Agro-environmental indicators. New IACS VISION in ACTION – NIVA

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AGRO-ENVIRONMENTAL INDICATORS
NEW IACS VISION in ACTION – NIVA

NIVA
NEW IACS VISION IN ACTION

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NIVA H2020 PROJECT
www.niva4cap.eu

European Commission

Context and objectives

➤ Agricultural activities have a strong impact on the environment

➤ UC1b has developed a set of indicators based on existing scientific methods and on data widely available in Europe (IACS, Sentinel-2 images, topographic data)

➤ Computation tools are open-source and available on the NIVA GitLab : **gitlab.com/nivaeu**

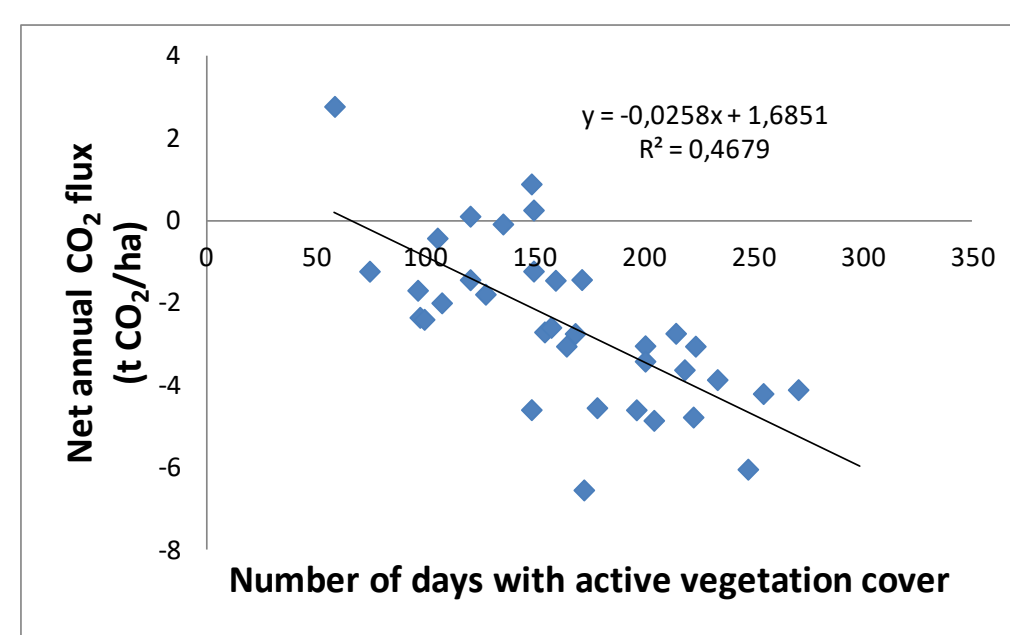➤ These indicators may contribute to assess some of the new CAP objectives and some Sustainable Development Goals
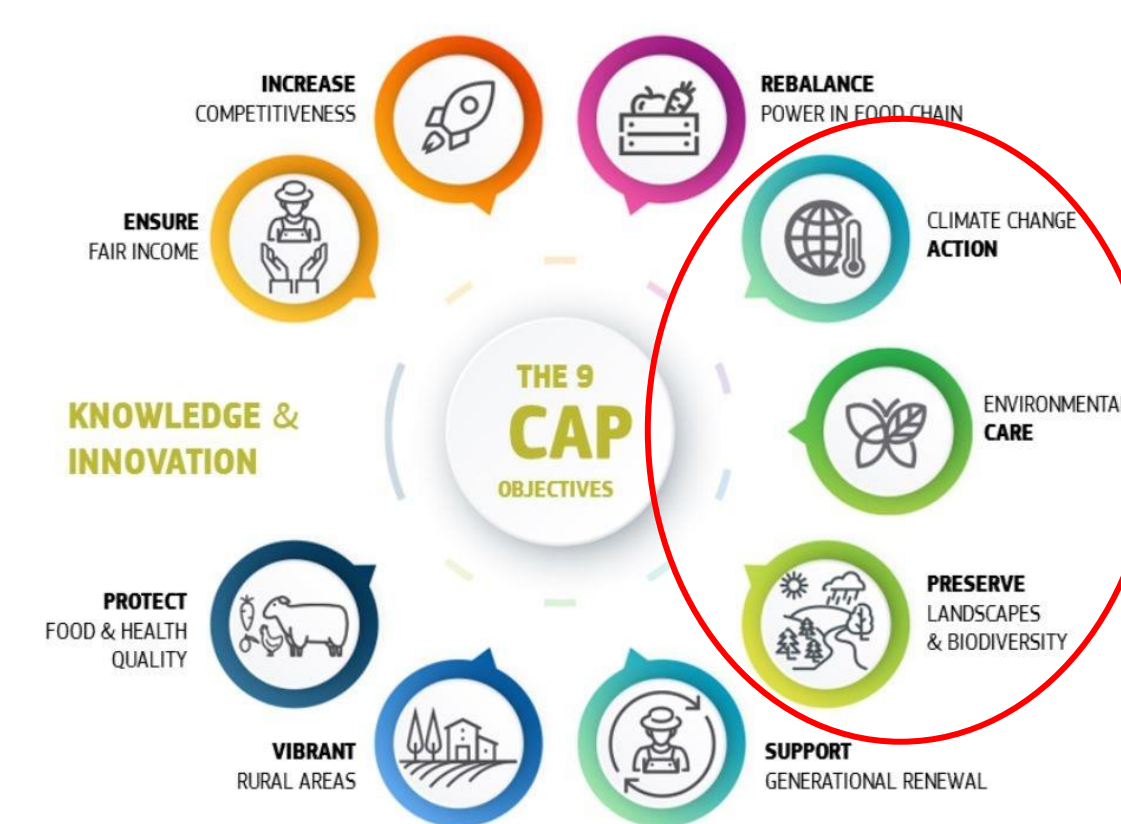
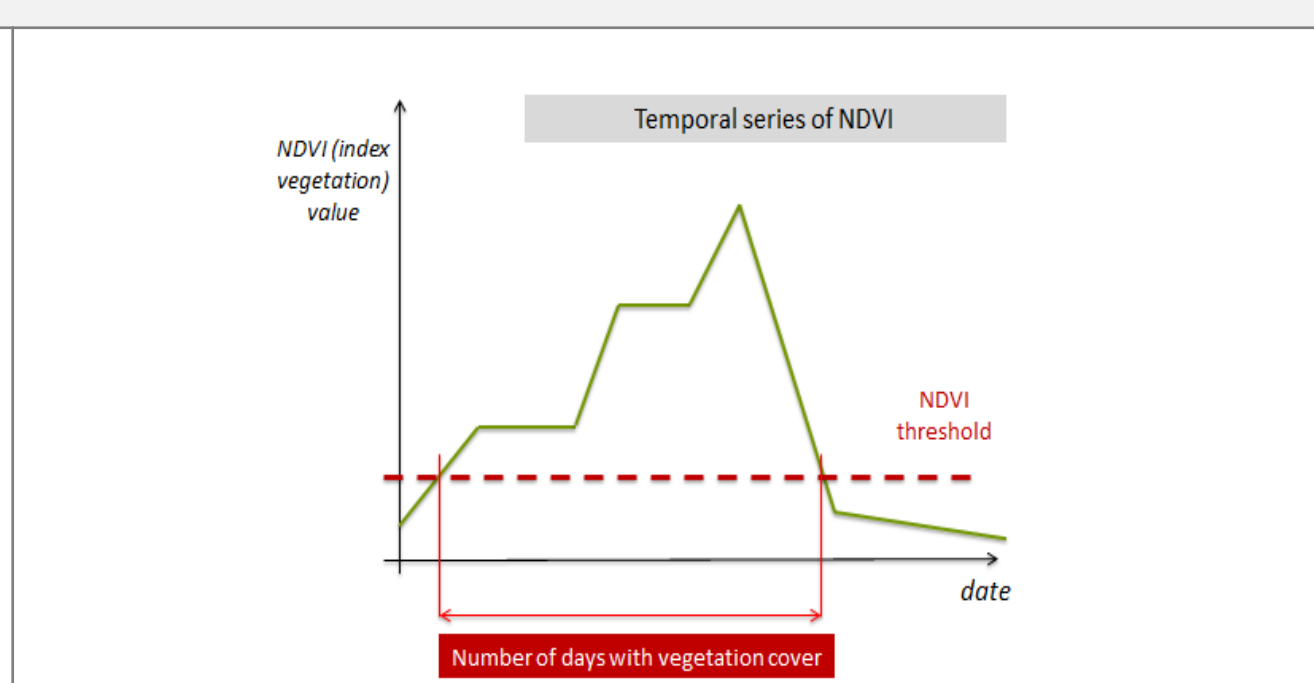## Carbon indicator: annual CO_2 flux due to crop vegetation cycle

