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VETERINARY MEDICINE

Feeding Process: Variation in TMR Preparation and Delivery on California Dairies

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Study 1 - Feeding Management Practices: On-farm Assessments

Objective:

Develop a systematic approach to identify opportunities in feeding management.

Approach:

Observe feeding management practices

Evaluate the mixing equipment

Analyze total mixed ration

Interview feeders

Analyze feeding management software data (1 month)

Study 2 - Feeding Process: Analysis of Variation of TMR Preparation and Delivery

Objective:

Describe industry practices based on records from feeding management software.

Materials and Methods:

Data from 12 consecutive months were extracted from the feeding management software of 26 California dairies, ranging in size from 600 to 6000 cows.

Are Feeding Management Practices Important?

Inadequate feeding management practices on dairies can result in an increased number of health events such as:

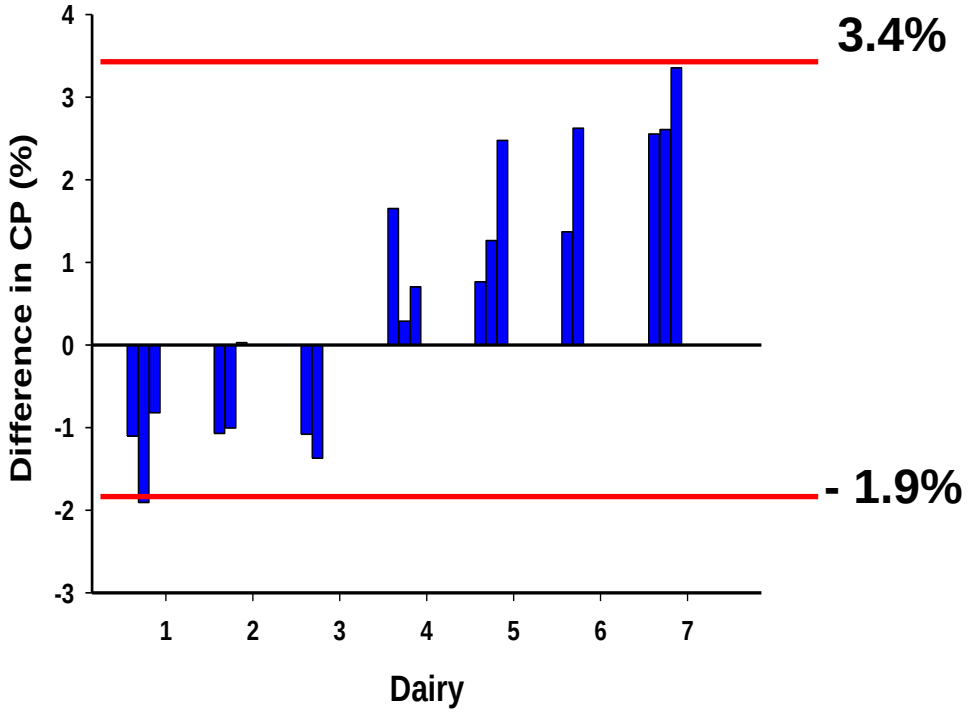
Displaced Abomasum

Diarrhea

Hypocalcemia

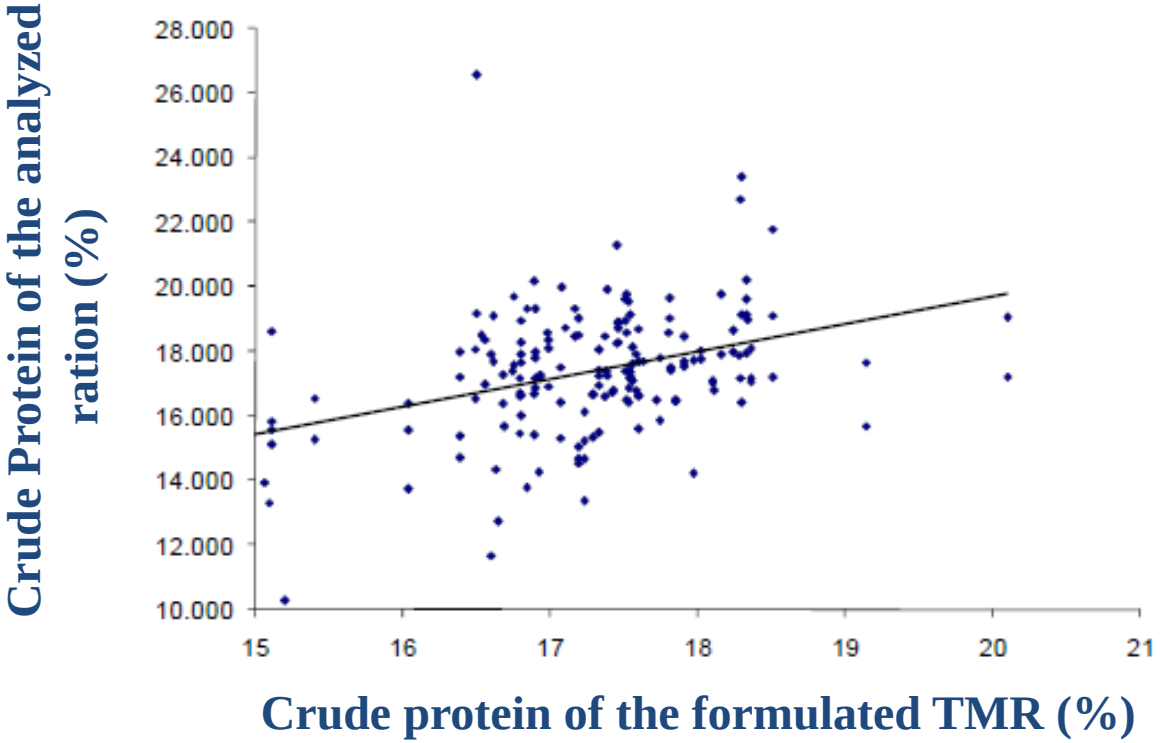
Pistachio Shell Impactions

If the ration fed differs from the formulated one, cows will not achieve their maximum production potential and some nutrients (i.e. nitrogen) will be wasted in manure rather than converted to milk.



Difference in percentage units of crude protein (CP) between the formulated and the analyzed CP in seven dairies in Merced County (Silva-del-Rio and Castillo, 2012).

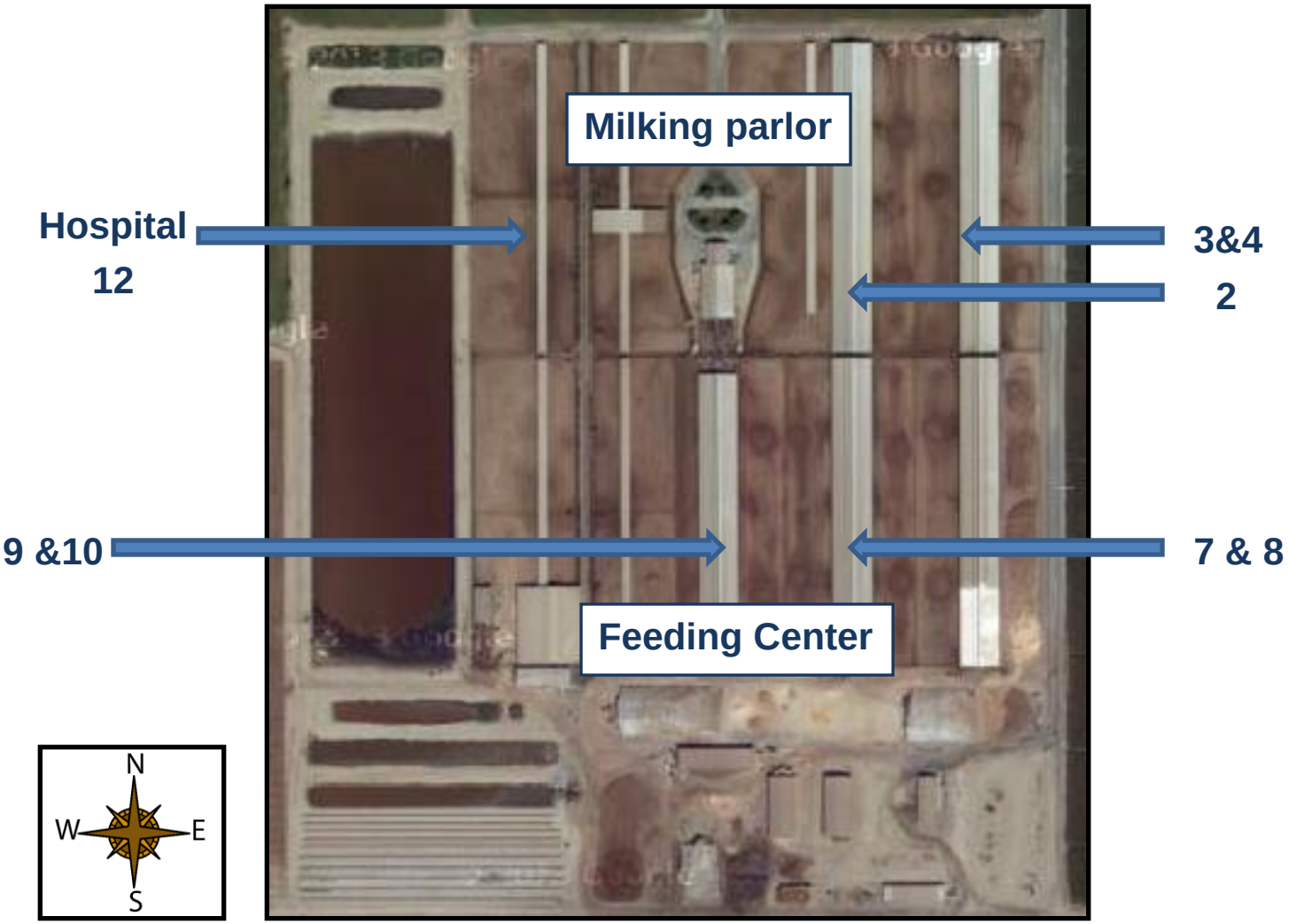
If the ration fed differs from the formulated one, cows will not achieve their maximum production potential and some nutrients (i.e. nitrogen) will be wasted in manure rather than converted to milk.



Correlation between the crude protein of the formulated and the analyzed ration in 15 Virginia dairies over a one year period (James and Cox, 2008; r=0.45; *P* = 0.55).

Dairy 1

Dairy 1



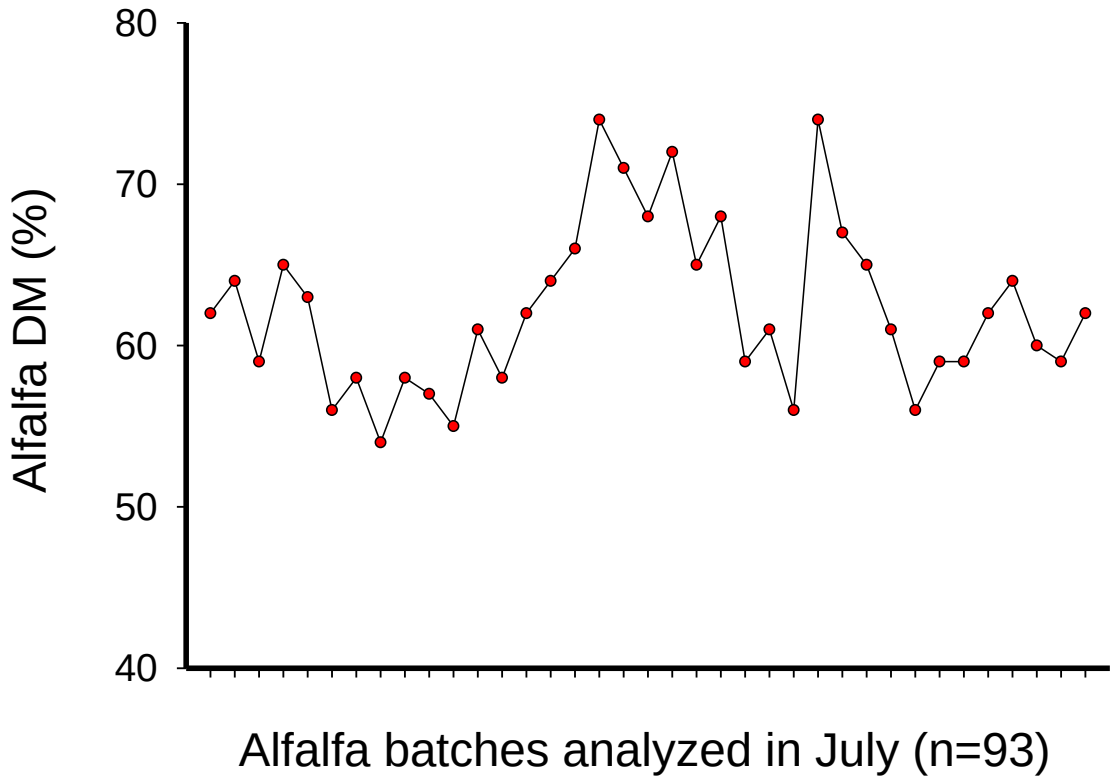
Commodities

Green Chop Alfalfa

Green Chop Alfalfa DM (%)

Two to three trucks arrived everyday with green chop alfalfa. The feeder evaluated dry matter daily and updated the feeding management software. He was equipped with a koster tester. He believed he was skilled to estimate dry matter visually.

