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Matilde Cassin[1]
Università Ca' Foscari di Venezia
Maria Bruna Zolin[2]
Università Ca' Foscari di Venezia

Productive needs and demand for protection: the complex issue of vulnerable areas

Abstract. This paper aims to analyse, at a European level, the extent to which dispositions contained in Council Directive 91/676/CEE have been applied. The Directive aims to decrease water pollution directly or indirectly caused by nitrates from agricultural sources, and to prevent other similar pollution. The analysis considers the main pressure factors within the Member States, the state of their implementation at a European level and also puts forward suggestions which bear in mind the fact that Europe cannot give up its agricultural sector and that water is a limited resource which is necessary for human survival.
Keywords: water resources; nitrate directive; vulnerable areas

Introduction

The complex link between the use of water resources and the agricultural sector in well known. The availability of water is, in fact, at the origin of agricultural activities: where it is abundant agriculture has high yields and is efficient. Among the productive sectors, agriculture is the highest consumer of water: at least a third of the world's agricultural production is obtained thanks to irrigated surfaces. The quantity and the quality of the waters are a crucial issue for the sector: on the one hand it is one of the principle causes of water pollution, on the other it suffers the consequences of pollution generated by other subjects (i.e. domestic and industrial waste).

The concentration of nitrates in the water tables is a direct consequence of the changes observed in agricultural systems. Pollution issues arising from the mid 1980s, have not yet been curbed. More specifically, if the use of nitrogen fertilisers is decreasing also thanks to recent Community regulations (i.e. cross compliance measures), other factors such as those regarding irrigation systems, the changes in mechanisation processes and the different breeding methods, have contributed and continue to add to the pollution of the water tables in more developed agriculture areas.

After a brief overall look at the most relevant pressure factors in Europe, the paper aims to analyse how the commitments laid out in the Directive have been implemented fifteen years on. It concludes by suggesting operational interventions with a view to improving the general situation.

[1] MA, PhD student, Cannaregio, 873 - 30121 Venice.
[2] Professor, Cannaregio, 873 - 30121 Venice.

Pressure factors

There are more than fifteen million holdings[3] in Europe. The highest number are in Romania (30% of the total), followed by Poland (14.5%), Italy (13.1%), Spain (7.6%), Greece (5.5%), Hungary (5.1%) and Bulgaria (4.4%). However, with the exception of Spain. these States are characterized by small-sized holdings, with an average Utilized Agricultural Area (UAA) which ranges from 3.1 ha in Romania to 6.7 ha in Italy. The States with the biggest holdings are the Czech Republic (79.3 ha Average UAA), the United Kingdom (57.4 ha), Denmark (54.7 ha), France (45.3 ha) and Sweden (46.1 ha).

Table 1. Farms (number of holdings, total area, utilized agricultural area)

Country, community	Number of holdings (/000)	Holdings (% on EU27 total)	Total area (Ha/000)	ATA[4] (Ha)	UAA[5] (Ha)	AUAA[6] (/000Ha)
UE27	15,021	100.0	216,433	14.4	172,867	11.5
UE25	9,872	65.7	197,353	20.0	156,033	15.8
UE15	6,239	41.5	157,547	25.3	126,055	20.2
Italy	1,964	13.1	18,233	9.3	13,116	6.7
Poland	2,172	14.5	17,032	7.8	14,426	6.6

Source: processing Eurostat data, 2003

Table 2. Holdings with livestock

Country, community	Number (/000) of holdings with livestock	Holdings with livestock (% on EU27 total)	Number (/000) of holdings with cattle	Number (/000) of holdings with sheep	Number (/000) of holdings with goats	Number (/000) of holding with pigs	Number (/000) of holding with poultry
UE27	9,466	100.0	4,210	1,593	933	5,125	7,172
UE25	5,290	55.9	2,637	716	429	2,197	3,325
UE15	4,171	44.1	2,228	665	368	1,432	2,465
Italy	355	3.8	148	79	31	124	142
Poland	1,452	15.3	935	18	68	761	1,128

Source: processing Eurostat data, 2003

The European farms are concentrated mainly in the plains and in hilly areas (only 11% of the holdings and 12.8% of the UUA are situated in mountain areas)[7]. Holdings in the mountains are more frequent in Austria and in Finland with 57.2% and 57.3% respectively of the total holdings. In the remaining cases, the holdings in mountain areas, are fewer and, on average, are smaller than other holdings. In Europe there are almost 9.5 million holdings (about 63% of the total), concentrated above all in Romania (38% of the UE27 holdings

[3] Eurostat, 2003.
[4] Average Total Area.
[5] Utilised Agricultural Area.
[6] Average Utilised Agricultural Area.
[7] Eurostat, 2003.

with livestock) and in Poland (15% of the European holdings with livestock), follow a long way behind by Bulgaria (6.3%), Hungary (6.0%), Greece (4.3%) and France (4.3%).

