



# **Pig farming methods and environmental impacts in Hungarian pork meat production**

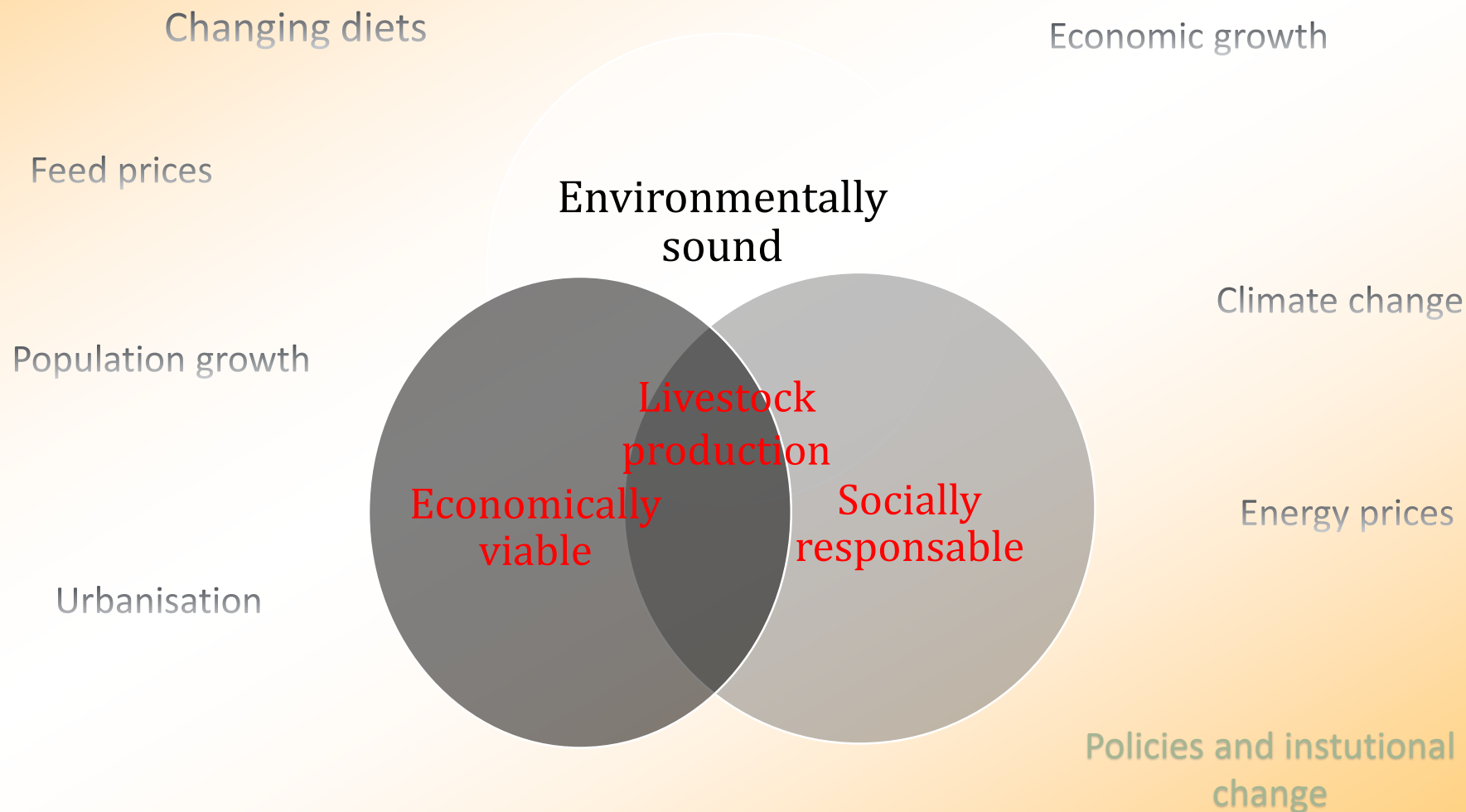
**Hungarian Agriculture and Live Sciences University,  
Gödöllő**



