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The effect of EU derogation strategies on the complying costs of the nitrate directive

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Abstract

Within the framework of the nitrate directive, member states have the possibility to apply for derogation, i.e. increasing fertilization standards under certain conditions. Several EU regions have made use of this possibility but all in a different way. In 2009, 6 different derogation policies were worked out. This paper focuses on the differences between the applied policies and makes an assessment of the impact of these differences on the application rate of derogation, the manure surplus and the costs to allocate the manure. Based on the MP-MAS model described by Van der Straeten et al. (2010) the different scenarios are applied on a single case area (Flanders) and the economic effects have been simulated. Results show large differences between the policy alternatives, leading to the conclusion that member states not only have to focus on the permission to allow derogation or not but also at the details of the derogation policy. Granting derogation at parcel level instead of farm level increases the potential effect of derogation, the height of the increase in fertilization standards under derogation determines the application rate of derogation: a higher increase leads to a higher application rate.

Keywords: Nitrate directive, MAS-model, derogation, Flanders

JEL classification: Q12, Q18, Q51, Q52.

1. INTRODUCTION

Nitrate leaching into the ground and surface water is since decennia a major problem in many EU member states. Fertilizer use for crop production is believed to be the major source of nitrate leaching (Fuller et al., 2010). The European nitrate directive (91/676/EC) focuses on this problem by aiming to reduce water pollution caused or induced by nitrates from all agricultural sources. The Nitrate directive exists already 20 years, but still many EU member states have difficulties to comply with the prescriptions of the directive. Especially the use of animal manure is difficult to manage and can lead to nutrient losses in the environment (Schroder, 2005; Schroder et al., 2004). Already lots of studies are dedicated to the manure problem in an attempt to solve the problem of over fertilization but still member states appeal on the derogation possibility to moderate the effects of the implementation of the directive for the farmers.

Member states are obliged to identify waters in which the concentration of nitrate in water is above, or at risk of reaching the 50 mg/l norm. Agricultural areas draining in these waters and which contribute to pollution should be designated as a nitrate vulnerable zones (NVZ) (Karaczun, 2005). In these regions member states are obliged to draw up (1) an action program, containing mandatory measures concerning the storage and application of manure and other organic and chemical fertilizers, and (2) a code for good agricultural practice, prescribing

the time and circumstances in which manure can be spread, the storage and spreading technologies to be used, and the fertilization standards for different crops (Goodchild, 1998). Within the nitrate directive most attention has been paid to the use of animal manure because this type of fertilizer is most difficult to manage. The impossibility to predict the exact nutrient availability and uptake is the reason why the precautionary fertilization standard for NVZ's of 170 kg manure-N ha-1 year -1 is imposed (Schroder, 2005).

It is argued that this standard is to stringent for some crops , leading to an increased use of chemical fertilizers (Schroder et al., 2007a). Some crops can benefit from a higher manure application rate without necessarily causing a higher nitrate leaching: e.g. Schroder et al. (2007b) has found in the case of cut grassland in sandy soils, an application rate up to 340 kg manure N ha-1 year -1 would not lead to an excess of the 50 mg nitrate standard. A higher nutrient dose will be justified for crops with a long growing season and a high nutrient uptake (Ondersteijn et al., 2002). Therefore the European commission gave the possibility to deviate from this norm. A Member State may request the European Commission to deviate from this obligation under certain conditions (derogation). A dispensation is based on monitoring programs and experiments (Fraters et al., 2007). The derogation option is used by several governments (Flemish, Walloon, Dutch, Danish, German, Irish, North-Irish, Austrian and British government (VLM, 2009). Only the Austrian government did not prolonged the derogation option because of the limited success (VLM, 2009).

In general, in all regions where derogation is obtained, derogation is granted at farm level, except in Flanders. In these regions the decision whether a farm can apply for derogation or not is based on two criteria: the importance of cattle on the farm and the share of grassland in the total farm area. The criteria levels can differ between member states, even as the new imposed fertilization standard. These criteria levels differ for almost every member state resulting in 6 different derogation scenario's.

