

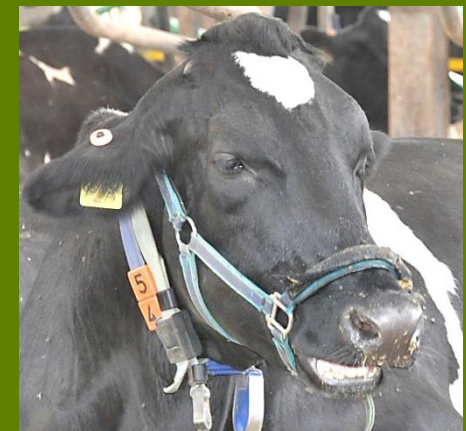
## Ability to estimate feed intake from presence at feeding trough and chewing activity

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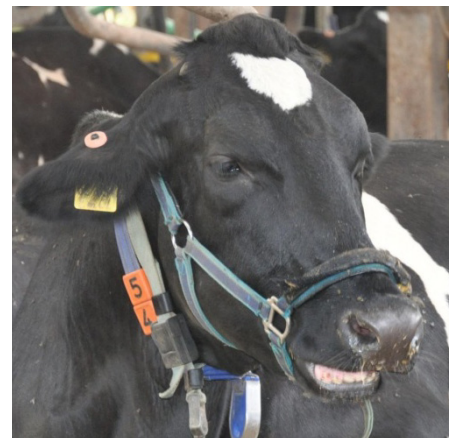
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## Monitoring of feeding behaviour of dairy cows

- Comparison of different sensor system:  
Presence at feed trough  $\leftrightarrow$  Chewing activity
- Estimate feed amount:  
Feed intake  
 $\leftrightarrow$   
Presence at feed trough;  
Chewing activity



## Animals

- Herd groups 36 cows : 18 feed weighing troughs
- 7 dairy cows: 3 primiparous, 4 multiparous;

Daily milk yield: 27-43 kg; 145-303 DIM

- Feeding: TMR

06:00 h and 16:00 h

ad libitum

corn silage, grass silage,  
concentrate, straw, additives  
(7 MJ NEL/kg DM, CF 16%)



## Feed intake and feeding time

- Feed weighing troughs (Insentec, The Netherlands)  
100 cm x 75 cm x 84 cm, capacity 40 kg FM
- Locked in passive state



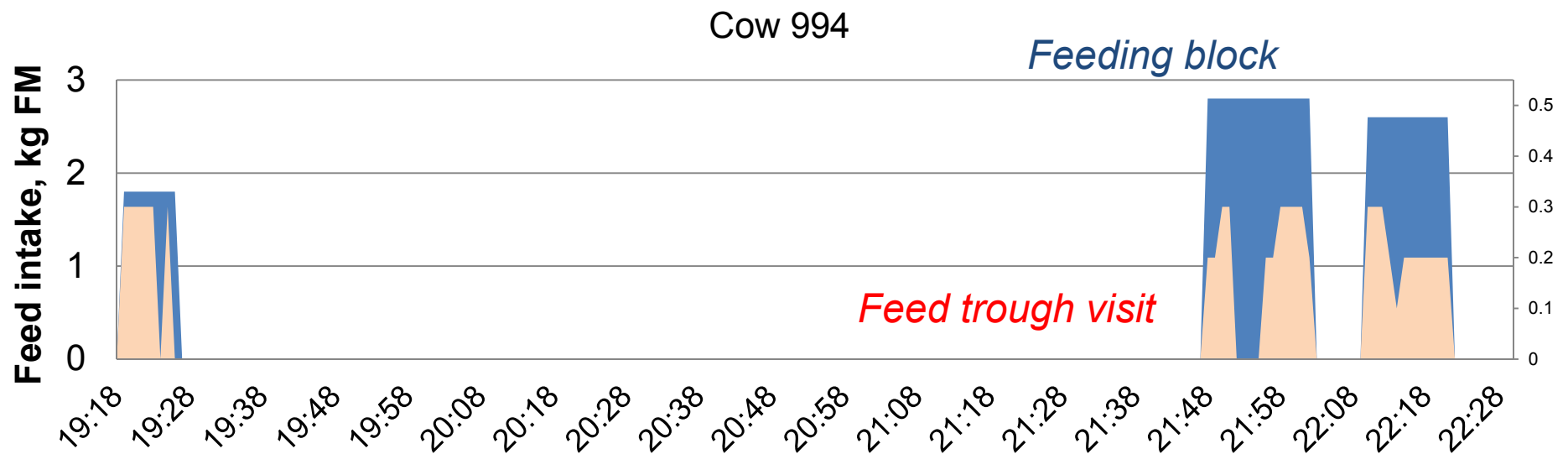
- Animal identification  
via transponder
- Records per visit:
  - ✓ Cow number
  - ✓ Trough number
  - ✓ Start & end time of visit
  - ✓ Visit duration
  - ✓ Weight loss



