



NORØK

Norwegian Centre for Organic Agriculture

soil effects

Long-term effects of slurry and anaerobically digested slurry on soil organic matter

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Viken fylkeskommune velferdstur på Tingvoll gard

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What happens to the soil if the farmer puts the manure in a biogas digester?



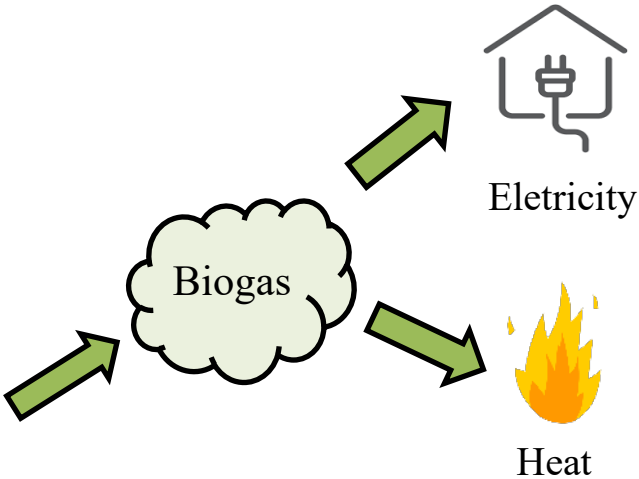
Biogas plant



Untreated cow
Slurry (US)



Anaerobic digester in Tingvoll



Anaerobically Digested
Slurry (ADS)

Soil Effects long-term experiment (2010-)

To compare long-term effects of anaerobically digested versus non-digested manure (slurry) on soil characteristics and crop yields.



Experimental desing

Treatments



Slurry type

Untreated Slurry (US)



Anaerobically
Digested Slurry
(ADS)



Slurry rates

Low (110 kg N ha^{-1})
(Organic farm with small import of feed)

High (220 kg N ha^{-1})
(«Conventional» farm;
or organic with high import of feed)

Treatments

USL

USH

ADSL

ADSH

CONTROL

Results (2011-2021)

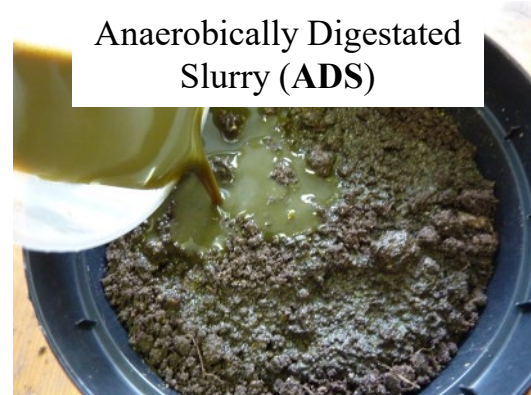
- Slurry and digestate composition
- SOM content
- Soil fertility
- Yield
- Nutrients balance (NPK)



What happens with the cow slurry after digestion?

Mean values ($n= 50$) of the chemical analyses over time

Characteristics	US	ADS
Dry matter (%)	5.3	3.4
pH (water)	7.4	7.7
Tot-N (g/kg)	2.6	2.2
NH ₄ -N (g/kg)	1.5	1.4
NH ₄ -N tot N (% av tot-N)	60.6	65.2
P (g/kg)	0.5	0.4
K (g/kg)	3.1	2.7



