

Report 2026

Agri-footprint 7.0 Methodology Report

Part 3: Data Comparison

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About us

Mérieux NutriSciences | Blonk is a leading international expert in food system sustainability, inspiring and enabling the agri-food sector to give shape to sustainability. Our purpose is to create a sustainable and healthy planet for current and future generations. We support organizations in understanding their environmental impact in the agri-food value chain by offering advice and developing tailored software tools based on the latest scientific developments and data.

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Table of contents

1. Introduction	1
2. Impact Categories	2
2.1 Global warming	4
2.1.1 Excluding peat & LUC	4
2.1.2 Peat oxidation	4
2.1.3 Land use change	4
2.2 Other impact categories	4
2.3 Data Updates impacts	6
2.3.1 Crop yield updatef	6
2.3.2 Manure update	9
3. Product comparison	13
3.1 Wheat grain cultivation in Germany	13
3.2 Maize cultivation in the United States	14
3.3 Soybean cultivation in Argentina	15
4. References	16



1. Introduction

The update to AFP 7.0 includes methodological changes and statistical data updates that have an extensive influence on the resulting environmental impacts. In this document, we explain all the major changes and their influence on the environmental impacts for AFP 7.0. The most significant changes between AFP 6.3 and AFP 7.0 include:

Update in data sources:

- Update on activity data for cultivation:
 - Crop yields from FAOstat ([Part 2 section 3.2.1](#)),
 - LUC data from the LUC tool ([Part 2 section 3.2.4](#)),
 - Manure data from FAOstat ([Part 2 section 3.2.5](#)),
 - Synthetic fertilizer use from the NPK model ([Part 2 section 3.2.6](#)),
 - Seed input from FAOstat ([Part 2 section 3.2.9](#))
 - Pesticide data from FAOstat ([Part 2 section 3.2.11](#)).
- Update on data for market mixes: update of production and trade data from FAOstat ([Part 2 chapter 5](#)).
- Update of Ecoinvent background data to version 3.10.

Update in Methodology:

- Crop System Efficiency Index ([CSEI](#)) is applied to the cultivation modelling, replacing the double cropping methodology that was applied in earlier versions.

Update in impact excel calculation method:

- The ReCiPe method has been updated from version 1.07 to 1.09.
- Update on the ReCiPe methodology 1.09 for AFP 7.0, the impact assessment method was changed. The characterisation factors for the climate change impact categories were updated to the characterisation factors from IPCC 2021.
- Additional impact categories were added. These include subcategories of land use and climate change.
 - For climate change, there are options for
 - including Land Use Change and Peat oxidation,
 - excluding Land Use Change and Peat oxidation,
 - Land use change emissions only,
 - Peat Oxidation Emissions only
 - For land use, there are options for
 - Land Transformation,
 - Land Occupation.

The [Methodology Report Part 2: Description of Data](#) provides a comprehensive overview of these updates.

2. Impact Categories

Figure 1, Figure 2 and Figure 3 shows histograms of the relative changes between Agri-footprint 6.3 and 7.0 for all impact categories of the ReCiPe 2016 Midpoint (H) method version 1.07 & 1.09 (with an adaptation to include peat oxidation emissions in the global warming category).

The figures display all Agri-footprint processes that exist in both libraries, excluding processes directly copied from the Ecoinvent library and transport processes. Transport processes were not included since the only change has been the underlying background process.

