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THE NITRATES DIRECTIVE, INCOMPATIBLE WITH LIVESTOCK FARMING?

THE CASE OF FRANCE AND NORTHERN EUROPEAN COUNTRIES

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SUMMARY

Comparing France's manure policies to those of the northern European countries brings to light significant differences in mindsets. **Policies in the north of Europe, which have gradually been aligned with Denmark's policy, have focused action on effective compliance with fertilisation balance, without attempting to block or avoid necessary structural changes**. When faced with these policies, farmers adopted a multi-pronged approach: they reduced herd sizes (the Netherlands), increased farm sizes and became specialised by developing their piglet production and reducing fattening/feeding activities.

"THE POLICIES ENACTED IN THE NORTHERN EUROPEAN COUNTRIES ARE MORE IN LINE WITH ECONOMIC ANALYSIS RECOMMENDATIONS THAN FRANCE'S POLICY"

By contrast, **France based its manure policy on controlling and supporting its livestock farming structures, without allocating sufficient means to control mineral surpluses**. This policy, enabled by massive subsidies allocated to pollution disposal infrastructures, led to a series of successive regulations. This choice was seen as a lesser of two evils: by amassing regulations to deal with growing livestock numbers, the country was able to put off financial sanctions and using fiscal leverage. These choices explain the poor environmental results compared to the sums invested by the government to aid surplus disposal. They also explain the lack of initiative on the part of farmers and the loss in competitiveness of France's intensive livestock farming sector.

The policies enacted in the northern European countries are more in line with economic analysis recommendations than France's policy. Based on this observation, we put forward several recommendations that could improve the ecological and economic efficiency of French policy (see "Main recommendations for France"):

- **Effectively apply regulations,** by defining the right ecological standards and sanctions.
- **Expand sensitive zones**, where stricter measures would be applied according to ecological issues.
- **Simplify regulations**, by eliminating measures that unnecessarily limit farm restructuring.
- **Facilitate manure transfers**, to help minimise manure disposal costs.
- **Compensate income losses** temporarily but without creating distortions.

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MAIN RECOMMENDATIONS FOR FRANCE

1. Effective application of regulations

- Rigorously apply the regulation on classified installations for environmental protection.
- Establish a set of ecologically efficient standards corresponding to various situations.
- Modify the composition of the regional nitrate expert groups for greater impartiality.
- Simplify the provisional balance method, by favouring caps on minerals.
- Make electronic filing of nitrogen accounting declarations standard practice.
- Simplify sanction procedures and close legal loopholes.
- Favour administrative sanctions and rely on criminal sanctions only in cases of fraud.
- Develop dissuasive financial sanctions (fines that exceed disposal costs).

2. Improving economic efficiency: environmental measures

- Develop stricter or additional measures in ecologically sensitive areas.
- Restrict nitrogen emission limits in water basins used for drinking water and where green algae grows.
- Extend ecological zoning (surface water eutrophication, risk of heritage destruction, odour- and ammonia-sensitive housing areas).
- Define “industrial livestock farming zones”.

3. Improving economic efficiency: measures for producers

- Harmonise authorisation thresholds for livestock farms with european levels.
- Eliminate limits on manure application areas and compulsory treatment.
- Discontinue the ban on new/expanded farms and restructuring regulations.
- Promote the development of manure management organisations.
- Eliminate coupled aid linked to specific technology use, except for pilot projects.
- Do not subsidise anaerobic digestion of energy crops.

4. Income support

- Implement mineral fertiliser standards rather than levy taxes on inputs.
- Eliminate the tax on livestock farming pollution, an unfair and ineffective tax.
- Provide flag-neutral aid during a limited period of structural adjustment.

INTRODUCTION

1. Indirect environmental impacts of market prices and CAP subsidies

Over the last century, higher land and labour costs and cheaper industrial factors (e.g., fertiliser, mechanisation) have led industrialised nations to seek new technical solutions for their agricultural sectors. The resulting structural changes, such as the expansion and specialisation of farms, intensification of production, have resulted in the environmental issues we face today: pollution, erosion, losses in biodiversity, abandoned farmland, etc.

In the case of intensive livestock farming, labour and agglomeration economies have encouraged farms to expand and specialise. Animal production has also been concentrated in several regions, such as Brittany (France), the Netherlands and Denmark.

By providing coupled aid linked to production and land, the historic CAP has often exacerbated environmental concerns due to market prices. However, reforming the CAP by decoupling payments like in 1992 and 2003, or by conditioning/greening payments as in 2003 and 2013, will not resolve all the agricultural-related environmental concerns. Pork, poultry and fruit and vegetable productions are not well supported by the CAP, but can be considerable sources of pollution. Green payments are good for biodiversity in terms of land use practices, but do not address pollution problems stemming from pesticide and mineral fertiliser use. It became apparent in the early 1990s that specific policies to deal with these types of pollution were necessary.

2. The Nitrates Directive and criticism of French programmes

> "THE 'NITRATES DIRECTIVE' REQUIRES MEMBER STATES TO IDENTIFY ZONES WHICH MAY BE AT RISK AND TO DEVELOP ACTION PROGRAMMES"

The 12 December 1991 directive, known as the "Nitrates Directive", concerns the protection of waters against pollution caused by nitrates from agricultural sources. Member States must identify zones which may be at risk for nitrate contamination or where contamination has been observed[1]. The directive also requires States to develop action programmes for identified zones, as well as submit a 4-yearly revision of vulnerable zones and action programmes. Action programmes must include codes of good agricultural practice[2] and limit fertiliser application. This restriction is based on all types of nitrogen application with respect to crop requirements. Furthermore, nitrogen application from livestock manure is limited to 170 kg per hectare. Member States may take additional action if these measures do not sufficiently reduce pollution.

1. Concentration over 50 mg/L.
2. Especially with regards to time of year, fertiliser spreading conditions, manure storage methods and land management.

BOX 1. The importance of nitrogen fertilisation in agriculture

Nitrogen: A chemical element with symbol N which is an essential component of living matter, just as carbon, oxygen and water are.
Nitrogen fertilisation: On a plot of farmland, the natural annual soil nitrate production cannot meet the needs of plant cover when expected crop yields exceed what is possible without fertilisation. The total quantity of nitrogen from fertilisers (organic or mineral) applied to a crop equals the crop's requirements (calculated according to fixed yields), plus forecasted nitrogen losses from the soil during the growing season, minus the overall other nitrogen supply to the soil (varies depending on the initial amount of nitrogen in the soil).

Source: Marcel Mazoyer (Dir.), Larousse agricole, le monde paysan au XXI[ème] siècle, *Larousse, 2003.*

The implementation of the Nitrates Directive in the different Member States has been subject to many ups and downs and the successive action programmes have not always been successful in keeping pollution in check. For example, in France, nitrate levels have only recently been stabilised in watercourses, but have slowly continued increasing in groundwater supplies. In Brittany, concentrations have decreased since the early 2000s in the most polluted watercourses and have stabilised elsewhere[3]. In this region, the results can be attributed to measures that aim to dispose of manure surpluses. They are also due to reduced poultry flocks and cattle herds, which are not linked to the Nitrates Directive.

Despite these recent uneven results, in 2010 the French Court of Auditors and Council of State deplored the failure of the policy to reduce pollution from agricultural sources because of a lack of political support and appropriate instruments.[4] They did note successes in certain regions or countries, such as Denmark. These institutions also highlighted the high cost of the programmes in comparison with their results and poor resource allocation, which favoured curative solutions over stopping pollution at the source. Moreover, in the late 2000s, France was taken to court over its non-compliance with certain European directives – namely, the 1975 directive concerning the quality of surface water intended for the abstraction of drinking water and the Nitrates Directive. As regards the Nitrates Directive, in addition to proliferating coastal green algae, the European Commission has reproached France for shortcomings in its identification of nitrate vulnerable zone (NVZs) and the content of its action programmes.

3. The Nitrates Directive and livestock farming: manure policy in France and northern European countries

"THE MANURE POLICY IS POSSIBLY THE OLDEST AND MOST COMPLEX OF THE AGRICULTURAL ENVIRONMENTAL POLICIES"

This Policy Paper focuses on the application of the Nitrates Directive to livestock farming, referred to as "manure policy"[5] in northern European countries. The nitrates problem first appeared in the European regions where animal populations were highest. The manure policy is possibly the oldest and most complex of the agricultural environmental policies. With twenty years' hindsight, it offers an interesting point for analysis.

