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Spatial distribution of land affected by the 'greening'. Geostatistic tool and applications

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The slide features a central mind map with the title "Changing the Game: Greening" in a green oval. Three branches extend from the center: "Implementation" (top), "Control" (left), and "Build a tool" (bottom). The "Implementation" branch leads to a box asking "where?" which points to a list of measures: "Permanent grassland", "Crop diversification", and "Ecological Focus Areas". These measures are grouped by a bracket labeled "ON ARABLE LAND" and "criticism".

Below the mind map, there is a snippet from a scientific article titled "EU agricultural reform fails on biodiversity" by G. Pe'er et al. (2014). The article discusses the expansion of the EU's Common Agricultural Policy (CAP) and its impact on biodiversity, noting that while the policy aims to protect farmed and grassland ecosystems, it has led to declining species and ecosystem services.

The slide also includes the European Commission logo at the top and the Joint Research Centre logo at the bottom right, along with the page number "2".

The main focus of the presentation is the game-changing introduction in the Common Agricultural Policy (CAP) of measures known as «greening».

The presentation starts with the assumption that all details of this new aspect of the CAP are thoroughly known by all the audience.

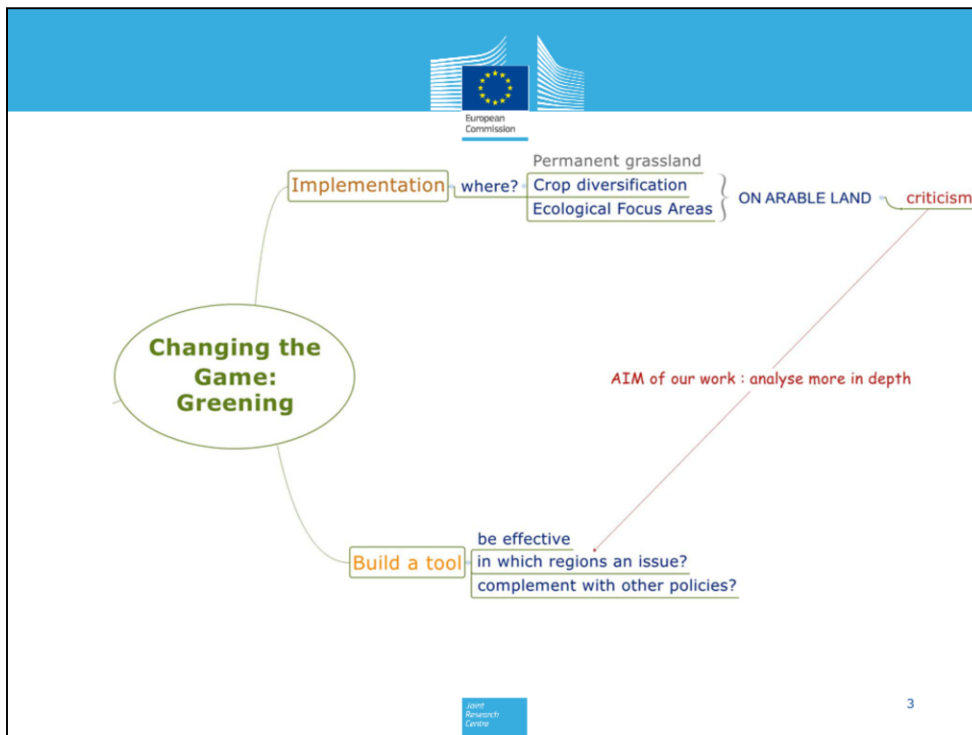
The presentation focuses on :

- Implementation of the policy
- A GIS (Geographic Information System) tool that we set up to analyze more in depth some aspects of implementation and on how this tool can be used as a decision-making tool
- And although it is a somewhat different aspect, it also deals with how control sampling changes following the introduction of greening (the link here is in the methodology used to develop our GIS tool with geostatistics).

There are three measures of concern for greening implementation: Conservation of permanent grassland; Crop diversification; Establishment of Ecological Focus Areas (EFA).

We focused on these last two measures and the fact they are applicable on arable land only, and with some exemptions here too.

This fact has led to criticism by many, including e.g. this scientific paper by Pe'er et al (2014) appeared in June 2014 in the magazine «Science».



The aim of our study has been to analyze more in depth this critical aspect and understand whether and in which regions of the EU this issue of policy effectiveness could be more problematic.

The main interest of this tool is that it can be used by member state administration to fine-tune the implementation of "greening" and/or complement "greening" in the first pillar with specific policies (e.g. with second pillar support) in regions with major problems, or where there is a higher risk of limited effectiveness of the «greening» policies.