Green Chop Alfalfa DM (%)



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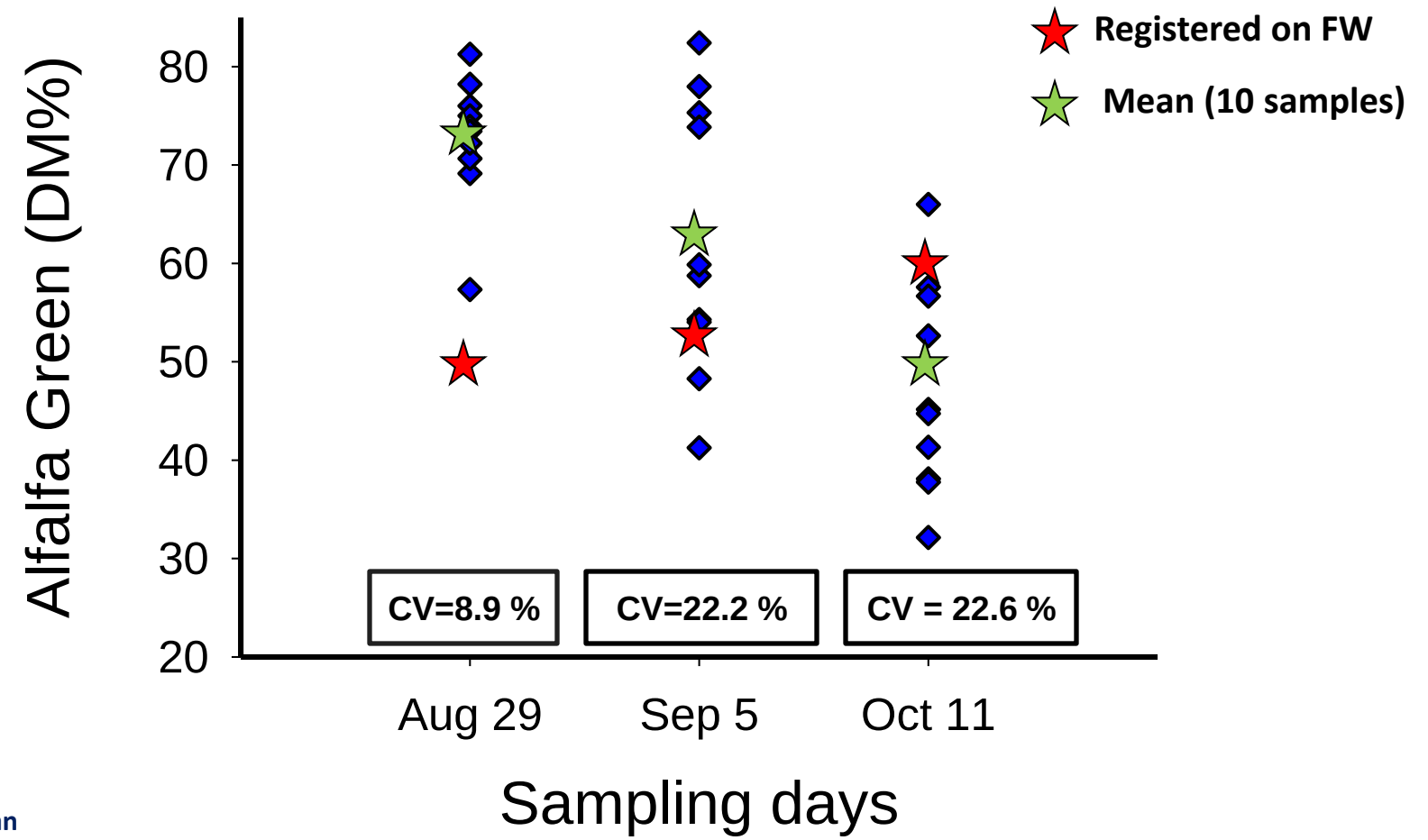
Green Chop Alfalfa

Green Chop (DM)



*%CV=SD/mean

Formulated vs Analyzed Ration

	Wet Chemistry	Formulated
	% of dry matter	
CP	16.5	17.8
ADF	24.7	20.0
NDF	33.3	25.0

Loading Ingredients

Front-end-Loader Position

Times (loader position)					
Ingredient	**Front**	**Middle**	**Back**	**Side**	**Center**
Enzabac-Canola	I	II		II	I
Corn gluten		III		I	II
Mineral		III			III
Rolled corn		II	I	II	I
Wet destillers		III		I	II
Whey		I	II	III	
Green Chop		III		I	II
Premix		III		II	I
Energy II		III		I	II
Cotton seed		III			III
Corn silage		III		I	II
Almond hulls		III		I	II
Whey		II	I	III	

Feed Additive as 1st Ingredient

Feed Additive (50 lbs)

+

Canola

=

The feeder empties a feed additive bag (50 lbs) in the front-end-loader.

Then, he loads canola and drops everything in the mixer wagon.

Time between Ingredients

Short Time

Dropping leftovers of the previous ingredient as the new ingredient

Leftovers are left on the front-end-loader and next ingredient is loaded

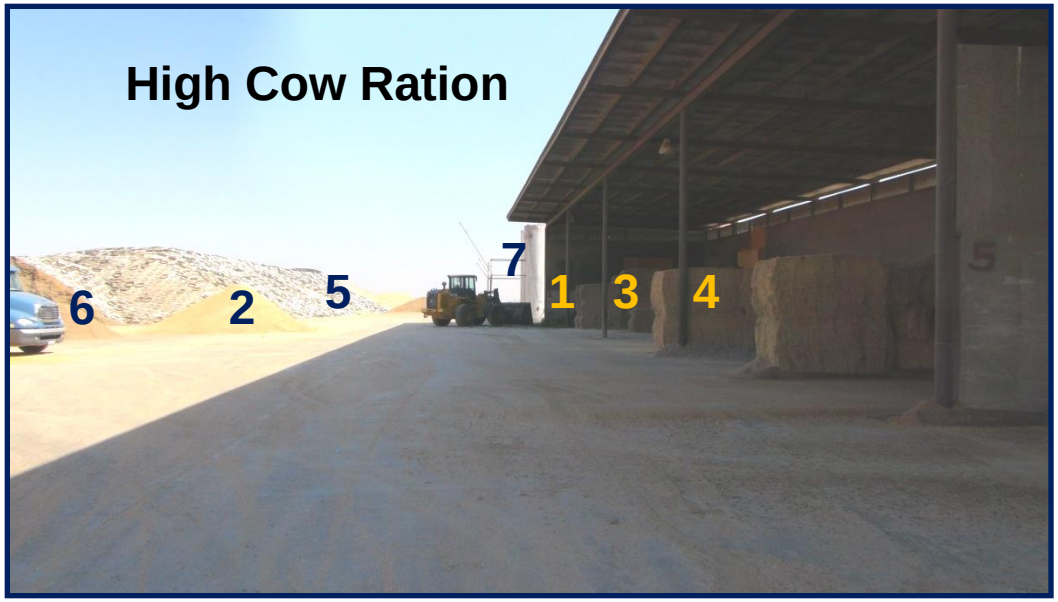
Long Time

Feeder signs the sheets for the commodities delivered

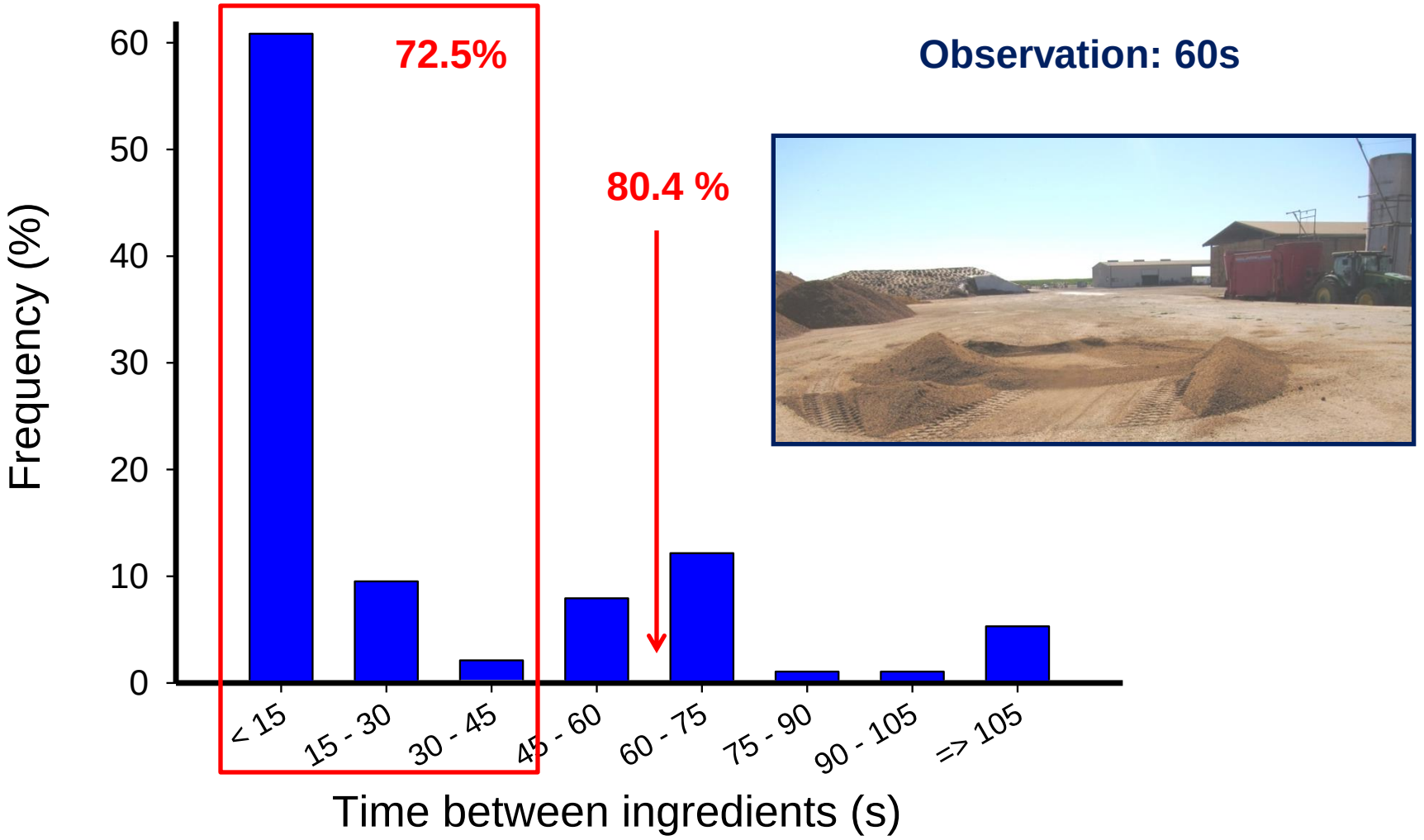
Commodities are far from the feeding center

Loading Time between Ingredients <45 s

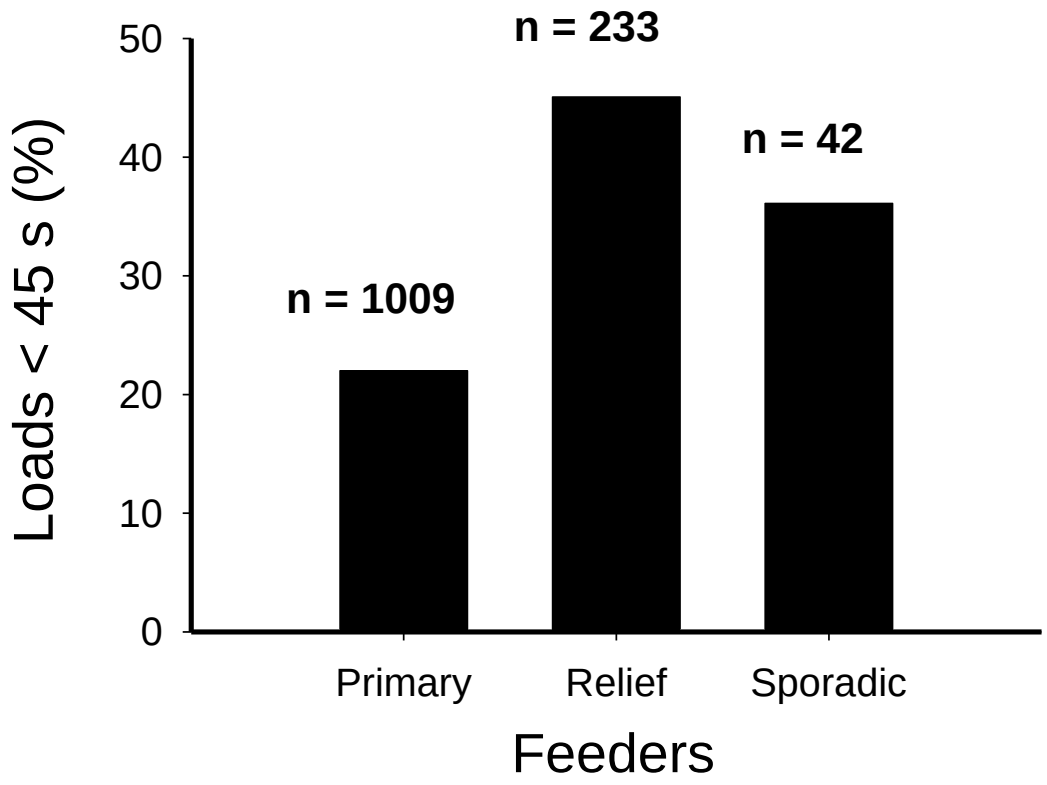
1. Alfalfa green chop	60 s	22.8%
2. Premix	60 s	72.5%
3. Energy II	65 s	16.7%
4. Cotton seed	150 s	3.7%
5. Corn silage	90 s	34.9%
6. Almond hulls	80 s	6.3%
7. Whey		



