DATASET OF REGIONAL NRSS AVAILABLE FOR PRODUCING BBFs IN THE EU

Deliverable 1.1 – D5 – WP1

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OPTIMISING BIO-BASED FERTILISERS IN AGRICULTURE – PROVIDING A KNOWLEDGE BASIS FOR NEW POLICIES

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Deliverable 1.1 – Version 1

Work-package n°1

Nature of the deliverable		
R	Report	x
Dec	Websites, patents, filling etc.	x
Dem	Demonstrator	
O	Other	

Dissemination Level		
PU	Public	x
CO	Confidential, only for members of the consortium (including the Commission Services)	

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LEX4BIO aims to reduce the dependence upon mineral/fossil fertilisers, benefiting the environment and the EU's economy. The project will focus on collecting and processing regional nutrient stock, flow, surplus and deficiency data, and reviewing and assessing the required technological solutions. Furthermore, socioeconomic benefits and limitations to increase substitution of mineral fertiliser for BBFs will be analysed. A key result of LEX4BIO will be a universal, science-based toolkit for optimising the use of BBFs in agriculture and to assess their environmental impact in terms of non-renewable energy use, greenhouse gas emissions and other LCA impact categories. LEX4BIO provides for the first-time connection between production technologies of BBFs and regional requirements for the safe use of BBFs.

The project runs from June 2019 to May 2024. It involves 20 partners and is coordinated by LUKE (LUONNONVARAKESKUS - Natural Resources Institute Finland).

More information on the project can be found at: http://www.lex4bio.eu

TABLE OF CONTENTS

D1.1: DATASET OF REGIONAL NRSS AVAILABLE FOR PRODUCING BBFs IN THE EU

I. INTRODUCTION

Nutrient recycling is one important aspect of circular economy towards which the European Union strives for. It includes the concept of recovering the nutrients that are already being used in the society to reduce the need for extracting them from natural resources. The main nutrients considered here are nitrogen (N) and phosphorus (P).

Information on the availability, nutrient content, and spatial distribution of different nutrient-rich side streams (NRSS; meaning organic, biodegradable biomasses) is needed to plan, promote and implement their enhanced reuse as fertilizer products (bio-based fertilizers, BFF) for agriculture.

In this report, the amounts of chosen NRSS have been estimated for the European Union member states. Also, their nitrogen and phosphorus contents are quantified, and their spatial distribution presented. The side streams included were those considered the most abundant and relevant from the nutrient recycling point of view, namely:

1. livestock manure,
2. agricultural plant biomasses (incl. straw, green maize, grass),
3. municipal biodegradable waste streams (biowaste and sewage sludge), and
4. industrial biodegradable waste streams (animal by products, residues from olive and wine production).

Currently some of these biomasses are part of nutrient recycling already, but their full potential is not yet harnessed.

The data presented is mainly based on Eurostat statistics, with supporting data from literature, as needed. The data is organized in a database (link below) and the maps describing the spatial distribution available in a web gallery (link below).

Data of nutrient rich side streams, nitrogen, and phosphorus content
https://px.luke.fi/PXWeb/pxweb/en/maatalous/

Nutrient maps
https://projects.luke.fi/biomassa-atlas/en/biomasses-in-eu/

PLEASE, NOTE:

This is an interim result of the Deliverable 1.1. The database, maps and the report will still be finalized and updated after this submission.

II. METHODOLOGY

For the EU-wide data collection, Eurostat data explorer[1] was used as the main source of information. As the Eurostat data rarely contains information on the nutrient content of different biomasses, biomass-specific factors for nutrients were acquired from literature as described in the following chapters. The data produced was collected for national and NUTS2 levels to assist in highlighting the spatial distribution and potential regional hotspots.

Estimation of the biomasses

Livestock manure

Livestock manure is the most abundant NRSS containing a significant amount of N and P for reuse in agriculture.

