dissemination	Toledo (Spain)		Document	flyer	Farming Livestock and fertiliser application	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF	1,16MB
57	FERTICOOP-GO-Innovacions per adaptar-se a les millors tècniques disponibles (MTD's) en el sector agrari cooperatiu català	FERTICOOP-GO is a project that aims to develop innovative tools for better management of livestock manure and agricultural fertilisation with an environmental approach in a collaborative framework, achieving enhanced agricultural management of manure and thus making better use of the production and quality of the extensive crops which are produced. A slideshow presentation describing the project, detailing the activities, methodology and results and explaining how to replicate it	Innovative tools (BAT) Manure management Valorisation Cooperatives	FCAC + IRTA	https://eufarmbook.eu/en/contributions/6630ff9b0b4d5b2ea1b30ab6	Catalan	06/07/2021	communication; dissemination; education/training	Catalunya (Spain)	https://www.cooperativesagraries.cat/ca/innovacio/l/10745-go-ferticoop.html	Document	Slideshow	Farming Livestock and fertiliser application	Fertilisation and nutrients management; Waste, by-products, and residues management; Best Available Techniques; Soil content analisys		PDF	1,91MB

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59	Maximizing Organic Production Systems - Growers Report	Technical report for organic growers and advisors setting out findings from a EIP Operational Group working with growers to optimise horticulture production and support the continuity of supply in line with growing market demands. This includes results from a 3-year short-term green manure trial, examples of organic cropping programmes, details of climate and weather monitoring on the farms, and the use of organic materials in organic production.	organic farming, cooperation, crop diversification, nutrient use efficiency, cover crops/green manures, yield, short supply chain	IOA	https://eufarmbook.eu/en/contributions/661ff893ad7afadbfd524a91	English	01/11/2021	communication; dissemination; education/training	Ireland	https://www.irishorganicassociation.ie/wp-content/uploads/MOPS-Growers-Report-2021.pdf	Document	Handbook	Crop farming; Environment; Economics	Agroecology; biodiversity and nature management; Crop rotation/crop diversification; Farming/forestry competitiveness and diversification; Fertilisation and nutrient management; organic farming; Plant production and horticulture; Pest/disease control; Soil management/ functionality; Supply chain, marketing and consumption		PDF	8.59 MB

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61	Maximizing Organic Production Systems - EU CAP Network - Good Practice Report	Factsheet summarisng findings from a EIP Operational Group working with organic growers to optimise horticulture production and support the continuity of supply in line with growing market demands.	organic farming, cooperation, crop diversification, nutrient use efficiency, cover crops/green manures, yield, short supply chain	IOA	https://eufarmbook.eu/en/contributions/661ffa20ad7afadbfd524b6f	English	01/11/2023	communication; dissemination	Ireland	https://www.irishorganicassociation.ie/wp-content/uploads/MOPS-Project-Outcomes-Summary-2311.pdf	Document	Factsheet	Crop farming; Environment	Agroecology; biodiversity and nature management; Crop rotation/crop diversification; Farming/forestry competitiveness and diversification; Fertilisation and nutrient management; organic farming; Plant production and horticulture; Pest/disease control; Soil management/ functionality; Supply chain, marketing and consumption		PDF	1.99 MB
62	SOS Aquae: Sustainable farming techniques and renewable fertilizers to combine agriculture, water and environment	SOS aquae is a OG with the aim to develop and disseminate modern and sustainable agrotechnics linked to the use of "renewable" fertilizers derived from the treatment of livestock slurries and digestate, to optimize the efficiency use of the nutrients, already available on the farm, and reduce the synthetic mineral fertilizers input. A presentation describing the objective and the innovation proposed by the project, the experimental tests and the main results.	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Paolo mantovi - CRPA	https://eufarmbook.eu/it/contributions/6620c5210beeac6e7e384fb7	Italian	01/02/2022	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/20220223/SOS_AQUAE_20220222_Mantovi.pdf?v=20220228	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	2026 KB