➤ CO_2 flux takes into the account the CO_2 emitted in the atmosphere (plants and soil respiration) and the CO_2 stored by plants due to photosynthesis.

➤ The computation of CO_2 flux is based on an empirical method: for main crops, annual CO2 flux depends on the number of days with active vegetation. This number of days is estimated from NDVI temporal series (from Sentinel-2 images).

«codeList»
EmpiricalCarbonCropTypeValue
+ winterBarley
+ spingBarley
+ maize
+ sorgho
+ pea
+ rapeseed
+ sunflower
+ potatoe
+ beet
+ springSoftWheat
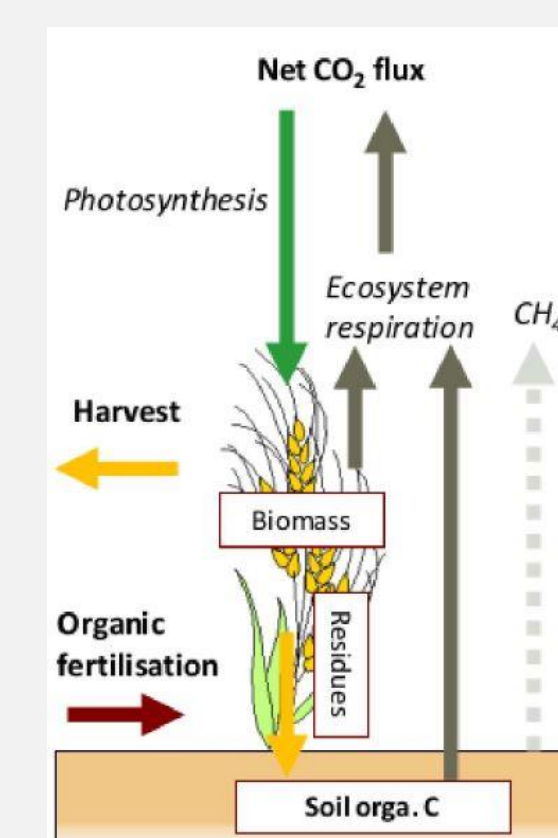+ winterSoftWheat
+ springHardWheat
+ winterHardWheat

