Grazing with a high stocking density

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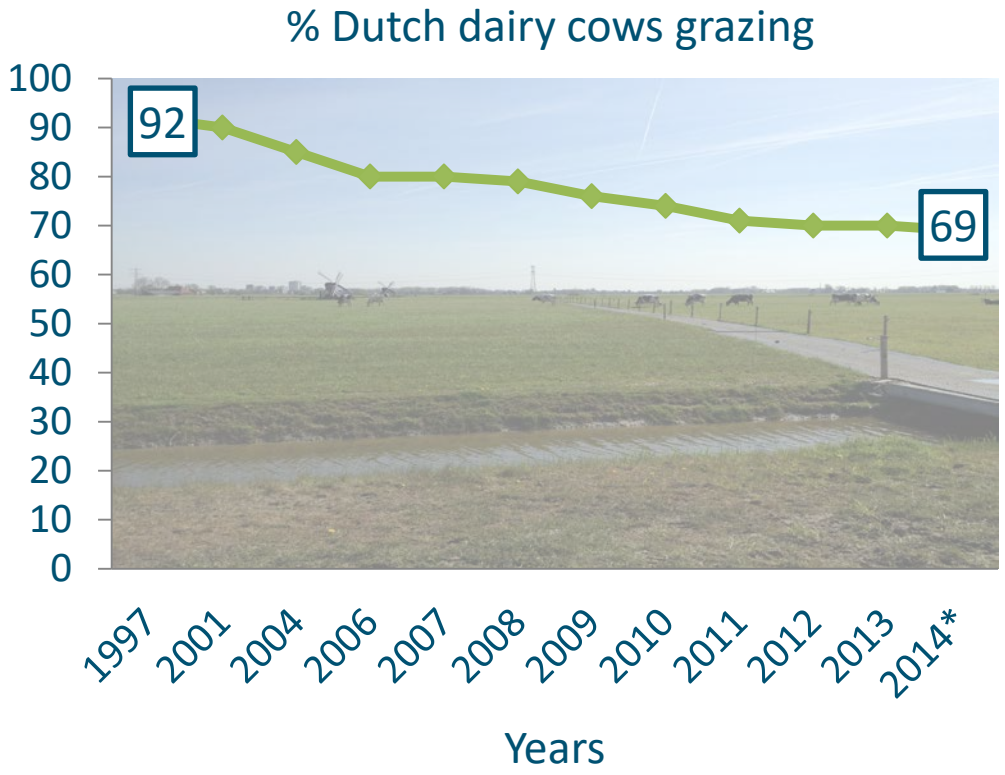
Grazing in the Netherlands



CBS, 2016

Main reasons:

- Increase in stocking density
- More automation
- To control feed intake and manure distribution

Social demand for grazing

- Contributes to:
  - Image Dutch dairy sector
  - Typical Dutch landscape
- Goal of Dutch government:

80% of Dutch dairy cows should graze in 2020

What about economic effects?

- Grazed grass is the cheapest source of feed

- Economic benefits of grazing (Evers et al., 2008; Van den Pol-van Dasselaar et al., 2014)
  - Increase with an increase in fresh grass intake
  - Dependent on grassland management

Importance of good grassland management

- Focus on grassland management
- Large variation in grassland productivity

  - 35 to 69 MJ NE_L ha^{-1} * *n=25 Dutch dairy farms, 2012-2014*

*NE_L = net energy for lactation

*fertilization level: 225 kg N ha^{-1}

How to graze with high stocking density?

- economic challenges -

- Small home plot: restricted fresh grass allowance

- Optimize fresh grass intake
  - Adjust additional feeding
  - Minimize trampling damage
  - Minimize rejected areas (excreta)

How to graze with high stocking density?

- environmental challenges -

- Different nutrient losses in barn and pasture

  (Van Bruggen et al., 2010; Vellinga et al., 2011)

NH_3 ↑ NO_3^- ↑

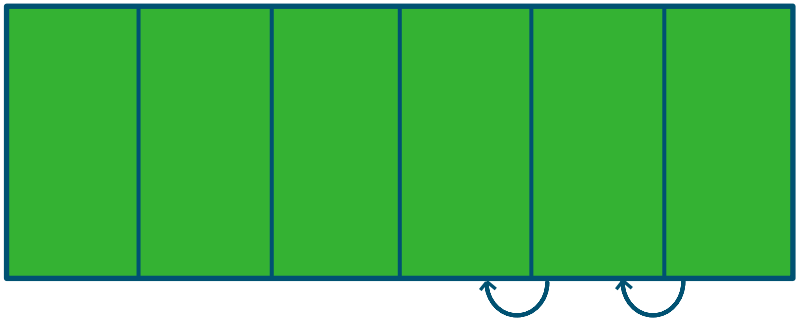
- Clustering of excreta in pasture: higher potential leaching
  - Minimize nutrient leaching

