Database of indicators for sustainable EU agricultural systems

Murray Scown, Lund University Centre for Sustainability Studies

January 30th, 2019

Contents

Background

Agricultural systems will play an important role in achieving the UN's Sustainable Development Goals (SDGs). Researchers, policymakers, and practitioners can contribute to guiding agricultural systems towards the SDGs by understanding, evaluating, and balancing trade-offs between the many interacting environmental and social components of these systems.

This spatial database contains environmental and social variables related to agriculture and the SDGs throughout the EU (and some additional states), summarised using the Nomenclature of territorial units for statistics (https://ec.europa.eu/eurostat/web/nuts/background). Variables were chosen based on a review of rural land system research articles, published as open access by Winkler et al. in the journal Land Use Policy (https://doi.org/10.1016/j.landusepol.2018.06.034), and a review of EU agricultural and sustainable development policies, the UN SDGs, and sustainability assessment tools for agriculture, published as open access by Scown et al. in the journal Proceedings of the National Academy of Sciences (in press as of 30/01/2018).

This document provides the metadata for the database, including data sources, processing, gap filling, spatial resolution, field names, and variable descriptions.

Authors

The researchers primarily involved in the background research, development, data processing, and publication of this database were:

Dr. Murray Scown, Lund University Centre for Sustainability Studies and Utrecht University Department of Physical Geography

Dr. Kimberly Nicholas, Lund University Centre for Sustainability Studies

Dr. Klara Winkler, McGill University Department of Natural Resource Sciences

Dr. Jan Blanke, Lund University Department of Physical Geography and Ecosystem Science

Funding

The development of this database was supported by Swedish Research Council Grant #2014-5899/E0589901.

Data Processing

Data sources and processing

All data were obtained directly from Eurostat wherever available. Additional variables were obtained from published CAP indicator tables, EDGAR emissions database, ESDAC soils database, EarthStat, or other sources. Where other sources were used, additional processing documentation was created, otherwise all processing is documented within the R code. GIS data were processed manually in ArcGIS and additional documentation is provided. Raw processing files can be obtained directly from the authors.

Time frame

We aimed for data between 2010 and 2017, but did allow the algorithm to select older data to fill gaps if necessary (see gap filling).

Spatial resolution

We aimed for all data at the NUTS2 level (https://ec.europa.eu/eurostat/web/nuts/background). This was possible for most variables, but in some cases we took national data. When national data was used, values were either directly transferred to NUTS2s within a country (if the variable is a proportion, percentage, or ratio) or were allocated from the national total based on agricultural area within each NUTS2 (if the variable is absolute).

The Data_resolution_used column describes how many NUTS2 and NUTS1 units were used with their own data. The list of NUTS0 codes describes any country where the national data was used to fill gaps, countries appear here even if data only used to fill a gap in one NUTS2 or NUTS1, it does not

imply that country has no NUTS2 or NUTS1 data. See data level lists in R for details on which NUTS2 had or didn't have data.

Gap filling

The first method for gap filling was to take the mean of multiple years, because some variables in some NUTS2 contained data for certain years but not others. If there are no years after 2010, we take the last years available in the data to perform the mean. If possible, the mean will be calculated from 5 years, but if there are less like 3 or 2, the mean will be calculated from them. If there is only one year, we take the data of that one year. If I remember correctly, in most cases there was data after 2010, but not always for 5 years. Then, we used older years to fill up and get a mean.

UAA

Utilised agricultural area (UAA) was used to calculate rates for certain variables (e.g., pesticide sales per UAA). When these calculations were done at the NUTS0 level, Eurostat UAA table ef_lus_main averaged over 2013 and 2016 was used. When done at the NUTS2 level, CORINE agricultural area from 2012 was used (due to missing NUTS2 data in Eurostat UAA). For organic farming calculations, UAA from table ef_mporganic averaged over 2003-2013 was used, which also differs from the other two UAA sources. Correlation between the UAA calculations was very high (Spearman's rho = 1) and only one source was used for calculations within a single variable.

Forthcoming Updates

EU agricultural subsidies data from https://farmsubsidy.org/ will be processed and added in a forthcoming update of the database.

Shapefile Information

The shapefile exported from R contains truncated field names and does not support NAs. Thus, NA value is set to -99999 in the shapefile. Field names are also truncated (see Truncated Field Names below). NUTS names not using Latin alphabet may not be correct, NUTS codes should be used instead.

