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Reform of the VAT rates for animal and plant products

An analysis based on five selected Member States

Berlin, 22.04.2022

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Summary

The objectives of the green new deal require rapid implementation through targeted measures. Measures related to changing dietary patterns include a reform of the value added tax (VAT) for animal and plant products.

Almost all European Member States provide reduced VAT rates for animal products. In the present study, the increase in value-added tax on animal products is being examined as a measure with a climate policy steering effect, since the consumption of animal products in general causes higher greenhouse gas (GHG) emissions per product than the consumption of plant products.

To better understand the impact of this measure, the effects in terms of behavioural changes in food demand, price changes in form of additional expenditures or savings per capita, changes in tax revenues for the state and the impact on GHG emission reduction have been examined for five selected European Member States (Austria, Belgium, Germany, Netherlands and Poland).

Within the study three different options of increased VAT rates are examined. They include increased VAT rates for meat products only (Option 1), increased VAT rates for meat and other animal products (option 2), increased VAT rates for all animal products and reduced VAT rates for plant products (option 3).

The most favourite condition in terms of additional tax revenues, decreased consumer expenditures on food and reduction in GHG emissions can be achieved by increasing the VAT rate for all animal products, while at the same time reducing the VAT rate for plant products.

The study concludes that in the short term, the increase in VAT may provide a first incentive to influence consumption. The increase in VAT on animal products sends a clear price signal, to which consumers react by changing demand.

The changes in VAT rates would lead to a discussion in society and thus public awareness of the issue. It would also pave the way for the medium to long-term development of a more targeted instrument for the demand side, such as a GHG-based levy on food.

1 Objective of the paper

With the adoption of the Green Deal in November 2019 the European Commission has sent a strong signal towards tackling climate change. Article 2.2.2 of this document, *Greening national budgets and sending the right price signals* indicates that,"well-designed tax reforms can boost economic growth and resilience to climate shocks and help contribute to a fairer society and to a just transition". In this context the reform of the value added tax (VAT) is mentioned, so that Member States have a chance to make a "more targeted use of VAT rates to reflect increased environmental ambitions, for example to support organic fruit and vegetables."

Therefore, changing dietary patterns and related food systems to a lower level of consumption of animal products and less food waste is essential for reaching the goals of the Paris agreement. This was again confirmed by a study recently published on science (Clark et al. 2020). This study shows that, without changes in food consumption patterns the climate target in 2050 is not achievable. Transformation of nutrition particularly affects the industrialized nations, with their high consumption of animal products.

In the EU 45% of all agricultural GHG emissions result from enteric fermentation (UNFCCC inventory submission 2020). However, technical possibilities to reduce livestock emissions are very limited, especially regarding emissions from the digestion of ruminants. A reduction in milk and meat production is therefore an important GHG reduction measure in this sector – and a reduced consumption of animal products an important prerequisite. Otherwise, imports from abroad would be necessary to close the supply gap. Pricing instruments can support consumer behaviour and increasing VAT on animal products would be easy to implement in the short term.

By 2050, also emissions from the agricultural sector must be substantially reduced and this can only be achieved by reducing livestock numbers and the associated emissions from animal husbandry. In addition, if climate neutrality is to be achieved by 2050, a greater reduction in the consumption of animal products will be essential, as new land use options can be created by freeing up forage areas (e.g. new sinks).

2 Approach and Assessment

The paper provides a quantitative and qualitative assessment of the consequences of a VAT increase on animal products for selected EU Member States. The following effects are considered:

1. (Gross) price changes (in the form of additional expenses or savings per person),
2. Behavioural changes in food demand,
3. GHG emission reduction potential and changes in tax revenues.

The estimations are examined based on different variants for a changed value added tax.

2.1 Three options for increasing VAT rates

Currently, Member states use different VAT rates for different products. Almost all countries grant a reduced rate on animal products. Only in Denmark the standard tax rate is applied to all food products. For a selected group of Member States different **options** of the value added tax are analysed. VAT rates are set individually for meat, other animal products (milk and eggs) and plant-based food (see rows of Table 2-1). VAT rates can get three different levels, standard tax rates, reduced tax rates and super reduced tax rates, here up to zero (see columns of Table 2-1).

Table 2-1: Options considered for a VAT increase

	Option 1	Option 2	Option 3
	Meat ↗ increase from reduced tax rate to standard tax rate	Meat ↗ increase from reduced tax rate to standard tax rate	Meat ↗ increase from reduced tax rate to standard tax rate
	Other animal products = constant at reduced tax rate	Other animal products ↗ increase from reduced tax rate to standard tax rate	Other animal products ↗ increase from reduced tax rate to standard tax rate
	Plan based products = constant at reduced tax rate	Plant based products = constant at reduced tax rate	Plant based products ↘ reduce VAT to zero[1]

Note: The quantities of out-of-home consumption are not considered, as different VAT rates apply to meals in restaurants or canteens as compared to food bought in the retail market. In addition, it is hardly possible to differentiate the tax rates for out-of-home consumption since the vegetarian components of a menu are not taxed differently than a piece of meat or the cheese for gratinating.
Source: Own assumption, Oeko-Institute

[1] In the context of a VAT reform, the introduction of a VAT exemption ("zero rate"), as well as a reduced rate between 0% and the reduced rates, is also under discussion. In September 2021 the EU Parliament adopted an Amendment about changing “Food and Environment and Food Prices” which supports the option to give Member States more flexibility to choose a zero VAT tax for healthy and sustainable products and a higher VAT rate for unhealthy food. (https://www.tappcoalition.eu/nieuws/16969/eu-parliament-majority-asks-for--true-pricing-food-products--and-highest-vat-tariff-for-products-like-meat)

2.2 Elasticities

Customers decide what to buy, but several conditions contribute to their decision, not least the product price. Economists use the term "elastic demand" to estimate the effect of price changes on the demand for products. Demand is called elastic when price changes cause large quantity changes in demand.[2] Depending on the relevance of the product people react to a price increase with a decline in demand. Values close to zero (low price elasticity) generally mean that consumers show only a weak reaction to price changes. This is particularly evident for essential goods, whereas a price elasticity above -1 applies for luxury goods. This varies from product to product, country to country, and depends on household-income levels. To estimate the climate policy impact of a VAT rate increase on animal products in the EU, knowledge of the price elasticity of the individual product groups is necessary.