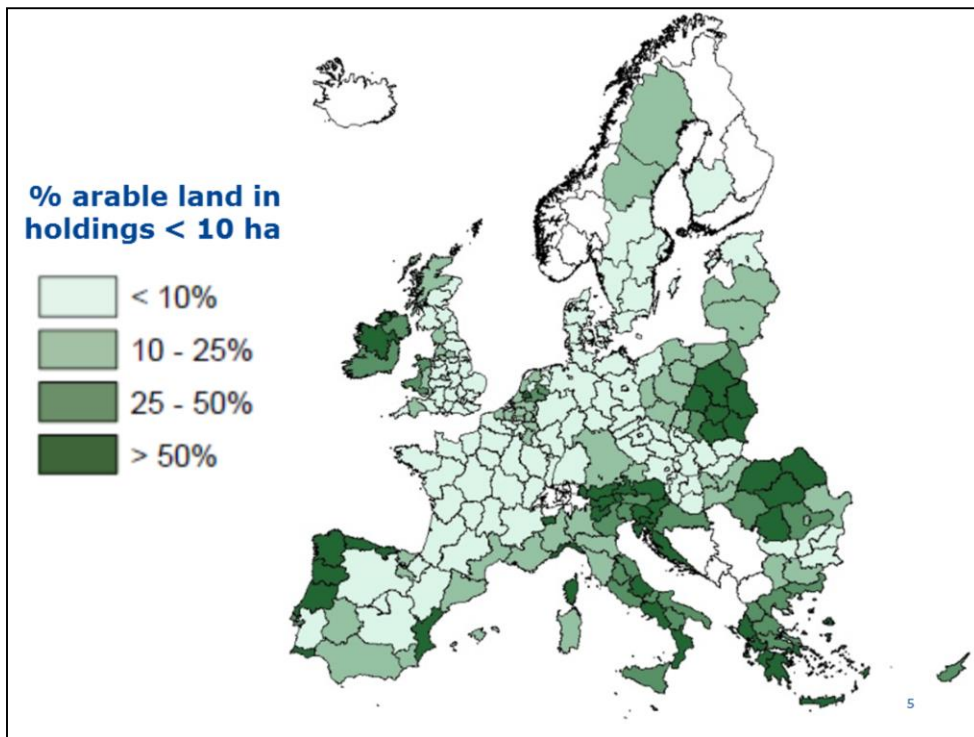
In some regions there may (will?) be little greening:

- No crop diversification < 10ha of arable land
- No EFA < 15 ha

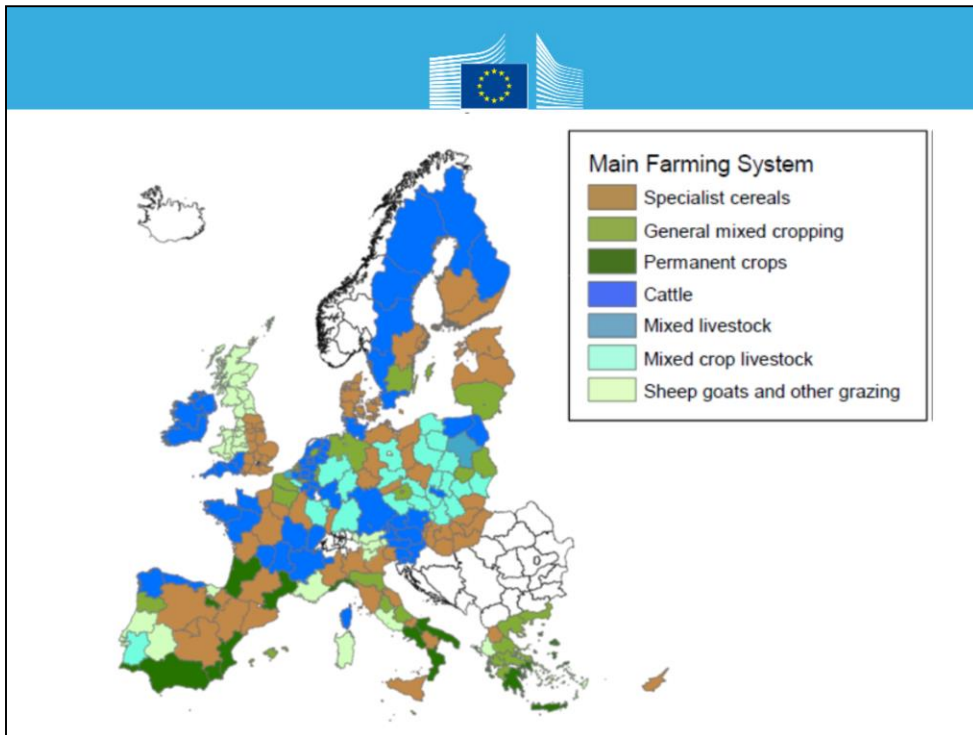
There are indeed exemptions from crop diversification (for agricultural holdings with less than 10 ha of arable land (AL)) and from establishing EFA (for agricultural holdings with less than 15 ha of AL).

