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Report on final case studies selected

Deliverable D1.1

INNOVATIVE DECISION-MAKING TOOL FOR DEFINING THE MOST SUITABLE MANURE MANAGEMENT STRATEGIES TO ACHIEVE A SUSTAINABLE LIVESTOCK FARMING SYSTEM DURING THE WHOLE VALUE CHAIN

Proposal number: 101135400-2

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1. Introduction

Livestock farming is a key sector that involves 40 % of the total agricultural activity in Europe. representing a total value for products equal to € 170 billion. However, there is an increasing concern due to livestock farming's contribution to environmental pollution since it generates more than 1.4 billion tonnes/year of manure leading to significant greenhouse gases (GHG) and air pollutants emissions (NH_3, NO_X) as well as to soil and water contamination caused by hazardous manure chemicals and biological contaminants (called here emerging contaminants). In this context extensive effort has been carried out for years to assess the detrimental effects of farming systems and to develop abatement methods to be implemented. However, despite major advancements, many fundamental issues are beyond the scope of existing legislation.

The main objective of NUTRITIVE is to develop a decision-making tool (DSS, decision support system) able to define the most efficient and sustainable (in its three pillars: environmental, economic, and social) manure management strategies for a given livestock farm limiting manure air emissions as well as soil and water contaminants. This will allow for the formulation of technical guidelines and recommendations that will support policy makers with enhanced knowledge to establish requirements for future European policies.

To fulfil this objective, the project is divided into six work packages (WP): WP1 Up-to-date inventory; WP2 Novel management strategies/technologies investigation; WP3 Modelling and Life Cycle Assessment (LCA); WP4 Guidelines formulation; WP5 Communication, dissemination, and exploitation; WP6 Management [Figure 1].

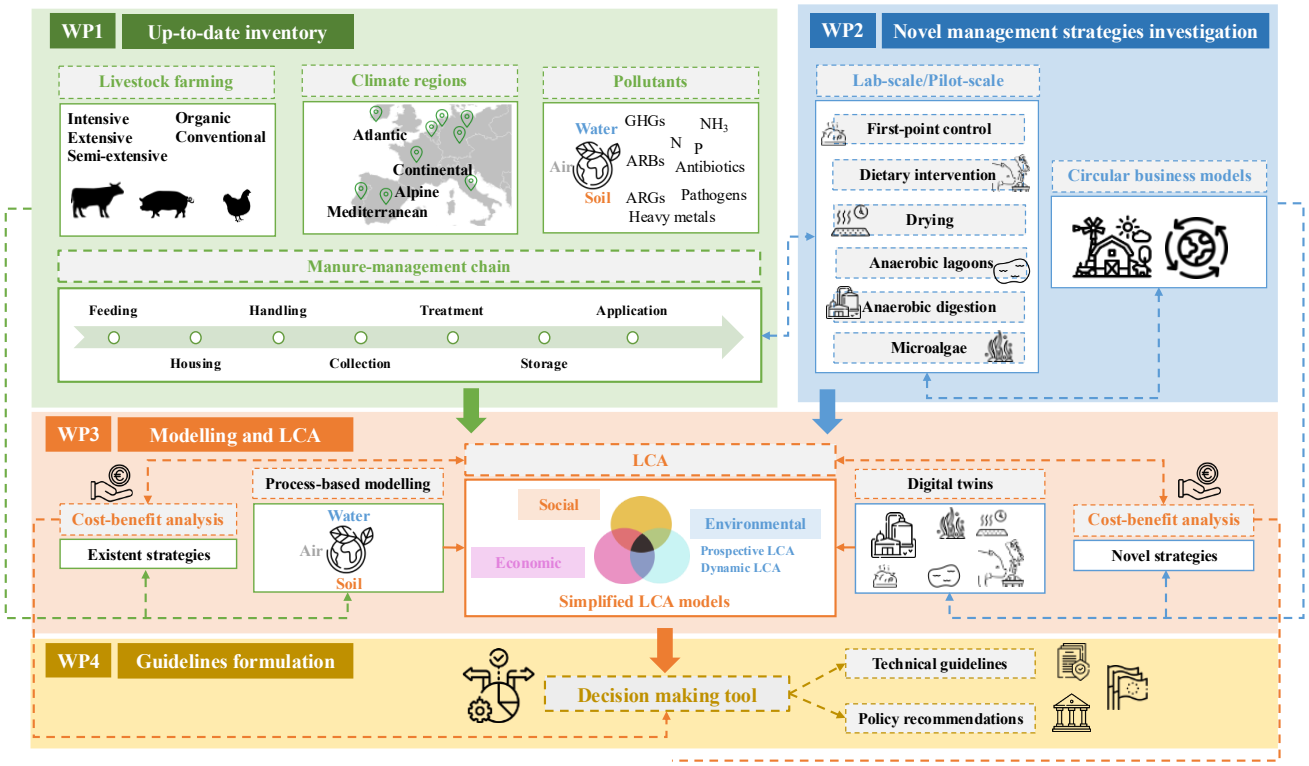

Figure 1 NUTRITIVE methodology.

NUTRITIVE anticipates a wide spread of the project outcomes, with the synthesis of the consortium as a baseline: 22 partners (4 Chinese) from 8 different countries across Europe, covering 6 climatic regions (2 Chinese ones), representing the whole supply chain experts, from animal feed to soil application [Figure 2].

