Sustainability of bedded pack barns

Bedding and housing in relation to cow comfort, milk quality and emissions

28 august 2014, EAAP Copenhagen, Session 48

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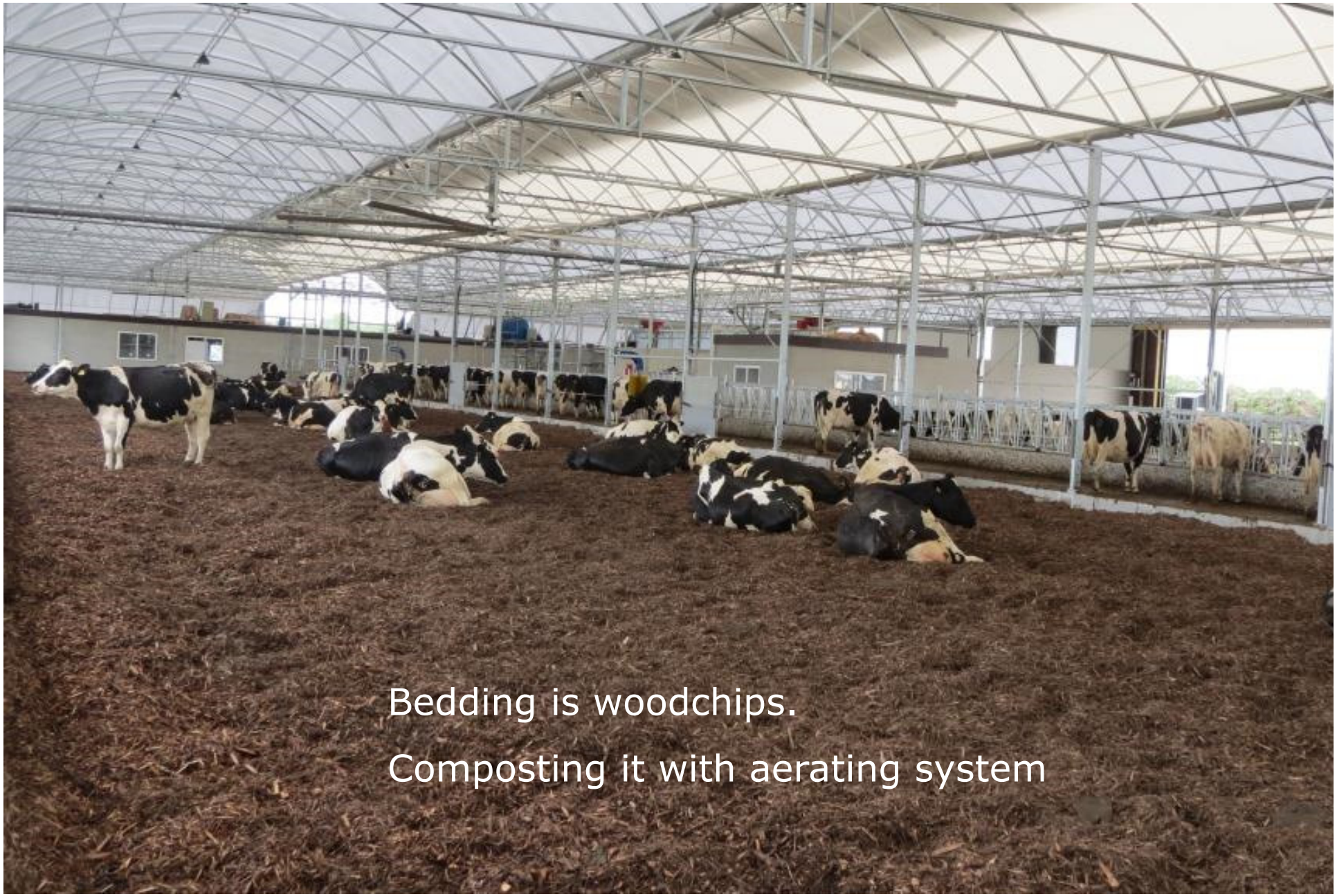
About 50 compost dairy barns in NL



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Why bedded pack barns?

Freestall (with cubicles)

Bedded pack barn

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Sustainability aspects

Drive of farmers

- Animal welfare, health and longevity
- Manure quality

Possible conflicts

Emission (NH3, N2O, CH4)	Government
Milk quality	Dairy Industry
Landscape	Local government

Experiments on 3 regional farms

Composting: wooden chips an sawdust

Drainage with sand

Absorbing with peat ground and reed

Cows in Green house with foil

Monitoring 10 commercial farms; 5 are composting wood chips

1. Blowing air

2. Blowing air

3. Suckling air

4. Suckling air

5. No aerating

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four using green waste compost
one cultivates straw

Farms 6 to 9

use compost

10 Straw


Composting ...
once a day mill the bedding
12 – 15 m2 per cow

Bedding material used on grassland and arable land

Overall sustainability

	Bedded pack vs freestall
DRIVERS	
Animal welfare and health	+
Manure quality: organic matter	+
Manure quality: availability nitrogen	-
Economics: stable and bedding	-
Economics: longer life	+
CONFLICTS	
N- and P balance	Results
Ammonia emission: stable	
Ammonia emission: land	
Milk quality	
landscape	+ / -

Animal welfare and health

Welfare	Bedded pack vs freestall
Time required to lie	+
Hygiene	0/+
Skin injuries	++
Legs and claws	+
Natural behaviour	+
Health	
Udder health	0
Antibiotics usage	0
Longevity	+?

