Annex Challenging biomonitoring

Eggs of backyard chicken eggs Harlingen 2013 - 2024

In perspective with the previous analyse results of TW biomonitoring in 2013, the results of the eggs of backyard chicken collected in 2024, show (in the middle of all results), that dioxins after 12 years still occur in the mainly agricultural area of the Northwest of the province of Frisian. The graphs below, representing the results by analyse methods bioassay DR CALUX, followed by a graph of the results of the chemical/GC-MS analysis. Both indicating there is still a source(s) of dioxins in the surrounding environment of the WtE waste incinerator REC, in Harlingen, NL.

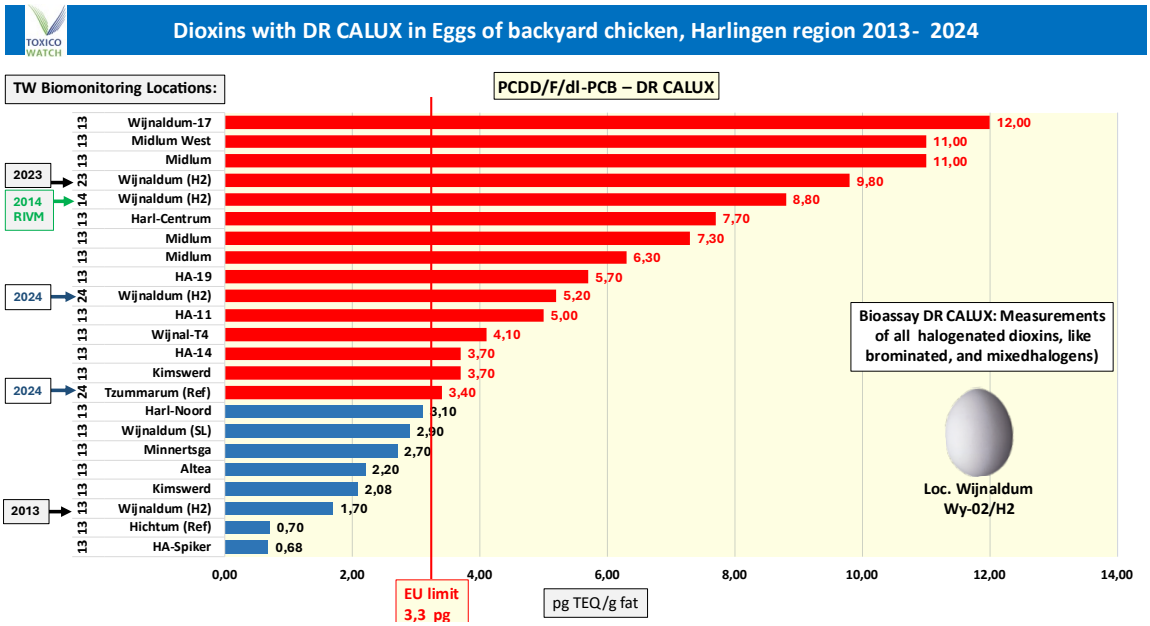


Figure 1: Dioxins in eggs (DR CALUX)