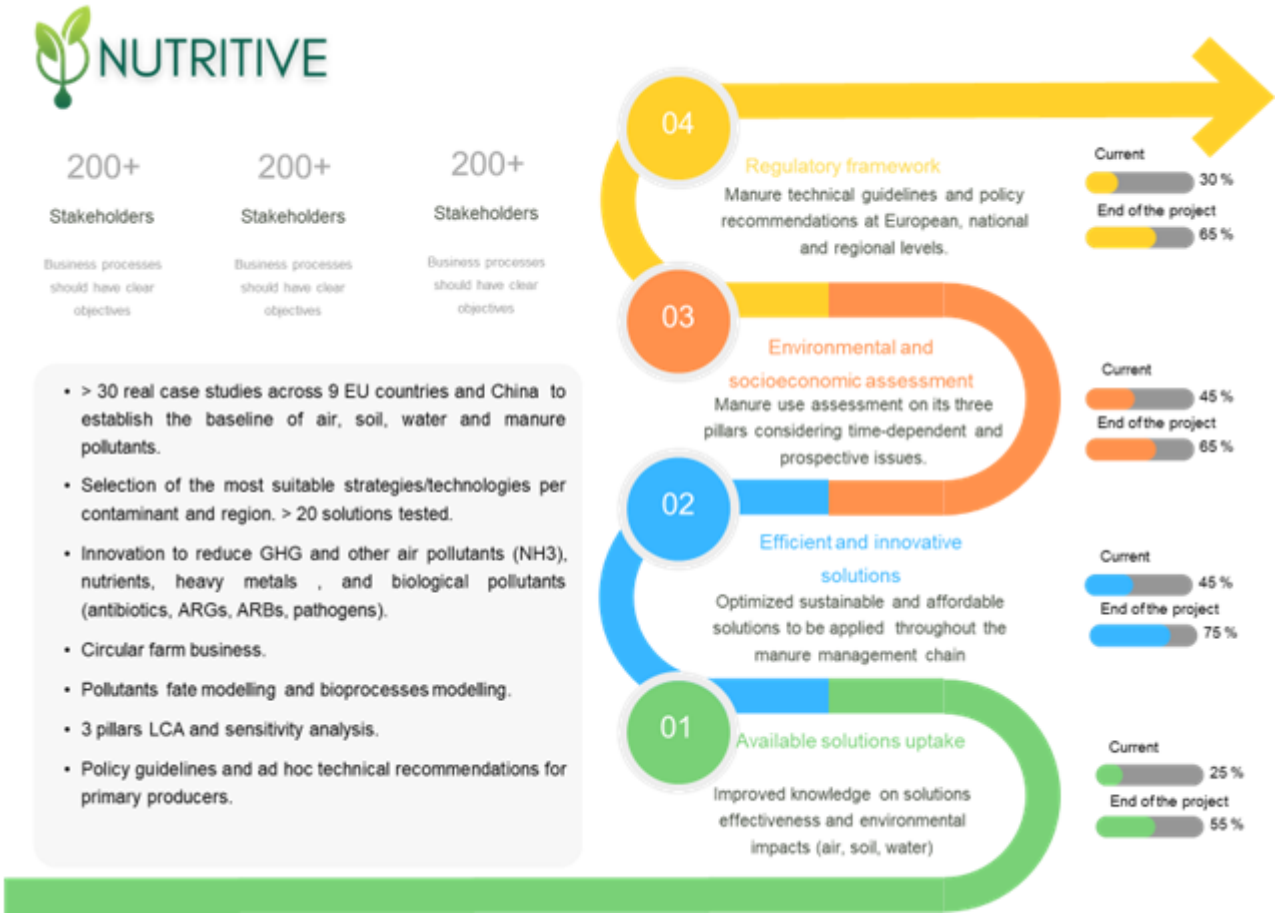

Figure 2 NUTRITIVE overview.

WP 1 covers the diversity in livestock and current practices. We will obtain region-specific data on manure management from case study farms across the EU and China, considering different animal categories (cow, pig, and poultry), climates (atlantic, mediterranean, alpine, and continental), and livestock types (intensive, semi-intensive, extensive, conventional, and organic). This information, completed with bibliographic data, will result in an up-to-date inventory regarding manure management practices already available and implemented, and associated pollutants affecting air, soil, water, and manure, which will feed WP3 modelling and LCA, and consequently, the DSS tool of WP4.

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2. Goal

The goal of this deliverable is to carefully select case study farms to cover the different livestock farming typologies. A subset of these farms should be accessible for sampling manure, water and soil samples. Ideally, the selected case studies will represent the EU's livestock structure.

3. Collecting information

During the submission phase of the project with acronym Nutritive, 32 case studies in Europe (+ 3 case studies in China) were preselected. This preselection considered different animal categories (cow, pig, and poultry), climates (atlantic, mediterranean, alpine, and continental), livestock production and feeding types (intensive, semi-intensive, extensive, conventional, and organic) and manure management chain (feeding, housing, handling, collection, treatment, storage, application).

At the start of the Nutritive Project (June 2024) preselected case studies were reviewed. This revision was described as Deliverable 1.1. This review was necessary because 1) the (access to) preselected case studies might have changed between submission (September 2023) and the start of the project (June 2024). And 2) because the current review included the essentials to take samples at the different case studies. As example, this review additionally considered the proximity of water bodies (surface water) and the use of antibiotics at the different case studies.

This review on the case studies was made possible by providing all the Nutritive partners access to a digital form towards all the partners of Nutritive [see 4 Form used to collect case study]. Based on an online brainstorming involving all the WP1 partners (meeting held on 10th of July 2024), information needed to be collected on the case studies was discussed. In the first half of August 2024 detailed feedback was collected regarding the digital form to collect the data on the case studies. With this feedback, a digital form was launched through a Microsoft Forms so the partners could provide the needed information in an efficient manner. At the same time using a universal Form, the risk of errors was minimised (e.g. typos). The Microsoft Form was open from August 25th until 4th of October 2024. All the submitted answers have been stored in a spreadsheet and initially analysed with the use of SharePoint List and QGIS during October 2024 [see 5 Collected data]. After collection of the answers, submitted case study farms were checked to make sure they would cover all the project goals [see 5 Collected data] and a final selection was made.

Information on farms from China will be provided once founding procedures are finished for this part of the project.

4. Form used to collect case study data.

The form to collect the case study data consisted of 61 questions divided into 7 sections. All questions and sections are described within this section. One submission holds data over one farm. There were various types of questions, varying from single and multiple choice to long free text. The form allowed to catch information in a consistent manner as well as nuance of the given case (should Partner feel the need to share additional info or clarify).

Below is an overview of all sections and questions, while pdf export of the form can be consulted, as provided in attachment [1].

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4.1. Section 1: Submitter (Question 1-6)

Collecting information about the partner submitting the information about farm. This section holds information needed to identify the person at Nutritive partner that's submitting data about the case study farm.

1. Partner submitting
   - Short name.
2. Person submitting
   - name and surname of the person submitting this data in the name of partner.
3. Email of person submitting.
4. Person submitting and person to contact the farm are the same person?
   - In case there is another person (not the person that is submitting this data) that would be the person to go to when asking more detailed questions about this Case Study during this Nutritive project This person should be contacted instead of person submitting.
5. Person to contact the farm
   - Name and Surname for person that should be contacted as being able to provide more detailed information regarding this Case study in the course of Nutritive project.
6. Email of person to contact the farm
   - This is to add contact person at partner that is normally responsible for contacting this particular case study farm

4.2. Section 2: General info about this farm (Q7-16)

This section's purpose is to collect general information covering mostly location and size of the company.

7. Acronym of the farm
8. Country.
9. GPS LATTITUDE coordinates of the location.
10. GPS LONGITUDE coordinates of the location.
11. NUTS3
    - Nomenclature of territorial units for statistics. To reference countries' regions for statistical purposes. According to information available in [20]
12. Economic Size of Farm
    - Categorized by Standard Outcome, as described in [21] and showed in [22]
13. Other way of determining size of Farm
    - If there's another way that is easier to obtain already that describes the size of farm
14. What's the profile of this farm?
    - Is it primarily for experimental purposes or industrial/production?
15. Role in Nutritive
    - Partner's suggestion for the role of this farm in the project. Should it be case, control can it be both?
16. Additional general information about the farm
    - General remarks on this farm, that will not be captured in the following questions.

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4.3. Section 3: Production details (Farm typologies) (Q17-32)

This section reports interrogation over the envisioned farm typologies including additional details regarding production.

