Industrial animal farming

Intensive animal farming causes a number of hazards, which may have a negative impact on the Baltic Sea Region environmental condition. The possible impact concerns all components of the environment: air, soil and – what is the most important for the Baltic Sea – water (surface water, subsoil water, rainwater). Negative effects of industrial animal farming have also social, economic and legal connotations.

The most inconvenient sources of pollution are big **factory farms**, in which even a few thousands of animals are kept. This particular kind of animal livestock farming is called **industrial** (or **factory**, **intensive**). In the *Council Directive 96/61/EC of 24th September 1996 concerning integrated pollution prevention and control* (*IPPC Directive*) industrial animal farms are defined as plants, that are obligated to possess **integrated permits** (which includes all pollutant emission from particular plant to all environment components), that is with livestock density for unless 40,000 individuals (poultry), 2,000 pigs over 30 kg, or 750 sows. In 2008, the Helsinki Commission (HELCOM) has recognized large-scale farms as point sources of agricultural pollution (***Baltic Hot Spots***). Also factory cattle farms with more than 400 Animal Units, as well as sheep, goats, horses and fur animals large-scale breeding installations with equivalent number of livestock were counted among this category.

The most disadvantageous, from environmental point of view, is litter-free breeding, which causes great amounts of liquid **manure**. The manure is a natural, liquid fertilizer, which contains of feces, urine and water. This is a highly concentrated fertilizer with heavy content of mineral components, microbiologically polluted. Improperly stored, managed and utilized manure can cause many serious threats, both to natural environment and to man's health.

In comparison, dung is less concentrated animal natural fertilizer, produced in litter rearing farms. **Dung** contains more organic matter, has higher temperature than liquid manure (worse development conditions for pathogenic microorganisms and parasites) and for that reasons is considered as more environmentally-friendly.

By contrast, on industrial poultry farms the **poultry dung** is produced, with different composition than the pig manure. Dung of hens (or turkey, duck, goose) is characterized by high concentration of minerals – both nitrogen and phosphorus. This follows from the fact that birds excrete urine with feces, in the form of solid uric acid. The problem is also an unbalanced diet, resulting in significant quantities of undigested phosphorus compounds excreted in faeces.

Negative influence of industrial animal farming depends on the species kept on farm, level of livestock density and on technology of the breeding and management of the produced fertilizers.

The industrial animal sector is being regulated by number of European Union's legal acts, from among which the most important are *Council Directive 96/61/EC of 24th September 1996 concerning integrated pollution prevention and control* (***IPPC Directive***) and *Council Directive 91/676/EEC of 12th December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources* (***Nitrates Directive***). There are also some

general recommendations, like *Reference Document on Best Available Techniques* (**BAT**) *for Intensive Rearing of Poultry and Pigs*, European Commission, July 2003 (**BREF**), *BS EN 13725:2003 Air quality. Determination of odour concentration by dynamic olfaktometry* (standard of odour air quality of European Committee of Standardization), ***Good Agricultural Practice Code***, ***Best Environment Practice*** (**BEP**), as well as international conventions and agreements, e.g. *Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area*, 1992, entered into force on 17 January 2000 (***Helsinki Convention***), and *Agenda 21 for the Baltic Region* (an agricultural sector activities).

On the national level intensive livestock rearing is regulated by number of legal acts. The rules of manure application (as natural fertilizer) are defined in the ***Fertilizer and Fertilization Act***, ***Good Agricultural Practice Code***, and in *Ministry of Agriculture Decree on application of fertilizers and education in fertilization (Dz. U. Nr 60, poz. 616 of June 1st, 2001)*. Fertilizing in the Nitrate Vulnerable Zones is restricted through the *Water Low Act (Dz. U. Nr 115, poz. 1229 of July 18th, 2001)*, the *Environmental Protection Act (Dz. U. Nr 62, poz. 627 of April 27th, 2001*) and through two Ministry of Environment Decrees regarding Nitrate Vulnerable Zones (*Dz. U. Nr 241, poz. 2093 of December 23rd, 2002* and *Dz. U. Nr 4, poz. 44 of December 23rd, 2002*). According to the *Fertilizer and Fertilization Act* the minimum level of capacity for storing of manure should allow for 4 months storing or 6 months in the Nitrate Vulnerable Zones. *Annex III* to *Helsinki Convention*, concerning the 6 months period of storing manure, is not obeyed.