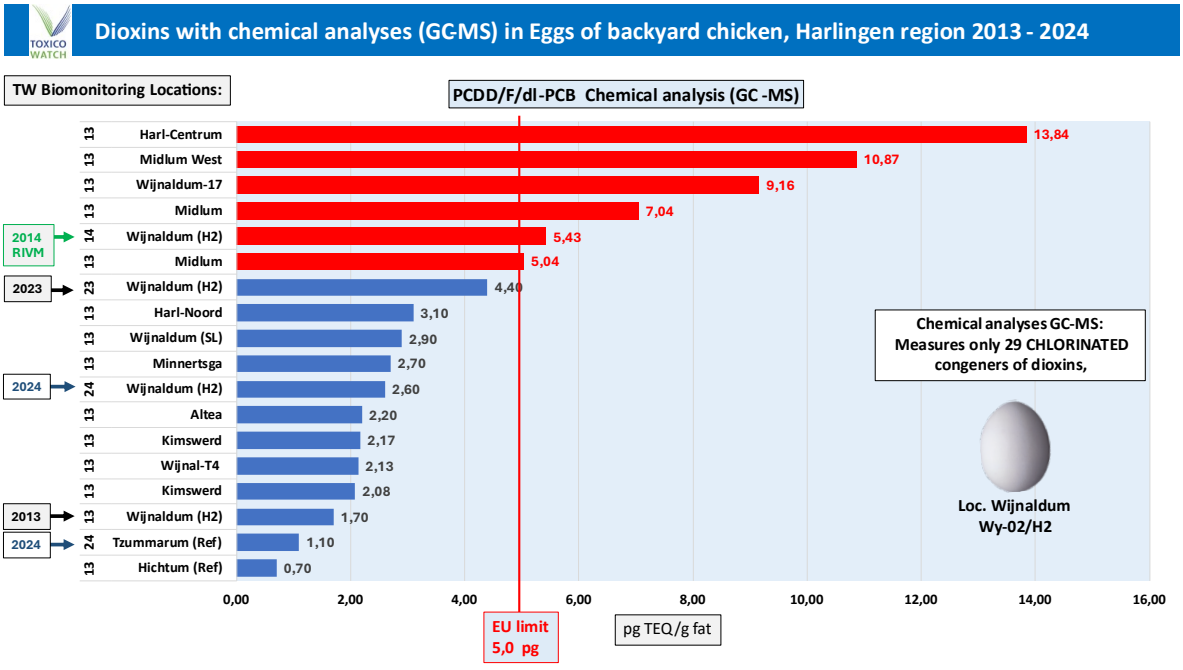


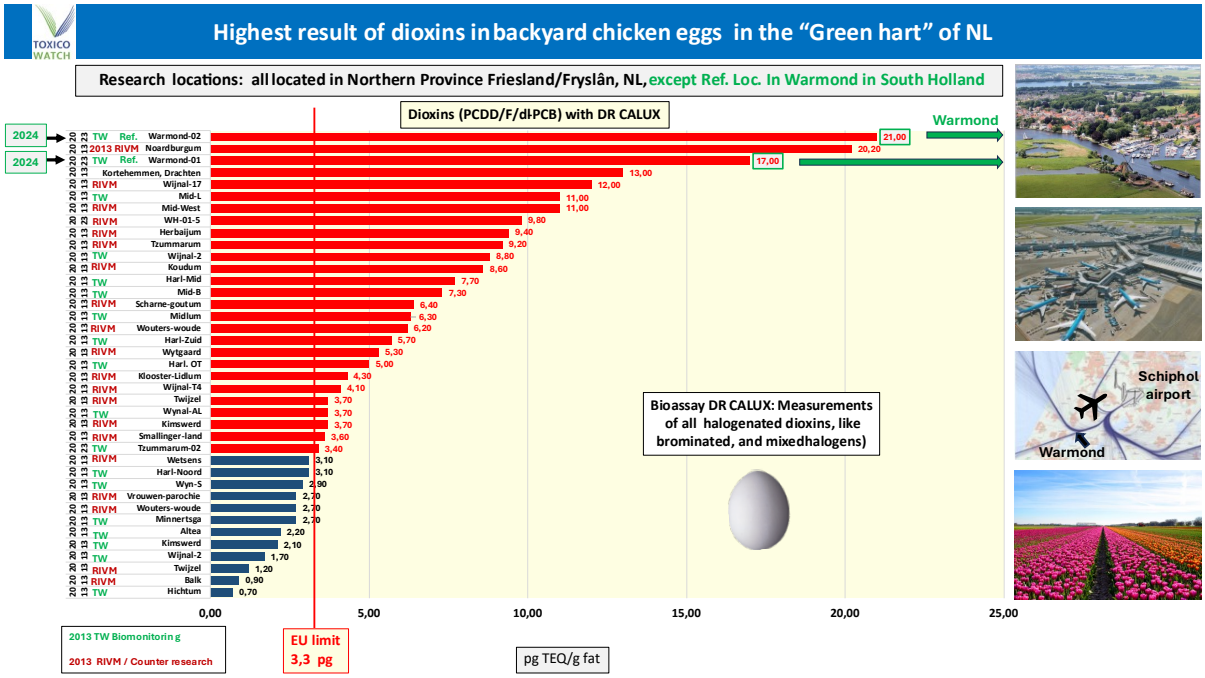
Figure 2: Dioxins in eggs (GC-MS)