In fact, the extent of the changes in behaviour is subject to uncertainties. However, this short study could not produce complete data sets for price elasticities for all product groups and Member States considered. The results of a short review revealed that the price elasticities available in the evaluated studies (see Annex I, Table 4-3) were determined based on different models and assumptions and are therefore methodologically inconsistent. Due to this general restriction, the same price elasticities have been applied in all selected Member States (Table 2-2).

Table 2-2: Price elasticities

	Meat	Dairy products	Fish	Butter
Price elasticities	-1.02	-1.0	-1.05	-0.42

Source: Wiss. Beiräte BMEL (2016)

2.3 Selection of Member States

The selected Member States reflect only a part of the 27 EU Member States. Out of the large Member States with high population figures and a high share in total EU agricultural emissions only Germany is included. Belgium, the Netherlands and Austria are representatives of smaller Member States, and Poland is representative of an Eastern European Member State with traditionally different dietary habits in terms of the types of meat consumed.

2.4 Data requirements

For calculating the price induced change of food consumption of dedicated products, various pieces of information are needed:

- Price elasticities per single product or product groups

- Current VAT rates for the products per Member State and information on reduced, super-reduced and standard VAT rates
- Information on per capita expenditures on animal and plant-based products

The climate policy steering effect of an increase of VAT rates on animal products will be estimated by calculating the GHG mitigation potential of reduced consumption of animal products (see chapter 3.2.2 for details).

More detailed information on the approach and data use is included in the Annex.

3 Main Findings

3.1 Overview

The level of tax change (Figure 3-1) influences behavioural changes, countries with a strong increase in VAT show a strong change in consumption (e.g. Poland). In countries such as Austria, on the other hand, behavioural changes are less pronounced, as the current tax rate is already higher.

Table 2-1: Change of VAT rate for animal products

	Reduced Rate - animal products	Standard Rate	Change of VAT for animal products
Austria	10%	20%	10%
Belgium	6%	21%	15%
Germany	7%	19%	12%
Netherlands	9%	21%	12%
Poland	5%	23%	18%

Source: Own presentation based on European Commission (2020)

Table 3-1 gives a first overview of the resulting changes in behaviour due to tax changes in selected Member States. Given the lower difference between the reduced VAT rate and the standard VAT rate in Austria of 10% and 20% (see Table 2-2), the change in demand is also the lowest compared to the other countries, with a maximum of -9.3% for meat products and -7.6% for milk products (see Table 3-1). The highest changes in demand for meat occur in Poland, where the VAT rate would increase from currently 5% to 23%.

Table 3-2: Changes in meat and dairy consumption

	Reduction in meat consumption	Reduction milk consumption
Austria	-9%	-8%
Belgium	-14%	-13%
Germany	-11%	-10%
Netherlands	-11%	-10%
Poland	-17%	-14%

Source: Own calculation, Oeko-Institute

The results of the three VAT options, were calculated both for individuals and for the whole population of the Member States concerned. Table 3-2 compares the impact of the different options of VAT increase for all Member States considered in terms of tax revenues, changes in consumption volume and GHG reductions.

Table 3-3: Overview of results presented as a mean of all selected Member States

		Option 1	Option 2	Option 3
Additional tax revenues	billion €/a	6.5	12.6	4.9
Total additional expenses or savings	mean value €/person/a	5 €	19 €	-33 €
Change meat consumption	% ggü. aktuell	-12.8%		
Change consumption in milk products	% ggü. aktuell	-	-10.5%	
Change consumption of plant products	% ggü. aktuell	1.8%	4.4%	
GHG reduction in our diet (GHG footprint)	kg CO_2eq./cap/a	- 76	- 135	
Reduction of GHG emissions from enteric fermention and manure management in the agricultural sector	Mio. t CO_2.eq./a	- 2.7	- 5.8	

Source: Oeko-Institute, own calculation based on Eurostat data, FAO data and UNFCCC inventory submission

GHG saving potential is calculated based on the GHG footprint of our diet, but also in terms of possible emission reduction in the agricultural sector (focusing on emissions from enteric fermentation and manure management only). The highest reduction is achieved in options 2 and 3 with an increased VAT rate for all animal products. By extending the increase to other animal products, especially dairy products, emission reduction can almost be doubled as compared to option 1 with the VAT increase on meat products.

For the additional tax revenues of the state, an increase in VAT results in considerable differences depending on the option: The higher taxation of all animal products generates almost twice as much tax revenues compared to the increased taxation of meat alone. The highest revenues per year in combination with high emission reduction potentials are achieved in option 2 (12.6 billion €). In this option, increased VAT on all animal products leads to high revenues. Equally high GHG reductions are achieved in option 3, but with lower tax revenues (4.9 billion €) through a VAT exemption for the consumption of foodstuff of plant origin such as fruit, vegetables and cereals.

To assess the social impact of the measure, the additional mean burden imposed on citizens by an increase in VAT was examined. The results evidence: the burden on individual increases in option 1 and 2, compared to their current expenditures. The highest burden occurs in option 2 with a VAT increase on all animal products. By reducing the VAT rate for foodstuff of plant origin such as fruit, vegetables and cereals to 0% (option 3), cost neutrality or even a reduction in total expenditure is possible due to the event of major changes in behaviour. In option 3 (VAT increase on all animal products and a simultaneous reduction of VAT on foodstuff of plant origin) the total burden on individuals decreases.