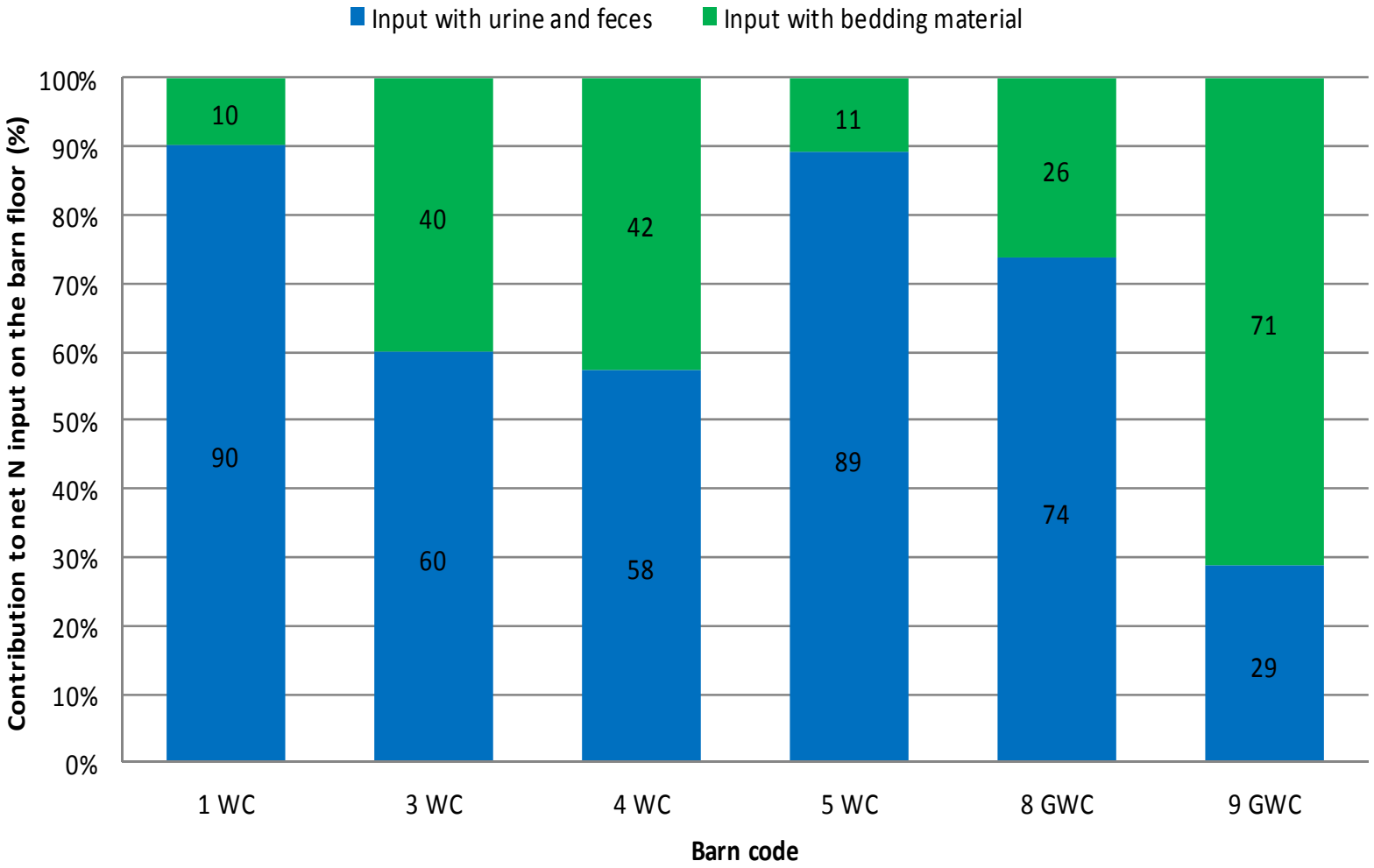
Economics bedded pack barns

	Bedded pack barn vs freestall
Investment manure storage	-
Investment roof	++
Total investment	+
Yearly costs stable and bedding	+
higher production per cow	+
lower replacement	--
Total yearly cost	-

Environment

- N- and P- balance
  - Input = bedding material and urine and faeces
  - Output = milk, animals, bedded pack and liquid manure
- Ammonia emission
  - Part of N losses is ammonia
  - Measured by flux chamber

