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# CHALLENGES AND BARRIERS IN IMPLEMENTING AN INTEGRATED SUSTAINABLE NITROGEN MANAGEMENT POLICY ON THE ROMANIAN GRASSLANDS

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## Abstract

*The nitrogen management on the Romanian permanent grasslands is dependent on various factors, but the traditional practices and agri-environment EU funded payment schemes are playing the most important roles. At the same time, policies and farmers are mainly acting against reducing the nitrogen losses especially by implementing measures for avoiding water pollution with nutrients, while the concept of improving nitrogen use efficiency through integrated practices for reducing both water and air nitrogen losses remains a topic insufficiently addressed. Nevertheless, the situation is not specific only to Romania, as the country is merely applying the international agreements and EU legislation. Therefore, this article is focusing on the analysis of the challenges and barriers in implementing an integrated sustainable nitrogen efficiency use at policy and farmer level, thus identifying possible options in promoting good practices that should lead at the reduction of nitrogen losses in both water and air in an integrated manner. Grasslands are particular challenging for Romania as are largely extensively and traditionally managed. Furthermore, manure cannot be incorporated in soils by ploughing, as in case of arable land, thus remaining more prone to nitrogen air losses.*

**Keywords:** nitrogen use efficiency, integrated nitrogen management, sustainable nitrogen management, manure, nitrates leaching, ammonia volatilization

**JEL Classification:** Q1, Q15, Q24

## INTRODUCTION

Nitrogen is part of the atmosphere, as most common colorless and odorless inert gas (not entering in chemical reactions in normal temperature and pressure conditions). Nitrogen cycles from soil to plants and animals to air and water bodies, and back again, and from one region to the other, as a result of natural drivers and human activities, and all these flows should be considered for an effective N management (Oenema et al., 2019).

Human activity is generating important reactive nitrogen emissions, out of which 65 Tg N / year (meaning 1/3 of total human reactive-N emissions) is produced by livestock (Uwizeye et al., 2020). At the same time, it is estimated that half of World population is alive due to nitrogen fertilisers (Galloway et al., 2008; Sutton et al., 2013), but nitrogen losses in water and air are reducing the efficiency of fertilisers and leading to significant pollution, while signals of reaching critical limits of a safe use for humanity are considered to be touched (Uwizeye et al., 2020).

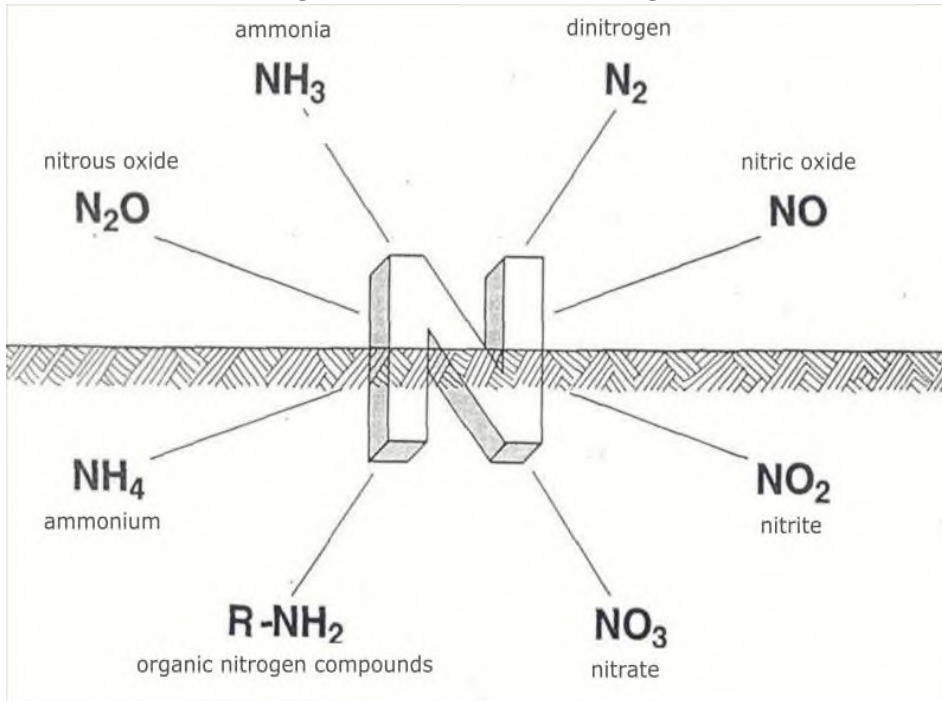
Nitrogen can take various forms (Figure 1). Reactive nitrogen (Nr) includes all forms of nitrogen that are biologically, photochemically, and radiatively active. Compounds of nitrogen that are reactive include the following: nitrous oxide (N<sub>2</sub>O), nitrate (NO<sub>3</sub><sup>-</sup>), nitrite (NO<sub>2</sub><sup>-</sup>), ammonia (NH<sub>3</sub>), and ammonium (NH<sub>4</sub><sup>+</sup>). Reactive forms of nitrogen are those capable of cascading through the environment and causing an impact through smog, acid rain, biodiversity loss, etc. (Amon et al., 2019).