17. Field of activity
    - Based on statistical classification of economic activities [23], focussing on: [24]
18. Animal category.
    - If there are multiple animals on a farm choose the one that will be measured as this instance (all the other details about feeding, intensity etc. should be applicable to that chosen animal). If more animal categories would be measured on a single farm each additional requires a separate entry in this form.
19. Animal subcategory.
    - To describe type of animals even further. To be able later to distinguish between meet and milk cows for example.
20. Livestock production system
21. Feeding
    - Description / short info about type of feeding regime / type of feed.
22. Headcount (scale of production)
    - headcount of animals per production cycle in measured farm
23. Rounds of production
    - frequency of animal rounds (number of animal rounds per year)
24. Type of building
    - This will affect the air emissions modelling.
25. Manure treatment steps in manure management chain
26. Type of manure treatment
    - Free text field to describe technique, additives, management....
27. Comment on manure treatment management
    - Anything more detailed that did not get caught so far
28. Annual amount of manure produced
29. Comment on annual amount of manure produced
    - Anything more detailed that should be brought up
30. Fertilizing with manure
    - More data must be captured regarding impact of the farm to the surroundings. Question is: is it available already? If you already have the knowledge, please describe it here. Otherwise, we will be asking more detailed questions in the questionnaire that will go to chosen case studies later in the project.
    - How often and when does the farm fertilize their own land / is it used outside?
    - Only with your own manure?
    - Which crops?
31. Use of antibiotics
32. Antibiotics used (antibiotic classes used)
    - Mention antibiotic class and if available can be also active substance / trade name and dose

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4.4. Section 4: Environmental parameters (Q33-40)

Based on GPS / NUTS location submitted this can be filled out by partners. But it has been also analysed per entire group submitted.

33. Biogeographic region (climate region) [5]
34. Soil region [25]
35. Soil type.
    - Based on [26], [25]
36. Water source for the farm
    - major source of water for the farm
37. Water intake
    - is there a water intake of drinkable water nearby (that might be affected by pollution from the farm but also that might provide a source of water samples results for baseline or comparison)
38. Waterbodies nearby
39. Types of waterbodies nearby
40. More info on waterbodies
    - If there's a need to put more info in regard of surrounding waters. For example: as we don't have "nearby" definition yet, please mention how close or how far away are the waterbodies you list in this form.

4.5. Section 5: Used in other projects (Q41-43)

This section checks whether the case studies are involved within other projects. This is mostly relevant for the literature study within WP 1 and can be relevant for WP 4.

41. Was this farm a part of any other projects?
42. If yes, please give some more info.
    - Like project's name, link to report and project contact person.
43. Other comments regarding other projects.

4.6. Section 6: Measurements (Q44-59)

This section collects information regarding already available results from various samples as well as possibility of sampling that can be performed during project.

44. Are there measurement data already available regarding the specified manure management?
45. What measurement data is ALREADY available?
    - Measurement data regarding pollution of ...
46. Results ALREADY available for **SURFACE WATER** samples
47. Results ALREADY available for **GROUND WATER** samples
48. Results ALREADY available for **SOIL** samples
49. Results ALREADY available for **AIR** samples
50. Results ALREADY available for **MANURE** samples
51. Results ALREADY available for **OTHER** type of samples
52. Is it possible to take samples at this farm during Nutritive?

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53. Which samples are relevant/ **POSSIBLE** to take?
    - Per the applied manure management, pollutants can be measured in samples of:
54. Pollutants in **SURFACE WATER** samples
    - Pollutants that can be measured during this project in samples of surface water.
55. Pollutants in **GROUND WATER** samples
56. Pollutants in **SOIL** samples
57. Pollutants in **MANURE** samples
58. Pollutants in OTHER TYPES OF samples
59. Additional info regarding taking samples
    - To add more details regarding future measurements data, like number of samples that can be taken.
    - Also give some more info regarding reasons if no samples can be taken.

4.7. Section 7: Final input (Q60-61)

All the data that partner has on their side regarding case studies presented to be used in Nutritive should be stored on Nutritive Cloud in Folder of WP1 [3], as a reference and possible source of more data (that was not submitted via this form). It can be a link to a file that holds information on more than one farm.

60. Link to the file on NutritiveCloud that would have more info regarding Farms submitted.
61. Final thoughts to share.
    - General comments regarding case study that were not covered in this form nor in the linked documentation.

5. Collected data.

5.1. General overview

In total, 40 responses were collected. Data was provided by 7 partners: AINIA, ATB, CEOAGRO, ILVO, MEDRAR, STA and TEAGASC. Not all of the initially declared farms made it to the submitted case studies. To cover the initially committed cases, some other farms were submitted instead by other partners to maintain consistency with the initial declared farms.

TEAGASC submitted 17 case studies, of which 10 case studies included dairy cattle farms across Ireland. To maintain representativeness with what was indicated in the project application, only 2 of these 10 case studies would be part of the final selection of case studies as the excluded ones did not bring additional variability to the dataset. [Table 1].

Partner submitting	bovine		chicken		pig		Total cases		
	declared	submitted	declared	submitted	declared	submitted	declared	submitted	selected
Ainia					3	1	3	1	**1**
ATB	5	6			1	0	6	6	**6**
ILVO	1	1	1	1	1	1	3	3	**3**
Medrar	6	4	1	1	1	1	8	6	**6**
STA	4	4	1	1	1	1	6	6	**6**
Teagasc	2	10*	1	2	1	5	4	17	**9**
CECOAGRO	1	1			1		2	1	**1**
Grand Total	19	26	4	5	9	9	32	40	**32**

*Table 1 Comparison of declarations and submissions *2 farms were left after case selection.*

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The intention according to the grant application was to cover 32 farms spread across 9 European countries, 4 climatic conditions, 6 livestock production systems, 3 animal categories and 7 steps within the manure management chain. The following section only focuses on the answers of the Form relevant to meet these goals of the WP 1 Deliverable 1.1 (climatic region, animal categories, livestock production and manure management chain). Moreover, an additional section provides information was needed to find the most interesting case studies for sampling regarding Deliverable 1.2 (manure, water and soil).

Answers submitted to the form (geographically anonymized), together with additional geospatial information (outcome of GIS analysis) can be found in attachment [2].

5.2. Criteria based on goals of WP 1

Geographical distribution

In the declarations, Partners informed that farms will be located in 9 European countries and possibly in China. While collecting information, it became evident that submitting data from the Portuguese farm would not be possible at the time. Information from Chinese farms is still pending funding procedures, thus not available at the moment.

Selected case studies are located in the following 8 countries: Belgium, France, Germany, Ireland, Italy, Poland, Spain and The Netherlands. Most of the case studies are located in Ireland (9), Spain (7) and Italy (5).

Eurostat reports [[29]-[30]] that, in absolute terms, France had the highest number of total livestock units in 2020 (19.0 million LSU), followed by Spain (16.6 million LSU), Germany (16.3 million LSU), Poland (10.0 million LSU) and Italy (9.3 million LSU). Except for a higher contribution from Ireland, selected case studies reflect the EU's livestock distribution: The majority of the EU's livestock is held in just a few member states including Spain and Italy.

The majority of the geographical characteristics can be described up to European administrative level of NUTS3 [6], without obscuring anonymity. If not mentioned otherwise that's the characteristics reference chosen in this document. The biggest density of the selected farms can be observed in Spanish ES112 (5), followed by 4 Irish farms in IE063, 2 farms are located in BE234, ITC11, ITC16, PL84, IE051 and IE053. The remaining 11 farms are dispersed in different NUTS3 locations.