Reference location 2024 in the green heart of the Netherlands

For the interest of (biomonitoring) research, a question of importance is: Which sample location could be of use as a reliable reference, (in case of i.e. dioxin analyses in eggs of backyard chicken)? In the 'green heart' of the Netherlands, in the Province of South Holland, specifically in the village of Warmond, at a historic estate with two private gardens of hundreds years old of existence, backyard chickens are held for private egg consumption. TW collected these chicken eggs in February 2024, initially to use as a reference for NL Biomonitoring research on POPs. The results, 21 pg TEQ/g fat, really turned out to be the highest of all our measurements in the Netherlands (in the figure below). This case shows that a reference location for dioxins is not easy to find, since dioxins (PCDD/F/dl-PCB) can be found even at unsuspected locations as seemingly pristine historic sites. In the case of Warmond, there are several possibilities that could be count a source of the high results these backyard chicken eggs, namely:

1. The intensive air flight traffic of the relative nearby located (25 km distance) international airport Schiphol, Amsterdam, with arriving and incoming fly records every 40 seconds.
2. The extensive flower (bulb) cultivation on the nearby farmlands in this Province region since the 1900s, which involves the heavy, frequently use of pesticides up to now. This historic locations are planted with high, old (< 200 years), mature trees and therefore assumed that the influence of nearby commercial bulb cultivation would be of less interference.[1]
3. Use of white paints (containing lead, Pb), for years in the green class houses in the summer to protect the plants inside, in the years 1960-2000. The present owner used the ruin of what once was the green glass house as the chicken enclosure, which is situated it in the natural park garden.

This example of taking reference samples at an historic mansion location, shows the challenge to find a good reference location. In the next chapter, another example performed by the RIVM/NL will be discussed.



[1] *https://www.rivm.nl/bestrijdingsmiddelen/onderzoek-bestrijdingsmiddelen-en-omwonenden*

Dioxins in milk

Some remarks must be made at the ongoing biomonitoring research of the waste incinerator in Harlingen, by the Wageningen University & Research (WUR). This study is also interpreted as a health indicator for the citizen of Harlingen. Maar is het voldoende om de uiterst giftige dioxinen te meten met een kopje melk bij een boer. In this study, dioxins are monitored by collecting one (1) milk sample from one (1) dairy farm location at 5 km distance of the waste incinerator REC for two times a year (2x/year). The WUR report shows the chemical analysis (GC-MS) result of 0.276 pg TEQ/g fat in a graph with a limit of 5 pg TEQ/g fat for the sum of dioxin (PCDD/F/dl-PCB). However, is this conclusion correct for the safety of people? To elaborate further, does the analysis of a solitary sample from a single location provide sufficient information to conclude that the environment is safe for human health in the case of dioxins?

In 2018, the European Food Safety Authority (EFSA) adjusted the tolerable daily intake (TDI) of dioxins by a factor of seven (7). The TDI of dioxins is in 2025, 0.25 pg TEQ/kg body weight (bw)/day.

A straightforward illustration demonstrates that consuming a glass of milk in Pietersbierum (5 km distance of REC) can surpass the tolerable daily intake. In Harlingen, the WUR measured a value of 0.276 pg TEQ/g fat. Consuming a glass of whole milk with a sandwich of cheese and dairy butter would easily exceed the limit 0.25 pg TEQ/kg bw/day. This example underscores the inadequacy of the prevailing safety limits in safeguarding the public against the hazards posed by dioxins emissions into the environment. It is also important to note that milk, dairy and egg products only account for a part of the total dioxin intake by human consumption (EFSA, 2018).

This means that the European food regulations for dioxins (PCDD/F/dl-PCB) must be updated, for it to meet the safety tolerable intake as formulated by EFSA. The safety standards for dioxins for food and feed give a false perspective of safety. It serves the industry, but not the health of the people and its environment, If these limits are not thoroughly adjusted.

WUR research on fluor

Biomonitoring measures on POPs/PFAS, needs to be implement in waste incineration monitoring protocols, to improve the understanding of health risks and POP emissions The incinerator can be a source, because of combusting PFAS content in waste, see figure below-waste. However, the applications of PFAS as pesticides or additives can be a potential source as well. In this regard, it is noteworthy that a monitoring programme conducted by the REC/LTO, which has been acknowledged by the government, does not employ the appropriate tools to measure PFAS. Based on this WUR/LTO Air-monitoring-programme, the general conclusion of the (local/Provincial) Governments and the management of the REC "there is nothing wrong with the air in Harlingen area and all is well under control" solely based on some 'lime-paper-analyses' is not sufficient and a solid research.