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
63	SOS Aquae: Environmental sustainability of fertigation with using digestate microfiltered fraction	SOS aquae is a OG with the aim to develop and disseminate modern and sustainable agrotechnics linked to the use of "renewable" fertilizers derived from the treatment of livestock slurries and digestate, to optimize the efficiency use of the nutrients, already available on the farm, and reduce the synthetic mineral fertilizers input. A presentation describing the results of environmental analysis by LCA method about fertirrigation technique using digestate microfiltered mixed with water in sub irrigation drip line instead of mineral fertilizer (Urea) and standard irrigation with sprinkler.	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Arianna Pignagnoli - CRPA	https://eufarmbook.eu/it/contributions/6620c7886711e677db50fd8e	Italian	01/02/2022	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/20220223/SOS_Aquae_23022022_Pignagnoli.pdf?v=20220228	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	1188 KB
64	SOS Aquae: The "Biogas done right" and the opportunities of digestate utilization in agriculture to promote nutrient circularity	The "BIOGAS DONE RIGHT®" is focused to produce quality food and supplies by differentiating and integrating agricultural activity with the production of energy (FOOD & FUEL) starting from residual biomass and additional raw materials through digestion anaerobic, reducing CO2 emissions from agricultural activity and increasing soil fertility.The "BIOGAS DONE RIGHT®" allows the agroecological reconversion of traditional agriculture according to the principles of Farming for future. The "FARMING FOR FUTURE" actions for the agroecological transition are the follow: - Renewable energy in agriculture - Agriculture 4.0 - Livestock manure management - Organic fertilisation - Innovative agricultural processes - Quality and animal welfare - Increase in soil fertility - Agroforestry - Production and utilisation of biomaterials - Biogas and other renewable gas	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Lorella Rossi - CIB	https://eufarmbook.eu/it/contributions/6621144e6711e677db510c9b	Italian	01/02/2022	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/20220223/SOS_Aquae_23022022_Rossi.pdf?v=20220228	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	1648 KB

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65	SOS Aquae: Matching crop row and dripline distance in subsurface drip irrigation increases yield and mitigates N2O emissions	Intensive irrigation and nitrogen (N) fertilisation are often linked to low N-fertilizer efficiency, and to high emissions of the greenhouse gas nitrous oxide (N2O). Efficient irrigation systems (e.g. subsurface drip irrigation [SDI]) combined with N-fertigation in a no-till agroecosystem can promote N-use efficiency, thereby curbing N2O emissions without depressing crop yield. Yet, crop type and SDI plant settings (and management) such as dripline spacing may determine the agronomic and environmental performance of SDI. In this two-year field study on maize (Zea mays L.) - soybean (Glycine max [L.] Merr.) rotation with conservation agriculture management (notill and cover crops), we investigated the effects of three different irrigation/fertilisation systems (SDI with a narrow dripline spacing (70 cm) + fertigation with ammonium sulphate, SDI with a large dripline spacing (140 cm) + fertigation with ammonium sulphate, and sprinkler irrigation [SPR] + granular urea application) on yield, N-fertilizer efficiency, and N2O emissions in a fine-textured soil. We hypothesized that SDI systems (especially with narrow dripline distance) would increase yield and mitigate N2O compared with SPR, and particularly for maize due to its higher water and nutrient demand. We found that SDI increased maize yield (+31%) and Nfertilizer efficiency (+43–71%). These positive results were only observed during the drier year in which irrigation supplied ca. 80% of maize water requirements. The narrower dripline spacing mitigated N2O emissions compared with sprinkler irrigation (by 44%) and with the wider spacing (by 36%), due to a more homogeneous distribution of N in soil, and to a lower soil moisture content. Soybean yield and N-use efficiency were not affected by the irrigation systems. We also found that SPR enhanced cover crop residue decomposition, thus promoting the release of C and N into the soil and increasing N2O emissions. Overall, our study provides important insights on key management decisions that define the sustainability of novel irrigation systems; in particular SDI with a 70 cm dripline distance should be promoted for maize to increase productivity and decrease N2O emissions in fine-textured soils.	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	F. Ardenti, D. Abalos, F. Capra, M. Lommi, S. Codruta Maris, A. Perego, C. Bertora, V. Tabaglio, A .Fiorini	https://eufarmbook.eu/it/contributions/6620ddf56711e677db510572	English	2022	communication; dissemination;	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/Pubblicazioni/FCR_289_2022_108732_Ardenti.pdf?v=20230116	document	report/paper	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	2120 KB

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66	SOS Aquae: Microfiltered slurries and digestates are useful and convenient for fertigation	FERTIGATION with slurries and digestates allows you to increase the efficiency of use of the plant nutrition elements that these products contain, in particular nitrogen. This is even more important now in which the costs of synthetic fertilizers have increased significantly and also bearing in mind that rural development policies are moving towards the Green Deal, in which the increase in circularity of nutrients already present in companies becomes an essential objective	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Paolo Mantovi, Arianna Pignagnoli, Fabio Verzellesi - CRPA	https://eufarmbook.eu/it/contributions/6620cc340beeac6e7e38510c	Italian	2022	communication; dissemination;	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/Pubblicazioni/IA11_2022_Mantovi_Sos_Aquae.pdf?v=20220420	document	report/paper	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	826 KB
67	SOS Aquae: The role of conservation tillage and renewable fertilizer to enhance organic carbon and nitrogen in the soil	SOS aquae is a OG with the aim to develop and disseminate modern and sustainable agrotechnics linked to the use of "renewable" fertilizers derived from the treatment of livestock slurries and digestate, to optimize the efficiency use of the nutrients and reduce the synthetic mineral fertilizers input. A technical paper that considers the role of Carbon farming about the ratio C:N in the maintenance of organic matter in the soil.	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Paolo Mantovi - CRPA	https://eufarmbook.eu/it/contributions/6620cd7c0beeac6e7e385170	Italian	2021	communication; dissemination;	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/Pubblicazioni/Sos-acquae-Agricoltura_conservativa-mantovi-2021.pdf?v=20211213	document	report/paper	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	925 KB
68	SOS Aquae: Double harvesting of head-chopped grain sorghum for biomethane production	SOS aquae is a OG with the aim to develop and disseminate modern and sustainable agrotechnics linked to the use of "renewable" fertilizers derived from the treatment of digestate, to optimize the efficiency use of the nutrients and reduce the synthetic mineral fertilizers input. A technical paper evaluating the double harvesting of grain sorghum silage for biogas production with different agronomic techniques such as minimum tillage and subsurface drip irrigation of digestate	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Paolo Mantovi - Fabio Verzellesi - CRPA - Gabriele Santi - R.G.R	https://eufarmbook.eu/it/contributions/6620d080ad7afadbfd526939	Italian/English	2021	communication; dissemination;	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/Pubblicazioni/SOS_AQUAE-Doppia-raccolta-di-trinciato-dal-sorgo-da-granella.pdf?v=20210408	document	report/paper	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	663 KB