The selected farms represent mostly 2 biogeographical regions [5]: atlantic (19) and continental (12). One farm is located in the mediterranean biogeographic region. It's important to mention that all 5 Italian farms, that are spread between 3 neighbouring NUTS, are located in an area, where influences of alpine, continental and mediterranean regions are present. Nevertheless, boundaries defined in Habitats Directive (92/43/EEC) put all submitted Italian locations within a continental climate. An overview of the NUTS regions of the case studies including the biogeographical regions is presented on the map [Figure 3].

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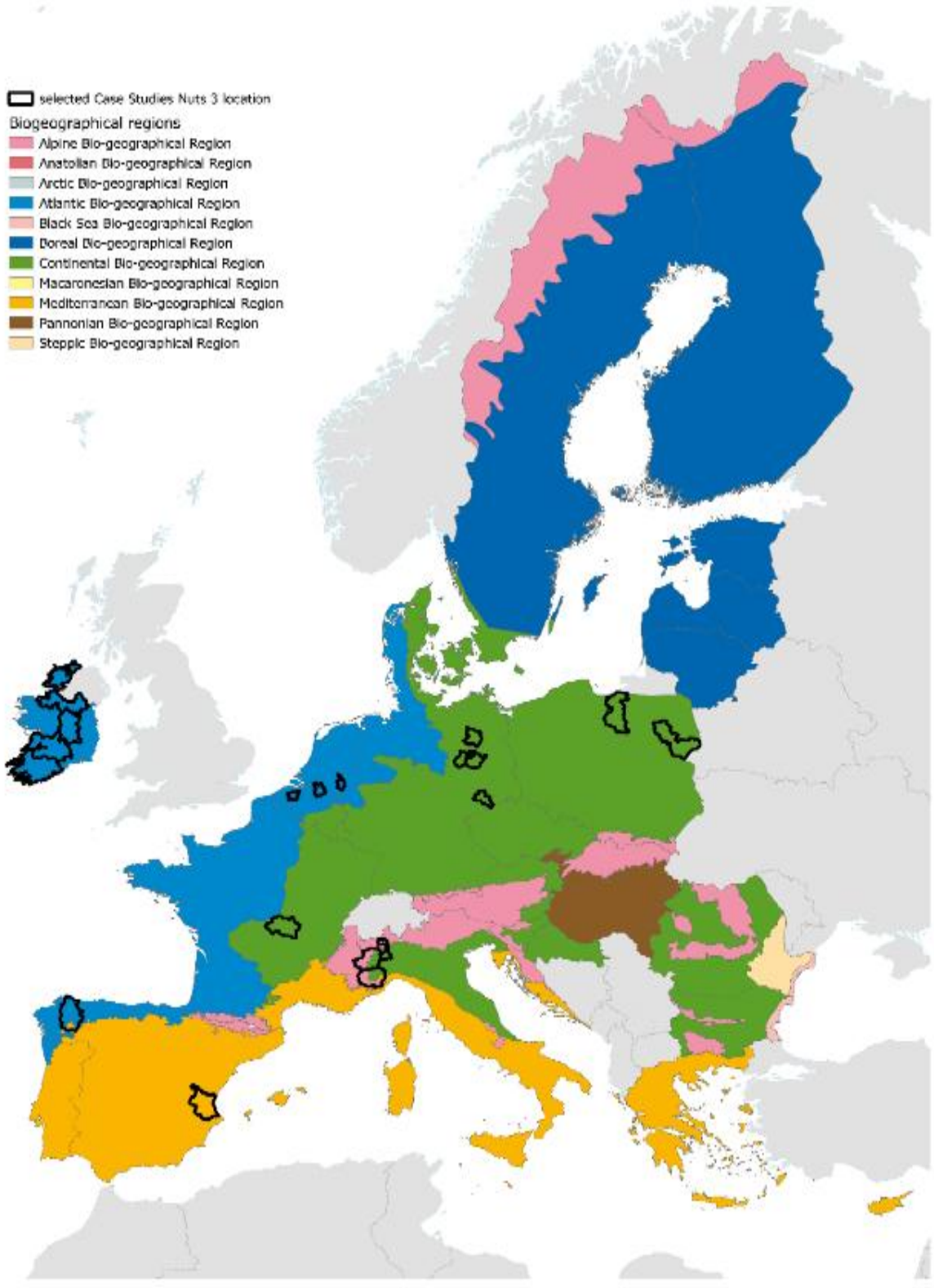

Figure 3 NUTS3 location of submitted case studies in context of their biogeographical regions

Animal categories and livestock production

Farm's main activities focus on raising cattle. Out of 18 farms, the raising of dairy cattle (A01.41) is the main field of activity on 15 farms. Raising cattle and buffaloes (A01.42) for meat is performed at 3 farms. Raising swine and pigs (A01.46) for meat is reported on 9 farms. Raising poultry (A01.47), mostly for meat, is the main activity on 5 of the selected farms.

Bovine farms use all types of livestock production systems: conventional (6), ecologic (1), extensive (1), intensive (6), intensive outdoors (2), organic (1) and semi-extensive (1). Pig farms are less diverse and mostly intensive (7). There's one pig farm with conventional and one using extensive production system. Among poultry farms only one uses semi-extensive system. The 4 remaining farms are producing in an intensive way.

As a result, all animal categories and livestock production systems that were previsioned in the grant application, are covered by the final case studies.

Eurostat reports [[29]-[30]] a total of 113 million livestock units (LSU) in the EU. About half (48.9 %) were cattle, 30.0 % were pigs and about one-seventh (14.5 %) were poultry. The percentage of animal categories selected in the case studies thus reflect the EU's livestock structure. Sheep and goat is another animal category raised within Europe (12 %), however, this animal category is left out of scope within this project. For the livestock production systems as defined in the proposal, as far as our knowledge, no Eurostat (or other numbers) were found (yet) to be able to compare with.

Manure management

Regarding the manure management chain, the partners were interrogated which manure management will be implemented in the case study. In one case of organic dairy cattle in Germany, no treatment of manure was declared. Two case studies (dairy cattle, Ireland) indicated that the manure management still need to be determined. The majority of the farms apply several steps in the manure management chain. The selected case studies cover all 7 manure managements steps with applying, storage and housing being the most widely used. Partners reported: 9 case studies that are involved in feeding or collection, 12 case studies in housing, 10 are involved in handling, 15 are involved in storage, 11 are involved in treatment and 17 case studies are involved in manure application on land. This latter is of importance to collect soil samples to trace the applied nutrients. It should be noted that 30 case studies indicated that soil samples can be taken, so of these 30 case studies, 17 case studies are of interest as for these cases manure is applied on land.

5.3. Additional criteria regarding sampling (Deliverable 1.2)

Antibiotics

The use of antibiotics is another additional selection criterium. This provides information regarding sampling of antibiotic residues, antibiotic resistant bacteria (ARBs) and genes (ARGs) and livestock-associated pathogens. Most of the farms use antibiotics. Out of the selected case studies, the majority are big farms with intensive production systems. Among the case studies there are 7 farms that have declared no use of antibiotics.

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Soil region.