However, first of all this is not a problem everywhere.

To start with...



In some regions only a minor proportion of arable land is expected to be excluded from both «greening» measures of crop diversification and EFA.



The impact in some regions where most arable land will be exempted from greening can be lower than some can worry about because of the main farming system.

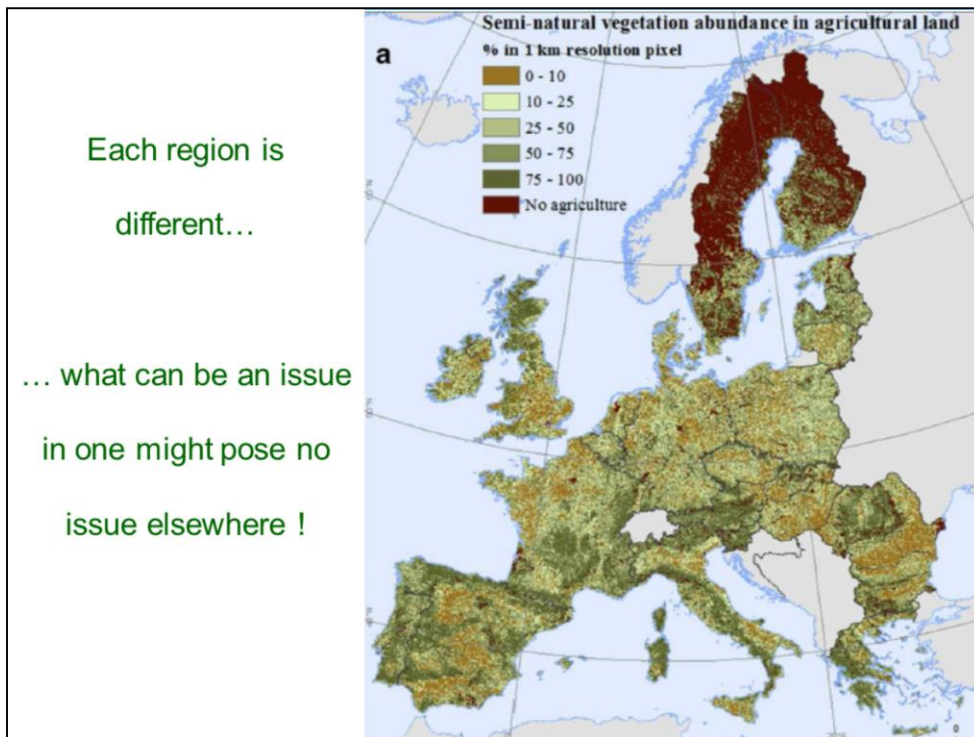
There could be less of an issue where there is more general / mixed cropping in smaller farms, with a varied agricultural landscape, compared to areas where farming is predominantly characterized by specialist cereal farmers in larger farms.

In other words: ...



Where large shares of arable land is used in quasi-monoculture without any landscape feature or diversity of crops, then «greening» policies are most needed.

In areas where there is an abundance of semi-natural vegetation and a more diversified typology of farming systems, exemption of most land from the application of the new «greening» policies might have a lesser impact.