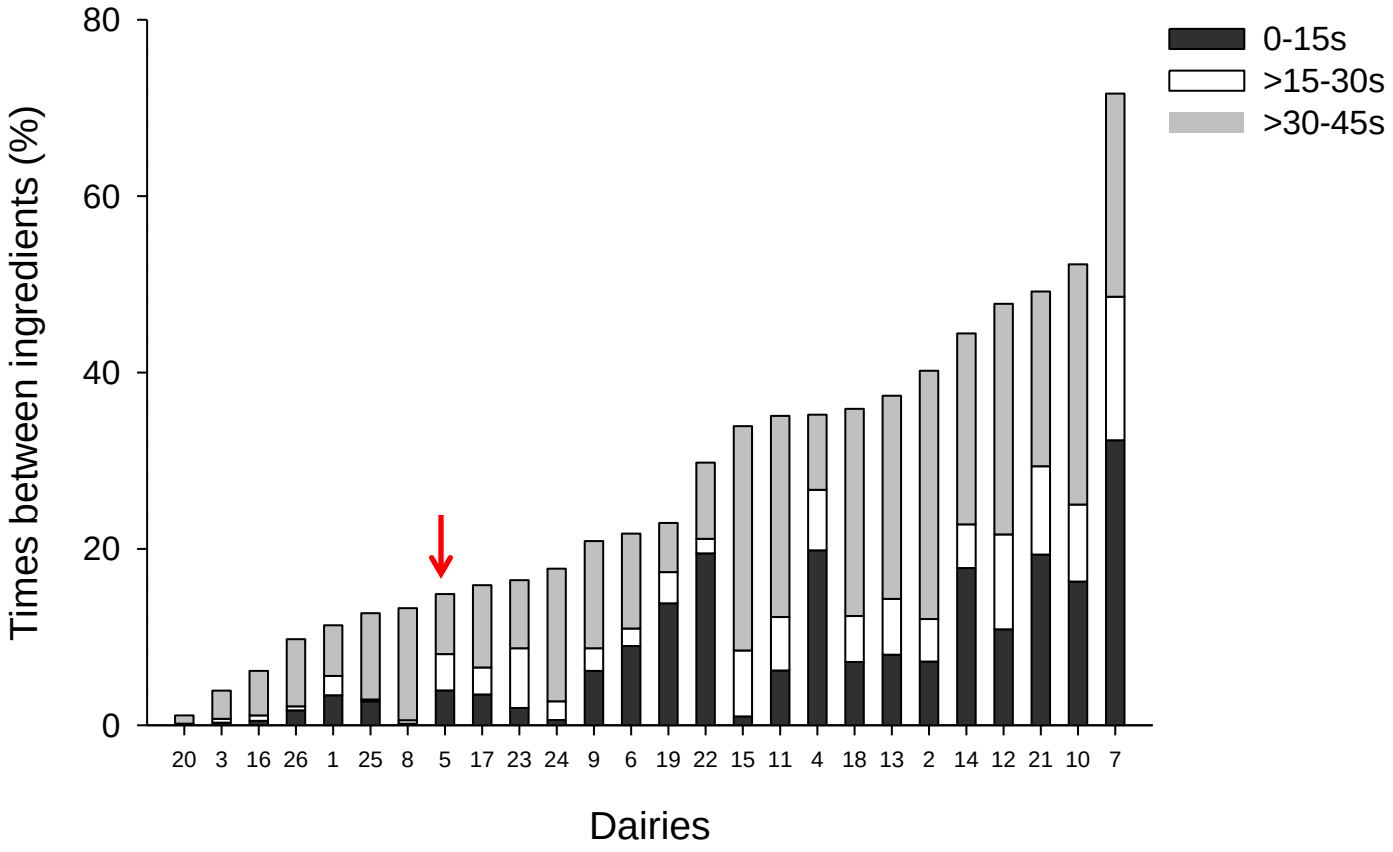
Loading time between Premix and Energy II



Frequency of loading time between ingredients <45 s

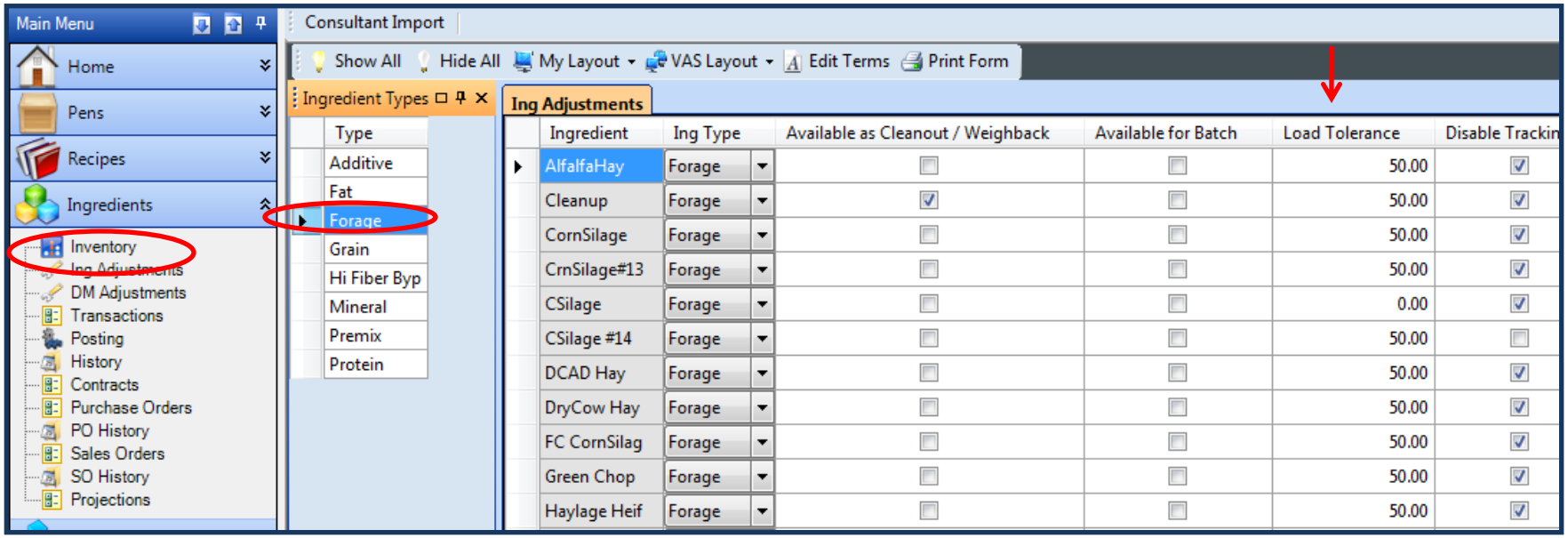


Frequency of loading time between ingredients



Weight Deviations from Target

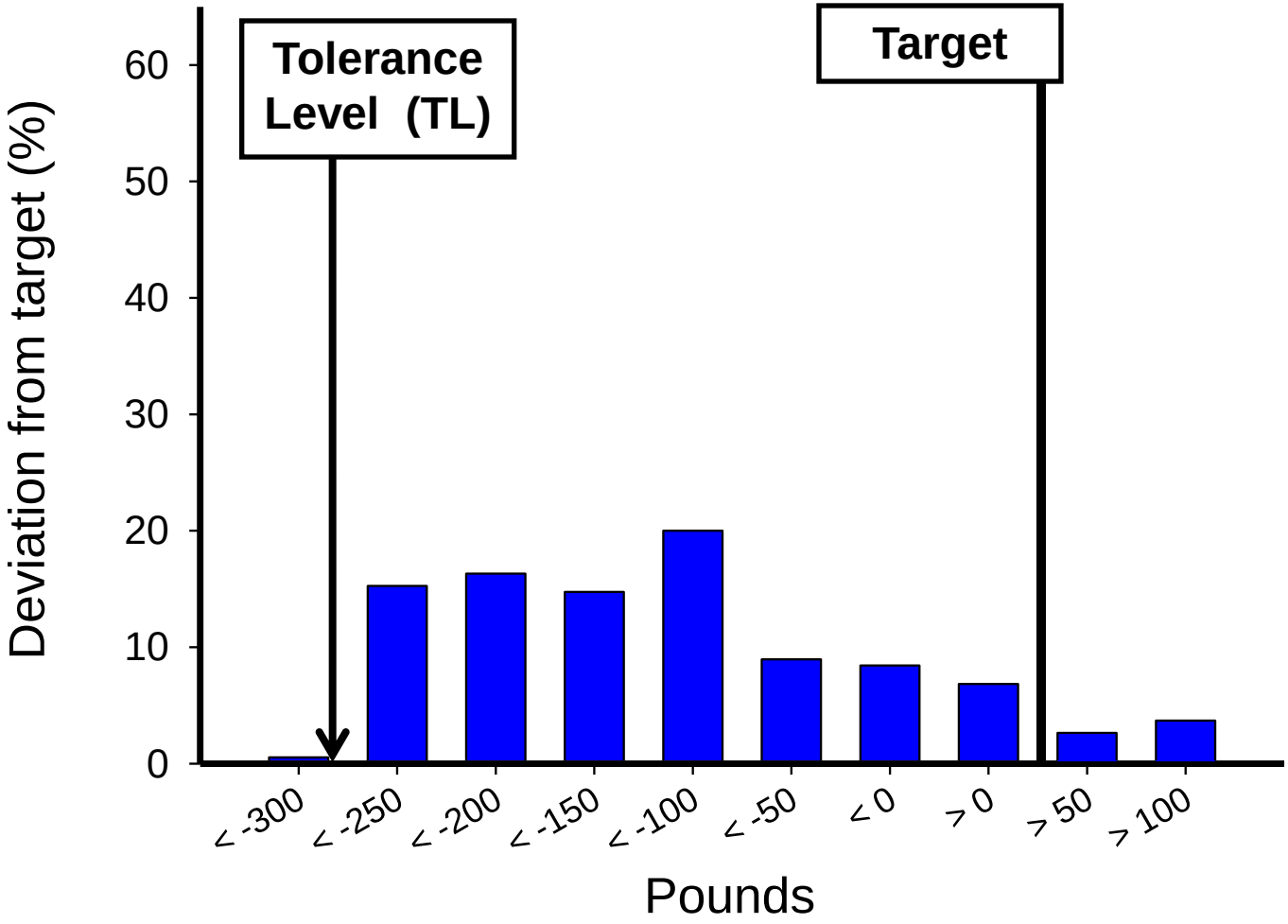
Tolerance Level per Ingredient



Tolerance level is the pounds below the formulated target assigned to each ingredient to avoid overloading.

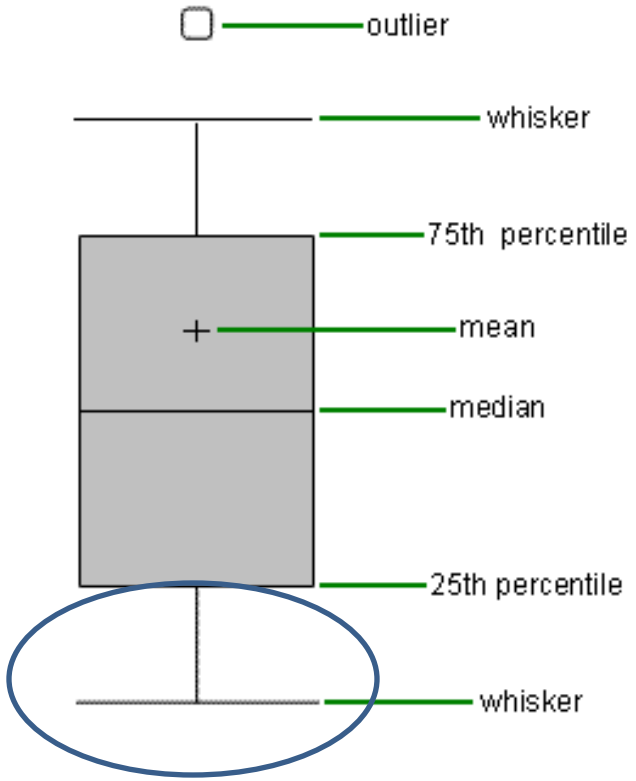
During the loading process, the mixer wagon scale indicates the amount of feed left to reach the formulated target but when the tolerance level is reached, the software moves on to the next ingredient.