To estimate the amount of manure produced in the EU27, information on the shares of different manure types per animal category is needed. This, to our knowledge, is not available in the Eurostat data explorer and therefore, the amount of manure (tons per year) was not calculated. Previous estimates have been made e.g. by Foged et al. (2011), using Danish data on manure quantity (Poulsen 2010) and the survey results by Bioteau et al. (2009) on the shares of different manure types per animal category. Also, a more recent estimate of manure amounts was published by Köninger et al. (2019).

However, the amount of nitrogen and phosphorus in livestock manure was calculated using the German data on nutrient excretion and the number of animals reported by Eurostat.

The nutrient coefficients were calculated as means or weighted means using the coefficients of the German Fertilizing Ordinance (DüV 2017) and the German statistics on animals to match the animal categories used by Eurostat. The number of animals were taken from Eurostat and the tables extracted were Poultry by NUTS 2 regions [ef_lsk_poultry] for poultry, with the newest data from 2016 and Animal populations by NUTS 2 regions [agr_r_animal] for other animals with the newest available data in 2020.

As phosphorus is given as kg P2O5 in the ordinance, the values were converted to kg of total phosphorus using the conversion factor of 0.436. The amounts of nitrogen and phosphorus in manure were then calculated by multiplying the numbers of animals with the animal-specific nutrient coefficients (Table 1).

Moreover, the manure nutrients were summed up into the database for all cattle, pig, and poultry categories as well as for sheep and goats.

Additional maps were created to compare the availability of manure nutrients with respect to available arable land (data from Eurostat, Crop production in EU standard humidity by NUTS2 regions [apro_cpshr] 2016-2019).

[1] https://ec.europa.eu/eurostat/web/main/data/database

Table 1. Animal classification from Eurostat and the respective nitrogen and phosphorus excretion coefficients (DüV 2017).

Code for number of animals (Eurostat)	Label	N excretion coefficient (kg N/head/year)	P excretion coefficient (kg P/head/year)
A2010	Bovine animals, less than 1 year old	15.2	2.63
A2020	Bovine animals, 1 to less than 2 years old	38.8	6.29
A2130	Male bovine animals, 2 years old or over	41.3	6.46
A2230	Heifers, 2 years old or over	51.0	6.87
A2300F	Dairy cows	130	19.8
A2300G	Non dairy cows	102	13.10
A3131	Piglets, live weight of under 20 kg	3.7	0.60
A3120	Breeding sows, live weight 50 kg or over	24.8	4.96
A3131	Pigs, from 20 kg to less than 50 kg	9.90	2.20
A3132	Fattening pigs, live weight 50 kg or over	11.1	1.89
A3133	Breeding boars	22.1	4.19
A4100	Live sheep	19.3	1.89
A4200	Live goats	15.2	2.49
A5110O	Laying hens	0.748	0.160
A5140	Broilers	0.337	0.070
A5210	Ducks	0.576	0.160
A5220	Geese	0.702	0.170
A5230	Turkeys	1.725	0.380

Horse manure was left out due to uncertainty of the exact content of the Eurostat database on ‘Equidae’. It was known e.g. for Finland that the Eurostat data includes only horses kept on farms, while the horses kept on stables without farm status are excluded even though their amount of horses is higher. It is not known whether a similar significant lack of data is represented in the datasets of other EU member states.

Also, fur animal manure was left out due no data on the number of animals in the Eurostat database.

Agricultural plant biomasses

The agricultural plant biomasses included into this report were mainly side streams from crops cultivated for food and feed. Some plants specially cultivated for energy production were also included. Eurostat served as the main data source for crop production in EU. Some harvest indices were also used to make the division between the crop and its residue. This data will still be updated by M42 as indicated in the project timetable.

The plant biomasses were derived from regional crop statistics by NUTS2, including area, production, and main area in EU standard humidity (apro_cpshr). Detailed description of database attributes is in Annual Crop Statistics Handbook (2020) of Eurostat.