Field Descriptions

Field_name	Description	Units	Data_resolution_used	Use	NUTS2	Source
risk_pov	Share of population at risk of poverty or social exclusion in thinly populated areas (rural areas)	Percent	NUTS2 – 144; NUTS1 – 22; NUTS0 – CY DE EE HR FR LT LU LV MK MT IS PT TR UK SI; NO NUTS0 DATA – ME LI	YES	2013	Eurostat
org_farm	Percent of utilised agricultural area under or being converted to organic farming	Percent	NUTS2 – 222; NUTS1 – none; NUTS0 – DE EL ES FR UK SI; NO NUTS0 DATA – CH LI ME MK IS TR	YES	2013	Eurostat
train35bas	Proportion of farm managers under 35 years of age with basic training	Proportion	NUTS2 – 231; NUTS1 – 15; NUTS0 – none; NO NUTS0 DATA – BE DE EL ES FR LI TR UK SI	YES	2013	Eurostat
train35ful	Proportion of farm managers under 35 years of age with full agricultural training	Proportion	NUTS2 – 231; NUTS1 – 15; NUTS0 – none; NO NUTS0 DATA – BE DE EL ES FR LI TR UK SI	YES	2013	Eurostat
train_bas	Proportion of farm managers with basic training	Proportion	NUTS2 – 232; NUTS1 – 16; NUTS0 – none; NO NUTS0 DATA – EL ES FR LI TR UK SI	YES	2013	Eurostat
train_ful	Proportion of farm managers with full agricultural training	Proportion	NUTS2 – 232; NUTS1 – 16; NUTS0 – none; NO NUTS0 DATA – EL ES FR LI TR UK SI	YES	2013	Eurostat
nitr_high	Percentage of groundwater sites with high quality in terms of nitrates	Percentage	NUTS0 – 28; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	NA	CAP Indicators
nitr_mod	Percentage of groundwater sites with moderate quality in terms of nitrates	Percentage	NUTS0 – 28; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	NA	CAP Indicators
nitr_poor	Percentage of groundwater sites with poor quality in terms of nitrates	Percentage	NUTS0 – 28; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	NA	CAP Indicators
irrigated	Percent of UAA that is irrigated land	Percent	NUTS2 – 232; NUTS1 – 15; NUTS0 – DE EL ES FR UK SI; NO NUTS0 DATA – LI IS TR	YES	2013	Eurostat
energy_rt	Rate of energy use in agriculture calculated from energy use in agriculture and forestry table, weighted by national UAA from Eurostat in 2013 and forest area from Eurostat averaged over latest 5 years of data.	toe/ha	NUTS0, NO NUTS0 DATA – DE	YES	NA	Own calc. from Eurostat
renew_pct	Percent of total energy consumption in agriculture from renewable energy	Percent	NUTS0; NO NUTS0 DATA – DE	YES	NA	Own calc. from Eurostat
renew_prod	Percent of total production of renewable energy from agriculture	Percent	NUTS0	YES	NA	CAP Indicators

gross_N	Gross N balance per ha of UAA	kg/ha	NUTS0	YES	NA	Eurostat
gross_P	Gross P balance per ha of UAA	kg/ha	NUTS0	YES	NA	Eurostat
forest	Share of forest area in NUTS – calculated from CORINE land cover	Proportion	NUTS2 – 320	YES	2013	CORINE
artific	Share of artificial surface area in NUTS – calculated from CORINE land cover	Proportion	NUTS2 – 320	YES	2013	CORINE
soil_loss	Estimated rate of soil loss by water erosion	Tonnes per hectare	NUTS2 – 265; NUTS1 – ES6 UKI; NUTS0 – ES FR PT; NO NUTS0 DATA – CH LI ME MK IS TR	YES	2013	Eurostat
com_birds	Common bird index	Index	NUTS0 – CZ CH BE DE DK EE FI FR NL SE UK; NO NUTS0 DATA – AT BG CY EL ES HR HU IE LI LT LU LV ME MK MT IS IT PT RO NO PL SK TR SI	YES	NA	Eurostat
farm_birds	Farmland bird index	Index	NUTS0 – AT CZ CH BE DE DK EE HU FI FR IE LT LV NL IT NO PL SE UK; NO NUTS0 DATA – BG CY EL ES HR LI LU ME MK MT IS PT RO SK TR SI	YES	NA	Eurostat
conv_till	Share of arable area under conventional tillage practices	Proportion	NUTS2 – 229; NUTS1 – 16; NUTS0 – none; NO NUTS0 DATA – BE EL ES FR LI MK PL TR UK SI	YES	2013	Eurostat
cons_till	Share of arable area under conservation tillage practices	Proportion	NUTS2 – 229; NUTS1 – 16; NUTS0 – none; NO NUTS0 DATA – BE EL ES FR LI MK PL TR UK SI	YES	2013	Eurostat
zero_till	Share of arable area under zero tillage practices	Proportion	NUTS2 – 229; NUTS1 – 16; NUTS0 – none; NO NUTS0 DATA – BE EL ES FR LI MK PL TR UK SI	YES	2013	Eurostat
nfert	N fertiliser application rates, averaged for each NUTS2 from half degree gridded data provided by Lu and Tian (2017) doi:10.5194/essd-9-181-2017	g N / m2 cropland / y	NUTS2	YES	2013	Lu and Tian (2017)
soil_prod	Average soil productivity of croplands (expressed in relative terms with indices without measurement units)	Index	NUTS2 – 269; NUTS1 – none; NUTS0 – none; NO NUTS0 DATA – EL ES FR MT IS PT NO PL TR UK	YES	2013	CAP Indicators
arable	Share of UAA that is arable land	Proportion	NUTS2 – 217; NUTS1 – 18; NUTS0 – EL FR; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
grassland	Share of UAA that is permanent grassland or meadow	Proportion	NUTS2 – 217; NUTS1 – 18; NUTS0 – EL FR; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
permanent	Share of UAA that is permanent cropland	Proportion	NUTS2 – 217; NUTS1 – 18; NUTS0 – EL FR; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
wheat_f	Fraction of UAA of wheat and spelt	Fraction	NUTS2 – 270; NUTS1 – 24; NUTS0 – BE; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from