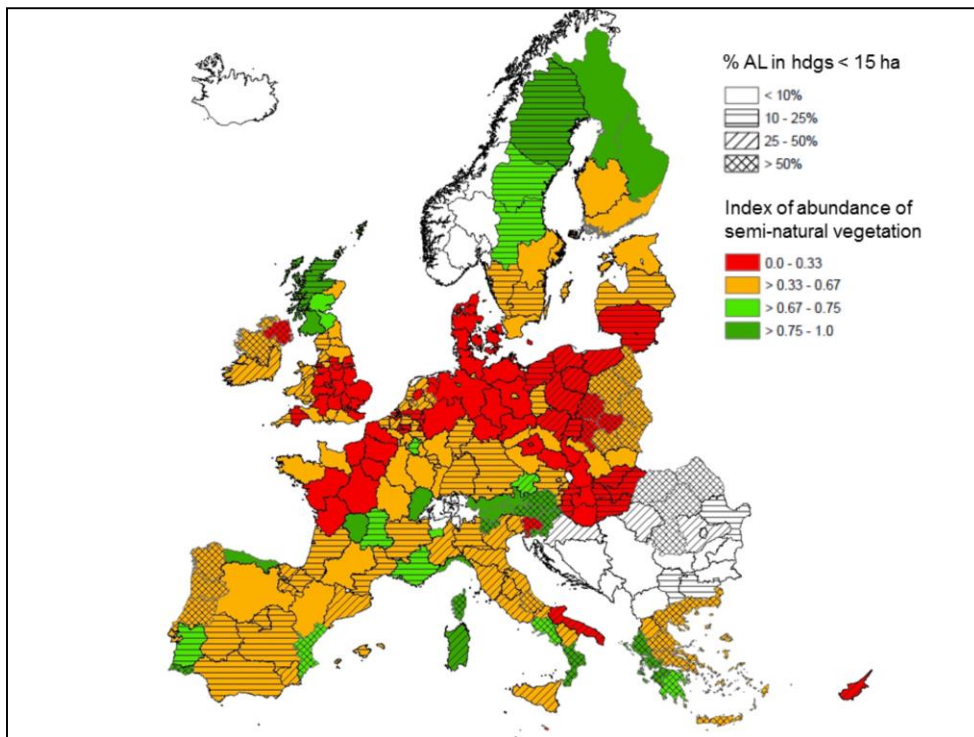


Colleagues at JRC have studied semi-natural vegetation abundance in agricultural land.

We used this data to assess regions where higher exemption from greening could pose less issues

Relative abundance of semi-natural vegetation at NUTS-2 level

In some regions little additional EFA
but
“already enough” semi-natural vegetation



Here, we overlay information about the proportion of arable land exempted from EFA (less than 15 ha of arable land), with an index of relative abundance of semi-natural vegetation, calculated at NUTS-2 level

Some areas are more problematic than others.

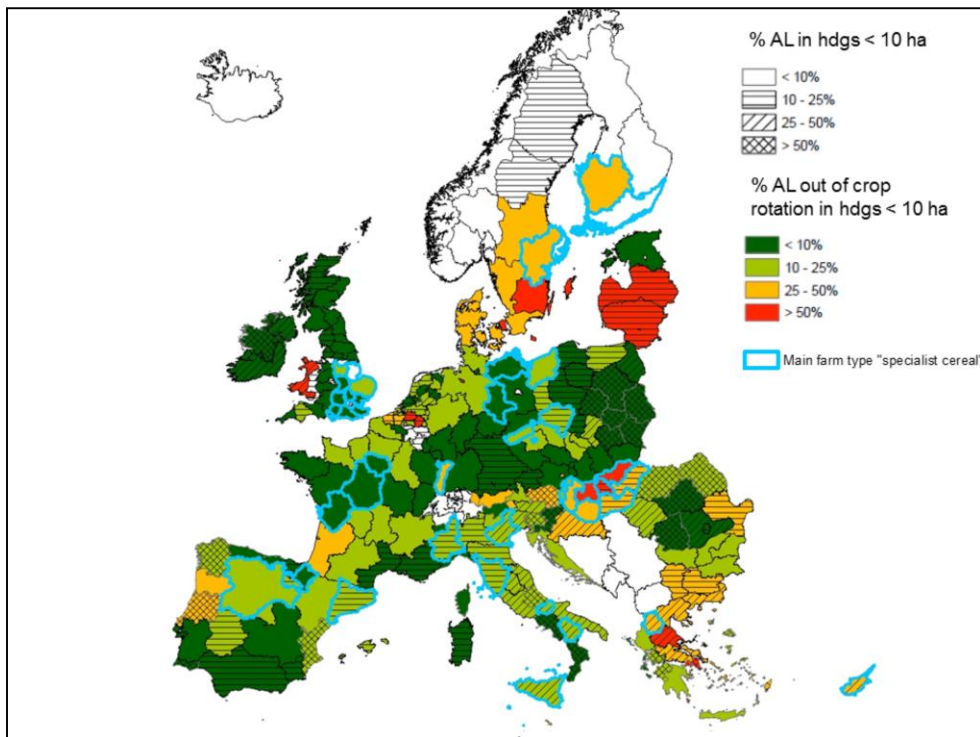
This analysis can be tweaked in the GIS to select and highlight various potential issues, and the GIS could be used to assist decision making if additional policies are desirable / used (e.g. from the second pillar of the CAP)

Similarly for **CROP ROTATION**

In some regions much exemption from greening measure
but
“already enough” arable land in crop rotation

A similar analysis can be performed for the measure of «crop diversification» using data on crop rotation from the Eurostat «survey of agricultural production methods»