% of N input in bedding from urine, faeces and bedding material



WC = wood chips
GWC = green waste compost

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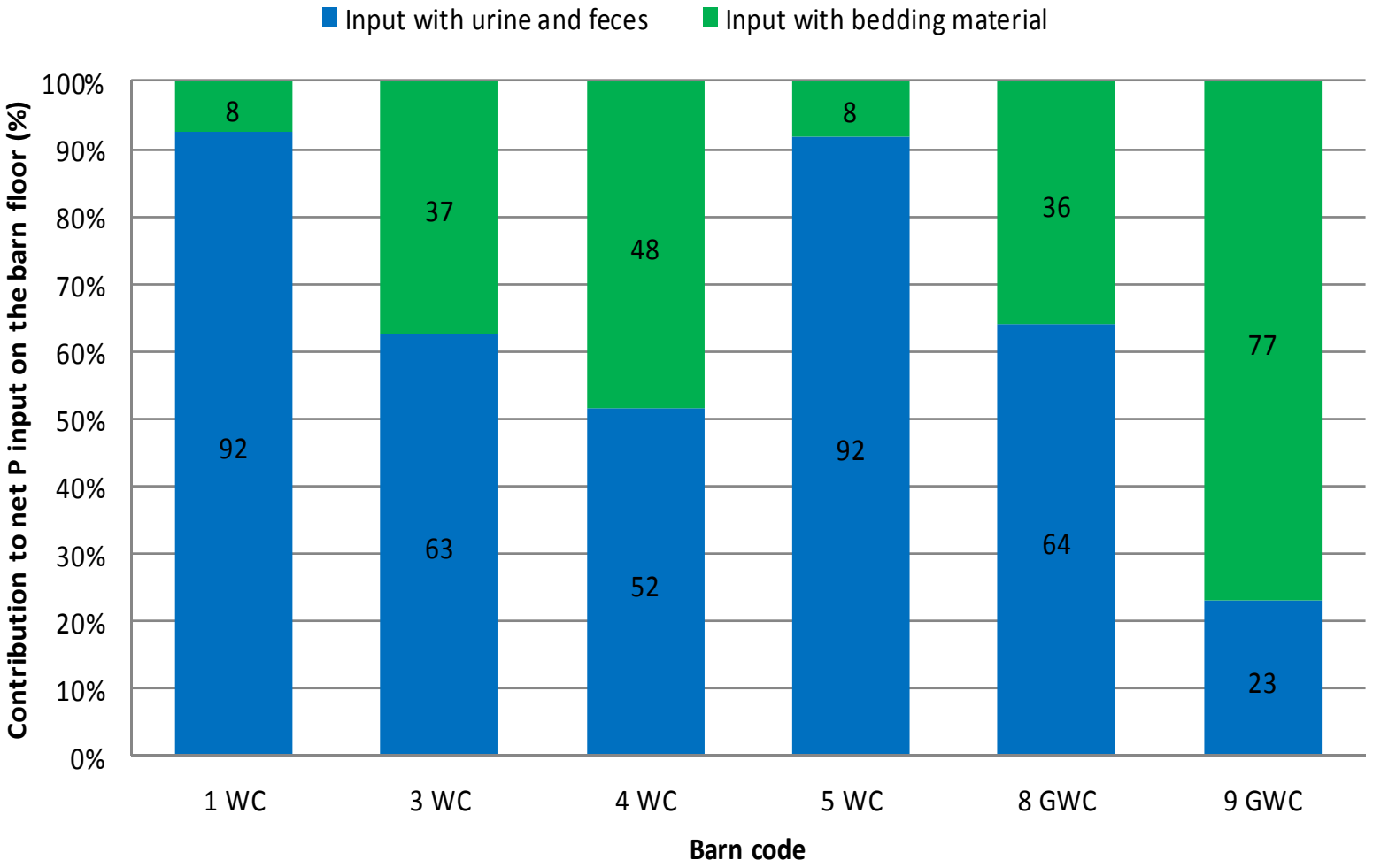
% of P input in bedding from urine, faeces and bedding material