This Policy Paper compares French policy to those in force in Denmark and the Netherlands. Animal density in the Netherlands is higher than in Brittany and Denmark, which are comparable. Policies in these three countries have shifted under pressure from the European Commission and litigation proceedings. Denmark and, more recently, the Netherlands, have received satisfactory marks from the European Commission on their manure policies, giving them right to a derogation on manure N spreading limits on grasslands[6]. In these countries, environmental policy efforts have not hindered major restructuring of intensive livestock farming, especially for pork producers.

In this context, economic analysis can be used to answer two questions:

3. The observation is more subtle in the water table. The 2000-2010 decade was a period of low water runoff, a factor reducing watercourse nitrate levels.
4. In particular, the absence of dissuasive taxes or price signals.
5. Manure policy.
6. 250 kg par hectare.

- Based on analysis of indicators and instruments, what explains the difference in environmental and economic efficiency observed between the policies in France and those in northern Europe?
- By comparing these policies, what recommendations could be made to improve French policy effectiveness, at reduced cost for farmers and for society in general?

The first three sections of this Policy Paper deal with French agricultural policy. The first section underlines France's excessive reliance on voluntary approaches, which alone are insufficient to reduce pollution and stimulate environmental innovation. The second section shows how the French government, when faced with the need for standards, issues too many standards and regulations, which not only lead to a bloated administration and paralyse the livestock industry, but which are also ineffective at targeting pollution and are poorly applied. In correlation, the third section discusses how the livestock industry has no motivation to restructure itself for greater long-term sustainability since environmental costs are not recovered by the industry players. Conversely, the fourth part shows how countries in northern Europe have focused action on effective limiting of fertilisers by recovering costs and without obstructing livestock restructuring. Before concluding, the final part of this Policy Paper offers recommendations for France to address the effective application and simplification of regulations as well as cost recovery.

1. The ineffectiveness of voluntary actions and regulatory capture

1.1. Voluntary actions: France's choice to combat diffuse pollution

> "FRENCH PROGRAMMES TO COMBAT DIFFUSE AGRICULTURAL POLLUTION RELY ON EDUCATION AND VOLUNTARY ACTIONS BY PRODUCERS"

In France, programmes to combat diffuse agricultural pollution have always relied chiefly – and still do – on education and voluntary actions by producers. This strategy was agreed to by the French government and the agricultural profession, with a view to making the policy painless by avoiding restrictions and sanctions. The debates preceding the vote on the French law on water and aquatic environments in 2006 is a telling example. The Minister for the Environment at the time stated his "trust in the agricultural sector to commit to good practices" and preference in encouraging "shifts in farmers' behaviour rather than allowing them to pollute by levying taxes". For its part, during the 2012 demonstrations against the application of the Nitrates Directive, the FNSEA (the French National Federation of Farmers' Union) called for "trusting farmers' common sense."

The French government has always supported proactive agricultural initiatives which benefit the environment. Integrated agriculture is one such initiative, for which the legal framework was created in 2002. It aims to limit the negative effects of agricultural practices on the environment and reinforce positive effects without affecting the economic profitability of farms. More recently, the industry and agricultural cooperatives have taken ownership of the concept 'ecologically intensive agriculture' (EIA), which refers to innovative agricultural production systems which are supported by ecosystems to reduce inputs and provide ecological services, without diminishing production. While integrated agriculture must comply with a set of specifications imposed by French law, EIA is presented as a progressive measure implemented by farmers of their own accord, with no restrictions or specifications to respect. Like integrated agriculture once was, AEI has become a national priority for the new Minister for Agriculture, who wants to mobilise the entire industry while also promoting agroecology[7]-focused research, development and education, seen as a way to move away from standards[8].

7. Official equivalent of EIA.
8. The Minister has specifically stated that the Nitrates Directive is an exception to this view, due to European litigation.

1.2. Economic criticism of a voluntary approach

"VOLUNTARY APPROACHES TO ENVIRONMENTAL CONCERNS ARE ONLY MARGINALLY EFFECTIVE"

There is considerable agreement in economic literature – both empirical and theoretical – that voluntary approaches to environmental concerns are only marginally effective. This can be explained by the central role economic players have in setting targets, the risk of opportunistic behaviour, unenforceable commitments and the lack of oversight. Voluntary approaches can also be used to get around existing regulations or to block new, stricter environmental policies.

Regulatory capture is when voluntary measures cost a business nothing, e.g., when the environmental objective is defined in a way that leaves policy unchanged. For capture to be successful, the regulatory agency must also profit in some way. Adopting voluntary approaches can effectively bring to light a common interest and lead to collusion between agency and industry. On one hand, public policymakers need to show that actions undertaken benefit the environment. On the other, they want to reduce expenditure by unloading a part of their administrative costs on industry, particularly for oversight. Voluntary approaches allow public policymakers to maintain a neutral stance between environmental objectives and employment in the polluting industry. Economists believe that voluntary approach outcomes could be improved if other credible instruments, namely economic, were implemented in case of non-compliance with targets. In other words, both parties must agree to build restrictive agreement.

As discussed in the introduction, the push for economies of scale, agglomeration economies and the ability to substitute factors of production has driven technological advances in agriculture, which are at the origin of negative effects on the environment. This is why going against these changes to limit negative consequences and produce ecological services inevitably implies a cost for producers. The real issue is that these 'environmental' costs are difficult to recover in competitive markets such as agriculture because the environment is a collective good that cannot be owned. In other words, consumers of agricultural commodities are ready to pay for 'private' food characteristics (taste, health benefits, etc.), but generally not for characteristics such as the environment, which as public goods, can be enjoyed free of charge. However, there are exceptions when environmental property rights do apply[9], or when players cooperate to produce or consume environmental goods[10] by avoiding 'free riders' (organic agriculture; certain PDOs; AMAPs[11]; charters of rural tourism; etc.). There are also producers and consumers who are ready to absorb these costs, particularly because they have altruistic motivations; they are, unfortunately, few in number.

1.3. Bretagne Eau Pure, an example of environmental regulatory capture

In Brittany, three Bretagne Eau Pure (BEP) programmes followed one another between 1990 and 2006 and continue today under another structure. Organised according to watersheds, the BEP programmes aimed to speed up voluntary regulation application by the agricultural sector. The French government, local communities and the local water agency financed these programmes; the chambers of agriculture are responsible for oversight. The BEP relies on collective action, awareness campaigns, training, demonstrations, diagnoses of agricultural practices and contractual commitments for the most motivated farmers.

A 2005 study by Brittany's regional agricultural statistics agency showed that results achieved by BEP correspond to those observed in existing economic literature. BEP improves practices when there is a credible regulatory threat and/or a public subsidy programme, or when actions are financially painless. However, BEP has no effect on mineral nitrogen use, most likely because there are no inspections and switching to organic fertilisers

9. Lease hunting is one example.
10. For cooperation to be compelling, environmentally beneficial agricultural practices must result in the specific characteristics of products or services, which is not always the case.
11. Association pour le Maintien de l'Agriculture Paysanne: French associations which support small farming by creating a partnership, which includes environmental commitments, between a group of consumers and a local farm.

would imply higher costs. Mineral nitrogen use is first and foremost sensitive to the price of oil[12] and agricultural commodities. Several official reports have highlighted BEP's weak environmental and economic efficiency, as well as the ambiguous role of the chambers of agriculture, which act as both judge and jury. As has been observed in other countries, education alone is not effective when optimal environmental standards imply diminished profits for producers, even when they understand the relationship between their practices and water quality.

Like Brittany's BEP programme, integrated agriculture and EIA as they stand now are essentially "regulatory capture". A first strategy is for players commit to targets that are not overly ambitious. In this way, the specifications for integrated agriculture were shown to not be more restrictive than existing regulations. A second strategy – one adopted by BEP and EIA – involves not committing to restrictive targets. The new production systems EIA calls for could remain attainable for a few industry pioneers, in that producers are not obligated to absorb additional costs. It is certainly plausible that technical agricultural innovations could have a positive effect on the environment and lead to private savings, but if this is so, why haven't they already been developed?

> "ONLY THE GOVERNMENT CAN CREATE PRICE AND SCARCITY SIGNALS ENCOURAGING ENVIRONMENT-FRIENDLY TECHNOLOGIES"

Economists agree, however, that innovation comes about in times of scarcity and relative prices of factors of production, as witnessed in the agricultural sector. Because the environment generally lies outside of the market – with free access at no charge – only the government[13] can create price and scarcity signals through environmental policies that would encourage innovative environmentally-friendly technologies. Many empirical studies have shown that there are more environmental innovations in countries with stricter environmental policies. It is therefore irrelevant to oppose environmental standards or taxes, which are drivers of green innovation, to innovative initiatives undertaken by producers. A good example of this is Denmark, a country where livestock production has been restructured in line with one of the strictest manure policies in Europe[14].