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69	SOS Aquae: Environmental sustenibility of using digestate in fertirrigation	3 innovative agricultural systems were evaluated and compared (Life Cycle Assessment) with agronomic trials to the conventional agricultural system: traditional soil management, chemicals fertilizers input, conventional application and sprinkler irrigation	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Arianna Pignagnoli - CRPA	https://eufarmbook.eu/it/contributions/6620d59dad7afadbfd526b1b	Italian	gen-23	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/convegno-finale-18012023/Sos_Aquae_CF_PC_18012023_Pignagnoli.pdf?v=20230124	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	3575 KB
70	Combining sustainable agrotechniques and renewable fertilizers: the OG SOS_AQUAE	The project results of experimental tests performed in the farm CERZOO, to understand the effects of subsurface drip irrigation and the use of digestate, as a renewable fertilizer, on the production yields and the reduction of greenhouse gas and ammonia emissions. Test were carried out on non-tillage based on spring-summer crops (sorgum and maize) alternating with autumn-winter cover crops, fertigated with ammonium sulphate by digestate stripping, injected through drip lines in sub-irrigation	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Andrea Fiorini - UCSC	https://eufarmbook.eu/it/contributions/6620d8820beeac6e7e385502	Italian	gen-23	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/convegno-finale-18012023/Sos_Aquae_CF_PC_18012023_Fiorini.pdf?v=20230124	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	3919 KB

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71	SOS Aquae: More efficient carbon and nitrogen agrosystems with biogas	Biogas done right: 10 "FARMING FOR FUTURE" actions for the agroecological transition. In particular, the aim is a greater stock efficency of C and N into the soils and a lower GHG and N emissions in the atmosphere linked to the digestate use in agriculture. Ecological practices (minimum soil tillage, innovative low-emission systems for the distribution of digestate) to reduce the use of synthetic fertilizers and increase the supply of organic matter in the soils. The "FARMING FOR FUTURE" actions for the agroecological transition are the follow: - Renewable energy in agriculture, replace fossil fuels with renewable energy sources to reduce pollution and emissions; - Agriculture 4.0, adopt advanced agricultural techniques and farming to optimize the use of nutrients; - Livestock manure management,use livestock manure and agricultural by-product to reduce emissions and produce renewable bioenergy - Organic fertilisation, using digestate to guarantee the return of nutrients into the soil and reduce the chemical input; - Innovative agricultural processes, adopt agronomic techniques (e.g., minimum tillage, no-tillage, organic fertilisation) to reduce emissions into the atmosphere; - Quality and animal welfare, implement agricultural and farm techniques to improve quality and animal welfare. - Increase in soil fertility, adopt double crops to increase carbon sequestration and soil fertility; - Agroforestry, integrate woody crops to increase photosynthesis and organic matter into the soil; - Production and utilisation of biomaterials, using biological, natural and renewable materials - Biogas and other renewable gas, produce methane and hydrogen from agricultural biogas.	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Guido Bezzi - CIB	https://eufarmbook.eu/it/contributions/662113c30beeac6e7e385efb	Italian	gen-23	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/convegno-finale-18012023/Sos_Aquae_CF_PC_18012023_Bezzi.pdf?v=20230124	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	3849 KB