Straw

The data on straw was based on the Eurostat statistics on crop production in standard EU humidity by NUTS2 (apro_cpshr), more precisely the data on cereals to produce grain (including seed). The attributes for grain species were as follows (Figure 1):

- Wheat and spelt
- Rye and winter cereal mixtures (maslin)
- Barley
- Oats and spring cereal mixtures (mixed grain other than maslin)
- Grain maize and corn-cob-mix
- Triticale
- Sorghum
- Other cereals n.e.c. (buckwheat, millet, canary seed, etc.)
- Rice

Cereals which are harvested green or yellow as the whole plant for fodder or renewable energy (G9100) were excluded from the dataset as they do not produce straw.

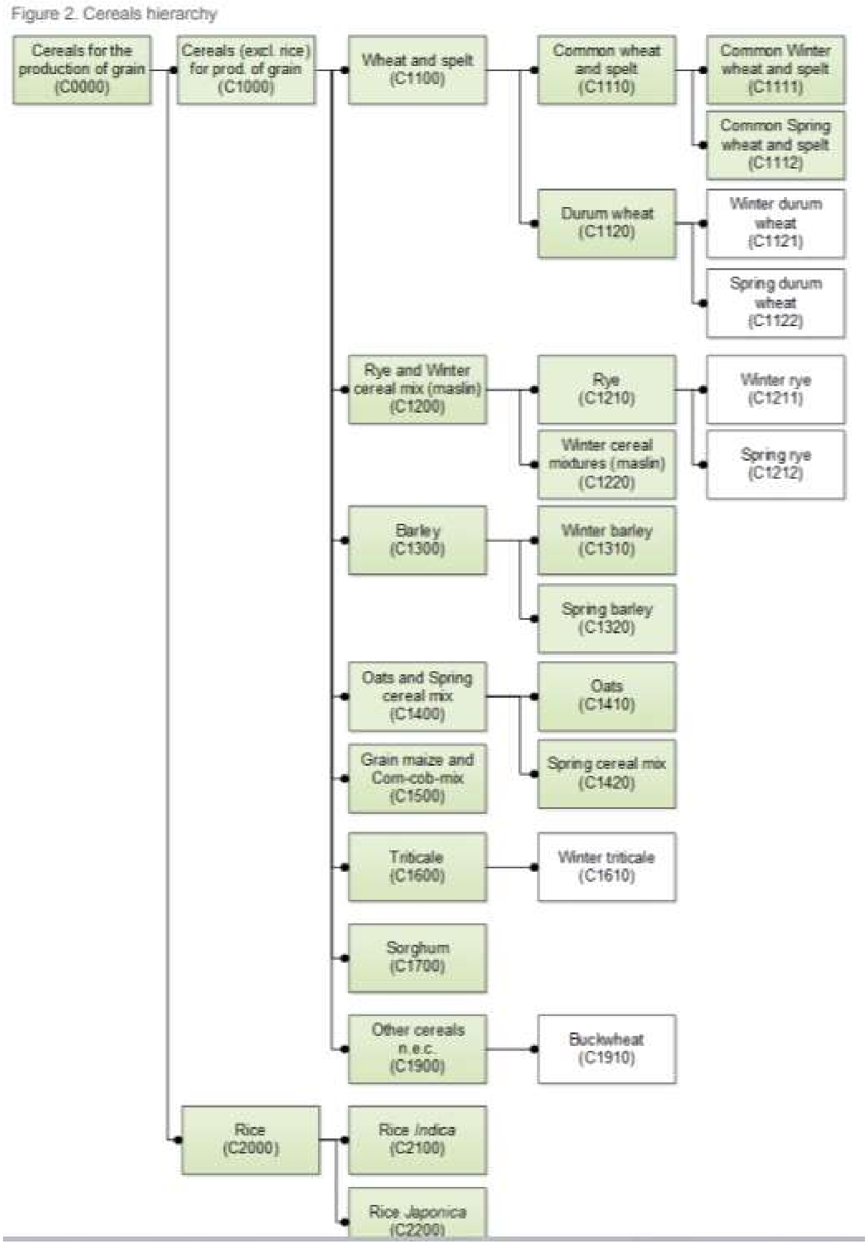

Figure 1. Cereals hierarchy and classification in Eurostat (Annual Crop Statistics Handbook 2020, p. 28).