# Questions

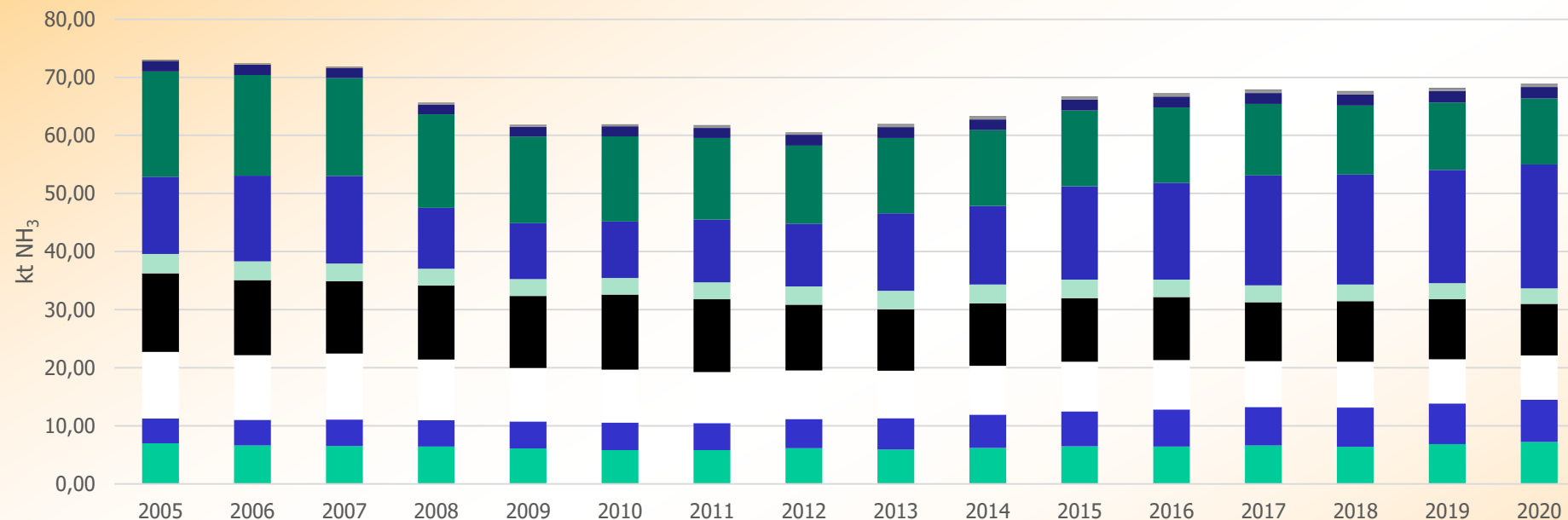
- ⇒ Q1: To which extent can differentiated farming methods add value to the pig meat sector?
- ⇒ Q2: To which extent can differentiated farming methods address environment and climate challenges?
- ⇒ Q3: Should certain farming methods be prohibited?