Currently, it's not possible to estimate detailed soil regions for Irish farms since no GPS location details were given (only NUTS3). However, all Irish farms will fall under soil regions with temperate climate. From the remaining 23 case studies, the most common soil regions are 215 and 217 (each present at 5 locations), followed by 102 and 129 (2 locations each). Table 2 is showing basic attributes connected with each reported soil region [25].

soil region	dominant soils	dominant parent material	dominant land use	elevation class	slope class
3	soil regions with boreal to temperate climate				
33	soil regions with predominant boreal sub-oceanic to temperate sub-oceanic climate				
34	Haplic and Stagnic Albeluvisols	loamy to sandy morainic deposits	rainfed arable land	plain	flat
38	Eutric Cambisols	loamy to sandy morainic deposits	rainfed arable land	plain	flat to undulating level
4	soil regions with temperate climate				
43	soil regions with predominant temperate oceanic to temperate sub-oceanic climate				
100	Haplic Luvisols	loess and loessic loam, residual or redeposited loam	rainfed arable land	plain	flat to level
102	Gleyic and Haplic Podzols	eolian sand, sandy loess, glacial deposits, peat	mixed cultivation pattern	plain	flat
44	soil regions with predominant temperate sub-oceanic climate				
106	Gleyic and Haplic Albeluvisols	Tertiary calcareous sediments and sandy continental series, fluvial deposits	grassland	plain to hill	level,partly sloping
45	soil regions with predominant temperate sub-oceanic to temperate sub-continental climate				
129	Haplic Albeluvisols	sandy glaciofluvial and loamy to sandy morainic deposits, cover sand	mixed cultivation pattern	plain	flat
146	Haplic Podzols	sandy glaciofluvial to fluvial deposits, loamy morainic deposits,cover sand, loess	rainfed arable land	plain	flat to level
451	soil regions with predominant temperate sub-oceanic to temperate sub-continental climate influenced by mountains				
147	Eutric and Dystric Cambisols	acid plutonic and volcanic rocks, crystalline metamorphic rocks (granite, rhyolite, gneiss, phyllite), Palaeozoic metamorphic and sedimentary rocks (slate, greywacke), loess	mixed cultivation pattern	low mountain	level to sloping
5	soil regions with mediterranean climate				
51	soil regions with predominant mediterranean sub-oceanic to warm temperate sub-oceanic climate				
215	Haplic and Gleyic Luvisols	glaciofluvial and glacial deposits	rainfed arable land	plain	flat to level
52	soil regions with predominant mediterranean mountainous to warm temperate mountainous climate				
217	Haplic Umbrisols	igneous and metamorphic rocks, Palaeozoic and Mesozoic sedimentary rocks	mixed cultivation pattern	low mountain to high mountain	sloping, partly steep
54	soil regions with predominant mediterranean sub-oceanic climate				
221	Haplic Calcisols	Triassic to Tertiary limestone, marl and sandstone	mixed cultivation pattern	low mountain	level to sloping

Table 2 Soil regions and their main attributes.

For most of submitted locations (12 case study farms) an impermeable layer is expected at the depth between 80 and 150 cm. In 8 locations there's no impermeable layer within 150 cm. In 3 locations this layer is expected between 40 and 80 cm [25]. This information is relevant to forecast the nutrient flow from manure application on the field towards soil and surface water.

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Waterbodies nearby

The Water Framework Directive (2000/60/EC; WFD) aims to achieve “good status” for all ground and surface waters in the EU. This is to be achieved (among others) by managing waters within river basin districts. Proximity of the waterbodies is not considered purely by a matter of distance to the closest one. Instead, GIS analysis have pinpointed waterbodies located in the same drainage network area as the farm. The definition of “nearby: have not been quantified at the time of gathering responses. A subjective value of 1 km was chosen during analysis. Submitted information as well as GIS analysis were combined to provide conclusive results. Geospatial datasets used to perform this analysis are listed in [chapter 7.2].

All selected farms have different types of waterbodies within the close proximity and inside their catchment zone [14][16][17][18]. In case of 20 farms there’s a waterbody within 1 km distance from the submitted GPS coordinates. Irish farms will be analysed upon submitting their GPS coordinates. Partners reported that in case of 19 farms it is possible to take water samples from surface water.

None of the farms are located within areas marked as prone to flooding (under WFD, [15] Irish farms to be analysed).

Groundwater samples can be taken at 18 case studies. However, as it can take multiple years for the pollutants to infiltrate groundwater, sampling of groundwater is left out of the scope. The complex transfer of pollutants from soil to groundwater depends on many factors and will make the interpretation of results unreliable. The association with run-off to surface water will be more relevant to fit within the scope. Nevertheless, it’s important to indicate that that 6 case studies are located in drinking water protection zones (5 in Italy and one in The Netherlands). Furthermore, all 3 Belgian farms and one French are located over groundwater basins that are vulnerable to nitrate pollution. Furthermore, it was possible to locate 23 farms within boundaries of at least one ground water body. (Irish – to be analysed). [17]

Protected areas

Within each NUTS3 [6] area where a selected case study farm is located, there’s at least one type of nationally designated protected area located as well [10]. In almost every case there’s some sort of protection inside the drainage network where the farm is located or immediately bordering one. Various protection categories are represented, following IUCN classification [27]. There’s only one farm that’s within the boundaries of a protected site (Möckern-Magdeburgerforth) where landscape is protected (NUTS: DEE06). This category V area can sustain activities such as traditional agricultural and forestry systems on conditions that ensure the continued protection or ecological restoration of the area. The farm located here reports as organic bovine farm.

5.4. Relevance to other WP within Nutritive

Selecting farms that cover a vast variety of parameters is crucial for the subsequent development of the project. These farms will as well be considered for the testing of some strategies and technologies proposed in WP2 (e.g. slurry streams as input for manure streams to be treated by WP2 technologies). Moreover, information gathered from case studies will be used for WP3 modelling and in turn will feed the DSS in WP4. Therefore, the selected farms should reflect the European livestock structure.

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6. Summary: collected data

A form was made available to all the partners in order to collect data from the case studies and to make a final decision on which case studies would be involved in Nutritive. The submitted answers provided details on the possible case studies. In total 40 case studies were submitted, of which 32 were finally chosen to maintain consistency with the preselected ones in the Grant proposal.

The selected holdings cover all envisioned animal categories. Most of them are raising bovine animals (17 out of case studies). All livestock production systems are present in selection, with major presence of intensive production system (18 out of 32 case studies). The different steps within the manure management chain are covered within the selected case study farms. Most farms combine different steps, as a result, each step of the manure chain is reported in at least 9 of all case studies.

The selected case studies cover 3 out of 4 climate (bio-geographical) regions. Alpine region is not covered, however, 3 Italian case study farms are located in an area, where influences of alpine, continental and mediterranean regions are present.

Based on the animal categories and geographical distribution, except for the higher contribution of Ireland within the case studies, we can state that the selected case studies reflect the European livestock structure.

The additional criteria specifically interrogated to be of interest for Deliverable 1.2 (sampling) were 1) the use of antibiotics 2) manure application on land and 3) proximity of water bodies. These additional insights will support Deliverable 1.2 to determine the number and locations of manure, water and soil samples to be taken.

