HRI 1: A RISK INDICATOR TO PROMOTE TOXIC PESTICIDES?

Are organic pesticides hundreds of times more dangerous than synthetic chemical pesticides? "What nonsense!" you might reply. But this is exactly the result you get, when applying the Harmonised Risk Indicator 1 that the European Union intends to use for the monitoring of the 50% pesticide reduction target under the European Green Deal.

Halving the use and risk of pesticides by 2030 is one of the key measures under the European Green Deal to halt biodiversity loss and promote healthy ecosystems. In its effort to make this target measurable and binding, the EU Commission has proposed[1] the Harmonised Risk Indicator 1 (HRI 1) to monitor it's achievement.

The HRI 1 is a rather simple indicator calculated by combining only two variables:

1. The respective **quantities** of pesticide active substances placed on the market (in kilograms)
2. The corresponding **weighting factors (WF)**, depending on the affiliation of the pesticide active substances to one of four groups: "low-risk pesticide active substances" (WF 1), "substitution candidates" (WF 16), "not approved active substances" (WF 64) or "approved active substances that do not fall into any other group" (WF 8).

And this is where the problem lies: of the approved active substances, 80 percent are found in the group of "substances that do not fall into any other group". This applies to synthetic chemical substances from conventional agriculture as well as naturally occurring substances from organic agriculture. Since all these pesticide active substances get the same weighting factor of 8, the HRI 1 "measures" **the same risk** for one kilogram of a nerve agent, such as the highly bee-toxic insecticide deltamethrin[2], as for one kilogram of quartz sand,[3] even though the latter is obviously not hazardous.

In addition, most organic substances have different mechanisms of action than synthetic chemical substances and therefore usually require higher application rates (in the range of kilograms per hectare). In contrast, most synthetic substances achieve the expected pesticide effect already in

1 https://eur-lex.europa.eu/resource.html?uri=cellar:ea0f9f73-9ab2-11ea-9d2d-01aa75ed71a1.0001.02/DOC_1&format=PDF

2 Deltamethrin is a pyrethroid insecticide active substance from the group of authorised "active substances that do not fall into any other group" (WF 8) and is used in conventional arable and vegetable farming. Its toxic effect is based on a disturbance of signal transmission at the synapses of nerve cells

3 Quartz sand is a "pesticide active substance" authorised for organic farming, used as a repellent to prevent damage caused by game, and falls into the group of authorised active substances that do not fall into any other group (WF 8)

the two-digit gram range per hectare or below. By only taking into account the quantity of active substances sold and not **the areas treated** with these active substances, neither their **toxicity**, the HRI 1 provides absurdly incorrect assessments, as the following examples show.

Example 1: Control of powdery mildew in viticulture

SULFUR is authorised in organic viticulture for the control of powdery mildew. The application rate is 6.4 kg/ha (as a maximum)[4], according to the Austrian Register of Plant Protection Products (ARPPP). Also approved for powdery mildew control, but only for conventional agriculture, is the synthetic chemical fungicide PENCONAZOLE, which application rate per hectare is only 32 grams (as a maximum)[5]. Both active substances belong to the group of "approved active substances that do not fall into any other category" and therefore receive a weighting factor of 8.

	SULFUR	**PENCONAZOLE**
Approval	Organic (and conventional)	Conventional farming
Risk rating	Approved active substances that do not fall into any other group	Approved active substances that do not fall into any other group
Weighting factor (WF)	8	8
Application rate per hectare	6,400 g/ha	32 g/ha
Contribution of this application to HRI 1	6,400 x 8 = **51.200**	32 x 8 = **256**

As the above example shows, the HRI 1 "measures" a **200 (!) times higher risk** for a single application of sulfur in organic viticulture than for a single application of the synthetic chemical fungicide penconazole in conventional viticulture, on the same area.

Example 2: Control of scab in a 1 hectare apple orchard

The active substance POTASSIUM HYDROGEN CARBONATE - also known as baking powder - is approved for the control of scab in apples in organic farming. For the same purpose, conventional farmers can use the synthetic chemical fungicide DIFENOCONAZOLE. While potassium hydrogen carbonate is classified as a low-risk active substance[6] (weighting factor 1) with an maximum application rate per hectare of 7,5 kilograms[7], difenoconazole is an “active substances of particular concern” and candidate for substitution[8] (weighting factor 16) with a maximum application rate of 56 grams per hectare[9].