# What is the new approach of sustainable livestock production?





## Trends in Agricultural NH<sub>3</sub> Emissions 2005-2020



■ Dairy Cattle Husbandry

■ Swine Husbandry

■ All Other Animals Husbandry

■ Animal Manure Application

■ Sewage Sludge and Compost Application

■ Non-Dairy Cattle Husbandry

■ Poultry Husbandry

■ N-fertilizer Use

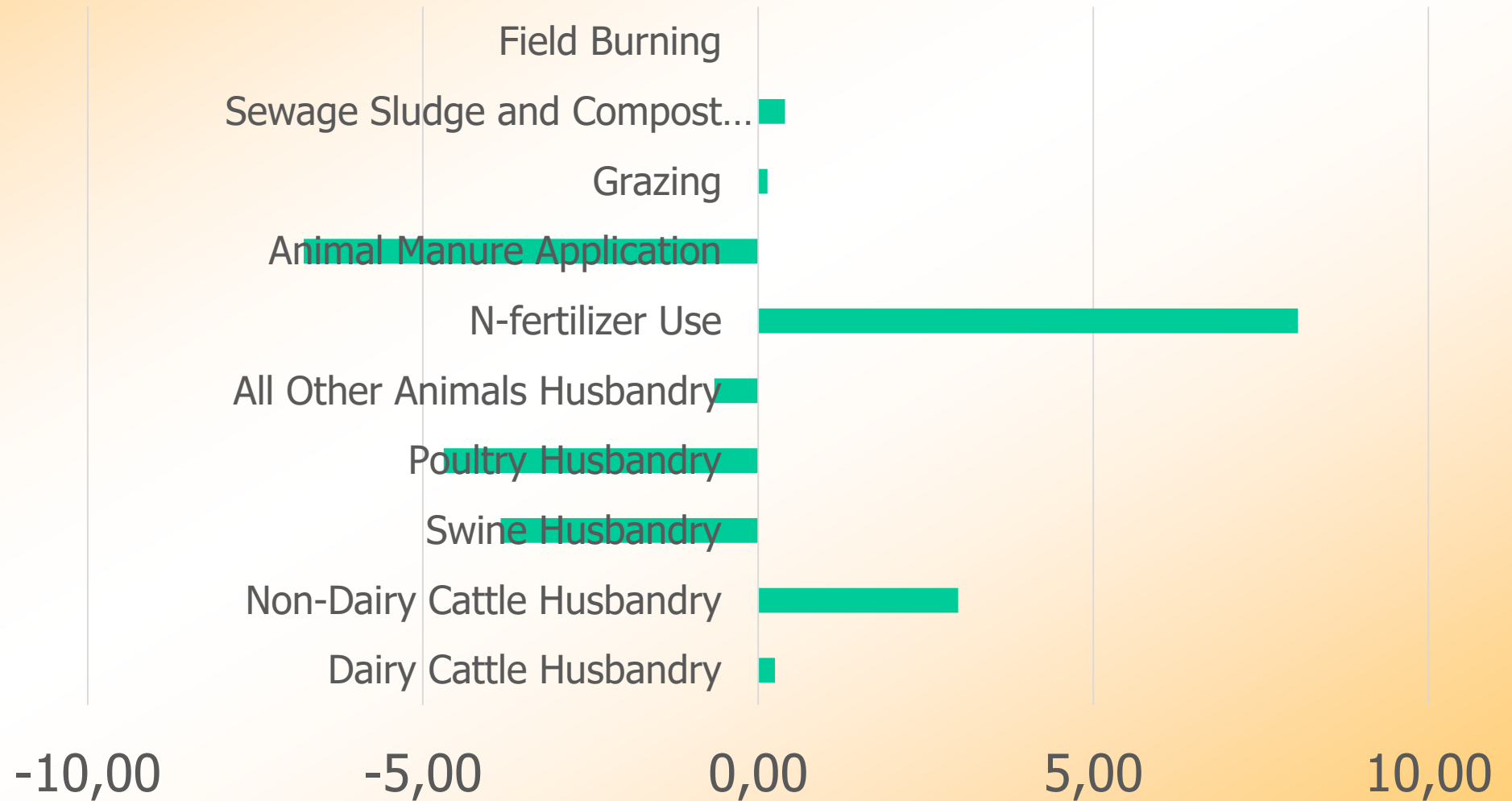
■ Grazing

■ Field Burning



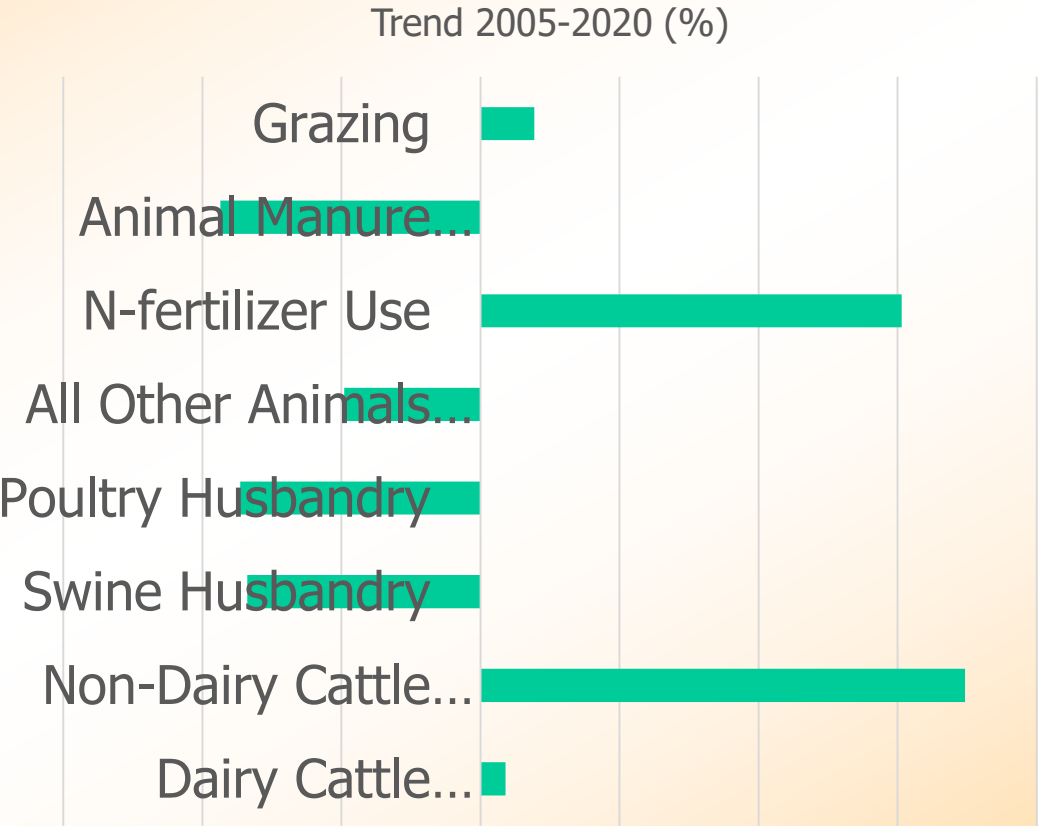
# Agricultural emissions NH<sub>3</sub>

Trend 2005-2020 (kt NH<sub>3</sub>)





# TREND in %





## National emission ceilings for air pollutions to ensure air quality (Directive-2016, 2284)

### Targeting ceilings

Basic Year 2005	2020		2050	
	EU	HU	EU	HU
Sulphur dioxide (SO <sub>2</sub> )	59%	46%	79%	88/73%
Nitrogen oxides (NO <sub>x</sub> )	42%	34%	63%	69/66%
Volatile organic compounds	28%	30%	40%	59/58%
Ammonia (NH <sub>3</sub> )	6%	10%	19%	34/43/32%
Small size components (PM <sub>2,5</sub> )	22%	13%	49%	54/64/55%



# Main trends

⇒ Agricultural emission is decreased by 5,6% between 2005 and 2020

- ⇒ Pork production sector is contributed by the decline of number of pork livestock
