

Physiological Nitrogen release from human population. A case study within East Europe

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Abstract

Human population living in rural areas with no sanitation might be considered as N pollution source not only due to its N-footprint, but also via direct physiological N release. We found that in the region of Prut and Dniester catchment in 2015 N consumption was equal to N release from humans. N release varied from 4.3 to 6.8 kgN cap⁻¹ yr⁻¹ being substantially larger than the WMO-recommended N protein consumption (2.9-3.5 kgN cap⁻¹ yr⁻¹). Estimated N load from this source to the environment made 33 GgN yr⁻¹.

Keywords: population, Nitrogen release, consumption, East Europe

1. Introduction

Per capita N footprint in various regions differs and strongly related to protein consumption rates and food production N losses (Galloway et al., 2014). It is essential that in regions with sanitation facilities physiological N excretion from humans is not considered as potential N loss pathway to the environment.

This study aims: i) to compute mean food N consumption/physiological N release from population, ii) to estimate potential contribution of human N release as N source in rural areas lacking sewage system.

2. Approach and methodology

2.1 Study region

Dniester and Prut basins within Ukraine-Moldova-Romania.

2.2 Calculation

We used FAO data to compute food N consumption. Physiological N release (via excretion, exhaling and sweating) calculation was based on peer-review studies and medical norms adopted in Ukraine. National statistics/reports were utilized to estimate rural population and sanitation facilities.

3. Results and Discussion

Population density had a tendency to decrease in Moldova and Ukraine over last decade. Increase in Romanian part was a result of emigration from neighbouring countries. Share of rural population in the region varied from 46% (Ukraine) to 57% (Moldova) in 2015.

Mean weighted N consumption was 5.1 kgN cap⁻¹ yr⁻¹ in 2015. We estimated that healthy adult might release 4.3 – 6.8 kgN cap⁻¹ yr⁻¹, which coincided well with study of Rose et al. (2015). We showed that N protein consumption rate (2.9 kgN cap⁻¹ yr⁻¹) recommended by WHO was much lower than minimal N excretion rate.

Estimated N load to the environment of study region through direct physiological N release in rural areas without sanitation facilities made 33 GgN yr⁻¹.

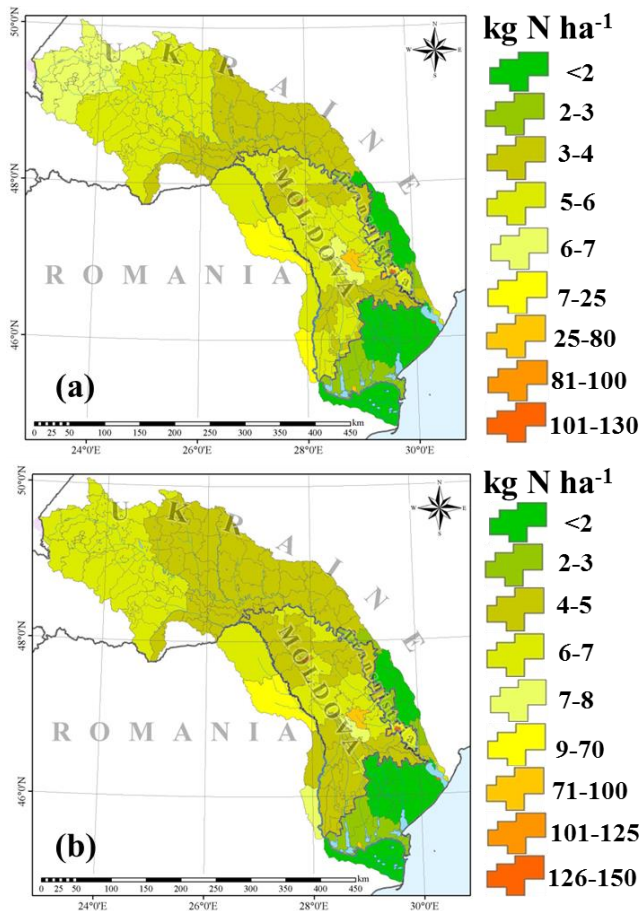


Fig. 1: N consumption (a) by/ release (b) from population in 2015 in the study region.

4. Conclusion

On average N consumption within the region was equal to excretion, which meant that there was no tendency towards overweight or obese in local population. We argued that the WHO-recommended rate was likely to be insufficient to sustain human homeostasis. More studies are required.

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References

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