			Spurious data: Brussels region (BE1 and BE10) have wheat fraction > 1 and total fraction >> 1, so all crop fractions given NA in this region.			Eurostat and CORINE
rye_f	Fraction of UAA of rye and winter cereal mixtures	Fraction	NUTS2 – 229; NUTS1 – 34; NUTS0 – BE LU ME MK; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
barley_f	Fraction of UAA of barley	Fraction	NUTS2 – 232; NUTS1 – 31; NUTS0 – BE IS LU ME MK; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
oats_f	Fraction of UAA of oats and spring cereal mixtures	Fraction	NUTS2 – 261; NUTS1 – 25; NUTS0 – BE LU; NO NUTS0 DATA – AL LI RS Spurious data: ITC and ITF had spurious values for 2014 which have been corrected in initial crop area processing.	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
maize_f	Fraction of UAA of grain maize and corn-cob-mix	Fraction	NUTS2 – 268; NUTS1 – 22; NUTS0 – BE LU ME MK; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
tritic_f	Fraction of UAA of triticale	Fraction	NUTS2 – 190; NUTS1 – 38; NUTS0 – BE IT LU MK RO; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
sorghum_f	Fraction of UAA of sorghum	Fraction	NUTS2 – 262; NUTS1 – EE0 IE0 IS0 LU0 LV0 ME0 MK0 UKI; NUTS0 – BE DE RO; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
oth_cer_f	Fraction of UAA of Other cereals n.e.c. (buckwheat, millet, canary seed, etc.)	Fraction	NUTS2 – 141; NUTS1 – 14; NUTS0 – BE BG EL IT LU MK PL PT RO TR; NO NUTS0 DATA – AL DE LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
rice_f	Fraction of UAA of rice	Fraction	NUTS2 – 293; NUTS1 – 13; NUTS0 – BE MK RO; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from

						Eurostat and CORINE
pasture_f	Fraction of UAA of Temporary grasses and grazings	Fraction	NUTS2 – 181; NUTS1 – 21; NUTS0 – BE BG IS IT LU ME MK RO UK; NO NUTS0 DATA – AL LI NO RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
rape_f	Fraction of UAA of Rape and turnip rape seeds	Fraction	NUTS2 – 213; NUTS1 – 43; NUTS0 – BE LU MK; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
sunflow_f	Fraction of UAA of Sunflower seed	Fraction	NUTS2 – 268; NUTS1 – 25; NUTS0 – BE MK; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
pulses_f	Fraction of UAA of Dry pulses and protein crops for the production of grain (including seed and mixtures of cereals and pulses)	Fraction	NUTS2 – 225; NUTS1 – 33; NUTS0 – BE LU MK NO; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
potato_f	Fraction of UAA of Potatoes (including seed potatoes)	Fraction	NUTS2 – 206; NUTS1 – 35; NUTS0 – BE IS LU ME MK NO RO; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
sugbeet_f	Fraction of UAA of Sugar beet (excluding seed)	Fraction	NUTS2 – 229; NUTS1 – 38; NUTS0 – BE; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
oth_rt_f	Fraction of UAA of Other root crops n.e.c.	Fraction	NUTS2 – 144; NUTS1 – 26; NUTS0 – BE CH IT LU PL PT RO UK; NO NUTS0 DATA – AL LI MK NO RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
oth_oil_f	Fraction of UAA of Other root crops n.e.c. Soya Linseed (oilflax) Cotton seed Other oilseed crops n.e.c.	Fraction	NUTS2 – 308; NUTS1 – EE0 IE0 IS0 LU0 LV0 ME0 MK0 UKI; NUTS0 – BE; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE

fibre_f	Fraction of UAA of Fibre crops	Fraction	NUTS2 – 308; NUTS1 – EE0 IE0 IS0 LU0 LV0 ME0 MK0 UKI; NUTS0 – BE; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
oth_ind_f	Fraction of UAA of Tobacco Hops Aromatic, medicinal and culinary plants Energy crops n.e.c. Other industrial crops n.e.c.	Fraction	NUTS2 – 261; NUTS1 – 24; NUTS0 – BE IT; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
fodder_f	Fraction of UAA of Leguminous plants harvested green Green maize Other cereals harvested green (excluding green maize) Other plants harvested green from arable land n.e.c.	Fraction	NUTS2 – 253; NUTS1 – 26; NUTS0 – BE RO; NO NUTS0 DATA – AL LI RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
citrus_f	Fraction of UAA of citrus fruits	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
brassic_f	Fraction of UAA of Brassicas	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
greens_f	Fraction of UAA of Leafy and stalked vegetables (excluding brassicas)	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
vfruits_f	Fraction of UAA of Vegetables cultivated for fruit (including melons)	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
rootveg_f	Fraction of UAA of Root, tuber and bulb vegetables	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE

peas_f	Fraction of UAA of Fresh pulses	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
oth_veg_f	Fraction of UAA of Other fresh vegetables n.e.c.	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
grapes_f	Fraction of UAA of grapes	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
nuts_f	Fraction of UAA of Nuts	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
olives_f	Fraction of UAA of olives	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
berries_f	Fraction of UAA of berries	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
frtrees_f	Fraction of UAA of fruit trees	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
tropfr_f	Fraction of UAA of tropical fruits	Fraction	NUTS2	YES	2013	Own calc. from EarthStat and CORINE
wheat_y	Yield of wheat and spelt	Tonnes / ha	NUTS2 – 228; NUTS1 – 29; NUTS0 – AL BE DE IS LU ME MK PT; NO NUTS0 DATA – LI MT	YES	2016 conv. to 2013	Own calc. from Eurostat