Deviation from the Target Weight – Corn silage



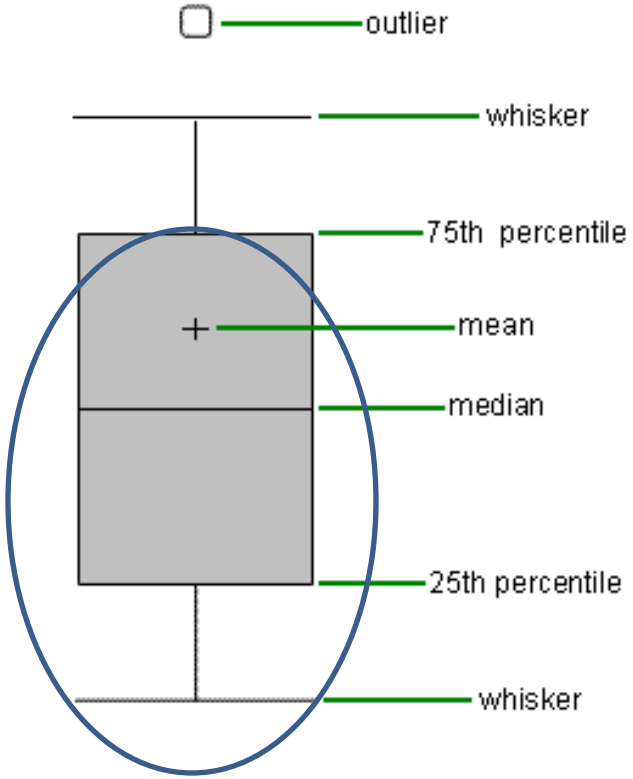
Lbs weighed: 8,729 (3,412 – 10,072)

BOX PLOT


outlier
whisker
75th percentile
mean
median
25th percentile
whisker

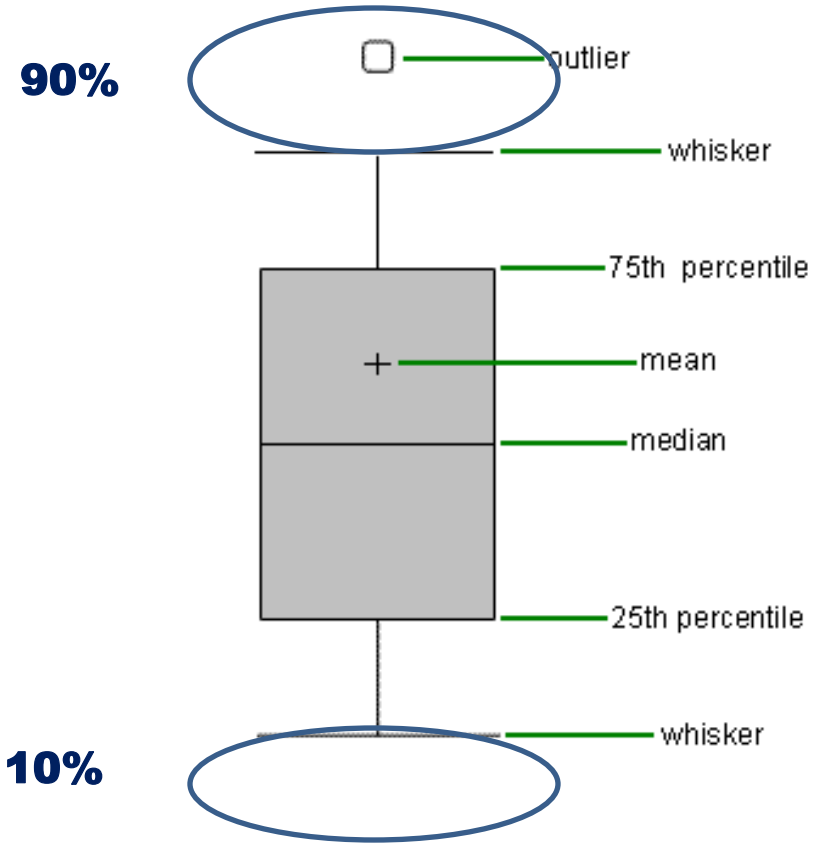
25%

BOX PLOT

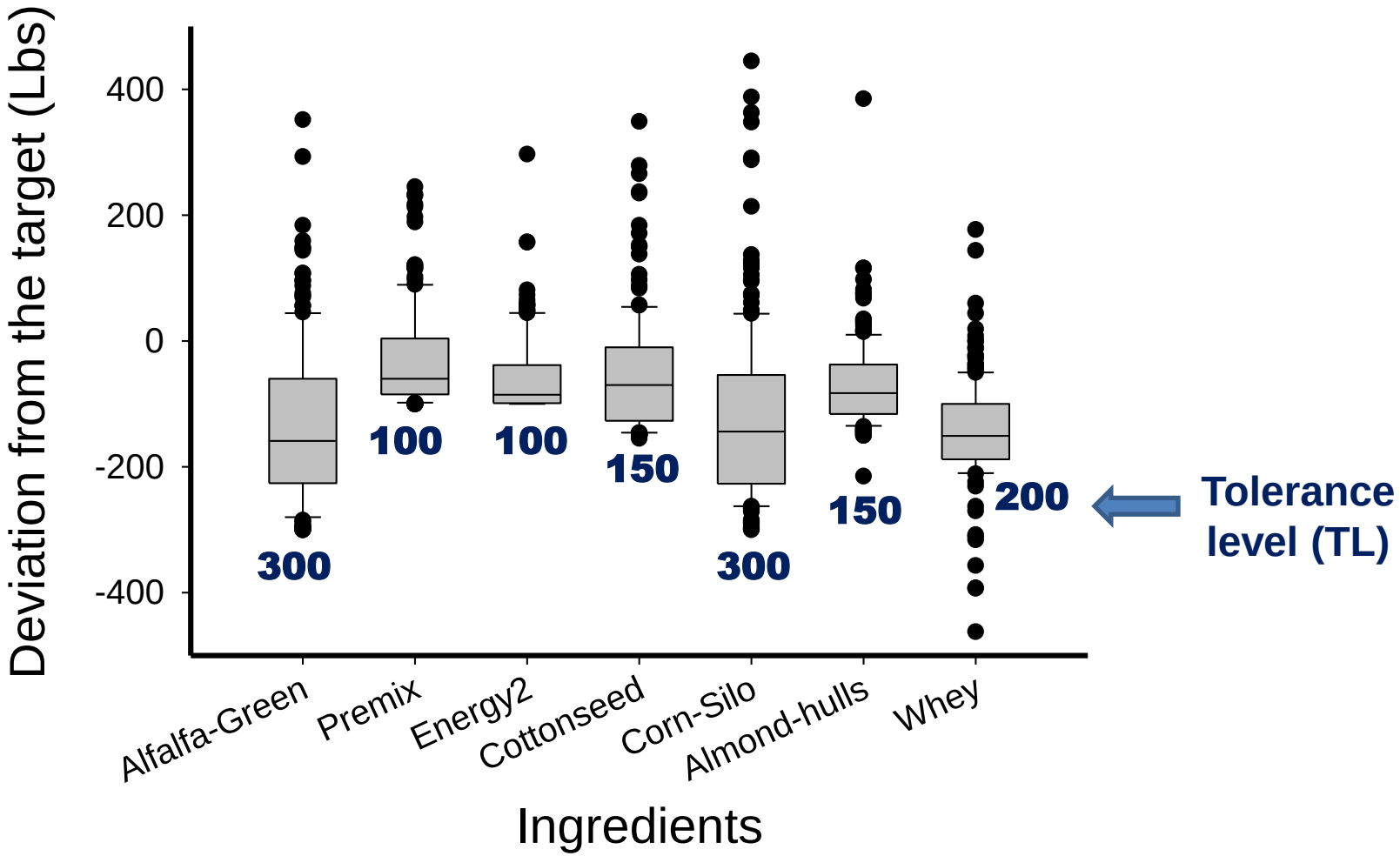

outlier
whisker
75th percentile
mean
median
25th percentile
whisker

75%

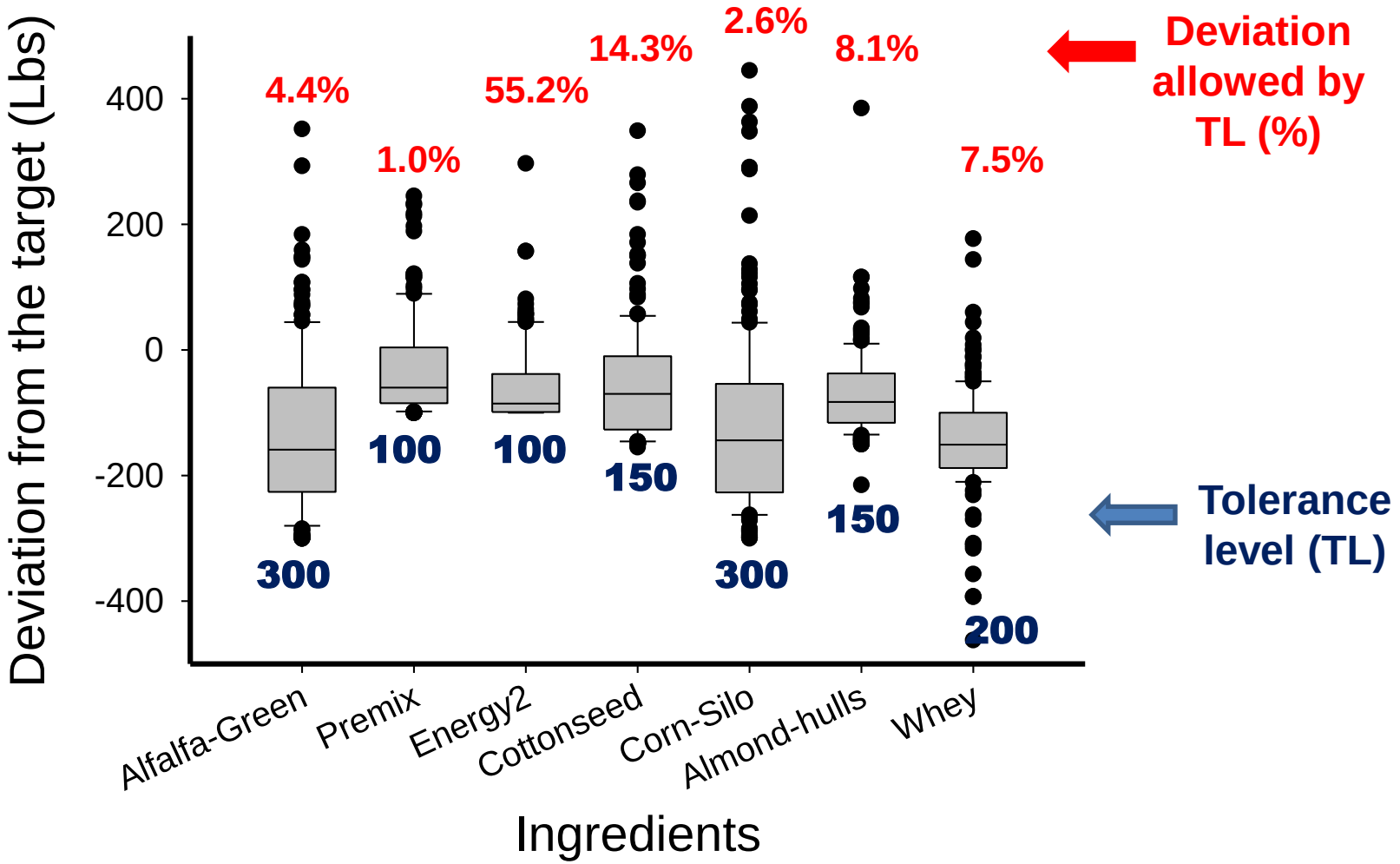
BOX PLOT


90%
outlier
whisker
75th percentile
mean
median
25th percentile
whisker
10%

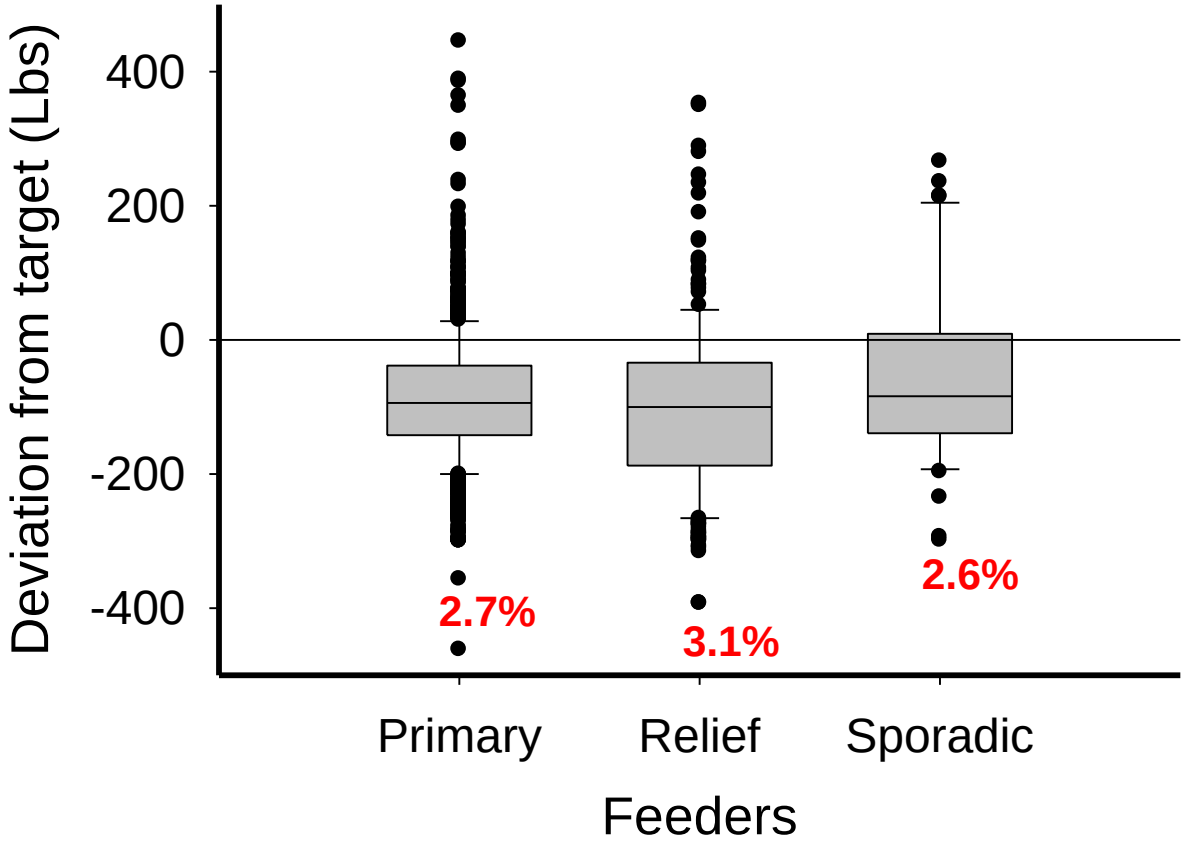
Deviation from the Target Weight by Ingredient – High Ration