## Single feed trough visits (interruption < 5 min) → feeding blocks

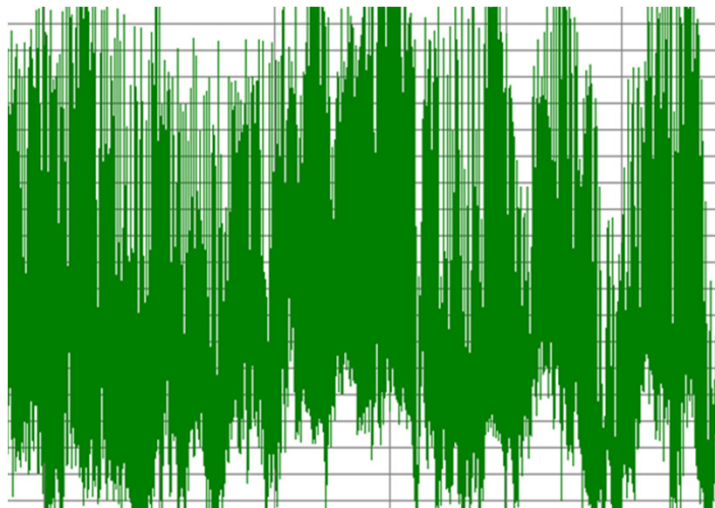
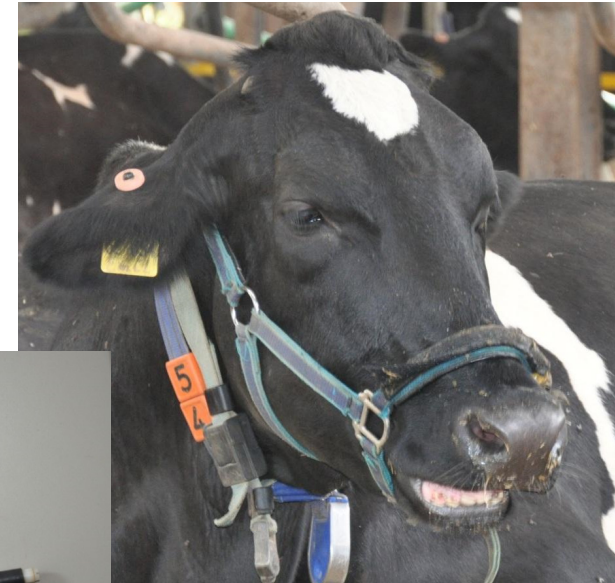
*5-8 measuring days per cow → 8 – 12 feeding blocks / day*

- **Feed intake:** Weight loss of feed trough
- **Feeding time:** Feed trough visit duration
- **Feeding time corrected:** Feed trough visit duration with measurable feed intake (weight loss > 100 g / visit)