Aim of the study

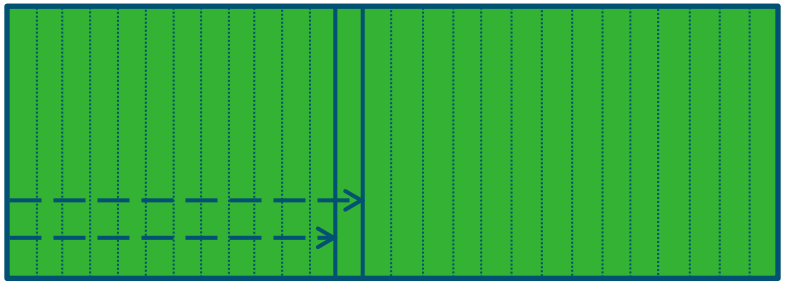
- To analyse the effect of potential grazing systems on:
  - Economic performance
    - Grass production
    - Grass allowance
    - Grass intake
  - Environmental performance
    - Manure division barn/pasture
    - Manure distribution in pasture

Two potential grazing systems

Continuous Rotational Stocking (CRS)

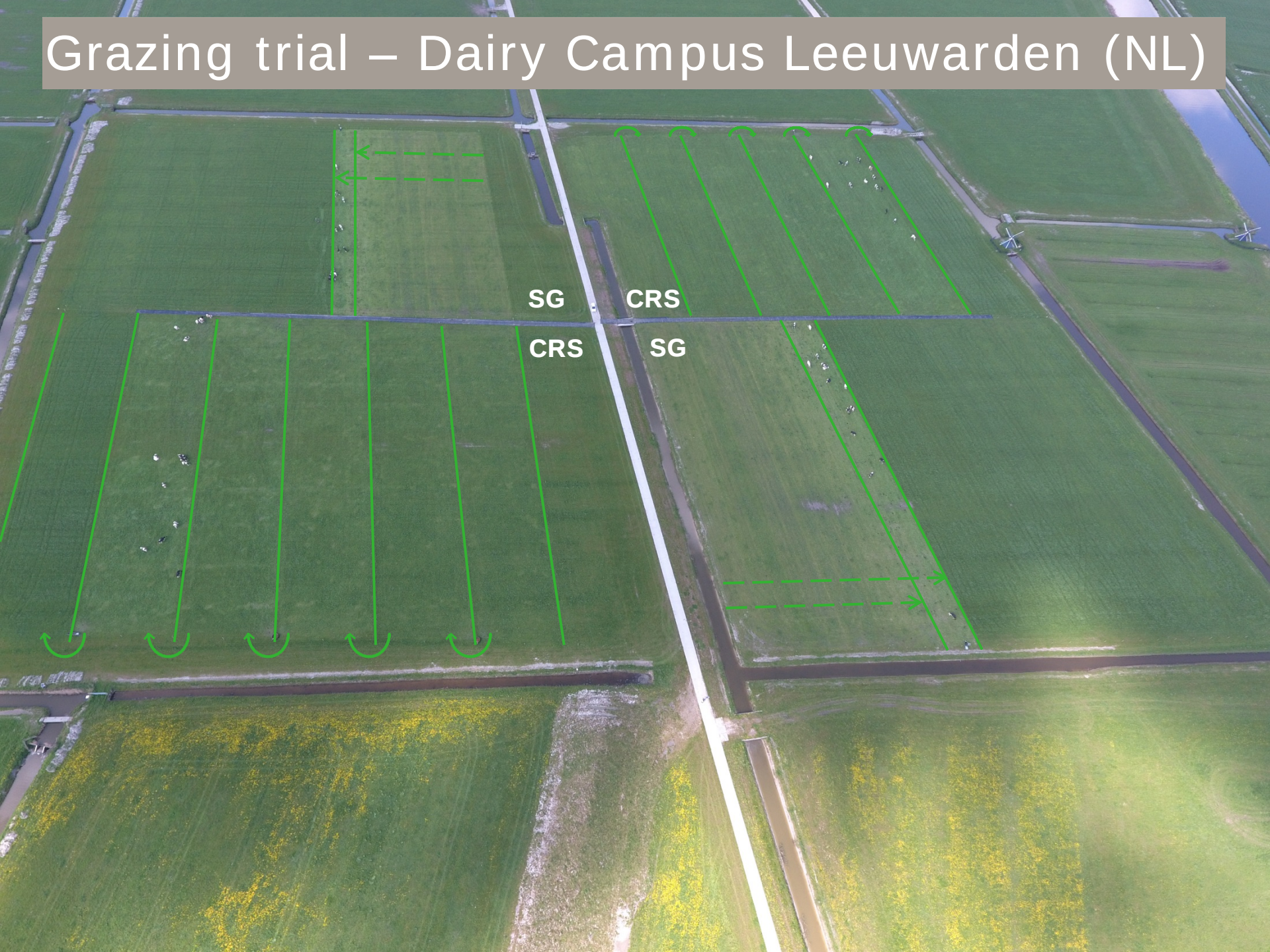


Strip grazing (SG)