Deviation from the Target Weight by Ingredient – High Ration

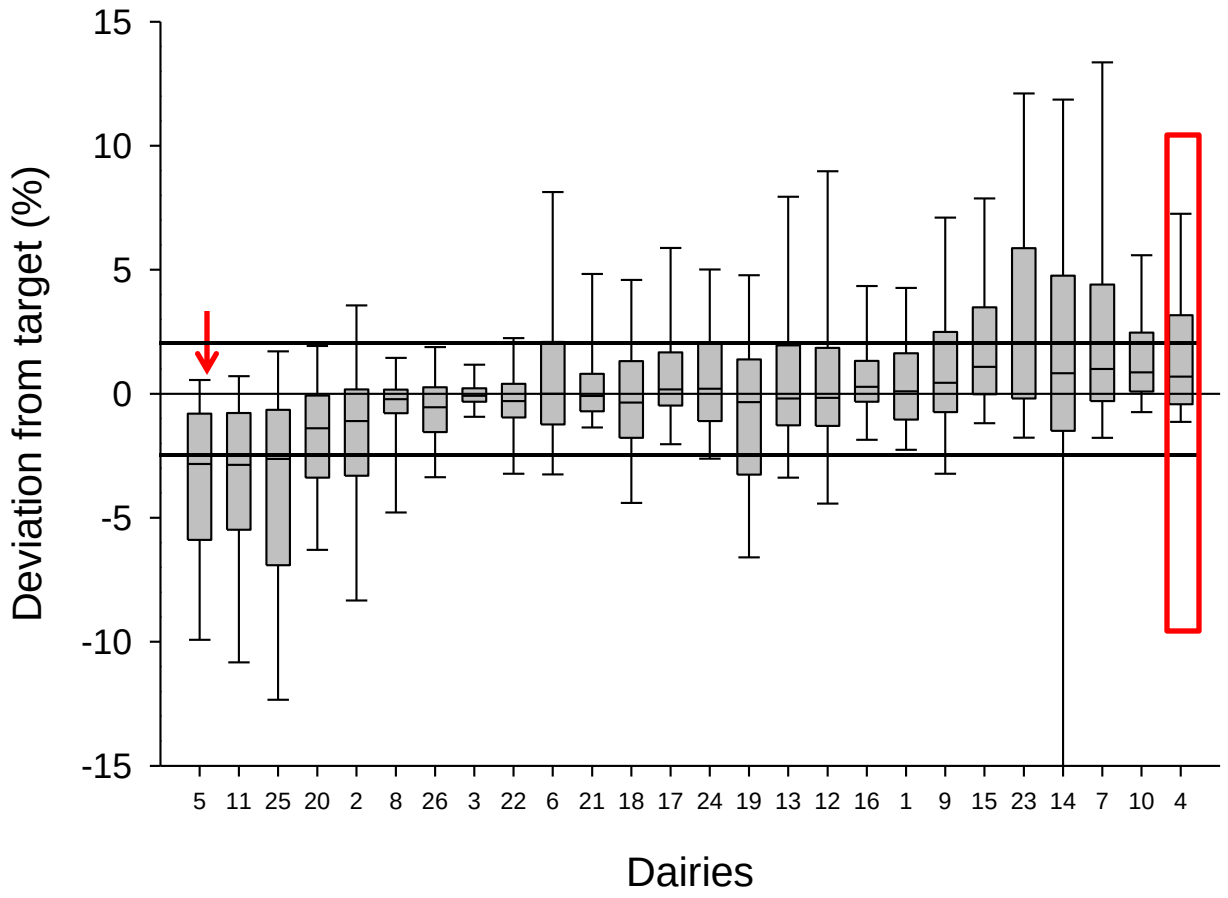


Deviation from the Target by Feeder

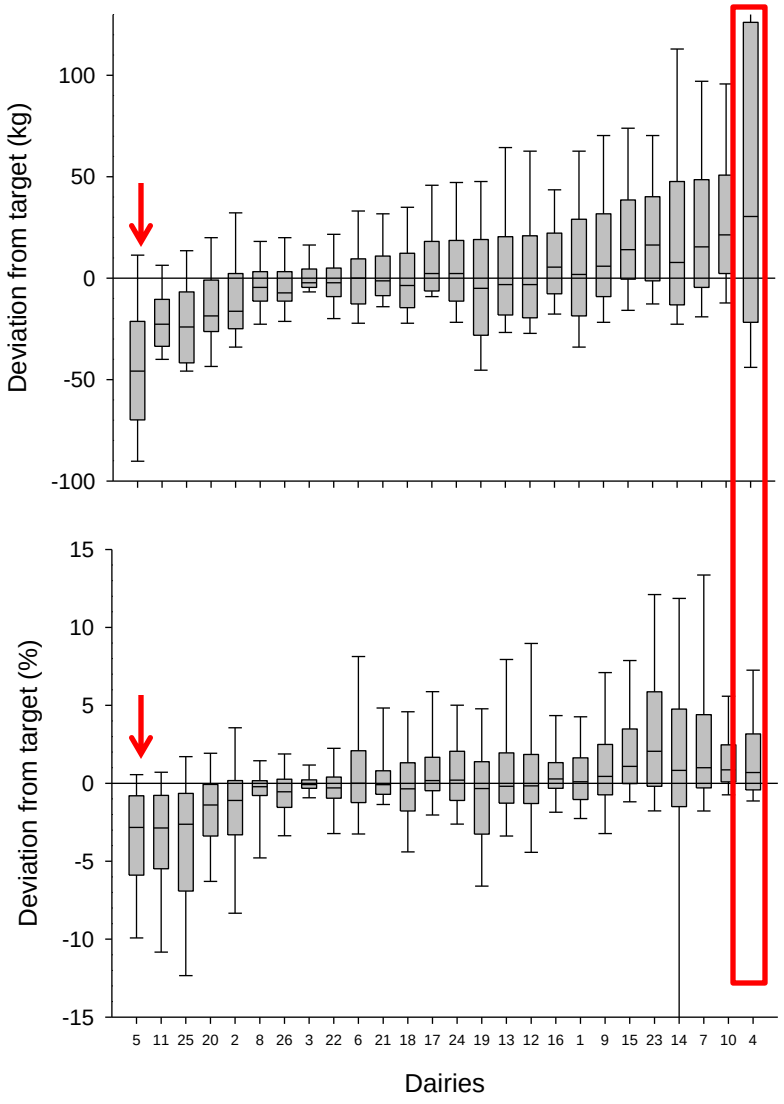


Deviation from Target (%)

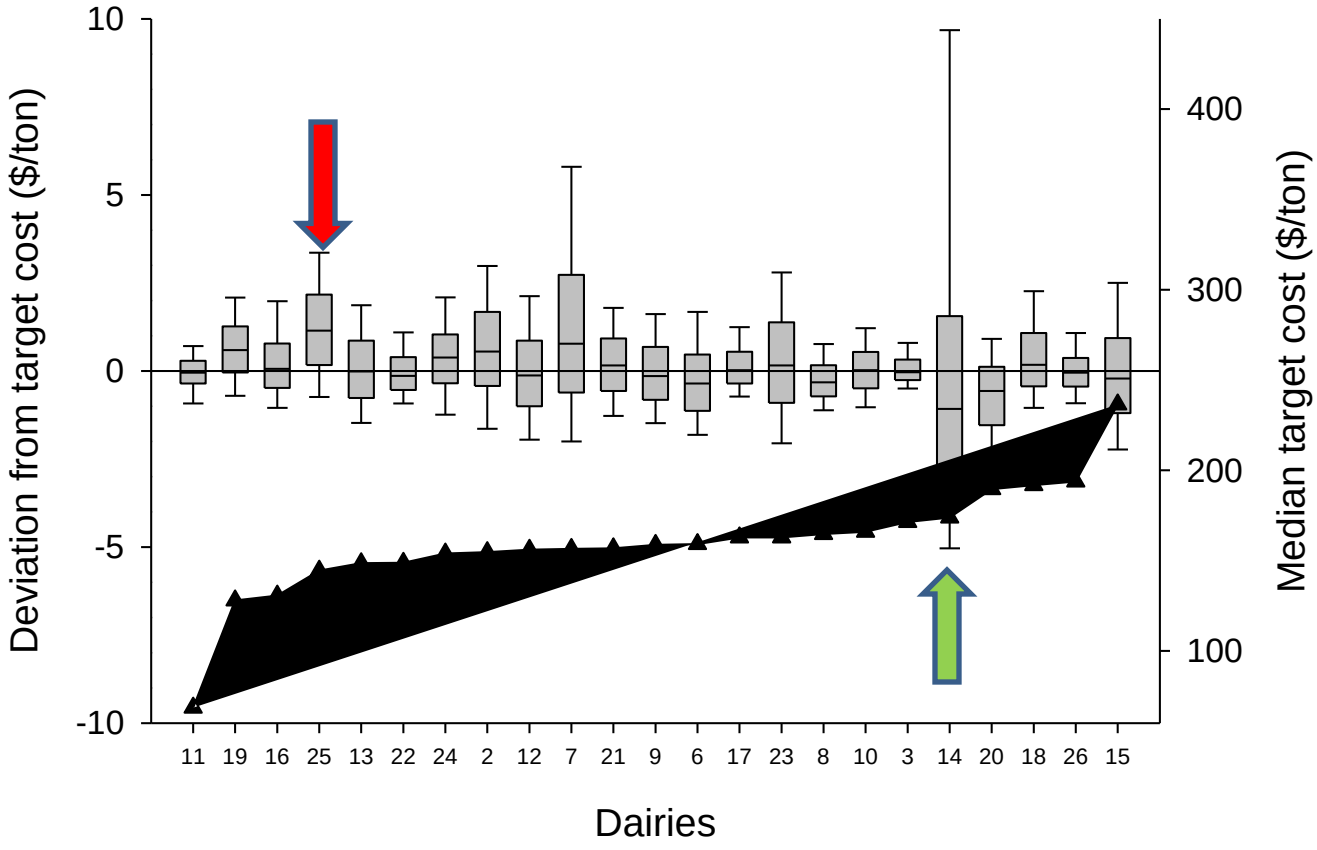
Deviation from Target (%)