4 https://psmregister.baes.gv.at/psmregister/faces/faces/psm.jspx?locale=de&refNr=11014996
5 https://psmregister.baes.gv.at/psmregister/faces/psm.jspx?locale=de&refNr=11016045
6 https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/active-substances/?event=as.details&as_id=51
7 https://psmregister.baes.gv.at/psmregister/faces/faces/psm.jspx?locale=de&refNr=11016431
8 https://ec.europa.eu/food/plant/pesticides/eu-pesticides-database/active-substances/?event=as.details&as_id=631
9 https://psmregister.baes.gv.at/psmregister/faces/psm.jspx?locale=de&refNr=11267105

	POTASSIUM HYDROGEN CARBONATE	DIFENOCONAZOL
Approval	Organic (and conventional) farming	Conventional farming
Risk rating	Low risk Active substances	Candidates for Substitution
Weighting factor (WF)	1	16
Application rate per hectare	7,500 g/ha	56 g/ha
Contribution of this application to HRI 1	7,500 x 1 = **7.500**	56 x 16 = **896**

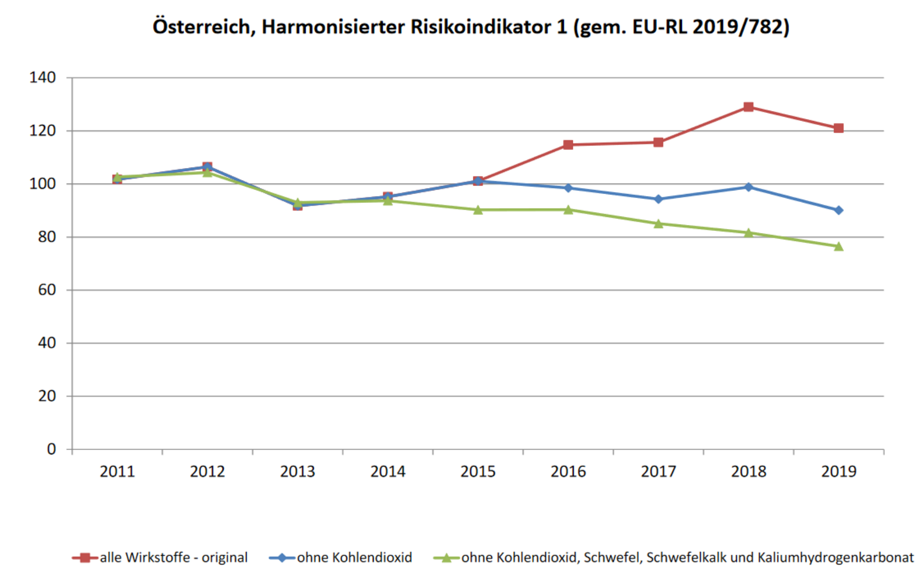
In this example, the HRI 1 calculates a more than **800 % higher risk** for a single application of an organic pesticide classified by EU authorities as a "low risk active substance" than for a synthetic chemical "pesticide of particular concern" and candidate for substitution. The **absurd result** of this is that the substitution of the problematic synthetic pesticide with the low-risk organic pesticide would lead to a calculated increase in the overall risk.

Example 3: The HRI 1 and organic farming in Austria

In the past decades, organic agriculture has grown continuously in Austria. Today, Austria is considered a European pioneer with an organic share of 26.4 % of agricultural land and 22.8 % of farms. Within the framework of the Biodiversity Strategy and the Farm to Fork Strategy, the European Commission also wants to increase the organic share to 25 % across the EU, as organic farming has proven to have positive effects on biodiversity[10]. The renunciation of synthetic chemical pesticides contributes significantly to this.

However, the HRI 1 paints a different picture. Unlike the EU average, this indicator points upwards in Austria (see figure below: red line). According to HRI 1, the overall risk from pesticides increased during the period in which farmers in Austria increasingly switched from conventional to organic farming. However, the risk decreases if active substances permitted in organic farming, like sulphur, lime sulphur, CO2 or potassium hydrogen carbonate are excluded from the Austrian pesticide sales statistics (green line).