It is noticeable that above mentioned legal acts are not commonly obeyed, as it is said in a document of the Polish Supreme Chamber of Control's, published after the newest control of industrial animal farms in Poland.

Statistical data

There are about **14.3 million** pigs in Poland (Central Statistical Office, November 2009) and population of poultry amounts to about **124.4 million** (Central Statistical Office, December 2009). The livestock density is equivalent to 89 pigs and 771 heads of poultry per 100 ha of farmland.

There are **752** industrial animal farms in Poland (Ministry of Environment, September 2010), including **146** pig farms (82 farms with more than 2,000 places for pigs over 30 kg, 48 farms with more than 750 sows and 16 farms with mixed production profile) and **606** poultry farms. Number of large-scale farms, calculated per 1,000 ha of arable land is 0.05 (pigs – 0.01, poultry – 0.04). Most farms are located in the **Wielkopolskie**, **Mazowieckie**, **Zachodniopomorskie**, **Kujawsko-Pomorskie**, and **Łódzkie** province.

According to the Centre of Agricultural Consultancy there are 62 organic pig farms (and 71 poultry farms) accordant with Organic Farming – EC Control System (*Regulation (EEC) No 2092/91*). In comparison, in Denmark the overall number of such farms is app. 364).

Analysis of the number of farms per 1.000 ha of agricultural land in indivi-

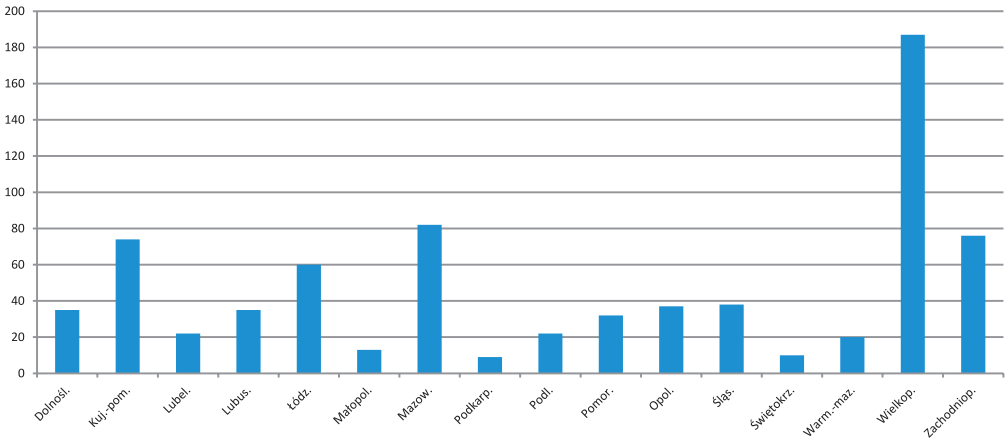

Fig. 1. Total number of industrial animal farms in individual provinces (Dolnośl. – Dolnośląskie, Kuj.-pom. - Kujawsko-pomorskie, Lubel. – Lubelskie, Lubus. – Lubuskie, Łódz. – Łódzkie, Małopol. – Małopolskie, Mazow. - Mazowieckie, Podkarp. – Podkarpackie, Podl. – Podlaskie, Pomor. – Pomorskie, Opol. – Opolskie, Śląs. – Śląskie, Świętokrz. – Świętokrzyskie, Warm.-maz. – Warmińsko-mazurskie, Wielkop. – Wielkopolskie, Zachodniop. – Zachodniopomorskie)