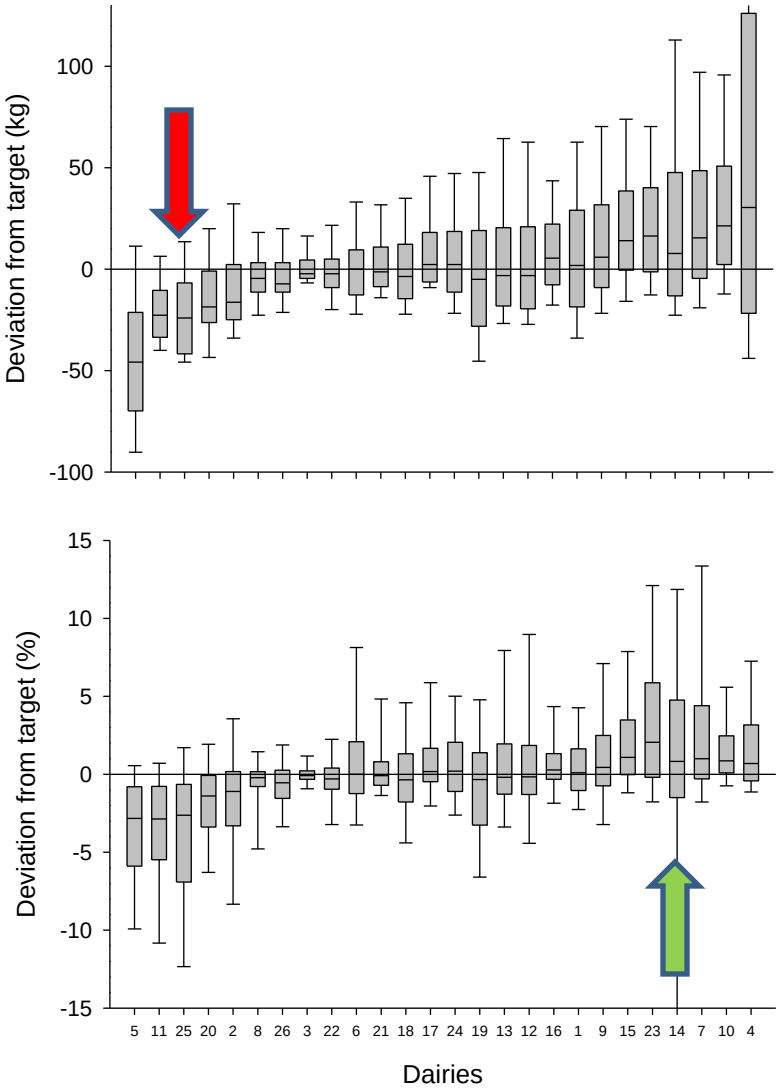
Deviation from Target



Variation of recipe $/ton

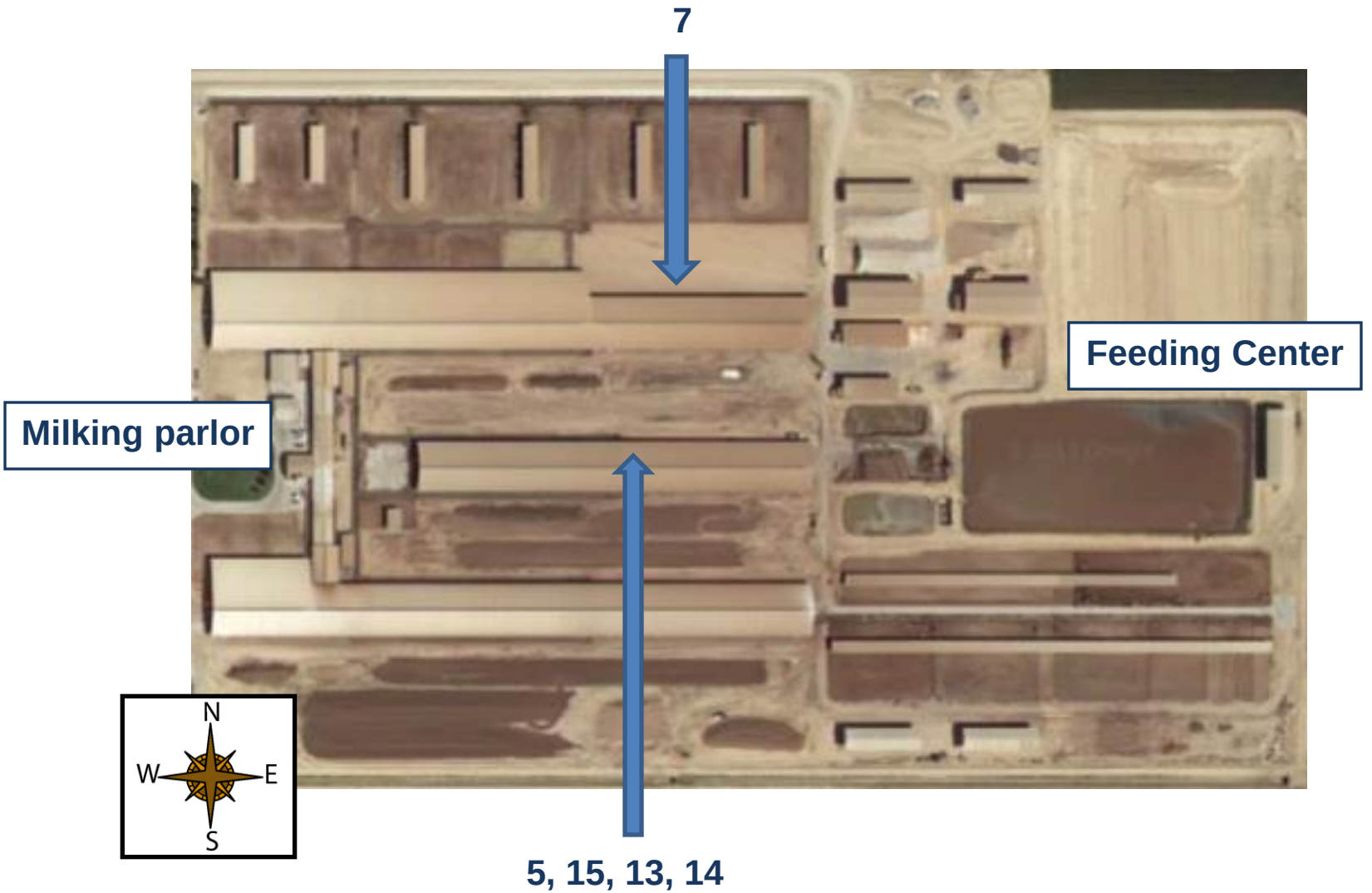


Deviation from Target



Dairy 2

Dairy Lay-Out




Commodities


Rolled corn


Canola & Alfalfa


Cottonseed & Almond hulls


Megalac


Poultry waste


Cottonseed meal


Mineral mix


DEERE
544K

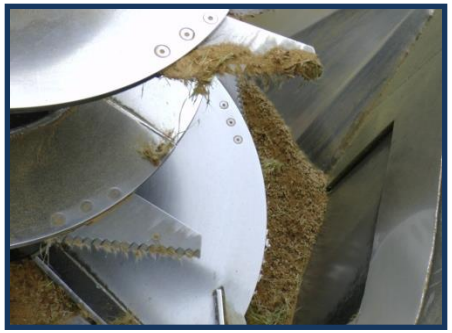
Hay Processing Issues

Hay Processing Issues

Mixer Wagon

Mixer Wagon Issues

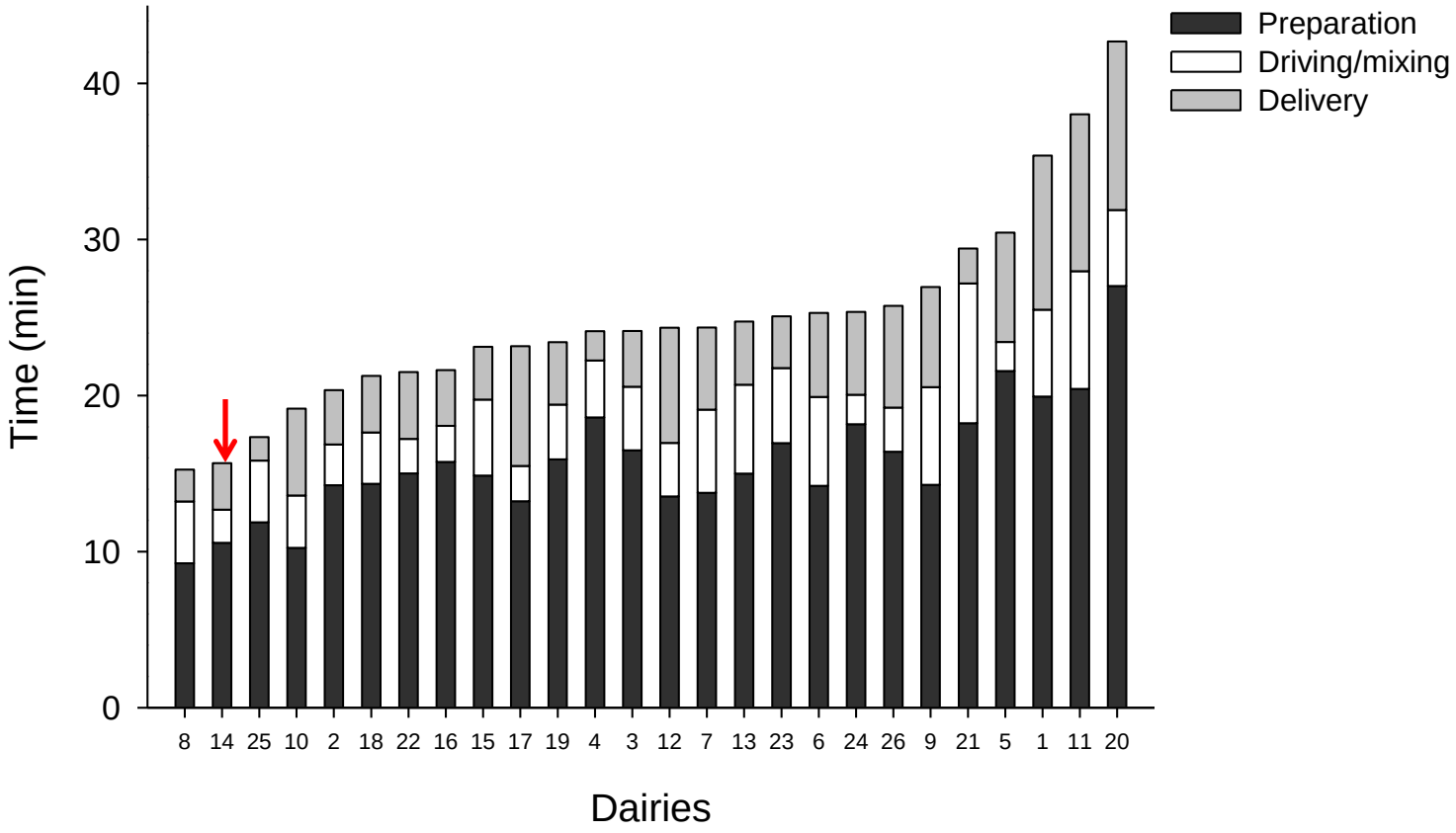
Before

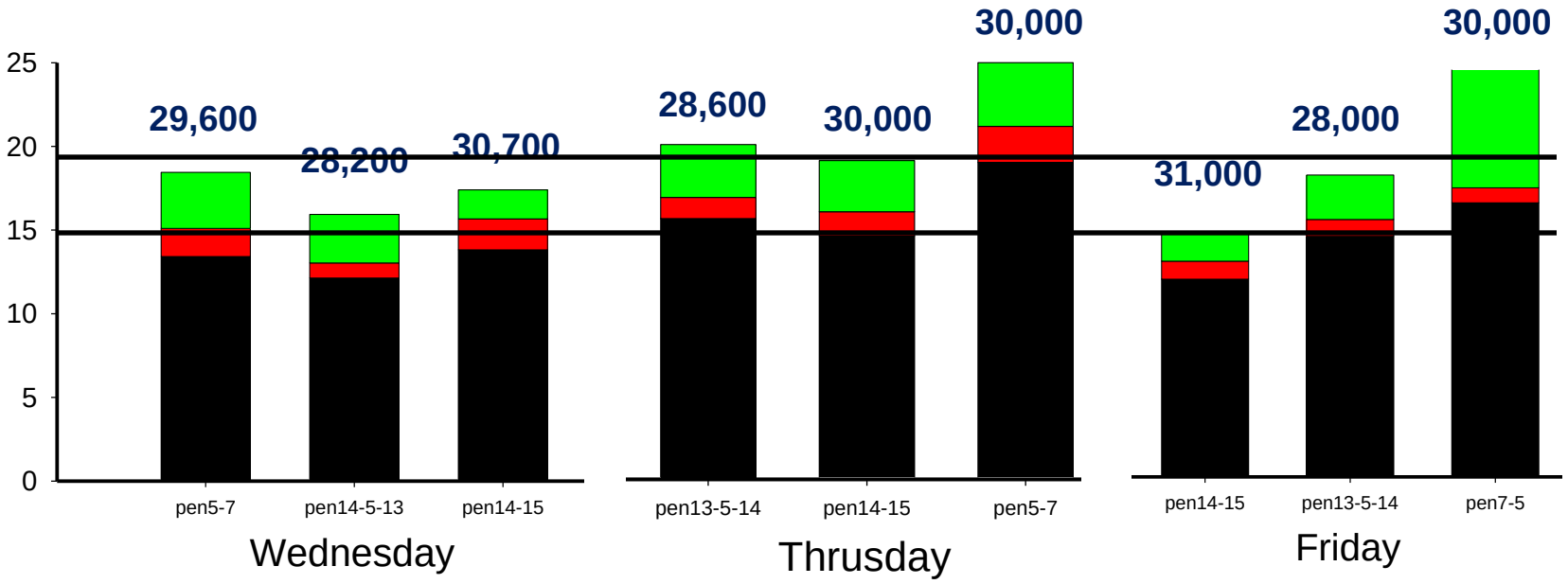


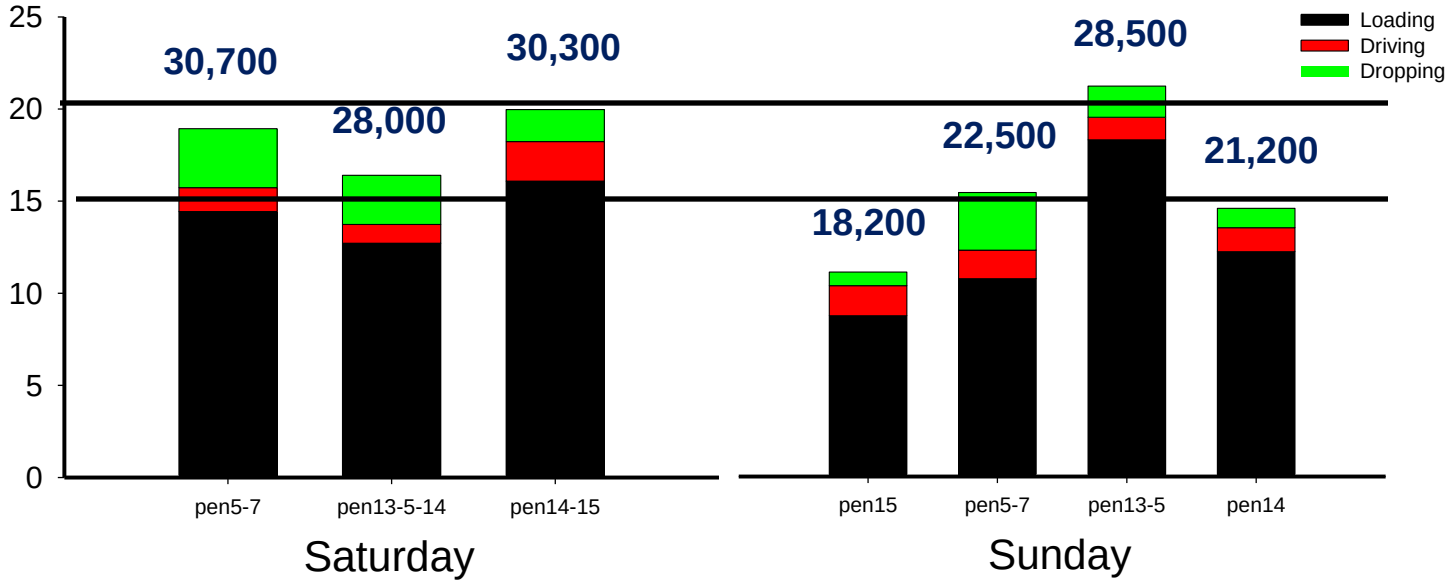
After

- Kicker amplification
- Change the angle of the blades
- Door blocked with feed

High cow ration: preparation times




25
20
15
10
5
0
29,600
28,200
30,700
28,600
30,000
30,000
31,000
28,000
30,000
pen5-7
pen14-5-13
pen14-15
pen13-5-14
pen14-15
pen5-7
pen14-15
pen13-5-14
pen7-5
Wednesday
Thrusday
Friday