7. References

7.1. Attached documents and linked project locations

[1] Questionnaire
[2] Anonymized answers and data from preliminary GIS analysis.
[3] NUTRITIVE - WP1\2. Tasks and subtasks\Task 1.1\Data for Case Study selection

7.2. GIS map sources

[4] U basemap from European Environment Agency WMS: (borders, countries, lakes, sea) source: https://www.eea.europa.eu/en/datahub/datahubitem-view/0c73bf39-37c5-4017-8fc0-5489cfcfddc2
[5] Biogeographical regions European Environment Agency (2016). Biogeographical regions, Europe 2016, version 1. https://sdi.eea.europa.eu/catalogue/inspire-pds/api/records/c6d27566-e699-4d58-a132-bbe3fe01491b
[6] NUTS3 European Comission Eurostat, https://ec.europa.eu/eurostat/web/gisco/geodata/statistical-units/territorial-units-statistics
[7] Basemap: https://www.openstreetmap.org/
[8] European Soil Database Maps: https://esdac.jrc.ec.europa.eu/content/european-soil-database-v20-vector-and-attribute-data
Panagos, P., Van Liedekerke, M., Borrelli, P., Köninger, J., Ballabio, C., Orgiazzi, A., Lugato, E., Liakos, L., Hervas, J., Jones, A. Montanarella, L. 2022. European Soil Data

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Centre 2.0: Soil data and knowledge in support of the EU policies. European Journal of Soil Science, 73(6), e13315. DOI: 10.1111/ejss.13315
[9] 'Soil Regions of the European Union and Adjacent Countries 1:5,000,000', 2005, accessed 2024-10-30, http://data.europa.eu/88u/dataset/ae71ffee-1ae9-4624-ae3f-f49513fe9dcb
[10] European Protected Sites (Emerald, Natura2000, NatDA)
[11] EEA Nationally designated areas (DAT-24-en): https://doi.org/10.2909/616ef48f-7196-4e30-b201-6c97808fa68a
https://data.europa.eu/data/datasets/bdd57fc8-89a1-48a3-8b07-22999cd43170?locale=en
https://sdi.eea.europa.eu/webdav/datastore/public/eea_t_natda-areas_p_2023-2024_v22_r00/
[12] Natura 2000 data - the European network of protected sites (Prod-ID: DAT-68-en) https://www.eea.europa.eu/en/datahub/datahubitem-view/6fc8ad2d-195d-40f4-bdec-576e7d1268e4
[13] Emerald Network data - the Pan-European network of protected sites (Prod-ID: DAT-260-en) https://www.eea.europa.eu/en/datahub/datahubitem-view/4c4c8086-c940-400b-9064-29063143b2de
[14] EUHydro European Environment Agency (2020). EU-Hydro River Network Database 2006-2012 (vector), Europe - version 1.3, Nov. 2020. https://doi.org/10.2909/393359a7-7ebd-4a52-80ac-1a18d5f3db9c
https://www.eea.europa.eu/en/datahub/datahubitem-view/2e782ca5-c7b2-4b48-8928-03031b642176?activeAccordion=1082763
[15] EEA potential flood-prone areas (2020). EEA potential flood-prone area extent. https://sdi.eea.europa.eu/catalogue/srv/api/records/254a8583-e34f-4324-bbdf-1fbda7a3d222
https://www.eea.europa.eu/en/datahub/datahubitem-view/254a8583-e34f-4324-bbdf-1fbda7a3d222
[16] WISE WFD groundwater body horizons reported under Water Framework Directive (2024). WISE WFD groundwater body horizons reported under Water Framework Directive. https://sdi.eea.europa.eu/catalogue/srv/api/records/2f198cd5-9cc6-4d4f-a2a1-3ad3f647aea5
https://www.eea.europa.eu/en/datahub/datahubitem-view/2f198cd5-9cc6-4d4f-a2a1-3ad3f647aea5
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(2021). WISE Water Framework Directive Database.
https://sdi.eea.europa.eu/catalogue/srv/api/records/dc1b1cdf-5fa0-4535-8c89-10cc051e00db
[18] (2012). European catchments and Rivers network system (Ecrins). https://sdi.eea.europa.eu/catalogue/srv/api/records/a9844d0c-6dfb-4c0c-a693-7d991cc82e6e
https://www.eea.europa.eu/en/datahub/datahubitem-view/a9844d0c-6dfb-4c0c-a693-7d991cc82e6e?activeAccordion=
[19] WISE WFD Protected Areas under the Water Framework Directive (Prod-ID: DAT-221-en) https://www.eea.europa.eu/en/datahub/datahubitem-view/06c3dcab-77bd-462b-b19e-32ac72d9155d

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7.3. Eurostat data and other reference documents

[20] NUTS - Nomenclature of territorial units for statistics, : https://ec.europa.eu/eurostat/web/nuts/overview
[21] Standard output (SO)source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Standard_output_(SO)
[22] Economic size of farms https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Small_and_large_farms_in_the_EU_-_statistics_from_the_farm_structure_survey#Economic_size_of_farms
[23] NACE https://ec.europa.eu/eurostat/web/nace
[24] ESTAT_Statistical_Classification_of_Economic_Activities_in_the_European_Community_Rev._2.1._(NACE_2.1) https://showvoc.op.europa.eu/#/datasets/ESTAT_Statistical_Classification_of_Economic_Activities_in_the_European_Community_Rev._2.1._%28NACE_2.1%29/data?resId=http:%2F%2Fdata.europa.eu%2Fux2%2Fnace2.1%2F014
[25] 'Soil Regions of the European Union and Adjacent Countries 1:5,000,000', 2005, accessed 2024-10-30, http://data.europa.eu/88u/dataset/ae71ffee-1ae9-4624-ae3f-f49513fe9dcb
[26] FAO/UNESCO Soil Map of the World https://www.fao.org/soils-portal/data-hub/soil-maps-and-databases/faounesco-soil-map-of-the-world/en/
[27] Lausche, Barbara J. (2011). Guidelines for Protected Areas Legislation. IUCN. p. 147. ISBN 9782831712451.(IUCN-EPLP No.81) https://iucn.org/resources/publication/guidelines-protected-areas-legislation https://books.google.be/books?id=13gGb2rQVQwC&pg=PA147&redir_esc=y#v=onepage&q&f=false https://en.wikipedia.org/wiki/IUCN_protected_area_categories
[28] European Comission, Eurostat Agriculture, forestry and fishery statistics , source: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Agriculture,_forestry_and_fishery_statistics
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[30] Eurostat 2020 report European Commission, Eurostat, Agriculture, forestry and fishery statistics — 2020 edition, Publication Office of the European Union,2020, https://ec.europa.eu/eurostat/web/products-statistical-books/-/ks-fk-20-001
[31] European Commission, Eurostat, Farms and farmland in the European Union - statistics, Publication Office of the European Union,2020, Farms and farmland in the European Union – statistics: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farms_and_farmland_in_the_European_Union_-_statisticsAnonymized answers and data from preliminary GIS analysis.
[32] Dairy and cattle rearing are the most common livestock farm specialisations.
[33] Source: Eurostat (ef_m_farmleg) https://ec.europa.eu/eurostat/databrowser/view/ef_m_farmleg/default/table?lang=en

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7.4. List of Figures and tables in this document

Figure 1 NUTRITIVE methodology. 4
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Nutritive data collection for Case Studies selection

This form is to gather data from **Nutritive Partners** about "their" farms.
This information will make it possible to select the most comprehensive case studies to use further along in the project.