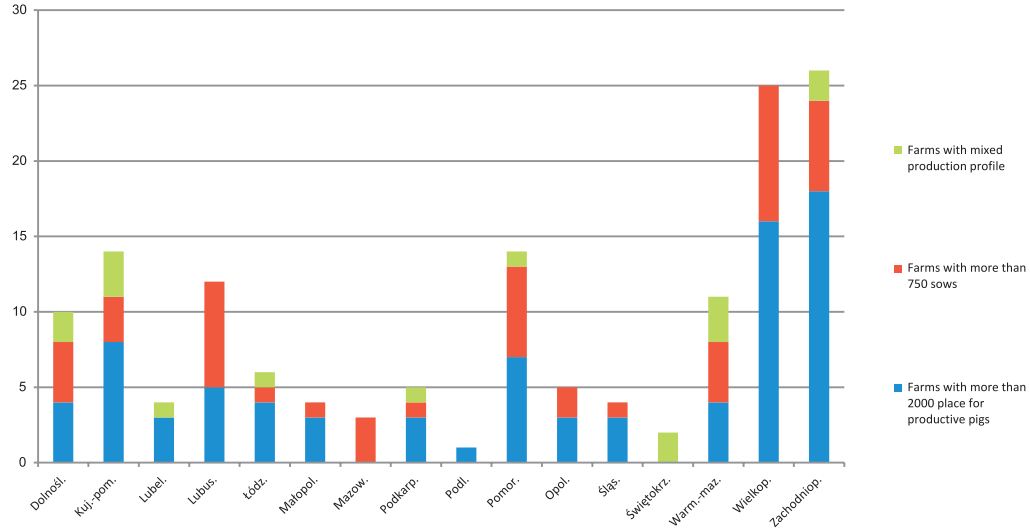

Fig. 2. Number of industrial swine farms in individual provinces

dual provinces, as well as based on the 10.000 inhabitants of rural areas of individual region, allows for interesting conclusions. Firstly, taking into account the acreage of arable land, also Śląskie, Lubuskie and Opolskie provinces are characterized by especially high indicator of the large-scale farms density. However, comparing the amount of the IPPC farms with the number of inhabitants of rural areas, especially high ratio is characteristic for Lubuskie province.

These data allows assess the actual share of industrial agriculture in the whole agricultural landscape of various Polish regions, as well as the possible scale of its impact on the population of the particular provinces. Analysis of

