**Review of the JRC/EEA EU-level HNV Farmland methodology**

**Expert workshop at Environment Agency Austria; Vienna, 19 October 2019**

**Introduction:**

The expert workshop will review concrete methodological tests to explore options for improving the current JRC/EEA approach for estimating the distribution of High Nature Value (HNV) farmland at European level. This will focus on three different aspects:

a) Ways to use national and case study data sets that are comparable to the EU approach for improving the HNV Corine Land Cover (CLC) selection rules per environmental zone or in individual countries.

b) Possibilities of using EU level data sets on agricultural land use intensity (e.g. farm structure, N-Balance) for refining CLC rules for locating EU HNV farmland in a probabilistic approach.

c) Review of opportunities to enhance HNV farmland assessments with satellite data; special focus on the comparison of Copernicus High Resolution Layers (e.g. the Grassland HRL) with the current EEA/JRC HNV distribution estimate (based on results of an analytical case study). s

Expected outcomes:

* Decisions on follow-up work on relating and – if, applicable - integrating farming intensity approach and/or satellite data into JRC/EEA HNV farmland methodology
* Indications for possible changes in CLC selection to institute on basis of country case study review and their joint interpretation.

**Draft agenda *(meeting location: UBA Vienna, Spittelauer Lände 5, 1090 Wien)***

10.00 Welcome and introduction (Chair: J-E Petersen)

10.15 Session 1: Review of available national data for refining rules on selection of CLC classes by environmental zone, Michael Weiss, UBA Vienna; followed by discussion (introduced by Angela Lomba, CIBIO, Portugal)

11.30 Brief coffee break

11.40 Session 2: Options for including a land use intensity dimension into the spatial representation of HNV farmland, Marta Bonato University of Amsterdam; followed by discussion (introduced by Maria Luisa Paracchini, JRC)

12.45 Lunch break

13.45Continuation of session 2

14.30 Session 3: Comparison of current HNV ‘map’ with satellite data opportunities, Tomas Soukup, GISAT (tbc); followed by discussion (introduced by Doris Marquardt, EEA)

15. 40 Brief coffee break

15.50 Summing up by organisers and next steps

16.00 End of workshop

**Background: summary of recent work as reviewed at 2017 workshop on HNV farmland**

The 2017 workshop began with an introductory session that reviewed EU level perspectives and the current JRC/EEA methodological approach as well as the work on identifying HNV farmland and farming systems in different countries (Germany, Italy and Romania). All workshop presentations can be found under: <https://projects.eionet.europa.eu/ecosystem-capital-accounting/library/hnv-expert-workshop-_-vienna-12-june-2017>

One key challenge in the comparison of the current JRC/EEA HNV farmland data set with similar national or European data sets is the need to ensure comparability of the underlying HNV concept and the ecological definition of what constitutes ‘high nature value’ with the original JRC/EEA approach. For example, the use of the ‘HNV farmland’ concept would imply a focus on the spatial delimitation of areas of farmland with a high nature value character, whereas the ‘HNV farming’ concept can be considered to focus on identifying where farming approaches are favourable to high nature value. In addition, national approaches can vary in the ecological threshold they apply for identifying what is ‘high nature value’ as the ecological and farming context varies from country to country. The potential differences and overlaps between the different concepts as well as national and European definitions are set out in Figure 1 below.



**Figure 1: Commonalities and differences between different types of HNV farming**

**– a conceptual comparison**

**Summary of break out session 1: Review of available national data and opportunities for refining rules for the selection of CLC classes in current JRC/EEA approach**

This breakout session discussed options for using national experience, case studies and data sets to improve the selection of HNV in the different environmental zones of Europe. The session began with a presentation by Environment Agency Austria (UBA Vienna) on the planned approach for the analysis of possibilities for refining CLC rules on the basis of national level data from three countries (Austria, Germany and Netherlands). This work comprised three steps:

1) Comparison of methodological approach of national HNV and EU-HNV according to three recognised HNV types and the time-period (actuality) of national reference data

2) Comparative analysis of statistical tables at country level between national and European data sets

3) Comparative analysis of spatially explicit GIS data for HNV farmland (where possible)