Eurostat does not provide sums for wheat and spelt (C1100) at NUTS2 level and they had to be derived from the subspecies reported. However, the EU member states report wheat with varying detail. None of them report spring wheat (C1112), but some of them have smaller number in winter wheat (C1111) than in common wheat and spelt (C1110). Thus, spring wheat seemed to be reported with common wheat and spelt in some cases, but not always. To overcome this problem, the difference between ‘common wheat and spelt’ and ‘winter wheat’ were calculated to have data for spring wheat (eq. 1). Then ‘winter wheat’, ‘spring wheat’ and ‘durum wheat’ (C1120) were summed up to have data for ‘wheat and spelt’ (eq. 2).

Equation 1. C1112 = C1110 – C1111

Equation 2. C1100 = C1111 + C1112 + 1120

For Italy and Bulgaria, common wheat and spelt were reported to be smaller than common winter wheat and spelt for some years. As this cannot be true, the calculated negative values for spring wheat were changed to zero. For Schleswig-Holstein there were no data for common wheat and spelt in 2016, and thus common winter wheat and spelt was used instead.

The average yields were calculated based on years 2011-2018, where available. However, there have been several changes in NUTS2 regions in 2016 and the data is not continuous. This was solved by calculating average values for years 2015-2018 for regions in Greece, in Finland (except Western Finland and Åland), in North-East and Central Italy and in Poland, and for 2016-2018 regions in France.

The amount of straw per crop was calculated by species-specific harvest indices (Table 2) using equation (3).

*Equation 3. Straw amount = Grain yield * DM * (1-HI) / HI*

where

- DM is percentage of dry matter and
- HI is the harvest index

Table 2. Crop-specific harvest indices used for estimating the amount of straw produced (Hakala et al. 2009) and coefficients used to calculate nitrogen and phosphorus content of straw.

Cereal	Harvest index	Nitrogen (%DM)	Phosphorus (%DM)
Wheat	0.45	0.5	0.1
Barley	0.55		
Rye	0.40		
Oat	0.5		

Straw nitrogen was estimated to be 0.5 % of dry straw and phosphorus 0.1 % of dry straw (McCartney et al. 2006, Hills & Roberts 1981). Eurostat cereals are in standard humidity of 14 % (i.e. 86% DM), which was also used for straw biomass. In literature, straw biomass is usually reported in around 90% DM content (McCartney et al. 2006 and Hills & Roberts 1981).

Green maize

Green maize is mainly produced as an animal feed, but in some EU countries, it is also partly produced as an energy crop for biogas production. The amount of green maize produced in total was estimated using Eurostat crop production in standard EU humidity by NUTS2 (apro_cpshr), attribute is G3000, Green maize.

However, the share currently used in biogas production and thus participating also in nutrient recycling via digestate fertilizer use is not reported by Eurostat. The total amount of green maize production does not thus represent the recyclable quantity.

Also, the nutrient content of the green maize is not available at present but will be added, if possible, by the D1.1 update (M42).

Grass biomasses

As with green maize, part of the fresh grass or grass silage can be and is used as a feedstock in biogas production and thus contribute to nutrient recycling via digestate fertilizer use. While most of the produced grass is used as animal feed, grasses from e.g. water protection zones and fallows could be harvested for use in production of BBFs.

However, data on the production of different grasses is apparently not available in the Eurostat data explorer. The database will still be studied in case some suitable information can be found and added to the D1.1 by the update in M42.