One response to this form will collect data regarding a SINGLE Case Study.

* Required

Submitter

Information needed to identify person at Nutritive partner that's submitting data about case study farm. (Due to technical limitations we need to collect this data manually. This won't be collelcted automatically by the form.)

1

Partner submitting *

Short name / abbreviation and not the full legal name

- ◯ AINIA
- ◯ ATB
- ◯ CECOAGRO
- ◯ ILVO
- ◯ MEDRAR
- ◯ STA
- ◯ TEAGASC
- ◯ USC
- ◯ VITO
- ◯ CHINA: CHENGDU
- ◯ CHINA: IUA
- ◯ CHINA: SICHUAN
- ◯ CHINA: XIHUA

2

Person submitting *

Your Name and Surname, as person submitting this data in the name of partner selected above

3

Email of person submitting *

Due to technical limitation this form cannot automatically collect emails of the responders.

Please enter an email

4

Person submitting and person to contact the farm are the same person? *

Is there another person (not the person that is submitting this data) that would be the person to go to when asking more detailed questions about this Case Study in the course of this Nutritive project? This person should be contacted instead of person submitting.

- ◯ No
- ◯ Yes

5

Person to contact the farm

Name and Surname for person that should be contacted as being able to provide more detailed information regarding this Case study in the course of Nutritive project.

6

Email of person to contact the farm

This is to add contact person at partner that is normally responsible for contacting this particular case study farm

Please enter an email

General info about this farm

Here we will cover mostly location and size of the company.

7

Name of the farm *

This does not have to be the official (like for taxes reasons) name of the farm. More like distinctive name that you as a partner give to this farm (like: "HappyCow Brussel", "Marios Solar Barcelona" and not like "Case27b/158XVF=IT") - that's easy to refer to for humans. More structured name will be applied to finally selected Case Studies.

8

Country *

- ◯ Belgium
- ◯ France
- ◯ Germany
- ◯ Ireland
- ◯ Italy
- ◯ The Netherlands
- ◯ Poland
- ◯ Portugal
- ◯ Spain
- ◯ China
- ◯ Other

9

GPS LATTITUDE coordinates of the location *

Preferably in DD (decimal degrees, simplest way to get them from google maps)

Number must be between -90 ~ 90

10

GPS LONGITUDE coordinates of the location *

Preferably in DD (decimal degrees, simplest way to get them from google maps)

Number must be between -180 ~ 180

11

NUTS3 *

Nomenclature of territorial units for statistics. To reference countries' regions for statistical purposes.
More information can be checked here: https://ec.europa.eu/eurostat/web/nuts/overview

While an Excell file with all NUTS for all EU countries can be consulted here (Tab: NUTS2021- NUTS2024):
https://ec.europa.eu/eurostat/documents/345175/629341/NUTS2021-NUTS2024.xlsx/2b35915f-9c14-6841-8197-353408c4522d?t=1717505289640

Example for ILVO NUTS3 location: **BE234**
2 letters for country code and 3 digits for the location. No spaces.

Please enter at most 5 characters

12

Economic Size of Farm

Categorized by Standard Outcome
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Standard_output_(SO)
As showed here:
https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Small_and_large_farms_in_the_EU_-_statistics_from_the_farm_structure_survey#Economic_size_of_farms

- ◯ very small < 2 000 €
- ◯ small 2 000 - 8 000 €
- ◯ medium 8 000 - 25 000 €
- ◯ large 25 000 - 100 000 €
- ◯ very large >100 000 €

13

Other way of determining size of Farm

If there's another way that is more easy to obtain already that describes the size of this farm

14

What's the profile of this farm? *

Is it primarily for experimental purposes or industrial/production?

- ◯ Industrial
- ◯ Experimental

15

Role in Nutritive *

Partner's suggestion for the role of this farm in the project. Should it be case, control can it be both?

- ◯ case
- ◯ control
- ◯ case/control
- ◯ Other

16

Additional general information about the farm

Place for general remarks regarding the farm that will not be captured in the following questions.

Production details (Farm typologies)

17

Field of activity *

Based on https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_(NACE)

ESTAT_Statistical_Classification_of_Economic_Activities_in_the_European_Community_Rev._2.1._(NACE_2.1):

- [ ] 01.41 Raising of dairy cattle (A01.4 Animal production).
- [ ] 01.42 Raising of other cattle and buffaloes (A01.4 Animal production).
- [ ] 01.46 Raising of swine and pigs (A01.4 Animal production).
- [ ] 01.47 Raising of poultry (A01.4 Animal production).
- [ ] 01.50 Mixed farming (A01.5 Mixed farming).
- [ ] Other

18

Animal category *

If there are multiple animals on a farm choose the one that will be measured as this instance (all the other details about feeding , intensity etc. should be applicable to that chosen animal). If more animal categories would be measured on a single farm each additional requires a separate entry in this form.

- ◯ bovine
- ◯ chicken
- ◯ pig

19

Animal subcategory

To describe type of animals even further. To be able later on to distinguish between meet and milk cows for example.

20

Livestock production system *

- ◯ intensive
- ◯ extensive
- ◯ semi-extensive
- ◯ conventional
- ◯ organic
- ◯ ecologic
- ◯ household
- ◯ Other

21

Feeding *

Description / short info about type of feeding regime / type of feed.

22

Headcount (scale of production) *

headcount of animals per production cycle in measured farm

The value must be a number

23

Rounds of production *

frequency of animal rounds (number of animal rounds per year)

The value must be a number

24

Type of building *

This will affect the air emissions modelling.

- ◯ open ventilation
- ◯ mechanical ventilation
- ◯ Other

25

Manure treatment steps in manure management chain *

- ☐ feeding
- ☐ housing
- ☐ handling
- ☐ collection
- ☐ treatment
- ☐ storage
- ☐ application
- ☐ Other

26

Type of manure treatment

Free text field to describe technique, additives, management....

27

Comment on manure treatment management

Anything more detailed that did not get caught so far

28

Annual amount of manure produced *

little / average / high or place a number (with units).

29

Comment on annual amount of manure produced

Anything more detailed that should be brought up

30

Fertilizing with manure

More data has to be captured regarding impact of the farm to the surroundings. Question is: is it available already? If you already have the knowledge, please describe it here. Otherwise we will be asking more detailed questions in the questionnaire that will go to chosen case studies later in the project.

- How often and when does the farm fertilize their own land / is it used outside?
- Only with your own manure?
- Which crops?

31

Use of antibiotics *

- ◯ Yes
- ◯ No

32

Antibiotics used (antibiotic classes used)

Mention antibiotic class and if available can be also active substance / trade name and dose

Environmental parameters

Once GPS / NUTS location have been submitted then most of this data can be assessed from available maps.

33

Biogeographic region (climate region)

Not needed if GPS coordinates or NUTS3 have been submitted.