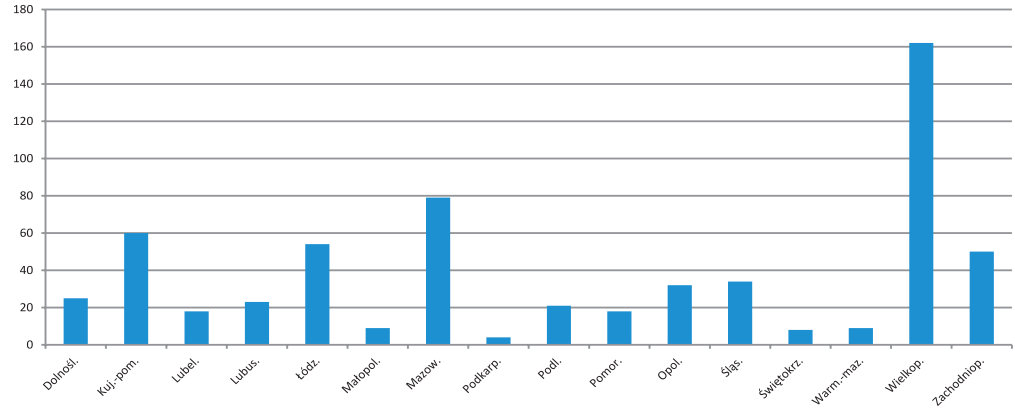

Fig. 3. Number of industrial poultry farms in individual provinces

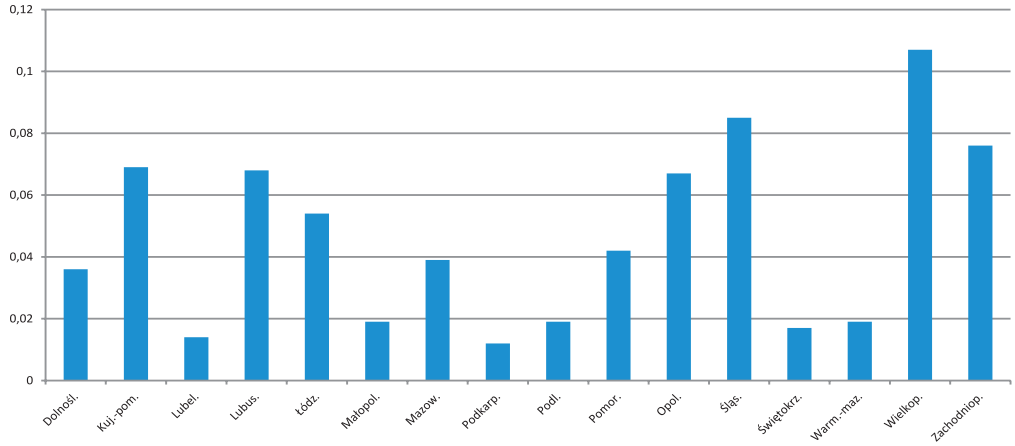

Fig. 4. Number of industrial animal farms per 1.000 ha of farmland, in individual provinces

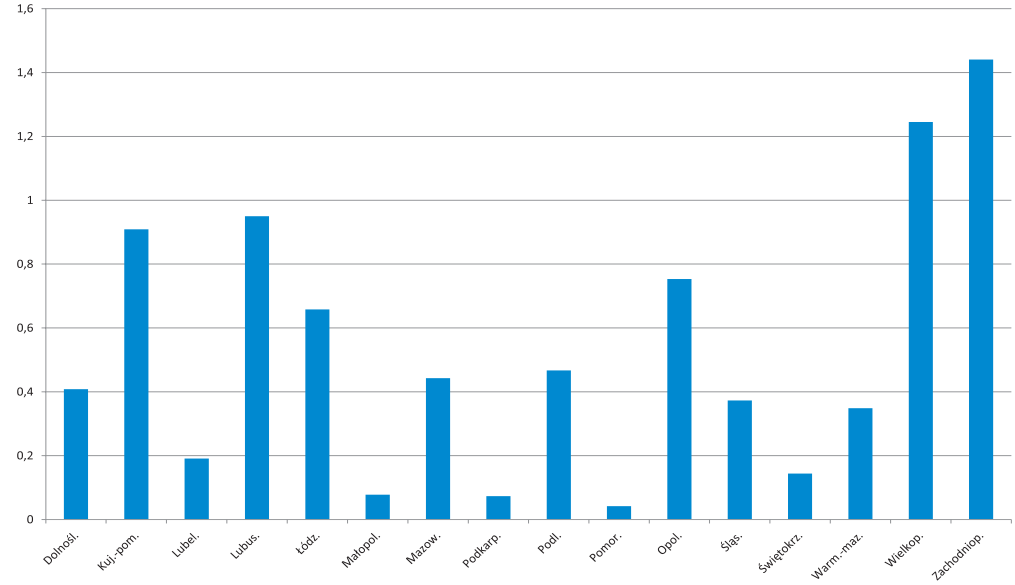

Fig. 5. Number of industrial animal farms per 10.000 inhabitants of rural areas, in individual provinces

only the number of farms in individual provinces indicate 5 provinces (listed earlier Wielkopolskie, Mazowieckie, Zachodniopomorskie, Kujawsko-Pomorskie, and Łódzkie), as the areas of highest concentration of industrial animal farms. Meanwhile, taking into account the acreage of agricultural land and population of individual provinces, among those listed above only **Wielkopolskie**, **Zachodniopomorskie** and **Kujawsko-Pomorskie** provinces are areas of particularly high share of large-scale livestock production in the socio-economic landscape. Right behind them ranks **Lubuskie**, **Śląskie** and **Opolskie** provinces.

Problems connected with intensive animal rearing

A) ENVIRONMENTAL PROBLEMS

- **water pollution** – the main danger related to agricultural usage of liquid manure is leakage of the nutrition macroelements (like nitrogen and phosphorus) to the ground water and surfaces water, connected with **overfertilization** of fields;
- **eutrophication** – "overfertilization" of inland and sea waters (algal blooms, decrease of fish population, ecosystems modifications, loss of bottom fauna, lack of oxygen in waters);
- **microbiological pollution** – *Staphylococcus sp.*, fecal streptococci, *Escherichia coli*, rubella bacilli, tubercle bacilli, foot-and-mouth disease viruses, various fungi and parasites are microbes connected to the liquid manure produced by pig farming; this kind of microbiological water pollution constitutes a sanitary danger;
- indirect effect that contributes to formation of **acid rain** and increased **greenhouse effect** (greenhouse gas emission harming the ozone layer).