$y = -0,0258x + 1,6851$
$R^2 = 0,4679$

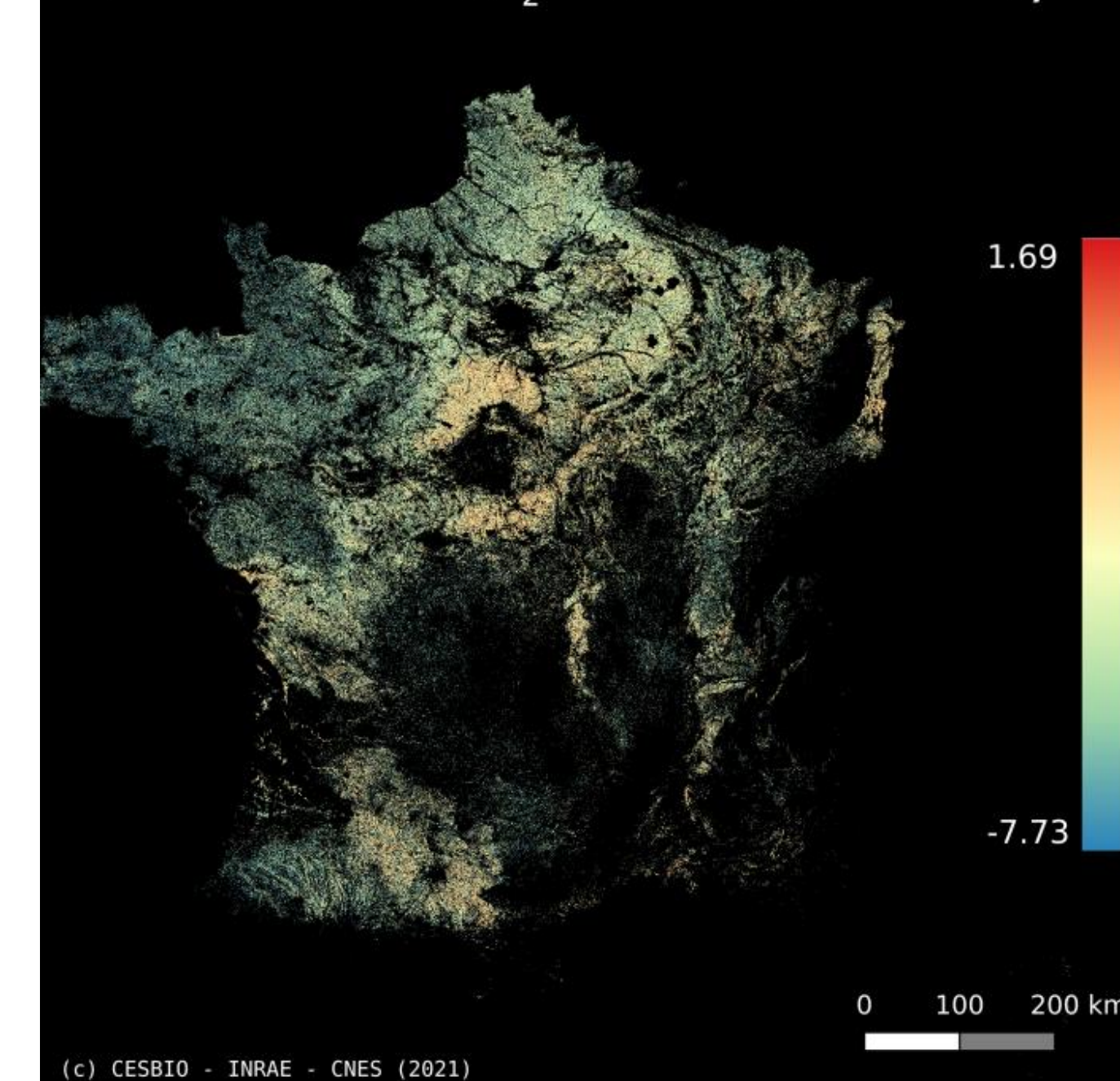List of crops concerned by the empirical method | Relationship between CO_2 flux and the nb of days with active vegetation | The NDVI threshold corresponding to bare