- ⇒ Feeding program used less protein thanks to better efficiency
- ⇒ Technological improvement is increased
- ⇒ In the stored inventory manure distribution is playing an important role
- ⇒ Expected magnitude of decrease impacted by increasing the fertilizer and the beef cattle livestock





# Typical pork housing techniques in Hungary:

⇒ Outdoor; indoor, indoor with outdoor access

⇒ Indoor housing techniques characterized by manure removal

- litter-based housing

- daily manure removal
- deep litter

- slurry-based housing

- ⇒ fully slatted floor,

- ⇒ partly slatted floor,

- ⇒ concrete floor with manure channel

# Main the types of pig farming

- ⇒ Free Range Pig Farming
- ⇒ Natural Pig Farming
- ⇒ Free Farmed Pig Raising
- ⇒ Stall Free Pig Farming
- ⇒ Outdoor Bred Pig Farming
- ⇒ Indoor Intensive Housing Pig Farm





# How We Can Decrease Ammonia Emissions

- ⇒ Nitrogen (N) management that takes into account the entire N cycle;
- ⇒ Livestock feeding strategies;
- ⇒ Low emission manure spreading techniques;
- ⇒ Low emission manure storage techniques;
- ⇒ Low emission animal housing systems;
- ⇒ Limiting ammonia emissions from the use of mineral N fertilizers.