Side streams from municipalities

Municipal biowaste

Eurostat Dataset: circular economy indicators - Generation of municipal waste per capita (cei_pc031) provides national total municipal waste generation per capita but doesn't separate biowaste from other waste forms. Dataset: Recycling of biowaste, kg per capita (CEI_WM030) tells the kilograms per capita of composting and anaerobic digestion of biowaste but does not address the generation or potential of recycling biowaste.

As these datasets did not provide enough detailed information, national biowaste capture and potential capture per capita data was gathered from Favoino & Giavini (2020), which combines national data in EU28. This data was supplemented by Eurostat Population on 1 January by NUTS 2 region [DEMO_R_D2JAN].

The national factors of biowaste collected and generated per capita were used to calculate the biowaste collected and potential of capture in NUTS2 regions by equations 4 & 5.

Equation 4. *Biowaste collected in NUTS2 region = Population in NUTS2 region * National biowaste collected per capita factor*

Equation 5. *Biowaste potential capture in NUTS2 region = Population in NUTS2region * National biowaste potential capture per capita factor*

Nitrogen and phosphorus amounts of these masses were calculated with nutrient content information in literature (Banks et al. 2018) by equations 6 & 7.

Equation 6. *Nitrogen amount in biowastes = Biowaste amount * Nitrogen content of biowaste (%FM)*

Equation 7. *Phosphorus amount in biowastes =*
*Biowaste amount * DM * Phosphorus content of biowaste (%DM)*

The nutrient content factors used are presented in the table 3.

Table 3. Nutrient coefficients and dry matter content for municipal biowaste.

Variable	Factor
Nitrogen content of biowaste	0.74% of FM
DM of biowaste	24%
Phosphorus content of biowaste	0.4% of DM

Sewage sludge

The Eurostat dataset on sewage sludge total production (env_ww_spd) provides national production of sewage sludge (as dry matter volume). This data was compared to national population 1.1.2019 [DEMO_R_D2JAN] to produce a factor for sewage sludge produced per capita. This national factor was then used to calculate the production in the NUTS2 regions based on population in each NUT2 area. From the amount of sewage sludge produced in the NUTS2 regions, the nitrogen and phosphorus were calculated on basis of literature (Fytili & Zabaniotou 2006) in equations 8 & 9.

Equation 8. *Nitrogen amount in sewage sludges =*
*Sewage sludge amount (as DM tonnes) * Nitrogen content of biowaste (%DM)*

Equation 9. *Phosphorus amount in sewage sludges =*
*Sewage sludge amount (as DM tonnes) * Phosphorus content of biowaste (%DM)*

The factors used are presented in the table 6.

Table 4. Nutrient coefficients used for sewage sludges.

Variable	Factor
Nitrogen content of sewage sludge	2.5% of dry weight
Phosphorus content of sewage sludge	1.6% of dry weight

Side streams from industries

Grape pomace from wine production

Grape pomace is a side stream of wine production.

The Eurostat dataset 'Crop production in standard EU humidity by NUTS2' (apro_cpshr) using attribute W1100 'Grapes for wines' includes the cultivated area of grapes (as 1000 ha), harvested grape production (as 1000 t) and grape yield (as tonne/ha). However, it fails to provide sufficient information on the NUTS2 areal production and the specify grapes specifically produced for wine production. More detailed data on some fruits and vineyards appear in the Orchard survey (the domain orch) and the Vineyard survey (the domain vit). Therefore, the data on the amount of grapes produced specifically for wine was gathered from dataset 'Grapes by production' (tag00121) using 'Grapes for wines' (W1100), which provided nation specific numbers of wine grape production.

The share of grape pomace from the grape yield per country was calculated based on the coefficient reported by Oliveira & Duarte (2016, Table 5) using equation 10.

Equation 10. *Grape pomace =*
*Grape yield for wine (t) * Proportion of grape pomace (%)*

The nitrogen and phosphorus content of the grape pomace was calculated based on nutrient coefficients reported by Ferrer et al. (2001; Table 5) using by equations 11 & 12.