2. Abundant regulations that are off-target and ineffective

In their 2008 report on the French pork industry and sustainable development, J. Lessirard and P. Quévremont noted the 'excessive complexity, relative ineffectiveness, and overall disappointing results' of France's regulatory framework. How did France get this to point?

BOX 2: Major stages of French regulations

1976: regulation concerning French classified installations for environmental protection
1991: directive on the protection of water from nitrate pollution from agricultural sources
1996: creation of ZESs (zones with structural surpluses, where the nitrogen limit of 170 kg/animal/hectare is exceeded); creation and expansion of livestock farms are banned
1998: Voynet-Le Pensec circular enters in force, imposing limits on manure application and mandating manure treatment or transfer in ZESs
2001: creation of ZACs (zones requiring additional action), located upstream from drinking water intakes, where total nitrogen fertiliser application is limited to 210 kg/hectare
2005: decree on livestock farm restructuring, which allows farms to regroup over one or several sites
2007: programme on watersheds under litigation with the EU, drastic limits imposed on total nitrogen fertiliser application
2010: plan to combat green algae, including regional action plans submitted by relevant players
2011: decree to simplify regrouping of classified livestock farms
2011: decrees which outline the new provisional balance method, meant to limit fertiliser application, and creation of regional nitrate expert groups (GREN)

12. Nitrogen fertiliser synthesis requires energy input, which explains the link between the price of oil and fertiliser.
13. As well as groups of players who implement collective coordination schemes.
14. Changes to production processes under pressure from environmental regulations could, in Porter's view, increase competitiveness through improved productivity.

2.1. Structural oversight: Classified installations and ZESs

> "FRANCE CHOSE TO FOCUS ON CONTROLLING THE CREATION AND EXPANSION OF LIVESTOCKS, RATHER THAN BALANCING FERTILISER APPLICATION"

In regions with high animal densities where the nitrates problem first emerged, the French government chose to focus on controlling the creation and expansion of livestock farms, rather than balancing fertiliser application, as intended by the Nitrates Directive. This is why, since 1976, livestock farms have been subject to the regulation on classified installations for environmental protection (ICPE), a cornerstone of the French legal framework. It aims to control pollution at the source by limiting livestock numbers. Livestock farms must file a simple declaration or obtain authorisation that includes an impact study and public survey depending on the farm's livestock pattern thresholds. The effectiveness of this regulation is limited in that, while the impact study offers an initial overview of the livestock numbers and manure production – allowing the fertiliser balance to be determined at the start of operations – it is not updated over time[15].

In 1996, the French government shifted its attention to geographical zones where the nitrogen pressure exceeded the limits allowed by the Nitrates Directive. It implemented specific programmes (for surplus disposal), which were annexed to the action programmes required by the Nitrates Directive. Districts were classified into ZESs when organic nitrogen[16] (manure) exceeded the maximum 170 kg/hectare limit. To prevent increased organic nitrogen levels, new or expanded livestock farms were banned in ZESs. The need for faster disposal increased demand for land used for manure spreading, bringing with it a need to regulate access to spreading for social reasons, i.e., to avoid land grabbing for manure spreading by large-scale farms to the detriment of smaller farms without the means to invest in manure treatment systems. In 1998, the Voynet-Le Pensec circular imposed a twofold requirement for each district located in a ZES. First, farms were subject to limits on third-party spreading land used in addition to their own land. Second, an organic nitrogen production limit was implemented at the farm level. If the limit is surpassed, farms must treat or transfer their surpluses[17]. Only districts with less than 140 kg/hectare of organic nitrogen could import transferred manure.

2.2. The necessity and disadvantages of restructuring regulation

The French government was aware that banning livestock farm expansions in ZESs threatened French competitiveness by blocking their structures. To compensate, the government passed a decree (30 May 2005) which authorised farm restructuring. Restructuring can be internal or external, depending on whether herd (and species) regrouping occurs over a single or several sites. The equivalence between different animals is measured by the nitrogen content in manure. Internal restructuring is authorised with the total nitrogen quota remaining unchanged. In the case of external restructuring, the government deducts up to 20% of the nitrogen carried over, reducing the nitrogen quota for the farm undergoing regrouping by the same amount. Furthermore, MP Marc Le Fur (Côtes d'Armor, Britanny) initiated the additional decree from 18 January 2011, which aimed to simplify the regrouping of classified livestock farms[18].

This regulation was most likely influenced by the tradable animal quota system that exists in the Netherlands and in Belgian Flanders (but not in Denmark). It effectively creates nitrogen quotas that can be exchanged between farms, allowing restructuring in zones where new farms or expansions are no longer possible, while farmers themselves finance the operations. Similar to how milk quotas or individual fishing quotas are transferable, this procedure helps maximise the value added to production for a given overall quota. The French government also wants to reduce overall mineral levels in these zones with surpluses through quota deductions.

15. Except in cases of litigation or requests for expansion.
16. Called organic nitrogen, because it occurs along with carbon, as opposed to the "mineral" nitrogen used in chemical fertilisers.
17. Mandatory treatment of surpluses can be extremely costly for farms near the limits and at odds with the circular's objective of supporting farms.
18. Farms are exonerated from the impact study and public survey if the regrouping does not significantly alter livestock numbers and manure application, and if the final livestock number does not exceed European limits, which are higher than national limits.

"THERE ARE MANY DISADVANTAGES TO THIS ANIMAL QUOTA SYSTEM COMPARED TO A SYSTEM BASED ON SOIL PURIFICATION CAPACITY"

However, there are many disadvantages to this animal quota system compared to a system based on soil purification capacity. First, it generates rents, which benefits existing livestock farms that are not necessarily in compliance with the Nitrates Directive. These rents also slow down restructuring. Second, by concentrating herds on regrouped sites, quota trading between farms lead farms to be even more disconnected from the land. Increased nitrogen pressure from manure over a given land area imposes greater reliance on subsidised slurry treatment[19].

2.3. Emergence of ecological zoning

In addition to the ZESs, which exceed Nitrates Directive limits, legal disputes on water and nitrates led the French government to establish an additional category for so-called 'ecologically sensitive zones'. Strengthened actions are planned for these zones to deal with environmental problems that are not an issue elsewhere. The decree from 10 January 2001 introduced this concept by creating ZACs, zones requiring additional action. They concern watersheds located upstream from drinking water intakes. In addition to requirements on winter soil and bank cover, ZACs are the first zones in France to implement limits on total (and not just organic) nitrogen fertilisation (210 kg/hectare), in keeping with the spirit of the Nitrates Directive.

Watersheds that were the subject of dispute with the EU were added in 2007 and watersheds with green algae were added in 2010. The disputed watersheds did not comply with the 1975 directive on water sources used for drinking water[20]. As a result, in these watersheds located in Brittany, total nitrogen fertiliser application per hectare of utilised agricultural area (UAA) was drastically capped at 140 kg for pork and cereal producers, 160 kg for mixed crop and cattle farms and 170 kg for vegetable producers. Improvements observed for certain watersheds and closings of non-compliant intakes put an end to the dispute in 2010.

However, because of the addition of green algae complaints to the nitrate lawsuits, the French government initiated a "Plan to combat green algae" in 2010, which concerns eight bays and 23 watersheds in Brittany. Total nitrogen fertilisation is limited to 210 kg per hectare as in the ZACs. This plan is unique in that local players must adhere to a regional action plan for each of the eight bays. The plan is evaluated by a regional steering committee and supported by an advisory council that brings the regional players and a scientific committee who assesses the projects. The plan allows for the threat of obligatory measures to be taken if the regional plan is inadequate, if participation by farmers is insufficient and if targets are not reached after three years. By threatening to classify the Baie de Horn-Guillec (Finistère, Brittany) as an "area subject to environmental restrictions", a regional plan that includes individual "voluntary" commitments by farmers, absent from the original plan, was finally drafted. Here, the collective threat fostered cooperation among the players, just as organic agriculture or certain PDOs can lead to collective benefits.

The last decrees enacted 7 May 2012 continue along the same line of differentiating policies based on local ecological issues. They allow regional action programmes to include stricter measures in certain areas of vulnerable zones[21] and particularly to limit the nitrogen balance at less than 50 kg per hectare. They can also require a yearly declaration of nitrogen from all sources, whether spread or exported, and where it was applied. The government set up an electronic declaration system for watershed with green algae, helping facilitate cross-checking of declarations.