rye_y	Yield of rye and winter cereal mixtures	Tonnes / ha	NUTS2 – 201; NUTS1 – 37; NUTS0 – AL BE DE EL LU ME MK PT TR UK; NO NUTS0 DATA – CY IS LI MT Spurious data: Gave ITC2 the value of ITC. ITF3 given value of ITF. SE11 given value of SE1. SE31 and SE32 given value of SE3. All NUTS2 within UKI (London region) given NA.	YES	2016 conv. to 2013	Own calc. from Eurostat
barley_y	Yield of barley	Tonnes / ha	NUTS2 – 227; NUTS1 – 30; NUTS0 – AL BE DE IS LU ME MK PT; NO NUTS0 DATA – LI MT Spurious data: Gave ITC2 the value of ITC. All NUTS2 within UKI (London region) given NA.	YES	2016 conv. to 2013	Own calc. from Eurostat
oats_y	Yield of oats and spring cereal mixtures	Tonnes / ha	NUTS2 – 203; NUTS1 – 34; NUTS0 – AL BE DE IS LU ME MK PT RO TR UK; NO NUTS0 DATA – LI MT Spurious data: All NUTS2 within UKI (London region) given NA.	YES	2016 conv. to 2013	Own calc. from Eurostat
maize_y	Yield of grain maize and corn-cob-mix	Tonnes / ha	NUTS2 – 212; NUTS1 – 15; NUTS0 – AL BE DE LU ME MK TR UK; NO NUTS0 DATA – CY EE FI IE IS LI LV MT NO	YES	2016 conv. to 2013	Own calc. from Eurostat
tritic_y	Yield of triticale	Tonnes / ha	NUTS2 – 160; NUTS1 – 32; NUTS0 – BE CY DE EL IT LU ME MK PT RO TR UK; NO NUTS0 DATA – AL FI IE IS LI MT NO	YES	2016 conv. to 2013	Own calc. from Eurostat
sorghum_y	Yield of sorghum	Tonnes / ha	NUTS2 – 92; NUTS1 – 11; NUTS0 – EL ES RO TR; NO NUTS0 DATA – AL BE CY CZ DE DK EE FI IE IS LI LT LU LV ME MK MT NL NO PL PT RS SE UK Spurious data: EL4 and EL43 given average value of EL41 and EL42. ES22 given ES2 value. CH0 and CH01 given average value of CH01, CH03, and CH06.	YES	2016 conv. to 2013	Own calc. from Eurostat
oth_cer_y	Yield of Other cereals n.e.c. (buckwheat, millet, canary seed, etc.)	Tonnes / ha	NUTS2 – 43; NUTS1 – 13; NUTS0 – BE BG CH EL ES FI IT LU ME MK NL PL PT RO RS TR; NO	YES	2016 conv. to 2013	Own calc. from Eurostat

			NUTS0 DATA – AL CY DE DK IE IS LI MT NO SE UK			
rice_y	Yield of rice	Tonnes / ha	NUTS2 – 49; NUTS1 – 20; NUTS0 – EL ES FR HU MK PT RO TR; NO NUTS0 DATA – AL AT BE CY CZ DE DK EE FI HR IE IS LI LT LU LV ME MT NL NO PL RS SE SI SK UK	YES	2016 conv. to 2013	Own calc. from Eurostat
pasture_y	Yield of Temporary grasses and grazings	Tonnes / ha	NUTS2 – 123; NUTS1 – 18; NUTS0 – BE BG DE ES IS IT LU ME MK RO; NO NUTS0 DATA – AL CY IE LI LV MT NL NO PT TR UK	YES	2016 conv. to 2013	Own calc. from Eurostat
rape_y	Yield of Rape and turnip rape seeds	Tonnes / ha	NUTS2 – 176; NUTS1 – 39; NUTS0 – BE DE EL ES IS LU MK TR; NO NUTS0 DATA – AL CY LI ME MT PT Spurious data: ITG1 given ITG value	YES	2016 conv. to 2013	Own calc. from Eurostat
sunflow_y	Yield of Sunflower seed	Tonnes / ha	NUTS2 – 164; NUTS1 – 21; NUTS0 – AL DE EL ES IE MK PT TR; NO NUTS0 DATA – BE CY DK EE FI IS LI LT LU LV ME MT NO SE UK Spurious data: ITG given average of ITG1 and ITG2. ITF5 given average of ITF1, ITF2, ITF3, ITF4, and ITF6.	YES	2016 conv. to 2013	Own calc. from Eurostat
pulses_y	Yield of Dry pulses and protein crops for the production of grain (including seed and mixtures of cereals and pulses)	Tonnes / ha	NUTS2 – 205; NUTS1 – 28; NUTS0 – AL BE DE LU MK PT RO TR UK; NO NUTS0 DATA – IS LI ME MT NO Spurious data: Gave ITC3 value from ITC. ME given NA.	YES	2016 conv. to 2013	Own calc. from Eurostat
potato_y	Yield of Potatoes (including seed potatoes)	Tonnes / ha	NUTS2 – 205; NUTS1 – 19; NUTS0 – AL BE DE IS LU ME MK NO RO TR UK; NO NUTS0 DATA – LI Spurious data: SE11 given SE1 value.	YES	2016 conv. to 2013	Own calc. from Eurostat
sugbeet_y	Yield of Sugar beet (excluding seed)	Tonnes / ha	NUTS2 – 150; NUTS1 – 37; NUTS0 – AL BE BG DE EL ES FI IT PT SE UK; NO NUTS0 DATA – CY EE IE IS LI LU LV ME MK MT NO SI	YES	2016 conv. to 2013	Own calc. from Eurostat