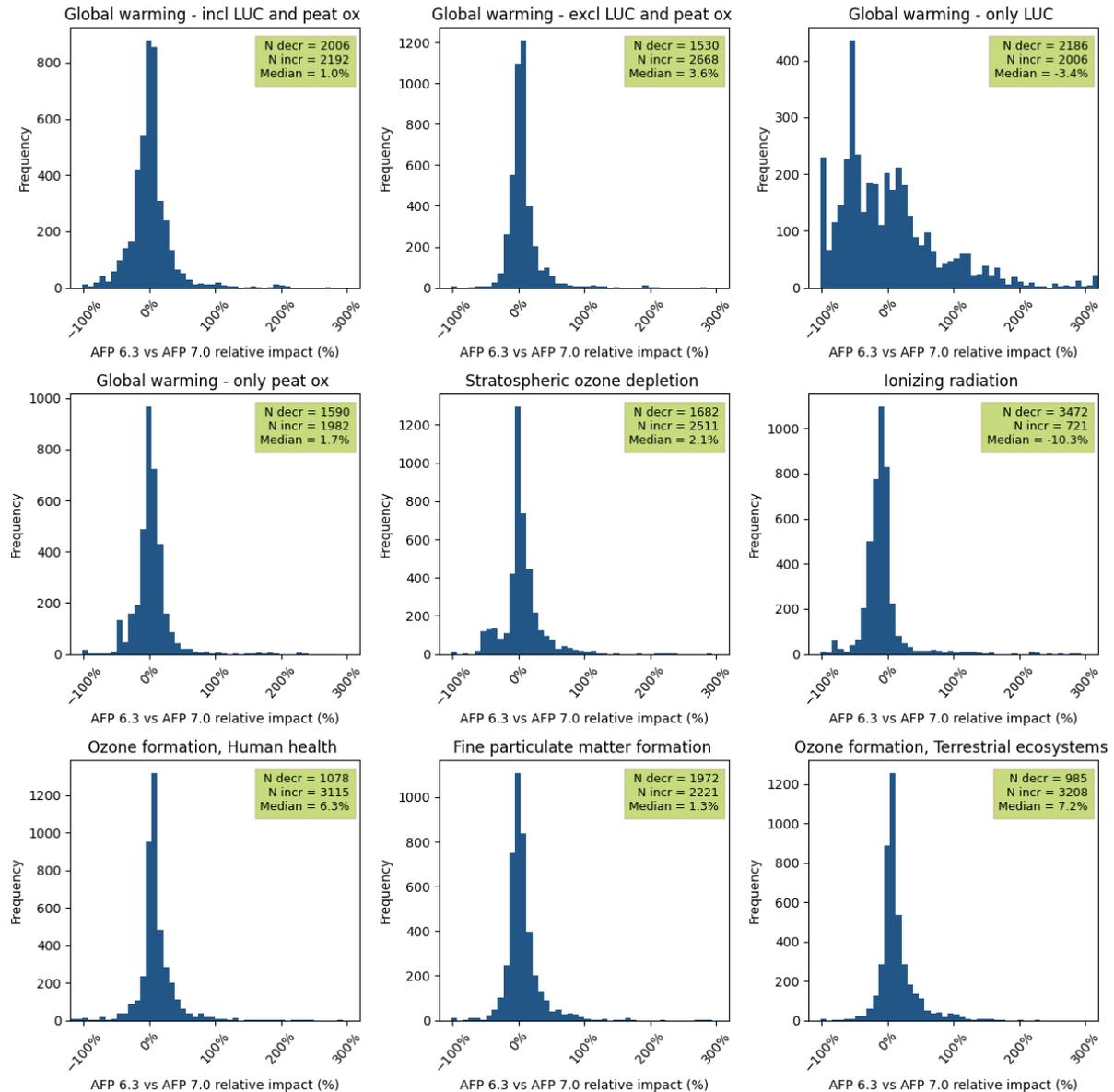


Figure 1: Histograms over relative changes for impact categories that were present in both AFP6.3 and AFP7.0, excluding background processes and transport processes. Processes at the 0% line have no difference in impact between AFP6.3 and AFP7.0. The text box indicates the number of processes that decrease (n decr) or increase (n incr) in impact score and median values.

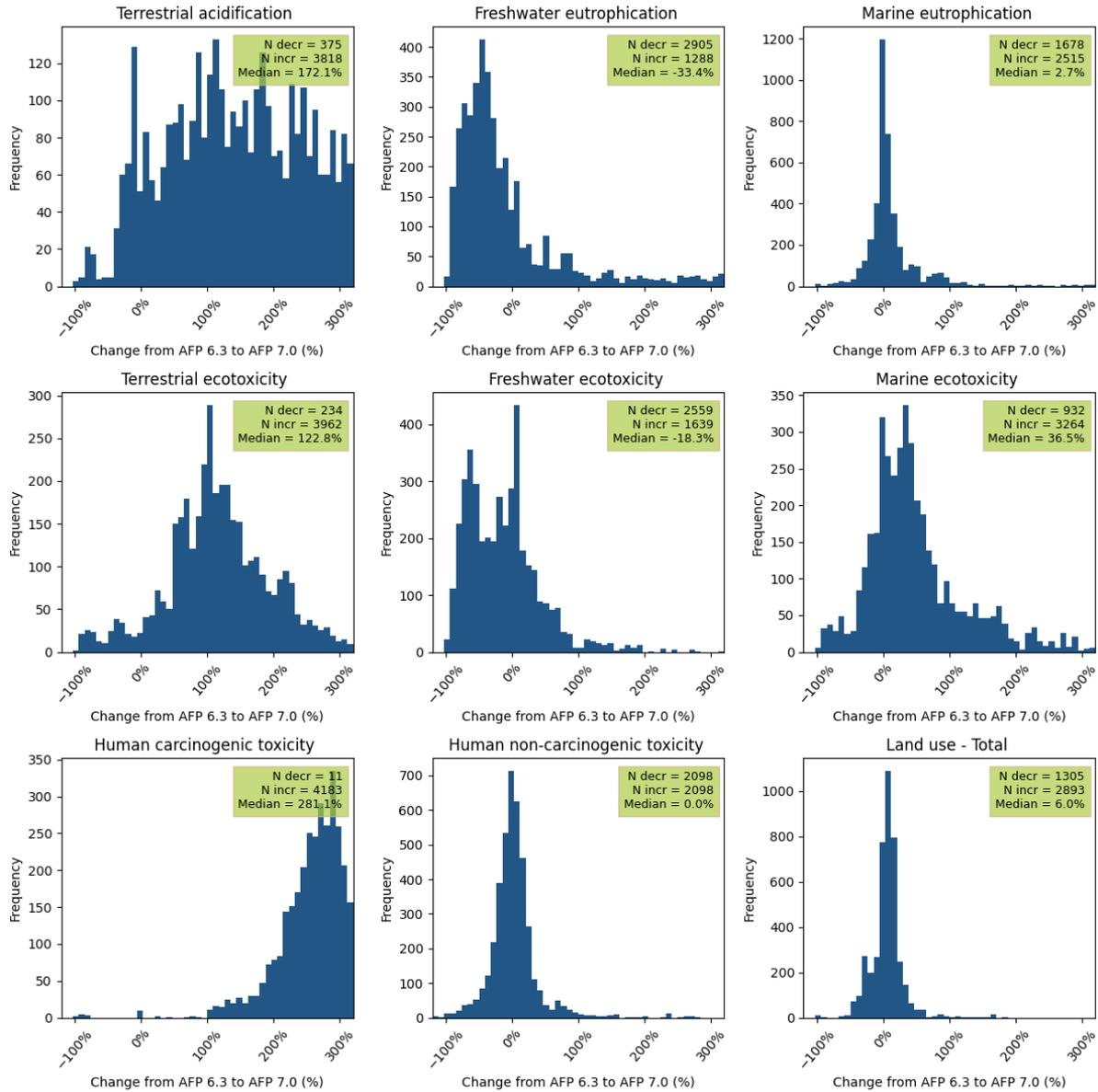


Figure 2: Histograms over relative changes for impact categories, continued.

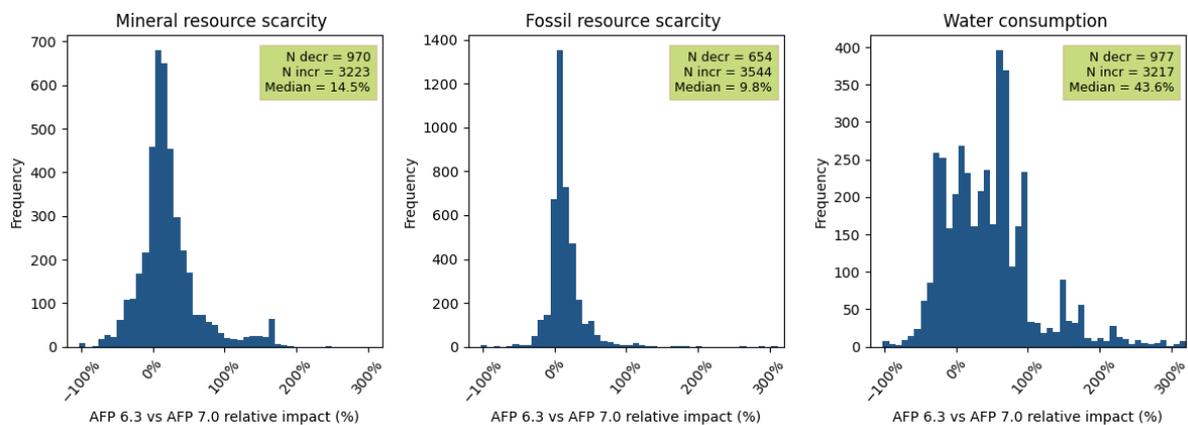


Figure 3: Histograms over relative changes for impact categories, continued.