At a European level, poultry farming is the most widespread, followed by pigs and cattle breeding. Poultry is also leads in terms of numbers and density per holding, followed by pigs and sheep. Differences among the Member States are significant. The average density of cattle in Cyprus (190 head per holding), Luxemburg (117 head per holding), Netherlands (111 head per holding) and the United Kingdom (94 head per holding) is clearly higher than the UE27 average density (21.2 head per holding). As far as sheep are concerned, the United Kingdom (421 head per holding), Spain (217 head per holding), Ireland (178 head per holding) and Cyprus (147 head per holding) have an average density which is higher than the UE27 figure (67 head per holding). Finally, of specific interest are the figures concerning the pig population whose average density reaches maximum values in Denmark (1,165 per breeding) followed by Ireland (1,543 heads) and Belgium (756 heads), while the European average stands at 29 heads with regard to breeding.

The consumption of nitrogen fertilisers in Europe (EU27) amounts to over eleven million tons[8], equal to about 66 kg per hectare of the utilised agricultural area. The Netherlands (144 kg/ha) have the biggest share of nitrogen fertilisers per hectare of utilised agriculture land, followed by Belgium (118 kg/ha) and Germany (105 kg/ha) and, at a considerable distance behind, France (86 kg/ha), the Czech Republic (85,6 kg/ha) and Ireland (80,7 kg/ha). They all have values which are above the average European quantities. Below the European average are Romania (19.3 kg/ha), Latvia (24.7 kg/ha), Portugal (59.9 kg/ha), Estonia (35.6 kg/ha), Austria (38.7 kg/ha) and Slovakia (3.4 kg/ha).

Table 3. Quantity of commercial nitrogen (N) consumed in agriculture

Country, community	Commercial nitrogen consumed in agriculture (/000 metric ton)	Commercial nitrogen / UAA (kg)
UE27	11,347	65,7
UE25	10,928	70,1
UE15	9,234	73,3
Italy	826	63,0
Poland	864	59,9

Source: processing Eurostat data, 2001

Legislative context: the Nitrates Directive

The Council Directive 91/676/CEE (hereafter referred to as the Nitrates Directive) aims to reduce the amount of water pollution directly or indirectly caused by nitrates emissions from agricultural sources and to prevent other pollution of a similar type.

[8] Eurostat, 2001.

The European Union[9] has been addressing the issue of nitrates pollution since the adoption of the fourth Framework Programme. The latter includes specific environmental RDT programmes and emphasises the need for a Council Directive to tackle the problem of water pollution caused by nitrates. Since the end of the eighties, the concentration of nitrates in underground waters has reached record highs due to the growing use of nitrogen fertilisers in the agricultural sector and the intensification of agricultural and livestock farming. This trend is emphasised by other changes such as the reduction of permanent pastures, manure storage methods and the elimination of many marshy areas.

The Nitrates Directive introduces the necessity to identify land which can be classified as a vulnerable zone: territorial areas that discharge nitrogen compounds, directly or indirectly, into waters that are already polluted or that could become so[10].

The identification of vulnerable zones by the Member States must take into consideration the physical and environmental characterises of both land and water. Within the two years subsequent to the publication of the Council Directive, the list of areas identified must be submitted to the European Commission and must then be reanalysed on a four yearly basis, and if necessary, checked, completed and modified based on water monitoring carried out over a minimum period of at least twelve months.

The Member States are obliged to establish one or more agricultural codes of good practice, within two years following notification to the Council Directive, which are to be applied to the vulnerable zones (application to the remaining territory is optional)[11].

Within a period of two years from the initial definition of the vulnerable zones - or one year from designations pursuant to their identification - each Member State must elaborate

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[9] Directive 75/440/EEC, concerning the quality required of surface water intended for the abstraction for drinking water in the Member States; Decision 77/795/EEC, establishing a common procedure for the exchange of information on the quality of surface fresh water in the Community; Directive 79/869/EEC, concerning the methods of measurement and frequency of sampling and analysis of surface water intended for the abstraction of drinking water in the Member States; Directive 80/778/EEC, relating to the quality of water intended for human consumption. These disposals establish the maximum concentration of nitrates in waters, the sampling methods used and the frequency with which said checks are carried out.

