

Assessment of nitrogen flows at farm and regional level when developing the manure management system for large-scale livestock enterprises

Briukhanov Aleksandr, Vasilev Eduard, Kozlova Natalia, Shalavina Ekaterina

Federal State Budgetary Scientific Institution "Federal Scientific Agroengineering Center VIM", (branch in Saint Petersburg), Saint Petersburg, the Russian Federation (http://www.sznii.ru/) E-mail: sznii6@yandex.ru



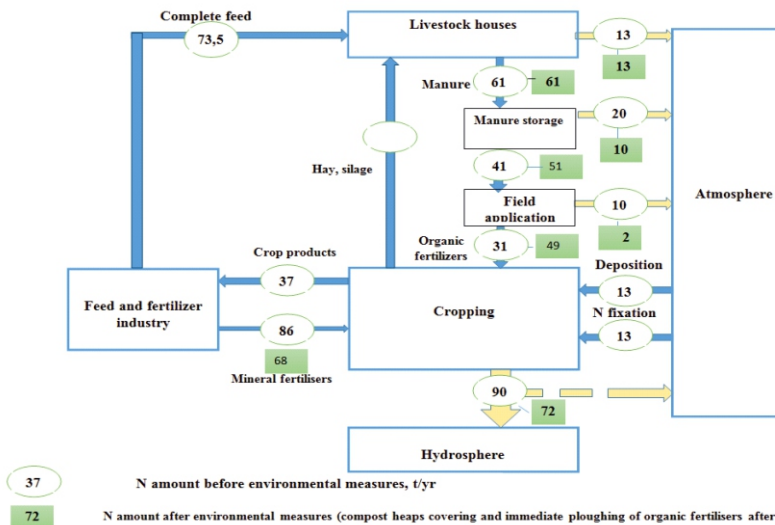
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Introduction

Priority environmental concern in livestock and poultry farming in Leningrad Region is manure utilisation on large-scale agricultural enterprises. The nitrogen flows on large-scale livestock enterprises in Leningrad Region were considered to determine how to take integrated manure management decisions towards reducing the nitrogen losses and, consequently, the environmental pressure. Nitrogen use efficiency (*NUE*) and *Nsurplus* values, obtained when calculating the nitrogen balances (Bittman, S. et al., 2014) for the whole Leningrad Region, its 17 administrative districts and individual agricultural enterprises were used as environmental assessment indicator. The calculations were based on available statistical information and farm survey data.

Improvement of manure management on a dairy farm.

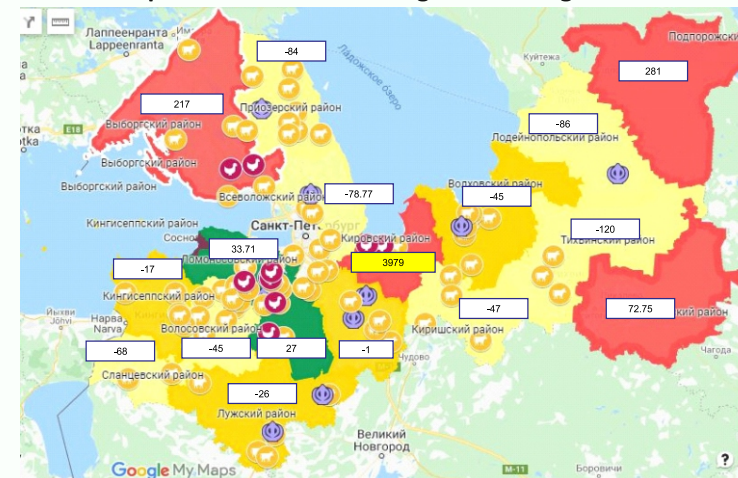
Nitrogen flows under introduction of environmental measures



The viability of manure storage and spreading techniques recommended by European BREF, namely compost heaps covering and immediate ploughing of organic fertilizers after spreading, was estimated on the example of an agricultural enterprise of mixed type (crop-animal production farm) in Leningrad Region with 3000 ha of farmland and 810 cows with the milk yield of 7000 kg/year. The estimated value of reduced total nitrogen losses and lower input of mineral fertilizers owing to higher nitrogen content in field-applied organic fertilizers can be 20%. According to the calculation results of the farm-gate balance for this farm the value of nitrogen surplus is 48.3 kg/ha, which is below the limit values and indicates the possibility to increase the application amount of nitrogen fertilizers. However, the value of the coefficient of nitrogen use efficiency $NUE=0.21$ is significantly below the European average and this shows the potential for reducing nutrient loss in manure management.

Administrative districts of Leningrad Region.

Environmental impact of livestock farming Field nitrogen balance. *Nsurplus*



	Potential environmental risk			
	High loss	Moderate loss	Soil depletion	High risk of soil depletion
<i>NUE</i>	0.01-0.4	0.7-0.9	0.9-1.5	1.51-3.0
Number of districts	4	2	4	7

Almost all pig and poultry enterprises in Leningrad Region do not have enough own fields for the produced manure application. As the distribution of livestock enterprises by the districts is uneven, *NUE* values by the districts were found in the following range: below 0.4 – four districts with the high risk of nitrogen loss; 0.7- 0.9 – two districts; 0.9 - 1.5 – four districts and 1.5 - 3.0 – seven districts with the high risk of soil depletion. *Nsurplus* values by administrative districts ranged from -120 kgN / ha in the district with nutrient deficiency to 3979 kgN/ha in the districts with the biggest number of poultry factories. For Leningrad Region as a whole, *NUE* was 0.28, *Nsurplus* was 123 kgN/ha.

Conclusion

The outcomes of research are the starting point for the development of a centralised manure management system in Leningrad Region, which would redistribute nutrients within the region and to other constituent entities of the Russian Federation.

References:

Bittman, S., Dedina, M., Howard, C.M., Oenema, O., Sutton, M.A. (Eds.), 2014. Options for Ammonia Mitigation: Guidance from the UNECE Task Force on Reactive Nitrogen. Centre for Ecology and Hydrology, Edinburgh, UK.

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