3.2 Detailed results

3.2.1 Impact on consumption

An increase in VAT rates changes the demand. Since the Member States under consideration today apply different tax rates to food, the effect of the VAT increase varies from one Member State to

another. Countries that currently reduce the tax rates on meat and milk particularly strongly react with the biggest drop in consumption in case of a tax increase. Besides this, the absolute level of reduction in meat and dairy consumption depends on the level of current consumption. The relative effects in total consumption of animal products are outlined in Table 3-1.

Table 3-3 shows the different reactions in the individual Member States. Due to the highest increase in the VAT rate, meat consumption in Poland shows the largest decrease with 8 kg/cap/a. The low in-house meat consumption in the Netherlands is also reflected in a lower decrease in meat consumption (-4 kg/cap/a) triggered by a VAT increase in the Netherlands.

Regarding dairy consumption, the smallest falls are in Austria, while the largest absolute falls are in Poland.

Table 3-4: Relative changes in meat and milk consumption in response to the increase in VAT

	In-House consumption of Meat in consumption weight		Reduction of Meat	Reduction of Meat	In-House consumption of dairy products	Reduction of dairy products
	slauthering weight kg meat	consumption weight kg meat	kg meat slaughtering weight	kg meat consumption weight	litre milk-eq.	
Austria	66	45	- 6	- 4	300	- 22
Belgium	53	37	- 8	- 5	261	- 34
Germany	78	54	- 9	- 6	358	- 34
Netherlands	50	34	- 6	- 4	345	- 34
Poland	70	47	- 12	- 8	259	- 36

Note: Uncertainties and differences are related to the share of in-house consumption of milk and meat products and the conversion of slaughtering weight to consumption weight and the conversion of dairy products to milk-equivalents

Source: Oeko-Institute, own calculation based on Eurostat data, FAO data and UNFCCC inventory submission

3.2.2 Effects on GHG emissions

In the following two different reduction potentials are considered. On the one hand emission savings in comparison to our current diet are identified. On the other hand, emission reductions in the agricultural sector are calculated.

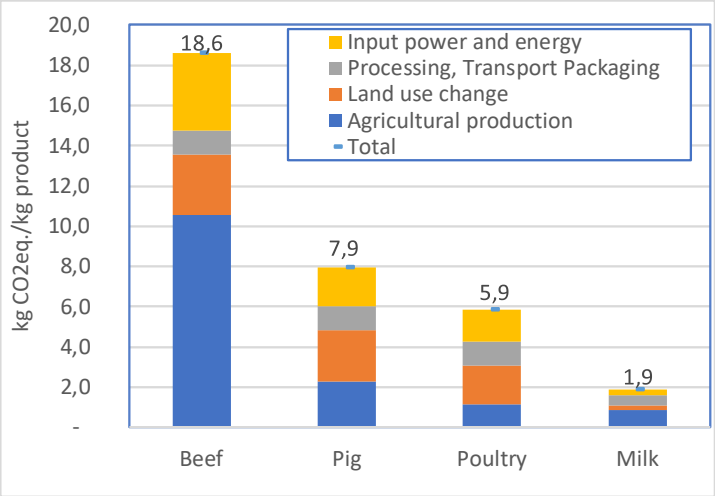
3.2.2.1 GHG mitigation impact of our diet

Total emissions from nutrition vary between Member States, mainly based on the level of animal proteins consumed and result in about 1,5 t CO_2eq./cap/a (Sandström et. Al. 2018)[3]. A complete GHG footprint of our diet includes all emissions along the value chain, including emissions from agricultural production, land use change, processing, transport and packaging, but also emissions

[3] The average GHG footprint of the EU diets is about 1,1 t CO2eq./cap/a. However, these estimates do not include emissions from processing, national transport, packaging, fertilizer production and energy use. According to an JRC-report (Monforti-Ferrario et al. 2015) emissions from pre- and postproduction of food, which are not included in the analysis are almost a third of total emissions from food production.

from fertilizer production and energy use. Figure 3-2 outlines the emission factors for animal products differentiated by the different processes, which are used in the present study.

Figure 3-1: Emissions from consumption of animal products in kg CO_2eq./kg product



Source: Meier, T. 2013

Option 1: Higher VAT on meat

The greenhouse gas emissions saved per inhabitant vary depending on the absolute level of current consumption, the changes in demand triggered and the consumption habits for pork, beef and poultry meat. GHG savings are lowest in the Netherlands. This is due to the low consumption of meat in house and a moderate change in VAT rate for meat products. The highest GHG savings per person can be achieved in Poland, where high changes in VAT rate and high changes in demand appear.

Options 2 and 3: Higher VAT rates on all animal products

Higher emission reductions will be achieved, if VAT rates are increased for all animal products including, above all, dairy products. These reductions are reflected in the results of options 2 and 3, which assume higher taxes on all animal products. Potential GHG reductions of these options are in most countries almost double that high as compared with those reductions achieved when tax increases apply only to meat.

In relation to total GHG emissions from our current diet emission savings through the increase in VAT vary between 6% and 11% of total emissions.

