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Shaping Change

Food Consumption Patterns and Reactive Nitrogen as a Policy Field in a Finite World

The excessive release of reactive nitrogen compounds into the environment is one of the biggest ecological problems of our time.

The largest single source of nitrogen emissions is the agricultural sector, whereas livestock production chains are responsible for a high proportion of nitrogen losses. Changing meat consumption patterns is imperative for sustainable consumption. The topic polarises public opinion. We argue for the development of a mix of policy measures to promote environmentally compatible food consumption, with special emphasis on the (reduced) release of reactive nitrogen.

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Agriculture and combustion processes lead to excessive levels of nutrients in the environment. Surpluses of nutrients, the loss of biodiversity, and climate change represent the three dimensions for which planetary boundaries have already been exceeded (on the concept of planetary boundaries and the “safe operating space” see Rockström et al. 2009, Steffen et al. 2015). Sensitive ecosystems and human health are massively impacted by the excessive inputs of reactive nitrogen (Soentgen 2013). Agricultural production to meet consumer demands is one of the central drivers leading to increased impacts of nitrogen burdens. Therefore, along with agriculture, transport, and the energy sector, food consumption patterns must also be taken into consideration when formulating national nitrogen policies. Only through a significant change in patterns of consumption will it be possible to return to the “safe operating space”. Thus, in its special report on nitrogen and strategies for resolving an urgent environmental problem, the Ger-

man Advisory Council on the Environment (SRU) (2015)¹ includes food consumption as one of the policy fields in which action is necessary.

The food preferences of consumers are subject to a variety of influences, and are often in conflict with environmentally aware consumption. Key factors influencing individual preferences and the consumption of animal protein are lifestyle, values and attitudes, as well as the broader societal conditions (cf. Stoll-Kleemann 2014).

On average, food-related nitrogen emissions in Germany are 20 kilogrammes nitrogen per person per year, which is about 88 percent of the total nitrogen footprint of an individual in Germany (figure 1). This includes nitrogen released from both the production and consumption of food (Leach et al. 2012, Stevens et al. 2014).

The consumption of animal protein per person in Germany is at a fairly constant high level, and is a driving factor contributing to the nitrogen problem. The food consumption patterns in Western countries, involving high levels of nitrogen losses in production and large quantities of waste, cannot be “globalised” for a growing world population while remaining within the “safe operating space”.

German policies which only address the production side run the risk of shifting environmental impacts of intensified agriculture to other countries. With regard to nature, the environment and animal welfare, it would be possible to introduce stricter requirements for the agricultural production in one country with-

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¹ For an English summary of the report see www.umweltrat.de/SharedDocs/Downloads/EN/02_Special_Reports/2012_2016/2015_01_Nitrogen_Strategies_summary.pdf?__blob=publicationFile.

out having to fear that this would lead to negative environmental impacts in other parts of the world, provided the measures were coupled with a reduction in domestic demand. A policy of increasing resource efficiency in production must be coupled with a sufficiency policy in consumption, even though adaptations in other countries can diminish the intended effects (Wolf et al. 2011). Furthermore, given that there are worldwide similarities in the consumption patterns of high-income households, including a high demand for animal products (*nutrition transition*) (cf. Popkin 1993), changes in consumption patterns in Germany, for example, could stimulate positive long-term changes in the lifestyles and consumption patterns in emerging and developing countries (WBA 2015).

Policy-makers in Germany and the European Union (EU) are mostly sceptical about intervention (Dagevos and Voordouw 2013). Current environmental policy initiatives to influence individual food consumption patterns include the provision of information and campaigns designed to increase public awareness and stimulate voluntary changes in behaviour. However, there is a lack of a consistent policy to provide guidance on environmentally compatible food consumption (Hünecke et al. 2010, SRU 2012). Social groups are affected to varying degrees by the different types of instrument. For example, people with less problem awareness and a lower level of education will often not be reached by information campaigns. Some lifestyle groups are more likely to reduce the amounts of animal products they consume as a result of financial considerations, for example, in response to increases in product prices (Cordts et al. 2013 a). A mix of measures and instruments is therefore necessary in order to successfully target the various groups (Heiskanen et al. 2009).

In the following, selected instruments and measures are presented which could lead to nitrogen-efficient food consumption. Decreasing the food portion of the personal nitrogen footprint will not only reduce nitrogen losses to the environment but also greenhouse gas emissions and water use by agriculture.

Policy Measures to Reduce Food Waste

A central step on the consumption side is the reduction of food waste. There is still considerable potential here to improve nitrogen efficiency. According to Gustavsson et al. (2011), about one third of all food produced worldwide is lost along the food supply chain or is disposed of as waste. Overall, on a per capita basis, much more food is wasted in Europe and North America than in developing countries. The EU has announced that it will assess how best to limit food waste throughout the food supply chain and that it will seek incentives to halve the disposal of edible food waste in the EU by 2020 (EC 2013).