soil enables to derive the nb of days with active vegetation
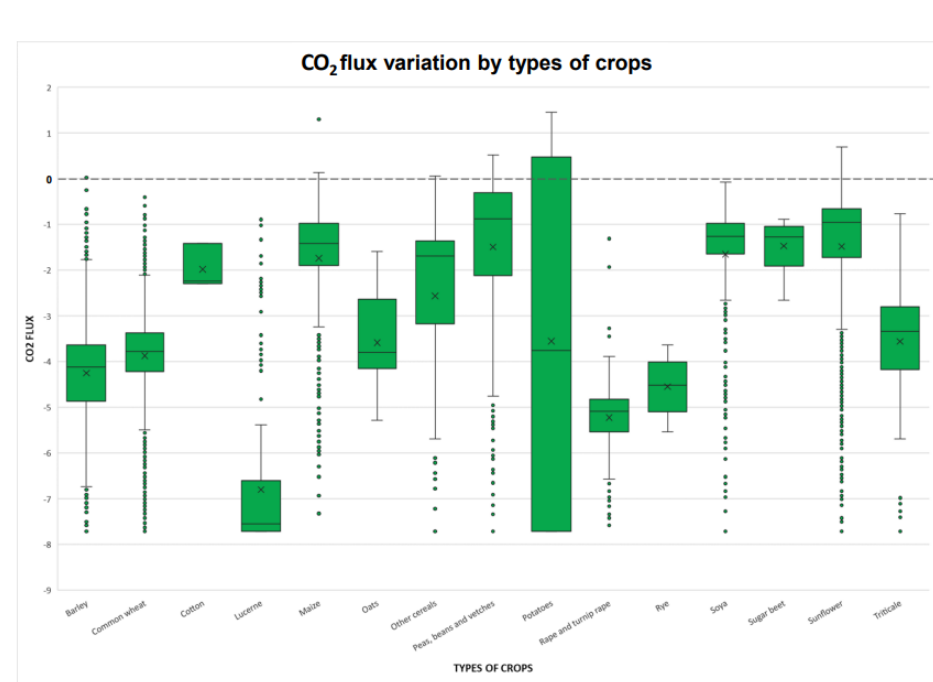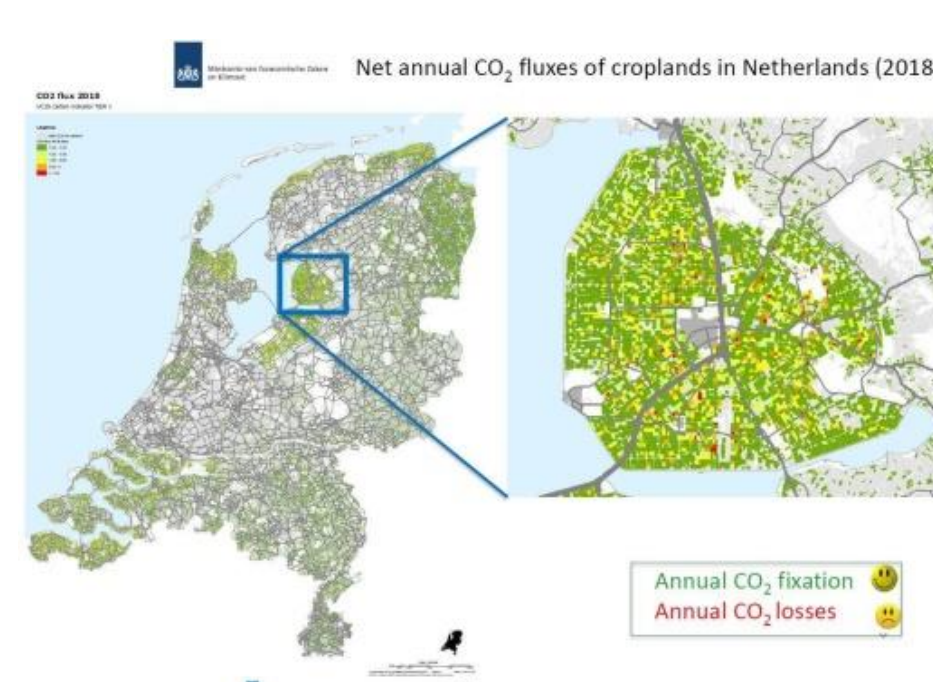
➤ The computation tool has been tested on various areas in Europe (France, Denmark, Netherlands, Spain)