B) SOCIO-ECONOMIC PROBLEMS

- **air pollution** – the anoxic (without oxygen) fermentation of manure, produces such gases as ammoniac, hydrogen sulfide, carbonyl compounds, amines, mercaptans, dinitrogen monoxide, etc. These gases causes offensive **odours**, danger for human health (e.g. pernicious effect on air-stream mechanism transformation of haemoglobin into hematine, plugged nose, lacrimation, headache, stress);
- **loss of recreation places** – for example, the liquid manure from farms in the Goldap's health resort neighborhood caused massive fish oxygen starvation in nearby lakes (2006);
- **high costs of drinking water purification**;
- **degradation of cropland** – improper storage and usage of liquid manure;
- farms' location in direct neighborhood of **Natura 2000** areas and different protected or valuable areas and the **Nitrate Vulnerable Zones**.

C) LEGAL PROBLEMS

- **fertilization plans are not taken into account when issuing integrated permits**;
- **lack of permanent monitoring of the soil quality**;
- the Polish Ministry of Agriculture refuses public access to information about

fertilization plans claiming that this is market sensible, private information; local communities around big farms have been entirely deprived of the possibility of controlling proper manure management; present situation shows that ***Aarhus Convention* principles regarding access to environmental information are not followed in Poland**;
- **deficiency of the Helsinki Convention implementation** – common failure to observe the Annexe III;
- **the lack of correspondence between EU law and national law, with regard to the definition of installations** – the Polish definition attributes the obligation of possessing integrated permits to the owner of the system, not to the installation itself (the latter is clearly stated in EU *IPPC Directive*);
- **Poland does not have any regulations concerning air odour quality** (the *Limitation of Odour Emission Act* is being discussed); in this situation there are no legal procedures that can be used if a farm causes odour emissions, which is often troublesome for local societies;
- **infringements of the law connected to activities of the pig farms**;
- **problems with inspection authorization of Regional Environmental Protection Inspectorates and local authorities**, which in some cases has powers, but do not make use of it;
- despite the fact that the ***Reference Document on Best Available Techniques for Intensive Rearing of Poultry and Pigs*** (**BREF**) is available in polish language, it **is not commonly applied**;
- **ineffectiveness of industrial farms controls** run by the Veterinary Inspection, the Environmental Protection Inspection and Sanitary Inspection;
- **insufficient cooperation and coordination** of activities, connected with industrial animal farms control, between institutions mentioned above;
- **disregard of building regulations** by factory farms, stated during Main Office of Architectonic Supervision's controls;
- **not taking into account the local community voice** under consideration during IPPC license process and farms localization.

Large-scale agriculture and the natural environment of the Baltic Sea

The stocks of pig in the whole Baltic Sea region counts around **67.3** million of animals, cattle – **35.6** million, while the poultry population – **189.8** million (Gren I.-M., Jonzon Y., Lindqvistet M., 2008: *Cost of nutrient reductions to the Baltic Sea – technical report, the working paper*). In the Baltic Sea catchment area are located over **1,320** large-scale poultry and swine (IPPC) farms (*Baltic Forum for Innovative Technologies for Sustainable Manure Management*, 2010). This figure does not include installations for rearing of cattle, fur animals, horses, sheep and goats with the density corresponding to the IPPC factory farming, and thus also strongly affecting the natural environment. This impact is so important mainly because of factory farms highly concentrated and industrialized animal production system, with significant **individual impact on environment** (high production of natural fertilizers). As such, industrial animal

farms must be recognized as point sources of agricultural pollution, which interactions with the environment – their intensity and scope – are different than in the case of diffuse (non-point) sources of agricultural pollution.

The intensification and industrialization of agricultural production is particularly dangerous for the environment of the Baltic Sea, as a result of its **ecological sensitivity**, caused by:

- **fewer species than in the open sea** (conditions not really optimal for either freshwater species or saltwater species),
- **the water exchange is slow** (nearly enclosed brackish-water area, seawater renewal through narrow Danish Straits and Sound (retention time 30 years), vertical salinity stratification of the water masses (halocline) prevents vertical mixing of the water, and prevents ventilation and oxygenation),
- **the Baltic Sea is situated in a densely populated area** (sewage from 85 million people is discharged into the sea, making it one of the world's most polluted sea).