Table 3-5: Reduction of GHG emissions of our current diet (GHG footprint)

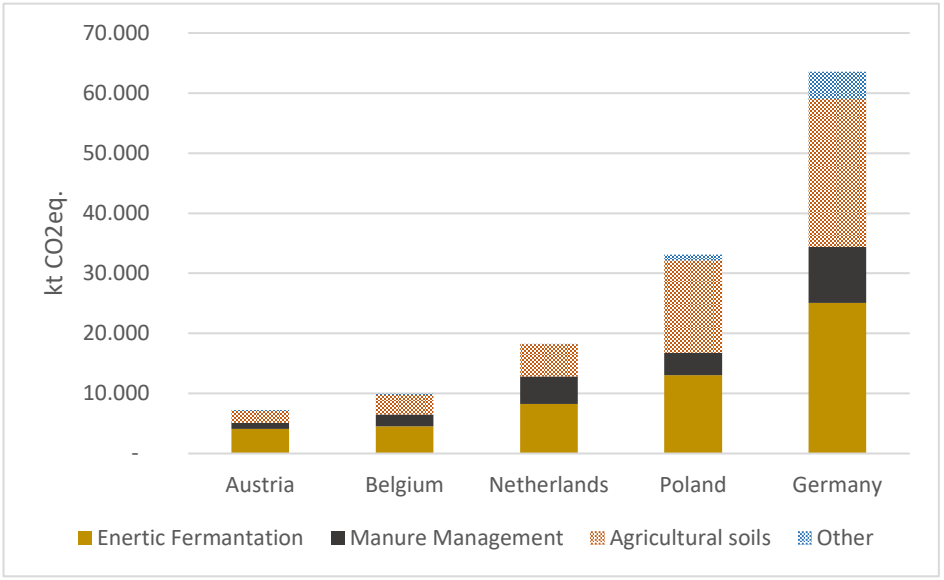
	GHG from current diet*	GHG savings Option 1	Change	GHG savings Option 2 & 3	Change
	kg CO_2eq./cap/a	kg CO_2eq./cap/a	%	kg CO_2eq./cap/a	%
Austria	1.527	- 56	-4%	- 95	-6%
Belgium	1.470	- 74	-5%	- 136	-9%
Germany	1.707	- 81	-5%	- 140	-8%
Netherlands	1.422	- 52	-4%	- 113	-8%
Poland	1.351	- 82	-6%	- 142	-11%

Note: GHG emissions from current diet are only a rough estimate based on FAO consumption data.
Source: Oeko-Institute, own calculation based on FAO data and Meier, T. 2013

3.2.2.2 Mitigation impact in the agricultural sector

The magnitude of changes in demand has an impact on the greenhouse gas emissions in the agricultural sector. However, a prerequisite for achieving such an impact is a reduction in livestock numbers in the same proportion as the change in consumption. Without a reduction in livestock numbers, the degree of self-sufficiency will increase, and more animal products would be exported. However, compared to total emission reduction in our diet, emission reduction is much lower, than in the agricultural sector. Emissions from livestock production in the agricultural sector originate from enteric fermentation, manure management and from fertilization of forage crops (part of N_2O emissions from agricultural soils). Despite declining livestock numbers, agricultural land can continue to be farmed and thus a reduction in N_2O emissions soil management is not necessarily happen. Consequently, calculated emission reduction is based on declining emissions from enteric fermentation and manure management only (see yellow and black bars in Figure 3-3).

Figure 3-2: Total GHG emissions from agriculture



Source: UNFCCC Inventory submission 2020

An increase in VAT rate for all animal products can save about 2% to 5% of GHG emissions from enteric fermentation and manure management in the single Member States. But therefore, it is

necessary to reduce livestock numbers in the same magnitude. Relative emission savings under option 1 are lowest in the Netherlands, due to a low in-house meat consumption and highest in Germany. Emission savings in the agricultural sector doubles in many Member States, if dairy products are included, finding the highest emissions reductions in Germany.

Table 3-6: GHG emission reduction from enteric fermentation and manure management

	GHG emissions from enteric fermenation & manure	GHG emission savings Option 1	GHG savings Option 1	GHG emission savings Option 2 & 3	GHG savings Option 2 & 3
	kt CO2eq.	kt CO2eq.	%	kt CO2eq.	%
Austria	5,104	- 139	-2.7%	- 253	-4.9%
Belgium	6,489	- 255	-3.9%	- 468	-7.2%
Germany	34,397	- 1,770	-5.1%	- 3,245	-9.4%
Netherlands	12,852	- 212	-1.7%	- 520	-4.0%
Poland	16,774	- 336	-2.0%	- 1,328	-7.9%
Total	**75,616**	**- 2,711**	**-3.6%**	**- 5,813**	**-7.7%**

Source: Oeko-Institut, own calculation based on Eurostat data, FAO data and UNFCCC inventory submission

Over the sum of all Member States considered and all options and scenarios, between 2.7 and 5.8 million tonnes of CO_2eq. can be saved, corresponding to 4% and 8% of total EU agricultural emissions from enteric fermentation and manure management respectively. However, these figures do not consider the reduction effect of a reduction in fodder production and possible effects of a change in the use of farmland.

3.2.3 Impact on tax revenues and burden on household incomes

VAT changes affect both, government expenditure or revenues and consumer expenditure on food products. However, increases in tax revenues for the state are not necessarily related to rising expenditures per capita on food. Based on the elasticity of the product, consumers react to price increases with a change in behaviour. If consumers reduce their demand for animal products and increase consumption of plant-based products, they save overall their expenditures for food since they shift to products with lower consumer prices. For the remaining consumption of animal products, they pay twice as much VAT surcharge. Depending on the magnitude of VAT increase and the consumption shift, this may reduce the burden on consumers while at the same time increasing tax revenues for the state.

Option 1: Higher VAT rates on meat

Despite a declining demand for meat, the burden on individuals is increased by the rise in consumer prices because of the increase in VAT rates for meat products in option 1. Due to declined meat consumption the additional burden on households is relatively small. In Belgium, the strong reduction in meat, does not lead to an additional burden and total expenditure can be reduced. The Netherlands has the highest additional annual tax burden of almost 10 euros per capita per year.

Option 2: Higher VAT rates on all animal products

In option 2 the additional burden increases further due to an extension of the tax increase to all animal products and are almost twice as high in all selected Member States as in option 1. Highest additional annual tax burden is found in the Netherlands with 30 €/cap/a, lowest tax burden in Poland with 14 €/cap/a. However, cost neutrality cannot be achieved in any of the Member States with the assumed elasticities.