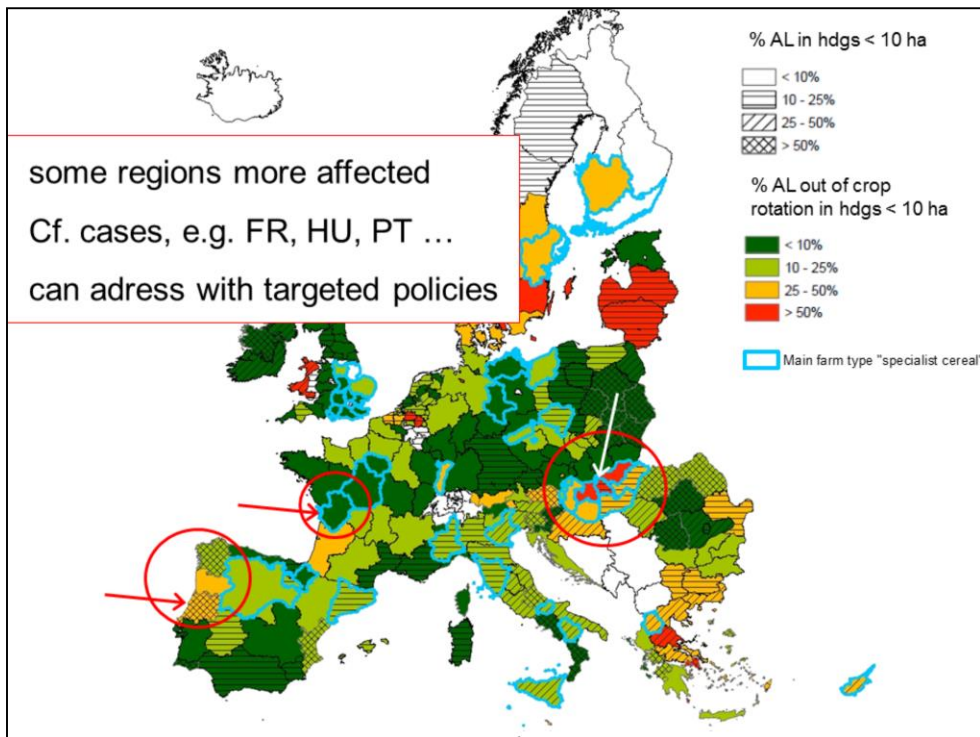
Despite of not complete correspondence of data with the definition of «crop diversification», Eurostat data can be used as a reasonable proxy, nad the main aim here is to highlight what the tool can do, while data can be easily upgraded in the database tables if more precise or recent data is available, while the tool can still be used.



We thus developed an analogous analysis with respect to the measure of "crop diversification".

Data on crop rotation is based on the "survey on agricultural production methods" by Eurostat, and does not provide the full spectrum of crop rotations, hence are to be taken with some carefulness, but they are the only homogenous data at EU level and are accurate enough to allow some careful assessment to be carried out.

AS A REMINDER: our main aim is to build the GIS tool that can then be improved in terms of data accuracy and completeness, updating the database but without affecting the way the tool can be used.



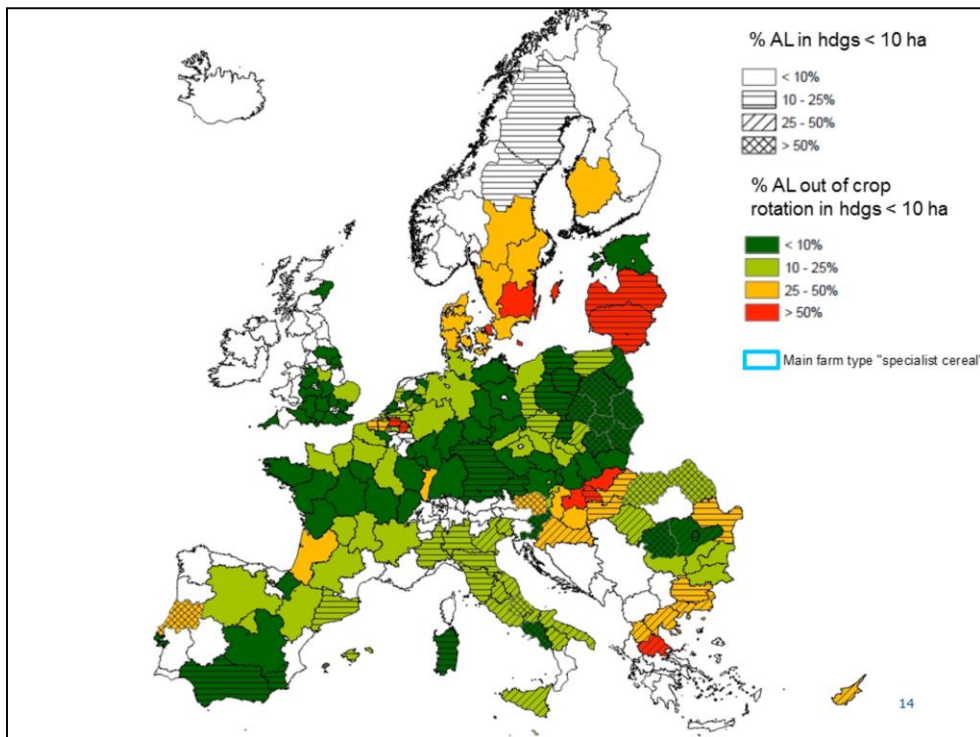
This map shows the complexity of the issues at stake but also the flexibility to use this tool and adapt it to analyse / assess the situation in key regions, and assist decision makers to develop more finely tuned implementation policies, or other policies (e.g. from the II pillar) to address specific issue or increase protection of biodiversity at the local lever where it is most needed.