19. Due to this risk of mineral concentration, the regulation on restructuring also imposed a stricter phosphorus standard.
20. Nitrate levels over 50 mg/L.
21. Watersheds facing possible litigation over drinking water and watersheds with green algae.

2.4. Sanctions: rarely applied and insufficiently dissuasive

"SEVERAL REPORTS CRITICISED THE OVERLY FORMAL OVERSIGHT AND A LACK OF RIGOUROUS APPLICATIONS OF LAWS IN FRANCE"

Between 2000-2010, several reports from various Ministries for Agriculture and Ecology criticised the overly formal oversight and a lack of rigorous application of laws regarding manure spreading and land lending. In its 2010 report[22], the Court of Auditors considered that the effectiveness of agricultural pollution regulations was limited due to too few measures undertaken and insufficient oversight. More generally, it noted that enforcement did not go far enough and had poor follow-up in the area of water. Despite increased inspections since 2005, administrative and criminal sanctions stay rare and enforcement agencies often neglect to follow up on citations.

In Brittany, because no legal follow-up was taken for most official reports regarding the watersheds in dispute, in 2008 the courts tried to develop alternative penalties. In this region, 14% of the ICPEs were inspected in 2010, and 15% were subject to action[23] after an infringement was observed. Moreover, in 2009 and 2010, 30% of official reports led to a fine and/or a hearing and 22% resulted in an alternative procedure (warning, mediation, etc.). The inspection rate is much higher for the disputed watersheds and watersheds with green algae (50%) than in the rest of the country. However, there are very few inspections on fertiliser application due to the complexity and absence of a set of references. Additionally, infringements of ICPE legislation are rarely followed by any administrative sanction (closing or consignment). In 2010, the Court of Auditors criticised the weakness of the fines compared to the economic benefits of committing the infringement (€1000 for a misdemeanour, €400 for a minor offence). Where nitrogen is concerned, this means the fine is not proportionate to the surplus N and the cost required to bring it back to zero.

2.5. Nitrates litigation and France's recent responses

In a letter dated 25 April 2009, three years before the case was brought before the European Court of Justice, the European Commission had already notified France about several areas of non-compliance[24] with the Nitrates Directive. In particular, France had not implemented a balanced fertilisation, was not in compliance with the annual organic nitrogen spreading limits of 170 kg/hectare and its regulations regarding manure spreading were lacking or inadequate. It also appeared that the nitrogen excretion standards for animals reported by France had been underestimated. In addition, during its review of the Ille-et-Vilaine (Brittany) action programme, the Commission highlighted that "the action programmes must impose [...] a quantified limit of nitrogen application of all sources in order to set an absolute threshold that must not be exceeded", whereas "the action programme [...] only sets quantified limits of nitrogen application in the ZACs".

France responded to these criticisms by enacting several decrees and orders in 2011, 2012 and 2013, which specified the content of its future action programmes. The order from 10 December 2011 outlines the means France will use to limit fertiliser application in order to a balanced fertilisation, a core component of the new regulations. The amount of nitrogen fertiliser to be applied is calculated using the provisional balance method, which balances nitrogen supply and losses. These regulations should be applied even more rigorously since the organic nitrogen limit now applies to utilised agricultural area[25] instead of the spreading area (decree from 10 October 2011). In its opinion dated 12 October 2011[26], the French environmental authority highlighted the challenges in monitoring and enforcing the balanced fertilisation given the complexity of the regulations, especially given that this target is still often considered an administrative formality.

22. Instruments for sustainable water management.
23. Prefectural order of formal notice or official report.
24. From France's third action programme.
25. As in the other European countries, this should not alter cattle stocking rates since nitrogen excretion standards will be increased proportionally. It will authorise an increase of 20% of pig and poultry stocking rates.
26. French General Council for the Environment and Sustainable Development; French Ministry for Ecology, Sustainable Development and Energy.

BOX 3. Provisional nitrogen balance and fertilisation balance

The estimated amount of nitrogen fertiliser to be used is calculated based on the provisional nitrogen balance, outlined by the Comité français d'étude et de développement de la fertilisation raisonnée[27]. **Nitrogen supply by fertilisers equals the difference between:**

- **Nitrogen losses:**

- The estimated quantity of nitrogen absorbed by crops
- Gaseous or microbial losses
- Losses from nitrate leaching
- Mineral nitrogen present in the soil at the end of reporting

- **and other sources of nitrogen application:**

- Supply by the soil, crop residue and grassland ploughing
- Symbiotic fixation of atmospheric nitrogen by pulses
- Atmospheric supply
- Supply through water irrigation

The estimated fertiliser balance is achieved if a reasonable yield target is set (determines the quantity of nitrogen absorbed by the crop) and other losses are minimised.

Source: Order from 19 December 2011

In each of France's administrative regions, a regional nitrates expert group (GREN) was created to provide the technical expertise needed to draft an operational method (the regional set of references). A majority of GREN[28] members are agricultural professionals, whether representatives from governmental agencies, chambers of agriculture, technical institutes or agricultural cooperation, while scientists[29] and water and environmental specialists are a minority. This situation gives agricultural professionals the ability to "voluntarily" set technical references limiting fertiliser application. The ineffectiveness of voluntary approaches *(see below)* leads us to believe that scientists would have a difficult time being heard, as they face ever-present pressure from agricultural professionals who do not want fertiliser application to limit crop growth. The complexity of the method chosen to calculate fertiliser application, and especially the multiple balance entries, provides numerous opportunities for unbalanced fertilisation to be approved legally.

2.6. Conclusion: regulatory capture if no threat of litigation

Additional regulations implemented under pressure from the European Commission have led to a burdensome legal framework with requirements that have no ecological benefit. With obligations on pollution clean-up technologies (treatment), the distribution of spreading land, and the limitation and restructuring of farms all create economic inefficiency and discourage entrepreneurs, without any guarantee of environmental efficiency. France chose to favour structural oversight measures rather than to target surpluses and pollution. The result: governmental inspections made cumbersome due to the multitude of legal texts. Regulations are also often excessively complex, which makes inspections all the more difficult. The method adopted in 2011 aimed to achieve greater agronomic precision by requiring all balance entries to be specified, rather than just fertiliser applications that were to be limited. This increases the possibilities to contest entries. These administrative costs are called transaction costs by economists in analogy to what happens on the markets. They can strain the economic efficiency of a policy when they are too high.

27. http://www.comifer.asso.fr/
28. Which composition is set out in the order dated 20 December 2011.
29. Most of those who are on the GREN work for INRA, the French National Institute for Agricultural Research under the (partial) authority of the Ministry for Agriculture, and whose administrative board includes several representatives from the agricultural and agro-food industries.

> "FRANCE ACTS AS IF IT DID NOT WANT SIMPLE REGULATIONS THAT LIMIT NITRATES"

Furthermore, although numerous and complex, the regulations still have many shortcomings. First, it would have been necessary to wait for the 2011 legislation for mineral nitrogen to be systematically included in the fertiliser calculations, which still does not guarantee a balanced calculation given the make-up of the GRENs. Second, sanctions are rare and hardly dissuasive. France acts as if it did not want simple regulations that limit nitrates. This could be interpreted as regulatory capture, which is facilitated by a long tradition of co-management of agricultural policies by government agencies and professional agricultural organisations. Nevertheless, this is not true with regards to the ecologically sensitive zones, where the French government has recently intensified efforts under pressure from European litigation proceedings. In these areas of France[30], simple and effective standards (notably, total nitrogen limits) and high inspection rates have led to a notable reduction in nitrogen application and flow.

3. Financial and fiscal leverage: Ignoring the polluter pays principle

3.1. Significant and constant subsidy flows in high animal density areas

In a region with a high livestock density such as Brittany, increased regulatory pressure was followed with various successive financial programmes in place since 1990. The French programme to control pollution of agricultural origin (PMPOA) was created in 1993. It financed investments for animal waste recovery and storage, or more specifically, to bring livestock buildings up to standard (but not surplus disposal). At the national level, public subsidies amounted to 1.5 billion euros for the first programme (1994-2001) and 560 million euros for the second (2003-2007), accounting for two-thirds of investments. Brittany alone was responsible for 25 to 30% of the national cost and PMPOA subsidies. From 1999, regional farming contracts, followed by sustainable agriculture contracts, were signed to shift agricultural practices. For example, they provided financial encouragement to substitute organic for mineral fertilisers. In 2002, faced with slow surplus disposal progress, more than 300 million euros were set aside for the "action plan to develop sustainable agriculture in Brittany and improve water quality", which financed the disposal of 80,000 tonnes of nitrogen, some 60,000 tonnes through manure treatment (30 to 60% of investments paid for by the government, local communities and the water agency). The Bretagne Eau Pure 3 programme also received 100 million euros in public subsidies between 2000 and 2006.