Especially dangerous process, from an ecological point of view, is the **eutrophication**. Polish *Water Law* defines it as an enrichment of waters with nutrients (nitrogen and phosphorus), causing an accelerated growth of algae and higher forms of plant life, resulting in the disruption of biological processes in the aquatic environment and affects the quality of these waters.

Effect of large-scale agricultural activities on the Baltic Sea's eutrophication, illustrate the following data (*Baltic Sea GIWA Regional assesment 17, 2005*; *EEA Report No 7/2005*):

- **50-80% of nitrogen pollution comes from runoff water from areas used for agriculture** (soil cultivation, use of fertilisers, storing and spreading manure, intensive and uncontrolled agriculture),
- **urban and industrial wastewater are still the main source of water pollution with phosphorus**, but in some countries (f.i. Nordic countries), where treatment is widely used in removing nutrients, the primary source of phosphorus pollution is agriculture,
- **the main causes of high rates of nitrogen and phosphorus loads** (kg N or P/ha/year) **for land unit area is high percentage of agricultural land** and high population density,
- during the last 30 years there has been a marked decline in nitrogen and phosphorus loads discharged from the housing and industry, while **stable amount of nutrients discharged to water from agricultural areas**.

The ways to act against negative effect of industrial animal farming

Due to the scale and intensification of production, as well as the number of livestock on the industrial farms, their significant impact on the environment and local communities is obvious. The general opinion about the industrial animal production, unfortunately backed by a shameful practice, is negative and thus, recognized as not **environmentally friendly**. However, it is possible to implement a number of specific ways to counteract the negative effects of industrial farming, which allows make it at least **environmentally neutral**.

Efficient ways to act against negative effects of the factory fattening, recommended many times by Green Federation GAJA, Coalition Clean Baltic, HELCOM and also enclosed in Baltic Sea Action Plan or the Polish Supreme Chamber of Control conclusions and recommendations, are:

- **considering all types of factory farms as HELCOM'S point sources agricultural;**
- **detailed inspection of a biding legal standards** (both in terms of fulfilling the obligation to obtain an integrated permit, as well as meeting the conditions contained therein and compliance by the installation of the existing legal regulations for environmental protection);
- **increasing local authorities participation in control and law enforcement process**, connected with industrial animal sector;
- **information about IPPC-plants should be published and commonly available** (up-to-date actualization and expanding of the Ministry of Environment's internet database and The European Pollutant Release and Transfer Register (E-PRTR);
- **promotion and increase the number of ecological livestock farms**;
- **using of biotechnological ways of liquid manure treatment** (decrease foul smell emission, biological disinfection and sanitization, organic matter mineralization, biogas production, purification in farm's biological refineries – controlled fermentation, making use of "efficient microorganisms");
- **setting efficient law regulations on air's smell quality**;
- **full implementation of ratified *Helsinki Convention***;
- increasing the meaning and popularization of the **Reference Document on Best Available Techniques for Intensive Rearing of Poultry and Pigs (BREF)**, **Good Agricultural Practice Code** and works of **Agenda 21** in sector of industrial animal production;
- **using of well-balanced fodder for animals**, to prevent animals from excretion a high number of nitrogen and phosphorus compounds;
- **increase of participation of local communities in administrative proceedings relating to the establishment of new farms** (for example, by keeping the existing standards of public consultation, to facilitate public access to information on environment and its protection, promotion practices related to the idea of citizen-friendly offices);
- **more restrictive approach to the farms that operate in or near protected areas**, including preventing the siting of new farms in those areas;
- **revision of existing in Poland Nitrate Vulnerable Zones (NVZ)**, which includes the establishment of new one, which corresponds to the real needs and circumstances set out in the *Nitrates Directive*.

All these practices allows to approach the industrial animal farming to **sustainable agriculture**, which relies on the use of environmentally friendly methods to mitigate the negative impact of agriculture on the environment through the introduction of integrated pest management and fertilization plan, based on nitrogen balance.