<https://www.unece.org/fileadmin/DAM/env/documents/2001/eb/wg5/eb.air.wg.5.2001.7.e.pdf>





# Nitrogén management

- ⇒ To guarantee effective utilization of N by crops and to reduce the risk of losses, it is critical to
  - ↳ avoid excess applications of both fertilizer and manure-nitrogen and,
  - ↳ apply at times of the year when nitrate discharge will be minimized and, where possible, crops are vigorously growing.
- ⇒ Careful matching of N inputs to crop requirements will save money by reducing the amount of purchased fertilizer needed and decrease the potential for nitrate leaching.



# Livestock feeding strategies



- ⇒ Ensuring that farm livestock are not fed more protein than that required for the target level of production can reduce the N excretion per livestock unit and per unit production.
- ⇒ Decreasing the amount of N in manure will not only decline ammonia emissions but also other potential N losses (leaching, denitrification).
- ⇒ N excretion by different types and classes of livestock is strongly dependent on the production system
- ⇒ For pigs, N excretion can be reduced by matching more accurately the diet to the specific requirements of different growth and production stages. This can be achieved by:
  - (a) Ensuring that the protein content of the feed or ration is not higher than the suggested level;
  - (b) Using different diets for lactating and gestating sows;
  - (c) Using different diets for different growth stages of fattening pigs (phase feeding).

# Low emission manure storage techniques

- ⇒ Storage of slurry and other liquid manures
- ⇒ Techniques for reducing ammonia emissions from manure stores include:

- ↳ Design of the store: size and surface area

- ↳ Covers for slurry tanks or silos:

- Roofs etc.
- Floating covers.
- Natural crusts.
- Floating crusts.
- Straw
- LECA balls





⇒ Storage of solid manure

↳ Cover solid manure stores.

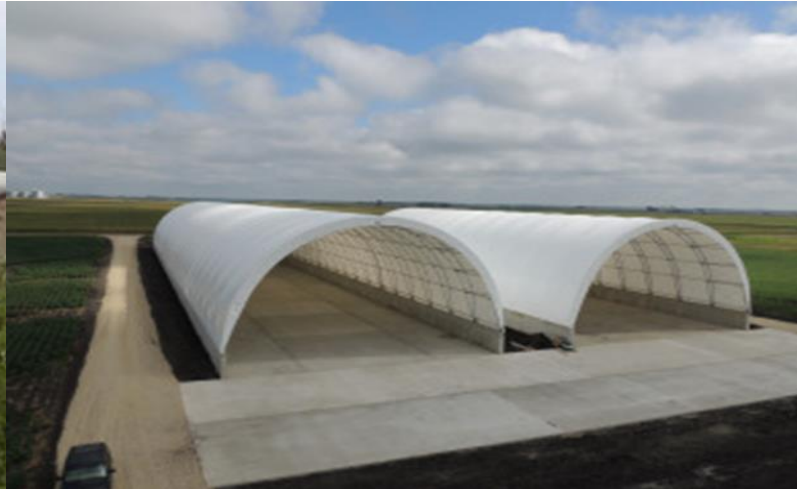
↳ Make the surface area of the stack as small as possible

⇒ Keep the manure as dry as possible, for example by:

↳ Storing under a roof, preferably on a concrete base;

↳ Covering with a sheet;

↳ Storing in narrow A-shaped heaps that shed water more readily, when no cover is used.



# Low emission manure spreading techniques

- ⇒ Low emission techniques for slurries and other liquid manures
- ⇒ The most effective means of reducing ammonia emissions from slurry application is to employ an appropriate application technique such as an injector or band spreader.
- ⇒ Injectors: These reduce emissions by placing the manure lower the soil surface, thus decreasing the manure surface area exposed to the air and increasing infiltration into the soil. They are generally more effective than crowd spreaders.
- ⇒ There are three types:
  - ⇒ Shallow (or slot) injectors
  - ⇒ Deep injectors
  - ⇒ Arable injectors





# Low emission animal housing systems

⇒ A range of emission abatement methods are available which vary from high to negligible cost and in their applicability to different housing systems.