BOX 4. Main financial programmes undertaken in Brittany to control agricultural pollution since 1990 (nearly one billion euros spent)

1990-1994: Bretagne Eau Pure 1 programme (improvement of agricultural practices through training and demonstrations)
1995-1999: Bretagne Eau Pure 2 programme
1999: Regional farming contracts
1994-2001: First PMPOA programme to bring livestock buildings up to standard
2000-2006: Bretagne Eau Pure 3 programme
2002: Action plan to develop sustainable agriculture in Brittany and improve water quality
2003-2007: Second PMPOA programme
2007: Programme for watershed in litigation proceedings with the EU
2008: Sustainable agriculture contracts
2010: Plan to combat green algae

30. In Brittany, they represent approximately half of the region.

More recently, specific financial efforts have been made in ecologically sensitive zones. In 2007, 60 million euros were allocated over five years to the disputed watershed, which cover 4% of Brittany's agricultural land. The programme provided financial subsidies for manure treatment and transfer and reducing herd sizes. In the watersheds where imposed fertilisation limits are low, agro-environmental measures and degressive payments for environmental restrictions were also created to compensate lower yields and higher costs of animal waste management. In 2010, the French government set aside an additional 134 million euros for the plan to combat green algae in Brittany, which accelerated nitrogen disposal in the watersheds, with a focus on anaerobic digestion. Nearly one billion euros in cumulated public subsidies have been invested over the past twenty years to control agricultural pollution in Brittany[31].

3.2. Pollution tax on livestock farms: An unworkable fiscal lever

Fiscal leverage has been underutilised and has even experienced setbacks. The pollution tax on livestock farms, the PMPOA's punitive measure, was created in 1993 with a view to bring livestock farms up to standard more quickly, but was only distributed starting in 1999. Initially, it was based on the quality of waste recovery[32] and stocking rates. It directly targeted nitrogen surpluses through stocking rates, but at a much lower level than in northern European countries. Following an amendment by MP Marc Le Fur (Côtes d'Armor, Britanny), the 2006 water law modified the basis of taxation of this tax. It is now prorated based on livestock numbers, but is not linked to nitrogen surpluses. The payment of the tax is spread over a larger number of farms, with or without surpluses, which makes it possible to divide the rate per nitrogen unit by a factor of nearly 8. The effect, for comparable-sized farms, is that land-based farms or those having disposed of their nitrogen surpluses pay as much tax as farms with surpluses. This is both unfair and negates any incentive to not pollute.

3.3. Consequences: Unfair and ineffective resource allocation

> "THE FRENCH GOVERNMENT CHOSE TO SUBSIDISE DISPOSAL INSTEAD OF PENALISING FARMS WITH SURPLUSES"

To protect income and support production and employment – including downstream of the sector – the French government chose to subsidise disposal instead of penalising farms with surpluses. There are several consequences to this choice in terms of distribution, incentive and economic efficiency. The first is that it is the French taxpayers and consumers of water from the Loire-Bretagne basin who finance the standardisation and surplus disposal of farms in Brittany. In this basin, the agricultural sector paid 6.8% of the total amount of water pollution taxes in 2006, while 80% of subsidies to agriculture for water improvements were financed by other water users or taxpayers. The Court of Auditors called this the "polluted pays" principle in its 2002 report. By doing so, France is not in compliance with the Water Framework Directive (WFD), which states that the costs should be recovered by sector, separated into industry, households and agriculture.

Second, this choice encourages the support and even development of high-polluting production systems and requires an extensive infrastructure for pollution clean-up, as the following two examples demonstrate: a) the building up to standard of slatted floor systems (slurry) was more costly and subsidised by the PMPOA than litter systems, which are still very rare; b) farm regrouping, which led to surpluses and additional waste disposal costs, is encouraged by high subsidies for treatment technologies and anaerobic digestion of slurry. This policy validates high animal density and discourages the innovation and restructuring that would lead to sustainable, value creating solutions, as is the case in Denmark.

Third, subsidies make it possible for unprofitable farms to stay in business because they no longer have to stop producing when pollution clean-up costs are higher than their added value. Real added value should be

31. In comparison, Brittany received 12 billion euros in subsidies from the first CAP pillar over twenty years.
32. Improved thanks to PMPOA subsidies.

calculated by subtracting the amount of subsidy from the apparent added value of the farm. Another problem lies in that subsidies alter the cost relationship between waste disposal methods by favouring specific technologies that receive investment aid (e.g., slurry treatment or, more recently, anaerobic digestion). Farms are over-reliant on treatment instead of finding other disposal solutions that could be less costly like manure spreading and mineral nitrogen reduction, manure exporting and reducing herd sizes. Manure treatment is a very costly technology due to the large volume of manure produced by livestock. With a cost that equals the average revenue of labour in pork production, it is only profitable for the most profitable farms which are able to achieve economies of scale. The cost of disposal at the sector level is too high, which reduce environmental efficiency for a given budget. Moreover, over-investment weakens the industry over the long term when subsidies are suspended.

4. The different strategies adopted by European northern countries: respecting the Nitrates Directive without immobilising structures

4.1. Denmark

> "THE CURRENT DANISH POLICY HAS THREE MAIN FOCUSES: FERTILISER ACCOUNTING, HARMONY RULES AND REGIONAL ZONING"

The current policy results from three successive action plans implemented in 1987, 1998 and 2005[33]. It has three main focuses: fertiliser accounting, harmony rules and regional zoning.

4.1.1. Fertiliser accounting: Easier inspections and dissuasive penalties

Each year, farmers must submit fertiliser accounts for their farms. In particular, these accounts include provisional fertilisation plans and nitrogen balance for the past year, detailing how much nitrogen has been applied coming from livestock manure and mineral fertilisers. This declaration makes it possible to calculate the farm's nitrogen quota based on crop type, soil type, expected yield and irrigation. The nitrogen quota is calculated using per-hectare nitrogen standards, established annually by the Danish authorities for different crop situations observed in the country. These standards are below economically optimum input[34] (-10% until 2009, and -15% since then). Standards can be challenged if farmers can prove their yields are better.

The nitrogen efficiency of livestock manure has increased from 15% in 1987 to 75% today, which has led to a major drop in the use of this mineral since 1990[35]. This has resulted in lower crop yields and protein content. Farmers submit fertiliser accounts online when making CAP declarations, using pre-completed forms. Information provided in plans and statements are checked against farm purchases. On the basis of a risk analysis, 6% of farms are subjected to paper checks, and 2% to farm inspections. These electronic declarations and non-systematic targeted inspections make it possible to reduce transaction costs. If farmers exceed their quotas, they are fined €1.30/kg excess N up to 30 kg/ha and €2.70/kg excess N following that. There is no similar accounting system for phosphorus; however, mineral phosphorus in animal feed has been taxed since 2005. There is a possibility this tax rate (currently €0.54/kg) could be increased.

4.1.2. Strict environmental requirements: Harmony rules and sensitive zones

Since 2002, harmony rules made livestock production land-based by setting livestock manure nitrogen limits that are stricter than those in the Nitrates Directive for large-scale crop farms, pig farms and poultry farms

33. OCDE, *Instruments mixes for environmental policy*, Paris: OCDE publishing, 2007, 234 p.
34. The dose of fertiliser that maximises profit per hectare of crops.
35. 67, 53 and 42% for N (nitrogen), P (phosphorus) and K (potassium) respectively.

(140kg/ha). Farmers owning[36] or renting insufficient land to respect the harmony rules can sign manure contracts with neighbours (for periods of 1 to 3 years; contracts must be declared to the authorities).This is the case for around 75% of poultry farms and 50% of pig farms. The government has implemented electronic crosschecks of accounts and fertiliser transfers. Livestock farmers pay around €1.00/kg N to the farms accepting slurry in areas with high animal stocking rates. There are few slurry treatment plants.

Denmark has defined ecological zones that are sensitive to nitrogen, ammonia and odours, where limits are stricter than normal. Manure application limits are reduced by 50 to 85% in nitrogen-sensitive zones (which cover between 50 and 65% of the country's surface area) depending on how vulnerable they are and their denitrification capacity. These zones are located around Natura 2000-areas. Farms must also restrict their ammonia discharge in zones close to natural areas, which cover 7% of the country. Finally, farms cannot be created or expanded in existing or planned urban, tourism, industrial or recreation areas. They must limit their odour production and respect minimum distances with respect to housing. These distances increase with housing density.