2.1 Global warming

The global warming impact consists of 3 different categories. In general, the changes in the global warming were mainly caused by the updated datasets with more recent data and the update in characterisation factors of the ReCiPe 2016 Midpoint (H) method version 1.07 & 1.09.

2.1.1 Excluding peat & LUC

This subcategory mostly looks at Greenhouse Gases (GHG) emissions not related to peat oxidation or land use change. These are mostly based on background dataset updates. Using the new IPCC 2019 characterization factors also affects this impact category. There is a small increase here, which may be explained by a combination of these factors.

2.1.2 Peat oxidation

No new methodological changes were made to the peat oxidation models. The average decrease in global warming could be mainly related with the CSEI methodology.

2.1.3 Land use change

The updated values for global show high variability warming due to some interactions in how the land use change emissions are calculated. This is caused by crop cultivation differences on a year-to-year basis. The way land use and land use change emissions are calculated according to the PAS50, is based on the comparison between the crop area from the most recent 3-year-average and the 3-year-average 20 years before that. This is shown in Equation 1. This does mean that land use change emissions for a certain crop 10 years ago could now be represented by another crop for this year, leading to a high volatility in the LUC data.

Equation 1: Crop expansion (%) calculation.

$$\text{Crop expansion(\%)} = \frac{\text{Area}_{\text{Year}} - \text{Area}_{(\text{Year} - 20)}}{\text{Area}_{\text{Year}}}$$

2.2 Other impact categories

Table shows the categories differences between AFP 6.3 and 7.0. This is based on the histograms shown in Figure 1, Figure 2 and Figure 3. The median change shows how much of an increase or decrease there is found overall within this impact category. The table also shows a qualitative measure of how large the distribution of the changes within each impact category are, smaller distribution here means that most of the change found is close to the median value, while a larger range means more deviation from the median. Finally, Table shows the expected cause of change ([Methodology Report Part 2](#)). Most impact categories show that the statistical data update is a significant factor for the change. This includes, among others, crop yields, which will affect all impact categories directly.

Table 1: Differences between AFP6.3 and 7.0 represented in compared impacts. Median change and distribution of change are shown, as well as reasons why these changes occur.

<i>Impact category</i>	<i>Median change (%)</i>	<i>Distribution of change</i>	<i>Expected cause of change</i>
Stratospheric ozone depletion	2%	Small	Statistical data update
Ionizing radiation	-10%	Small	Statistical data update, Background data update
Ozone formation, human health	6%	Small	Statistical data update
Fine particulate matter	1%	Small	Statistical data update
Ozone formation, terrestrial ecosystems	7%	Small	Statistical data update
Terrestrial acidification	172%	Large	Statistical data update
Freshwater eutrophication	-33%	Large	Statistical data update
Marine eutrophication	3%	Small	Statistical data update
Terrestrial ecotoxicity	123%	Large	Statistical data update
Freshwater ecotoxicity	-18%	Medium	Statistical data update
Marine ecotoxicity	36%	Medium	Statistical data update
Human carcinogenic toxicity	281%	Medium	Statistical data update
Human non-carcinogenic toxicity	0%	Small	Statistical data update
Land use	6%	Small	Statistical data update
Mineral resource scarcity	15%	Small	Statistical data update
Fossil resource scarcity	10%	Small	Statistical data update
Water consumption	44%	Large	Statistical data update

2.3 Data Updates impacts

The crop yield and applied manure (swine and poultry) are analyzed to understand the impact generated by these 2 datasets. To illustrate it, we decided to change the yield and analyze the impact results, the same logic was applied to manure (swine and poultry). The results of this iteration are shown below.

2.3.1 Crop yield update

Yield is a critical variable that significantly influences the environmental impact emissions associated with crop production. This influence extends throughout the agricultural value chain and into downstream processes that utilize crop outputs (such as grains, straw, husks, and other products).

Crop yields are highly susceptible to a vast array of global circumstances, including local climate variability, soil health dynamics, the prevalence of pests and diseases, specific management practices, and socioeconomic factors. These complex interactions can lead to considerable fluctuations (increases or decreases) in reported yields, making it challenging to attribute performance to a single cause or to provide a universal explanation for every outcome.

In this context, we will not be attempting to address or explain the multifaceted reasons behind yield variability. Instead, our primary focus is on a structured analysis: we aim to observe and quantify the relationship (or lack thereof) between the achieved yield levels and the resulting impact emissions of the crop production, at farm. To assess the impact of the yield update, we model a fully consistent AFP 7.0 scenario and compare it against an alternative AFP 7.0 run that uses the yield from AFP 6.3. By keeping the model version constant and changing only the yield inputs, any differences in the results can be directly attributed to the update in yield values.