- Both daily rotational systems
  - Reduce selective grazing and clustering of excreta
- CRS
  - 6 day rotation
  - Fixed fences
- SG
  - 30 day rotation
  - Moving back and front wire

Grazing trial – Dairy Campus Leeuwarden (NL)



Set up grazing trial

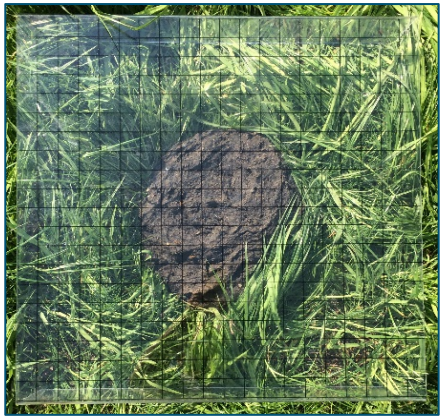
Parcel	1		2	
Grazing system	CRS	SG	CRS	SG
# cows	15	15	15	15
Hectares	2	2	2	2

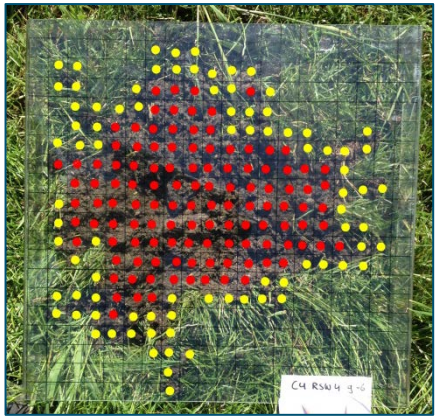
- 60 milking cows on 8 ha = 7.5 cows ha^{-1}
- 7 hours per day
- Additional feeding: maize, concentrates
- **2016** and 2017: April-October

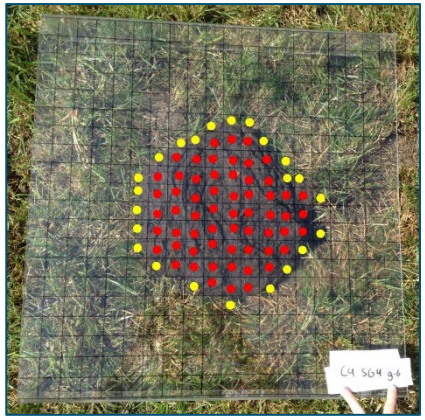
How much manure ends up in pasture?

- Measured 136 fresh manure patches
  - Height: ruler
    - 10 times per manure patch

  - Surface: flat-o-meter with 3 cm squares



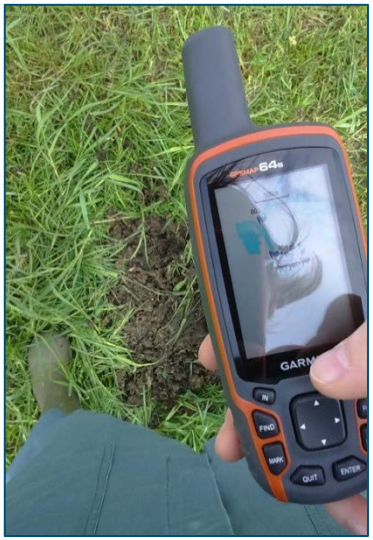


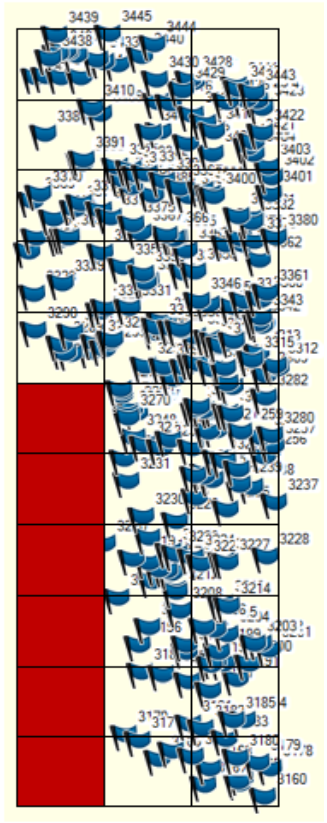


Total manure exposure = volume per manure patch * # patches

How is this manure distributed in pasture?