4.1.3. Important structural changes despite environmental constraints

Provisions in the 1994 law on agriculture were recently relaxed to allow for structural changes considered necessary by professionals. Livestock contribution to manure nitrogen at a single site is limited to 50 tonnes; however, this threshold is currently under debate. The proportion of owned land required for livestock farms contributing over 12 tonnes of nitrogen has been lowered to 30%, compared to 60 or 100% previously, to allow for larger farms. The Danish pig farming industry has undergone major restructuring in recent years. Farm sizes have grown considerably and more farmers have specialised in piglet production, 30% of which is exported to Germany. This transformation, which is probably caused by farmers taking advantage of comparative advantages, has led to an increase in the sector's added value, despite having Europe's strictest environmental constraints.

4.2. The Netherlands

4.2.1. Tradable animal quotas and fines for MINAS return losses

> "MANURE POLICY HISTORY IN THE NETHERLANDS IS UNIQUE FROM TWO POINTS OF VIEWS: TRADABLE ANIMAL QUOTAS AND THE MINAS SYSTEM"

In comparison with Denmark, manure policy history in the Netherlands is unique from two points of view: tradable animal quotas and the MINAS system. Quotas, expressed in amounts of phosphates, were created in 1987, and non-land based quotas were made tradable in 1994. These transfers, which were geographically restricted, made it possible to reduce mineral levels in areas with surpluses, thanks to government quota reductions.

MINAS (MINeral Accounting System) was launched in 1998. It reflected a policy shift favouring economic incentives over the regulatory approach previously adopted. Under MINAS, farmers submit returns calculating the difference between mineral inputs and outputs for nitrogen and phosphorus. They are fined for mineral losses to the environment that exceed penalty-free thresholds. Initially applied to intensive farms, MINAS was extended to all farms by 2001. Between 1998 and 2005, penalty-free thresholds were gradually reduced – for example, from 300 kg/ha to 140 kg/ha for grassland farms. Penalties, which were fixed at €0.68/kg N and €2.60-€10.40/kg P in 1998, were increased to €2.53-€5.07/kg N and €20.60/kg P in 2002 (before further increases later on) to attain prohibitive levels. At these prices, it was always more cost-effective to eliminate losses than pay penalties. When MINAS was implemented, the plan was to phase out animal quotas, which would gradually become superfluous as mineral losses to the environment were better controlled. However, this was not done.

36. A minimum proportion of owned land is required for manure spreading.

Between 1998 and 2002, nitrogen and phosphorus contributions by mineral fertilisers dropped by 29 and 22% respectively in the Netherlands. At the same time, the net total of soil nitrogen and phosphorus fell by 35 and 33% respectively. During the MINAS period, the concentration of nitrates in groundwater and surface water decreased significantly with respect to previous periods[37]. Social policies were implemented to finance decreases in herd sizes, which fell by 15 to 30% depending on the animal type. Zoning made it possible to encourage the cessation of activities in natural areas, while intensive livestock farms were grouped in agricultural development zones.

4.2.2. MINAS: An effective system with several drawbacks

The MINAS system has many advantages. It is fair because it only penalises producers with mineral surpluses. In this respect, it implements the "polluter pays" principle. It creates strong incentives to use minerals efficiently on farms by reducing surpluses. The resulting optimisation has led to trading of manure rights between farmers. This allows farmers who accept slurry from third parties to cover the costs of reducing mineral fertiliser use by renting their land for manure production. MINAS is economically efficient because it lets farmers choose the least expensive elimination method for them (reducing minerals, renting manure production rights, treatment, exporting or reducing herd size).

However, despite these qualities and the positive results obtained (particularly from dairy farms), problems soon arose with MINAS. A replacement system was therefore planned for 2006. These problems included efforts by pig and poultry farmers facing the heaviest penalties to exploit the system's weaknesses by challenging mineral standards, slurry sampling, stock variations, etc. Consequently, there were many legal challenges and refusals to pay. This increased the MINAS system's administrative costs which, given its ambitious nature, were already high. However, the biggest problem was the fact that MINAS did not respect the Nitrates Directive's organic fertilisation provisions. The European Commission therefore took the Netherlands to the European Court of Justice, which condemned the country's first action plan in a judgement dated October 2003.

4.2.3. A new policy based on Denmark

In 2006, the Netherlands' third action plan established an application standards system for minerals that replaced MINAS. The new system sets limits on the total amounts of nitrogen and phosphate that can be applied and other limits for organic nitrogen. As in Denmark, fertiliser application standards can vary depending on crop and soil types. They are stricter than normal recommendations and will become increasingly so. Nitrogen excretion values for dairy cows change according to production levels. The nitrogen efficiency of organic fertilisers will be progressively increased. The European Commission has approved a derogation allowing the Netherlands to set an increased organic nitrogen application limit for grassland farms of 250kg/ha. The new system imposes fines on those who exceed these different limits and criminal penalties for fraud.

> "COUNTRIES IN THE NORTH OF EUROPE ARE PROGRESSIVELY FALLING INTO LINE WITH THE DANISH SYSTEM"

Comparing Denmark and the Netherlands raises some useful points. Denmark did not have to introduce a quota system for manure production because it avoided excessive animal density by making livestock farming standards land-based early on. In the Netherlands, the MINAS system failed because of transaction costs and non-conformity with European regulations. Countries in the north of Europe (the Netherlands and also Belgian Flanders) are progressively falling into line with the Danish system, which combines fertilisation limits, mineral accounting declarations, fertiliser transfers and non-systematic fines to reduce transaction costs.

37. Water availability was low over the 1998-2002 period, a factor in lowered nitrate concentrations.

5. Recommendations for France: Simplified regulations that are effective and economically efficient

5.1. Applying and simplifying regulations

5.1.1. Finding the right balance between ecological efficiency and inspection cost

First and foremost, a set of ecologically efficient rules should be drafted, putting in place what the Danish call nitrogen accounting. Recent texts on nitrates are one attempt to do this. These rules would be based on provisional balance that include all nitrogen sources. However, the composition of the French GREN in charge of setting technical references must be reviewed – currently, there is no guarantee that they function in an impartial manner. The participation of independent scientists, water professionals and members of civil society should be encouraged to counterbalance the agricultural sector.

However, rules must not only be ecologically efficient. **They must also be easy to enforce** and lead to few disputes. This implies accepting a loss of agronomical precision as a result of reduced spending on enforcement. In this respect, provisional balance methods must be simplified in line with the Danish model, which calculates farms' nitrogen quotas based on per-hectare standards defined using crop and soil types. This would have the advantage of limiting verifications to balance entries on applied nitrogen.

To further reduce enforcement costs, online nitrogen accounting declarations, which work well in Denmark, should be extended from watershed with green algae to all vulnerable zones in France. This would make it possible to carry out automatic crosschecks of fertiliser transfers and documents – and identify farms requiring physical inspections.

5.1.2. Implementing automatic and dissuasive sanctions, not linked to CAP aids

Finally, **it must be possible to easily and systematically impose sanctions on farmers not respecting the rules**. This is a key issue for French nitrate policy. Here, policymakers must focus on simplifying procedures and eliminating legal loopholes. These efforts must not be left to decentralised government agencies and their localised views, as is currently the case. Administrative sanctions (fines, perhaps) must be put in place, with criminal sanctions to punish fraud, as in Denmark. In addition, to bring about a real change in behaviour, financial sanctions must be dissuasive. This means that fines must be proportional to the extent to which limits are exceeded. Sanctions must also ensure it costs farmers more to pay fines than to dispose of minerals. In this respect, it is interesting to note that Danish penalties are around the figure of €2/kg N, which corresponds to the average cost of treating slurry[38].

At this point, we should underline that **the environmental conditionality of CAP aids is not a dissuasive sanction for off-land livestock farms**. In 2006, during debates on the law on water, the minister used environmental conditionality as an argument in favour of abandoning taxes on nitrogen fertilisers and abolishing the pollution tax for farms. In line with this measure, implemented in 2003, single farm payments are reduced if agricultural good practices are not respected. However, the environmental conditionality mechanism only works if producers who pollute receive agricultural aids, to say nothing of the excessive formalities involved. Off-land pig and poultry farms, which have the highest nitrogen surpluses, receive low single farm payments, unlike crop and cattle farms. Indeed, off-land pig and poultry farms receive few land-based direct aids, and animal production is not supported by the CAP.