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2019 Annual CO_2 Net Flux in t/ha
1.69
-7.73
(c) CESBIO - INRAE - CNES (2021)
0 100 200 km

Annual CO_2 net flux computed at pixel level in whole France

Variation of CO_2 fluxes by type of crop in Ain French department | Results in the Netherlands at parcel level | Spanish results in Castile and Leon
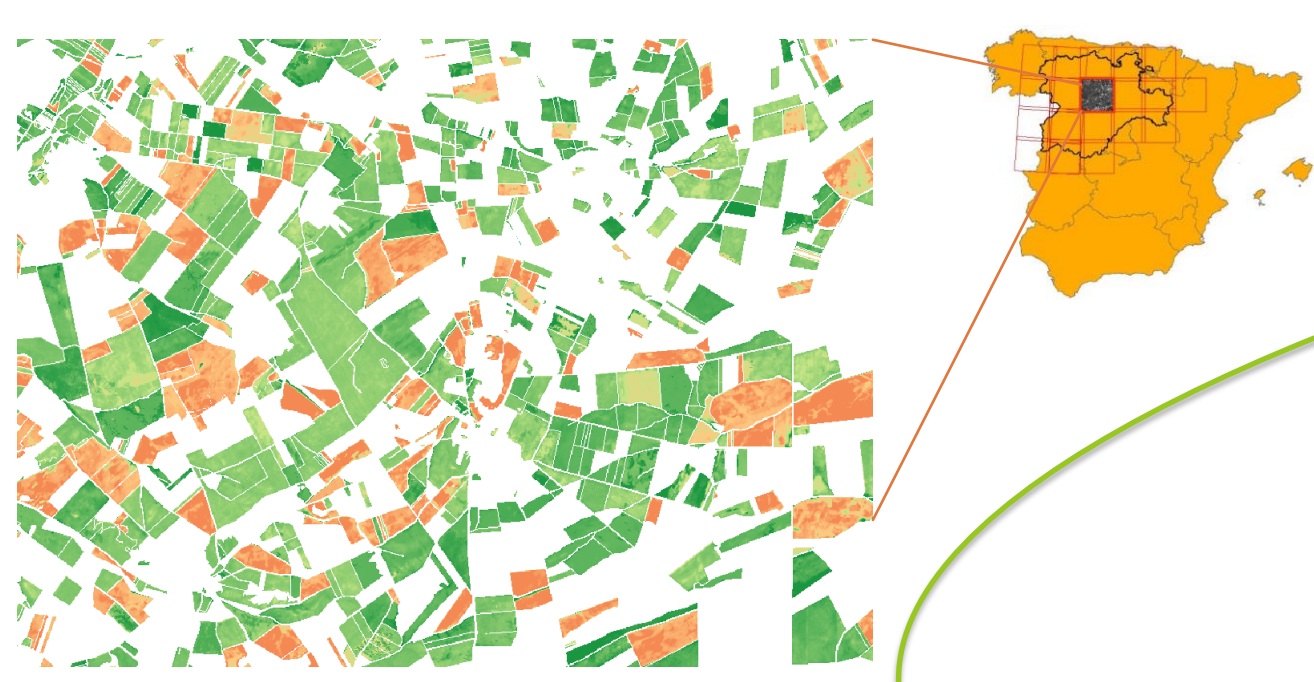
Biodiversity indicator

➤ Land cover characteristics and agricultural practices influence the potential of an agricultural landscape to host a high proportion of species that occur in that region.

➤ The biodiversity indicator is reflecting this potential. It may be computed on each cell of a kilometric grid for each agricultural year, on most agricultural landscapes, i.e. landscape dominated by crops.

➤ The landscape characteristics taken into account are the quantity of semi-natural elements (woods, hedges, ponds, rocks …), mean field size and crop richness/diversity

➤ The biodiversity indicator corresponds to a multi-diversity index that takes into account the species richness of 7 taxonomic groups

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Birds Butterflies Bees Syrphids Carabids Spiders Plants

Nitrate leaching indicator

➤ The nitrate leaching indicator measures the risk of nitrate leaching due to crop rotation over a drainage period