Until now, only few research is done with respect to the derogation option in the nitrate directive. Buysse et al. (2005) pointed the possibility that allowing derogation for a single or few crops would stimulate farmers to increase the cultivation of these crops. According to Kruitwagen et al. (2009) the economic effects of derogation are twofold. First, less mineral fertilizers should be used to reach the same fertilization level, leading to lower costs. Second, derogation provides costs savings for dairy farmers because less manure has to be disposed off the farm (usually at high costs). A positive side effect of derogation is the decline in national manure surplus because of the higher average manure rate on grassland (Kruitwagen et al., 2009). On the other hand Claeys et al. (2008) has found that in the Flemish case the impact of derogation on manure surplus is limited, especially when phosphorus is considered to be the limited nutrient.

In general, derogation is thus a cost saving policy measure. However, the impact of derogation on the costs depends on the increase of the fertilization space, i.e. the joint impact of the fertilization standards under derogation and the number of hectares under derogation. The latest is the result of two factors: the potential area under derogation and the willingness to

apply for derogation of the farmer. In this paper we analyze the individual and joint effect of the imposed derogation rules on both factors.

Therefore the remaining of the paper is as follows: first the different set of derogation rules imposed in the different EU regions are described. In the following part a short description of the manure allocation model is given followed by a description of the data. In the result section first the potential effect of derogation for the different scenario's is given, followed by an assessment of the derogation behaviour based on data for the Flemish region. This estimated behaviour is then used to assess the willingness to apply for derogation under each policy scenario. This outcome is then used to calculate the expected effect of applying each policy scenario.

2. DEROGATION RULES WITHIN EUROPEAN UNION

In Europe, 9 regions applied for derogation. In almost every region, a different policy regarding derogation is imposed. In general, 2 types of derogation can be distinguished. On the one side, a fertilization standard of 230 kg manure-N ha-1 year-1has been applied at farm level in the case that N-manure is at least 2/3 originating from cattle. On the other side, the new fertilization standard at farm level for N-manure is 250 kg manure-N ha-1 year-1 with the restriction that only farms cultivating grassland can apply for derogation. The minimum percentage of grassland varies between the different policies from 48 to 80%.

The first two member states making use of the derogation option were Denmark (since 2002) and Austria (since 2004). Farms with a minimum share of grassland of 70% and a minimum share of cattle manure of 66.7% can apply for derogation. The fertilization standard under derogation is 230 kg manure-N ha-1 year-1 imposed at farm level. In 2008 Austria did not prolonged the derogation option. Since 2006 The Netherlands are the third region where derogation can be applied. The derogation policy was less stringent: only the grassland criteria was imposed: farms with at least 70% grassland are able to apply for derogation. The new fertilization norm is 250 kg manure-N ha-1 year-1. In Germany derogation can be applied since 2006 for farms where at least 2/3 of the total manure production originates from cattle. The new fertilization standard under derogation is 230 kg manure-N ha-1 year-1. In 2007 Wallonia, Ireland, North-Ireland and Flanders were the last four regions making use of the possibility to apply for derogation. North-Ireland and Ireland have both the same derogation policy. Derogation is applied at farm level where farms can obtain a new fertilization standard of 230 kg manure-N ha-1 year-1 when more than 80% of the area is cultivated with grassland.

The derogation policy in the two Belgian regions deviates from the general types applied in the other regions. In Wallonia, use is made of both derogation criteria (66.7% cattle manure and 48% grassland) but distinction is made between the fertilization standards for grassland (230 kg manure-N ha-1 year-1) and arable crops (115 kg manure-N ha-1 year-1). In Flanders the derogation policy is completely different from all others.

The Flemish government succeed in obtaining a unique derogation regulation in two ways. First derogation is granted at parcel level instead of farm level and second, the

fertilization norm depends on crop type. In principle, all farmers with land in Flanders can apply for derogation. However, not all parcels are qualified to apply for derogation. The first restriction is the area in which the parcel is located. When the parcel lies in a phosphate saturated area, in a groundwater collection area or an area with a high nature value, the parcel is excluded from derogation. The crop is the second limiting factor. Only crops or crop sequences where the extra manure rate would not lead to an exceeding of the 50 mg nitrate norm are specified as derogation crops. The five groups are Grassland, Maize preceded with 1 cut of grass, sugar beets, fodder beets and wheat followed by a cover crop. The fertilization standards under derogation are 250 kg manure-N for grassland and grass + maize and 200 manure-N for the rest. The type of manure that can be applied on parcels under derogation is restricted as well. The tolerated manure types are cattle manure, manure from horses, cheeps and goats. Like in other countries, farmers have to fulfill several administrative tasks (keep up fertilization plan, fertilization register, analyzing soil and manure and following the code for agricultural practices).