[10] The Annex I outlines the criteria for identifying waters affected by pollution and waters which could be affected by pollution. The following fall into this category:

- whether surface freshwaters, in particular those used or intended for the abstraction of drinking water, contain or could contain, if action pursuant to Article 5 is not taken, more than the concentration of nitrates laid down in accordance with Directive 75/440/EEC;
- whether groundwaters contain more than 50 mg/l nitrates or could contain more than 50 mg/l nitrates if action pursuant to Article 5 is not taken;
- whether natural freshwater lakes, other freshwater bodies, estuaries, coastal waters and marine waters are found to be eutrophic or in the near future may become eutrophic if action pursuant to Article 5 is not taken.

[11] Annex II establishes the contents of the codes of good agriculture practice. In particular, measures covering the following should be present:

- periods when the addition of fertilizer to the land is inappropriate;
- the application of fertilizer to steeply sloping ground;
- the application of fertilizer to water-saturated, flooded, frozen or snow-covered ground;
- the conditions for land application of fertilizer near water courses;
- the capacity and construction of storage vessels for livestock manures, including measures to prevent water pollution by run-off and seepage into the groundwater and surface water of liquids containing livestock manures and effluents from stored plant materials such as silage;
- procedures for the land application, including rate and uniformity of spreading, of both chemical fertilizer and livestock manure, that will maintain nutrient losses to water at an acceptable level.

appropriate Action Programmes. Annex III of the Council Directive specifies the measures to be included in the programmes.

The holdings with livestock must agree to observe minimum levels of effluent per hectare, fixed at 170 kg per hectare (210 Kg per hectare in the first two years).

At the end of the first four years from the implementation of the Council Directive and each subsequent year, the Member State, is obliged to present the European Commission with a summary report on the interventions carried out.

The state of implementation in Europe

Article 10 of the Nitrates Directive establishes that the Member States shall submit a report to the Commission on a four yearly basis containing information related to what extent the Directive has been implemented. The Commission has recently published its third report concerning the application of Council Directive 91/676/EEC[12], based on the information submitted by the UE15 Member States for the period 2000-2003. The report shows a clear improvement in the quality of monitoring and reporting. The monitoring network has, in fact, been extended. A total of approximately 20 thousand groundwater monitoring stations were operational between 2000-2003 compared with 16 thousand between 1996-1999, while surface water monitoring stations increased in the same period from 14 to 22 thousand. The water quality survey revealed that 17% of EU monitoring stations had nitrate concentrations that exceeded 50 mg NO3/l by13; 7% were in the 40 to 50 mg NO3/l range; 15% were in the 25-40 mg NO3/l range and approximately 61% of the groundwater stations had concentrations below 25 mg NO3/l. Comparison with the data of the previous reporting period (1996-1999) revealed that, at EU 15 level, stable and/or decreasing trends prevail.

With reference to surface waters, only 2.5% of EU monitoring stations revealed nitrate concentrations in excess of 50 mg NO3/l and 4% recorded values ranging from 40 to 50 mg NO3/l. The most problematic situations are in the United Kingdom, France and the Netherlands. The period 1996 – 1999 also revealed a negative trend in the number of surface water stations (55%) while the number of stable stations was at 31%.

[12] [Report... 2007].

[13] Average values.

