National default values for manure in Sweden

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Baltic Sea Region Programme 2007–2013

The project is partly financed by the European Union
European Regional Development Fund

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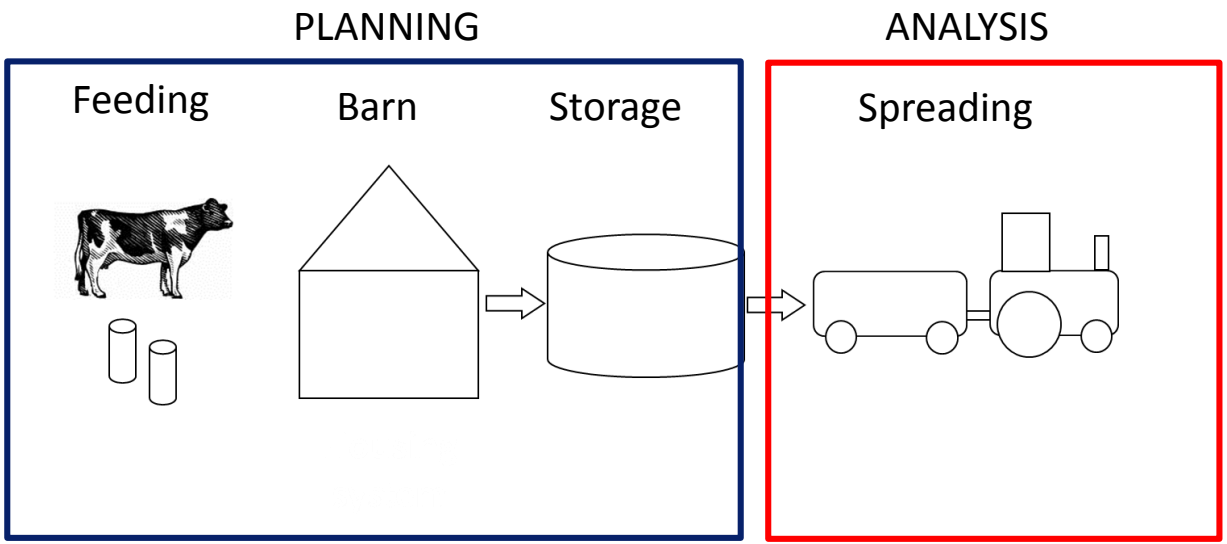
Manure handling – a chain



Calculated or default values

Analysis of nutrient content!!

Planning tool VERA – excreted amounts

- **Faeces and urine nutrient content** can be calculated in two ways, either
  a) based on 'standard feeding' for different animal species and production levels, or
  - b) based on actual feeding and production level on farm (nutrient balance of animal categories)
- **The amount of manure** is based on excreted amount of dry matter (DM) and the DM-content of faeces and urine with 'standard feeding' as above.
- Data have recently been updated for dairy cows and pigs. Next animal species to be updated are poultry and other types of cattle.

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Examples of default excretion values, N, P and K per animal place and year

Tabell 5. Årsproduktion av kväve (N), fosfor (P) och kalium (K) I färsk träck och urin från olika djurslag

Djurslag	Innehåll av växtnäring (kg/djurplats och år)		
	N	P	K
Mjölkko, 8 000 kg ECM[a]/år	132	15,2	114
Mjölkko, 10 000 kg ECM[a]/år	142	16,5	106
Mjölkko, 12 000 kg ECM[a]/år	178	21,0	117
Diko, helår	63	12	75
Diko, enbart stallperiod 6 mån	22	5	28
Kviga/stut <1 år	21	3	26
Kviga/stut >1 år	47	8	54
Gödtjur 1-12 mån	32	6	15
Vallfodertjur 1-16 mån	36	6	33
Betestjur 1-18 mån	40	6	46
Sugga, 2,2 omg/år (inkl. 23 smågrisar till 30 kg)	35	6,7[b]	13

Planning tool VERA – manure property changes in stables

- Addition of bedding material (amount and type)
- Addition of cleaning and waste water (default values)
- Number of cattles, robotic milking? (higher water consumption with robots, default value)
- Ammonia emissions (default values depending on animal species, manure handling system (liquid, solid, deep straw bed) and bedding material
- Losses due to turn-over in the organic matter. Netto amounts of DM are recalculated to amount of manure based on empirical values of DM content and bulk density.