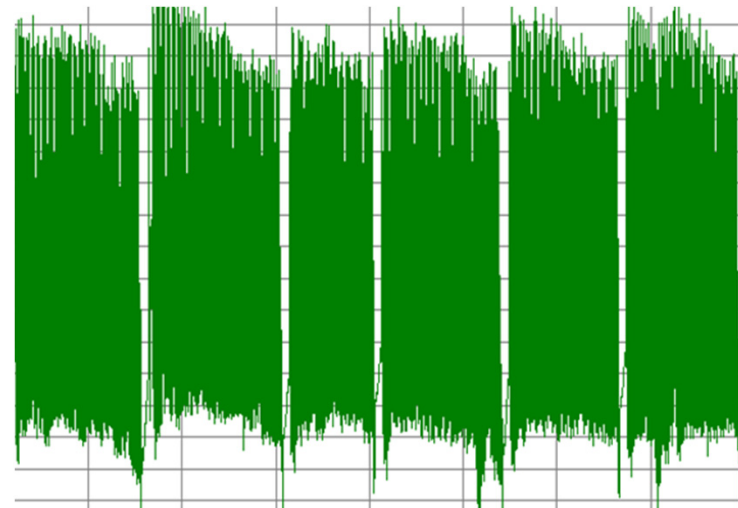


## Chewing and rumination time

- Pressure sensor (ART-MSR)  
halter, noseband, MSR 145 logger  
storage capacity approx. 40 h
- RumiWatch Converter  
*Frequency 10 Hz → 1 min*