➤ Nitrate leaching triggers a risk for water quality and a loss of nutrients

➤ This nitrate leaching indicator is based on the following principles:
o After harvest, crop stubbles may release nitrate due to mineralisation effects
o A catch crop or other intermediary cover mainly takes up nitrate for its growth
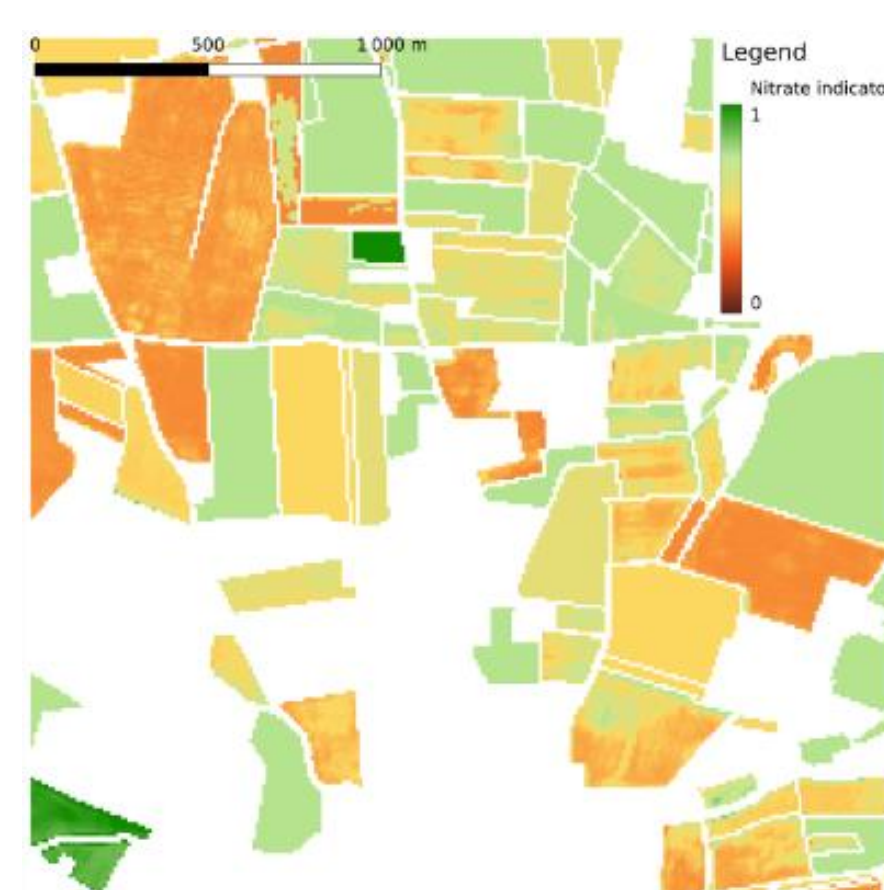o The new crop takes up nitrate for its growth

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Crop rotation
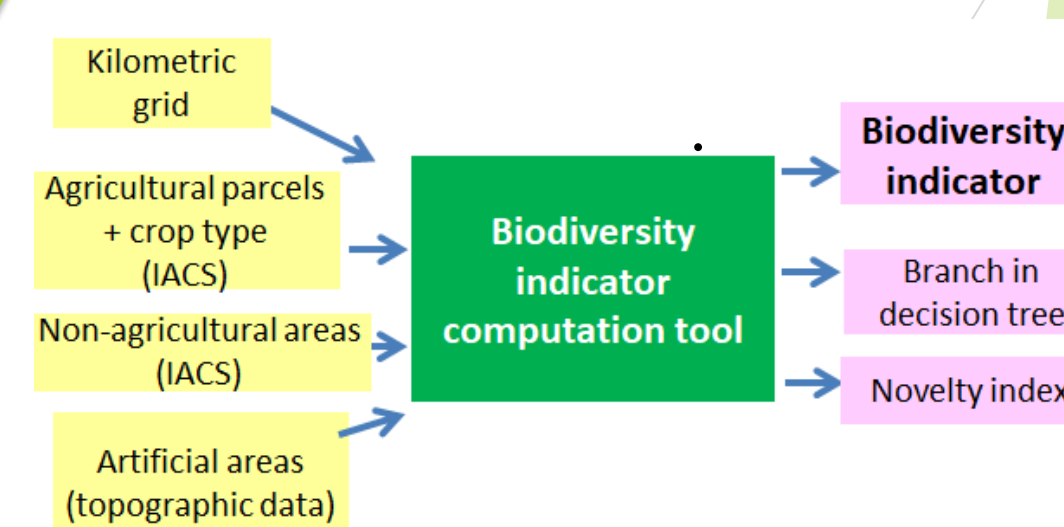Previous crop Catch crop Crop
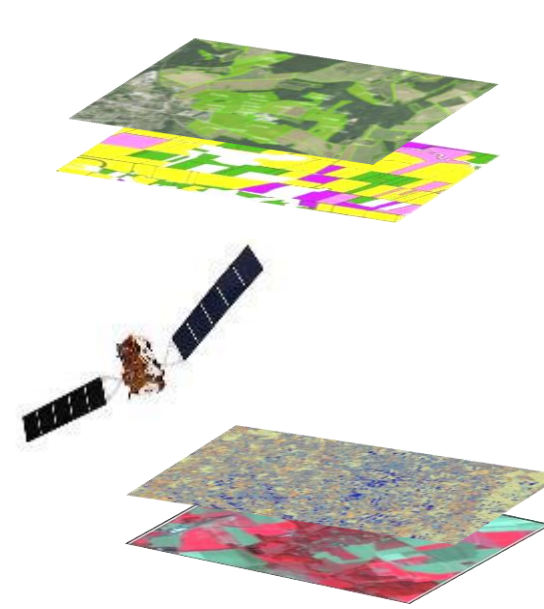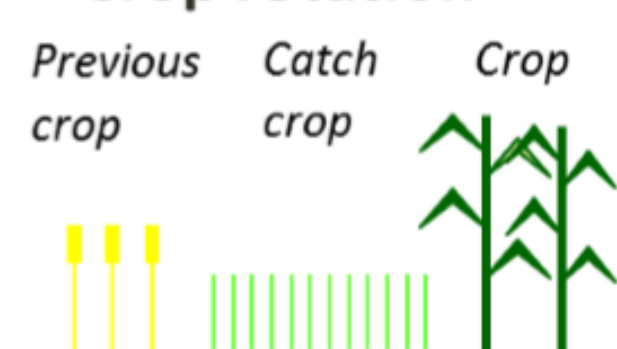
IACS data provide information about previous and current crops.