			Spurious data: SE1, SE11, and SE12 given SE value.			
oth_rt_y	Yield of Other root crops n.e.c.	Tonnes / ha	NUTS2 – 49; NUTS1 – 14; NUTS0 – BE BG CH ES IS IT LU NL PL RO RS TR UK; NO NUTS0 DATA – AL CY DE EL FI IE LI ME MK MT NO PT SE	YES	2016 conv. to 2013	Own calc. from Eurostat
oth_oil_y	Yield of Other oilseed crops n.e.c. Soya Linseed (oilflax) Cotton seed Other oilseed crops n.e.c.	Tonnes / ha	NUTS2 – 153; NUTS1 – 30; NUTS0 – AL BE DE DK EL ES FI IE IT LU MK NL NO TR UK; NO NUTS0 DATA – IS LI ME MT PT Spurious data: BE given average value of BE2 and BE3. CY0 and CY00 given CY value. ES62 given ES6 value. ITF4 given ITF value.	YES	2016 conv. to 2013	Own calc. from Eurostat
fibre_y	Yield of Fibre crops	Tonnes / ha	NUTS2 – 71; NUTS1 – 19; NUTS0 – BE EE ES FI HU IE IT LU PL RO TR; NO NUTS0 DATA – AL CH CY DE DK IS LI ME MK MT NO PT RS SE SI UK Spurious data: CH removed.	YES	2016 conv. to 2013	Own calc. from Eurostat
oth_ind_y	Yield of Tobacco Hops Aromatic, medicinal and culinary plants Energy crops n.e.c. Other industrial crops n.e.c.	Tonnes / ha	NUTS2 – 143; NUTS1 – 23; NUTS0 – AL BE DE ES FI IT LU ME MK PT SE TR UK; NO NUTS0 DATA – CY DK IS LI MT NO Spurious data: EL62 given EL6 value.	YES	2016 conv. to 2013	Own calc. from Eurostat
fodder_y	Yield of Leguminous plants harvested green Green maize Other cereals harvested green (excluding green maize) Other plants harvested green from arable land n.e.c.	Tonnes / ha	NUTS2 – 196; NUTS1 – 19; NUTS0 – AL BE CY DE IT LU ME MK MT RO UK; NO NUTS0 DATA – IS LI NO	YES	2016 conv. to 2013	Own calc. from Eurostat
citrus_y	Yield of citrus fruits	Tonnes / ha	NUTS2	YES	2013	EarthStat
brassic_y	Yield of Brassicas	Tonnes / ha	NUTS2	YES	2013	EarthStat
greens_y	Yield of Leafy and stalked vegetables (excluding brassicas)	Tonnes / ha	NUTS2	YES	2013	EarthStat
vfruits_y	Yield of Vegetables cultivated for fruit (including melons)	Tonnes / ha	NUTS2	YES	2013	EarthStat
rootveg_y	Yield of Root, tuber and bulb vegetables	Tonnes / ha	NUTS2	YES	2013	EarthStat
peas_y	Yield of Fresh pulses	Tonnes / ha	NUTS2	YES	2013	EarthStat

oth_veg_y	Yield of Other fresh vegetables n.e.c.	Tonnes / ha	NUTS2	YES	2013	EarthStat
grapes_y	Yield of grapes	Tonnes / ha	NUTS2	YES	2013	EarthStat
nuts_y	Yield of Nuts	Tonnes / ha	NUTS2	YES	2013	EarthStat
olives_y	Yield of olives	Tonnes / ha	NUTS2	YES	2013	EarthStat
berries_y	Yield of berries	Tonnes / ha	NUTS2	YES	2013	EarthStat
frtrees_y	Yield of fruit trees	Tonnes / ha	NUTS2	YES	2013	EarthStat
tropfr_y	Yield of tropical fruits	Tonnes / ha	NUTS2	YES	2013	EarthStat
bovine	Livestock density of live bovine	Heads / hectare	NUTS2 – 214; NUTS1 – 21; NUTS0 – TR; NO NUTS0 DATA – AL LI NO RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
milk_cows	Livestock density of dairy cows	Heads / hectare	NUTS2 – 214; NUTS1 – 21; NUTS0 – TR; NO NUTS0 DATA – AL LI NO RS	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
pigs	Livestock density of live swine	Heads / hectare	NUTS2 – 207; NUTS1 – 28; NUTS0 – none; NO NUTS0 DATA – AL LI NO RS TR	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
sheep	Livestock density of live sheep	Heads / hectare	NUTS2 – 177; NUTS1 – 29; NUTS0 – TR; NO NUTS0 DATA – CH AL CZ DK FI LI NO RS Spurious data: AT13 given AT1 value.	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
goats	Livestock density of live goats	Heads / hectare	NUTS2 – 177; NUTS1 – 29; NUTS0 – TR; NO NUTS0 DATA – CH AL CZ DK FI LI NO RS Spurious data: AT11 and AT13 given AT1 value.	YES	2016 conv. to 2013	Own calc. from Eurostat and CORINE
gdp_cap	GDP in Euros per capita	Euros per capita	NUTS2 – 276; NUTS1 – none; NUTS0 – none; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
pps_cap	Purchasing Power Standard per capita	PPS per capita	NUTS2 – 276; NUTS1 – none; NUTS0 – none; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
rur_gdp	GDP in Euros per capita in rural areas	Euros per capita	NUTS2 – 156	YES	2013	CAP Indicators
rur_pps	Purchasing Power Standard per capita in rural areas	PPS per capita	NUTS2 – 156	YES	2013	CAP Indicators