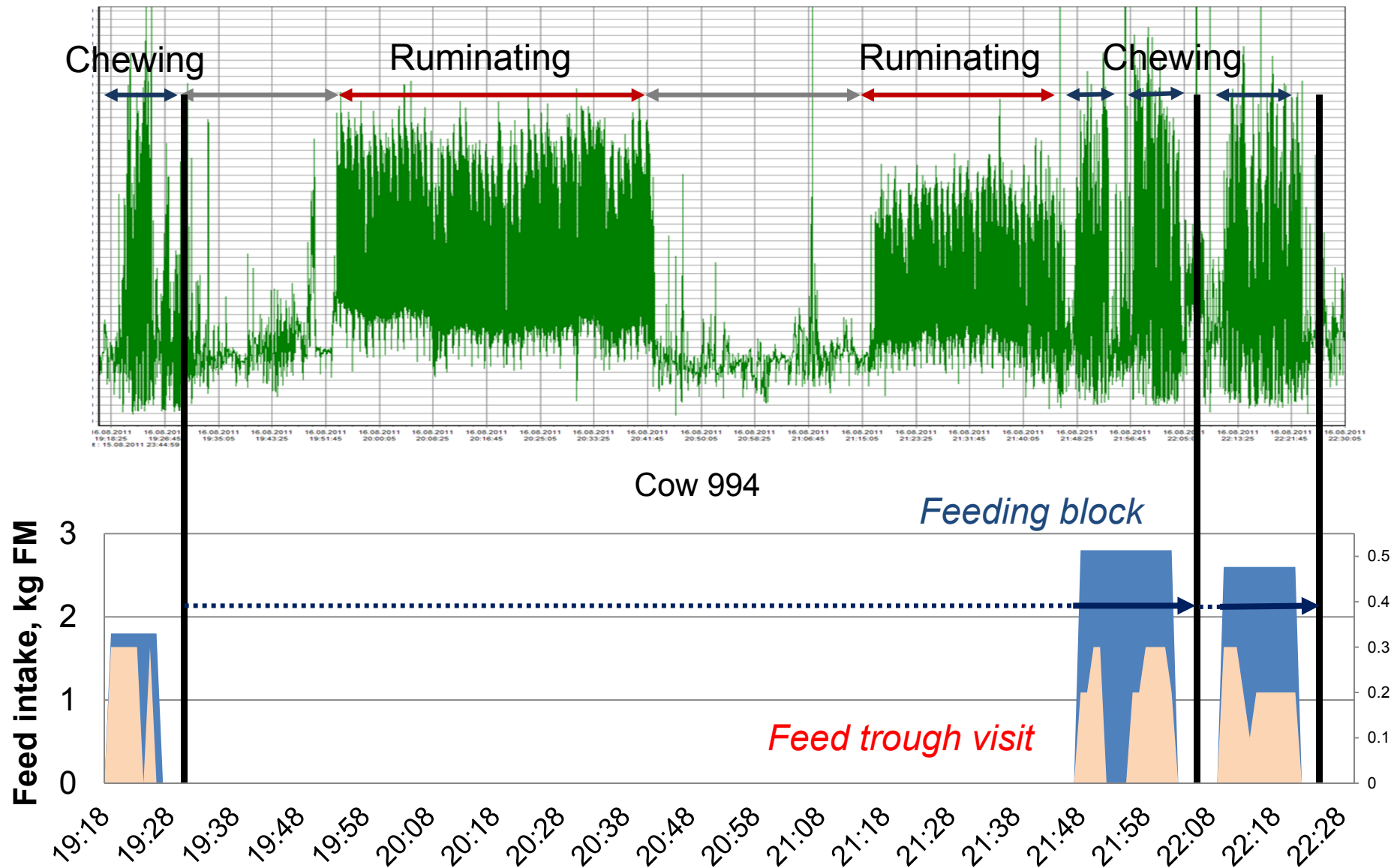


Chewing



Ruminating

# Material & Methods



Average feed, chewing and rumination records per cow

	<b>24 h</b>	<b>Feeding block</b>
<b>Feed intake</b> (kg FM)	48 +/- 5,1	5 +/- 4,5
<b>Feeding time</b> (min)	271 +/- 43	28 +/- 22
<b>Feeding time corrected</b> (min)	240 +/- 47	25 +/- 22
<b>Chewing time</b> (min)	265 +/- 49	27 +/- 23