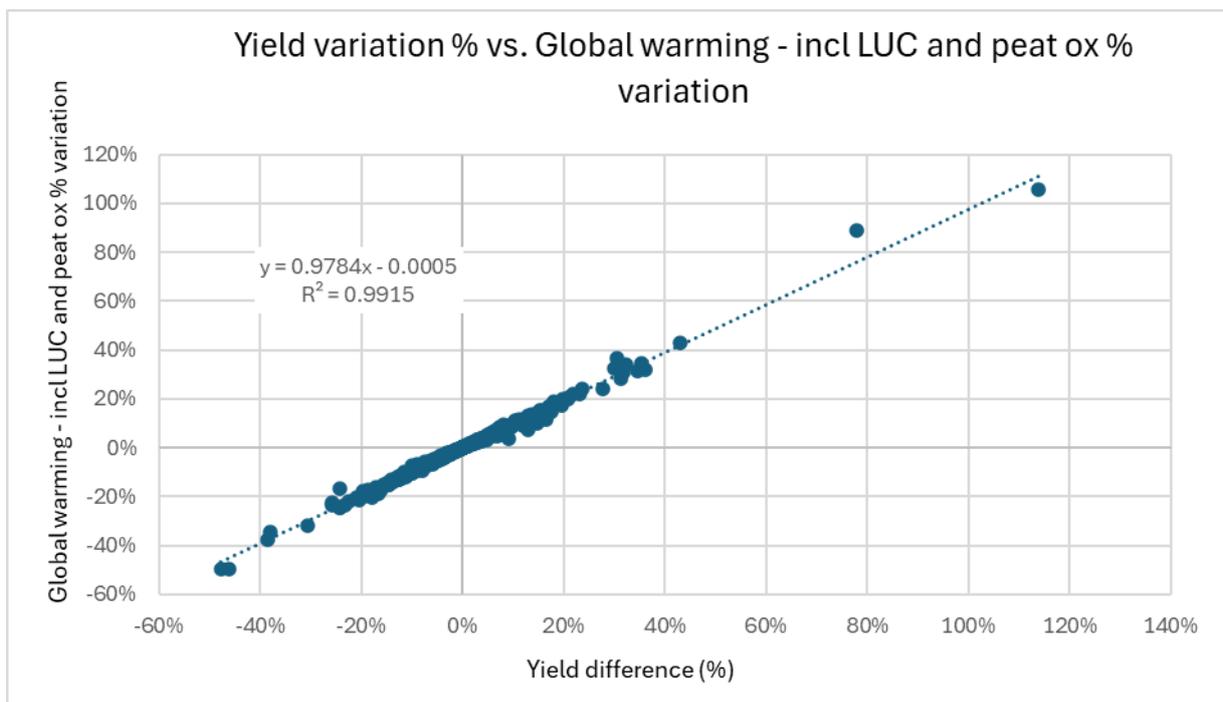


Figure 4: Dispersion graphic of the relation between the difference in the yield (AFP 6.3 vs 7.0) after the update of the data, and the impact on Global warming - incl LUC and peat ox % variation.

As we can observe in Figure 4, the increase or decrease in the Global warming (including LUC and peat) is highly related to the variation on the crop yield, increases on the yield may predict a decrease in the total emissions, while a reduction in the yield generates an increase on the emissions. If we analyze the impact of the yield on Global warming - incl LUC and peat ox., we can conclude that the 0.3 % of the total changes between versions can be explained by the yield data change.

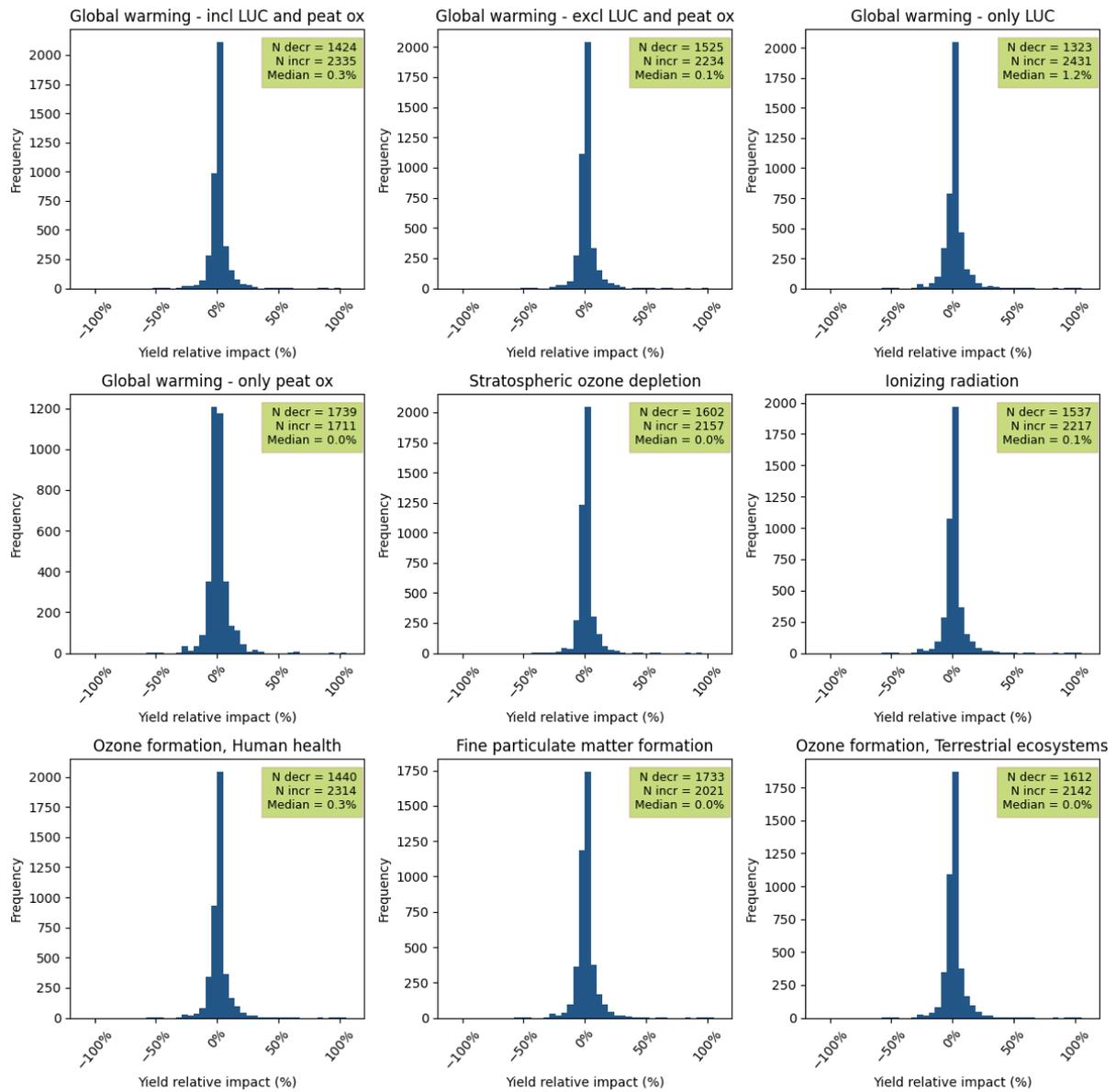


Figure 5: Histograms over relative changes for impact categories by the yield data change, excluding background processes and transport processes. Processes at the 0% line have no difference in impact between AFP6.3 and AFP7.0. The text box indicates the number of processes that decrease (n decr) or increase (n incr) in impact score and median values.