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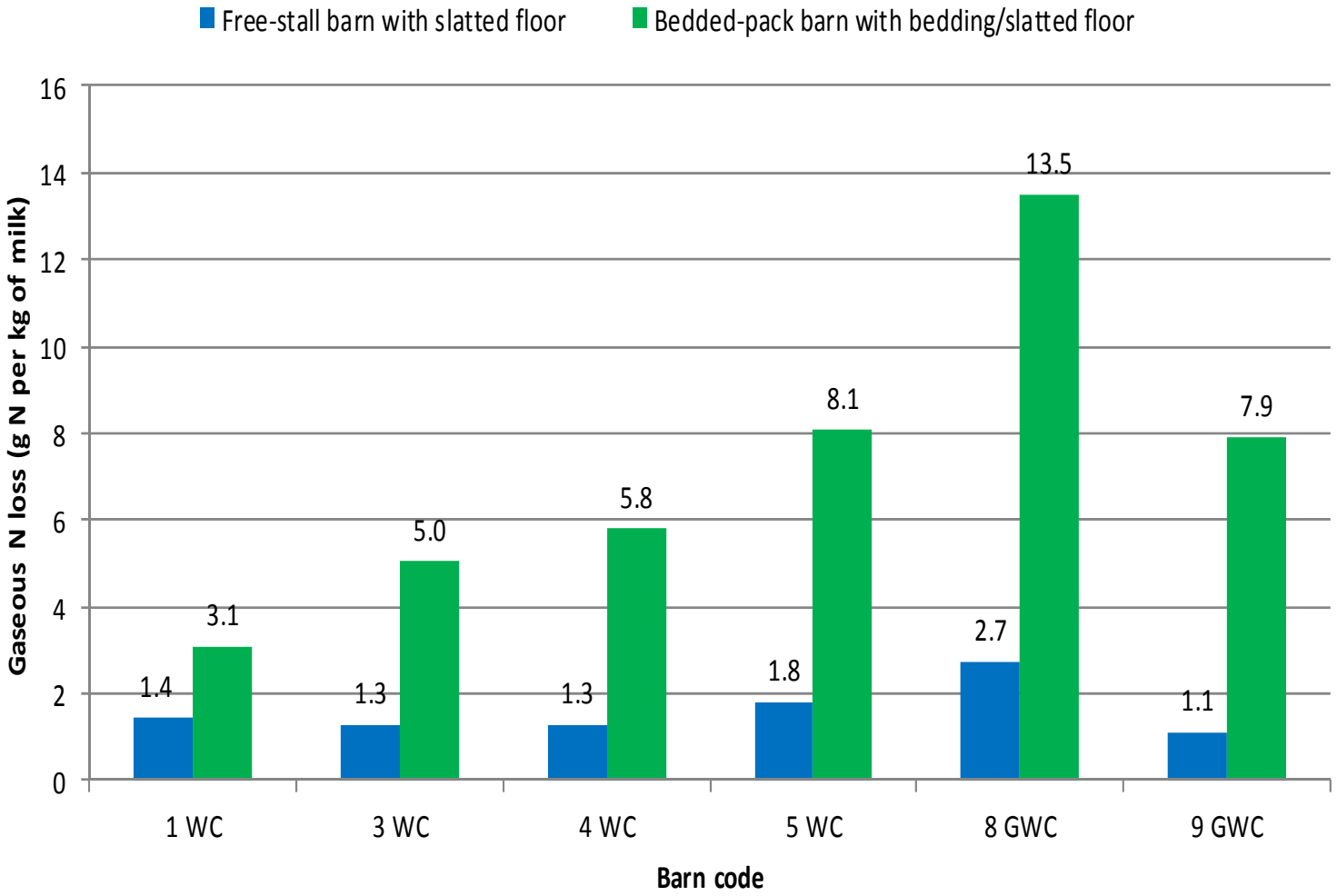
Gaseous N loss stable (in g N per kg milk)



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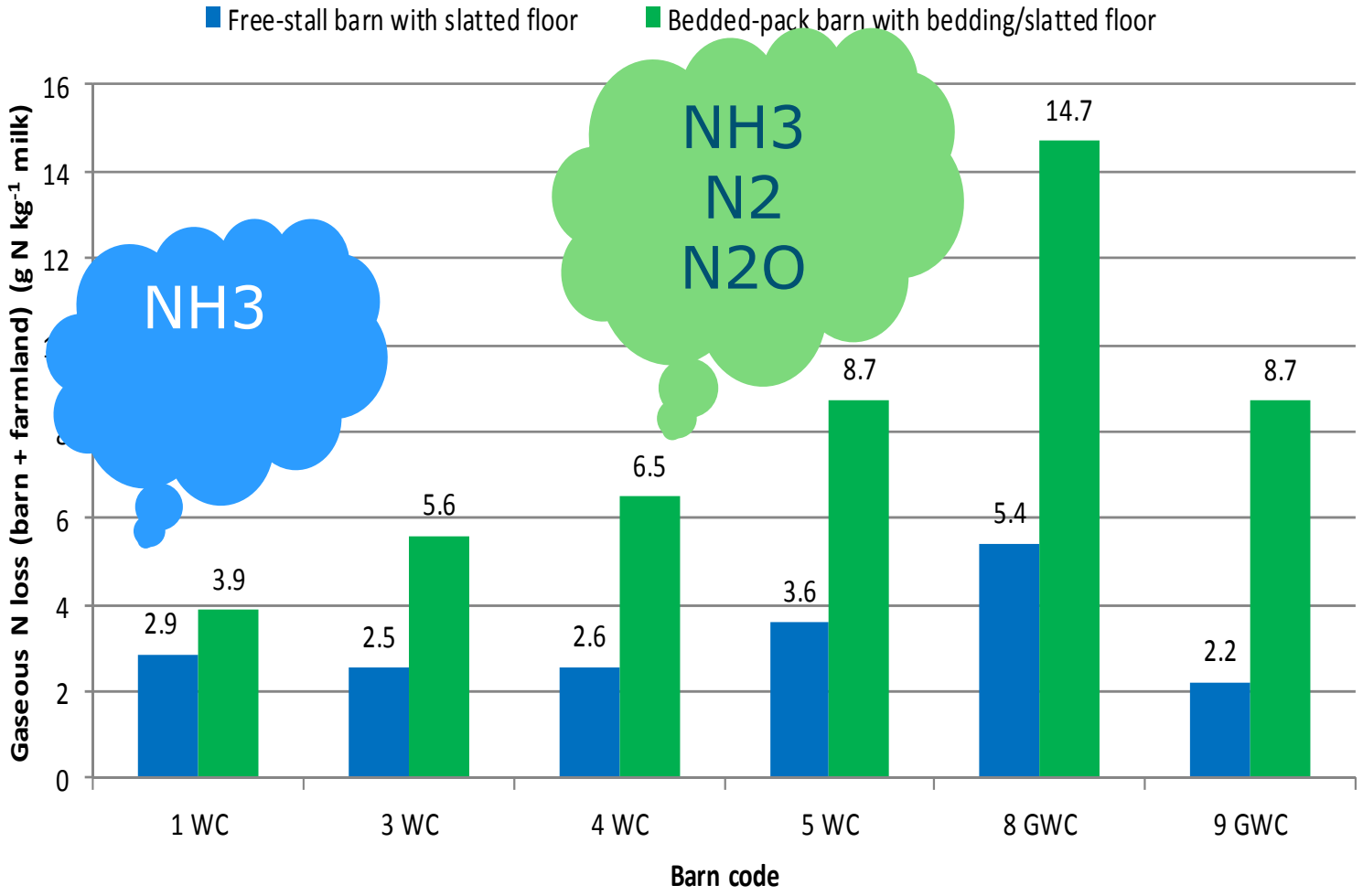
Total N loss stable and land (in g N per kg milk)