3. METHOD & DATA

In this paper the impact of the differences in derogation policies on sector performance are analyzed. To be able to compare the different policies in the set of EU-regions, the policies are applied to a single case area, the Flemish region. For this region detailed information exist at farm level about the use and production of nutrients gathered by the Flemish land organization (in Dutch VLM). For each Flemish farm the crops grown and the corresponding fertilization standards are known at parcel level (depending on the nutrient, area and crop), the number of animals per animal type and the corresponding nutrient excretion standards, the use of each type of manure per farm and the quantity of transported and processed manure. The data includes information over farms involved with derogation and the number of hectares per farm under derogation. The dataset contains 38.777 farms for the year 2007. Because of the availability of this detailed information, the Flemish area is the perfect case area to examine the differences in impact of the derogation policy options.

In order to perform an impact analysis of the different derogation options, different steps have to be performed. The first step is to determine for each policy alternative which farms comply with the prescriptions and which farms will apply for derogation. In the second step, the valid fertilization standards are applied and the total farm fertilization space is determined. The third step is to run the manure allocation model (Van der Straeten et al., 2010) and to simulate the individual farm' and total sector'costs.

The manure allocation model is described in detail by Van der Straeten et al. (2010, 2011). This multi-agent simulation model based on mathematical programming simulates farmer behaviour in a cost minimizing way. Each farmer has the choice to allocate his manure: disposing manure on his land, transporting it to other farms or process the manure. Manure spreading is limited because of the imposed fertilization standards. When a farmer cultivates the land, he has also the right to spread manure on it. This right is called a Nutrient Allocation Right

(NAR) and is exchangeable between farmers. Because NARs are scarce, these NARs have a value depending on the relation manure production – manure demand. In a region with a high manure surplus, NARs have a large value. The manure allocation model is able to simulate the regional differences in market price of NARs (Van der Straeten et al., 2011).

To avoid an overflow of results, three key sector parameters are chosen to indicate the effect of the policy on sector performance: total costs, net costs and manure surplus. The total costs are defined as all costs a nutrient producer has to make to allocate his manure. This is the sum of the disposal, transport and processing costs and the costs for obtaining extra NARs. The net costs are the total costs adjusted with benefits generated from selling NARs to other farms. Because at aggregated level, benefits from trade outweigh the costs from trade, the aggregated net costs are all costs made from the sector, without taking the NAR-trade into account. The manure surplus is the sum of all positive farm surpluses, it is a measure for the total quantity of manure which cannot be put on own farmland.

4. RESULTS

The result section is structured as follows: first the maximum potential impact of different derogation scenario's are assessed, second the behaviour towards the application of derogation is described and estimated, third the expected impact is analysed, based on the estimated behaviour.

4.1. Potential impact of derogation scenario's

Within the EU almost each member state applying for derogation, has imposed a different set of rules for derogation. Despite the importance of derogation for livestock farming sector, no comparison of the different set of rules has performed at this moment. In this result section importance of derogation is showed for the Flemish case. In the second part of the result section the impact of the different derogation rules valid in the EU on the total fertilization space.

A first important indicator to highlight the effect of a derogation rule is the maximum extra fertilization space for nitrogen from animal sources. This indicator is calculated by applying derogation on all farms complying with the derogation prescriptions and by assuming derogation is applied on all land fitting the derogation rules within these farms. In other words, a 100% utilization of the derogation option is assumed. The differences in the derogation potential are given in Table 1.

Table 1: potential application rate of derogation with different derogation scenario's, applied on Flemish case

	Potential Number of farms	Potential Acreage (ha)	Extra fertilization space (million kg N_animal)
Flanders	30845	476969	33.51
The Netherlands	8828	70314	5.68
Germany	17207	364137	23.46
North-Ireland and Ireland	7103	44387	3.55
Wallonia	9187	176609	3.64
Austria/Denmark	4041	51216	3.11

Source: own calculation

As shown in Van der Straeten et al. (2010) differences in fertilization space lead to differences in costs of allocating the manure. First, by spreading more manure on farm land, the higher costs of manure processing can be avoided and thus total costs will be lower. Second, because more manure can be spread on own land, there will be less demand for NARs and thus a lower price per NAR must be paid. These effects are summarized in Table 2.