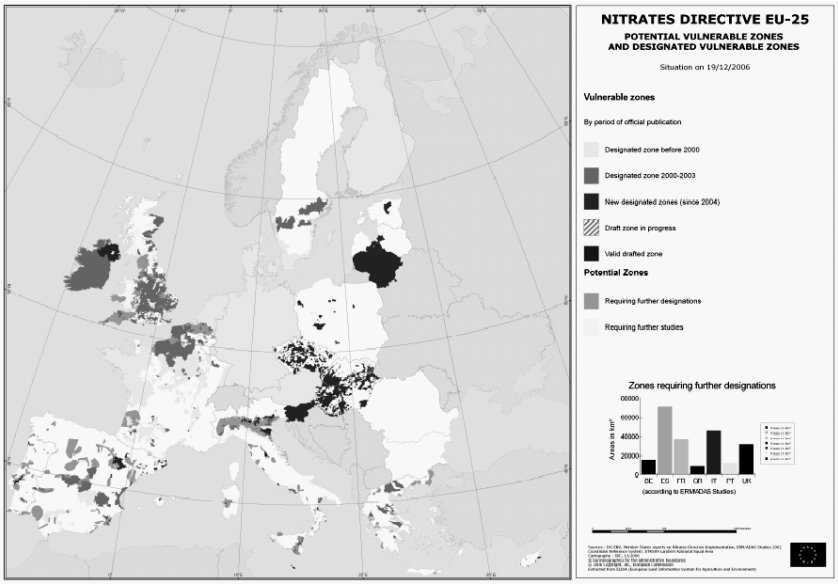

Figure 1. Nitrate Vulnerable Zone designation EU 25 (year 2006) and area requiring designation according to Commission assessment
Source: [Report... 2007].

Significant progress has been made in nitrate vulnerable zone designation. The Member States, in fact, reviewed and, in several cases, added to the quantity of nitrate vulnerable zones: The United Kingdom (from 2.4% to 32,8% of the territory), Spain (from 5% to 11%), Italy (from 2% to 6%), Sweden (from 9% to 15%), Belgium (from 5.8% to 24%).

All Member States have established one or more action programmes on their territory, however, some critical aspects remain. In several cases, for example, Member States failed to impose compliance with the standards for manure nitrogen application (since 20.12.2002, 170 kg N/ha).

With reference to new Member States, the implementation of the Nitrates Directive is still underway. According to the commitments made during the negotiation for accession, new Member States fulfilled their obligation by ensuring transposition, having a functioning water monitoring network in place and the designation of nitrate vulnerable zones. All the new Member States have set up action programmes. The Commission is currently analysing the designation of nitrate vulnerable zones and the action programmes in order to assess their compliance with the Nitrates Directive. Three out of ten new Member States (Malta, Slovenia and Lithuania) decided to apply their action programme to the whole territory. Seven Member States designated a percentage of the territory ranging from 2.5% (Poland) to 48% (Hungary) as nitrate vulnerable zones.

Concluding remarks

Analysis of water resource requirements is tri-directional: ecological (in short supply and vulnerable), social (needs to be faced with a participatory approach) and economic (resources to be efficiently allocated).

In short, increasingly affected by human activities, water is the most vulnerable factor that immediately shows the signs of degradation caused by the mismanagement of natural resources. In particular, in places where the nitrates have reached unsustainable values, it means that the agricultural exploitation being carried out is not in keeping with the potential of the land. The European Union, however, cannot be deprived of its agriculture or animal breeding activities. It does not yet have economically sustainable methodology which will allow for the removal of nitrates from the water. To make the situation worse, there are other contributing factors: the state of the water infrastructures (by typology of network, maintenance and technology of the systems) are generally poor and there is a lack of planning concerning the regulation of water usage. Based on these premises, what methods should ultimately be adopted in order to qualitatively and quantitatively preserve this resource which is fundamental for human life? The medium term CAP reform has introduced the principle of cross compliance (which is now compulsory) as a condition for benefiting from market support concerning the well being of the environment, the general public, the flora and fauna and animal welfare). The beneficiaries are, in fact, obliged to maintain all surfaces in good condition, bearing in mind both agricultural and environmental aspects (regulation (CE) 1698/2005). Only after many years of good agricultural practices will it be possible to reduce nitrate concentration in the waters. Other major interventions are required such as: the protection and the improvement of the water table (reduction of polluting processes and monitoring of the water table); a reduction of the surface area dedicated to farming and crops which have a strong impact on the environment; the promotion of sustainable practices (organic farming, introduction of intercalary cultures, good agricultural practice, crop rotation, conversion of agricultural land into woodland and forest); efficient methodologies to encourage a reduction in the amount of irrigation water used; a review of Community policies in order to give aid to and favour those crops that require more limited amounts of fertilisers and water. Action must be taken to train and inform key agricultural players of the issues at hand and of the possible solutions which constitute and promote good agricultural practices

It will take many years of constant good practice, before we can hope to see a decrease in nitrate levels and the amount of waste. Cost-efficiency studies regarding other preventative measures should be encouraged in order to identify which are the most efficient. Surely we must not waste any more time. Discussions concerning the nitrates issue have been going on since the mid 1980s. The Council Directive is fifteen years old and its application is still far from satisfactory.

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