Information campaigns highlighting the value of foodstuffs should be developed as well as instruments designed to raise consumer awareness about ways of reducing waste, along the lines of the campaign *Zu gut für die Tonne!* (*Too good for the bin!*) of the Federal Ministry of Food and Agriculture (BMEL).²

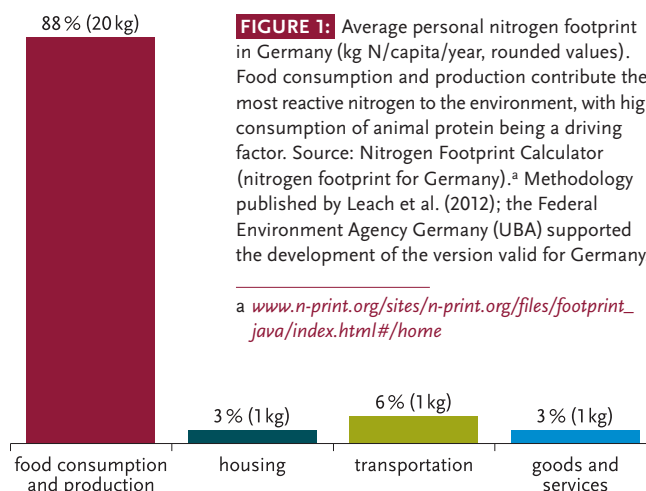


FIGURE 1: Average personal nitrogen footprint in Germany (kg N/capita/year, rounded values). Food consumption and production contribute the most reactive nitrogen to the environment, with high consumption of animal protein being a driving factor. Source: Nitrogen Footprint Calculator (nitrogen footprint for Germany).^a Methodology published by Leach et al. (2012); the Federal Environment Agency Germany (UBA) supported the development of the version valid for Germany.

^a www.n-print.org/sites/n-print.org/files/footprint_java/index.html#/home

Educational campaigns can be used to raise public awareness in order to reduce avoidable losses caused by exaggerated quality requirements (e.g., total absence of blemishes) or inflexible product preferences. Information should also be provided about the environmental burdens of reactive nitrogen which result from customer requirements regarding size, shape, and colour of vegetables. This could stimulate a reconsideration of the demands placed on such products. Customer expectations mean that some sorts of vegetable (e.g., broccoli) are being fertilised directly before they are harvested, even though only a fraction of the applied nitrogen is actually taken up by the crop (Armbruster et al. 2013).

In this context it is also important to consider alternatives to the ambiguous German labelling with a *Mindesthaltbarkeitsdatum* (*minimum durability date*). A first step would be an equivalent to the English terms “use by” for fresh products such as meat or cheese and “best before” or “best by” for products which as a rule can be consumed even after the specified date, such as muesli. It would also be possible to add “No durability limit”. Following an initiative of the Netherlands and Sweden, ways are being discussed in the EU of excluding durable food products from the requirement to be labelled with a “best before” date (Council of the European Union 2014).

Policy Measures to Reduce the Consumption of Animal Products

Nitrogen emission rates are generally very high in the production of animal protein – in particular from the farming of cattle and pigs (figure 2, p. 16). In general, the production of a calorie of cereals/carbohydrates results in lower emissions of reactive nitrogen than the production of a calorie of meat (Xue and Landis 2010). Reducing the consumption of animal products is therefore very important.

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² <https://www.zugutfuertonne.de>

Meat Consumption Patterns

Animal products constitute an important part of the daily diet in Germany. Some 85 percent of the German population eat meat and meat products daily or almost every day (Heinrich-Böll-Stiftung et al. 2013). In the EU the current average per capita protein intake is about 70 percent higher than would be required according to the World Health Organization's (WHO) recommendations (Westhoek et al. 2011).

Levels of meat consumption remain high in Germany, but the statistics currently show a downward trend. In view of the demographic structural change in Germany, a further overall reduction is to be expected (Cordts et al. 2013 b). The proportion of people with a predominantly or exclusively vegetarian diet has increased in recent years. Starting from a low level of approximately one percent of the population in 2008 (MRI 2008), the proportion had nearly doubled by 2012 (MRI 2014). The population groups who have chosen to reduce their meat consumption include women, younger people, and social groups with higher levels of education and higher net household incomes. These individuals are increasingly considering the effects of their meat consumption in terms of animal welfare, personal health, as well as environmental impact (Cordts et al. 2013 b).

Developing Synergy Effects between Health Policies and Consumer Information

In addition to reducing emissions of reactive nitrogen, the consumption of less animal protein could also have positive effects for human health (Wolf et al. 2011, Meier and Christen 2013, Westhoek et al. 2014). It is therefore recommended that policy measures should be developed in cooperation between government departments, including other partners where appropriate, for example, health insurance organisations. It would then be possible to make use of synergy effects and to increase the acceptance of the measures.