<b>Rumination time</b> (min)	534 +/- 61	45 <sup>1</sup> +/- 48

<sup>1</sup> Rumination time per feeding block includes data of 2 cows only



## Classification of chewing and feeding time corrected

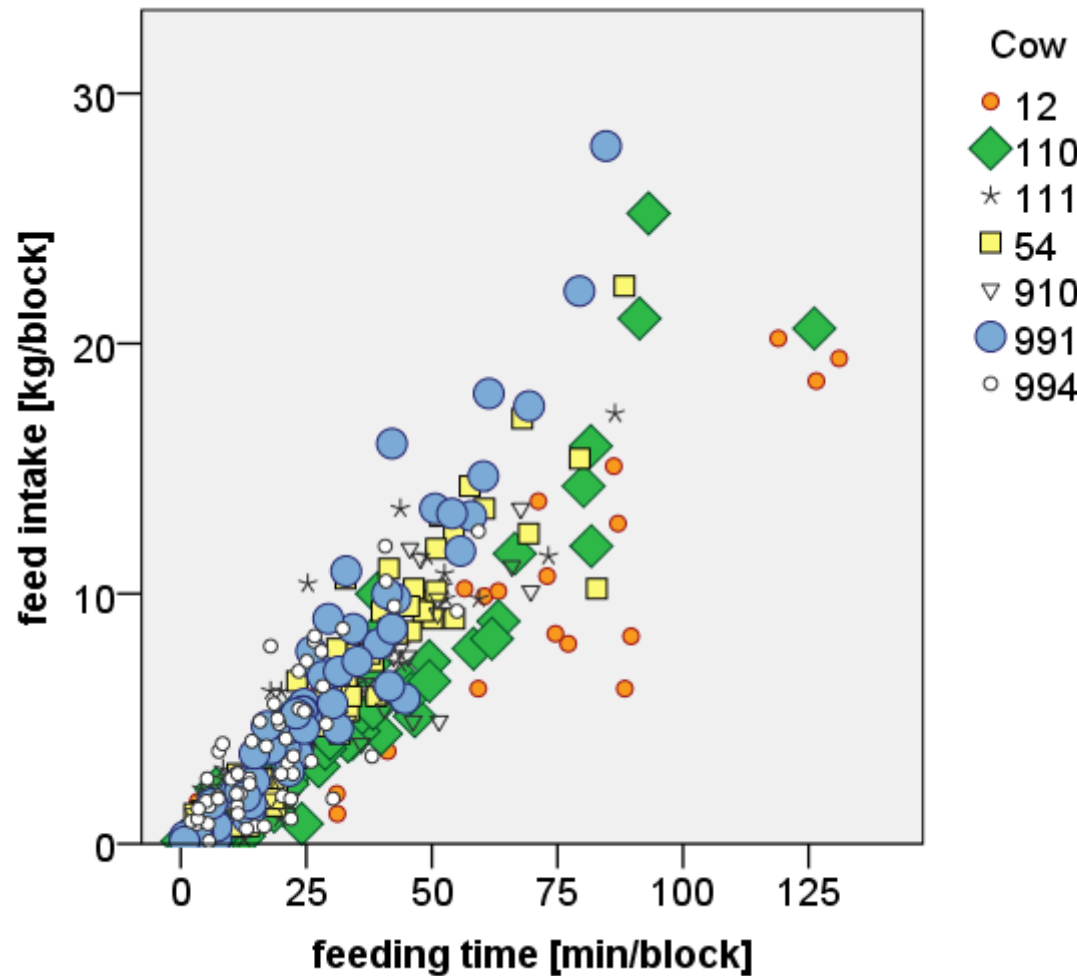
- Each 1-min time slot (8660-11550 min / cow)
- In average, 92% accordance of (no) feeding / (no) chewing