25
20
15
10
5
0
30,700
28,000
30,300
18,200
22,500
28,500
21,200
Loading
Driving
Dropping
pen5-7
pen13-5-14
pen14-15
pen15
pen5-7
pen13-5
pen14
Saturday
Sunday

Main feeder

Dropping Uniformity

Samples	Lbs (22x24")
1	22.7
2	48.5
3	48.6
4	1.4
5	47.5
6	9.0
7	30.6
8	14.7
9	34.3
10	52.6

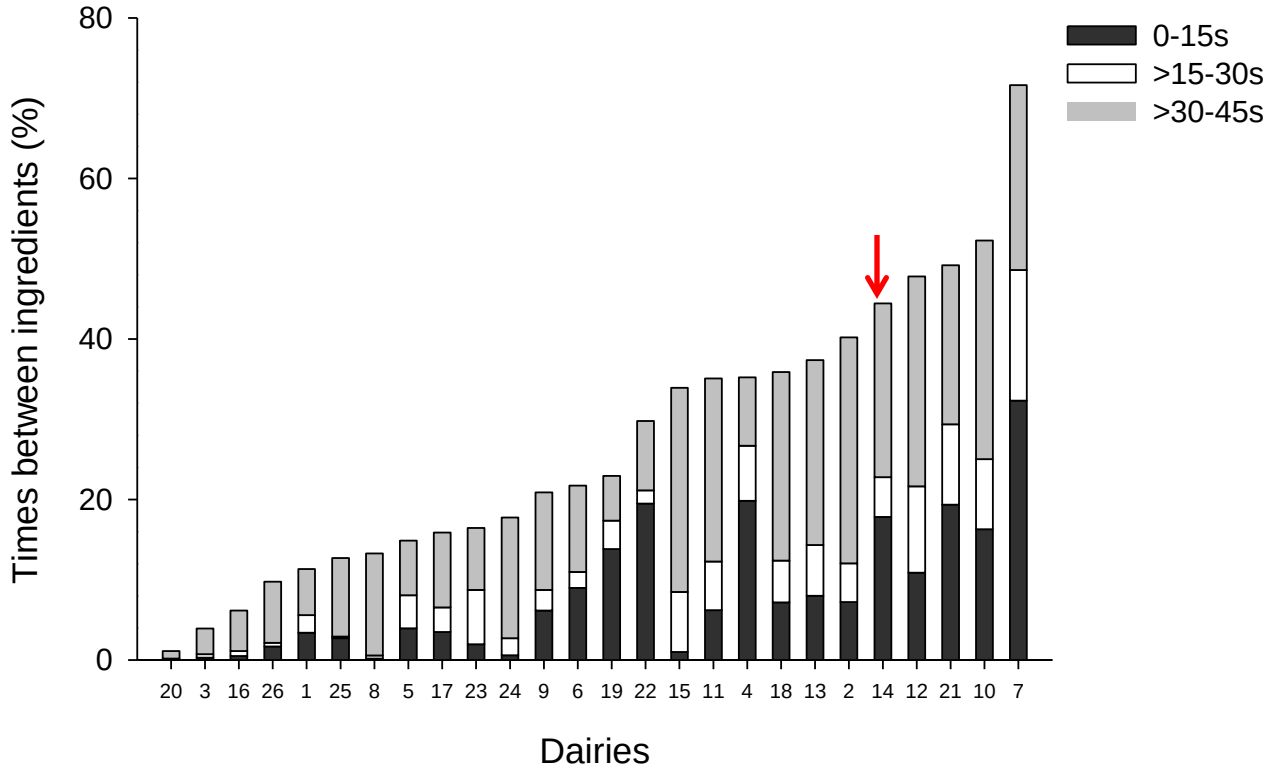
CV=59.5%

Dropping Uniformity

CV=59.5%

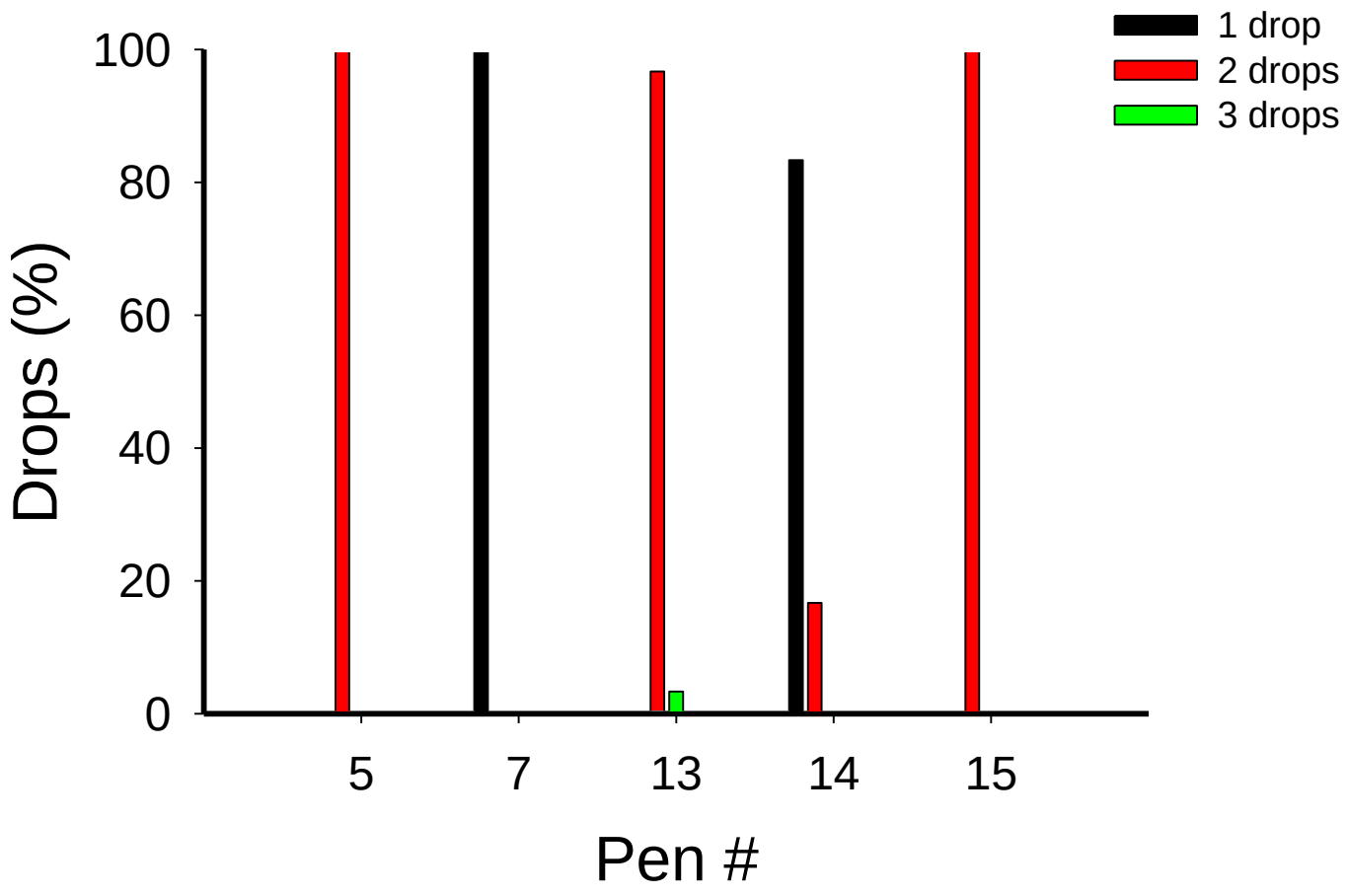
Loading Ingredients

Frequency of loading time between ingredients

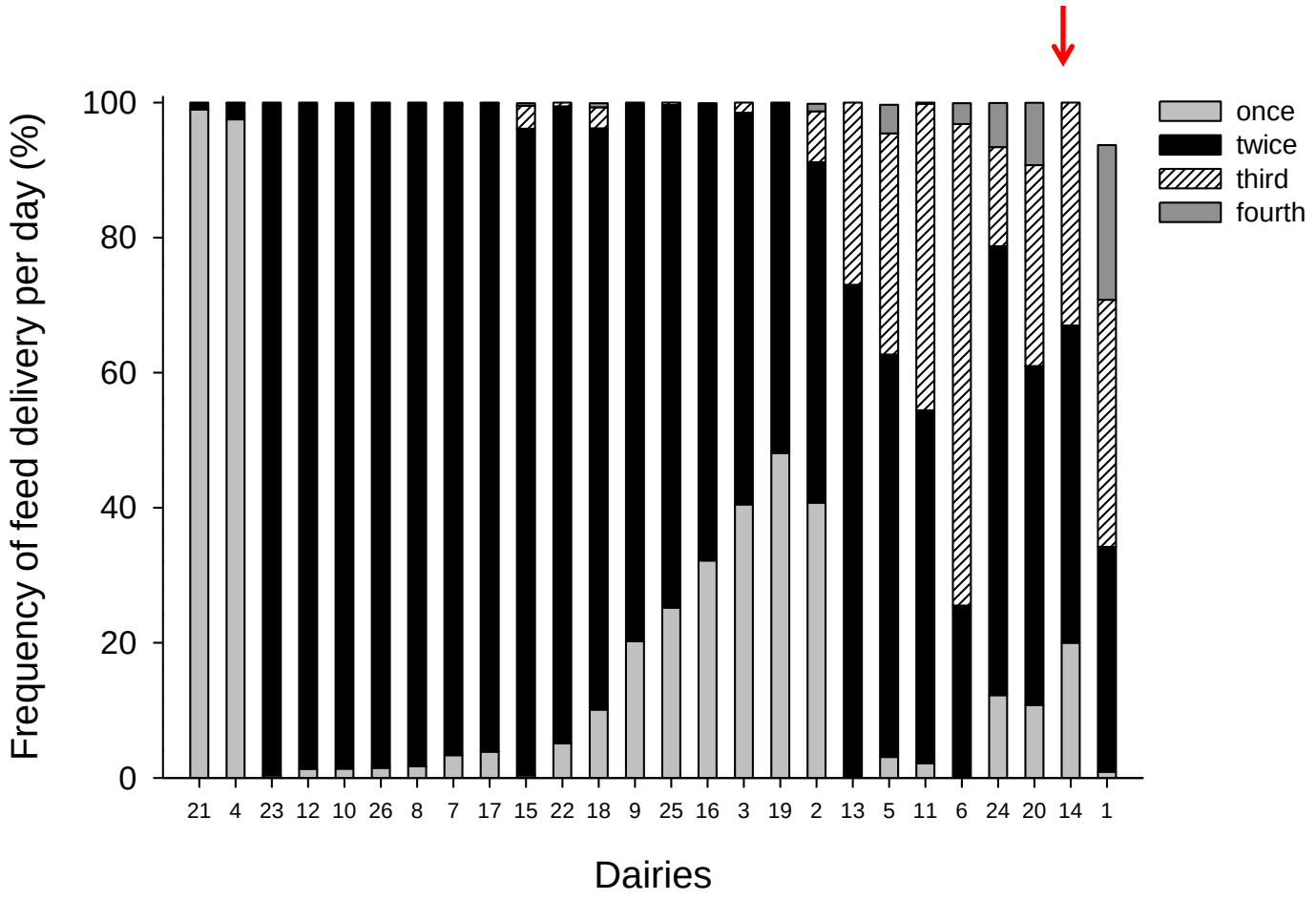



TMR Delivery

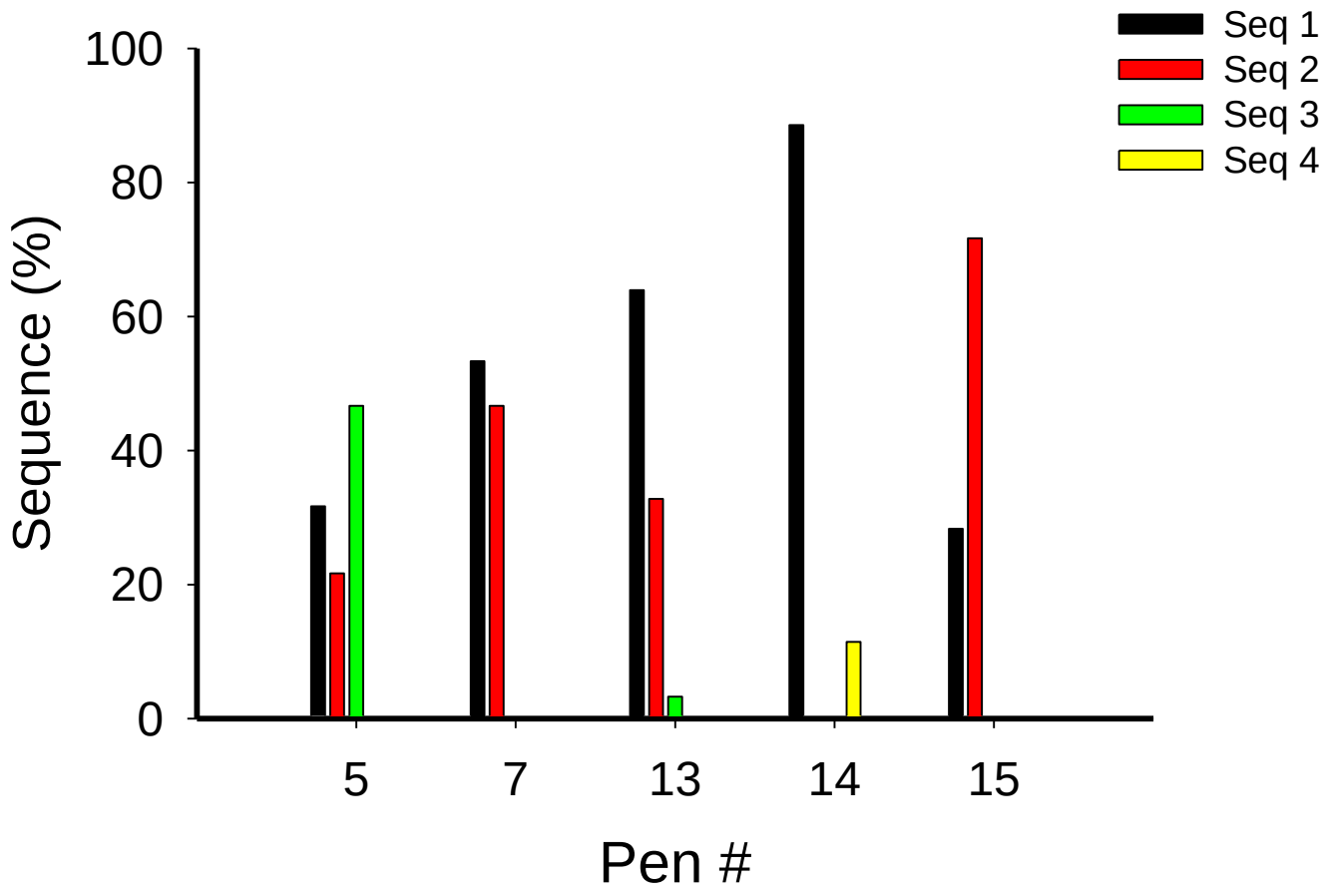
Drops per pen/day



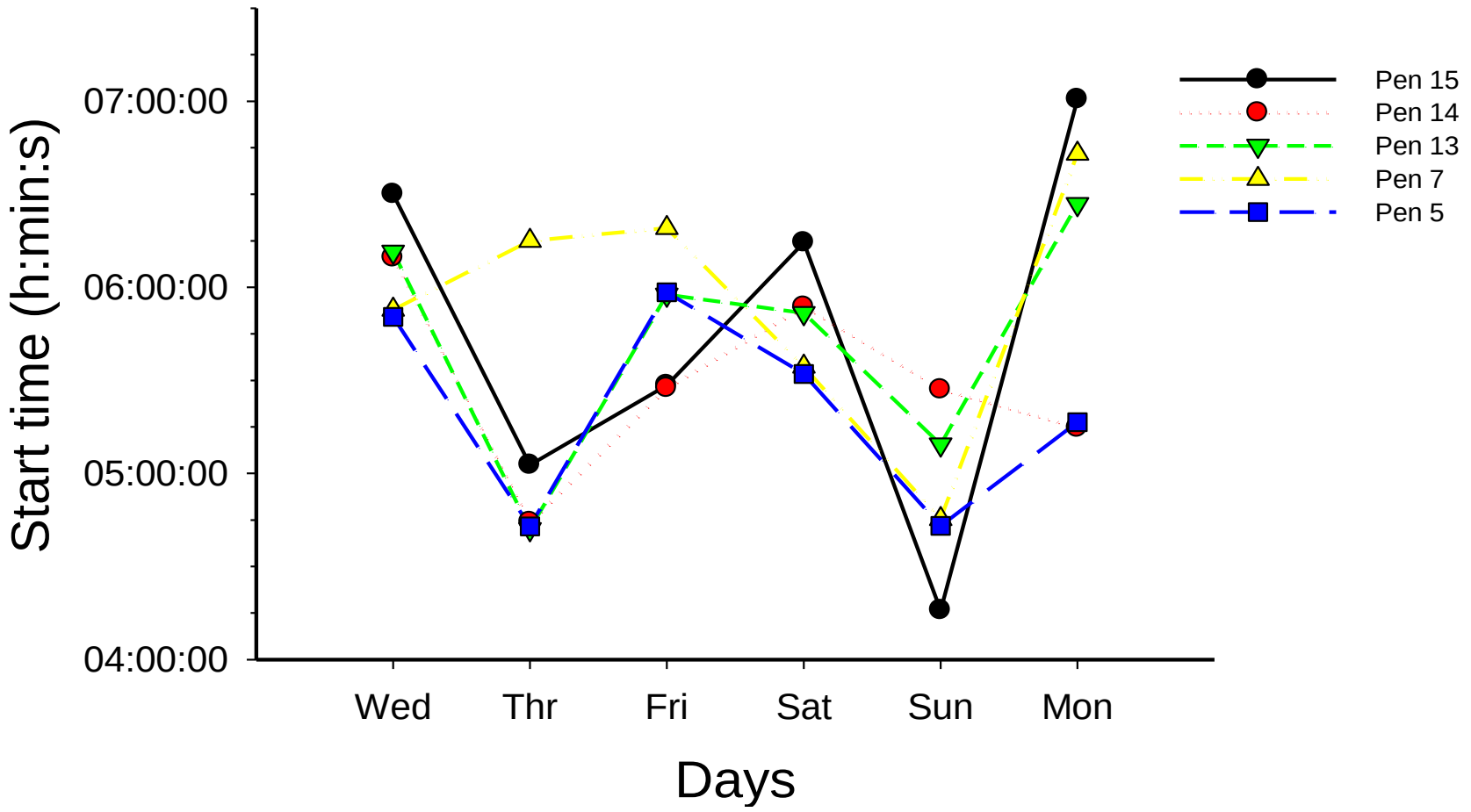
Frequency of drops/pen/day