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72	SOS Aquae: Agricultural innovation in Emilia Romagna	A presentation at final congress about experience of the Operational Groups for agricultural innovation in the Emilia Romagna region. 235 EIP Agri Operational Groups in 2022 and 81 pilot projects for a total of 11.8 million euros	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	Maria Costanza Balboni -RER	https://eufarmbook.eu/it/contributions/6620d99fad7afadbfd526ce3	Italian	gen-23	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/convegno-finale-18012023/Sos_Aquae_CF_PC_18012023_Balboni.pdf?v=20230124	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	978 KB
73	SOS Aquae: Goal of the project	Sustainable farming techniques and renewable fertilizers to combine agriculture, water and environment. SOS_AQUA has aimed to develop and disseminate modern and sustainable agro-technics linked to the use of 'renewable' fertilizers derived from the treatment of slurry and digestate, to optimize the efficiency use of the nutrients already available in the farm and reduce the input of synthetic mineral fertilizers	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	CRPA	https://eufarmbook.eu/it/contributions/662120a5ad7afadbfd5277a3	Italian	giu-21	communication; dissemination	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/divulgazione/SA_SosAquae_rollup_005_LQ_RGB.pdf?v=20210611	Document	flyer	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	1661 KB
74	SOS Aquae: Subsurface drip irrigation with microfiltered digestate	SOS Aquae is a OG with the aim to Develop a system to valorise the liquid fraction of the digestate (the most present and most problematic fraction to be valorised) by mixing it with water in fertigation for an efficient use of nutrients and saving mineral fertilizers input. A presentation about subsurface drip irrigation with microfiltered digestate, which allows to optimize the efficiency of use of nutrients already available on the farm, reducing the use of synthetic mineral fertilizers but also water and energy	Sustainable agrotechnics, Renewable fertilizers, Fertigation, Digestate microfiltration, Subsurface drip fertigation	CRPA	https://eufarmbook.eu/it/contributions/6620dc0dad7afadbfd526e12	Italian	lug-22	communication; dissemination; education/training	Emilia Romagna (IT)	https://sosaquae.crpa.it/media/documents/sosaquae_www/documenti/presentazioni/20220708/Sos_Aquae_SVG_Correggio_08072022_Mantovi.pdf?v=20230222	Slideshow presentation	educational/training presentation	Crop farming, environment	Agroecology; climate and climate change; crop rotation/crop diversification; farming equipment and machinery; fertilisation and nutrients management; soil management/ functionality;	CC BY 4.0: https://creativecommons.org/licenses/by/4.0/	PDF	3283 KB

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75	Gas Loop, a nitrogen virtuous cycle in the pig livestock	The objective of Gas Loop was to trigger a virtuous cycle (loop) of nitrogen which, starting from the capture of ammonia emission from the air of the pigsties, increase the environmental sustainability of the pig farming. Thanks to the recovered ammonium sulphate, these results are achieved: reduction of industrial fertilizer inputs and consequently the greenhouse gas emissions generated by their industrial production; greatest welfare and health status of pigs, due to the lower presence of ammonia in the rooms; to increase the pigs performance reducing the carbon footprint of the kg of meat produced. https://sway.cloud.microsoft/8e3pYfx2NrcN6HmU?ref=Link&loc=play	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	CRPA	https://eufarmbook.eu/it/contributions/662141256711e677db5115a5	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://sway.cloud.microsoft/8e3pYfx2NrcN6HmU?ref=Link&loc=play	Slideshow presentation	informative presentation	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	1.8 MB
76	Ammonia emission capture from the pig livestock as a circular solution from the OG Gas_Loop activities	A simple video scribing that illustrates the problem of the ammonia emissions from pig farming and the Operational Group Gas Loop solution to convert them into a fertilizing resource	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	CRPA	https://eufarmbook.eu/it/contributions/6621375cad7afadbfd527ab4	Italian	giu-22	communication;	Emilia Romagna (Italy)	https://gasloop.crpa.it/ngcontent.cfm?a_id=24261&tt=t_bt_app1_www	Video	tutorial/how-to video	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	mp4	53 MB
77	Ammonia emission capture from the pig livestock as a circular solution from the OG Gas_Loop activities	A simple video scribing that illustrates the problem of the ammonia emissions from pig farming and the Operational Group Gas Loop solution to convert them into a fertilizing resource	Ammonia Emission, Nitrogen recovery, Pig welfare, Pig livestock, ammonium sulphate	CRPA	https://eufarmbook.eu/en/contributions/65f9aa93137e1cd60be198c7	English	giu-22	communication;	Emilia Romagna (Italy)	https://www.youtube.com/embed/Af3gftp9g84	Video	tutorial/how-to video	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	mp4	53 MB