<i>All cows</i>		Chewing	
Feeding		0	1
Feeding	0	77 %	5 %
	1	3 %	15 %

<i>Cow 910</i>		Chewing	
Feeding		0	1
Feeding	0	77 %	8 %
	1	2 %	13 %

<i>Cow 110</i>		Chewing	
Feeding		0	1
Feeding	0	74 %	3 %
	1	3 %	20 %

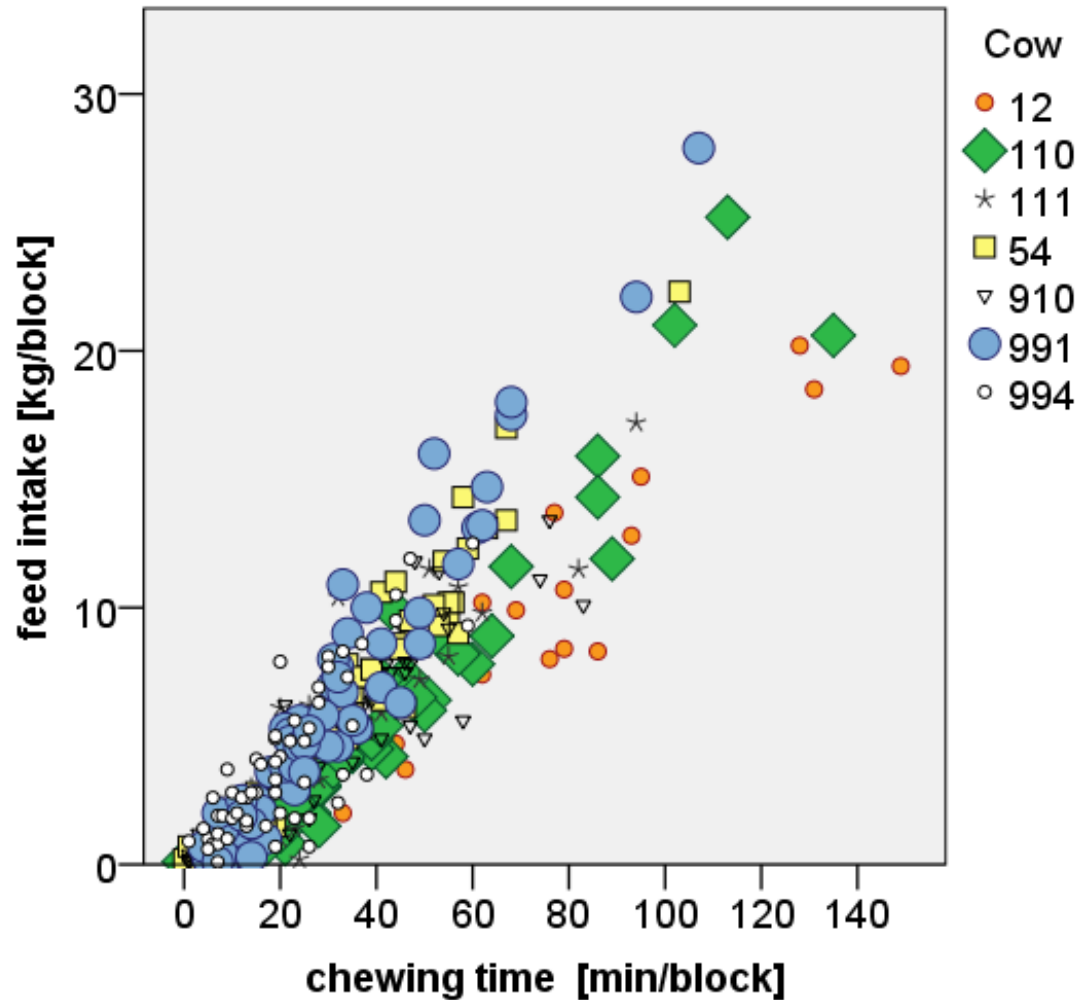
## Feed intake and feeding time per feeding block