Equation 11. *Nitrogen in grape pomace =*
*Grape pomace amount * DM (%) * Nitrogen content of grape pomace (%FM)*

Equation 12. *Phosphorus in grape pomace =*
*Grape pomace amount * DM (%) * Phosphorus content of grape pomace (%DM)*

where

- DM is percentage of dry matter and
- FM is percentage of fresh matter

Table 5. The coefficients used in estimating the amount of grape pomace and its nutrient content.

Variable	Factor
Proportion of grape pomace from grape yield for wine	13% of total mass
Nitrogen content of grape pomace	1.73% of FM
DM of grape pomace	26.4%
Phosphorus content of grape pomace	0.28% of DM

Olive pomace from olive oil production

The pressing of olives for olive oil produces a pomace which could be utilized in the production of biomass-based fertilizer products.

In the Eurostat statistics, the dataset 'Olives for olive oil production' in 'Crop production in standard EU humidity by NUTS2' (apro_cpshr) includes the following information: the code O1910 tells the cultivated olive area (as 1000 ha), harvested olive production (as 1000 t) and olive yield (as tonne/ha). However, it fails to provide sufficient information of the NUTS2 areal production and to specify the olives produced for oil production. Therefore, the dataset 'Olives by production' (Tag 00122) was used and provided sufficient country-specific data on 'Olive production to oil processing' (Code O01910).

The amount of olive pomace was then derived country-specifically by multiplying the olive yield for oil production with a coefficient reported by Ruiz et al. (2017; Table 6) as in equation 13.

Equation 13. *Olive pomace amount =*
*Olive produced for oil * Pomace proportion of olives in oil production*

The nitrogen and phosphorus contents in the olive pomace were calculated according to Lacolla et al. (2019; Table 4) by equations 14 and 15.

Equation 14. *Nitrogen amount =*
*Olive pomace amount * Nitrogen content of olive pomace (%FM)*

Equation 15. *Phosphorus amount =*
*Olive pomace amount * DM (%) * Phosphorus content of olive pomace (%DM)*

Table 6. The coefficients used in the estimation of the amount of olive pomace from olive oil production and its nutrient contents.

Variable	Factor
Proportion of olive pomace	25% of total mass
Nitrogen content of olive pomace	1.08% of FM
DM of olive pomace	44.1%
Phosphorus content of olive pomace	0.21% of DM

Animal by-products

The Eurostat database on slaughtering in slaughterhouses - annual data (APRO_MT_PANN) provides national number of slaughtered heads of domestic animals. This data was used as the basis of annual amount of national slaughter waste from cattle, pigs, and poultry. Data was limited to national level only and could not be applied on NUTS2 regions.

The amount of animal by-products from slaughtering in slaughterhouses was calculated from the amount of animal heads slaughtered and the average of slaughter waste per animal head in equation

16. The average of slaughter waste per head factor was based on minimum amounts specified in Finnish Environment Institute (2000). All the different slaughtering side fractions were taken in account except the hides of cattle.

Equation 16. *Amount of slaughter waste (cattle, pig or poultry) = Animal heads slaughtered * slaughter waste average per animal head*

From the national amounts of animal by-products from slaughtering (cattle, pigs, poultry), nitrogen and phosphorus amounts were calculated according to the nutrient composition of cattle, pigs and poultry (FAO, 2018) by equations 17 & 18.

Equation 17. *Nitrogen amount in slaughter wastes = Amount of slaughter waste * Nitrogen content of animal (%FM)*

Equation 18. *Phosphorus amount in slaughter wastes = Amount of slaughter waste * Phosphorus content of animal (%FM)*

The factors used are presented in the table 7.

Table 7. Conversion factors used in the calculation of animal by-product generation and their nutrient content.