Table 2: potential economic effects of derogation with different derogation scenario's, applied on Flemish case

	Total costs (million euro)		Net costs (million euro)		Manure surplus at farmlevel (kg N)		
	Total (million €)	Average (€/kg)	Total (million €)	Average (€/kg)	Total (kg N-manure)	Number of surplus farms	Average (kg N/surplus farm)
No derogation	154.47	1.27	98.64	0.81	53.19	11 780	4 515
Flanders*	79.78	0.66	62.13	0.51	41.34	8 184	4 747
The Netherlands	140.08	1.15	89.86	0.74	51.53	10 854	4 926
Germany	97.75	0.80	67.15	0.55	44.33	8 998	4 675
North-Ireland and Ireland	144.13	1.19	93.10	0.77	52.24	11 175	4 679
Wallonia	142.05	1.17	92.39	0.76	51.78	11 001	4 720
Austria/ Denmark	143.13	1.18	94.65	0.78	51.97	11 008	5 051

The differences in fertilization space lead to large differences in simulation results. In the Flemish scenario, with full compliance, the minimum costs to allocate all produced manure would be 79.78 million euro, this is a saving of 48.4% of the total costs. This is the scenario with minimal costs. At the other side, the Irish and North-Irish scenario is the less cost saving derogation scenario (only a saving of total costs of 6.7%). The effect of the net costs in more moderated. Savings in net costs varies between 4.0% in the Walloon case up to 37% in the Flemish case. Derogation offers farmers also the possibility to eliminate their manure surplus. Again the policy option will have a large influence on the number of farms: from only 605 in the Irish and North-Irish case up to 3 596 farms in the Flemish scenario.

The difference in effect on total and net costs is the result of the effect of the costs made to obtain NARs from other farmers. Because of the decreased price of NARs, farmers have to pay less for NARs. This effect is however outweighed in the net costs because of the decreased benefits for the suppliers of NARs.

4.2. Derogation application behaviour

However not all farms qualified for derogation will use this possibility. Because of different reasons farmers can choose to not apply for derogation or apply derogation on only a part of their potential area. This behaviour is important because this defines the possible effect of a derogation policy. In order to measure the effect a logit analysis is performed wherein the derogation behaviour (apply or not apply for derogation) is estimated based on farm and NAR-market characteristics. The analysis is performed on a dataset of the Flemish land agency. All Flemish farms qualified for derogation are included (30845 farms in year 2007). Table 3 gives the results of this Logit analysis.

Table 3: Estimation results of a logit estimation of the derogation application behaviour

Variable	Coefficient	Std. Error	z-Statistic	Prob.
constant	-3.584867	0.085303	-42.02502	0.0000
Total N production (kg N)	6.48E-05	5.73E-06	11.30510	0.0000
Share of cattle manure (%)	0.008737	0.000377	23.16057	0.0000
Share of manure from other animals (%)	-0.002250	0.000638	-3.525400	0.0004
N surplus in scenario without derogation (kg N)	-9.95E-06	4.88E-06	-2.039846	0.0414
NAR price (€ / kg N)	0.496942	0.025369	19.58861	0.0000
Share of grassland and maize (%)	0.003542	0.000867	4.084179	0.0000
Manure pressure * Potential increase in fertilization space	0.000328	1.29E-05	25.46664	0.0000
Potential increase in fertilization space (%)	0.012705	0.001836	6.919178	0.0000

Mean dependent var	0.360356	S.D. dependent var	0.480112
S.E. of regression	0.405115	Akaike info criterion	1.009775
Sum squared resid	4569.699	Schwarz criterion	1.012436
Log likelihood	-14053.63	Hannan-Quinn criter.	1.010632
Avg. log likelihood	-0.504564		
Obs with Dep=0	17816	Total obs	27853
Obs with Dep=1	10037		

All included independent variables have a significant effect in the 99.9% confidence interval except the manure surplus without derogation. The total nitrogen production on the farm has a positive influence on the probability to apply for derogation. This probability increases when the share of nitrogen produced by cattle increases. The share of grassland and maize has also a positive effect on the probability of applying for derogation. Related to this, the percentage of which the total farm fertilization space can increase because of derogation has again a positive effect of the chance of applying for derogation.

Farms situated in a region with a high average price for NARs have also a higher chance to participate even as farms with a higher nitrogen surplus. The last positive effect on the probability of participation goes out from the financial consequences of derogation. The chances to apply for derogation increases with increasing potential benefits or lower potential total costs.