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Planning tool VERA – manure property changes in storage

Depending on covering (roof, stable crust, no cover):

- Addition of precipitation in the community reduced with evaporation (default value), and storage surface
- Additions of effluents from silage storages
- Addition of water from hard standings (area) or other water additions like roof
- Ammonia emissions (default values depending on animal species, type of manure and storage conditions like cover or not, manure handling system (liquid, solid, deep straw bed) and DM turn-over losses (composting).

Normative/default values: Amount of manure per animal place and storage length (6-12 months)

	Producerad mängd gödsel per djurplats vid olika lagringstid (m³)											
	Fastgödsel[a]				Urin + gödselvatten				Flytgödsel			
	Lagringstid (antal månader)				Lagringstid (antal månader)				Lagringstid (antal månader)			
	6	8	10	12	6	8	10	12	6	8	10	12
Mjölkko, 8 000 kg ECMb)/år	7,1	9,5	11,9	14,3	4,4	5,9	7,3	8,8	14,5	19,4	24,2	29,1
Mjölkko, 10 000 kg ECMb)/år	7,2	9,6	12,0	14,4	4,5	6,0	7,5	9,0	14,8	19,7	24,6	29,5
Mjölkko, 12 000 kg ECMb)/år	8,0	10,7	13,4	16,1	5,1	6,8	8,5	10,2	16,6	22,1	27,6	33,1
Kviga/stut < 1 år	1,8	2,4	3,0	3,6	1,3	1,7	2,2	2,6	3,0	4,0	5,0	6,0
Kviga/stut > 1 år	2,9	3,9	4,9	5,9	2,4	3,2	4,0	4,8	5,2	6,9	8,6	10,3
Gödtjur, 1–12 mån	1,9	2,6	3,2	3,9	1,5	1,9	2,4	2,9	3,3	4,4	5,5	6,6
Vallfodertjur, 1–16 mån	2,5	3,4	4,2	5,1	2,1	2,8	3,5	4,2	4,5	6,0	7,6	9,1
Betestjur, 1–18 mån	3,0	4,0	5,0	6,0	2,5	3,4	4,2	5,1	5,3	7,1	8,9	10,7
Diko, 6 mån stallperiod	3,9				2,2				6,1			
Sugga i produktion, 2,2 omg/år	1,5	2,0	2,5	3,0	3,0	4,0	4,9	5,9	4,7	6,3	7,8	9,4
Suggplats i satellit, 6,5 omg/år	3,2	4,3	5,4	6,5	6,4	8,6	10,7	12,8	9,5	12,6	15,8	18,9
Sinsuggplats i suggnav, 4,4 omg/år	0,7	0,9	1,1	1,3	1,2	1,6	2,0	2,5	1,8	2,4	3,0	3,6
Slaktsvin 3,0 omg/år	0,4	0,5	0,6	0,7	1,0	1,3	1,7	2,1	1,6	2,1	2,6	3,1
Värphöns 100 st	1,9	2,6	3,2	3,9					4,8	6,4	8,0	9,6
Unghöns 100 st, 2,2 omg/år	0,6	0,8	1,0	1,2								

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Swedish inventory of fertiliser use in Sweden, every 2nd year

- Amount N, P and K in manure calculated by using the same default values as in VERA together with animal production data.

Additional information from the inventory:

- **Storing**
  - handling methods of manure (solid, liquid, semisolid, deep straw litter)
  - storage conditions (filling storage and type of cover or no cover) and capacity (months).
- **Application**
  - time of spreading,
  - which crops,
  - application rates,
  - spreading techniques, time between spreading and incorporation.
- **The result is used for instance when calculating the ammonia emissions from Swedish agriculture.**

Statistics Sweden, 2014

’Manure sampling safari’ – farm scale sampling

- In 1999, JTI sampled manure from 130 farm storages with solid or liquid manure from cattle and pigs. Data concerning micro-nutrients are still used (Steineck et al., 2000) as well as reference of calculated DM content.
- In 2004, JTI also sampled poultry manure (Salomon et al., 2006).
- Other studies with balances of cattle barns, showed that micro-nutrients (Zink) increased in the barn (Gustafson et al., 2007), explained by corrosion of barn equipment.