Information about catch crop is derived from Sentinel-2 images (NDVI temporal series)

Legend
Nitrate indicator
1
0

The nitrate leaching indicator is computed at pixel level and expressed on a scale between 0 (low) and 1 (high).

Kilometric grid
Agricultural parcels + crop type (IACS)
Non-agricultural areas (IACS)
Artificial areas (topographic data)
Biodiversity indicator computation tool
Biodiversity indicator
Branch in decision tree
Novelty index

The Novelty index is a quality flag of the biodiversity indicator.
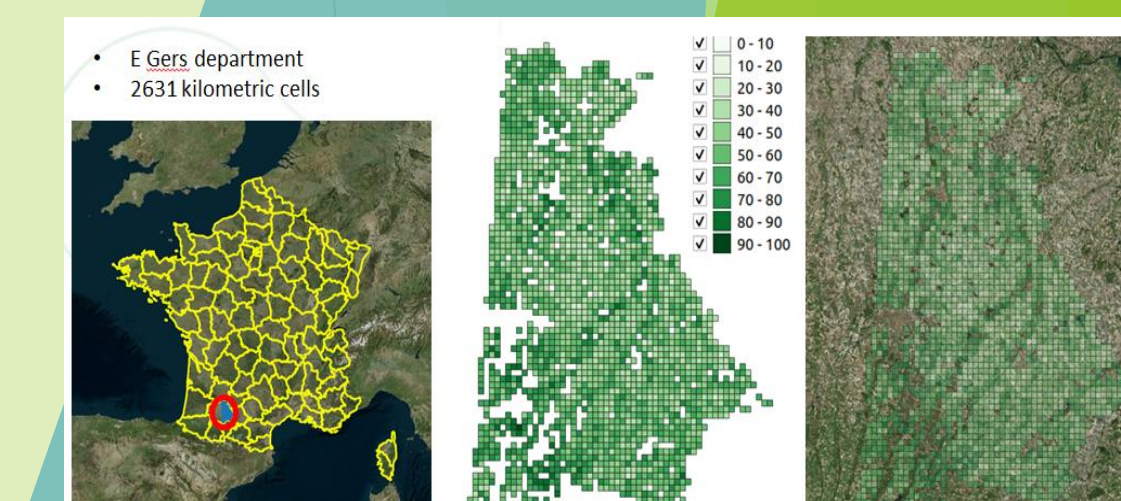
Results from testing in France

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