The only variable with a significant negative influence on the probability is the nitrogen production from other animals (horses, cheeps, goats and rabbits).

The influence of the total nitrogen production on the probability is not significant while the importance of the animal group has a significant positive influence on this chance. The more the relative importance of cattle is, the higher the probability. For manure from other animals, the influence is the opposite. The influence of cattle is positive because on parcels under derogation only manure from grazing animals (cattle, cheeps, goats and horses) can be applied. Extremely stated, a specialized pig farm cannot dispose more of his manure on his land by applying derogation. Contrary, for such a farm, applying derogation will result in less own manure that can be spread on own land because all the NARs from that parcel must be used by using derogation manure (and thus not only the extra NARs). The influence of manure from other animals is more difficult to predict in advance because this group of animals contains grazing animals (cheep, goat and horses) as non grazing animals (rabbits and minks). An explanation of negative relation can be found in the fact that cheep and goats and in less extent horses are able to graze during most of the year en thus all produced manure is disposed directly on the land. Because they are mainly fed by grazing, the growth of grass is the most determining factor for the number of animals per hectare of land. Through this, the 170 kg manure N norm will not be exceeded very often on parcels grazed by these animals. Moreover those animals demand grasslands with a rather low nitrogen content, meaning that derogation is often not desired.

The possibility to apply for derogation is also positively influenced by the value of one NAR. This means that in regions with a high value of NARs, farmers are more encouraged to enlarge their available number of NARs. This behaviour has also been found by (Buysse et al., 2007; Buysse et al., 2008): a higher quota rent leads to a higher use of the right. Moreover the influence of the manure pressure increases when the number of NARs can be enlarged in a larger extent, indicating the potential economic benefit from the increase in NARs. The farmer is thus influenced by the economic consequences of derogation.

The latest factor, the extent in which the number of NARs can potentially be increased (%) has also a positive effect on the chance to apply for derogation. This can be explained from the transaction costs theory. The application for derogation generates transaction costs. For example, a number of administrative task must be fulfilled (fertilization register, grazing register, …) , generating mainly fixed transaction costs, i.e. transaction cost which remain constant independent the extend of derogation. Therefore it is economically more interesting to spread the costs over more extra NARs.

4.3. expected impact of derogation scenario's based on estimated behaviour

The influence on the chance to apply for derogation of each independent variables is analyzed for the Flemish case. Most variables are independent from the policy scenario except the potential increase in fertilization space. By changing the fertilization standard under derogation, the variable will change. The changed potential increase will affect the logit value

and the calculated probability to apply. Based on the probability it is determined which farms applying for derogation (all farms with a chance higher than 50% and complying to the derogation rules) (Table 4) and a new optimal manure allocation behaviour is simulated by means of the manure allocation model.

Table 4: expected application rate of derogation with different derogation scenario's, applied on Flemish case

	Number of farms applying for derogation	Area under derogation (ha)	Extra fertilization space (million kg N)
Flanders	5238	200641	14.73
The Netherlands	678	21618	1.81
Germany	4533	175143	11.59
North-Ireland and Ireland	297	9706	0.82
Wallonia	529	23980	0.74
Austria/Denmark	513	17568	1.09

Based on this procedure, 5 238 are assumed to apply for derogation when the Flemish policy is implemented. This is 17% of all farms qualified for derogation. The corresponding extra fertilization space is 14.73 million kg N, or an increase of 13.4% of the fertilization space without derogation. Applying all other derogation options, the number of farmers choose to apply for derogation are lower resulting in a lower area under derogation and a lower corresponding extra fertilization space. Similar as done when estimating the effect in the case of full compliance, the data of Table 4 are used in the manure allocation model in order to assess the economic effects. The results are given in Table 5.

