

Improved concrete outdoor runs in housing systems for growing-finishing pigs: automatic manure scrapers

Description

Keeping fattening pigs indoors with access to concrete outdoor runs is common within organic pig production in Europe. The main environmental impact in this type of production system is related to ammonia emission from urine and faeces in the outdoor run.

Automatic scrapers in the outdoor elimination area reduce the farmer's workload while providing the possibility to increase scraping frequency. More frequent removal of manure from the elimination area, in turn, reduces ammonia emissions and thereby reduces the environmental impact.

Legislation

There is no organic farming regulation in Europe regarding ammonia emissions or the cleanliness of outdoor runs for pigs.

Relevance for animal welfare

Good pen hygiene and access to a dry lying area are important to keep pigs clean and promote good animal welfare.

More frequent scraping of the toilet area in the outdoor run can improve pen hygiene, both indoors and outdoors. Frequent scraping and a good drainage of wet excretions to keep outdoor areas dry is especially important during the summer, as pigs may wallow in faeces or urine, which is detrimental to both health and ammonia emissions.

There is limited knowledge on the risk of injuries for pigs from automatic scrapers. Hence, no recommendations to decrease the risk of injuries for the construction or use of this technology can be made. Scrape-systems that move the manure across or between different groups of animals, however, increase the risk of spreading diseases.

Applicability box

Theme

Pigs

Farm type

Indoor housing with outdoor run

Production stage

All stages of pig production

Welfare Environment Cost



Automatic scrapers removing manure daily or several times per day if needed, can reduce ammonia emissions.

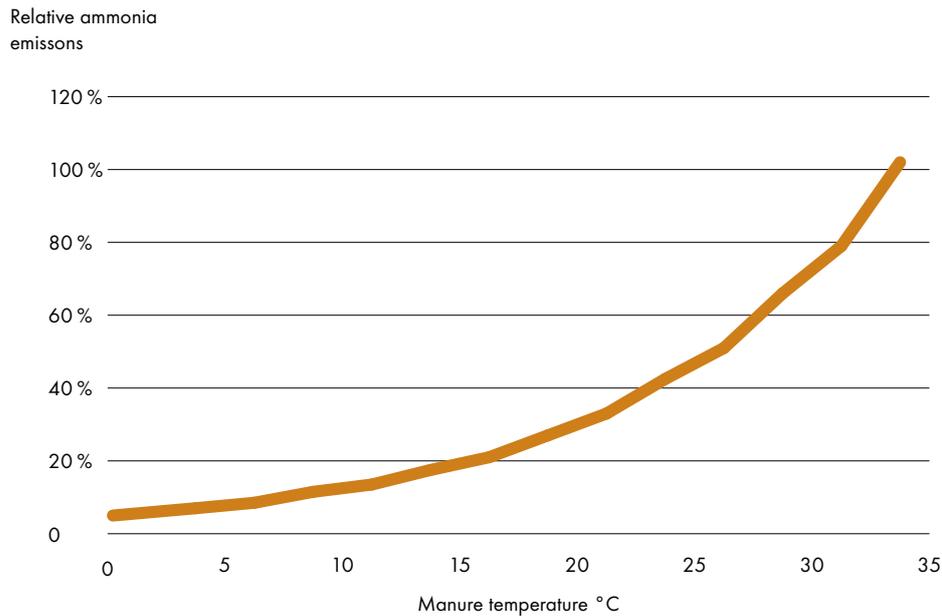


Figure 1: Graph of the relative ammonia emissions in relation to manure temperature. The higher the manure temperature, the more ammonia is emitted. At a manure temperature of 15 °C, the relative ammonia emissions are at a level of 20 %, whereas at 30 °C the level of relative ammonia emissions increases to around 80 %.

Relevance for environmental impact

- Ammonia emissions increase exponentially with higher temperatures (Figure 1).
 - One effective way to reduce ammonia emissions from the outdoor run is to increase the cleaning frequency. Daily scraping of the toilet area during the warm period of the year considerably decreases ammonia emissions compared to no scraping for several days. A dry clean area has no to hardly detectable ammonia emissions.
 - While outdoor areas are generally cleaned 1 to 3 times a week, an automatic scraper allows to remove manure daily or even several times per day, if needed.
 - To further reduce emissions, the pen and outdoor run design should incentive pigs to excrete in a designated part of the run, reducing the total area where excretions occurs. Pigs naturally prefer to keep excretion areas away from lying and feeding area, and this willingness increases with age. Thus, when lying and feeding areas are provided indoors, pigs prefer to excrete in the outdoor area.
- Therefore, the outdoor run should be structured to allow the separation of behaviours.
- The addition of roughage or rooting areas in the outdoor run can reduce the total area used for excretion.
 - Different groups of pigs can have different excretion behaviours, that cause a variation in ammonia emissions.
 - Lastly, to decrease ammonia emissions good manure management principles need to be followed. This includes that removed manure is kept in a covered storage, which helps to save nitrogen for crop production.

Cost and labour

- Technologies for the automatic removal of manure on the floor are available for different livestock species. Most common are scrapers used on both solid and slatted floor. Scrapers can be either pulled in rope, chain or cable by an electrical motor or by and hydraulic rail. These usually entail high investment costs, but reduce the workload as compared to scraping with a loader.
- If automatic scrapers are retrofitted to existing outdoor runs, adjustments in the layout can be required and imply additional costs.
- On the other hand, cleaner outdoor areas can reduce soiling of the indoor areas and thereby lower the workload for cleaning or renewal of the bedding material.

Recommendations / requirements

- **Design:** The outdoor area should be designed in a way that motivates pigs to use a designated area for excretion in the outdoor run. It is also important to have good drainage of the outdoor run, especially to dry up wet concrete areas not covered by automatic scrapers.
- **Warm weather:** The frequency of manure removal should be increased during warm periods of the year to decrease ammonia emissions.
- **Manure management:** To reduce the farm's total ammonia emission it is important to have good manure management, including frequent removal of manure, covered storage of manure and incorporation in soil within a few hours after spreading on cultivated fields.
- **Safety:** Scrapers with electrical motor can be fitted with safety stops that are activated if a pig blocks the scraper. Supervision of the pigs during scraping an area is recommended, or to lock the pigs away from the area.
- **Cold weather:** Longer periods of cold weather with ice and snow can be challenging for scrapers. However, hydraulic scrapers are easily removed and areas can be scraped with a loader during these periods.
- **Robots:** Automatic robots are used in cattle production to vacuum clean alleys. This technique could reduce the risk of spreading diseases between pens, but the robots need to be adapted to pig stables.

Further information

- **Salomon E. et al. (2020):** Ammonia emissions from outdoor fattening pigs on concrete pad – a farm case study. In: Proceedings of the IAHA video pre-conference on organic animal husbandry, pp. 44-47 [[Link](#)].

Imprint

Publisher:

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Permalinks: orgprints.org → [power](https://power.projects.au.dk), projects.au.dk → [power](https://power.projects.au.dk)

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The project "POWER - Proven welfare and resilience in organic pig production" is one of the projects initiated in the framework of Horizon 2020 project CORE Organic Co-fund (<https://projects.au.dk/coreorganiccofund/>) and it is funded by the Funding Bodies being partners of this project (Grant Agreement no. 727495). The opinions expressed and arguments employed in this factsheet do not necessarily reflect the official views of the CORE Organic Cofund Funding Bodies or the European Commission. They are not responsible for the use which might be made of the information provided in this factsheet.



