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8 Misconceptions about Proposed EU Limits for Cadmium – A Clarifying Note

Safer Phosphates™ has been publishing relevant information and sharing data on the Cd limit value debate. This note clarifies some of the most widespread misconceptions found in communications regarding the proposed new EU Fertilizer Regulation, and thus aims to contribute to a balanced, fact-based debate that puts human and environmental health ahead of other interests.

With the Circular Economy Package adopted in 2015, the European Commission set the stage for increased recycling and reuse to help modernize and transform the regional economy towards more sustainable production and consumption patterns. Part of this package includes new fertilizer regulations aimed at levelling the playing field for domestic plant nutrition production, by harmonizing regulatory access to the internal market.

The proposal includes limit values for heavy metal (HM) content in fertilizers. There are around sixteen HMs that are hazardous to human and environmental health that are associated with phosphate rock and phosphate-based fertilizers. Cadmium (Cd) has been one of the sources of greatest concern. Under certain conditions, it accumulates in soils when fertilizers are applied, leaches into water, and transfers into the food chain.

In this note we clarify the facts behind 8 of the most widely-held misconceptions about the EU`s proposed cadmium limits:

1. Proposed EU limits on cadmium content in phosphate-based fertilizers will be the strictest in the world

The proposed EU Cd are a necessary protective instrument to stop increase of Cd concentration in soils and dietary intake of Cd. Human, animal and environmental health risks have led several countries to impose Cd limit values, amongst Australia, New Zealand, Japan and the state of California. While the EU currently has no Cd limits, several EU member states restrict Cd levels in phosphate-based mineral fertilisers. These range from 75 mg/kg P_2O_5 in Austria to as low as 22 mg Cd/kg P_2O_5 in Finland. In 2011, Sweden requested the introduction of a stricter Cd limit at 20 mg/kg P_2O_5, in comparison to their existing limit of 44 mg Cd/kg P_2O_5. The Swedish request, and the request from the Czech Republic in 2012 to impose a limit of 50 mg Cd/kg P_2O_5, were rejected by the European Commission at the time.

The global leader in fertilizer Cd content governance is Switzerland. A legal limit for Cd has been in place since 1986 and is set at 22 mg Cd/kg P_2O_5 in products that contain more than 1% P. This limit is practically the same as the one currently being considered by the European Commission for products containing more than 5% P. Recent studies commissioned by the Swiss Federal Office for Agriculture have concluded that the limit is correct and meaningful. It should be strictly implemented, and Cd in fertilizers be kept as low as possible to reduce proven long-term accumulation in agricultural soils. Since January 2016, the Swiss pollution mitigation strategy has also included an obligation to, within the next decade, recycle phosphate from waste water, sewage sludge and ash for agricultural reuse.

Table 1: Cd limit values

Country	Limit value (mg Cd/kg P_2O_5)
Switzerland	22*
Finland	22
Sweden	44 (20)
Austria	75
EU (proposed)	60 -> 40 -> 20
*> 1% P	

2. The proposed Cd regulation would significantly limit the number of potential trading partners for EU-based fertilizer manufacturer and farmers

It is a commonly repeated concern that the proposed Cd regulation will create supply bottlenecks and dependence on Russia which is known for its large deposits of igneous phosphate ore that are naturally low in Cd. This view does not reflect reality as there is already sufficiently diverse supply of low-cadmium phosphate ore and even more options for producers to adapt production to reduce cadmium content.

First, Cd limit values will not bar traditional suppliers from the market. An array of choices exist that would allow the market adapt to the new policy and consumer demand for creating a sustainable supply chain system that is based on feedstock that is low in heavy metals. Options to mitigate any potential impact on fertilizer production include blending of high-grade rock with lower-grade rock, sourcing rock from multiple suppliers, using secondary nutrients in the existing production process, or decadmiation of their products.

Second, significant opportunities exist to increase the substitution of non-compliant products with others, including from developing markets such as Canada. Several new low-Cd mines and greenfield projects around the world are currently being developed and can contribute to the diversity of supply of low heavy-metal feedstock. Today, a number of rock producers are standing ready to satisfy demand. SaferPhosphate™ partners alone have a total of 13 million tonnes of low Cd phosphate rock concentrate capacity. This does not include potential new production in Canada and Jordan, which would amount to another 10 million tonnes per year. In addition, available data on low-Cd reserves suggest that selected mines in Syria and Egypt would be compliant with Cd limits.