Option 3: Higher VAT rates on all animal products and VAT exemption for plant products

A VAT exemption for foodstuff of plant origin (zero rate) in option 3 significantly reduces the additional burden on individuals. Cost neutrality is achieved in all Member States and total expenditure even decreases as compared to today.

Table 3-7: Additional expenses or savings per capita

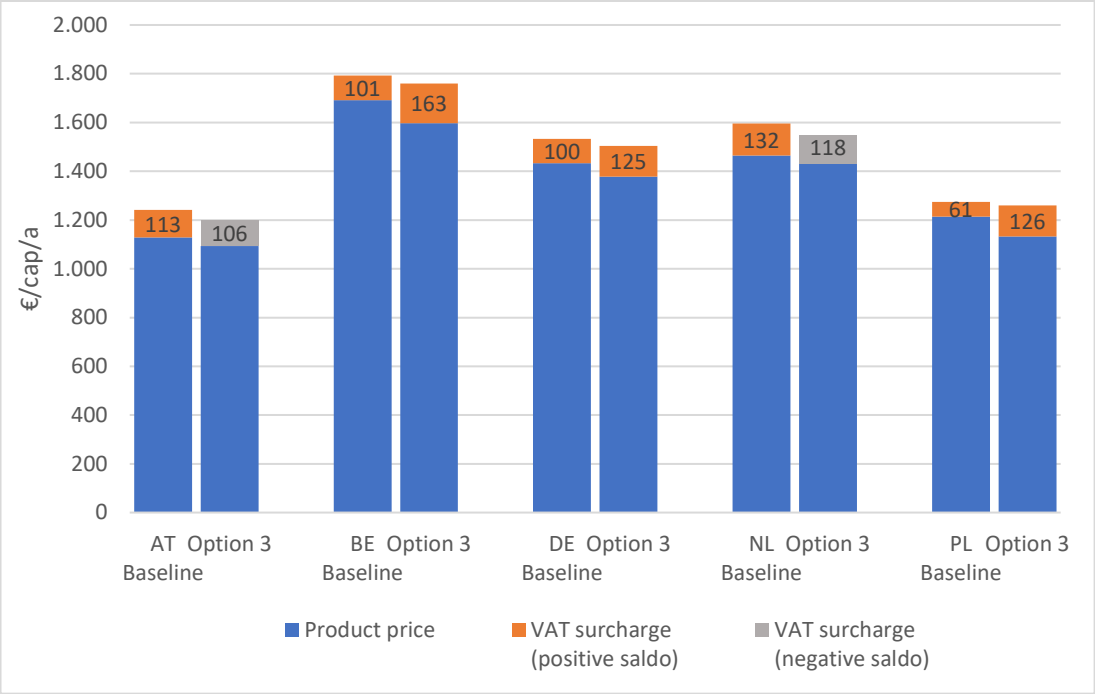
	Option 1	Option 2	Option 3
	€/cap/a	€/cap/a	€/cap/a
Austria	5.0 €	14.6 €	-41.7 €
Belgium	-1.1 €	16.9 €	-32.5 €
Germany	6.8 €	20.7 €	-29.8 €
Netherlands	9.5 €	30.1 €	-48.1 €
Poland	4.2 €	14.3 €	-14.9 €

Source: Own Calculation, Oeko-Institut based on Eurostat data

Total tax revenues

Depending on the size of the population and the level of consumption of animal products, additional tax revenue is generated by the increase in VAT rate on animal products. The highest revenue is achieved in option 2, where taxation is increased for all animal products. In option 3, tax revenues decrease as compared to option 2, due to an increase in the tax-exempt consumption of foodstuff of plant origin. In the Netherlands and in Austria, tax revenues even decrease as compared to today. In the other Member States the government has higher revenues from VAT than today, while at the same time the burden on individuals is reduced (see Figure 3-4).

Figure 3-3: Total expenditures for food by product price and VAT surcharge



Source: Oeko-Institute, own calculation, based on Eurostat data

Compared to option 2, the revenue of the state is reduced by the loss of revenue from the taxation of foodstuff of plant origin (zero rate). The combination of a reduction in consumption of animal products plus the abolition of VAT on food products of plant origin can reduce expenditure of individuals on food and increase tax revenues for the state (except for Austria and the Netherlands).

Table 3-8: Additional tax revenues

	Option 1	Option 2	Option 3
	billion €	billion €	billion €
Austria	201	434	- 60
Belgium	676	1.254	693
Germany	2.910	6.184	2.011
Netherlands	536	1.098	- 238
Poland	2.153	3.594	2.483
Total	**6.476**	**12.564**	**4.889**

Source: Own calculation, Oeko-Institute based on Eurostat data

4 Conclusion

By increasing VAT rates on animal products, the GHG footprint of our diet can be reduced, as consumption of animal products is lowered. At the same time, it contributes to a reduction in emissions in the agricultural sector if livestock numbers are reduced accordingly. Further emission reductions are possible, if freed up forage area is used for rewetting of organic soils or other more extensive farming methods. Increased VAT rates on food can be a first but already established instrument of market steering and thus an important starting point for the introduction of price instruments.

The following conclusions can be drawn from the evaluation of the individual Member States:

- The increase in VAT on animal products sends a clear price signal, to which consumers react by changing demand.
- In the short term, the increase in VAT may provide a first incentive to influence consumption.
- By extending the VAT increase to all animal products, higher GHG reductions can be achieved than if the focus was solely on meat. This is necessary in view of 2050 targets.
- The GHG reduction potential will only be realized if reduced demand leads to a reduction in the production of animal products and not to the current production level being maintained and an increase in exports.
- Other instruments are needed to reduce livestock on the supply side.
- The increase in VAT on animal products will not be sufficient as a sole instrument to trigger the changes in demand needed by 2050.
- The additional burden on individuals can be significantly reduced when reducing VAT on foodstuff of plant origin.
- The increase in VAT on animal products is one of the few measures that combine a climate policy steering effect with additional revenues for the state. These could be redirected, for example, into the restructuring of livestock in terms of animal welfare and climate protection.
- Countervailing developments such as a further decline in producer prices, lower sales of higher value products and the promotion of exports of animal products need to be monitored and reacted to.