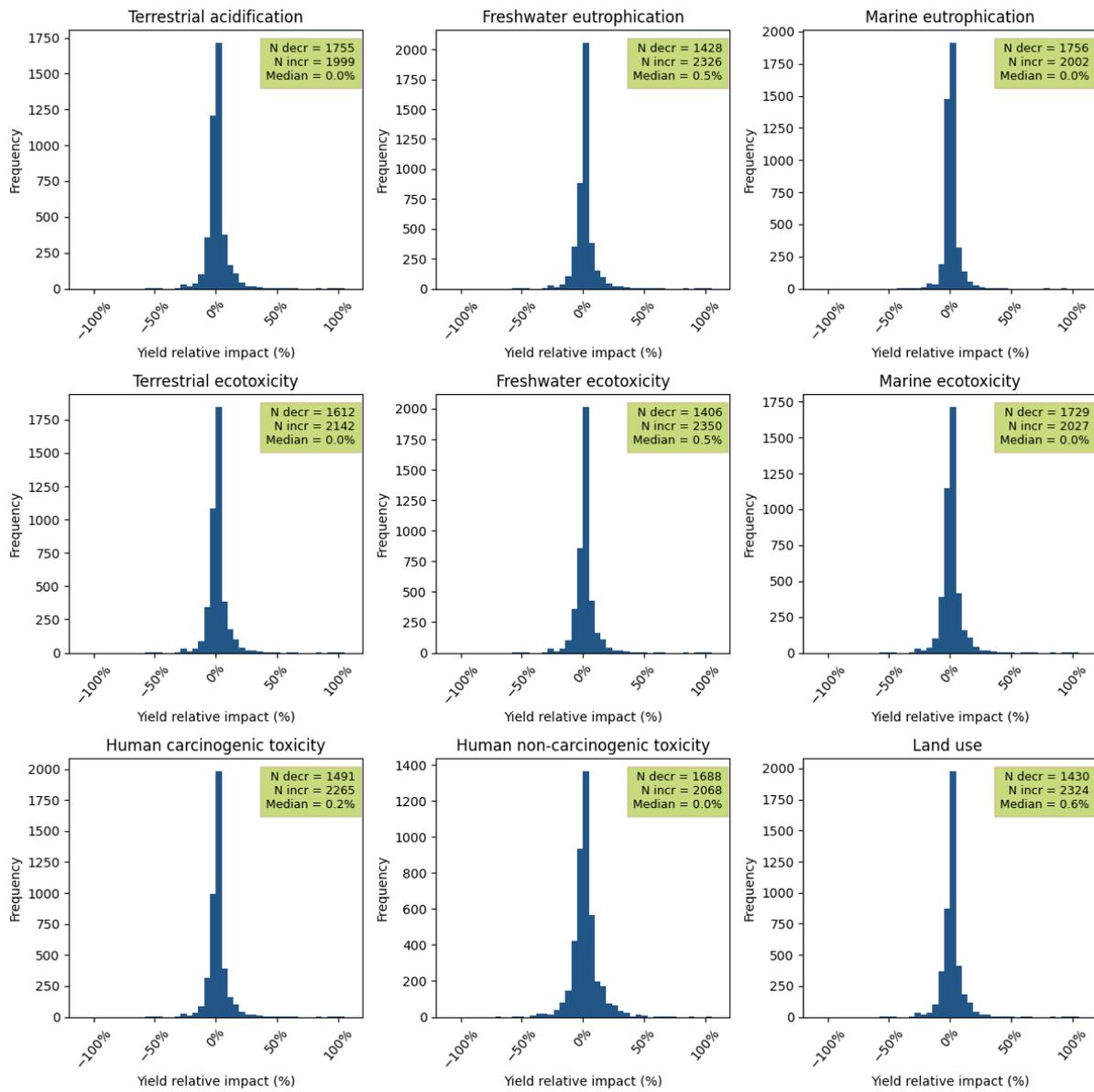


Figure 6: Histograms over relative changes for impact categories by the yield data change, continued.

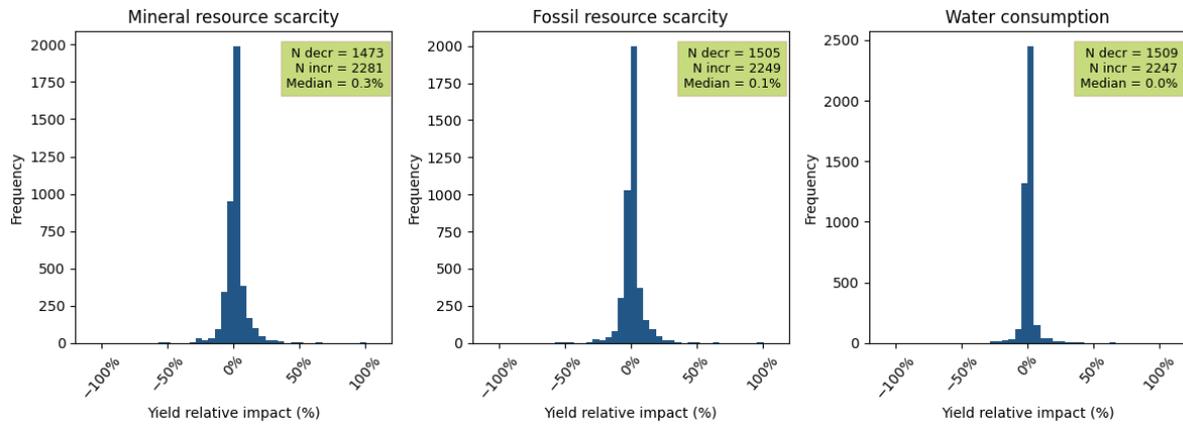


Figure 7: Histograms over relative changes for impact categories by the yield data change.