Variable	Factor
Slaughter waste average of cattle per head	180 kg per animal
Nitrogen content of cattle slaughter waste	2.9% of FM
Phosphorus content of cattle slaughter waste	0.7% of FM
Slaughter waste proportion of pig per head	26 kg per animal
Nitrogen content of pig slaughter waste	2.5% of FM
Phosphorus content of pig slaughter waste	0.56 % of FM
Slaughter waste proportion of poultry per head	0.77 kg per animal
Nitrogen content of poultry slaughter waste	2.8% of FM
Phosphorus content of poultry slaughter waste	0.58% of FM

Spatial distribution of the NRSS as maps

The biomass data collected for national and NUTS2 levels was placed on maps to highlight their spatial distribution throughout the EU and to show potential hot spots.

The crop statistics data are provided by national level. The harvested production data are also available at NUTS 1 and NUTS 2 levels, except for France and Germany only at NUTS 1 level.

The Nomenclature of Territorial Units for Statistics, abbreviated NUTS (from the French version Nomenclature des unités territoriales statistiques), is a hierarchical classification system to divide the EU territory for the purpose of collection, development and harmonization of EU regional statistics, and socio-economic analyses of the regions and for the framing of EU regional policies. There are four levels - NUTS 0, 1, 2 and 3 respectively, moving from larger to smaller territorial units-. NUTS 0 levels correspond to national countries and NUTS 2 levels correspond to regions for the application of regional policies. An introduction to the NUTS classification is available here: http://ec.europa.eu/eurostat/web/nuts/overview. There are correspondences between NUTS levels and national administrative units.

NUTS classification got legal status in 2003. The regulation specifies stability of the classification for at least three years. Thus, data refers to the same regional unit for at least three years. But changes to classification are also possible in every third year. Fortunately, in case of an amendment to the classification, the Member State concerned must replace historical data by time series according to the new regional breakdown within two years. In such cases the time series is substituted by one updated according to the newest classification and the data following the previous classification are not available anymore from the Eurostat webpage. The regulation makes it easier to join regional data to spatial geometries to produce thematic maps. In case of changes in NUTS classification check of time series integrity is recommendable. Changes are listed in Eurostat Nuts history web page.

It follows from regional breakdowns that in Eurostat database there can sometimes be several rows for the regions with a same name. For example, for Finland there were changes between present NUTS categories and NUTS 2006. In the Eurostat database for Crop production in EU standard humidity by NUTS 2 regions [apro_cpshr] and Harvested production in EU standard humidity (1000t), there are still rows for former NUTS 2 regions "Itä-Suomi", "Etelä-Suomi" and "Pohjois-Suomi", but there are no data for them. Data exist instead for the new NUTS 2 regions: "Helsinki-Uusimaa", "Etelä-Suomi" and "Pohjois- ja Itä-Suomi". "Länsi-Suomi" has stayed as it was, so it is presented in the database only in one row.

In the reported work, the discontinuity of region names meant that summing up the calculated nutrients of poultry manure (data available for 2016) and of other animal's manure (data available for 2020) needed several regions to be joined by old and new NUTS 2 codes to enable data merge. Also, some former regions were split in two. For example, in Poland, former Mazowieckie region (PL12) was split to Warszawski stoleczny (PL91) and Mazowiecki regionalny (PL92). Having the poultry data for former Mazowieckie region and other animals for PL91 and PL92, all the poultry from Mazowieckie were addressed to PL92 as it was supposed to be more rural area than PL91. Similar operation was done in Lithuania (LT00 split to LT01 and LT02, poultry to LT02) and in Hungary (HU10 split to HU11 and HU12, poultry to HU12). In Ireland the regional changes were complicated and more regional knowledge might have helped to place poultry to the correct regions. Therefore, the maps and statistics summarizing nitrogen and phosphorus from all manures (cattle, pigs, sheep, goats, poultry) have only nutrients originating from manure of cattle, pigs, sheep and goats in Ireland and Irish poultry manure is excluded.