With regard to the comparability between national HNV data and the JRC/EEA dataset the following initial conclusions can be drawn for some countries:

* Austria: The designation of HNV farmland Types 1 and 2 is based on the national IACS database displayed on a 1km raster resolution (which does not cover the Alpine area)
* Germany: The estimation of the HNV farming area is done by extrapolation based on in situ mapping on 1,200 sample sites; furthermore, the characteristic species and habitat types that trigger the identification of HNV farming for each sample site are different from the focus on species and habitats in annex 1 of the EU habitats directive that underpins the JRC/EEA approach.
* The HNV farmland dataset from the Netherlands is based on polygons with a differentiation of HVN Types 1, 2 and 3.

Despite the differences in the underpinning data sets some conclusions can be drawn from this first rough comparison:

National HNV farmland in Austria, Germany and Netherlands is also considered to occur in areas that contain the CLC-Class “non-irrigated arable land” (particularly in the environmental zones “Continental” & “Pannonian”) while the EEA/JRC approach does not identify this class as containing HNV farmland in these environmental zones. This is probably due to the different ecological focus underpinning the respective analyses.

For Austria the JRC/EEA assessment shows a very high share of natural grassland compared to the national HNV farmland assessment – this is most likely due to the fact that the Austrian HNV data set does not cover alpine pastures and meadows land outside of UAA

In the Netherlands pastures (CLC Class 2.3.1) are twice as high in the European HNV farmland assessment compared to the national HNV assessment – this may relate to the different reference period or to different ecological HNV selection criteria for the two assessments.

For Germany, the European HNV farmland approach uses CLC selection rules that vary according to a landscape type mask that was derived from a German data base – this can lead to abrupt changes in CLC section between different areas that are not found in the German data set. Furthermore, the representation of the CLC class pastures is twice as high in the JRC/EEA HNV farmland assessment compared to national results.

***Key outcomes of break-out discussion and next steps:***

The discussion among participants initially reviewed the first results of the comparison carried out by UBA Vienna (as reflected above). In addition it covered the following points:

* The comparative analysis may be hampered by the fact that the CLC minimum mapping unit is 25 ha, which only allows a rough spatial representation of HNV farmland, as remaining HNV farmland pockets or landscape elements are often much smaller.
* Inclusion of land outside of UAA (utilised agricultural area) – as the JRC/EEA approach is based on CLC it may identify areas outside official UAA as HNV farmland, which reduces comparability where national approaches take the UAA as reference point and are based on official agricultural data sets, such as IACS.
* Another element that needs to be considered to ensure that methodological approaches are comparable is the ecological definition used in national approaches – the EU level approach sets a rather high ecological threshold (see above) whereas countries may consider a wider range of species and ecosystems to be representative of HNV farmland/farming (for which there can be good reasons); from the countries analysed so far it has not been found that national approaches applied a more narrow definition.
* The previous point can be linked to the idea of accepting that there can be different types of HNV farmland, representing higher and lower ecological thresholds, with a wider definition adopted in some national approaches (see also Fig 1 for a representation of that idea)
* In this context, one idea discussed was that one could follow a nested approach whereby HNV farmland could consist of a core as defined in the JRC/EEA approach (focus on Habitats Directive annex 1 species and habitats) which could be complemented with a wider umbrella where nature value would be less narrowly defined.
* The participants also reviewed other data sets that could help validate or improve the results of the JRC/EEA approach, in particular for grassland. These include:
	+ The LUCAS survey: the possible integration of LUCAS data regarding grassland ecosystems could be checked but is applicable only for future surveys.
	+ The COPERNICUS High Resolution Layer for grassland is expected to be finished by the end of 2017 and could be particularly useful for improving the understanding of the spatial distribution of grassland, independent of whether it is inside or outside of official UAA.
	+ The results of national work on mapping the distribution of ecosystem types under the EU MAES process or similar initiatives; where available GIS data sets arising from this process could be very useful for checking whether all valuable ecosystem areas are captured by the current JRC/EEA approach.