2.3.2 Manure update

The Manure is composed by Poultry and Swine manure types; it is important to mention that both are updated at the same moment. In Figure 8 and Figure 9 a comparison between versions of the kg/ha of Manure applied is performed. The differences and impacts are represented in percentage (%), with the intention to simplify the analysis of them.

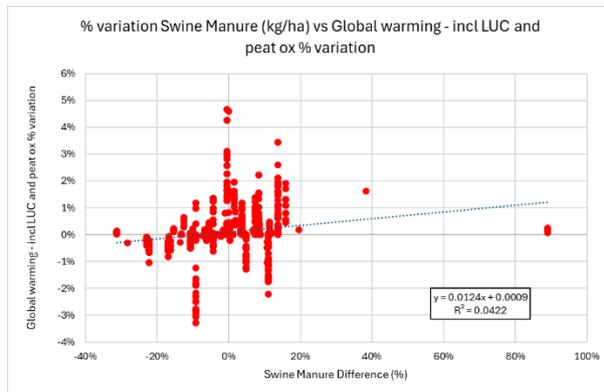


Figure 8: Dispersion graphic of the relation between the difference in Swine Manure (AFP 6.3 vs 7.0) after the update of the data, and the impact on Global warming - incl LUC and peat ox.

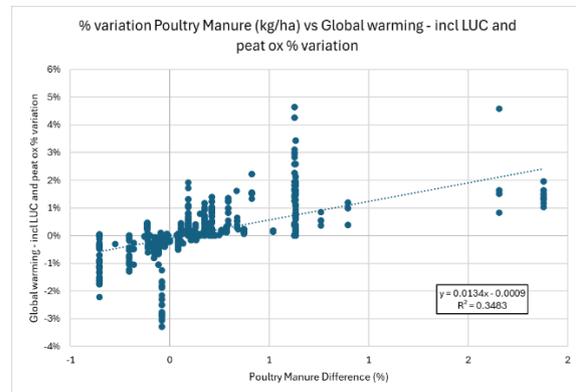


Figure 9: Dispersion graphic of the relation between the difference in the Poultry Manure (AFP 6.3 vs 7.0) after the update of the data, and the impact on Global warming - incl LUC and peat ox.

From Figure 8 and Figure 9 we can conclude that:

- Positive linear relationship increases in the amount of manure (kg N/ha) results in increases of Global Warming Emissions.
- Low R^2 (in both cases), and low sensitivity (slopes of 0.01), with large changes in the amount of manure, low changes in emissions can be expected, showing a low dependency on changes in manure levels.
- The variation in the Global Warming Emissions is between -3.28 %, and 4.65%.
- Manure applied (kg/ha) variation ranges is bigger for Poultry, presenting values from -35% to +188%, while for Swine the variation registered goes from -31% to +89%. This difference adds more weight to the Poultry manure

In Figure 10, Figure 11 and Figure 12, we can observe that the relevance on the impacts generated by the changes on the manure are not highly relevant to the database.

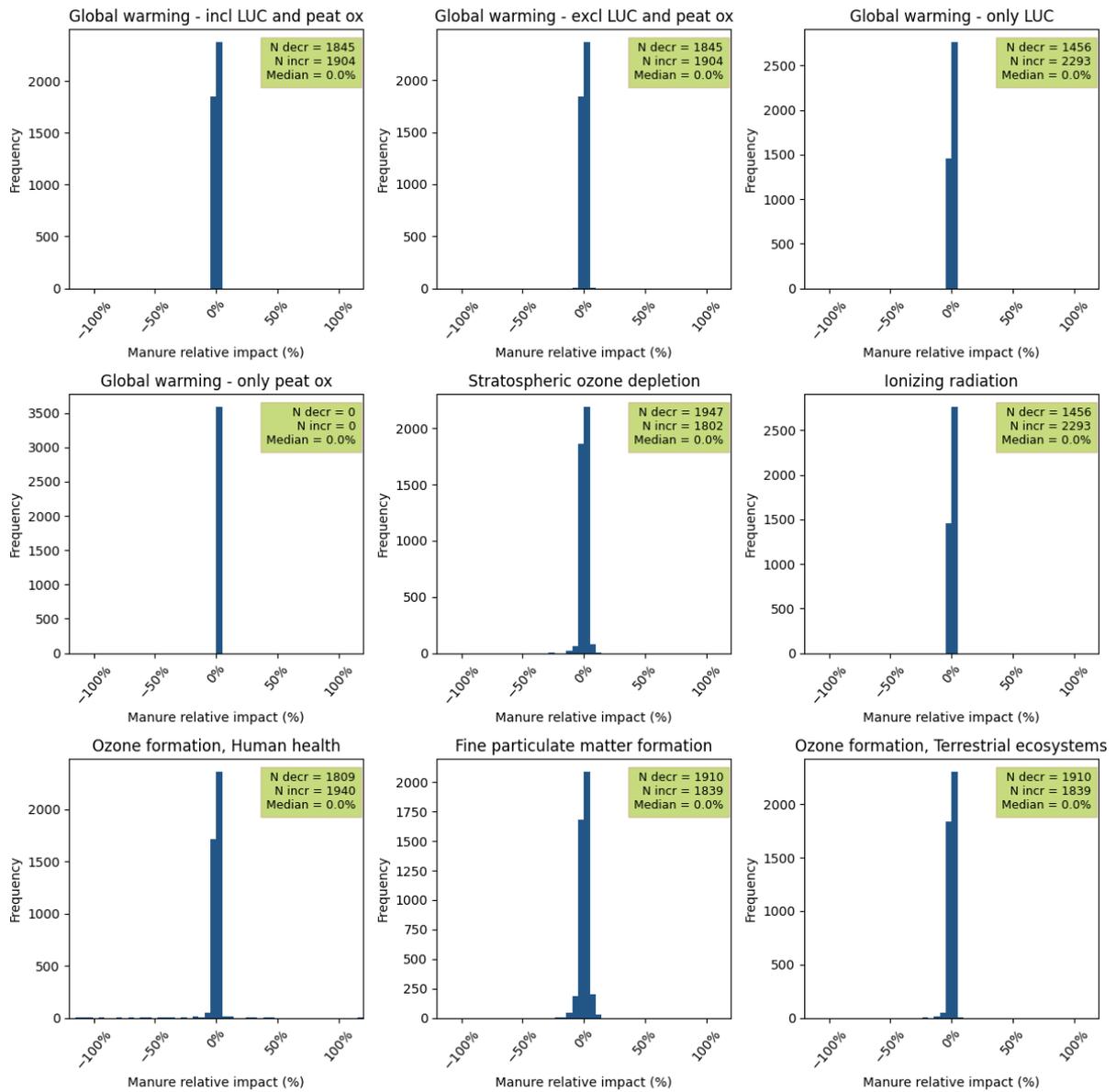


Figure 10: Histograms over relative changes for impact categories by the manure (Swine and Poultry) data change.