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Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
78	Ammonia emissions from the pig livestock: from a problem to a fertiliser resource	Gas Loop has developed and monitored an air washing system that removes ammonia from the air of the stables, recovering it in an ammonium sulphate solution to increase the animal welfare and productivity due to better air quality inside the pig housing. The pig livestock becomes more sustainable, the ammonia concentration in the rooms where the air is treated by Ammonia Washing Machine is 62% lower than in untreated rooms and the ammonia emissions into the atmosphere are reduced by 54% (ammonia emission avoided for 1,94 kg NH3/animal place per year). The ammonia reduction in the pigsties improves animal welfare, the pig's lungs health and the health of workers. The best breeding conditions increase the feed conversion rate and nitrogen use efficiency. The device draws ammonia rich-air from the stable through suction ducts located below the slatted floor and the air treatment is based on the chemical absorption of ammonia by counter-current acid washing into a tower. The process take place at pH 4.5 and sulfuric acid solution is used as absorbent matrix.	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Giuseppe Moscatelli, Andrea Zanaroli, Arianna Pignagnoli, Paolo Rossi e Maria Teresa Pacchioli - Centro Ricerche Produzioni Animali – CRPA scpa, Reggio Emilia	https://eufarmbook.eu/it/contributions/662137fd0beeac6e7e3863d6	Italian	dec-2023	communication; dissemination; evaluation	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/documenti/CRPA_Opuscolo_GAS_LOOP.pdf?v=20240220	Document	booklet	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	1.7MB
79	Innovations in the pig livestock: Gas Loop, the nitrogen cycle can be improved	A technical article, in a specialized pig breeding national magazine, shows the Gas Loop innovation to reduce ammonia in the pig rooms, to capture ammonia emissions and convert them into a fertilizer as ammonium sulphate solutions	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Moscatelli, Valli, Pacchioli, CRPA	https://eufarmbook.eu/it/contributions/662138700beeac6e7e38641b	Italian	jan- 2022	communication; dissemination	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/pubblicazioni/SN_01_2022_p30_33.pdf?v=20240124	Document	technical/technology article	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	3.1 MB

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
80	Problems and solutions underlying the birth of the Gas Loop Operational Group	The Po Valley basin represents one of the areas with the highest ammonia and particulate matter concentrations of (PM2.5 and PM10) in Europe. Ammonia causes health problems in livestock farms, odours and it is an important precursor of fine dust. The stagnation of pollutants (ammonia NH3, nitrogen oxides NOx and sulphur oxides SOx) on the basin makes particularly important the reactions between them and produces a large amount of fine particulate matter. The activities and challenges of the GAS LOOP innovation are: • To develop a pilot able to clean the air and to recover ammonia from pig livestock • To implement the system up to a Technological Maturity Level equal to TRL 9 (ready for market); • To monitor and evaluate the air washing treatment efficiency, the avoided ammonia emissions and the enhanced indoor air quality for human operator and animal; • To produce, quantify and characterize the recovered fertilizer (ammonium sulphate solution) in a view of Nutrient Recovery and Circular Economy; • To evaluate GHG (t CO2eq) reduction due to replacement of N industrial fertilizers; • To increase the animal welfare and productivity due to better air quality inside the pig housing, • Dissemination of the activities and the results, Training courses on the topic of the emissions reduction and training-demo visits.	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Valli, CRPA	https://eufarmbook.eu/it/contributions/662138e9ad7afadbfd527b79	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/presentazioni-cf-12122023/GasLoop_Valli_12_12_2023.pdf?v=20231218	Slideshow presentation	educational/training presentation	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	892 KB

81	An air treatment system that reduces ammonia emissions and produces ammonium sulfate	The Gas Loop Operational Group, thanks to the experiences and results achieved by Ammonia Washing Machine (https://ammonia.crpa.it/), has implemented and brought the prototype system from the technological level it was at (TRL 6) to a TRL level 8-9, a real system, complete and ready for applicability. Gas Loop promotes a virtuous cycle (Loop) of nitrogen which, starting from the capture of ammonia, cascades into an increase in the environmental sustainability of pig farming: the recovered ammonium sulphate allows the reduction of industrial fertilizer inputs, thus avoiding greenhouse gas emissions generated by their production; the greater animal welfare and health, due to the lower presence of ammonia in the rooms, increases pigs performance by reducing the carbon footprint of the kg of meat produced. The results achieved by Gas Loop have demonstrated the benefits of the pigsty air treatment system with ammonia capture and recovery. Among the 4 operating methods tested previously, Gas Loop developed and brought to maturity the one that had proven to be the most promising and specifically the treatment of the air sucked from the under-slatted-floor through holes drilled in the side wall of the building lower level than the walking surface. In this way, the ammonia emissions developed by the slurry present in the cracked area are captured and prevented from spreading into the environment above which hosts the animals. The treatment is based on the chemical absorption of ammonia by backwashing with an acid reagent in a tower with packing bodies. Sulfuric acid (H2SO4) reacts with ammonia (NH3) to form a stable suspension of ammonium sulphate ((NH4)2SO4) which accumulates in a tank at the base of the washing tower. The treatment system was implemented with sensors and logic for continuous operation. The recovered nitrogen, resulting in compliance with EU Regulation 2019/1009, can be valorised as a mineral nitrogen fertilizer on the same farm or marketed (Nutrient Recovery and Reuse), thus avoiding greenhouse gases (66 t CO2eq/t p.v. per year) deriving from the production of equal quantities of industrial nitrogen fertilizer. Gas Loop, by limiting ammonia emissions, is effective in reducing the acidification impact and the formation of particulate matter compared to the control, by 21% and 17% respectively. The suction of air from under the slatted floor allows significant emission reduction to be achieved with reduced treatment flow rates (14 m3/h per item). The treatment improved indoor air quality, reducing the average concentration of ammonia in the treated room by 62% and emissions by 54%.	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Moscatelli, CRPA	https://eufarmbook.eu/it/contributions/66213953ad7afadbfd527ba6	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/presentazioni-cf-12122023/GasLoop_Moscatelli_12_12_2023.pdf?v=20231216	Slideshow presentation	educational/training presentation	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	4 MB