Correlation coefficient  
r (p < 0.01)

Cow	r
12	0.937
110	0.938
111	0.932
54	0.938
910	0.907
991	0.950
994	0.800
Group	0.891

## Feed intake and chewing time per feeding block



Cow	r feeding	r chewing
<b>12</b>	0.937	<b>0.937</b>
<b>110</b>	0.938	<b>0.955</b>
<b>111</b>	0.932	<b>0.929</b>
<b>54</b>	0.938	0.532/ 0.958 <sup>1</sup>
<b>910</b>	0.907	<b>0.917</b>
<b>991</b>	0.950	<b>0.966</b>
<b>994</b>	0.800	<b>0.824</b>
<b>Group</b>	0.891	0.780/ 0.907 <sup>1</sup>

Correlation r ( $p < 0.01$ )

<sup>1</sup> low amplitude classification in cow 54

## Liner regression model for estimation of feed intake

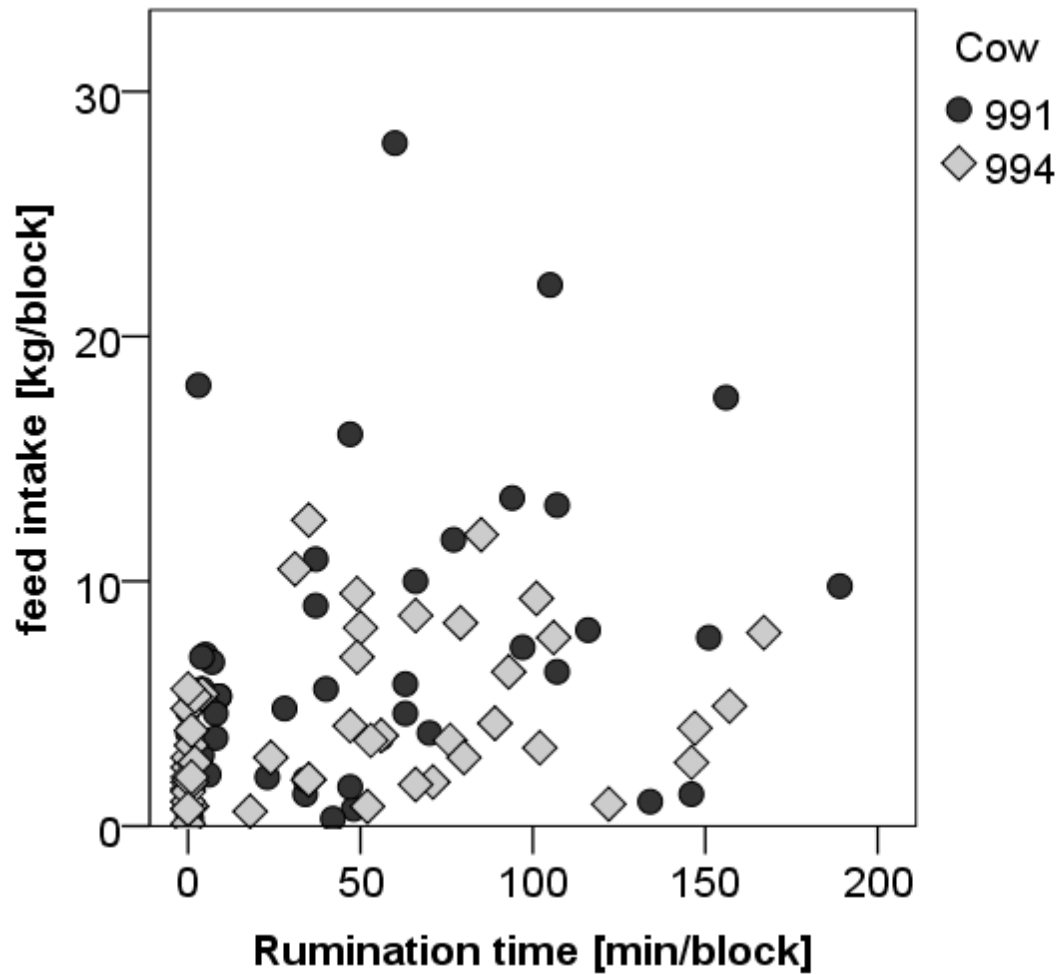
<b>Input variable</b>	<b>R<sup>2</sup> Cow individual</b>	<b>R<sup>2</sup> Group</b>
<b>Feeding time</b>	0,639-0,903	0,794
<b>Chewing time</b>	0,679-0,933	0,823
<b>Feeding &amp; Chewing time</b>	0,699-0,940	0,825
<b>Feeding time corrected</b>	0,869-0,934	0,842
<b>Feeding time corrected &amp; chewing time</b>	0,874-0,950	0,844

- High accordance between time of feed trough visit and chewing time
- Feeding time and chewing time were highly correlated with feed intake
- The combination of feeding and chewing time improved prediction accuracy for feed intake only to a low extend
- Correlation between rumination time and feed intake was low
- Broader data base required for estimation of feed intake  
→ variations in e.g. feed, lactation stage, health status, seasonal effects, and cow individuals

