

Industrial pig farms in Belarus – nutrients' share in Baltic Sea catchment

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Pork production is one of the important fields of agriculture in Belarus. Annually, around 2.7 millions of pigs are bred in Belarus, and around 400000 tones of pork were produced in 2008. Apart playing an important role in agriculture and economy, pork production has a significant impact on environment, and especially water resources. This is particularly important for Belarus – a country, which is very rich in different water resources, lakes and rivers. Being a part of the Baltic Sea catchment area, Belarus plays a role in forming the ecological status of the Baltic marine environment.

The environmental situation in the Baltic Sea has drastically changed over recent decades. Human activities both on the sea and throughout its catchment area are placing rapidly increasing pressure on marine ecosystems. Of the many environmental challenges, the most serious and difficult to tackle with conventional approaches is the continuing eutrophication of the Baltic Sea. The eutrophication is caused by excessive inputs of nitrogen and phosphorous which mainly originate from inadequately treated sewage, agricultural run-off and airborne emissions from shipping and combustion processes. Eutrophication leads to problems such as intensified algal blooms, murky water, oxygen depletion and lifeless sea bottomsⁱ.

The aim of the present report was to analyse the situation with manure management on large industrial pig farms in the Baltic Sea catchment area in Belarus. The report is based on field trips and interviews with representatives of management of industrial pig farms in Vitebsk, Grodno and Brest regions of Belarus, representatives of Vitebsk regional committee of natural resources and protection of the environment, Grodno regional committee of natural resources and protection of the environment, association Vitebskzhivprom, Ministry of Agriculture and Food of Belarus, Institute of melioration and grass farming of National Academy of Sciences of Belarus.

Overview of the situation with industrial pig farms in Belarus

Pig-breeding is one of the important spheres of agriculture in Belarus. Pork production takes the leading place in the meat market of Belarus.

In 2003 there were about 3.3 mln of pigs, including about 2.2 mln in agricultural enterprises (66.7%) and 1.1 mln in personal farms and small private agricultural facilitiesⁱⁱ.

On 1st of April 2008 there were 2.7 mln of pigsⁱⁱⁱ in all farms, including private household farms. According to the governmental plan, 395000 tones of pork should be produced in Belarus in 2008, which is on 10.5% more, than in 2007^{iv}.

At present the majority of pork is produced on large industrial pig farms (complexes), located in different regions of Belarus (up to 80%).

Annually, large-scale industrial pig farms produce 20-22 mln tones of wastewater and manure, which requires significant treatment and management to minimize possible harm for the environment^v.

All industrial pig farms in Belarus are conventional, and there are no organic pig farms at the moment.

Environmental and legal regulations of possible locations for animal farms and complexes

The legislation of Belarus considers animal farms and complexes as objects that potentially can cause considerable harm to the environment, and, especially, water objects. The reason is the danger of waste water from farms and complexes.

It should be noticed, that in existing practice taking organic substances off industrial animal farms and complexes to fields is considered to prevent water objects pollution, especially when purification plants are out of repair or absent on farms and complexes.

Environmental impact of industrial pig farms

Majority of industrial pig farms are significant sources of pollution of neighboring environment, including air pollution, microbiological pollution, water pollution and other factors, including contribution to formation of acid rain and greenhouse gas effect^{vi}.

Environmental impact of many pig farms is quite significant, especially of those, which remove their liquid manure to the fields by mobile transport or with outdated reservoirs system.

According to information of the regional structures of Ministry of the Environment in recent years, there were almost no emergency cases with manure treatment facilities, when waste water from reservoirs was able to reach natural water objects.

Fig. 1. Old manure tank on the industrial pig farm, Grodno region



Table 1. Nitrogen content in waste water from an industrial pig farm (for 54000 pigs)^{vii}

Content of Nitrogen, mg/l / Parameter	Original waste water	Clarified waste water	% of cleaning
General nitrogen	1255.8	522	58.4
Ammonia nitrogen	705.7	481.5	31.8
Nitrate nitrogen	4.5	1.9	57.6

Using of clarified liquid manure for irrigation on designated fields, leads to the surface run off with corresponding impact on open water sources. On many industrial pig farms, construction plans

made provisions for direct waste water discharge into open water sources during spring tide, which can also lead to negative consequences on the environment. But such cases are quite rare at the moment.

There are no environmental permits, which should be obtained by industrial pig farms on regular basis. However, all pig farms, as large water consumers are obliged to apply for water usage permits, which are issued by the Ministry of Natural Resources and Protection of the Environment or its regional committees. Such a permit is usually issued for the period of several years (2-4) and determines amount of water, which can be used by pig farm for its production purposes. But it doesn't regulate content of nitrogen or phosphorous in waste water.

Environmental monitoring is organized on periodical basis by local inspections of natural resources and protection of the environment, but without proper laboratory testing, mainly by site visits, and with proper testing in case of emergency situations. Other organizations (centres of hygiene, institutes of academy of sciences and other) did their own monitoring and testing on some of the farms, but the data was not provided to the Ministry of the Environment.