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Nitrogen losses

	Bedded pack barn vs freestall
stable	++
land	-
total	+

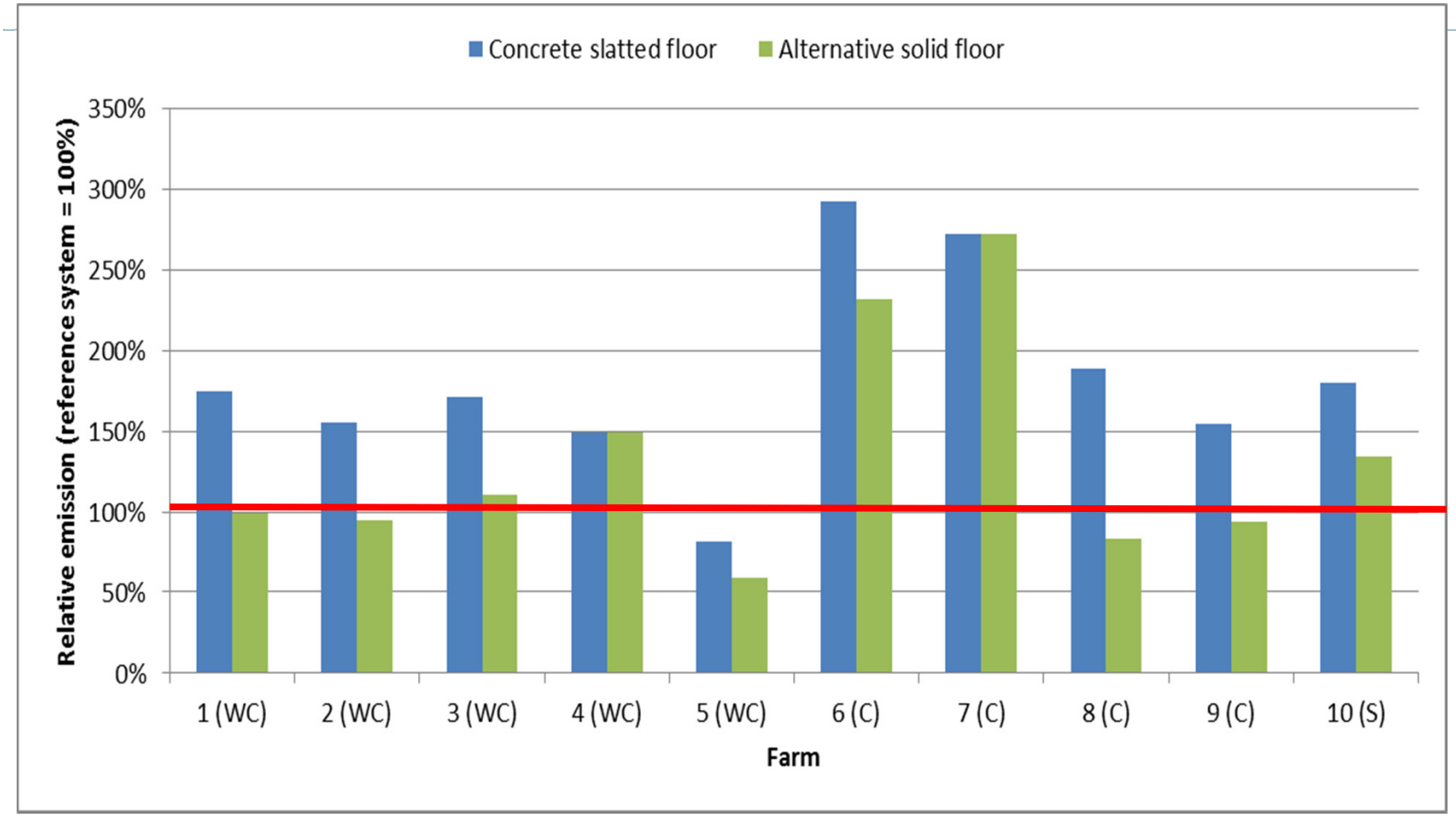
Disc injection reduces 70% ammonia

Spreading ‘compost’ no emission

Measuring emission of ammonia and green houses gasses

Ammonia emission, relative (%)

(bedded pack barn vs freestall with slatted floor)