Advantages and challenges of the existing systems at the national level in SWEDEN

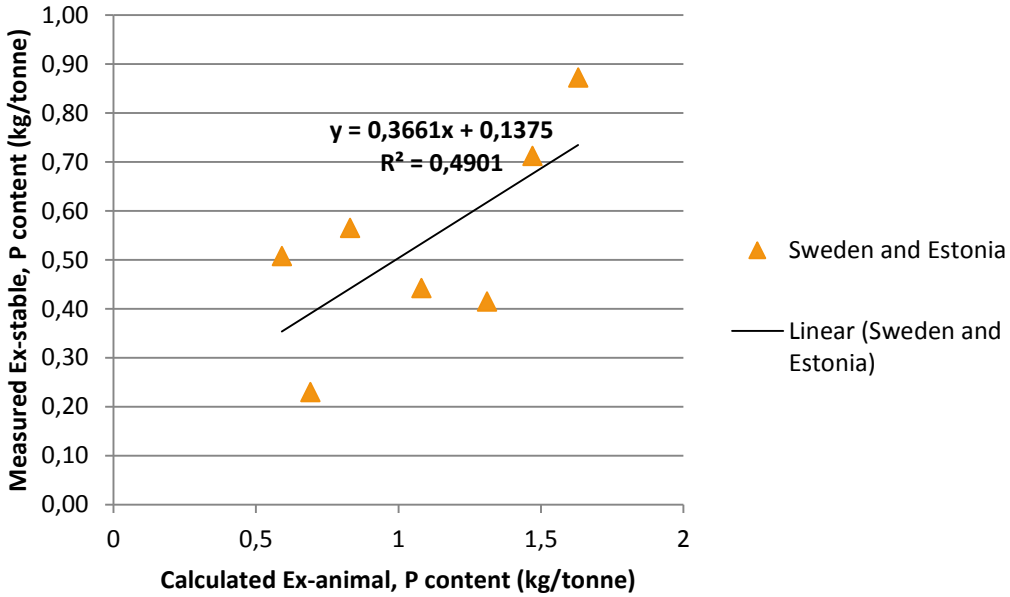
Advantages

- Default values of nutrient content of manure used by many stakeholders.
- Good as planning tool for amount of P and K on farm, and the need of supplementary mineral fertilisers on farm.
- A good help for calculating the need of storage capacity, used both by consultant and authorities.
- A good help for planning in which fields to place the manure based on content of P and K together with soil analysis and at which doses =>
- More efficient use of P and K on farm level, better economy, reduced risks of eutrophication.

Challanges

- To update feeding rations continuously (can change rather fast), as well as emission factors for ammonia, reflecting barn design, handling methods and technologies of today.
- Lack of feed analysis data on farm level, like nutrient content of roughage (silage).
- The changes of manure properties in stables depending on barn design, water dilution, management routines, need to be investigated additionally.
- The advisory service can see a potential of improvement of the formula for calculating needed storage capacity.
- High risk of pollution, if the fertilisation is not based on actual content of nutrients, in the first hand Nitrogen.

Baltic Manure: Correlation between calculated P content excreted (Ex-animals) and measured Ex-housing



Sindhöj et al., 2013

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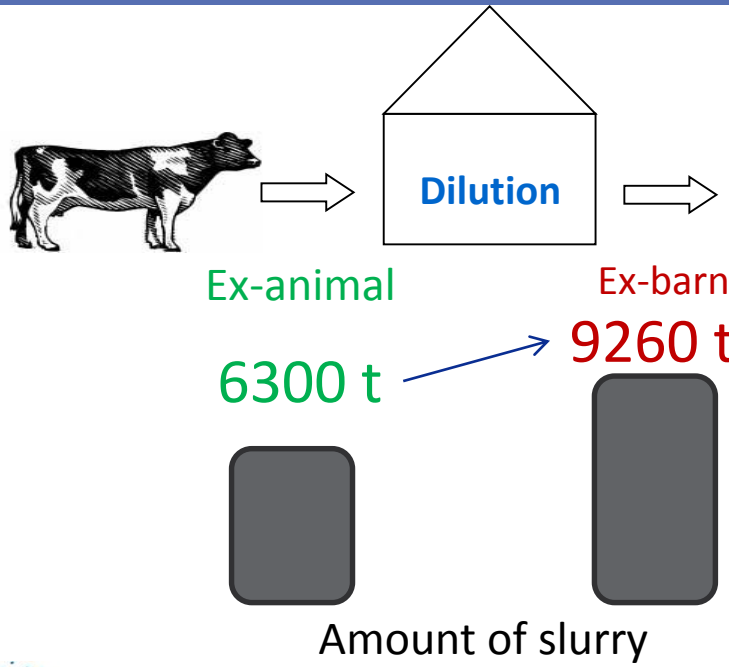
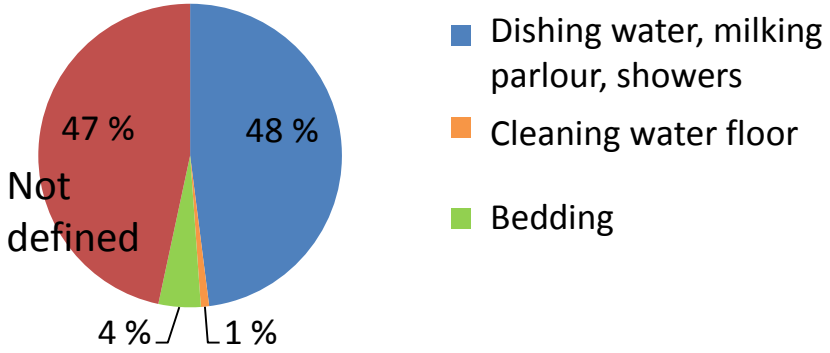
Swedish dairy farm, barn with 285 cows