Native SOM variation

SOM in the field in 2010

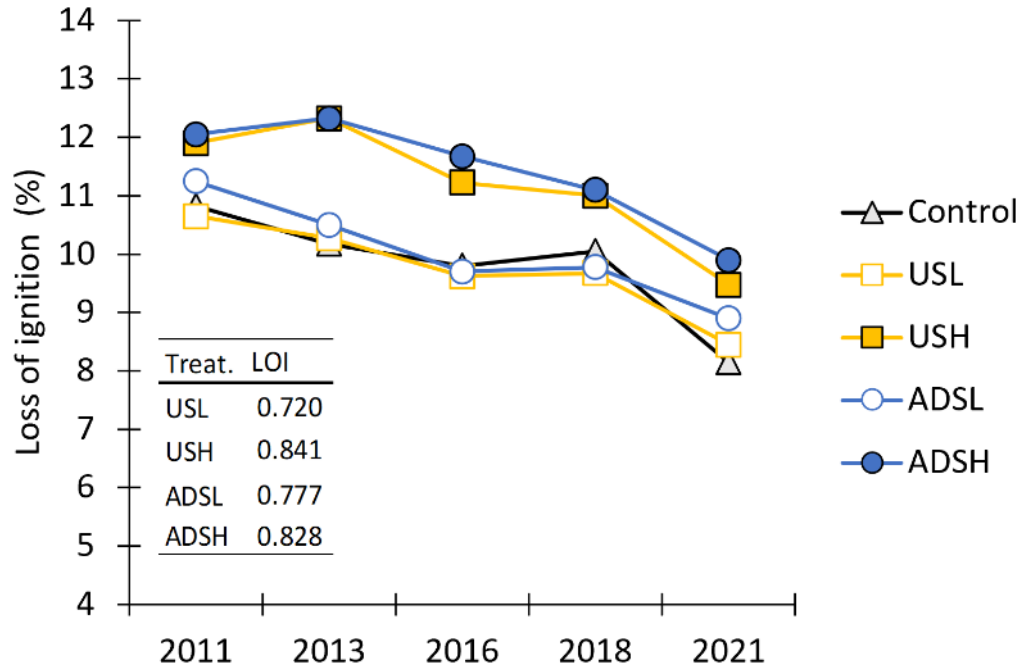
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A	18,8	22,8	28,5	21,8	18,0	13,5	13,1	11,3	10,9	11,0	10,5	9,1	8,5	9,0	7,9	8,5	6,6	11,1	6,4	6,9	7,1
B	17,4	15,9	14,3	13,6	10,1	9,1	8,7	5,1	7,1	7,5	6,9	6,7	8,8	8,6	12,5	12,5	12,1	8,1	13,0	14,6	11,8
C	8,3	8,2	8,7	9,2	8,2	7,1	6,2	5,0	4,7	6,3	5,4	5,8	5,2	5,5	4,9	4,1	7,6	6,6	9,4	9,3	9,3
D	5,6	4,7	6,3	6,7	6,3	6,0	5,3	4,8	5,1	4,9	5,9	5,2	4,1	5,2	3,7	4,8	5,9	4,7	6,9	6,2	9,8

Legend: Indication of organic matter content by different colours

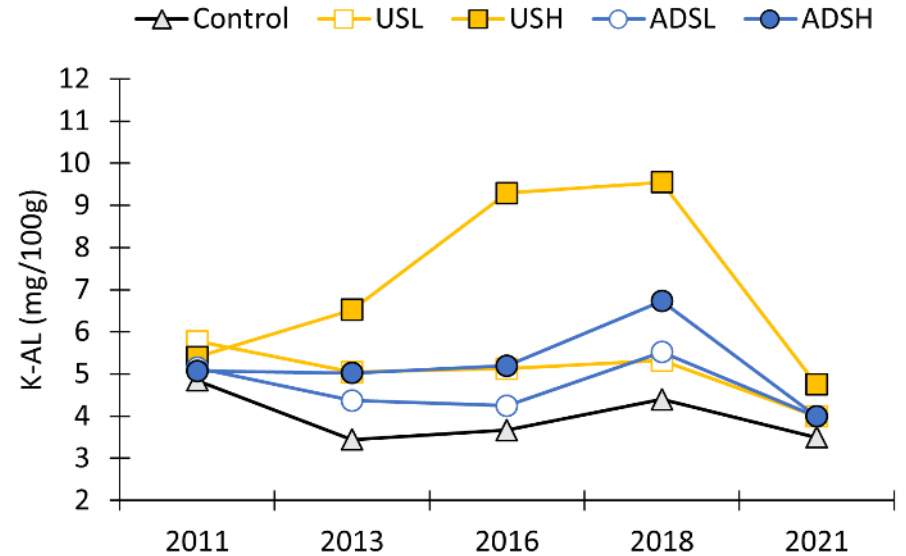
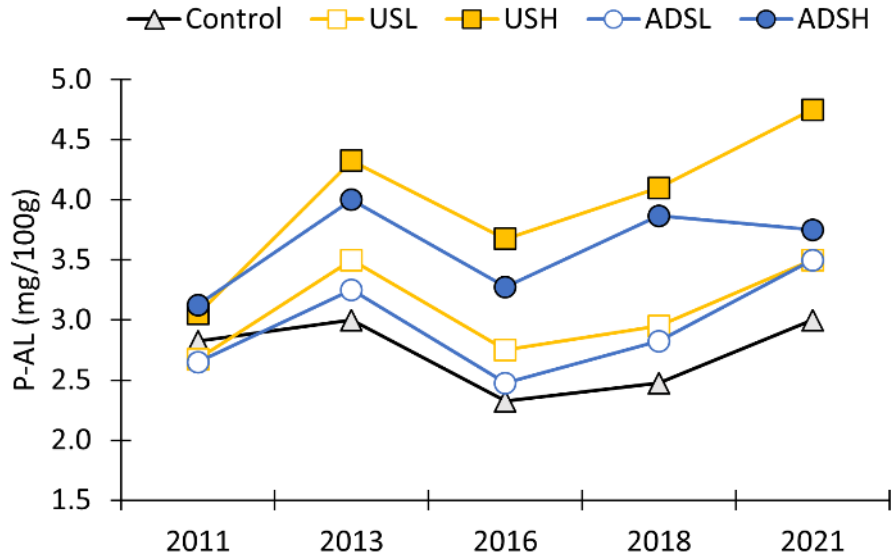