WC = wooden chips
C = green waste compost

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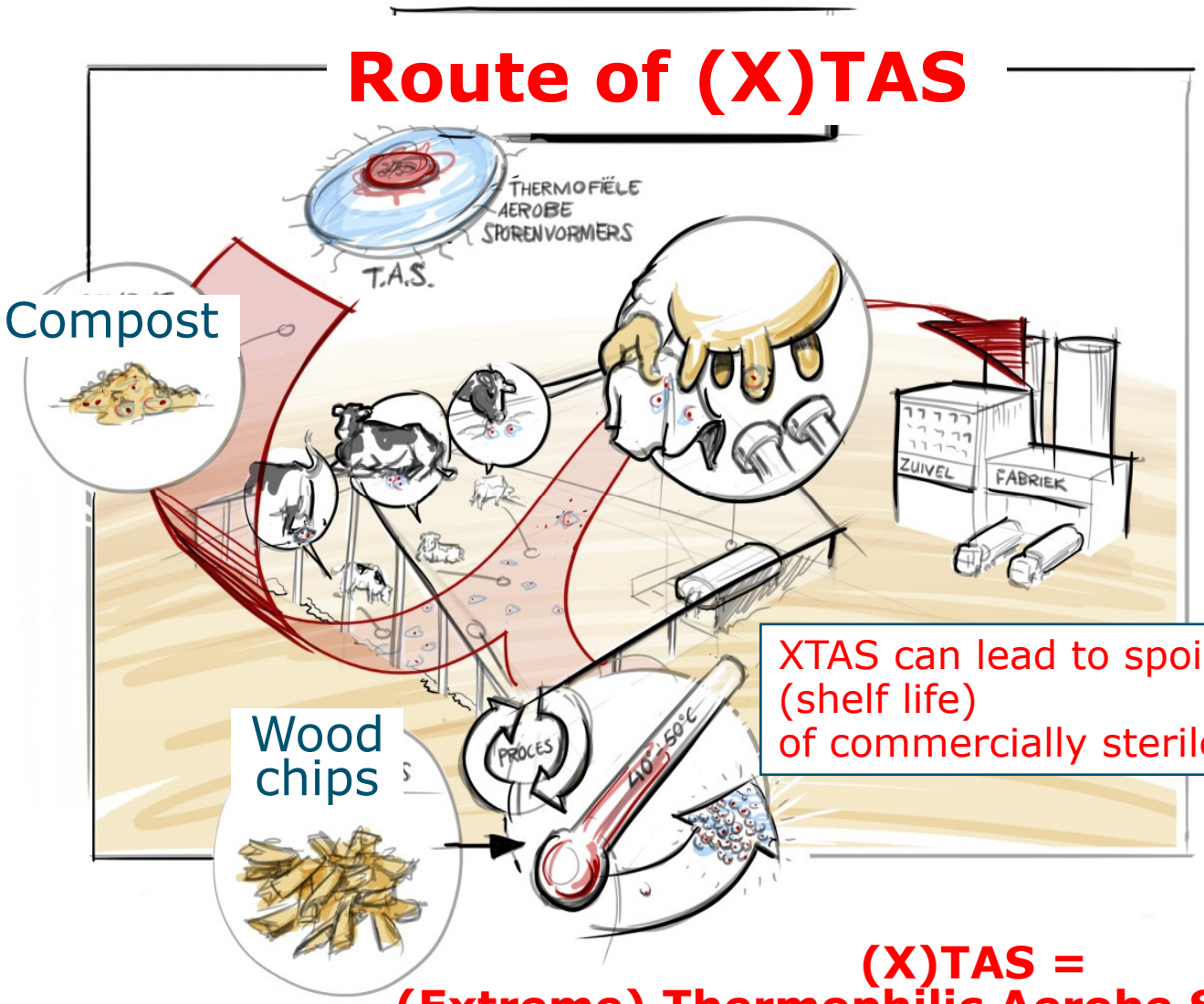
Risk of sporeforming bacteria for milk quality

Route of (X)TAS



XTAS can lead to spoilage problems
(shelf life)
of commercially sterile dairy products

(X)TAS =
(Extreme) Thermophilic Aerobe Sporenformers

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Bacteria and spores of bacteria in milk

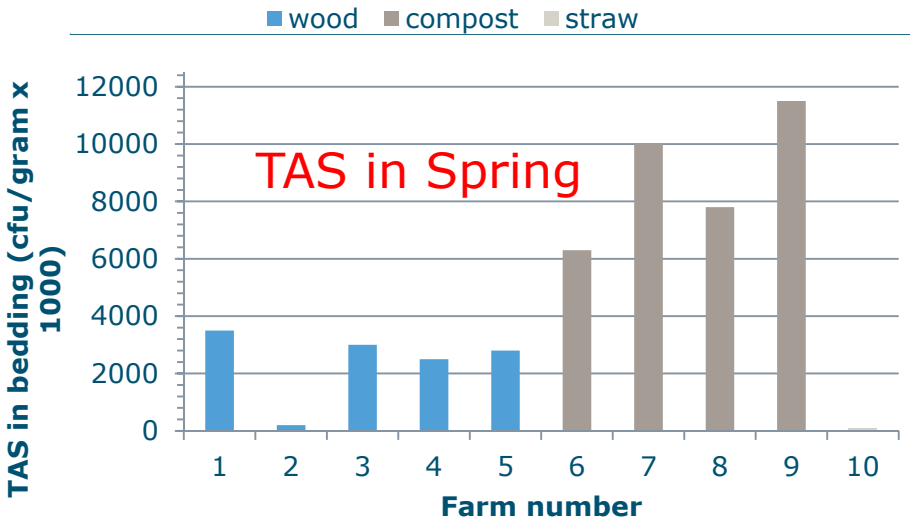
(Average in Netherlands)