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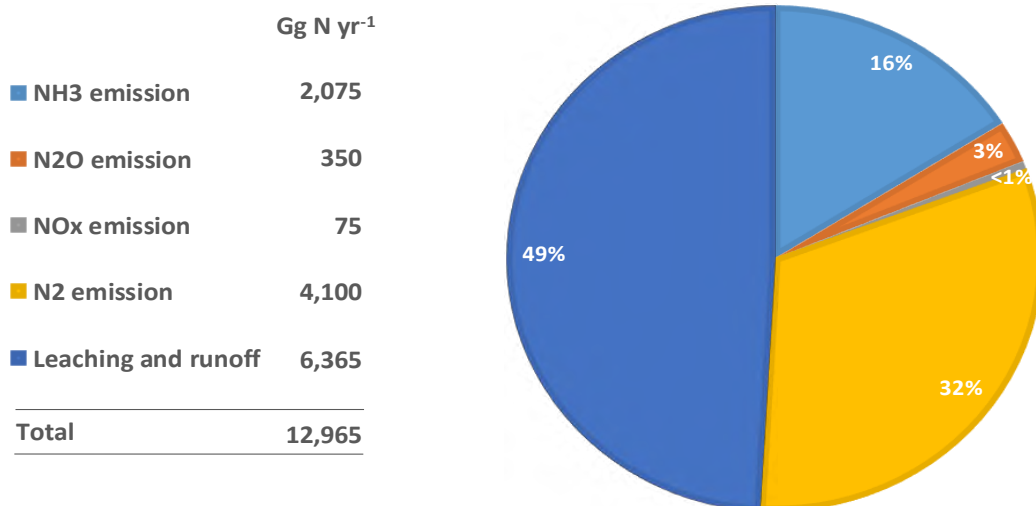
**Figure 1: Forms of reactive nitrogen**



Source: (Barbara Amon et al, 2019)

Nitrogen losses cannot be completely avoided by improving agricultural practices, but may be reduced. The losses estimates are subject to large uncertainties but imply that 50% or greater of N inputs to agricultural soils in the EU28 (including atmospheric deposition) are subsequently lost to the environment through gaseous emissions, leaching and runoff, with the remaining 50% being recovered by crops.

**Figure 2. Estimates of N losses from agricultural soils in EU28 (Gg N yr<sup>-1</sup>) for the year 2014. Values derived from the 2016 GHG inventory submission to UNFCCC by the European Union**



Source: (T. Misselbrook et al, 2019) .

Of the losses, almost half is via leaching and run-off and another third as dinitrogen via denitrification. Losses via ammonia volatilisation was estimated at 16%. (Misselbrook et al., 2019).

In its efforts on preventing and avoiding water and air pollution, Romania became part of several international agreements and is applying the EU legislation, as described below.

## MATERIALS AND METHODS

The study is focusing on the analysis of the challenges and barriers at the level of international, EU and national framework. Particularly, we were under screening the relevant international agreements and legislative acts, as well as the national legislation and national implementing acts for the EU legislation, together with the administrative structures set in place for the administration of the existent regulatory framework.

Thus, at international level, the policies concerning the nitrogen management were developed primarily aiming at environment protection, setting certain international obligations and, in some cases, including also reduction targets/pollution limits. The relevant international agreements and EU legislation for Romania are on:

- a) prevention and reduction of **air pollution** (Convention on Long-Range Transboundary Air Pollution - CLRTAP, Gothenburg Protocol and EU Directive no. 2284/2016),
- b) prevention and reduction of **water pollution** (Nitrates Directive).

It is worth mentioning that ammonia and nitrogen oxides are not GHG, thus not related to Green Deal. Part of GHG is only the nitrous oxide, but Green Deal is not yet producing effects.

Consequently, the administration is ensured by different structures, as follows:

- At global level, the CLRTAP Secretariat is under the United Nations headquarters in Geneva, through the Economic Commission for Europe (UNECE), and the Secretariat of the GPNM is located at the United Nations headquarters in Nairobi;
- At EU level, although environmental policy is managed by the Directorate-General for Environment, the water and air policies are managed by different compartments (Clean Water and Clean Air) and nitrates have remained under the responsibility of the unit for land use and management.