38. Meanwhile, in France, the pollution tax for farms is €0.03/kg N.

5.1.3. Abandoning instruments dealing with structures, in certain conditions

If the proposals in paragraphs 5.1.1 and 5.1.2 are implemented, **it would be possible and desirable to begin work on simplifying regulations**. This simplification would lead to lower costs in two areas: farmers' costs and losses of earnings from complying with regulations, and administrative costs and constraints from enforcing regulations. This concerns ZESs in particular. ZESs are not real ecological zones in that there is no particular ecological issue except the non-compliance with the Nitrates Directive. First, district limits on third-party spreading land and treatment obligations could be abolished. These measures have no ecological basis and effectively controlling surpluses would encourage the development of manure markets distributing manure and treatment technologies in a way that mutually benefits all producers *(see above)*.

Eliminating surpluses should make it possible to ease restrictions on creating and expanding farms, as well as regulations on restructuring and production rights. These regulations do not exist in Denmark, and the Netherlands has plans to abolish them. They are no longer justified, if implementing the law on classified establishments and disposal subsidies does not lead to unmanageable increases in animal density[39]. First, this means that environmental risks and pollution by ICPEs must be more carefully anticipated *(see above)*. This should be done in such a way as to encourage restructuring, in particular by bringing thresholds for livestock farms in line with European levels. This is already the case for livestock farm regroupings, and could be widened to cover new and expanded farms.

Second, we must **avoid policies that are not land-based** and the artificial creation of unprofitable livestock farms that can result from overly generous disposal subsidies. Anaerobic digestion is a problem in this respect. The resulting energy is purchased at a public rate – increased twice in 2006 and 2011 – and benefits from investment aids paid by the French government and local authorities. This makes the activity very attractive, especially as it is a way of financing manure treatment[40]. Public subsidies would be justified if the aim were to produce renewable energy from waste (green or slaughterhouse waste) at a reasonable cost. However, energy crops themselves should not be encouraged. They have an unsatisfactory carbon balance because of the ways in which they indirectly modify land use. Animal density would then be limited by available waste stocks.

5.2. Improving the economic efficiency of manure policy

> "LOOKING FOR ECONOMIC EFFICIENCY NEEDS POLICIES THAT ARE DIFFERENTIATED ACCORDING TO PRODUCERS' COSTS AND THE ECOLOGICAL ISSUES"

Looking for economic efficiency – creating value while minimising costs – needs policies that are differentiated according to producers' costs and the ecological issues facing each region. At the same time, efficiency gains must not be cancelled out by the administrative costs resulting from this differentiation.

5.2.1. Zoning: Adapting regulations to take into account ecological issues

Stricter environmental requirements and higher compliance costs are therefore justified in areas where higher returns are expected, because this leads to more collective value being created. This is a strong argument for a zoned environmental policy, with stronger and/or specific measures in zones facing serious environmental issues. To start with, mineral application limits (for nitrogen but also phosphorus) should be lowered in areas facing issues to do with drinking water or the eutrophication of inland and marine waters[41]. In addition to the adaptation of regulations, it may be necessary to implement agricultural practices that reduce mineral leaching (cover crops, grass strips, etc.), depending on the ecological issue faced.

39. Over and above issues of pollution and mineralisation, the increase in pig and poultry density accentuates crop specialisation (leading to an increase in intensive cultures), which has negative consequences on biodiversity.
40. In particular through the production of slurry-based complete fertilisers.
41. This is not possible with the tax, for reasons of tax equality and black market risks.

Following legal challenges on the European level, these recommendations have mostly been implemented in the ZACs, watersheds under dispute and green algae watersheds. However, if regulations on structures were simplified as suggested, **further reflections on zoning, as it exists in Denmark, would be necessary**. This means extending it to cover fresh water sources that are sensitive to eutrophication (phosphorus limits upstream of dammed lakes), natural heritage areas and residential areas sensitive to odours and ammonia emitted by livestock. These new zones could overlap with existing zones. As is the case in the Netherlands, this means defining different "industrial zones" with higher levels of intensive livestock farming. This would, in turn, streamline the ICPE procedure.

5.2.2. Manure markets: Allocating disposal efforts across producers

"IT IS THE MOST EFFICIENT PRODUCERS WHO MUST MAKE CLEAN-UP EFFORTS"

While it seems possible to adapt policies in line with the environmental issues faced by different zones without creating overly high transaction costs, it is much more difficult to do so for many small-scale producers. It is nevertheless well established in economics that sector-wide pollution regulations cost less overall if additional efforts by producers with lower costs compensate the non-respect of regulations by producers with higher costs. In other words, **it is the most efficient producers who must make clean-up efforts**. However, regulations are generally the same for everyone, in order to reduce transaction costs. This means it is impossible to efficiently allocate disposal efforts across producers. The same is not true of tax systems where flexibility is automatic, because economic agents have an incentive to make efforts if their unitary abatement costs are inferior to the tax. This explains why agents with lower costs make more efforts than those with higher costs. If regulations create rights that are negotiable on markets, price signals have the same effect.

In France, two markets for nitrogen quotas are already operational:

- The market for animal production rights, established under regulations on restructuring livestock farms in ZESs.
- The market for manure application rights, established under the Nitrates Directive action plans, where manure is mobile, rather than nitrogen quotas.

The first market, the limitations of which have been discussed above, would disappear if regulations on restructuration were abolished. However, the second market would see an increase in transactions if regulations were effectively enforced, as is the case in northern European countries.

Livestock producers with low costs would treat or export their manure, freeing up land where manure could be spread. Other producers would choose to spread manure or reduce herd sizes. This would ensure compliance costs with the Nitrates Directive were minimised across the sector[42]. Consequently, the price of land in high-density animal zones would probably increase, given that the value of manure spreading rights accumulates in land. Increased land prices in intensively farmed areas would discourage installations and therefore regulate animal density. Increased land prices would also benefit producers already settled in the zone and compensate for additional costs caused by applying the Nitrates Directive.

It would therefore be advantageous to encourage manure markets, as long as externalities resulting from these transactions were correctly managed. To start with, this would mean abolishing regulatory constraints[43] to do with manure spreading in ZESs. These constraints would no longer be effective, because livestock farmers benefiting from economies of scale by treating or exporting would have an incentive to rent their land for manure spreading. The government could then encourage private or cooperative structures to manage these markets and reduce transaction costs between lessors and lessees.

42. Manure elimination costs vary widely between livestock farms of different kinds and sizes, which drives transactions.
43. Manure limits and obligatory treatment thresholds.

However, while the manure market is a cost-effective way of eliminating water pollution, it does not deal with pollution caused by ammonia, odours or manure transport. For this reason, it has met with social resistance. These questions could be resolved by redefining existing manure zones *(see below)* or developing appropriate technological regulations.

Finally, to ensure markets for manure application rights effectively minimise costs, we must avoid creating economic distortions. **This means abolishing aids coupled with specific elimination options (for example as a % of investment)**. These aids artificially reduce the cost of the elimination options concerned and encourage their overuse, to the detriment of less costly solutions. Examples include slurry treatment, but also anaerobic digestion, which receives aids that considerably exceed the value of the carbon credits saved[44].

5.3. Protecting producers' revenues

The recommendations below deal with the issue of revenue, which is a major obstacle to the implementation of the Nitrates Directive. There are two main recommendations:

- Avoid needlessly reducing revenues.
- Provide temporary compensation for decreases in revenue during structural adjustment periods following the implementation of efficient policies. These periods are inevitable in zones subject to overly high density of animals.

5.3.1. Avoiding needless increases to producers' costs

This first point leads us to recommend mineral application thresholds rather than taxes on inputs (fertilisers and cattle feed)[45]. Indeed, under a standards system, the right to spread minerals is free as long as farmers do not exceed certain limits. Ad valorem taxes on inputs, however, are payable from the first kilogram. In other words, all input consumption is taxed, whether producers exceed limits or not.

In addition, it is better to estimate pollution using mineral surpluses rather than inputs (for heterogeneous animal densities). This leads to a fairer and more educational result. This also explains why producers' costs of reducing nitrogen leaching are lower with mineral standards than input taxes[46].

Furthermore, we have seen that manure contracts reduce collective costs, because transactions allow some livestock farmers to avoid adopting overly costly disposal strategies.

Finally, **the pollution tax payable by livestock farmers could be abolished**, as this is an unfair tax that has no impact on reducing pollution, being based on animal numbers rather than pollution indicators.