At the end of this session EEA and JRC participants provided some reflections on the overall context for future work. One key point is that the European HNV farmland layer aims to reflect a harmonized selection of similar top-rated HNV areas in Europe (based on clear ecological criteria). In some cases, it will therefore rather represent a sub-selection of national HNV farmland/farming areas. As the JRC/EEA is principally based on a selection of CLC-classes, the differences of the mapping units between European and national datasets will always result in varying products. Extremely small areas cannot be mapped in European HNV-farmland. In this context it needs to be recognised that the JRC/EEA approach only aims at being representative of the share of HNV farmland per square km; hence this lack of spatial precision does not matter in terms of quality of results. It can reduce comparability with national level results, however.

Although additional national (biodiversity) data have been included in the past on European level their update and time relevance is quite heterogeneous. As they are not available homogenously over all countries their usage needs to be re-considered for future HNV updates and is likely to be very limited. Instead focus will be on the CLC selection rules based on environmental zones are with the aim achieve a coherent and comparable classification in Europe as well as compatibility with national HNV datasets (as far as feasible).

Options for acquiring national data sets for comparative analysis were reviewed with participants of the workshop. Finally in addition to Austria, the Czech Republic, and Germany, also, Romania, Croatia, Portugal, Estonia and Italy provided either national data on biotope mapping or the identification of HNV farmland/farming areas at national level.

Update for 2018:

Environment Agency Austria has checked the national data according to the three steps set out on page 3 above (as far as appropriate and feasible). The results of the analysis will be presented in session 1 of the workshop in October 2018. Those organisations or researchers who provided the national data for comparison purposes will be informed and can provide feedback.

**Summary of break out session 2 on options for using EU-level data sets to bring a land use intensity dimension into the spatial representation of HNV farmland**

This break out session began with a presentation by Maria Luisa Paracchini on developments in European data sets and research projects that may allow to integrate a land use intensity dimension into the spatial representation of HNV farmland. Her view was that upcoming data sets or data treatment will allow improving the consideration of land use intensity substantially.

The main purpose of this approach would be to identify spatial farm intensity data that have a good match with farm management practices that are indicative of the likely presence of farm types supportive of HNV (e.g. gross nutrient balance). The analytical logic is that CLC selection rules could be combined with a spatial mask for farming intensity so that a potential over-selection could be avoided as livestock densities or nutrient use above a certain level make it unlikely that species or habitats of HNV character would be present. This would seem appropriate as the JRC/EEA approach already uses a probability assessment per 1 km grid cell.

The discussion among participants covered the following points:

Developing a methodological approach:

* How to calibrate land use intensity for HNV? Should we develop different masks for high and medium HNV? Should we introduce a gradient? In some areas of high nature value, e.g. for high mountains, we can have a good understanding and data on land use, for other areas we need to rely on proxy data.
* Can we adjust the EEA/JRC estimation of HNV farmland by taking out the very intensive areas in a ‘data cleaning’ exercise?
* There is quite a lot of information in the ecological literature to develop possible thresholds for intensity that are compatible with HNV species and habitats, in particular for grassland.

Reviewing what we know about farming systems and parameters that are relevant to assess their connection to HNV farmland/farming:

* How many places do we still have with high nature value and extensive farming? Alpine pastures, some sheep systems are some of the few examples; hardly any arable systems seem eligible. Do we need two tiers of HNV identification to highlight more the need to protect the remaining special pockets? Different quality tiers to be applied across Europe?
* Precision farming – will achieve lower N levels but pool of species is missing – could this ever be HNV? Need to consider in thresholds that farmers get better with use of inputs over time.
* Knowing the motivations and drivers of farmers’ decision-making (CAP payments and beef example) can help to interpret results /maps. However, the application of such ancillary data at EU-level would be very challenging.

Review of current data foundation:

* Older 2008 data currently used do not reflect changes in fertilizer use in new Member States, e.g. Romania. In 2017 an update of the CAPRI model with new data for 2010 will be ready. It will be interesting to examine if the new 2010 data will already reflect changes in fertilizer use.
* Is there an opportunity to add HNV aspects to FSS (e.g. farming features)? The FSS is already considered quite a burdensome exercise, hence Eurostat/others rather aim to reduce not increase the number of questions. Probably only a realistic option at MS level.
* Data on CAP implementation is probably difficult to use as, for example, the implementation of rules for Ecological Focus Areas is not coherent across MS. In addition, data series on policy implementation are only available for the period when certain policy instruments were in place, which may not exceed one single CAP implementation period (e.g. 2000 – 2006).