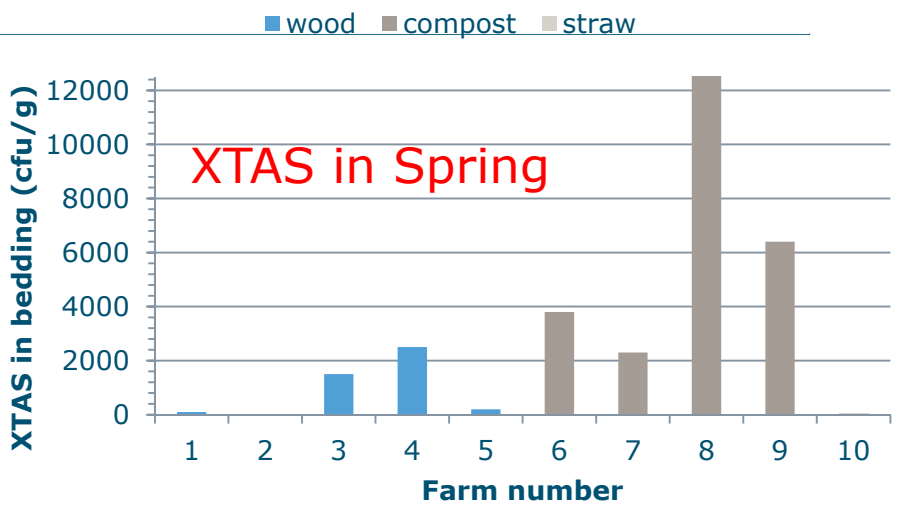
Population	Heat resistance	Amount per liter milk
Total bacteria	-	~ 10.000.000
MAS spores	10 min 80°C	~ 30.000
Butyric acid bacteria spores	10 min 80°C	~ 100
TAS spores	30 min 100°C	~ 10
XTAS spores	20 min 115°C	< 0,01 (< 1 per 100 liter)

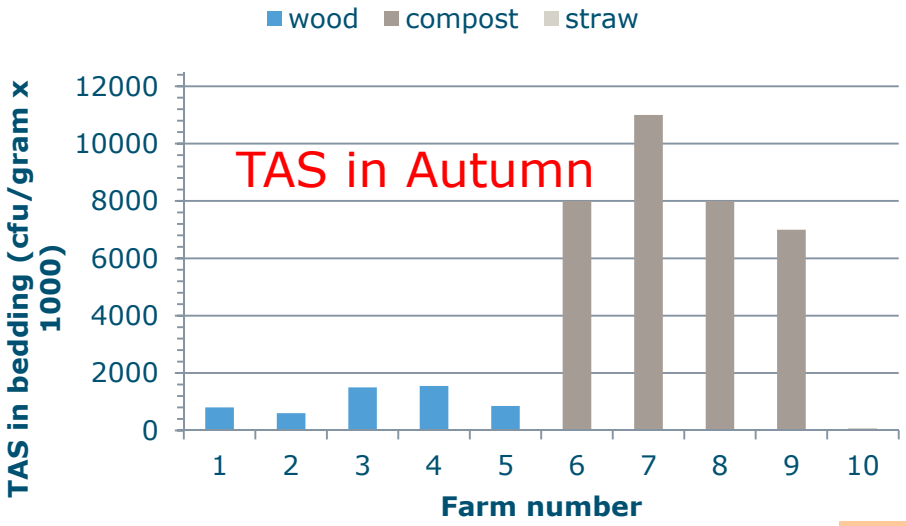
TAS = Thermophilic Aerobic Sporeformers

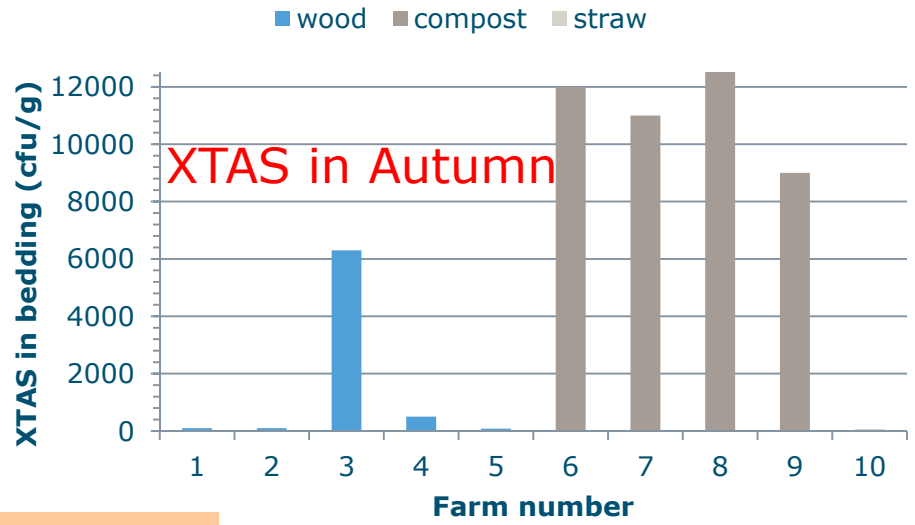
XTAS = eXtreme TAS

(X)TAS in bedding (Source: NIZO)