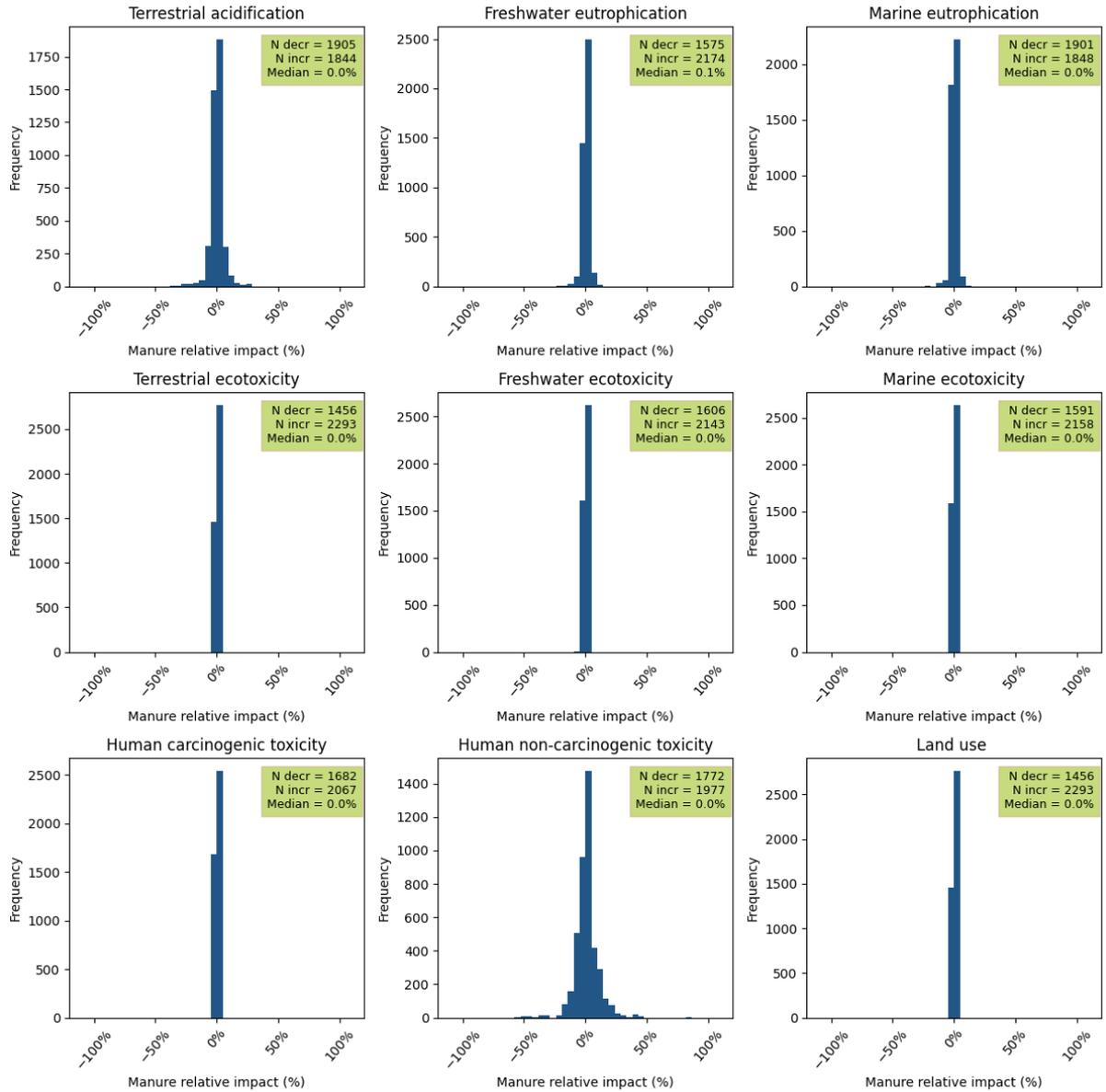


Figure 11: Histograms over relative changes for impact categories by the manure (Swine and Poultry) data change.

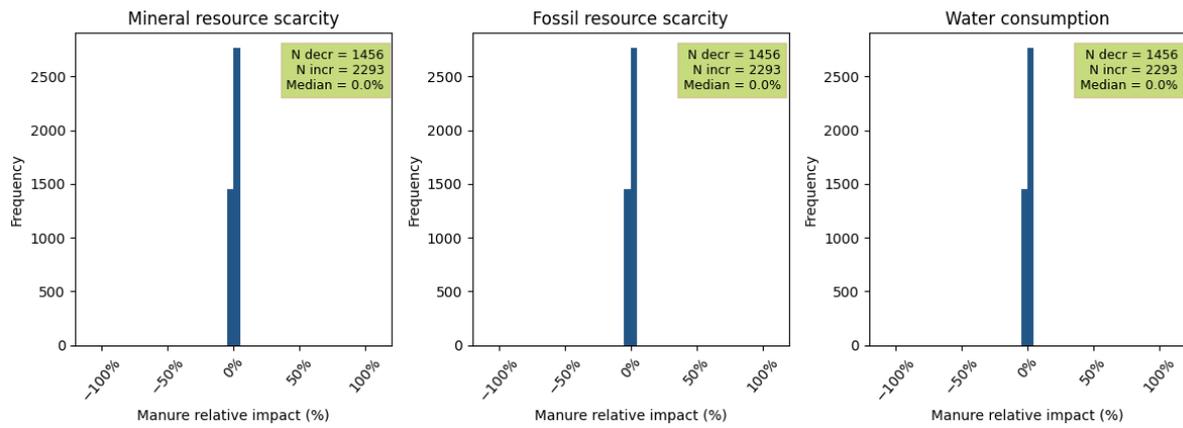


Figure 12: Histograms over relative changes for impact categories by the manure (Swine and Poultry) data change.