As an aexample we can highlight three regions with different charateristics.

FR53: «Poitou-Charentes» region, 84% AL overall, over 40% specialist cereals, but very little AL in holdings of less than 10 ha of AL, and less than 10% of these are out of crop rotation

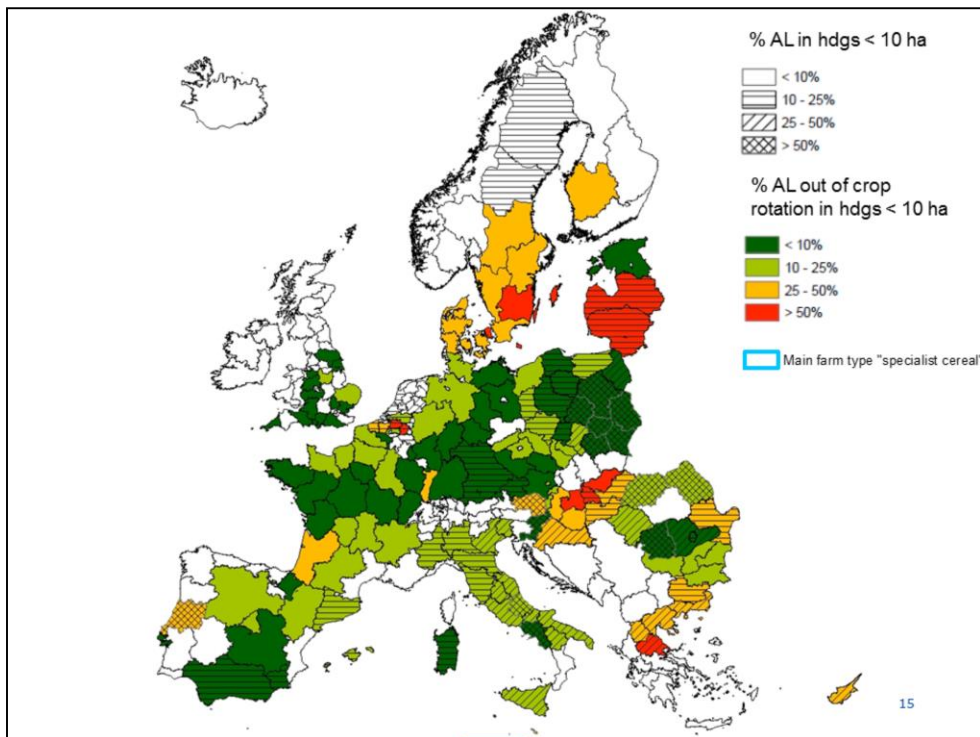
HU10: «Közép-Magyarország» region, 79% AL overall, 44% specialist cereals, only 12.5% of AL in holdings of less than 10 ha of AL, but over 50% of these are out of crop rotation

PT16: «Centro» region, 38% arable land (AL) overall – it could pose problems that over 50% is in holdings of less than 10 ha of AL, 55% of all AL in these holdings is out of crop rotation



The tool can easily be tweaked to perform ad-hoc analyses.

One can select only the NUTS-level-2 regions where the overall ratio of arable land (AL) to utilized agricultural area (UAA) is over a third (33%)



Then it is possible to introduce multiple SQL queries to exclude other regions from the analysis.

Here, in addition to the previous selection (*), only regions where over a third of all arable land (*in holdings of all sizes*) is mostly excluded from rotation are shown.

- - -

(*) *Reminder: excluding regions where the overall ratio of arable land (AL) to utilized agricultural area (UAA) is over a third (33%)*

The aim of this presentation is NOT to assess all particular situations and tediously show all results, but to demonstrate how the tool can be used for a number of analyses, setting up some simple SQL queries and selecting regions on the basis of a number of key characteristics.



Reminder: I had promised to speak of control / sampling: here I go.