Thank you for  
your attention

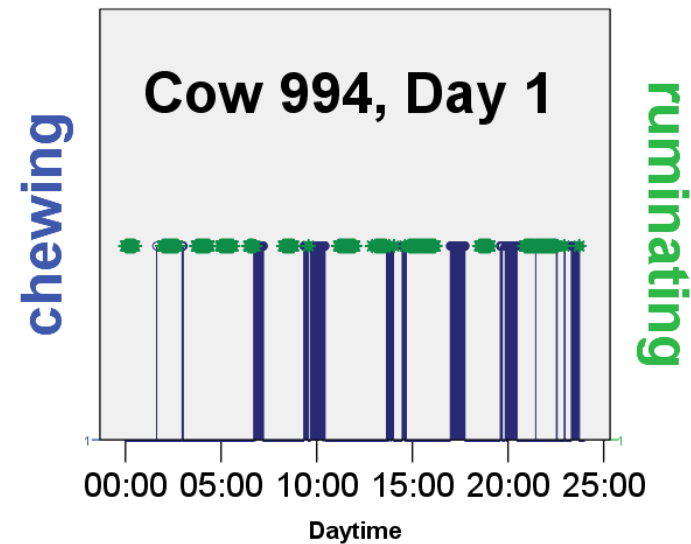


## Feed intake and ruminating time

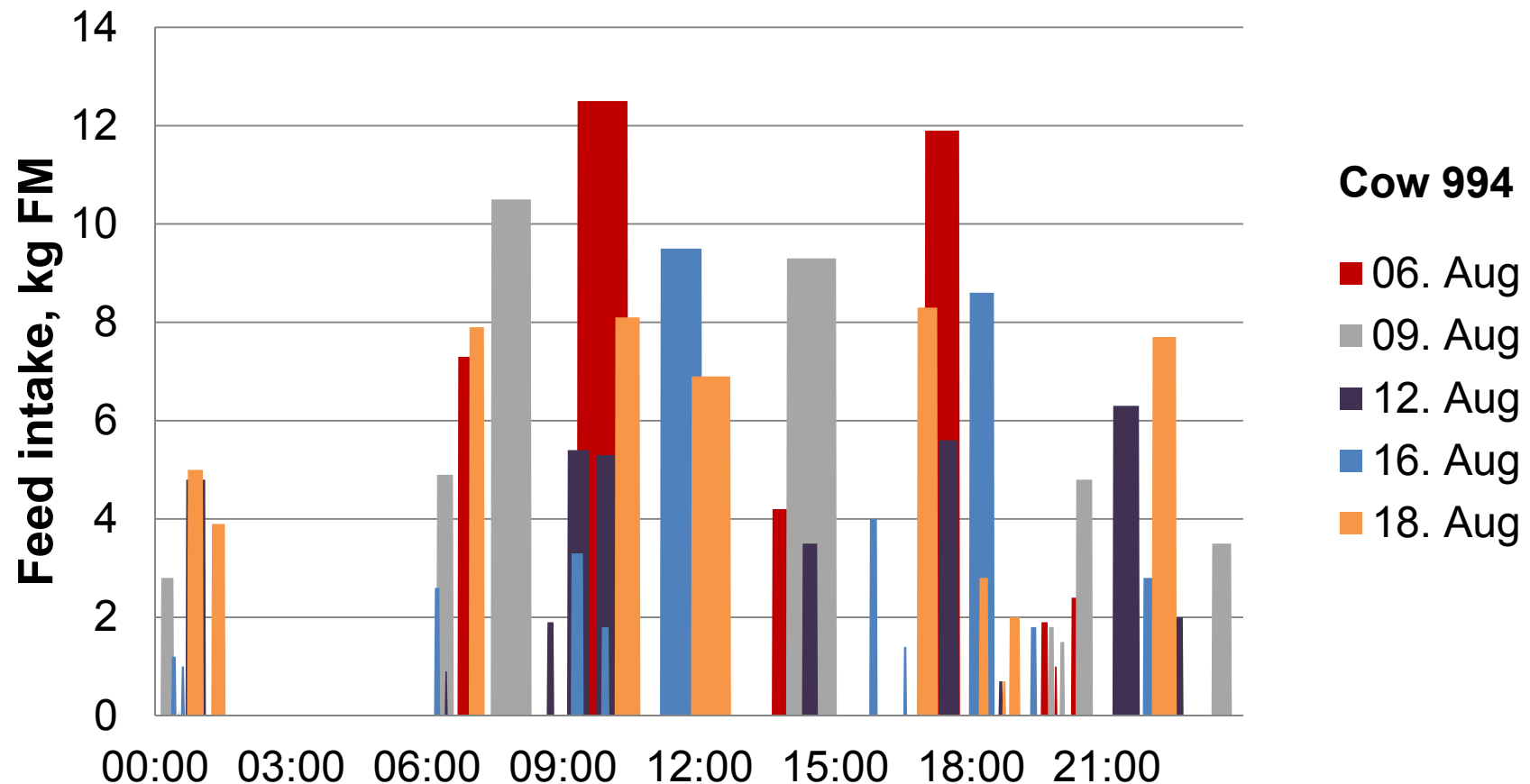


Correlation  $r$  ( $p < 0.05$ )

Cow	$r$
991	0.337
994	0.362



- Single feed trough visits (interruption < 5 min) → feeding blocks  
→ 8 – 12 feeding blocks / day





## Average feed intake and feeding time per cow per day