Metadata No.	Title	Description (up to 300 words)	Keywords	Creator(s)	EU-FarmBook Platform URL	Language(s)	Date of completion	Intended purpose	Geographic location(s)	URL to the original material	Category	Type	topics	subtopics	License	Format	File size
82	Less ammonia in the pig rooms increases the health of the animals and zootechnical yields	The project activities were completed with the evaluation of the possible effects of a reduced presence of ammonia in the breeding pig rooms on the health and productivity of the pigs. In both winter and summer the removal of ammonia from the air is associated with slightly better breeding performance. The yields at the slaughterhouse and the quality of the carcasses, as well as the lung health status of the animals were optimal for all the groups monitored, confirming a high standard of welfare and quality of the pig on the farm where the test was carried out.	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Pacchioli, Bertolini, CRPA	https://eufarmbook.eu/it/contributions/66213a1e6711e677db51123f	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/presentazioni-cf-12122023/GasLoop_Pacchioli_Bertolini.pdf?v=20231216	Slideshow presentation	educational/training presentation	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	689 KB
83	Effect of Gas Loop innovation on the environmental sustainability of the pig livestock	The environmental sustainability of the innovation was analyzed by applying the Life Cycle Assessment (LCA) methodology. The study calculated the environmental impact of the conventional management of pig farming (control) compared to the innovative one (Gas Loop)in which the air is treated by the system and renewable ammonium sulphate is produced. The boundaries of the study system include in the control and innovative thesis the feed and electricity used in breeding, the impact of raising the young pigs entering the fattening phase and the emissions of CH4, N2O and NH3 of the respective two thesis. In addition, for the innovative thesis all impacts for the construction and operation of the treatment system (electricity, reagents and materials) and the environmental benefit due to the ammonium sulphate produced were considered. The LCA analysis estimated the Carbon Footprint, the acidification and the formation of particulate matter derived from the heavy pig fattening. The results show that the carbon footprint by applying the innovation is equivalent to the control, i.e. 437.5 kg CO2 eq/head for the Gas Loop thesis compared to 438.3 kg CO2 eq/head for the control. The environmental benefit linked to the production of the renewable fertilizer is partly offset by the emissions linked to the treatment (construction, maintenence and consumables). The Gas Loop thesis, on the other hand, by limiting ammonia emissions, is effective in reducing the acidification phenomenon and the formation of particulate matter compared to the control, by 21% and 17% respectively.	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Pignedoli, Pignagnoli, CRPA	https://eufarmbook.eu/it/contributions/66213aa4ad7afadbfd527c0e	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/presentazioni-cf-12122023/GasLoop_Pignedoli-Pignagnoli_12_12_2023.pdf?v=20231216	Slideshow presentation	educational/training presentation	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	2 MB

84	Design and costs of installing the Gas Loop innovation: A case study	In addition to the environmental benefit, the economic sustainability of the innovation was assessed, both in terms of impact on the value of the kg of meat produced and by calculating the costs to be incurred in the case of a complete installation or in the case of just preparing the building to host at a later stage the treatment system. The treatment system entails a management and depreciation cost (as of 2023) between 0.15 and 0.17 euros per kg of live weight sold which is compared to the price of €2.27/kg, for heavy pigs in the protected circuit for the supply chain PDO (CUN pigs, December 2023), means an incidence of 7.3%. In collaboration with the partner pig farm Colombaro, a case study was developed based on the reality of one of its 6 sheds that host fattening, the only shed on the farm still to be renovated. The working hypothesis was to demolish the current pigsty and rebuild a new one with the same external dimensions (114.96 x 18.6 m). The new pigsty has a maximum capacity of 1,440 animals in line with the current one. The pits under the slatted floor have a vacuum system to move away the slurry. The estimated cost of the pigsty is €1,284,400, to which must be added the works necessary to prepare the pigsty for the 4-machine Gas Loop system (installation of suction ducts, suction pipes, gate valves, etc.), for a estimated amount of €28,000, while the other device (including treatment machines) can be carried out at a later time, because they are external and do not involve demolitions and/or demanding removals. The total cost of the treatment plant was estimated at €208,000, of which 13.5% was attributable to the preparation works mentioned above. The preparation works for the new building alone have a cost equal to 2.2% of the basic cost of the pigsty, while if the complete system were also installed the incidence would be 16.2% on the cost of the pigsty. The impact of innovation compared to the value of the kg of meat sold is not negligible (7.3%). However, considering the modest cost of the additional preparation works on the total cost of construction/renovation of a new pigsty (2.2% compared to 16.2% of the complete installation), it is advisable to foresee these works, because they will allow in a second time to easily implement the air treatment system. The intervention, on the contrary, on existing pigsties would be more complex and expensive.	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Rossi, CRPA	https://eufarmbook.eu/it/contributions/66213b306711e677db5112ce	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/presentazioni-cf-12122023/GasLoop_Rossi.pdf?v=20231218	Slideshow presentation	decision-making presentation	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	1 MB