In the following, a quick word on the non-obvious link with what said earlier, linking up with the statistical estimation of agricultural holdings with less than 10 ha of AL

Then I intend to BRIEFLY explain a little about control sampling and what is changing with the new CAP



Basic estimation of control sample

An example of application

The link is in the methodology: estimating the
number of holdings with < 10 ha of arable land

Change brought by greening requirements =
change in random / risk-based sampling

Until 2014



1% random sampling + 4% risk-based sampling

From 2015

5% sample → *how to?*
art. 34 of Reg 809/2014

- a) 1 – 1.25% randomly BPS
- b) 1 – 1.25% «control population for greening » randomly from (a)
- c) Remaining 3.75-4% from «control population for greening»
→ RISK ANALYSIS
[...]
- g) 20-25% of farmers implementing greening with certification
schemes randomly, the rest risk analysis
[...]

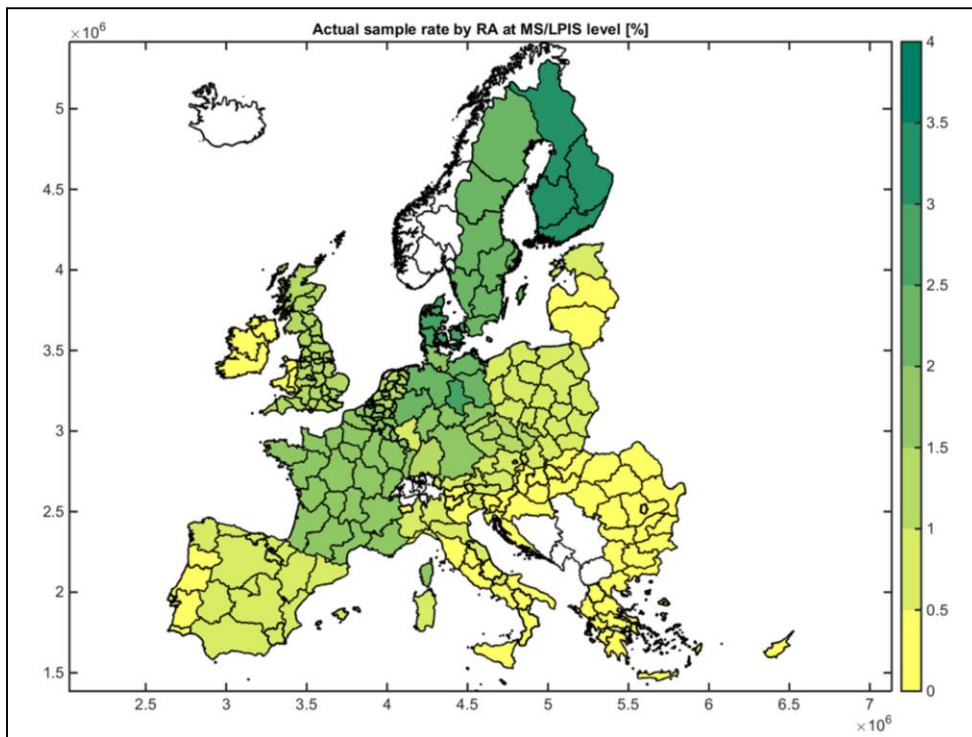
There is a whole list of rules that explain how the different proportion of random and risk-based sampling must be carried out for each sub-population of beneficiaries, depending on which greening constraints apply to each sub-population and also how each sub-population respond to any existing greening obligations (e.g. whether it applies collective implementation of uses national / regional certification schemes).



We have simplified by assessing:

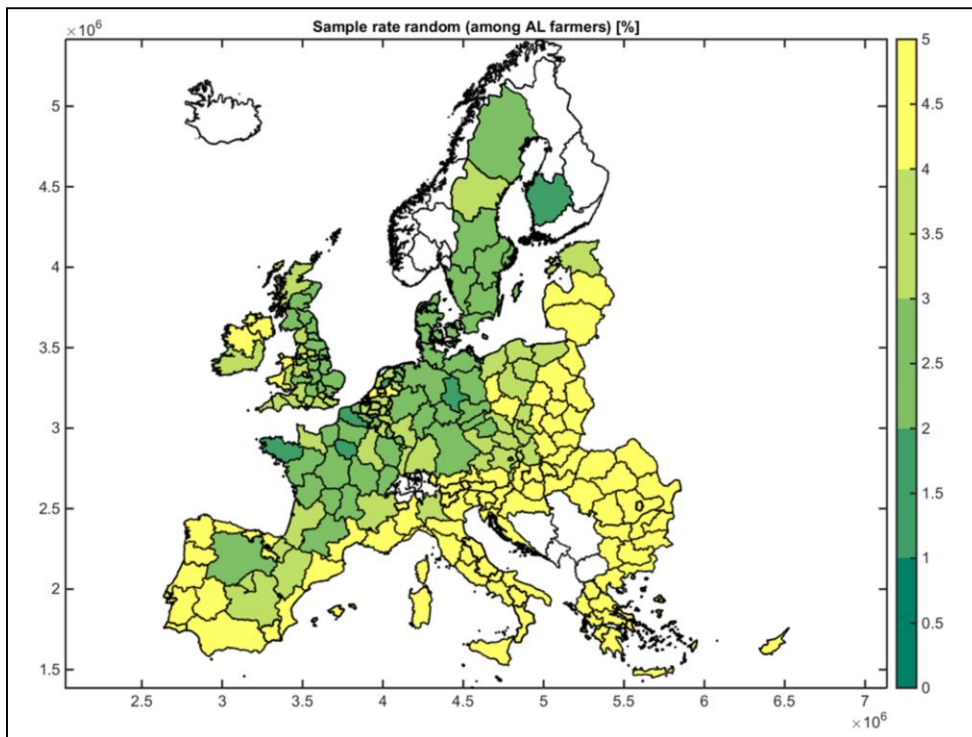
- Expected estimated proportion of sub-population exempted from both crop diversification and Ecological Focus Areas (holdings with < 10 ha of arable land);
- Calculating the risk-based sample size on the sub-population for which at least one greening measure applies.

