

## *Guidelines for calculated manure systems (WP3)*

*HELCOM Manure Standards policy workshop*

*6 November 2018  
Warsaw, Poland*

Allan Kaasik  
Estonian University of Life Sciences



© Canva

## *Current situation and main differences between countries (1)*

- Calculation systems for manure quantity and quality available (Denmark, Sweden), but only results are given in published tables for users(ex-animal/ housing/ storage).
- Manure data table values are updated annually (Denmark), as needed (Finland, Sweden etc.), or they are relatively old (Russia).
- The calculation formulas are similar in many basic aspects (If they exist).



© FineArtAmerica

## Current situation and main differences between countries (2)

Manure N,P,K content (ex-animal)

Main formula e.g. for dairy cows:

Feed N,P,K – (milk N,P,K + body weight gain N,P,K + embryo N,P,K)

- *minor country-specific differences in calculation*
- *differences in the N, P, K content in milk, body weight gain and embryo*
- *results still very similar*



© FineArtAmerica

## Current situation and main differences between countries (3)

Example ex animal (dairy cows)

- Based on Swedish default feeding and production values (8000 ECM milk/year)
- For calculation of faeces and urine N,P,K content country-specific formulas are used

	N kg	P kg	K kg
Denmark	120	14	102
Estonia	119	16	102
Finland	120	14	102
Latvia	119	14	104
Poland	120	15	103
Sweden	120	14	102



© FineArtAmerica

## Current situation and main differences between countries (4)

### Ex-housing calculations

The base formulas are similar:

*Manure quantity (ex-housing) =*  
 manure quantity (ex-animal) + inputs (bedding, technological water etc.) – grazing – losses (DM decay, water evaporation)

*Manure N,P,K (ex-housing) =*  
 manure N,P,K (ex-animal) + inputs (bedding etc.) – grazing – losses (N emission)

- *country-specific differences in losses. For example N loss depending on the region, keeping technologies etc.*
- *In most countries, nitrogen emission percentage related to keeping technology is similar for all of animals age groups.*



© Unsplash

## Current situation and main differences between countries (5)

Ex-storage calculations

The base formulas are similar:

*Manure quantity (ex-storage)* =  
manure quantity (ex-housing) + inputs (precipitation etc.) – losses (DM decay, water evaporation)

*Manure N,P,K (ex-storage)* =  
manure N,P,K (ex-housing) + inputs (covering material N,P,K etc.) – losses (N emission; N,P,K leaching)

- *country-specific differences in losses. For example N loss depending on the region, storing technologies, etc.*
- *In most countries, nitrogen emission percentage related to storing technology is similar for all of animals age groups.*



© Pexels

## Calculation tool

- Ex animal calculations based on Danish calculation system and algorithms.
  - *there is a difference between models of other countries in calculating the amount of manure*
  - *N, P, K calculations are very similar*
- Ex housing and ex storage calculation based on mass balance method.
- The tool (farm level) is designed to calculate manure quantity and chemical composition in one specific animal building or buildings where manure is collected to the same manure storage or storages (depends on the keeping technology).



© Pexels

# Comparison of the manure chemical analysis and calculated results in test farms

- Test farm 1 (Estonia): 591 dairy cows, liquid manure

	Quantity	DM	N (total)	NH <sub>4</sub> -N	P(total)	K(total)
	t	%	kg/t			
Mass balance	14 499	9,6	4,47	2,72	0,77	3,53
Chemical analyze	***	<b>7,7</b>	<b>4,2</b>	<b>2,7</b>	<b>0,69</b>	<b>2,5</b>

- Test farm 2 (Germany): 3309 slaughter pigs (28,9-124,9 kg), liquid manure

	Quantity	DM	N (total)	NH <sub>4</sub> -N	P(total)	K(total)
	t	%	kg/t			
Mass balance	2164	6,6	5,18	4,21	1,07	2,08
Chemical analyze	***	<b>4,53</b>	<b>5,32</b>	<b>3,58</b>	<b>1,27</b>	<b>2,59</b>



© Pexels

\* Accuracy of the input data at the ex-housing and ex-storage levels

- Quantity of technological water
- Coefficient of DM decay and water evaporation at ex-storage level

\*\* Potassium content in the feeds was not analyzed (default values at ex-animal level)



## Calculation tool – work in progress

- Currently the calculation tool is being finalized after testing and discussion between the partners
  - Final choice of animal categories, manure types, housing technologies, storage solutions etc.
  - Validation via pilot farm data from all countries
- Documentation
- User manual



© Pexels

*Thank you!*



Contact: [allan.kaasik@emu.ee](mailto:allan.kaasik@emu.ee)