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85	Knowledge exchange of agricultural innovations between Japan and the Emilia Romagna region (Italy)	Building relationships between different regions of the world for a sustainable future: cutting-edge innovations in agriculture in Ibaraki Prefecture, Japan and Emilia Romagna, Italy for a possible twinning	Ammonia emissions, Nitrogen recovery, Pig welfare, Pig livestock, Ammonium sulphate	Moscatelli, CRPA	https://eufarmbook.eu/it/contributions/66213ba26711e677db511307	English	ott-23	communication;	Emilia Romagna (Italy)	https://gasloop.crpa.it/media/documents/gasloop_www/presentazioni-19-10-2023/Webinar_Presentation_Emilia_Romagna_Moscatelli.pdf?v=20240209	Slideshow presentation	informative presentation	livestock; environment	animal husbandry and welfare; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	pdf	3 MB
86	STRUVITE - Livestock manure and digestates treatment to reduce emissions and produce Struvite	STRUVITE OG designed and implemented a prototype, at farm-scale system, for recovering nitrogen and phosphorus from agro-livestock digestate to promote the relocation of nutrient surplus from high livestock areas to areas instead characterized by chemical fertilizer demand. General multimedia presentation of the activities and results of the operational group, focused on the nutrient recovery from digestates.	Struvite Nutrient recovery Digestate treatment Ammonia Emission GHG emissions	CRPA	https://eufarmbook.eu/en/contributions/661ea295957f6433af637260	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://sway.cloud.microsoft/Oym6frsaEw1hQ0b5?ref=Link&loc=play	Slideshow presentation	informative presentation	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	1.2 MB
87	STRUVITE - Livestock manure and digestates prototype treatment developed to reduce emissions and produce Struvite	STRUVITE OG designed and implemented a prototype, at farm-scale system, for nitrogen and phosphorus recovering from agro-livestock digestate to promote the relocation of nutrient surplus from high livestock areas to areas instead characterized by chemical fertilizer demand. The booklet describes the activities and the final results of the innovation project	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Moscatelli, Bercelli, Pignagnoli e Piccinini – CRPA	https://eufarmbook.eu/it/contributions/661f70a30beeac6e7e38102d	Italian	dec-2023	communication; dissemination; evaluation	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/GOI_Opuscolo_STRUVITE.pdf?v=20231219	Document	booklet	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	2 MB
88	STRUVITE extraction from pig slurry	Struvite is a operational group with the aim to produce treated fractions which are less emissive in ammonia and GHG than the raw input digestate. Technical article in a specialized pig breeding national magazine to describe the production of struvite, the recovery of nitrogen and phosphorus from manure and digestates, reducing their environmental impact in the storage and agronomic use in areas with high livestock density.	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Piccinini, Bercelli e Moscatelli– CRPA	https://eufarmbook.eu/it/contributions/661f72930beeac6e7e3810c2	Italian	01/11/2022	communication; dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/Pubblicazioni/SN_08_2022_Struvite_Moscatelli.pdf?v=20221109	Document	technical/technology article	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	2 MB
89	STRUVITE Operational Group topic and prototype for nutrient recovery from digestate	STRUVITE OG designed and implemented a prototype, at farm-scale system, for nitrogen and phosphorus recovering from agro-livestock digestate to promote the relocation of nutrient surplus from high livestock areas to areas instead characterized by chemical fertilizer demand. Description of the problems and solutions underlying the birth of the operational group	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Giuseppe Moscatelli, CRPA	https://eufarmbook.eu/it/contributions/661f748cad7afadbfd52292c	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/presentazioni-cf-15122023/Piccinini_1_Struvite_15-12-2023.pdf?v=20231218	Slideshow presentation	educational/training presentation	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	2 MB