It should be kept in mind that our estimate of the size of the risk-based sample is actually the largest possible risk-based sample size, i.e. if for instance collective implementation or specific certification schemes were used, then the actual risk-based sample would be smaller.



This slide shows the percentage of risk-based sampling at the level of Land Parcel Identification System (LPIS) / member state (MS).

The left vertical ruler bar colour-codes from 0 to 4% the size of the risk-based sample using our estimate of percent of arable land exempted from «greening» (agricultural holdings of less than 0 ha of arable land)



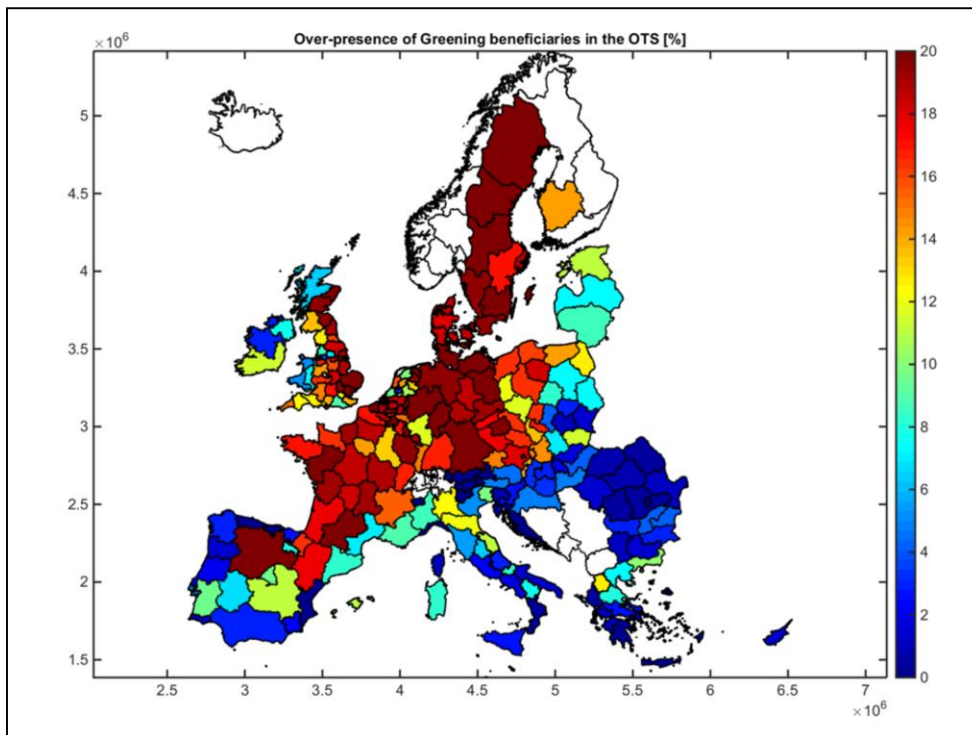
Conversely, this slide shows the rate of the random-based sample, from 0 to nearly 5%. Areas in yellow such as Southern Italy are those areas where little «greening» is implemented, therefore areas with a very small risk-based sampling.



Correct take-up of greening is considered important. «Greening» is considered a riskier policy, because of various reasons:

- It is complex by definition
- It is new
- It is not always easy to monitor and control
- etc.

This has pushed for rules to be adopted which skew risk-based sampling towards the «control population for greening»



There is in fact, because of how the sampling is done, an over-representation of the «greening» beneficiaries overall in OTS checks. This is more definite in regions where there is a higher proportion of «greening» implementation.

We considered it useful to be geographically aware of this fact.