The changes in VAT rates would lead to a discussion in society and thus public awareness of the issue. While this bears the risk of consumers adopting a negative attitude, it also offers the chance that additional effects could be achieved through increased knowledge and awareness. It would also pave the way for the medium to long-term development of a more targeted instrument for the demand side, such as a GHG-based levy on food.

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Annex

Annex I. Methodology

Introduction

Different data sets are used for the calculations. The calculation of price changes, i.e. the additional burden on consumers and the calculation of changes in tax revenue, is based on Eurostat data on consumer expenditure (see Table 4-6). Per capita expenditure only considers expenditure for consumption at home and no expenditure for out-of-home consumption. Depending on the Member State, a significant proportion of meat consumption takes place outside the home (e.g. lunch in canteens, school meals, etc.) and most Member States apply a reduced tax rate for out-of-home consumption. However, it is not practicable to increase the VAT rate on animal products alone for out-of-home consumption, and a general increase on all meals would partly lead to a heavy additional burden. Therefore, the VAT increase is only calculated on the consumption of animal products in households.[4]

Consumption volumes

The Eurostat data do not provide any underlying consumption volumes; therefore, the consumption volumes are obtained via FAO data. FAO data for meat refer to absolute consumption volumes, i.e. including bones, animal feed etc. Compared to the consumption quantities, the data are up to 40% higher depending on the animal species.

The FAO data only consider the complete consumption of animal products and do not show the share of out-of-home consumption. In general, data sets on the share of out-of-home consumption of animal products are not publicly available for the selected Member States. However, as these data are relevant at least for the estimation of the GHG reduction potential, a uniform data set of a market research institute is used for out-of-home catering.

Table 4-1: Overview of relative shares of out-of-home consumption of meat products

	Share in total meat consumption
Austria	24%
Belgium	19%
Germany	11%
Netherlands	33%
Poland	21%

Note: The figures for the share of out of home consumption vary considerably depending on the source, thus uncertainties remain.

Source: MORDOR INTELLIGENCE

[4] Other instruments are available for the reduction of out-of-home consumption of animal products. Examples include introducing a “climate menu” or reducing the size of animal product portions.

Compensation for the reduction of animal products

By reducing meat consumption in option 1 and reducing consumption of all animal products in options 2 and 3, the calorie intake per person is also reduced. It is therefore assumed in the options, that the reduced amount of animal calories is compensated by calories on a vegetable basis. This is reflected in increasing expenditures for plant-based products. Since it is unclear which vegetable products exactly compensate for the amount, the increase in vegetable products is not product specific.

VAT rates

There are different VAT rates applied in the individual Member States. The following Table 4-2 shows the different rates for meat, milk and foodstuff of plant origin as well as the higher standard rate.

Member States have a standard rate and a reduced rate which may be applied to products listed in Annex III of VAT Directive 2006/112/EC.

In the context of a VAT reform, the introduction of a VAT exemption ("zero rate"), as well as a reduced rate between 0% and the reduced rates, is also under discussion.[5]

In order to keep the burden on households as low as possible, in option 3 the VAT rate for plant products is reduced to 0%. This should both compensate for the increase in VAT on animal products and stimulate higher consumption of plant products. In options 1 and 2, the increase in consumption of plant products is to compensate for the reduction in animal products without a reduction in VAT on plant products.

Poland already applies reduced VAT rates of 5% respectively. Without the possibility of a further reduction of VAT rates for plant based products, no effects would be achieved in option 3.

Table 4-2: Overview of VAT rates applied in the selected Member States

	Reduced Rate - animal products	Reduced Rate- plant products	Standard Rate
Austria	10%	10%	20%
Belgium	6%	6%	21%
Germany	7%	7%	19%
Netherlands	9%	9%	21%
Poland	5%	5%	23%

[5] https://ec.europa.eu/taxation_customs/business/vat/action-plan-vat/proposal-vat-rates_en

Source:
https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.pdf

Elasticities

Based on a literature review, price elasticities for animal products were determined for the selected Member States where available.

The evaluated studies show price elasticities between -0.37 and -1.19 for meat and between -0.17 and -1.22 for dairy products (Table 4-3). For the calculation price elasticities based on a German study were used.

Table 4-3: Overview of price elasticities for animal products

	Meat total		Butter		Milk Products		Source
	Min	Max	Min	Max	Min	Max	
Austria		-0.91	-0.64	-1.35			1)
Germany	**-0.37**	**-1.02**	**-0.12**	**-0.42**	**-0.19**	**-1.0**	**2)**
France	-0.73	-0.85	-0.09	-0.16	-0.65	-1.22	3)
Italy					-0.87	-0.91	4)
Netherlands max	-0.64	-0.88			-0.14		5)
Spain					-0.17	-0.36	6)
World		-0.85					7)
Western Europe		-1.19					7)
EU 27*		-1.03					8)
* Mean value for bovine, pig and poultry meat							

Source: 1) Widenhorn und Salhofer 2014; 2) Wissenschaftlicher Beirat 2016, zitiert nach Efferts und Adams (2014) und Thiele 2008; 3) Boizot-Szantai und Sans 2014 (meat), Bouamra-Mechemache et al. 2008 (butter, milk products); 4) Bouamra-Mechemache et al. 2008; 5) Ernst 2018; 6) Briz et al. 1998; 7) Gallet 2009 (zitiert in Ernst 2018); 8) Wirensius et al. 2011 (cited in Ernst 2018)

GHG mitigation potential, emission factors

The GHG reduction potentials of the different options are quantified based on greenhouse gas emissions per product, expressed in kg CO_2eq/kg product (e.g. milk). For the calculation of GHG emissions from meat consumption, the production of beef, pork and poultry meat and milk is considered for the individual Member States. These can be determined using the agri-short-term outlook of the European Commission (2019). The emission factors per kg of meat and litre of milk are derived approximately from the inventory data for the individual Member States. Only the emissions caused by digestion and the emissions from manure management in agriculture (stable and storage) are considered, but not the emissions from fodder cultivation. It is assumed that plant production will continue on the former forage areas. Emissions from nitrogen input to soils, e.g. manure spreading or nitrogen input on pasture are not considered. The emission factors determined are based on kg of slaughter weight or litre milk produced.