5.3.2. Compensating revenue losses temporarily so as not to create distortions

"WITHOUT GOVERNMENT AID, UNPROFITABLE FARMS WILL DISAPPEAR"

Effectively applying regulations will mean that some livestock farms will no longer be profitable enough to finance manure treatment technology or even pay for manure spreading rights. Without government aid, these unprofitable farms will disappear.

Should government aids be introduced? If so, on what basis? Here, we must distinguish the short and long terms. In the short term, capital and labour are immobile, farm buildings have not been paid off and farmers cannot easily find work elsewhere. Providing aid for a limited period of time is therefore justified, to allow farmers to pay off investments and earn an income. In the long term, capital and labour are mobile and

44. Nevertheless, innovative technologies should still be encouraged in their early stages, by providing one-off support to producers who take the risk of testing them.
45. All the more so as taxes should be overly high to reduce input intake and pollution.
46. However, implementing ad valorem taxes is much less expensive for the government.

aids are no longer justified – unless we wish to encourage dependent farms that do not create value and exacerbate the deadweight effect.

In addition, **aids should be neutral. In other words, they should not encourage farmers to adopt a particular solution** (treatment, exporting, reducing herd size, closing, etc.). These recommendations would help free up lands where manure can be spread and favour the restructuring of livestock farms. Ultimately, several types of sustainable livestock farms would coexist – ranging from small-scale land-based farms producing products with high added value, to competitive large-scale farms producing standardised products while eliminating manure surpluses without long-term subsidies.

5.4. Extending regulations to cover accidental pollution, not dealt with under the Nitrates Directive

In line with the Nitrates Directive, the above analysis and recommendations deal primarily with sources of diffuse pollution. However, livestock farms also pollute accidentally as a result of problems with manure storage and transport (leaks from pits and pipes). This affects bodies of water in particular. Slurry-based systems (where livestock is reared on slatted floors) are at higher risk of polluting water than solid manure-based systems (where livestock is reared on bedding). For pork farms, slurry-based systems are much more frequent than bedding due to time savings, which more than compensates for higher investment costs.

In addition, environmental damage, which is proportional to the surface area of the river polluted, is directly related to the amount of slurry spilled and therefore the size of livestock farms. The repeated nature and seriousness of this kind of pollution in a region like Brittany[47] raises doubts as to the efficiency of ICPE legislation in the field of risk prevention. **ICPE legislation should therefore be strengthened by focusing on the safety of slurry-based systems.**

Private insurance companies could also play a role in preventing accidental pollution, as it is their job to identify and reduce risks. Farms using slurry-based systems could pay higher premiums and/or be subject to stricter safety standards. This would make them less attractive compared to solid-manure based systems. However, for insurance companies to internalise these pollution risks, **pollution insurance must be compulsory and courts must take into account environmental harm**, which is not currently the case despite recent progress in this field[48].

47. Mostly caused by pig farms.
48. See jurisprudence and the Loi sur la responsabilité environnementale (Law on Environmental Responsibility) of 2008.

CONCLUSION

> "IN NORTHERN EUROPEAN COUNTRIES, FARMING IS AN ECONOMIC ACTIVITY LIKE ANY OTHER, WHICH MUST BE PROFITABLE WITHOUT HARMING THE ENVIRONMENT"

Comparing France's manure policies to those of the northern European countries brings to light significant differences in mindsets. Policies in the north of Europe, which have gradually been aligned with Denmark's policy, have focused action on effective compliance with fertilisation balance, without attempting to block or avoid necessary structural changes. When faced with these policies, farmers adopted a multi-pronged approach: they reduced herd sizes (the Netherlands), increased farm sizes and became specialised by developing their piglet production and reducing fattening/feeding activities. These structural shifts aimed to increase added value per unit of nitrogen excreted. These countries do not have the same taboo as in France regarding penalising farmers or applying the polluter pays principle. Farming is an economic activity like any other, which must be profitable without harming the environment.

By contrast, France based its manure policy on controlling and supporting its livestock farming structures, without allocating sufficient means to control mineral surpluses. This policy, enabled by massive subsidies allocated to pollution disposal infrastructures, led to a series of successive regulations. This choice was seen as a lesser of two evils: by amassing regulations to deal with growing livestock numbers, the country was able to put off financial sanctions and fiscal leverage. The measures were chiefly co-managed by the French government and the agricultural industry, with a shared goal of maintaining the added value of the animal sector and avoiding farmer protests[49]. These choices explain the poor environmental results compared to the sums invested by the government to aid surplus disposal. They also explain the lack of initiative on the part of farmers and the loss in competitiveness of France's intensive livestock farming sector. Farmers find themselves caught up in bureaucratic red tape and face challenges in making their farms more profitable. In Brittany, the agricultural industry has recently submitted a modernisation plan based on easing administrative rules for pork farms to avoid the sector's decline. One could even wonder if the options chosen may have even contributed to confining the French intensive livestock farming industry to the west of the country, which only served to aggravate the problems. The government's inability to control surpluses reinforces social opposition, expressed through public surveys included in impact studies.

The policies enacted in the north of Europe are more in line with economic analysis recommendations[50] than France's policy. Based on this observation, we can put forward several recommendations that could improve the ecological and economic efficiency of French policy:

- **Effectively apply regulations,** by defining the right ecological standards and sanctions.
- **Expand sensitive zones,** where stricter measures would be applied according to ecological issues.
- **Simplify regulations,** by eliminating measures that unnecessarily limit farm restructuring.
- **Facilitate manure transfers,** to help minimise manure disposal costs.
- **Compensate income losses** temporarily, but without creating distortions.

If these recommendations were applied, it would be possible to plan long-term shifts comparable to those in Denmark and the Netherlands, with the same cause and effect, i.e., specialisation around the country depending on comparative advantages. For example, Brittany has a relative lack of manure spreading or cereal cultivation. It does have a long tradition of livestock farming and expertise. As such, the region could specialise in

49. A long-standing tradition in Brittany.
50. See also P. Le Goffe, "Les instruments de régulation des pollutions des élevages : une analyse économique", in: *Flux d'azote liés aux élevages en France : réduire les pertes, rétablir les équilibres*, Chapitre 10, Expertise scientifique collective, INRA, Paris, 2012, pp. 461-500.

piglet production. Other major crop production areas, located further east and closer to markets , could specialise in pig feeding/fattening operations. However, impediments to intensive farming development need to be removed in these regions (little incentive to raise livestock in a time when cereal prices are high, no agglomeration economies when a sector gets up and running), also with public aid, as part of a broad approach to the future of livestock farming in France.

> "BY GIVING THE INDUSTRY TOO MUCH WEIGHT, THE FRENCH GOVERNMENT WAS HINDERED IN IMPLEMENTING ECONOMICALLY EFFICIENT POLICIES"

The only unanswered question is why France did not make the same choices as the northern European countries. Why develop ineffective policies which penalised producers in the end, the very thing policymakers wanted to avoid? It is true that animal density in intensive livestock farming areas is lower in France than in the Netherlands and pressure from the European Commission on France has been much recent. However, when faced with the same pressure, the northern countries were much quicker to adopt effective measures. They were less obstructionist, while France put off reacting by piling up complex and non-restrictive regulations. As we noted, co-management of agricultural policies by the French government and agricultural industry enabled environmental regulatory capture. By giving the industry too much weight, the French government was hindered in implementing economically efficient policies that would maximise collective value over the long term. It would be interesting to explain the origin of France's tradition of co-managed agricultural policy, which is not as strong in the other countries. Is France's approach linked to its historical, social or economic background, or to its specific institutions, such as its very complex and bloated administrative agricultural structure (ministry, professional organisations, education and research, banks and insurance, etc.)?

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ACRONYM LIST

EIA: Ecologically Intensive Agriculture
PDO: Protected Designation of Origin
BEP: *Bretagne Eau Pure*, a French programme for clean drinking water in Brittany
FNSEA: *Fédération nationale des syndicats d'exploitants agricoles*, or French National Federation of Farmers' Union
GREN: *Groupe Régional d'Expertise Nitrate*, or French regional nitrate expert group
ICPE: *Installations Classées pour la Protection de l'Environnement*, or French classified installations for environmental protection
MINAS: MINeral Accounting System
NVZ: Nitrate Vulnerable Zone
PMPOA: *Programme de Maîtrise des Pollutions d'Origine Agricole*, or French programme to control pollution of agricultural origin
EU: European Union
ZAC: *Zones d'Action Complémentaires*, or French delineation of zones requiring additional action
ZES: *Zone d'Excédents Structurels*, or French delineation of zones with structural surpluses

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