3. Product comparison

In this chapter, we take an in-depth look at various highly produced feed products and explore how changes in activity data, modelling updates, background processes and other changes from Agri-footprint 6.3 to Agri-footprint 7.0 affect the global warming impacts of these products. The products considered are Wheat grain cultivation in Germany, Maize cultivation in the United States, Soybeans cultivation in Argentina.

3.1 Wheat grain cultivation in Germany

In Agri-footprint 7.0, the total climate change impact of wheat cultivation in Germany has increased from 0.417 kg CO₂e to 0.436 kg CO₂e per kg of wheat grain produced at farm. This change is due to updates in the statistical data used in the calculations and the CSEI effect.

The activity data per hectare has not changed much for most data points, but there are a few small differences. The yield per hectare has decreased from 7735 to 7354 kg/ha and the co-product yield decreased from 3254 to 3093 kg/ha according to FAO statistics used for Agri-footprint 7.0 (FAO, 2024). As a result, small changes in activity data occur in energy use, manure application and pesticide use, which are all based in part on yield data.

The environmental impact per kg of product is shown in the contribution analysis below:

Table 2: Contribution analysis of wheat grain cultivation in Germany, impact as carbon footprint emissions per kg of product.

Product: 1 kg Wheat grain, at farm {DE} Economic

Allocation AFP 7.0	Allocation AFP6.3
86.38%	86.38%
Allocation coproduct AFP 7.0	Allocation coproduct AFP6.3
13.62%	13.62%

Overview	CC impact	Yield (kg/ha)
AFP 6.3	0.417	7735
AFP 7.0	0.4362	7354
Difference	0.0192	-381
Relative difference (%)	4.9	-4.6

Product impacts (per kg of output)	Agricultural	Transport	Energy	Fertilizer production	Pesticides	Manure	Other	LUC	Peat ox.	Total
AFP 6.3	0.227	0.00702	0.0068	0.0356	0.0205	0	0.0215	0.00279	0.096	0.417
AFP 7.0	0.186	0.00692	0.048	0.0572	0.0017	0	0.026	0.00028	0.11	0.436
Relative difference (%)	-17.99	-1.38	610	60.60	-91.75	0	20.98	-90.14	14.82	2.37

There are strong differences in increase or decrease depending on which activity data is considered. The non-land use change and non-peat oxidation at-farm emissions have decreased significantly, while the transport has decreased slightly. There is a strong increase in emissions related to energy and fertilizer production. A very strong decrease in land use change emissions can also be seen, which matches the findings in 2.1.3. Overall, there is only a slight increase noted in wheat grain from Germany.

3.2 Maize cultivation in the United States

The climate change impact of maize cultivation in the United States has increased from 0.273 kg CO₂e in Agri-footprint 6.3 to 0.302 kg CO₂e in Agri-footprint 7.0.

The main difference on a per hectare basis is the decrease of the yield from Agri-footprint 6.3 to Agri-footprint 7.0 due to an update in FAO data. This affects all other parameters, directly increasing the impact per kg of maize at farm.

The decrease in yield explains a small part of the increases for emissions related to the specific activity data. An increase in fertilizer use per kg output explains both the increase in the at-farm emissions and the emissions related to fertilizer production. Finally, there is a strong increase in land use change emissions. This is related to the land use change methodology, as noted in 2.1.3.

Table 3: Contribution analysis of Maize cultivation in the United States, impact as carbon footprint emissions per kg of product.

Product: 1 kg Maize, at farm {US} Economic

Allocation AFP 7.0	Allocation AFP 6.3
94.67%	94.67%

Allocation coproduct AFP 7.0	Allocation coproduct AFP 6.3
5.33%	5.33%

Overview	CC impact	Yield (kg/ha)
AFP 6.3	0.2731261	11040
AFP 7.0	0.3019032	10860
Difference	0.0288	-180
Relative difference (%)	11%	-2%

Product impacts (per kg of output)	Total	Agricultural	Transport	Energy	Fertilizer	Pesticides	Manure	Other	LUC	Peat
AFP 6.3	0.273	0.153	0.00514	0.0389	0.0497	0	0	0.0136	0.00185	0.011
AFP 7.0	0.302	0.16	0.0055	0.0438	0.0611	0	0	0.0164	0.00316	0.0118
Relative difference (%)	10.54	4.77	6.91	12.71	22.89	0	0	20.94	70.32	7.67

3.3 Soybean cultivation in Argentina

The climate change impact of soybean cultivation in Argentina has decreased from 4.47 to 1.00 kg CO_{2e} / kg product.

The biggest change is seen in the land use change emissions and fertilizer. There is also a slight decrease in yield, increasing impacts for all activity data. The decrease in land use change emissions is due to the land use change methodology, as described in section 2.1.3. This explains how this methodology can sometimes cause large variations such as these.

Table 4: Contribution analysis of Soybean cultivation in the Argentina, impact as carbon footprint emissions per kg of product.

Product	Soybeans, at farm {AR} Economic	
Allocation AFP 7.0	Allocation AFP 6.3	
96.56%	96.56%	
Allocation coproduct AFP 7.0	Allocation coproduct AFP 6.3	
3.44%	3.44%	

Overview	CC impact	Yield (kg/ha)
AFP 6.3	4.4741097	2890
AFP 7.0	1.0000222	2828
Difference	-3.4741	-62
Relative difference	-78%	-2%

Product impacts (per kg of output)	Total	Agricultural	Transport	Energy	Fertilizer	Pesticides	Manure	Other	LUC	Peat
AFP 6.3	4.47	0.166	0.0039	0.0852	0.00447	0	0	0.0451	4.17	0.000862
AFP 7.0	1	0.156	0.00284	0.0933	0.00031	0	0	0.0533	0.69	0.000839
Relative difference	-77.65%	-5.81%	-27.24%	9.50%	-93.12%	0%	0%	18.11%	-83.37%	-2.63%

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