Biomass incineration

In the course of biomonitoring studies, TW has been confronted on several occasions with government and/or industry studies that claim that there is no link to incinerator emissions because dioxins are everywhere. This was also the case in 2016, when a national survey by the RIVM found dioxins everywhere and therefore could not be related to waste incinerator emissions.

In 2019 TW get the location data after legal proceedings. A review of the RIVM study (Hoogenboom et al., 2016) based on this location data revealed another conclusion. The data shows a relationship of increased dioxin in eggs and biomass incinerators (see figure). Emissions of dioxins by biomass incinerators need to be further investigated (as discussed with RIVM, dr. R. Hoogenboom, 2019). However, this has still not yet been followed up.

The fact that C-wood, collected at municipal waste/recycling hand-in locations, is NOT allowed, by Dutch national regulations, to be burned/destructed at MSW incinerators, like the latest build state-of-the-art waste incinerator REC in Harlingen, with required combustion temperatures of 850°C for at least 2 seconds in PCZ. A representative of Omrin has confirmed to TW that treated wood contaminated with toxic chemicals, such as C-wood, collected at designated public waste and recycling facilities, is incompatible with the state-of-the-art WtE REC facility. This advanced facility operates at an incineration temperature of 850°C and is equipped with APCD filter systems. Instead, the contaminated wood will be incinerated in biomass plants. 'C-wood is treated wood, such as impregnated (Wolmanised/CCA) wood (garden) fences or (railway) sleepers. This wood contains biocides, heavy metals or tar and hydrocarbons (sleepers) that are harmful to people and the environment. Impregnated wood has been soaked in chemicals and is, therefore, the least environmentally friendly.'

Therefore, it is logically incomprehensible, that C-wood is allowed, by Dutch regulations, to be burned by a much less equipped biomass power plant with combustion temperatures of max 450°C and without even a required short-term monitoring of POP emissions. This everyday practise is an example of the inconsistency of regulation and enforcement concerning dioxin emission reduction of industrial facilities.

The TW study on the received RIVM data, refuted the RIVM conclusion, that the dioxin pattern would not be unique to Harlingen. There is clearly a relationship between dioxins and emissions from a waste incinerator. The fact that the elevated results of dioxins in eggs of backyard chicken in the province of Friesland/ Frisian, just occur in the close vicinity of biomass incinerator is evident. The highest dioxin value in the RIVM national survey (n-64) was in Nordburgum (Friesland). This the location where dead (bioindustry/farm and nature conservation) animals are incinerated at a Biomass-Energy-plant.

The results of this TW study on RIVM counter research data, were presented to RIVM in 2017 at location WUR university at a meeting. TW findings were taken seriously by RIVM (Hoogenboom) with the intention to investigate these outcomes by followed up research. However, this has not happened to date in 2025. Since these TW's research results were not published at that time, although they were presented at some scientific forums, is the reason to mention the biomass results in this report. As well because there are nowadays even far fewer inspections on biomass incineration plants, although warnings of health risks of this alternative 'GREEN' waste incineration was already issued in 2006.