10 https://ec.europa.eu/food/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf



Source: Bundesministerium für Landwirtschaft, Regionen und Tourismus

What do we learn from this? According to HRI 1, the problem is not those pesticide active substances whose negative effects on ecosystems and human health have been documented in countless scientific studies. The real problem is those naturally occurring active substances used in organic farming.

This absurd results of the HRI 1 ignited a public controversy[11] in the summer of 2020. Some even argued that in view of the "risks" of organic pesticides that allegedly have now become apparent (on the basis of the HRI 1), it would be time to question the ecological advantages of organic farming.

Conclusions & Recommendations

These examples illustrate that the HRI 1 provides absurd results, let alone useful ones, and is not suitable to monitor pesticide reduction under the Geen Deal. The HRI 1 discriminates most strongly against organic pesticides. This applies not only to the examples given, but to most of the common organic pesticide active substances such as calcium carbonate, iron compounds, copper salts, vegetable oils, or acetic acid. This is because they are all used in far greater amounts per hectare than synthetic chemical pesticides, due to a different mode of action.

But even within conventional pesticides, there is a systematic bias in favour of the most toxic ones, which toxicity is systematically underestimated when the HRI 1 is applied. This is particularly true for highly toxic insecticides such as pyrethroids or neonicotinoid-like pesticides, due to an inverse correlation between the toxicity of active pesticide substances and their application rates per hectare.[12] Due to the systematic underestimation of the risks of synthetic pesticides (such as neurotoxins from the chemical group of neonicotinoids, organophosphates or pyrethroids) and at the same time exorbitant overestimation of the risks of naturally occurring organic active substances, the application of the HRI 1 endangers other important goals of the Green Deal besides the 50 %

11 https://www.bio-austria.at/a/bauern/bio-landwirtschaft-darf-nicht-zum-suendenbock-gemacht-werden/
12 https://www.science.org/doi/full/10.1126/science.abe1148

pesticide reduction target. These include reversing the decline of pollinators and expanding organic farming to 25 % of the agricultural area in the EU.

For the sake of completeness, it should be pointed out here that the HRI 1 has further conceptual weaknesses in addition to those described above. For example, every withdrawal of a pesticide authorisation automatically and retroactively leads to an increase in the baseline risk - and thus the baseline value for calculating the risk reduction.[13]

The weaknesses of the HRI 1 have already been indicated by the European Court of Auditors in February 2020. In their report *Sustainable use of plant protection products: limited progress in measuring and reducing risks,* the auditors recommend to develop *better risk indicators*, since the current indicators *do not take into account how, where and when pesticides are actually used*. Therefore, the European Commission *is unable to precisely monitor the effects or risks resulting from pesticide use,* the auditors concluded[14].

Praise for the HRI 1, on the other side, comes from the European pesticide industry. The European Crop Protection Association (ECPA) – now Croplife Europe – described the indicator in a statement[15] on the Farm to Fork Strategy as an *appropriate way to measure the risk reduction of pesticides*. However, the pesticide industry is critical of the pesticide reduction target of the European Green Deal.

These examples make one thing clear: the pesticide reduction target cannot be achieved if the HRI 1 continues to be used. A meaningful indicator must reflect the actual risks in a reasonable approximation. In any case, it must point in the right direction. As the HRI 1 does not fulfil these criteria, it is unsuitable for monitoring the EU pesticide reduction target.

How can this be solved? The HRI 1 must be replaced as soon as possible by an indicator that

- **i) is based on actual application data of pesticides,**
- **ii) takes into account the area treated with pesticides, and**
- **iii) reflects the different hazards of different pesticide active substances in a more differentiated way than the HRI 1 does.**

Until robust application data and an improved risk indicator are available, the systematic overestimation of the risk of organic pesticides compared to conventional pesticides could be mitigated by evaluating organic and conventional pesticides separately.

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13 https://www.pan-europe.info/sites/pan-europe.info/files/20211202_PAN%20Europe%20position%20on%20pesticide%20indicator%20final.pdf

14 https://www.eca.europa.eu/Lists/News/NEWS2002_05/INSR_Pesticides_EN.pdf

15 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12183-Sustainable-food-%E2%80%98farm-to-fork%E2%80%99-strategy/F506589_en