

Development of standards for protecting the environment from the adverse effects of animal farming

**Jacek Walczak, PhD Eng, Wojciech Krawczyk PhD. PhD Eng Agata Szewczyk,
PhD Eng Paweł Paraponiak**

Work has been carried out to determine national standards for the concentration of animal production, i.e. cattle, pigs and poultry, in terms of permissible environmental damage.

The work involved determining the gas emissions and the content of biogenic elements in manure from animal farms.

Based on these figures, guidelines for determining the concentration of animal production have been developed.

Table 5.**Environmental damage in relation to the size of dairy cows herd**

| Type of damage | Number of head in the herd | | | | | |
|---|-----------------------------------|-----------|------------|-------------|-------------|-------------|
| | 20 | 60 | 120 | 240 | 480 | 700 |
| N-NO₃ deposition (kg) | 2854.8 | 8564.4 | 17128.8 | 34257.6 | 68515.2 | 102518 |
| CO₂ eq. emission (t) | 251.8 | 755.4 | 1510.8 | 3021.6 | 6043.2 | 8813.0 |
| VOC emission (kg) | 1440 | 4320 | 8640 | 17280 | 34560 | 50400 |
| Minimum fertilized area(ha) | 15.8-16.5 | 45.3-47.5 | 85.6-90.0 | 171.2-180.0 | 382.4-400.0 | 561.8-587.5 |
| Optimal fertilized area (ha) | 50 | 150 | 250 | 550 | 1200 | 1800 |

Table 6.**Environmental damage in relation to the size of sow herd**

| Type of damage | Number of head in the herd | | | | | |
|---|-----------------------------------|------------|-------------|------------|------------|-------------|
| | 20 | 60 | 120 | 240 | 480 | 700 |
| N-NO₃ deposition (kg) | 673.4 | 2020 | 4040 | 6216 | 8080 | 23569 |
| CO₂ eq. emission (t) | 1.8 | 5.5 | 11,1 | 22.2 | 44.5 | 63.0 |
| VOC emission (kg) | 104.0 | 312.0 | 624.0 | 1248.0 | 2496 | 3640 |
| Minimum fertilized area (ha) | 2.87-3.64 | 9.54-11.84 | 17.65-25.58 | 35.3-44.5 | 70.6-90.1 | 102.6-129.7 |
| Optimal fertilized area (ha) | 15 | 50 | 100 | 170 | 360 | 450 |

Table 7.**Environmental damage in relation to the size of a laying hens flock**

| Type of damage | Number of hens in the flock | | |
|---|------------------------------------|--------------|----------------|
| | 300 | 1 000 | 200 000 |
| N-NO₃ deposition (kg) | 195.8 | 652.5 | 130500 |
| CO₂ eq. emission (t) | 0.5 | 1.7 | 340.0 |
| VOC emission (kg) | 28.5 | 95.0 | 19000.0 |
| Minimum fertilized area (ha) | 1.13-1.14 | 3.76-3.82 | 752.9-764.7 |
| Optimal fertilized area (ha) | 5 | 15 | 3000 |

Conclusions:

- **In terms of deposition, it is environmentally safe to keep a maximum of:**

200 cows,

600 sows

200,000 laying hens

These assumptions correspond approximately to a minimum farm area of 150 ha, but in order to eliminate the risks, the figure should be tripled (450 ha).

- **In terms of emission of volatile organic compounds (VOC), farms with the minimum cultivated area do not meet the requirement of spatial isolation and are sources of odour nuisance for the environment.**
- **A programme for reducing greenhouse gas emissions and biogenic potential should be implemented for farms exceeding the proposed area ranges.**