Baltic Manure: Dilution in the barn, example



Measured 1580 out of 2960 t/yr



Sindhöj et al., 2013

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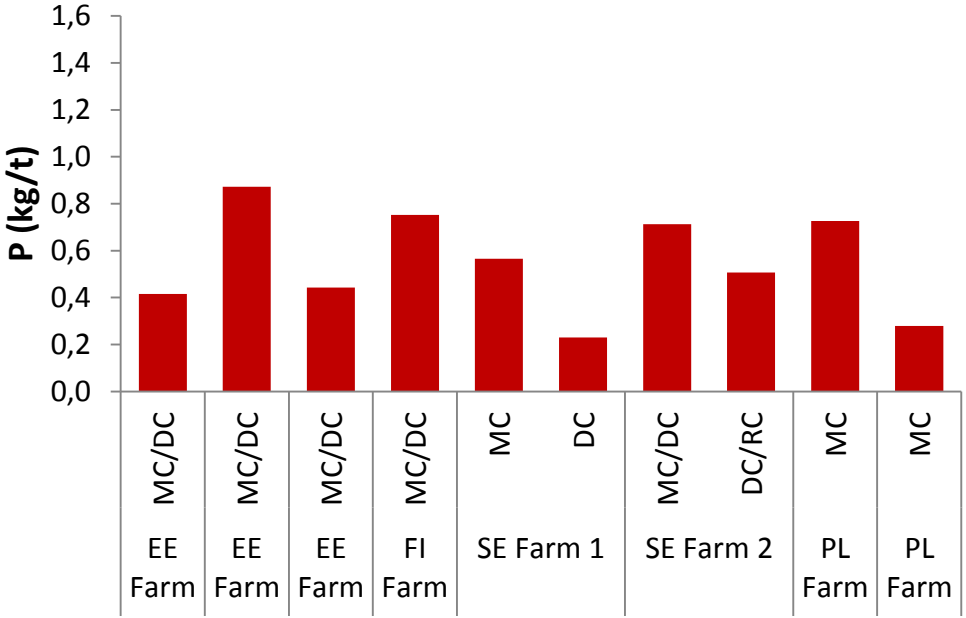
Baltic Manure:
P content of manure, ex-housing (SE, EE, FI, PL)



Sindhöj et al., 2013

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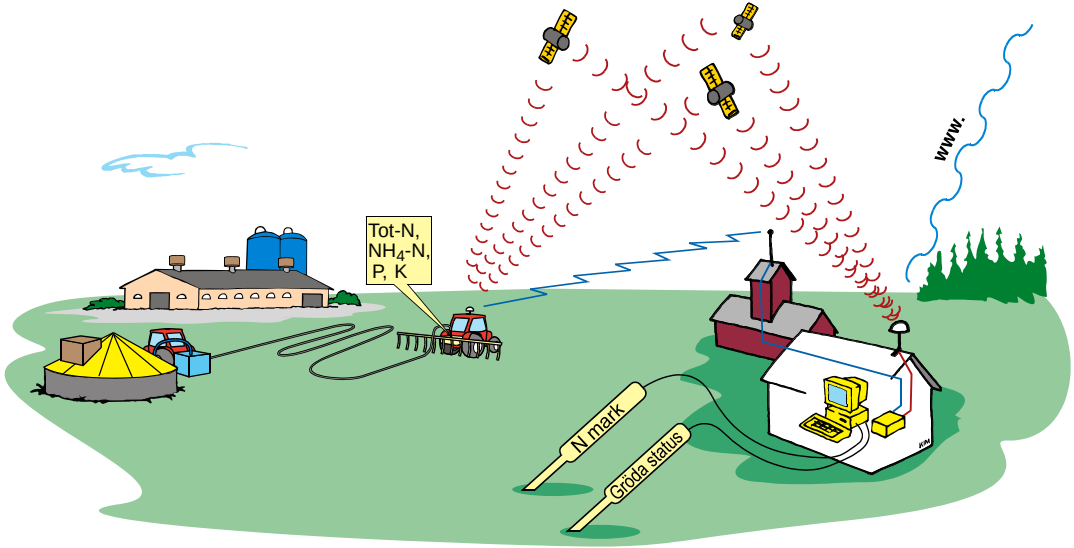
Precision agriculture: manure spreading