Table 4-4: Overview of emission factors used in the agricultural sector

	Milk			Meat			
	Milk yield	EF Milk		EF bovine	Other Meat	EF pork	EF poultry
Belgium	22,59	0,55		10,45	3,83	0,97	0,08
Germany	21,27	0,53		10,95	3,91	0,64	0,14
Netherlands	23,04	0,53		6,33	2,66	1,55	0,09
Austria	18,81	0,58		10,84	3,80	0,45	0,12
Poland	14,82	0,74		9,30	3,32	0,57	0,09
EF Mittelwerte	**20,11**	**0,59**		**9,57**	**3,50**	**0,84**	**0,10**

Note: EFs consider GHG emissions from enteric fermentation and manure management only. EF for other meat is based on mean value of bovine, pork, poultry as the calculated EFs for sheep/goat show a large variation between Member States and are not completely reliable.
Source: Oeko-Institute, Own calculation on basis of UNFCCC inventory submission

Annex II. Data Tables

Table 4-5: Information on approach and data sources

						2017
Expenditures per person meat consumption €/person/year			Based on Eurostat data on purchasing power parities (prc_ppp_ind), real expenditures (PPS_EU27_2020) for meat (A01010102) and population data. Data reflects only expenditures for in-house meat consumption.			
Expenditures per person consumption of other animal products (€/person/year			Based on Eurostat data on purchasing power parities (prc_ppp_ind), real expenditures (PPS_EU27_2020) and population data for fish (A01010103), milk, cheese and eggs (A01010104) and the share of animal oil and fats (A01010105) determined on the basis of FAO consumption data. Data reflects only expenditures for in-house consumption of milk and other animal products.			
Expenditures per person consumption of plant products (€/person/year)			Based on Eurostat data on purchasing power parities (prc_ppp_ind), real expenditures (PPS_EU27_2020) and population data for bread and cereal (A01010101), fruits, vegetables, potatos (A01010106). Data reflects only expenditures for in-house consumption of plant based products.			
In House Meat consumption (kg/person/year)			Based on FAO data on Food supply quantity for total meat consumption in slaughering weight, multiplied by share of out of home consumption based on market research data set for out of home meat consumption from MODOR INTELLIGENCE.			
In house consumption of milk products (kg milk eq./person/year)			Based on FAO data on Food supply quantity for total milk consumption, transfered in milk equivalent, multiplied by share of out of home consumption based on market research data set for out of home meat consumption from MODOR INTELLIGENCE. Assumption applied that the share of out of home consumption in milk products is 1/2 of the share or meat products, as milk products are usually more consumed at home.			
In House consumtpion of other animal products (kg/person/year)			Based on FAO data on Food supply quantity for fruits, vegetables and cereals.			
		Current	Variant 1	Variant 2	Variant 3	
	VAT rate meat products	Current VAT rate	Increase VAT rate for eat to standard VAT rate of the Member States.	Increase of VAT rate for meat, milk and other animal products to Standard rate of the Member States.	Increase of VAT rate for meat, milk and other animal products to Standard rate of the Member States. Reduction of VAT rate for plant based products to zero.	
	VAT rate other animal products					
	VAT rate plant products					
VAT increase	Additional expenses or savings per person	€/person	Based on effective price change due to changes in VAT rate in the respective variant and price eleatsicity. Calculated on the basis of expenditures per person for consumption (Eurostat data_prc_ppp_ind).			
	Additional tax revenues	billion € / Year	Difference between current tax revenues and changes due to changes in VAT rates. Based on effective price change due to changes in VAT rate in the			
	Change Meat Consumption	% to current	Based on price eleasticity due to changes in VAT rate in the respective variant and price elasticity for meat of -1,02.			
	Change in milk consumption	% to current	Based on price eleasticity due to changes in VAT rate in the respective variant and price elasticity for milk of -1,0.			
	Change Consumption of plant products	% to current	Based on increase of consumption of plant products, necessary to compensate for the reduction in the consumption of animal products.			
	Change in GHG emissions from diet shift (GHG footprint)	kg/cap/a	Based on FAO consumption data and emission factors from GHG footprint (Meier, 2013).			
	Change in GHG emissions from enteric fermentation and manure management	Mio. t CO_2-eq.	Based on animal specific emission factors calculated on the basis of the 2020 inventory submission to UNFCCC. Includes only CH4 and N2O emissions from enteric fermentation and manure management. It is assumed that the forage area freed up as a result of a reduction in livestock numbers remains in production and may be used for the cultivation of plant-based products to substitute animal products.			