Third, barriers to free trade of P-based fertilizer products hamper trade patterns in the EU. In fact, high-Cd rock from African producers currently has a competitive advantage due to its duty-free status, while trade barriers in the form of import duties are applied to low-impurity rock. This barrier could be removed by cancelling the 6.5% import tax on P containing fertilizer products from certain countries. This current import duty ignores the long-term externalities arising from the use of high-Cd products and serves special corporate interests, while the European environment and human health concerns are left on the sidelines.

3. Decadmiation is economically unfeasable

Decadmiation technologies reduce or remove Cd in phosphate-based fertilizers, either at the beginning of the production cycle in the rock, or in the intermediate product (phosphoric acid) stages. Several reports have already evaluated existing technologies, related costs and additional factors that are important for their implementation. In fact, these technologies are already used for food grade phosphoric acid, which is a higher-value product that must comply with stricter safety standards than the fertilizers that are used to grow crops. While there is currently no decadmiation process in operation by an industrial phosphate-based mineral fertilizer producer, the technology is already available.

The most common argument against introducing decadmiation technology is its impact on the cost of production. Cost have most recently been estimated to amount to 10%-20% of the fertiliser production cost, or 12-30 EUR per tonne P_2O_5, depending on the technology applied.

This argument, however, ignores the fact that costs decline quickly as a new technology matures. Moreover, some producers have already received EU support to conduct R&D in this area, but did not move forward.

Global players have ample scope for implementation of such technology without financial aid of the EU. In an industry that reports billions of revenue every year, the unwillingness to make technological changes in the interests of human and environmental health sounds self-centred. While there is strong basis to belief that profitability can be sustained, positive effects of EU investment in recycling R&D, instead, could be large.

4. Fertilizer prices are likely to rise

There is no economic foundation for the statements that a gradual lowering of Cd limits would increase fertilizer prices for farmers. In contrast, economic research finds that the EU exhibits limited to moderate levels of fertilizer market concentration and that any increase in production cost would only partially be reflected at the farm level, as competition in the global fertilizer market would absorb costs.

In fact, this competition is even unlikely to significantly affect the financial standing of major fertilizer producers. Given their strong profit margins, there is substantial capacity to absorb potential production cost increases.

To maintain fertilizer prices, blending of low- and high-Cd grades is an already established industry practice for certain types of fertilizer production. Available data on low-Cd rock reserves suggests that EU demand can be met from these sources if they were to be chosen as feedstock and import duties removed or lowered.

Moreover, organic and recycling products are likely to assume a larger role in reducing emissions in fertilizer production and use over the next decade, resulting in significant increased demand for these products. The answer hinges on the economics of conventional vs. renewable fertilizer, which vary from raw material to region to technology process. The substitution of mineral fertilizers from third countries for recovered nutrients from within the EU will reduce dependency.

5. Cd restrictions will harm EU-based fertilizer producers and the jobs they create

Often overlooked is the fact that the revision of the EU Fertilizer Regulation is a consequence and part of the Circular Economy Action Plan. This provides a regulatory framework for nutrient recycling. Moreover, it draws attention to the economic and environmental potential of reusing waste streams. The role of the bioeconomy in the debate is thus largely underestimated.

Ample opportunity exists for new businesses, new jobs, new producers, and joint ventures between established and new players. Many of the waste-based products still are in a development stage. While their current economic competitiveness versus conventional fertilizer is not yet given, their deployment stands to get a boost from the regulation. In the next decade, the EU will collectively strive for innovation and technological advancement while member states will set ambitious recycling targets. Increased substitution of fertilizer feedstock "made in the EU" or final fertilizer products made from recovered nutrients clearly presents a significant new supply contribution which should be considered as an opportunity for rock and fertilizer independence from third countries, as well as a price increase buffer.

6. Scientific evidence for a strict limit of 20 mg Cd/kg P_2O_5 is weak

The establishment of Cd safety thresholds is subject to considerable controversy, also because of the inherent complexity of the task and imperfect knowledge. In recent years, two studies have made the point that the risk of long-term Cd accumulation in EU soils is smaller than previously thought, and thus a safety value of 80 mg/kg P_20_5 could be sufficient.