Table 5: expected economic effects of derogation with different derogation scenario's, applied on Flemish case

	Total costs (million euro)		Net costs (million euro)		Manure surplus at farmlevel (kg N)		
	Total (million €)	Average (€/kg)	Total (million €)	Average (€/kg)	Total (kg N-manure)	Number of surplus farms	Average (kg N/surplus farm)
No derogation	154.47	1.27	98.64	0.81	53.19	11 780	4 515
Flanders*	108.80	0.89	75.08	0.62	45.58	10 127	4 500
The Netherlands	144.76	1.19	95.96	0.79	52.27	11 549	4 525
Germany	122.21	1.00	78.49	0.65	47.25	10 618	4 450
North-Ireland and Ireland	147.78	1.21	97.93	0.81	52.76	11 689	4 514
Wallonia	147.76	1.21	97.94	0.81	52.67	11 706	4 500
Austria/ Denmark	146.33	1.20	97.23	0.80	52.54	11 628	4 518

Similar to what is found in the case of full compliance, the different policy option generate large differences in costs when simulation is based on the estimated behaviour toward derogation. The savings in total cost varies between 4 and 30% and in net costs between 0.7 and 23%. These are large differences in policy impact leading to the suggestion that a member state should consider all consequences well before choosing a policy scenario.

5. DISCUSSION AND CONCLUSIONS

The derogation option offers the farm sector a possibility to mitigate the impact of becoming a nitrate vulnerable zone. Different EU member states applied for derogation but surprisingly the rules for derogation differ largely between member states. The imposed criteria to determine a farm can apply for derogation or not, the corresponding criteria levels, the new fertilization standards and the level of appliance (farm or parcel level) differs between the member states. In this paper the economic effects of the policy choices are examined.

Next to the economic effects, the corresponding environmental effects of derogation are important as well. However, measuring these effects asks a detailed modelling of all possible factors influencing the nitrogen production, nitrogen use, nitrogen release from manure and nitrogen losses. This makes it very hard to simulate the environmental consequences of a policy regulating the manure use (Buysse et al., 2005; Rajsic and Weersink, 2008; Schroder, 2005). For that reason we have chosen to focus on the economic consequences.

In Flanders 33% of all farms able to apply for derogation have applied derogation. In The Netherlands also 33% of the potential number of farms have applied for derogation but in all other regions the application rate is much lower, e.g. 3.9% in Denmark, 2.8% in North-Ireland, 0.24% in Germany and only 0.005% in Austria (VLM, 2009). Related to other EU regions, the application rate of derogation in Flanders is very high.

The success in Flanders is the result of the unique set of rules the Flemish government has obtained. That derogation can be applied at parcel level instead of farm level makes it possible that more farmers can apply for derogation. The high application rate in The Netherlands shows that not only the policy it selves is an important determinant of the application rate but also the extent in which the manure problem acts. In both The Netherlands and Flanders, the total region is indicated as a nitrate vulnerable zone and there is a manure surplus at sector level. The consequences of the manure policy are more experienced by farmers in these two regions than in other regions.

Because of the imposed derogation criteria and the restriction that only manure of grazing cattle can be disposed on farmland under derogation, derogation will be mostly applied by cattle producers. In The Netherlands and Flanders, dairy production is very intensive in terms of kg milk production per hectare of land, meaning a high nutrient production per hectare. Therefore, in both regions at the one hand dairy farmers are strongly affected by the introduction of the nitrate vulnerable zone but on the other hand dairy farmers comply mostly to the derogation criteria and possess the right type of manure and thus have the key to reduce the impact in their own hands.

In other regions, e.g. Germany and Denmark dairy production is less intensive in terms of production per hectare, meaning that dairy farmers have less problems to remain under the 170 kg manure-N ha-1 year-1 standard. Farms complying with the imposed derogation criteria and farms having a manure surplus are therefore often not the same, resulting in a lower derogation application rate.

However the imposed policy rules seriously affect the potential success of derogation. The imposed policy has a large impact on the number of farms complying to the derogation criteria, the potential number of hectare under derogation or the extra obtained fertilization space. The latest has a significant impact on the allocation costs of manure.

Whether a farmer applies for derogation or not is partly based on farm characteristics en market conditions wherein these farms operate. In general the probability to participate increases with an increasing importance of manure from cattle on the farm. The extent in which the fertilization space will increase because of derogation influence the chance of participate positively. Also the price of NARs in the region influence the chance to participate positively.

For the entire farm sector derogation has a positive effect on the costs for manure allocation. For farms with a manure surplus, derogation leads to an increased quantity of manure that can be disposed on own land. Those farms can avoid transportation, processing and NAR acquisition costs by applying derogation. Non surplus farms can increase their available number of NARs and offering these at the NAR market. As a result, also other farms can dispose more manure on land. By doing that, they avoid processing costs but more transport costs and NARs must be bought. However, the result remains positive and thus derogation influence the entire sector positively.

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