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90	Struvite crystallization prototype: presentation of the treatment line	Struvite is developing a prototype for treating pig digestates in order to produce a recovered fertilizer matrix with a high N and P content in a saline and stable form, the Struvite (ammonium magnesium phosphate), and a liquid fraction with a reduced content of nutrient. The objective is also to produce two fractions after the treatment which are less emissive (ammonia, methane and nitrous oxide) than the raw digestate, regards the emissions from the storage and field application.	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Moscatelli, CRPA	https://eufarmbook.eu/it/contributions/661f778bad7afadbfd522a6f	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/presentazioni-cf-15122023/Visita_Virtuale_Struvite_15_12_2023.pdf?v=20231218	Slideshow presentation	informative presentation	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	4 MB
91	STRUVITE: Results about struvite precipitation	STRUVITE OG designed and implemented a prototype, at farm-scale system, for nitrogen and phosphorus recovering from agro-livestock digestate to promote the relocation of nutrients surplus from high livestock areas to areas instead characterized by chemical fertilizer demand. Description of the activities and results in relation to the prototype treatment development, laboratory and farm scale test. Evaluation of the treatment efficiency in different operational set-up.	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Bercelli, CRPA	https://eufarmbook.eu/it/contributions/661f794ead7afadbfd522b0a	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/presentazioni-cf-15122023/Bercelli_Struvite_15-12-2023.pdf?v=20231218	Slideshow presentation	educational/training presentation	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	2 MB
92	The STRUVITE treatment produces digestate fractions with lower ammonia and GHG emissivity	STRUVITE OG designed and implemented a prototype, at farm-scale system, for nitrogen and phosphorus recovering from agro-livestock digestate to promote the relocation of nutrients surplus from high livestock areas to areas instead characterized by chemical fertilizer demand. After the treatment the output fractions are less emissive in ammonia and greenhouse gas GHG (methane and nitrous oxide) than the raw input digestate, regarding the emissions from the storage and from field application.	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Moscatelli, CRPA	https://eufarmbook.eu/it/contributions/661f7b42ad7afadbfd522bd0	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/presentazioni-cf-15122023/Moscatelli_Struvite_15_12_2023.pdf?v=20231218	Slideshow presentation	educational/training presentation	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	4 MB
93	STRUVITE: Life Cycle Assesment (LCA) to evaluate the environmental sustainability of the innovative treatment line	LCA evaluated the potential environmental impacts relating to the production of the Struvite recovered fertilizer. The digestate management by the Struvite prototype reduces the contribution to climate change by 33% compared to traditional management. The methane emission from the storage is the main component of the greenhouse gas emissions; Future research aimed at improving the efficiency of the prototype must also aim to reduce the contribution to eutrophication and acidification.	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Pignagnoli, CRPA	https://eufarmbook.eu/it/contributions/661f7ea60beeac6e7e38160f	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/presentazioni-cf-15122023/Pignagnoli_Struvite_151223.pdf?v=20231218	Slideshow presentation	educational/training presentation	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	1 MB

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94	The European Nutri-Know project and the new PR-FESR STRUVITE project	Further insights and applications: the European Nutri-Know project and the new PR-FESR STRUVITE project for the efficiency implementation of the prototype.	Struvite Nutrient recovery Digestate treatment Ammonia Emissions GHG emissions	Piccinini, CRPA	https://eufarmbook.eu/it/contributions/661f7fd70beeac6e7e381768	Italian	dec-2023	communication; dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/struvite_www/presentazioni-cf-15122023/Piccinini_2_Struvite_15-12-2023.pdf?v=20231218	Slideshow presentation	educational/training presentation	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	2 MB
95	STRUVITE: Digestates treatment to reduce emissions and promote the Struvite production	The aim of the GO was reduce the nitrogen and phosphorous content in the digestates in order to reduce the emissions of ammonia, methane and nitrous oxide in the atmosphere, during the storage and field use than raw digestates. The recovering of nitrogen and phosphorous produced a renewable fertilizers (struvite) with slow-release nutrients so as replace synthetic fertilizers.	Struvite Nutrient recovery Digestate treatment Ammonia Emission GHG emissions	CRPA	https://eufarmbook.eu/en/contributions/66704a3feae64a688c6e5252	Italian with English sub-title	01/10/2023	communication;	Emilia Romagna (Italy)	https://struvite.crpa.it/ngcontent.cfm?a_id=31742&tt=t_bt_app1_www	Video	documentary video	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery; fertilisation and nutrients management;	default (CC BY 4.0)	mp4	471 MB
97	STRUVITE: Digestates treatment to reduce emissions and promote the Struvite production	The aim of the GO was reduce the nitrogen and phosphorous content in the digestates in order to reduce the emissions of ammonia, methane and nitrous oxide in the atmosphere, during the storage and field use than raw digestates. The recovering of nitrogen and phosphorous produced a renewable fertilizers (struvite) with slow-release nutrients so as replace synthetic fertilizers.	Struvite Nutrient recovery Digestate treatment Ammonia Emission GHG emissions	Sergio Piccinini, Giuseppe Moscatelli, Arianna Pignagnoli	https://eufarmbook.eu/it/contributions/6620df110beeac6e7e3858f9	English	01/12/2023	Communication; Dissemination	Emilia Romagna (Italy)	https://struvite.crpa.it/media/documents/crpa_www/Settori/Ambiente/Download/Archivio_2024/BI_43_2024_Struvite_Piccinini.pdf?v=20240320	Document	Thecnical/Technology article	livestock; environment	climate and climate change; competitiveness; farming equipment and machinery	default (CC BY 4.0)	pdf	1 MB

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