Source: Own presentation, Oeko-Institute

Table 4-6: Austria

					Current
Expenditures per person meat consumption			€/person/year		299,90
Expenditures per person consumption of other animal products			€/person/year		340,55
Expenditures per person consumption of plant products			€/person/year		600,37
In House Meat consumption			kg/person/year		66,03
In house consumption of milk products			kg milk equ. /person/year		299,67
In House consumtpion of other animal products			kg/person/year		21,79
		Current	Variant 1	Variant 2	Variant 3
	VAT rate meat products	10%	20%	20%	20%
	VAT rate other animal products	10%	-	20%	20%
	VAT rate plant products	10%	-	-	0%
VAT increase	Additional expenses or savings per person	€/person	5,0	14,6	- 41,7
	Additional tax revenues	billion € / Year	0,20	0,4	- 0,1
	Change Meat Consumption	% to current	-9,3%	-9,3%	
	Change in milk consumption	% to current	-	-7,5%	
	Change Consumption of plant products	% to current	1,4%	3,3%	
	Change in GHG emissions from diet shift (GHG footprint)	kg/cap/a	- 56	-	95
	Change GHG emissions from enertic fermentation and manure management	Mio. t CO_2-eq.	- 0,50	-	0,25

Source: Own calculation based on Eurostat data, FAO data and UNFCCC inventory submission, Oeko-Institute

Table 4-7: Belgium

					Current
Expenditures per person meat consumption			€/person/year		521,77
Expenditures per person consumption of other animal products			€/person/year		434,46
Expenditures per person consumption of plant products			€/person/year		836,08
In House Meat consumption			kg/person/year		53,50
In house consumption of milk products			kg milk equ. /person/year		261,29
In House consumtpion of other animal products			kg/person/year		29,43
		Current	Variant 1	Variant 2	Variant 3
	VAT rate meat products	6%	21%	21%	21%
	VAT rate other animal products	6%	-	21%	21%
	VAT rate plant products	6%	-	-	0%
VAT increase	Additional expenses or savings per person	€/person	- 1,1	16,9	- 32,5
	Additional tax revenues	billion € / Year	0,68	1,3	0,7
	Change Meat Consumption	% to current	-14,4%	-14,4%	
	Change in milk consumption	% to current	-	-13,0%	
	Change Consumption of plant products	% to current	1,3%	4,4%	
	Change in GHG emissions from diet shift (GHG footprint)	kg/cap/a	- 74	-	136
	Change GHG emissions from enertic fermentation and manure management	Mio. t CO_2-eq.	- 0,84	-	0,5

Source: Own calculation based on Eurostat data, FAO data and UNFCCC inventory submission, Oeko-Institute

Table 4-8: Germany

					Current
Expenditures per person meat consumption			€/person/year		375,14
Expenditures per person consumption of other animal products			€/person/year		415,69
Expenditures per person consumption of plant products			€/person/year		742,17
In House Meat consumption			kg/person/year		78,32
In house consumption of milk products			kg milk equ. /person/year		357,68
In House consumtpion of other animal products			kg/person/year		21,39
		Current	Variant 1	Variant 2	Variant 3
	VAT rate meat products	7%	19%	19%	19%
	VAT rate other animal products	7%	-	19%	19%
	VAT rate plant products	7%	-	-	0%
VAT increase	Additional expenses or savings per person	€/person	6,8	20,7	- 29,8
	Additional tax revenues	billion € / Year	2,91	6,2	2,0
	Change Meat Consumption	% to current	-11,4%	-11,4%	
	Change in milk consumption	% to current	-	-9,4%	
	Change Consumption of plant products	% to current	1,7%	4,2%	
	Change in GHG emissions from diet shift (GHG footprint)	kg/cap/a	- 81	-	140
	Change GHG emissions from enertic fermentation and manure management	Mio. t CO_2-eq.	- 6,68	-	3,2

Source: Own calculation based on Eurostat data, FAO data and UNFCCC inventory submission, Oeko-Institute

Table 4-9: Netherlands

					Current
Expenditures per person meat consumption			€/person/year		341,48
Expenditures per person consumption of other animal products			€/person/year		345,43
Expenditures per person consumption of plant products			€/person/year		909,29
In House Meat consumption			kg/person/year		50,43
In house consumption of milk products			kg milk equ. /person/year		344,97
In House consumtpion of other animal products			kg/person/year		23,88
		Current	Variant 1	Variant 2	Variant 3
	VAT rate meat products	9%	21%	21%	21%
	VAT rate other animal products	9%	-	21%	21%
	VAT rate plant products	9%	-	-	0%
VAT increase	Additional expenses or savings per person	€/person	9,5	30,1	- 48,1
	Additional tax revenues	billion € / Year	0,54	1,1	- 0,2
	Change Meat Consumption	% to current	-11,2%	-11,2%	
	Change in milk consumption	% to current	-	-9,9%	
	Change Consumption of plant products	% to current	1,6%	4,2%	
	Change in GHG emissions from diet shift (GHG footprint)	kg/cap/a	- 52	-	113
	Change GHG emissions from enertic fermentation and manure management	Mio. t CO_2-eq.	- 0,88	-	0,5

Source: Own calculation based on Eurostat data, FAO data and UNFCCC inventory submission, Oeko-Institute

Table 4-10: Poland

					Current
Expenditures per person meat consumption			€/person/year		419,30
Expenditures per person consumption of other animal products			€/person/year		274,96
Expenditures per person consumption of plant products			€/person/year		579,94
In House Meat consumption			kg/person/year		69,70
In house consumption of milk products			kg milk equ. /person/year		258,50
In House consumtpion of other animal products			kg/person/year		13,72
		Current	Variant 1	Variant 2	Variant 3
	VAT rate meat products	5%	23%	23%	23%
	VAT rate other animal products	5%	-	23%	23%
	VAT rate plant products	5%	-	-	0%
VAT increase	Additional expenses or savings per person	€/person	4,2	14,3	- 14,9
	Additional tax revenues	billion € / Year	2,15	3,6	2,5
	Change Meat Consumption	% to current	-17,5%	-17,5%	
	Change in milk consumption	% to current	-	-13,7%	
	Change Consumption of plant products	% to current	3,1%	5,9%	
	Change in GHG emissions from diet shift (GHG footprint)	kg/cap/a	- 82	-	142
	Change GHG emissions from enertic fermentation and manure management	Mio. t CO_2-eq.	- 3,11	-	1,3

Source: Own calculation based on Eurostat data, FAO data and UNFCCC inventory submission, Oeko-Institute