int_gdp	GDP in Euros per capita in intermediate areas	Euros per capita	NUTS2 – 208	YES	2013	CAP Indicators
int_pps	Purchasing Power Standard per capita in intermediate areas	PPS per capita	NUTS2 – 208	YES	2013	CAP Indicators
urb_gdp	GDP in Euros per capita in urban areas	Euros per capita	NUTS2 – 136	YES	2013	CAP Indicators
urb_pps	Purchasing Power Standard per capita in urban areas	PPS per capita	NUTS2 – 136	YES	2013	CAP Indicators
emp_rate	Employed persons aged 15-64 years as percentage of total population	Percent	NUTS2 – 276; NUTS1 – none; NUTS0 – none; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
tot_unemp	Unemployed persons aged 15-74 years as a share of the total economically active population of the same age class	Percent	NUTS2 – 275; NUTS1 – none; NUTS0 – FI; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
yth_unemp	Unemployed persons aged 15-24 years as a share of the total economically active population of the same age class	Percent	NUTS2 – 267; NUTS1 – AT1 AT3 DE2 DEB FR8 ITC; NUTS0 – DE FI; NO NUTS0 DATA – CH LI ME MK IS NO TR	YES	2013	CAP Indicators
VARIABLE CALCULATIONS						
irrig_rate	Total freshwater abstraction from surface and groundwater for irrigation divided by total agricultural area (note: not divided by irrigated area, which is captured in previous indicator)	m3 / ha	NUTS2 – 195; NUTS1 – 20; NUTS0 – CH DE EL FR LU MK IS TR UK; NO NUTS0 DATA – BE IE LI ME NO	YES	2013	Own calc. from CAP Indicators and CORINE
afi_awu	Agricultural factor income divided by AWU (total labour force directly employed by the holding)	Euros / AWU	NUTS2 – 187; NUTS1 – 16 (DE); NUTS0 – CY CZ BE EL ES FI FR LT LU LV MT NO PL UK SI; NO NUTS0 DATA – LI ME MK TR	YES	2013	Own calc. from Eurostat
labour_use	Proportion of population aged 15 to 64 directly employed by the holding (AWU)	Proportion	NUTS2 – 217; NUTS1 – 16 (DE); NUTS0 – EL FR UK SI; NO NUTS0 DATA – CH LI IS ME MK NO TR	YES	2013	Own calc. from Eurostat and CAP Indicators
pest_rate	Pesticide sales per agricultural area	Kg of active ingredient / ha	NUTS0	YES	NA	Own calc. from Eurostat
gva_awu	Labour productivity in Gross Value Added (GVA) in basic prices per AWU (total labour force directly employed by the holding)	Euros / AWU	NUTS2 – 203; NUTS1 – 16 (DE); NUTS0 – CY CZ BE EL ES FI FR LT LU LV MT NO UK SI; NO NUTS0 DATA – LI ME MK TR	YES	2013	Own calc. from Eurostat

ADDITIONAL VARIABLES PROCESSED IN GIS						
emi_co2eq	Total emission rate of CO2, CH4, and N2O from all agricultural sources in 2010 in CO2 equivalents	t CO2-eq / ha / y	NUTS2	YES	2013	EDGAR
emi_nh3	Emission rate of NH3 from agriculture in 2010	t NH3 / ha / y	NUTS2	YES	2013	EDGAR
emi_pm10	Emission rate of PM10 from agriculture in 2010	t PM10 / ha / y	NUTS2	YES	2013	EDGAR
emi_pm25	Emission rate of PM2.5 from agriculture in 2010	t PM2.5 / ha / y	NUTS2	YES	2013	EDGAR
soc	Soil organic stock in the layer 0-30 cm at 2010	t C / ha	NUTS2; CH06 no data	YES	2013	ESDAC
bio_threat	"Index of potential risk to soil biodiversity based on assessments of the threat associated to 13 possible stressors: climate change, land - use change, habitat fragmentation, intensive human exploitation, soil organic matter decline, industrial pollution, nuclear pollution, soil compaction, soil erosion, soil sealing, soil salinisation, the use of GMOs in agriculture, and invasive species" – JRC	Index	NUTS2; CH06 no data	YES	2013	ESDAC
C_factor	Soil Cover Management factor (C-factor) index – higher values correspond to higher risk of soil erosion	Index	NUTS2; CH NO TR no data	YES	2013	ESDAC
precip	Spatially-averaged long term mean annual precipitation (1970-2000) for locations within each NUTS2 region	Mean mm / year	NUTS2	YES	2013	WorldClim
deg_days	Spatially-averaged number of growing degree days (GDD) at locations within each NUTS2 region	Mean GDD	NUTS2	YES	2013	UW-Madison Biosphere Atlas
nat2000_pr	Proportion of territory covered by Natura 2000 areas	Proportion	NUTS2	YES	2013	EEA + CORINE
nat2000_ag	Proportion of agricultural land covered by Natura 2000 areas	Proportion	NUTS2	YES	2013	EEA + CORINE

cal_frac	Fraction of calories delivered to food (from Cassidy et al.)	Proportion	NUTS2	YES	2013	EarthStat
crop_suit	FAO's index COMBINED SUITABILITY OF CURRENTLY AVAILABLE LAND FOR PASTURE AND RAINFED CROPS (HIGH INPUT LEVEL) (FGGD). High input chosen for mechanized, market-oriented European farming systems (see index documentation).	Index	NUTS2	YES	2013	FAO