The following additional points were covered:

Recent studies in Germany suggest that a Natura 2000 designation does not necessarily prevent species loss or agricultural intensification as many economic and social trends are the same inside and outside Natura 2000 areas. This could imply that differentiating CLC selection rules by a Natura 2000 mask (which currently provides for more generous selection for areas inside Natura 2000 in the JRC/EEA approach) would not make sense, so this rule will need to be re-considered.

Update for 2018:

Several of the options that were discussed under this topic were explored through work at the JRC and subsequently at University of Amsterdam. First findings of the estimation of adding a “land use intensity dimension” will be presented and discussed at the workshop.

**Session 3: Overlay of Copernicus HRL data layers with current European HNV ‘map‘; review of satellite data opportunities**

Since the first concept of High Nature Value farmland estimation in 2008, the portfolio of available Earth Observation (EO) data has expanded significantly both by means of spatial and temporal resolution. Among the improvement of technical parameters, the general availability of such data has changed too, and large datasets, such as the Sentinel became freely available.

Since 2006 several High Resolution Layer’s (HRL) were produced covering different land cover characteristics as grassland (2015) and forest (from 2012) areas or impervious (sealed) surface (from 2006) and permanent water bodies and wetlands (2015). For all HRL layers a change product(s) and methodology is adopted or expected to be developed for future periods (for 2015 status layers). These datasets can provide seamless coverage across Europe for a defined time span and have the technical accuracy to track vegetation-related features that support HNV characteristics. The latest High Resolution Layers provide Europe-wide (EEA39) data at a spatial resolution of 20m and an aggregated 100m product compatible with HNV dataset.

The methodological approach of how EO data can be used for HNV farmland improvement was explored by GISAT: In the focus of the analysis was the HRL Grassland layer which accommodates most relevant land cover characteristic for HNV farmland. The contribution of HRL layers may be expected particularly for HNV farmland Type 1, targeting specific land cover classes. Only partial or indirect details can be extracted on mosaic of habitats or land use. EO data do not provide any details of species presence or distribution. Thus HRL’s are suitable only for the improvement of Type 1 and Type 2 of HNV farmland.

The main aim of this improvement is to increase the geometrical accuracy of CLC by applying the HRL Grassland layer (spatial resolution, MMU). Selected CLC classes are considered to improve grassland identified within HRL (pastures, natural grasslands and sparsely vegetated areas). Introducing the grassland mask within the selected CLC classes attempts to reduce commission errors of CLC (due to the 25 ha MMU). For additional classes as complex cultivation patterns, land principally occupied by agriculture with significant natural vegetation, agro-forestry areas mainly other HRL’s should be applied (Imperviousness layer, Forest Layer, Water Layer).

The results of the initial horizon scanning showed that High resolution layers - with the outlook of a regular 3 year frequency update- represent a valuable input for the improvement of HNV farmland distribution estimates. These harmonised datasets also provide better spatial resolution, enabling the reduction of MMU effect of CLC classes. It is expected that pimarily the grassland product may improve the HNV delineation by means of geometry, the other HRL’s may contribute to eliminate of improbable LC within HNV as sealed or water surfaces.

Work in 2018:

Based on the findings of the analysis above, GISAT will shows a comparison of current HNVF data sets with available HRLs, i.e. providing HRLs profile (plus CLC attribution) in current HNF areas and demonstrate it for different countries/regions selected. The HRL profile approach means that the presence and composition of all tested HRLs will be analysed within the current HNVF delineation based on the JRC/EEA methodology. In addition, GISAT will aim to show example(s) of improved HNVF delineation using the proposed methodology based on the use of HRLs.

**List of participants (status of 20 September):**

Participants from EU level organisations:

European Environment Agency: Jan-Erik Petersen & Doris Marquardt

EU Joint Research Centre: Maria Luisa Paracchini

ETC ULS staff (at Environment Agency Austria): Elisabeth Schwaiger, Gebhard Banko, Michael Weiss, Andreas Bartel (tbc)

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