More information campaigns should be initiated to promote the reduced consumption of animal products. According to Cordts et al. (2013 a), knowledge of the harmful effects to people's health from the consumption of meat results in a three times greater reduction in consumption than environmental concerns. Nevertheless, the environmental aspect is the second most important predictor of behaviour after health. Animal welfare considerations, in contrast, only have a relatively modest influence on the level of meat consumption. Therefore consumer information should combine advice on healthy diets and possibilities for the environmentally appropriate substitution of animal protein. An exemplary model provides the campaign *Eating Better: For a Fair, Green, Healthy Future* in Great Britain, which recommends "eating less meat and more food that's better for us and the planet".³

Lifestyles as a Factor Influencing Consumption and Promoting Sustainable Lifestyles

People who are aware of the effects of their consumption on the environment, their health, and on society and who adapt their patterns of consumption to a more environmentally friendly lifestyle are frequently referred to as the LOHAS group (Lifestyles of Health and Sustainability). According to the *GfK ConsumerScan*, 26 percent of consumers in Germany belong to this LOHAS group (Pech-Lopatta 2013). Well-being and a secure collective future are important to these individuals. They can also be regarded as "flexitarians", since their per capita meat consumption is about a quarter below the average of that of other lifestyle groups as, for example, unreflective consumers (Pech-Lopatta 2013).

Politicians and government administrations should support social initiatives that are working for a more sufficient diet by creating framework conditions that offer scope for the initiatives to

3 www.eating-better.org/about.html



FIGURE 2:

Spreading of manure. While agriculture is the main source of reactive nitrogen emissions in Europe, livestock farming is the key driver of total nitrogen losses. Through the concentration of livestock farming in specific areas, some localities have become heavily polluted.

develop (cf. Blättel-Mink et al. 2013). An example could be setting up appropriate exchange platforms and laboratories for sustainable urban food supply. Social initiatives can generate networks, and dedicated individuals and groups can act as “change agents”, helping innovations out of their niche existence into the centre of societal attention (Kristof 2011), for example, via social media.

The Important Role of Kindergarten and School Meals

The meals provided in kindergartens and schools can play an important role in promoting awareness about healthy and environmentally compatible diets. This is all the more significant because the dietary habits and preferences developed in early years continue to influence patterns of consumption in adulthood. In addition, German child day-care centres also offer meat too frequently from the point of view of nutritional physiology (Arens-Azevêdo et al. 2014).

The provision of well-balanced, environmentally appropriate meals in child day-care centres and schools should be promoted and combined with teaching about the efficient use of food resources and ways of reducing food waste. This is especially significant with regard to its influence on consumers from socio-economically disadvantaged milieus.

Creating Financial Incentives

Financial incentives should address both the production and the consumer side. In addition to economic instruments to promote nitrogen efficiency in agriculture, legislators can also use appropriate consumer-side economic instruments to influence demand – for example, by means of higher prices that guide consumers away from nitrogen-inefficient products. Given the sensitivity of consumers of animal products to price changes (Thiele 2008), such an approach would appear to be promising (cf. SRU 2012). Hence, the lower value-added tax rate of seven percent for animal products in Germany should be replaced by the regular 19 percent value-added tax rate. Such an amendment to the value-added tax system could form part of a broader revision of an excessively complex system which includes numerous anomalies for individual foodstuffs (Bundesrechnungshof 2010).

Furthermore, stricter regulations on methods of production could lead to higher prices and a reduction in consumer demand, although adaptations and imports from other parts of the world can dampen the consumer-side effects. Germany is a low-wage country as far as the slaughtering industry is concerned, with a high proportion of sub-contracted personnel and temporary staff. Wage costs in Germany are significantly lower than in Belgium, Denmark, France, and the Netherlands (Efken 2013). The introduction of the minimum wage in the German meat industry in August 2014 is therefore to be welcomed also from an environmental point of view. But it is not yet possible to judge whether problems will be encountered with the implementation, such as increased levels of unregistered working hours (WBA 2015).

The prices of animal products can also be influenced by stricter animal welfare requirements for livestock farmers, for example, requiring more indoor floor space per animal (BMELV 2012).

Summary and Future Prospects of Consumer Policies

Emissions of reactive nitrogen compounds have risen to such a high level that planetary boundaries have been exceeded. Agricultural production to meet consumer demands is one of the central drivers leading to increased impacts of nitrogen burdens. More stringent environmental requirements in the agricultural sector need to go hand in hand with changes in food consumption. The currently high level of consumption of animal products needs to be reduced, along with food waste. Consumption patterns are difficult to change. In the interest of gradually changing these patterns, the authors recommend a combination of different target group specific information and monetary instruments that ensure that environmental costs are reflected more strongly in the prices of animal products.

Flexitarian, vegetarian and vegan lifestyles are becoming more widespread, and consumers are driven by a whole range of influences. About two to 3.7 percent of the German population are vegetarians (MRI 2014, Cordts et al. 2013 b). Moreover, change agents are presenting the topic to the general public through the media. It is therefore conceivable that the on-going change in cultural values will lead within a few decades to numerous measures being accepted as normal and societally acceptable which today would be regarded as very far-reaching interventions.

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