Truncated Field Names

Original field names are shown on left and refer to those in description table above and R database. Truncated field names are shown on right and refer to those in shapefile.

ORIGINAL	TRUNCATED
afi_awu	afi_awu
arable	arable
artific	artific
barley_f	barly_f
barley_y	barly_y
berries_f	berrs_f
berries_y	berrs_y
bio_threat	bi_thrt
bovine	bovine
brassic_f	brssc_f
brassic_y	brssc_y
C_factor	C_factr
cal_frac	cal_frc
citrus_f	citrs_f
citrus_y	citrs_y
com_birds	cm_brds
cons_till	cns_tll
conv_till	cnv_tll
crop_suit	crop_st
deg_days	deg_dys
emi_co2eq	em_pm10
emi_nh3	em_pm25
emi_pm10	emi_c2q
emi_pm25	emi_nh3
emp_rate	emp_rat
energy_rt	enrgy_r
farm_birds	frm_brd
fibre_f	fibre_f
fibre_y	fibre_y
fodder_f	foddr_f
fodder_y	foddr_y
forest	forest
frtrees_f	frtrs_f
frtrees_y	frtrs_y
gdp_cap	gdp_cap
goats	goats
grapes_f	graps_f
grapes_y	graps_y
grassland	grsslnd
greens_f	grens_f
greens_y	grens_y
gross_N	gross_N

gross_P	gross_P
gva_awu	gva_awu
int_gdp	int_gdp
int_pps	int_pps
irrig_rate	irrg_rt
irrigated	irrigtd
labour_use	labor_s
maize_f	maize_f
maize_y	maize_y
milk_cows	mlk_cws
nat2000_ag	nt2000_g
nat2000_pr	nt2000_p
nfert	nfert
nitr_high	ntr_hgh
nitr_mod	nitr_md
nitr_poor	nitr_pr
nuts_f	nuts_f
nuts_y	nuts_y
oats_f	oats_f
oats_y	oats_y
olives_f	olivs_f
olives_y	olivs_y
org_farm	org_frm
oth_cer_f	oth_cr_f
oth_cer_y	oth_cr_y
oth_ind_f	oth_nd_f
oth_ind_y	oth_nd_y
oth_oil_f	oth_l_f
oth_oil_y	oth_l_y
oth_rt_f	oth_rt_f
oth_rt_y	oth_rt_y
oth_veg_f	oth_vg_f
oth_veg_y	oth_vg_y
pasture_f	pastr_f
pasture_y	pastr_y
peas_f	peas_f
peas_y	peas_y
permanent	permnnt
pest_rate	pest_rt
pigs	pigs
potato_f	potat_f
potato_y	potat_y
pps_cap	pps_cap
precip	precip
pulses_f	pulss_f
pulses_y	pulss_y
rape_f	rape_f
rape_y	rape_y

renew_pct	rnw_pct
renew_prod	rnw_prd
rice_f	rice_f
rice_y	rice_y
risk_pov	risk_pv
rootveg_f	rotvg_f
rootveg_y	rotvg_y
rur_gdp	rur_gdp
rur_pps	rur_pps
rye_f	rye_f
rye_y	rye_y
sheep	sheep
soc	soc
soil_loss	sol_lss
soil_prod	sol_prd
sorghum_f	srghm_f
sorghum_y	srghm_y
sugbeet_f	sugbt_f
sugbeet_y	sugbt_y
sunflow_f	snflw_f
sunflow_y	snflw_y
tot_unemp	tot_nmp
train_bas	tran_bs
train_ful	tran_fl
train35bas	trn35bs
train35ful	trn35fl
tritic_f	tritc_f
tritic_y	tritc_y
tropfr_f	trpfr_f
tropfr_y	trpfr_y
urb_gdp	urb_gdp
urb_pps	urb_pps
vfruits_f	vfrts_f
vfruits_y	vfrts_y
wheat_f	wheat_f
wheat_y	wheat_y
yth_unemp	yth_nmp
zero_till	zer_tll

Eurostat SDG Variable Sources

Goal 1. End poverty in all its forms everywhere

1. **Unemployed persons aged 15-24 years (youth unemployment rate) and 15-74 years (total unemployment rate) as a share of the total economically active population**
   Eurostat code: lfst_r_lfu3rt
   Years: 2010-2017
   Ages: 15-24, 15-74
   Sex: T (combined)
   Unit: PC (percentage)
2. **Share of population at risk of poverty or social exclusion in thinly populated areas (rural areas)**
   Eurostat code: ilc_peps11
   Years: 2010-2017
   Unit: PC
3. **Severely materially deprived people**
   Eurostat code: tgs00104
   Years: 2010-2017
4. **People living in households with very low work intensity**
   Eurostat code: tgs00108
   Years: 2010-2017

Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture

1. **Agricultural factor income per AWU**
   Eurostat code: agr_r_accts
   Years: 2010-2017
   Agricultural indicator: PROD_BP
   List of products: 26000 (“Factor Income”)
   Unit: MIO_EUR (others: MIO_NAC)
2. **Percent of UAA under or being converted to organic farming**
   Eurostat code: ef_mporganic
   Years: 2003, 2005, 2007, 2010, 2013
   Agricultural area: Total
   Eurofarm indicators: A_3_2_3_HA (“ha:Organic farming (incl. in conversion)
   Further processing: Data divided by indicator "AGRAREA_HA" to get percentage
3. **Government support to agricultural research and development**
   Eurostat code: sdg_02_30
   Years: 2010-2017
   Unit: MIO_EUR

Goal 4. Quality education

Data received directly from Eurostat on 08/06/2018

CAP indicator definition:

"The indicator provides information on **the share of farm managers who have attained basic and full education levels in agriculture. The indicator also shows the share of young farm managers (below 35 years) in total with the different levels (basic and full) of agricultural training acquired by them.**"

Our calculations:

Proportion of total farm managers with basic training

Proportion of total farm managers with full training

Proportion of farm managers below 35 years with basic training

Proportion of farm managers below 35 years with full training

Variables:

EB_TRAINING#1 = 'Total' & EB_AGEMANAGER#1 = 'Total' & EB_SEXMANAGER#1 = 'Total'

EB_TRAINING#1 = '[0001] Basic' & EB_AGEMANAGER#1 = 'Total' & EB_SEXMANAGER#1 = 'Total'

EB_TRAINING#1 = '[0003] Full' & EB_AGEMANAGER#1 = 'Total' & EB_SEXMANAGER#1 = 'Total'

EB_TRAINING#1 = 'Total' & EB_AGEMANAGER#1 = '[0001] Y_LT35' & EB_SEXMANAGER#1 = 'Total'

EB_TRAINING#1 = '[0001] Basic' & EB_AGEMANAGER#1 = '[0001] Y_LT35' & EB_SEXMANAGER#1 = 'Total'

EB_TRAINING#1 = '[0003] Full' & EB_AGEMANAGER#1 = '[0001] Y_LT35' & EB_SEXMANAGER#1 = 'Total'

Goal 6. Ensure availability and sustainable management of water and sanitation for all

1. **Percent of UAA that is irrigated land**
   Eurostat code: aei_ef_ir
   Years: 2005, 2007, 2010, 2013
   Crops: UAAIT (Irrigated utilised agricultural land, others: Irrigable …)
   Unit: PC_UAA
2. **Volume of water applied to soils for irrigation purposes (per capita)**
   Eurostat code: env_wat_abs
   Years: 2005, 2007, 2010, 2013
   Water process: ABS_AGR_IR (Water abstraction for agriculture - irrigation)
   Water source: FRW (fresh surface and ground water)
   Unit: M3_HAB(Cubic metres per inhabitant) (others: MIO_M3)
3. **Volume of water applied to soils for irrigation purposes (rate)**

   Eurostat code: env_wat_abs
   Years: 2005, 2007, 2010, 2013
   Water process: ABS_AGR_IR (Water abstraction for agriculture - irrigation)
   Water source: FRW (fresh surface and ground water)
   Unit: MIO_M3 (Million cubic metres) (others: M3_HAB)

Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all

1. **Energy use in ktoe in agriculture**

Eurostat code: nrg_100a
Years: 2010-2017
Unit: KTOE (kilo tonnes oil equivalent)
Product: 0000 (all products)
Processing: Since country data, weighted with UAA data (ef_lus_main) and forest data (lan_lcv_fao)
Comments: Since I did not find data on how much energy forestry consumes relative to agriculture, I assume here 1:1

2. **Percent of total production of renewable energy from agriculture**

Eurostat code: nrg_100a
Years: 2010-2017
Unit: KTOE (kilo tonnes oil equivalent)
Product: 5500 (renewable energy)
Processing: Since country data, weighted with UAA data (ef_lus_main) and forest data (lan_lcv_fao)
Comments: Divided by “energy use inagriculture (previous dataset) to get percentage

Goal 12. Ensure sustainable consumption and production patterns

1. **Sales of pesticide by type of pesticide**

Eurostat code: tai02
Years: 2010-2017
Unit: Kg of active ingredient
Pesticide: calculated sum of all pesticides reported
Processing: Since country data, weighted with UAA data (ef_lus_main)
Comments: Since Greece is missing in UAA dataset, it is now also missing in resulting weighted map

Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

1. **Common bird index**
   Eurostat code: sdg_15_60
   Years: 2010-2017
   Comspec: CO_FARM (Farmland birds)
   Unit: I90
2. **Farmland birds index**
   Eurostat code: env_bio_2
   Years: 2010-2017
   Unit: I100 (??)
3. **Estimated rate of soil loss by water erosion**
   Eurostat code: aei_pr_soiler
   Years: 2000, 2012
   Unit: T_HA (tonnes per hectare)
4. **Conservation status of agricultural habitats (grasslands)**
   CAP: C.36
   Years: 2007-2012
   Unit: % of assessments of habitats