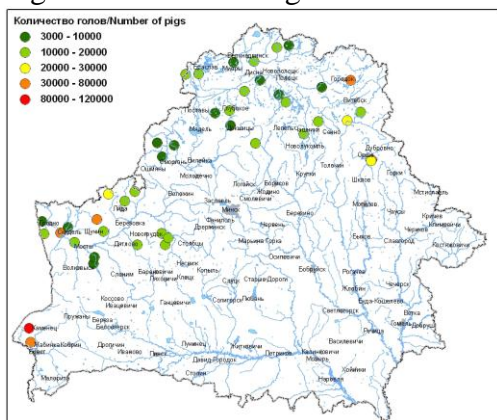
Industrial pig farms in the Baltic Sea catchment area in Belarus

Belarusian part of the Baltic Sea catchment area is formed by basins of 3 major rivers – Zapadnaya Dvina/Daugava in Vitebsk region, Neman/Nemunas in Grodno region, and Zapadniy Bug in Brest region.

In frame of this study we paid special attention to Vitebsk and Grodno regions with Zapadnaya Dvina and Neman river basins.

There are 56 large scale industrial pig farms, ranging from 3000 to 108000 of pigs in the Baltic Sea catchment part of Belarus (Brest, Grodno, and Vitebsk regions) with app. about 890000 pigs;

Fig. 2. Location of large-scale industrial pig farms in the Baltic Sea catchment part of Belarus



Applied manure utilization technologies and methods of handling of wastewater from animal housing

Industrial pig farms implement different methods of manure and wastewater utilization and management, starting from direct placing on agricultural fields and concluding with complicated technological processes, including biogas production.

In general, different technologies can be divided into several groups.

These technologies include receiving of clarified liquid manure, which further goes to special reservoirs. From these reservoirs clarified liquid manure is being transported to fields, either through sprinkling machines or through mobile transport, which is quite expensive and costly, from energy and man-power point of view. Clarified liquid manure is further used on limited field territory around the pig farm. In fact, it leads to possible pollution of the environment, including ground water.

Fig.3. Transportation of liquid manure to the field, Vitebsk region.



Fig. 4. Solid manure clamp in the field near the pig farm, Grodno region



Fig.5. System of consecutive cleaning reservoirs on one of the pig farms, Grodno region



At the same time there are some other positive examples of waste water management on industrial pig farms in BS catchment area of Belarus.

There is one example of manure treatment technology, which involves biogas production. This scheme is implemented on large (app. 78000 pigs) industrial pig farm “Zapadnyi” (Brest region, Zapadnyi bug river basin).

The biogas production unit on the pig farm “Zapadnyi” was constructed as an innovation project. The unit was constructed at the end of 2007, and in fact started its operation in 2008. The capacity of the unit is 520 kW (planned). The project allows to treat app. 43 tones of liquid and 43 tones of solid manure daily. The final biological product is used as a fertilizer on fields. Depending on time of the year, the unit produce from 300 to 500 kW of electroenergy and hot water.

Conclusions

- There are 56 large scale industrial pig farms, ranging from 3000 to 108000 of pigs in the Baltic Sea catchment part of Belarus (Brest, Grodno, and Vitebsk regions) with about 890000 pigs;
- There are several large scale pig-farms (e.g. “Zapadniy”, Brest region, “Mostovskiy kumpyachok”, Grodno region, “Severnyi”, Vitebsk region, and others) which have effective systems of manure management and utilization, including biogas reactors, biological cleaning, and bioengineering constructions, which allow to minimize the negative environmental impact of manure;
- There are quite many pig farms with significant negative environmental impact on the environment, and water resources in the Baltic Sea catchment area part of Belarus;
- General situation with manure management on most of industrial large-scale pig farms in the Baltic Sea catchment part of Belarus can be characterised as non-satisfactorily, and requires urgent attention from relevant governmental bodies;
- Manure treatment systems on majority of plants are outdated and requires repairing and updating;
- The situation with local environmental monitoring requires improvement as only a few pig farms have necessary capacity for monitoring themselves;
- There is no exact data available on pig farms on actual run-off of phosphorus and nitrogen elements.

Recommendations

For relevant national and regional authorities of the Republic of Belarus, responsible for pork production and environmental control:

- 1) To ensure proper environmental monitoring of manure discharge on regular basis on all industrial pig farms, including monitoring of final discharge, soil, and water objects in terms of nitrogen and phosphorous contamination.
- 2) To consider introducing of environmental permits, to be renewed on regular basis, which will also consider measures, taken to reduce nitrogen and phosphorous content in final discharges.
- 3) To conduct detailed research of manure management systems and environmental impact of large scale industrial pig farms in the Baltic Sea catchment area part of Belarus.
- 4) To consider the Helcom Baltic Sea Action Plan (Eutrophication segment) as a voluntary guidance document to address the problems of nitrogen and phosphorous run off from the industrial pig farms.
- 5) To ensure proper implementation of the requirements of Aarhus convention, and organize public hearings during environmental impact assessment processes while constructing new pig farms.
- 6) To promote installation of biogas production technologies on large-scale industrial pig farms, as well, as biological manure treatment systems and bioengineering constructions, as important elements of manure management system.

For relevant Baltic Sea region authorities and institutions:

- 7) To ensure funding possibility of infrastructural projects with clear environmental benefits to be implemented on industrial pig farms in Belarus, e.g. the EU Neighbourhood Program, bilateral agreements, and other funding bodies.

References

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