Nutritive was submitted with map from EEA :
European Environment Agency : Biogeographical regions. Europe 2016, version 1:
https://sdi.eea.europa.eu/catalogue/idp/api/records/c6d27566-e699-4d58-a132-bbe3fe01491b
, based on this dataset:
https://www.eea.europa.eu/en/datahub/datahubitem-view/11db8d14-f167-4cd5-9205-95638dfd9618

- ◯ Alpine
- ◯ Anatolian
- ◯ Arctic
- ◯ Atlantic
- ◯ Black Sea
- ◯ Boreal
- ◯ Continental
- ◯ Macaronesian
- ◯ Mediteranean
- ◯ Pannonian
- ◯ Steppic

34

Soil region

If GPS coordinates are given this can be analyzed by ILVO, otherwise we need to agree on classification used and options to choose as single choice or go for free text. For example this one for Europe:
https://data.europa.eu/data/datasets/ae71ffee-1ae9-4624-ae3f-f49513fe9dcb?locale=en

35

Soil type

https://www.fao.org/soils-portal/data-hub/soil-maps-and-databases/faounesco-soil-map-of-the-world/en/

36

Water source for the farm *

major source of water for the farm

- [ ] local network
- [ ] own well
- [ ] openwaters at location
- [ ] Other

37

Water intake *

is there a water intake of drinkable water nearby (that might be affected by pollution from the farm but also that might provide a source of watersamples results for baseline or comparison)

- ◯ Yes
- ◯ No

38

Waterbodies nearby *

- ◯ Yes
- ◯ No

39

Types of waterbodies nearby

- [ ] river
- [ ] lake
- [ ] channel
- [ ] wetlands
- [ ] artificial water reservoir
- [ ] groundwater / aquifers
- [ ] Other

40

More info on waterbodies

If there's a need to put more info in regard of surrounding waters. For example: as we don't have "nearby" definition yet, please mention how close or how far away are the waterbodies you list in this form.

Used in other projects

Mostly relevant for the literature study

41

Was this farm a part of any other projects? *

projects that have anything to do with manure management. others are rather irrelevant

- ◯ Yes
- ◯ No

42

If yes, please give some more info

Like project's name, link to report and project contact person

43

Other comments regarding other projects

Measurements

Information regarding already available results from various samples as well as possibility of sampling that can be performed during project.

44

Are there measurement data already available regarding the specified manure management? *

- ◯ Yes
- ◯ No

45

What measurement data is ALREADY available?

Measurement data regarding pollution of ...

- ☐ surface water
- ☐ ground water
- ☐ soil
- ☐ air
- ☐ manure
- ☐ Other

46

Results ALREADY available for **SURFACE WATER** samples

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- ☐ CO2
- ☐ NH3
- ☐ CH4
- ☐ antibiotics
- ☐ pathogens
- ☐ heavy metals
- ☐ Other

47

Results ALREADY available for **GROUND WATER** samples

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- [ ] CO2
- [ ] NH3
- [ ] CH4
- [ ] antibiotics
- [ ] pathogens
- [ ] heavy metals
- [ ] Other

48

Results ALREADY available for **SOIL** samples

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- [ ] CO2
- [ ] NH3
- [ ] CH4
- [ ] antibiotics
- [ ] pathogens
- [ ] heavy metals
- [ ] Other

49

Results ALREADY available for **AIR** samples

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- [ ] CO2
- [ ] NH3
- [ ] CH4
- [ ] antibiotics
- [ ] pathogens
- [ ] heavy metals
- [ ] Other

50

Results ALREADY available for **MANURE** samples

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- [ ] CO2
- [ ] NH3
- [ ] CH4
- [ ] antibiotics
- [ ] pathogens
- [ ] heavy metals
- [ ] Other

51

Results ALREADY available for OTHER type of samples

If you have added any other type of samples please specify which parameters ara available here:

52

Is it possible to take samples at this farm during Nutritive? *

- ◯ Yes
- ◯ No

53

Which samples are relevant/ **POSSIBLE** to take?

Regarding the applied manure management, pollutants can be measured in samples of:

- ☐ surface water
- ☐ ground water
- ☐ soil
- ☐ air
- ☐ manure
- ☐ Other

54

Pollutants in **SURFACE WATER** samples

Pollutants that can be measured in the course of this project in samples of **SURFACE WATER**

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- ☐ CO2
- ☐ NH3
- ☐ CH4
- ☐ antibiotics
- ☐ pathogens
- ☐ heavy metals
- ☐ Other

55

Pollutants in **GROUND WATER** samples

Pollutants that can be measured in the course of this project in samples of **GROUND WATER**

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- [ ] CO2
- [ ] NH3
- [ ] CH4
- [ ] antibiotics
- [ ] pathogens
- [ ] heavy metals
- [ ] Other

56

Pollutants in **SOIL** samples

Pollutants that can be measured in the course of this project in samples of **SOIL**

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- [ ] CO2
- [ ] NH3
- [ ] CH4
- [ ] antibiotics
- [ ] pathogens
- [ ] heavy metals
- [ ] Other

57

Pollutants in **MANURE** samples

Pollutants that can be measured in the course of this project in samples of **MANURE**

*Due to technical limitations it's not possible to have milti-choice Likert type of question. So this had to be divided by types of samples.

- [ ] CO2
- [ ] NH3
- [ ] CH4
- [ ] antibiotics
- [ ] pathogens
- [ ] heavy metals
- [ ] Other

58

Pollutants in OTHER TYPES OF samples

Pollutants that can be measured in the course of this project in OTHER TYPES OF samples

If you have added any other type of samples please specify which parameters can be measured here:

59

Additional info regarding taking samples

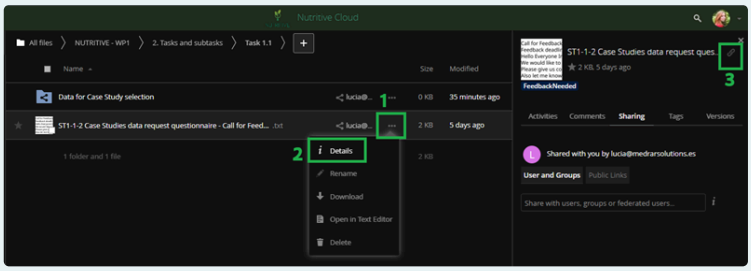
To add more details regarding future measurements data, like maybe number of samples that can be taken.
Also give some more info regarding reasons if no samples can be taken.

Final input

60

Link to the file on NutritiveCloud that would have more info regarding Farms submitted *

All the data that partner has on their side regarding case studies presented to be used in Nutritive should be stored on Nutritive Cloud in Folder of WP1:
NUTRITIVE - WP1\2. Tasks and subtasks\Task 1.1\Data for Case Study selection
, as a reference and possible source of more data (that was not submitted via this form). It can be a link to a file that holds information on more than one farm.
Graphic is showing how to obtain a link to file - it's going to be accessible only by people that have access to that folder
Easiest is to copy paste the link, but if you're typing this in manually make sure to start with
http:// or **https://**
and not with www.xxxxx



Please enter a URL

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Final thoughts to share

General comments regarding case study that were not covered in this form nor in the linked documentation.

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