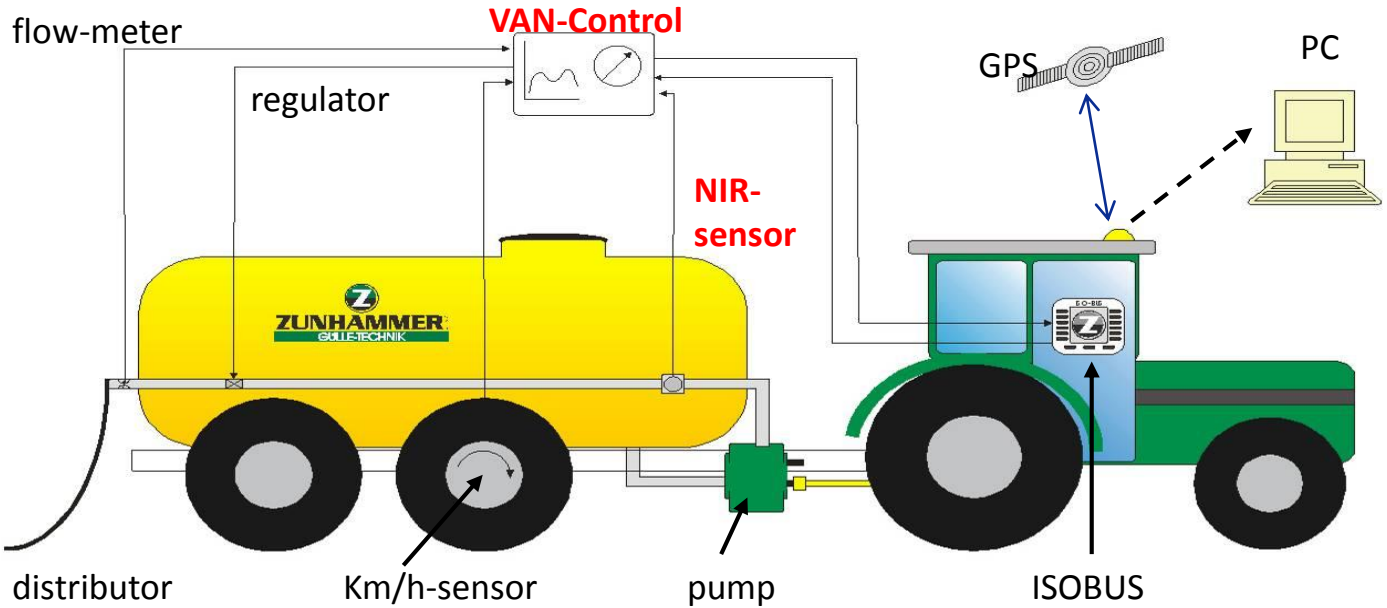


Band spreading, placement

Injection – low ammonia emissions

VAN-Control

The ´lab´ on the tanker makes it possible to measure the contents immediately before distribution



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National needs for developing the existing system in SWEDEN

- Help with updating the calculations more frequently.
- Validation and identification of errors when calculating nutrients in manure and amounts:
  - errors in dosage of feed components, in declaration, in sampling for analysis etc.
- Dilution of manure in barns and outdoor sources.

Potential of developing and implementing a regional joint basis for an advanced nutrient standards system from the perspective of SWEDEN

- Better understanding of how barn design and management inside the barns influence nutrient content and mass of manure leaving the stable.
- Improved calculation of storage capacity necessary for environmental-friendly use of manure.
- Learning from each other.

Thank you for your attention!

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