1-5 Wood chips
6-9 Compost
10 Straw

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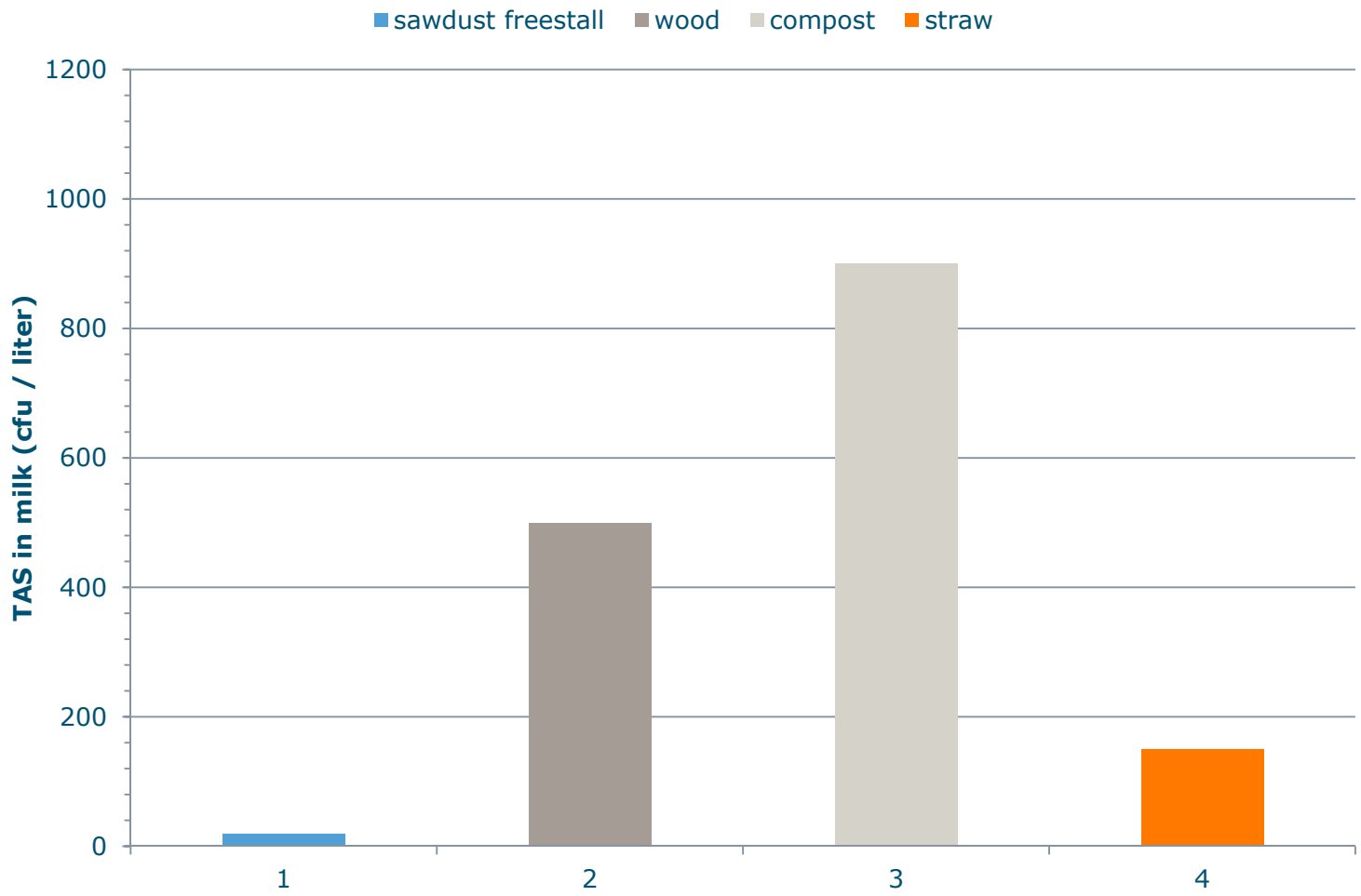
TAS in milk (Source NIZO)



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Conclusions Thermofilic Aerobic Sporeformers

- Using compost as bedding material is a risk for milk quality due to (X)TAS spores.
  This also applies for composting wood chips unless the composting could be managed in a way that the formation of XTAS spores is prohibited.

- Partly based on this study the Dutch Dairy Organization (NZO) strongly recommends not to use composting materials in dairy barns.

Conclusions: overall sustainability

	Bedded pack vs freestall
DRIVERS	
Animal welfare and health	+
Manure quality: organic matter	+
Manure quality: availability nitrogen	-
Economics: stable and bedding	-
Economics: longer life	+
CONFLICTS	
N- and P balance	-
Ammonia emission: stable	-
Ammonia emission: land	+
Milk quality	-
landscape	+ / -

Change of bedding:

use of compost is prohibited, now straw?

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Points to continue

- Bedding material and management
  - Alternative for compost
  - Control composting process of wood chips
- Synthetic floors
- Sustainability of whole farming system

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