The current NUTS 2016 classification is valid from January 1, 2018 and lists 104 regions at NUTS 1 and 281 regions at NUTS 2 level. The NUTS classification will change next time on 1January 1, 2021.

The NUTS geometries can be downloaded at Eurostat GISCO. Six historical NUTS classifications, five map scales and five file formats are provided. For mapping purposes, we selected the scale 1:1 million and the previous NUTS 2016 classification (the current is NUTS 2021). The downloaded package contains several zipped sub-packages. The 6th and 7th characters in file names refers on shape type. File names with *RG* contain the region polygons (BN for line boundaries and LB for labels). For digit codes: 3035, 3857 and 4326 refer on coordinate reference systems EPSG code. Two projections are provided: European LAEA projection (EPSG 3035) and web mercator (EPSG 3857). Also, geographic coordinates WGS84 (EPSG 4326) are provided. For statistical maps, it is strongly advised to use an equal-area projection such as European LAEA (Lambert Azimuthal Equal Area). For thematic mapping of EU nutrient rich side streams in NUTS2 regions we extracted the folder NUTS_RG_01M_2016_3035_LEVL_2, and for NUTS0 the folder NUTS_RG_01M_2016_3035_LEVL_0.

Table 8. The download options for Eurostat GISCO NUTS datasets. The options selected are coloured in light brown.

Parameter	Supported values	Description
Type	RG	Region (polygon)
	LB	Label
	BN	Boundary (line)
Scale	1:1M	The map scale factor. The smaller the value, the stronger the simplification.
	1:3M	
	1:10M	
	1:20M	
	1:60M	
Year	2003, 2006, 2010, 2013, 2016, 2021	The NUTS version
Projection	3035	The coordinate reference system EPSG code. Two projections are provided: European LAEA projection (EPSG 3035) and web mercator (EPSG 3857). For statistical maps, it is strongly advised to use an equal-
	3857	
	4326	

		area projection such as 3035. Geographic coordinates WGS84 (EPSG 4326) are also provided.
NUTS level	0	The NUTS level to be displayed on the map, from national (NUTS_LEVEL=0) to local level (NUTS_LEVEL=3).
	1	
	2	
	3	

Preparation of shapefiles for mapping

Territories behind the oceans (Guyane, Guadeloupe, Martinique, La Réunion and Mayotte) were removed.

Eurostat crop statistics for Germany are reported in NUTS1 regions only. To join the Eurostat data to shapefile and represent values on the map at the most detailed spatial level possible, the NUTS2 regions were substituted by NUTS1 regions for Germany.

For data provided only on national l. NUTS0 level, the shapefiles were prepared by removing territories behind the oceans.

III. RESULTS

The results of the data collection are available in the links provided in the introduction of this report and again below:

- database of the amounts and nutrient contents of the chosen NRSS
  https://px.luke.fi/PXWeb/pxweb/en/maatalous/

- maps describing the spatial distribution of N and P in the NRSS
  https://projects.luke.fi/biomassa-atlas/en/biomasses-in-eu/

Additional data may be added to the results during the D1.1 updating period (by M42). These may include especially more detailed data on agricultural plant biomasses (as described in section II) and additional maps.

IV. DISCUSSION AND CONCLUSIONS

The results of the data collection based on Eurostat data will be discussed more thoroughly by the D1.1 update deadline (M42). This will include an analysis of the strengths and weaknesses of the database in relation to the data needed in mapping NRSS on EU level or as a basis for national data collection.

Also, comparisons will be made between the Eurostat-based dataset and data collected from national sources in three EU member states (FI, DE, AU). This will be done to see potential differences between the datasets with the hypothesis that the quality of the data produced using Eurostat and rough nutrient coefficients lacking any variability between the countries and of the data derived from national data sources differ from each other with the latter hypothetically being more precise.

The aim is also to describe potential gaps and inconsistencies in data no matter the source and give recommendations to what kind of data should be collected when working towards using it to support nutrient recycling and taking up new measures.

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