SOM in the treatments

Treatments



P-AL and K-AL

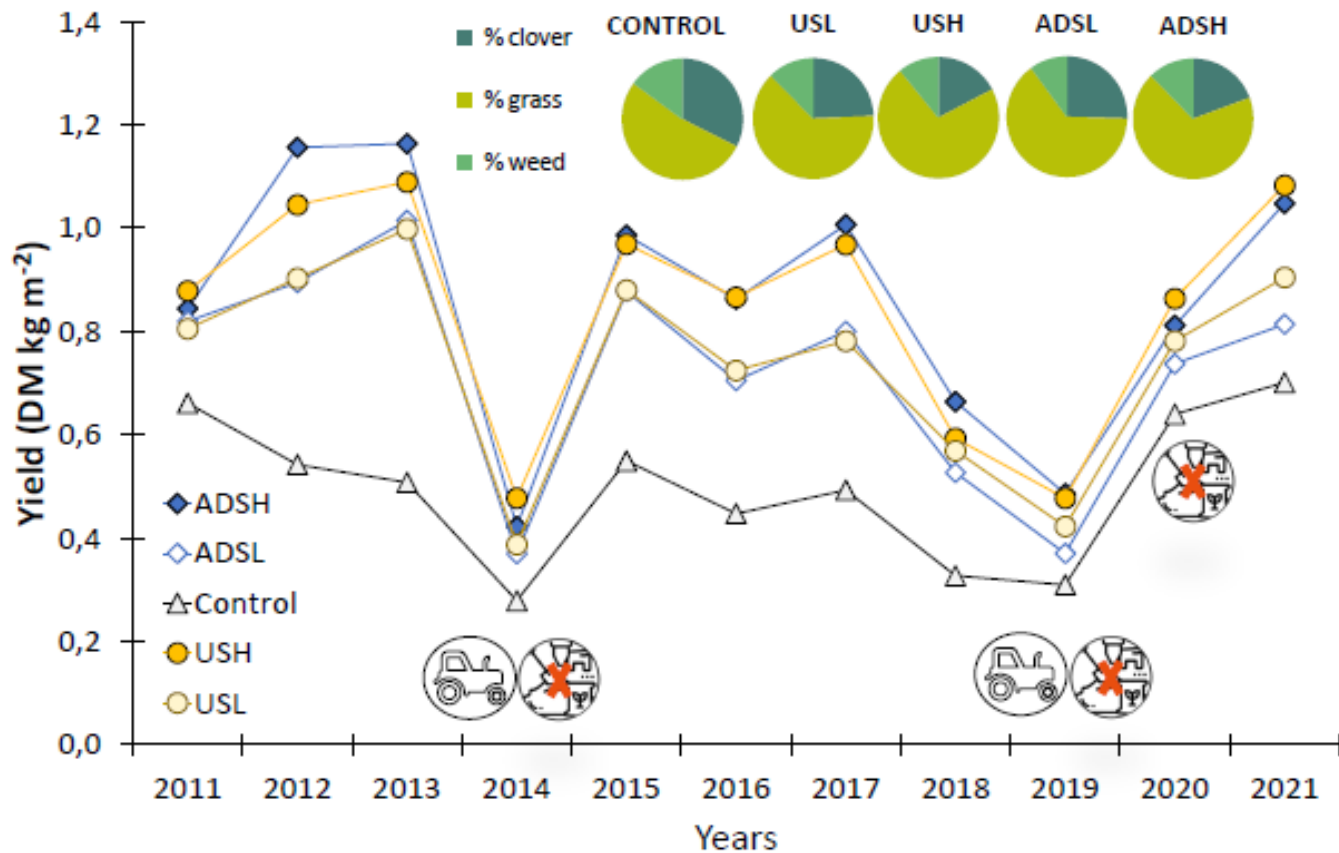


Yield

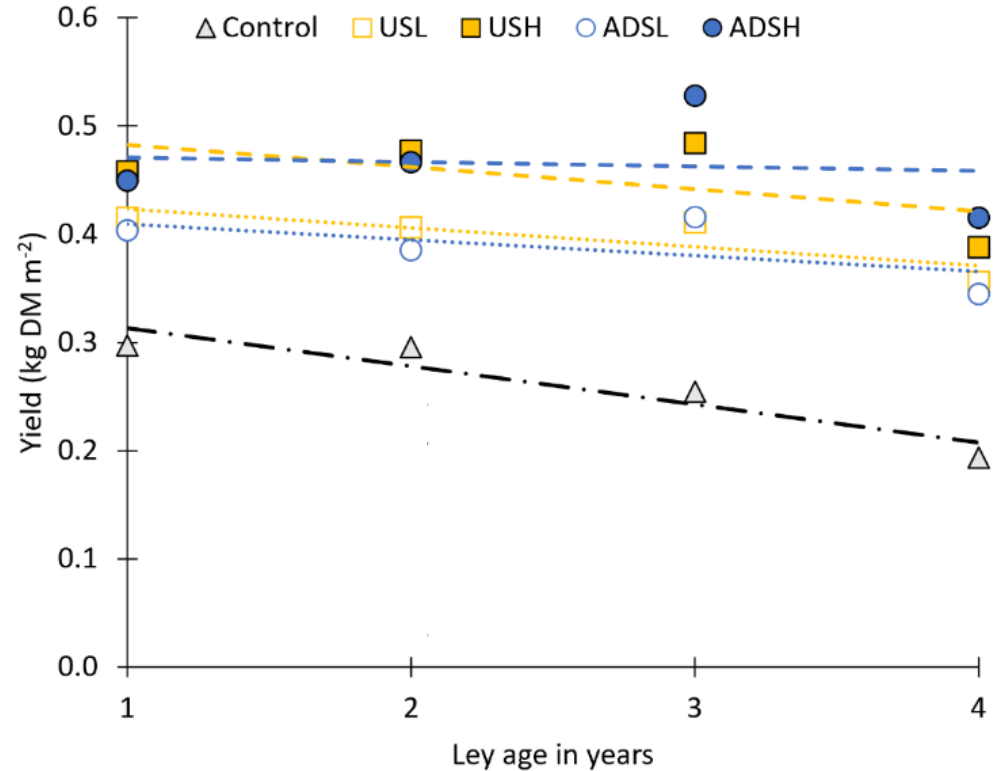
Rotation : 4 yr ley + 1 yr green fodder with re-establishment of ley
2 harvest: June and August



Yield

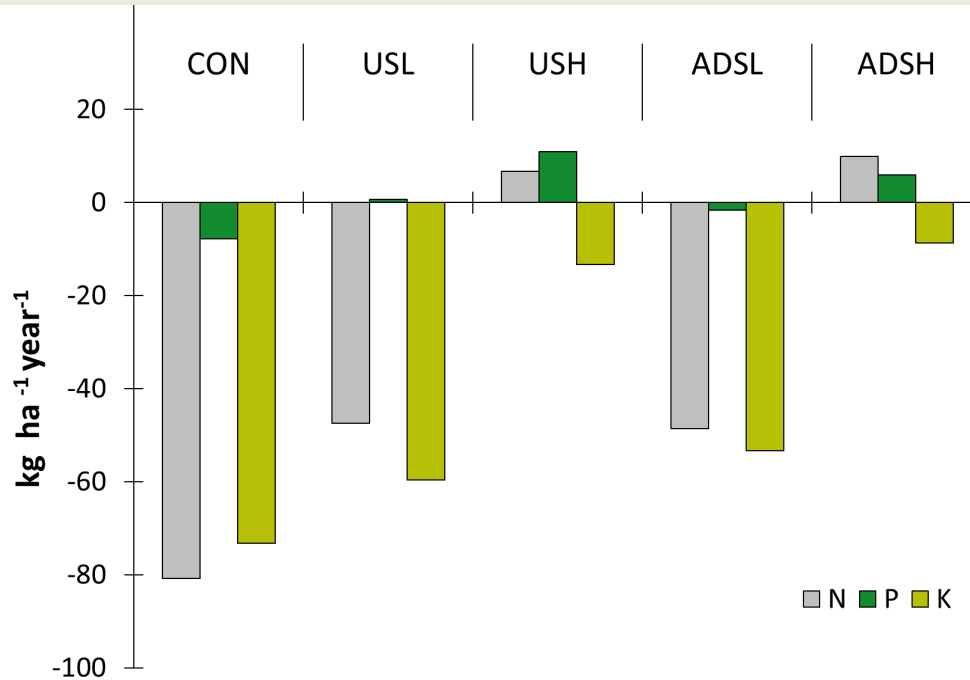


Yields of the ley



Nutrient budgets (2011-2021)

Nutrient budget = INPUT (fertilizer) – OUTPUT (yield)



Conclusions

- ✓ The effect of US and ADS on SOM, soil fertility and crop yield are similar, despite their initial differences.
- ✓ Long-term application of US and ADS did not increase or even maintain the SOM content in the soil top layer.
- ✓ Long-term application of high and low rates of ADS and US, maintained yields but at different levels; the yields were on average 17% higher by a double application of manure.



Thank you!

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More info:

<https://www.norsok.no/>

<https://www.youtube.com/channel/UCyq6x7OFN83nIP9518OoDg/videos>

GLTEN Metadata Portal

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