- ⇒ Slurry based pig houses
- ⇒ Reduce the surface area of the slatted area,
- ⇒ Reduce the exposed surface of the slurry beneath the slats,
- ⇒ Lower slurry temperature
- ⇒ Improve animal behavior and design of pens
- ⇒ Avoid ventilation directly above the surface of the slurry in the channels.



⇒ Straw-based pig houses

⇒ In straw-based pig housing systems, i.e. with solid manure production, the following considerations are important:

↳ Manage bedding to ensure pigs have a clean, dry bed;

↳ Ensure that drinkers and troughs do not leak;

↳ Prevent urine accumulation.

**Weaned pigs' accommodations**



Image courtesy Justin Byrum PINTEREST.com



Image courtesy COREPIG 2011



Image courtesy MASSEY University






## Conclusion

- ⇒ Livestock farming and related manure management have to deal with a number of environmental problems, in addition to increasingly severe regulations
- ⇒ The survey and statistical analysis showed that advanced ammonia emission reduction techniques for pig housing, external manure storage cover, manure processing, and field application are not yet common
- ⇒ It is essential to provide more information about these results influencing the environment, applicability of each intervention, and their benefits in education and training, instead of prohibition of certain farming
- ⇒ It is important to be focused on the mechanisms that control the loss of manure N and the practices that can be performed at each level of manure management to minimize losses
- ⇒ Overall, in Hungary, the use of farm-level environmental/sustainability tools is spreading under a kind of official pressure, with very little voluntary interest. Consequently, it can be stated that there is still much to do to improve the awareness of farmers in the field of sustainable agriculture.

# 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, 2014.
- ⇒ Survey of applied ammonia mitigation technologies in the Hungarian pig production practice, Archives of Environmental Protection Vol. 48 no. 1 pp. 83–91, PL ISSN (Tibor Vojtela, Marianna Magyar , Sándor Koós , Nóra Péterfalvi, László Fenyvesi, Béla Pirkó).
- ⇒ DOI 10.24425/aep.2022.140547
- ⇒ Advisory and Knowledge Transfer Tool for Ammonia Emission Mitigation on Pig Farms in Hungary, Marianna Magyar, Béla Pirkó, Julianna Kótiné Seenger, Nóra Hegedűsné Baranyai, Károly Dublec, Tibor Vojtela, Renáta Rák, György Borka, Anita Szabó and Zsuzsanna Benedek
- ⇒ <https://doi.org/10.3390/app11135970>
- ⇒ Hungarian Meteorological Service. (2020). National Inventory Report for 1985–2018. (<https://unfccc.int/documents/226419> (accessed on:19.04.2021)).



- 
- ⇒ Ministry of Agriculture. (2020) BAT Pig Guideline, Guideline for Determining the Best Available Techniques in the Process of Authorisation of Intensive Rearing of Pigs), Hermann Ottó Intézet,
  - ⇒ ([http://www.hermanottointezet.hu/docs/BAT\\_utmutato\\_az\\_intenziv\\_sertestenyeszteshez\\_2020.pdf](http://www.hermanottointezet.hu/docs/BAT_utmutato_az_intenziv_sertestenyeszteshez_2020.pdf) (accessed on 8.08.2021)) (in Hungarian)
  - ⇒ Loyon, L. (2018). Overview of Animal Manure Management for Beef, Pig, and Poultry Farms in France, *Frontiers in Sustainable Food Systems*, 2:36. DOI: 10.3389/fsufs.2018.00036
  - ⇒ Piwowar, A. (2020). Farming Practices for Reducing Ammonia Emissions in Polish Agriculture. *Atmosphere*, 11 (12), 1353. DOI: 10.3390/atmos11121353



Thank you for your attention