- Recorded GPS coordinates of manure patches
  - CRS: 12 blocks
  - SG: 12 strips





- Chi-square test for equal distribution of manure patches

Manure exposure to pasture

Manure patch characteristics	Unit	Average	Min-Max
Height	cm	3.2	1.3-7.0
Surface	cm^2	651	234-1,656
Volume	cm^3	2,017	307-4,334

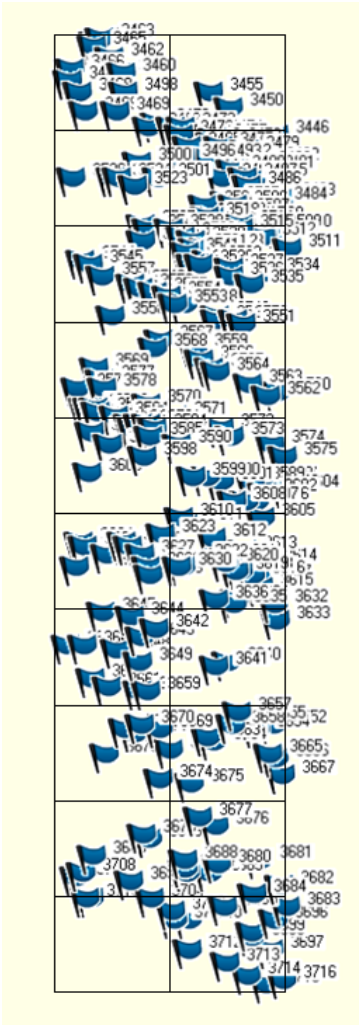
Number of patches	Unit	Average	Min-Max
Per grazing day	#	64	16-95
Per cow per day	#	4	1-6

1.8 m^3 solid manure in pasture per cow per 7 months

23% solid manure in pasture (7 h)

Manure distribution in pasture

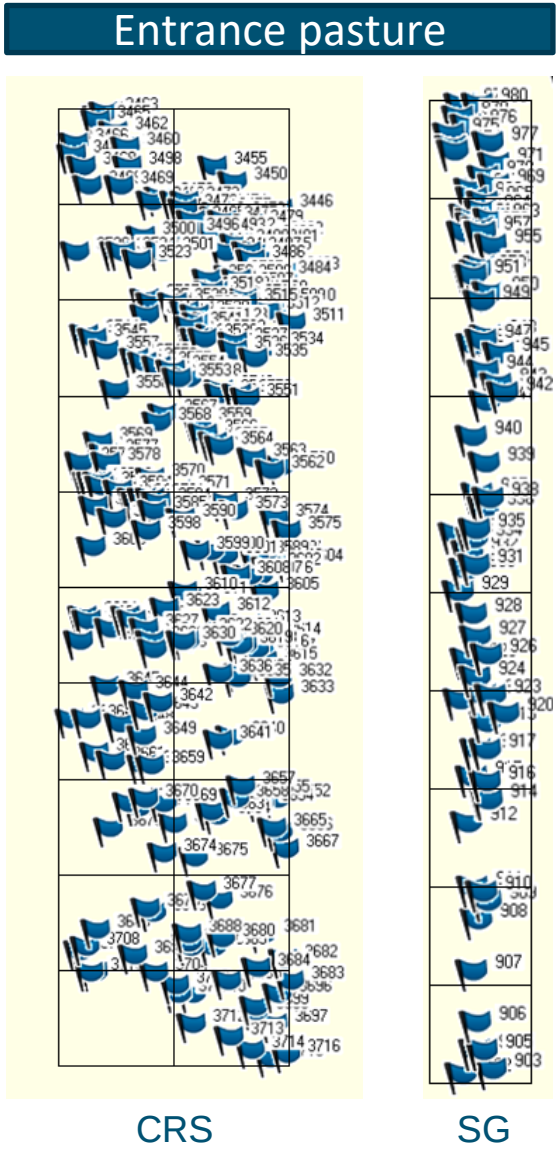
- 12 CRS blocks: 10 not homogeneous
- 12 SG strips: 10 not homogeneous



CRS SG

Reasons for heterogeneous distribution

- More manure patches at entrance pasture
  - Cows enter/exit at same place
  - Cows gather at entrance
    - Before milking
    - During rainy weather
- With CRS more clusters of manure patches
  - More herding behaviour



Concluding remarks

- 23% solid manure in pasture for CRS and SG
  - Related to grazing time
- No significant difference between CRS and SG
  - CRS and SG improvement compared to conventional stocking
  - Further improvement: design cow traffic
- Impact on:
  - Grass production, allowance and intake
  - Economic and environmental performances

Good grassland management requires a helicopter view

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