In 2014, Six & Smolders modelled future long-term changes in soil Cd concentrations. Considering arable land and two crops in Europe, the authors predicted soil Cd concentrations to decrease, on average, by 15% over the next 100 years. They further found that Cd accumulation only occurs with fertilizer Cd content higher than 80 mg/kg P_2O_5. In 2017, an update was published. In contrast to the previous study, a more realistic soil data approach was chosen to construct the model. The acceptable level of Cd content in fertilizers to achieve a stand-still in average EU soils was found to be 73 mg/kg Cd P_2O_5.

However, a more recent modelling study by Römkens et al. (2017) from Wageningen Research finds Cd to accumulate in soils even in a "business as usual scenario", and to become more pronounced with a Cd fertilizer content equal or larger than 20 mg/kg P_2O_5. This study is based on a spatially explicit modelling approach, yet considers both grassland and arable land as

well as multiple crops. While both studies predict an increase in soil Cd as shown in Table 1, the level of relative change predicted by Römkens et al. is higher than by Smolders. This is due to differences in one output factor, namely leaching.

Science is meant to guide decision and policy making, but not replace it. While some stakeholders will focus on the EU average value as main criterion guiding limit values, others may use regional results to state that an average value of zero accumulation is not protective enough. The major question, however, is not about absolute expected changes in soil Cd, the modelling approach, or if the leaching factor is under- or overestimated. It is also not about whether the actual Cd content in EU-traded fertilizers is higher than assumed, or if future fertilizer products may contain more Cd as high-purity deposits are being mined first.

The key question, instead, is rather simple: Should accumulation be avoided and environmental and human health be protected? If avoidance (=net depletion) is the preferred policy strategy, a limit value of 20 mg Cd/kg P_2O_5 is the best option. This value is in line with previous findings and supported by the EC proposal.

Table 2: Percent change in soil Cd after 100 years at actual EU average fertiliser Cd content

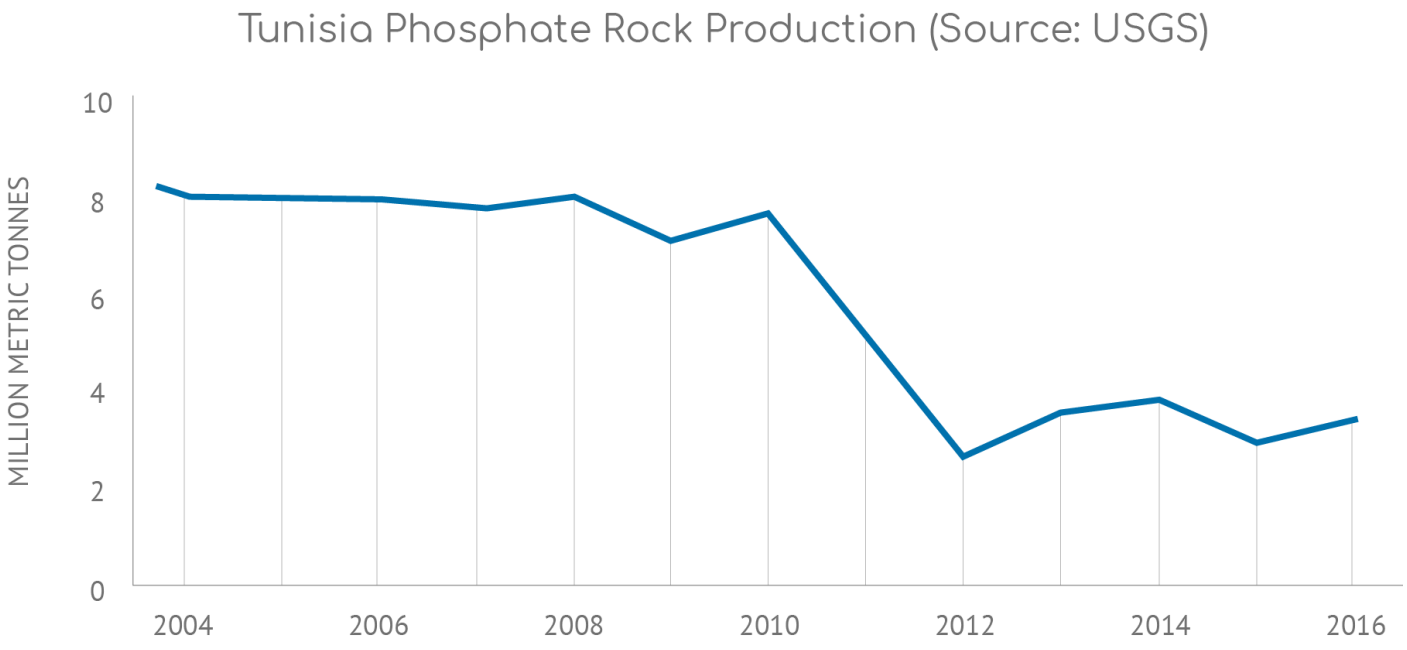
Scenarios (Cd limit values)	Smolders (2017)	Römkens et al. (2017)
Business-as-usual	-16	+3
20	-21	+1
40	-13	+5
60	-5	+8
80	+3	+11