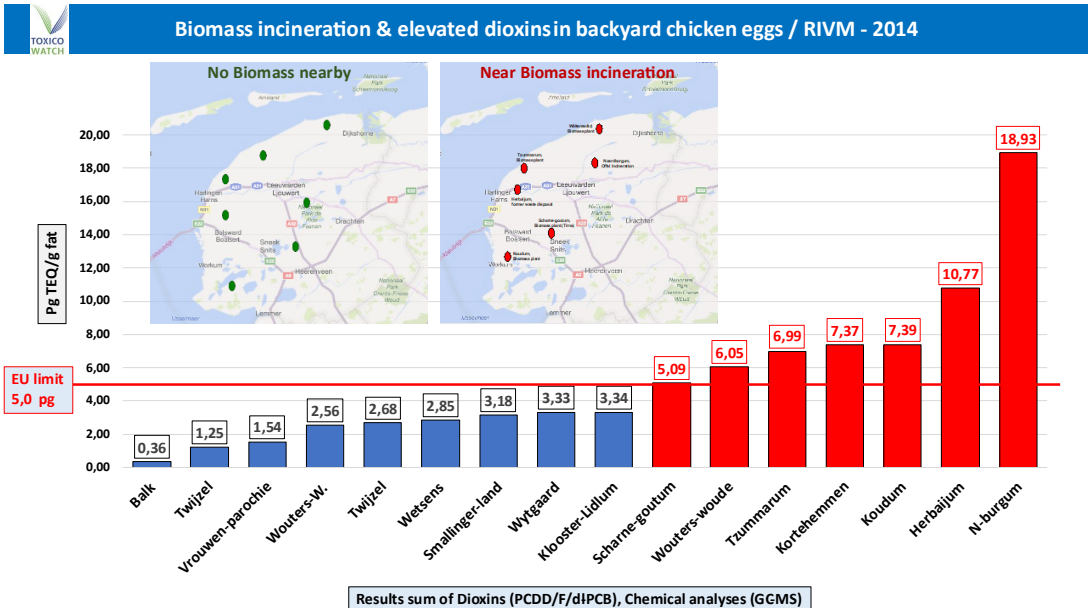


Figure 3: Biomass incineration

Biomass incinerators

The so-called 'green' biomass waste incinerators act under a much lighter enforcement policy than regular waste incinerators. Biomass plants provide an alternative route for waste deposition. For example, in the Netherlands, a waste incinerator is not allowed to burn impregnated (garden) wood. The population must pay a tax for discarding impregnated garden fences when brought to municipal collection points, but the treatment of processed/impregnated garden wood is worrisome. According to a municipal spokesperson, treated wood (mostly containing Wolman salts with 2,4-Dinitrophenol, Sodium arsenate, Sodium chromate, and Sodium fluoride) must be delivered to such designated biomass incinerators. However, this with toxic chemicals treated wood, will be incinerated at much too low temperatures, which is equipped with much less efficient filter systems aimed to destroy the so-called 'Substances of Very High Concern' (S