## RESULTS AND DISCUSSIONS

The only international agreement on nitrogen integrated management is UNEA Resolution 4/L.16 — Sustainable Nitrogen Management, a resolution which has yet limited effect at international and national level. Through direct interviews at the level of Romanian Ministry of Environment, Waters and Forests was acknowledged that the UNEA Resolution is currently at the stage of UN Member States appointing representatives to establish an international coordination mechanism and actions are in place for setting-up a Secretariat. However, the international coordination mechanism cannot lead to mandatory provisions for the UN Member States, like, for example, in the case of EU Regulations or Directives (which in case of infringement will lead to sanctions for the EU Member States), thus tending to act more as an exchange of good practices platform. Nevertheless, it is encouraging the strong support that UNEP is having under the '*Targeted Research for improving understanding of the global nitrogen cycle towards the establishment of an International Nitrogen Management System (INMS)*' project or – '*Towards INMS*', which gather over 70 global project partners involved in research, aiming at evidence-based options for effective good practices to be promoted in national policies and further be applied world-wide for reducing nitrogen losses.

At national level, the environmental policy reflects the structure of the European Commission. Thus, despite reactive nitrogen emissions and nitrates pollution are being managed by the same institution (through the Ministry of Environment, Waters and Forests), the responsibility falls under different departments, leading to a non-integrated policy on nitrogen. The only exception is the Code of Good Agricultural Practice which, starting with August 2021, includes in addition to the measures for reducing nitrates pollution, also a sub-chapter related to the reduction of ammonia and nitrous oxide emissions; however, these provisions are only recommendations of good practices and not legally bounding.

Beyond the administrative structures and legal provisions, are the farmers. At national level, farmers are under the supervision of institutions responsible with the compliance with Nitrates Directive measures in some specific cases: as direct payments beneficiaries (subsidies for agriculture), if applying for investments grants or if owning animals equivalent of more 100 livestock units (LUs). The small and medium-size farmers applying traditional shepherding practices / applying extensive management of grasslands are particularly important for the local communities, as are representing the most important farming category and the activity is one of the most important income source. It is worth mentioning that large areas of grasslands are under agri-environment voluntary commitments financed under the National Rural Development Programme (with 750,513 ha of grasslands under commitments, according to MARD data from the 2021 campaign for the Single Area Payment Claim). Under these areas, chemical fertilisers are banned and N from organic fertilisers is limited at 40 kg per ha and year. While the Romanian shepherds are still facing significant financial challenges in ensuring the means for proper manure storage (for preventing nutrients leaching) and simple equipment for manure field-application, there are no legal provisions in force for this category of farmers for limiting the reactive nitrogen emissions at the level of manure management in stables and while manure is applied on the field / adopting good farming practices with this scope.

The nitrogen regulatory framework at both international and national level is fragmented, in the sense that it aims to reduce losses of reactive nitrogen on either water or air.

While the legislation on water protection is more comprehensive and advanced in terms of implementation, the provisions on air emissions are less regulated and applied at both international and national level.

The progress so far in promoting an integrated nitrogen management approach is represented at international level only by the UNEA Resolution 4/L.16 on Sustainable Nitrogen Management (from 2019), while at national level only by the new introduced (August, 2021) provisions on preventing ammonia and nitrous oxides emissions into the Code of Good Agricultural Practices (for avoiding water pollution with nitrates having agriculture as source). Furthermore, both the UNEA Resolution and the national Code are not leading to mandatory provisions. Nevertheless, the Global Partnership on

It thus appears that an important barrier in adopting integrated N management practices it relies in the international set-up of agreements and subsequent legislation, which has been developed throughout the year on either water and air protection. Thus, despite the scientific literature is clearly indicating that an integrated N management is essential for an effective N management/improving nitrogen use efficiency, the national authorities are not yet sufficiently encouraged and mobilised for adopting an integrated sustainable N management policy that would be able to trigger farmers' behavioural changes and interest in investing in modern equipment.

The main challenge stays with the small and medium-size farmers and especially the grasslands users. Nevertheless, the technical challenges for an integrated manure management for improving nitrogen use efficiency by limiting both air and water nitrogen losses are more difficult in case of grasslands, as is not possible to incorporate the manure in soil by simple agriculture practices, as ploughing in case of arable land, neither being feasible the promotion of sophisticated stable designs or equipment for reducing air emissions for manure field-application.

## CONCLUSIONS

Research is currently ready to provide consistent evidence-based effective integrated good agricultural practices proposals for the reduction of nitrogen losses, but without an administrative system ready to uptake the knowledge, the progress remains slow. The solutions are relying on a better promotion of integrated nitrogen management through consolidated Codes of good practices / guidelines, thus gradually raising the level of awareness at institutional and farmers' level. Furthermore, awareness campaigns and training sessions through knowledge transfer networks should be financed and implemented with public financial support, as well investments in farming infrastructure. Once the level of awareness is raised and the farmers readiness to adopt integrated nitrogen good practices is improved, the voluntary good practices should be approved as mandatory legal provisions.

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