7. Cd restrictions will have serious impact on North & West African phosphate operations

In 2016 the EU imported approximately 4.5 million tons of P_2O_5, either as raw material, intermediate product, or finished product. Around 45% of this was sourced from companies in North & West Africa, most of which would be in excess of proposed Cd limits. It is misleading, however, to present this as evidence that the proposed Cd limits would have a negative impact on the region`s economy. Some have even gone so far to suggest that cadmium limits in the EU could cause economic migration and extremist activity in North and West African countries.

One such example is Tunisia, which is an important supplier of phosphate to South Europe. In a recent article, it was argued that avoiding Cd limits would be "a lifesaver to [the] country and to save [their] production". However, an analysis of Tunisia's phosphate rock production data shows that other factors –namely stable governance – may be more important. While Tunisia produced around 8 million tonnes per year in the early/mid-2000s, the country's rock production fell to a low of 2.5 million tonnes in 2011 due to the fallout from the "Jasmine Revolution". Volumes have since picked up (to around 3.5 million tonnes), but remain well below previous highs.

Regulation could, at least initially, impact the profit margins of producers in North & West Africa. However, there are options to mitigate this. The implementation of phosphate rock and phosphoric acid decadmiation technologies is the obvious first step. The EU is proposing progressive limits so that producers have sufficient time to implement such projects and adapt production processes. Additionally, financing would be made available where economically required, without unduly engaging in anti-competitive behaviour.



8. Voluntary labelling of low-cadmium fertilizers is sufficient

The IMCO committee supports a Green Label for products that contain less than 5 ppm of Cd, As, Pb, Cr (VI), and Mg. However, even with a Green Label there remains a considerable lack of information to guide good choices. Fertilizer buyers currently have little to no indication about the component origin of products they purchase or impurities they contain. Listing the content of those heavy metals for which the new fertilizer regulation establishes safety thresholds promotes long-term environmental health, crop quality, and human health.

It should therefore be permissible to list clear information on the label that specifies the amount of HM that phosphate-based fertilizer contain. This would bring three important benefits that a voluntary label does not have: The information allows consumers to look after their own interests and are a good basis for better decision-making and buying choice. A better-informed consumer can make a more environmentally friendly and health-conscious decision. Also, it can balance administrative inspection and monitoring costs by establishing a self-regulatory regime, thus preventing non-compliance and enforcement problems. In addition, this would motivate the industry to make low- and no-heavy metal products available. Such a quality claim is a competitive factor next to price, nutrient content, and packaging.

Conclusions

The fertilizer industry is capable of responding to the demands of proposed Cd limit values in the EU. New manufacturers from the EU bioeconomy recycling sector are leveraging momentum that the broken phosphate cycle debate has created, and building awareness about the appeal of their products. The issue is thus not about exaggerated arguments, but about realistically addressing the concerns identified. Primarily, this means addressing environmental and health risks by introducing limit values, and improving information and awareness, which requires labelling and education.

The polemic and often blurring of focus found in some communications is not in the best interest of citizens of EU countries, and only serves specific corporate interests that benefit from the status quo. Industry players should take into account the scientific evidence upon which the proposed Cd limits is grounded, and the social welfare and sustainability development rationale backing such limits.

Securing environmental quality and human health is not solely the responsibility of policy makers. It should be first and foremost in the interest of producers and businesses to build products that are safe and sustainable. The well-known challenge is that costs and benefits occur at different times, for different stakeholders. While corporate profit occurs immediately, the environmental and health benefits of low-Cd fertilizers may not be felt for many years – which is why policy-makers seek to think long-term.