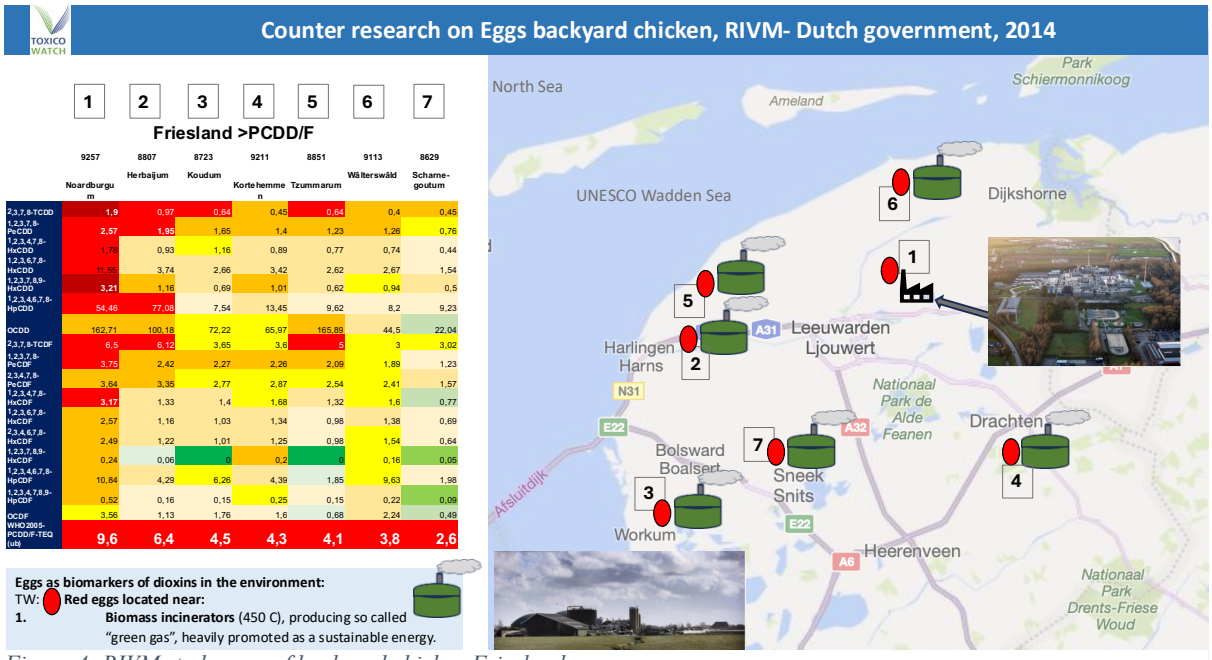


Figure 4: RIVM study eggs of backyard chicken Friesland

Dioxins in grass in surrounding area WtE REC, 2014 - 2024

Another government study needs to be reviewed and corrected. In September 2024 TW collected grass samples in the vicinity of Harlingen and analysed these samples for dioxins (PCDD/F/dl-PCB). The results of these grass samples were much lower than the RIVM measured in March 2014 (2014-3), March 2015 (2015-3) and December 2015 (2015-12).

The results of this grass research (RIVM 2014-2015) show high levels of PCDD/F/dl-PCB. The conclusion, was however, no deposition of dioxins from the incinerator was found. In the interpretation of this report, RIVM used reference data from the Lickebaertpolder, not far from the site of the largest waste incinerator in the Netherlands (AVR, Rotterdam (Traag et al., 2006; RIVM, 2018b).

With the application of the right reference data, a problem of high dioxin emissions from the incinerator to the environment is visible (see figure 21). The actual emissions by the REC were seriously underestimated, because of applying an inappropriate frame of reference, which obscured the true emissions from the waste incinerator. In other grass, such as Weber (2018) background values for grass of 0.06 pg TEQ/g dw are recommended.

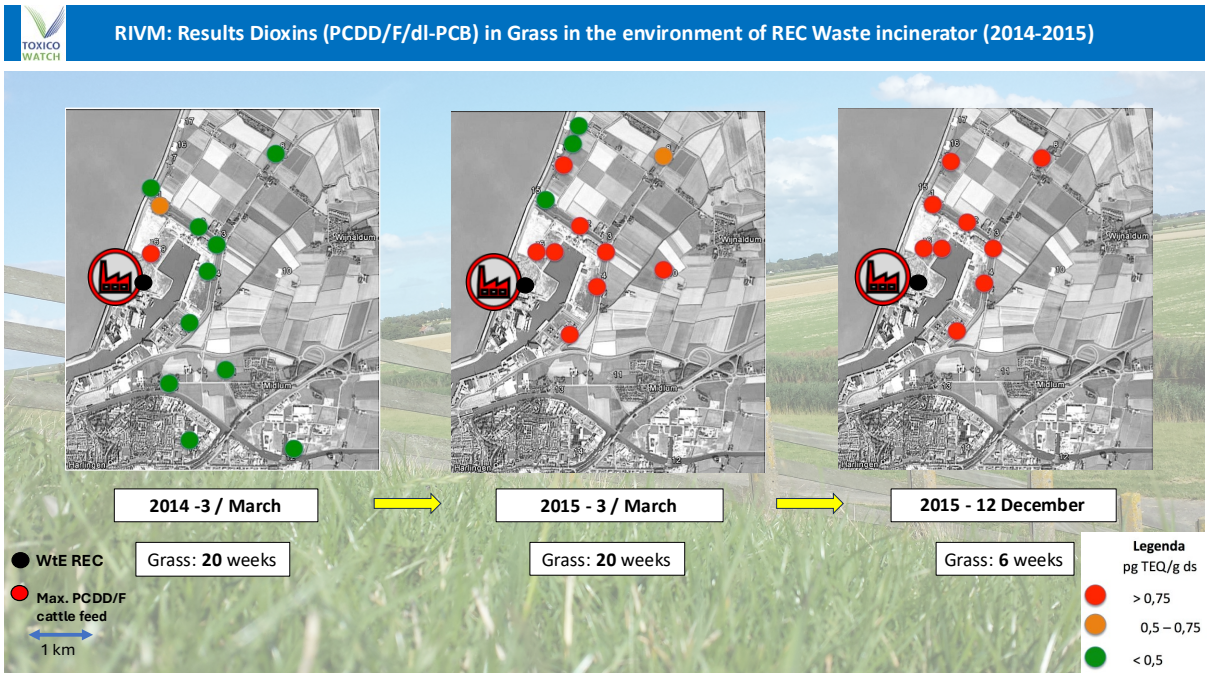


Figure 5: Dioxin Grass research 2014 – 2015 RIVM