Sequence of Delivery



First drop: delivery time



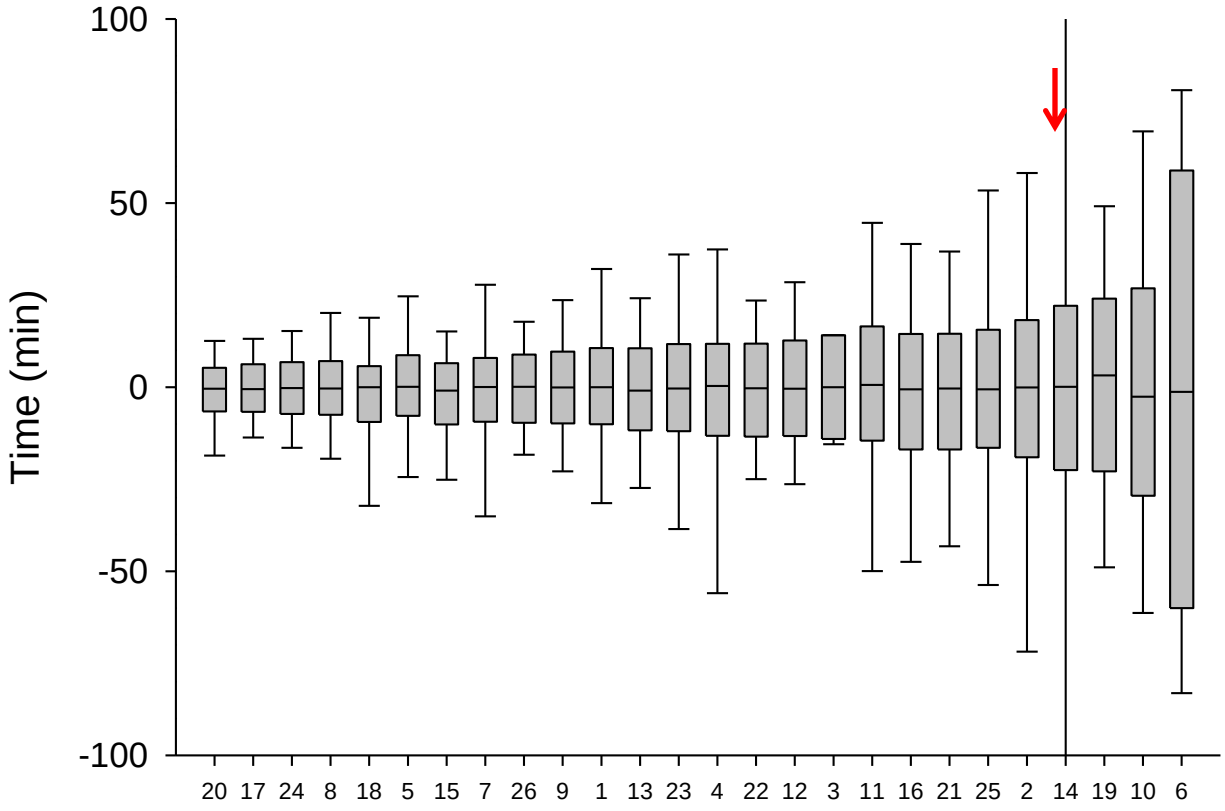
Feeding sequence

Dropping order by pen - variation along the week						
Seq	Wed	Thr	Fri	Sat	Sun	Mon
1	5 - 7	13 - 5 - 14	14 - 15	5 -7	15	5 - 7
2	14 - 5 - 13	14 - 15	13 - 5 - 14	13 - 5 - 14	5 - 7	13 - 5
3	14 - 15	5 -7	7 -5	14 - 15	13 - 5	14
4	_	_	_	_	14	15

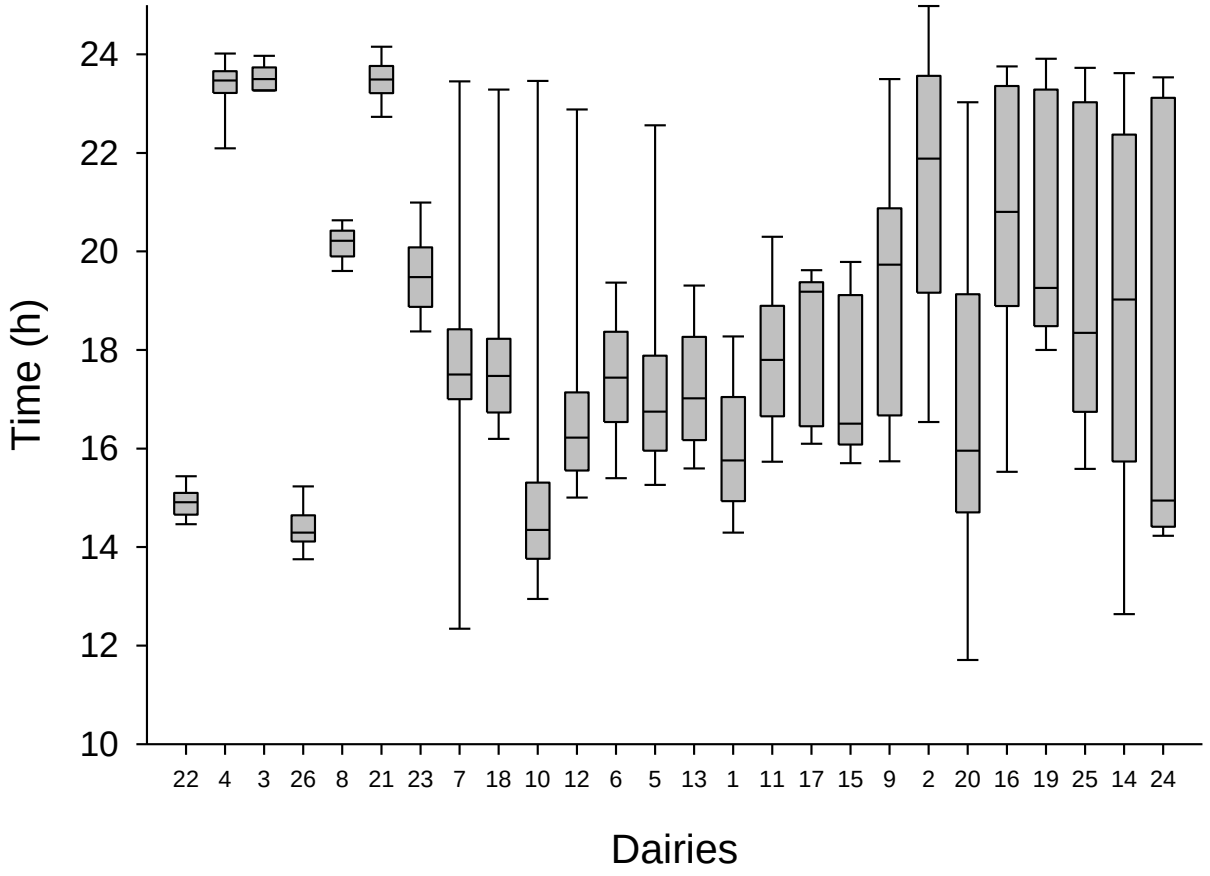
Feeding sequence

Dropping order by pen - variation along the week						
Seq	Wed	Thr	Fri	Sat	Sun	Mon
1	5 - 7	13 - 5 - 14	14 - 15	5 -7	15	5 - 7
2	14 - 5 - 13	14 - 15	13 - 5 - 14	13 - 5 - 14	5 - 7	13 - 5
3	14 - 15	5 -7	7 -5	14 - 15	13 - 5	14
4	_	_	_	_	14	15

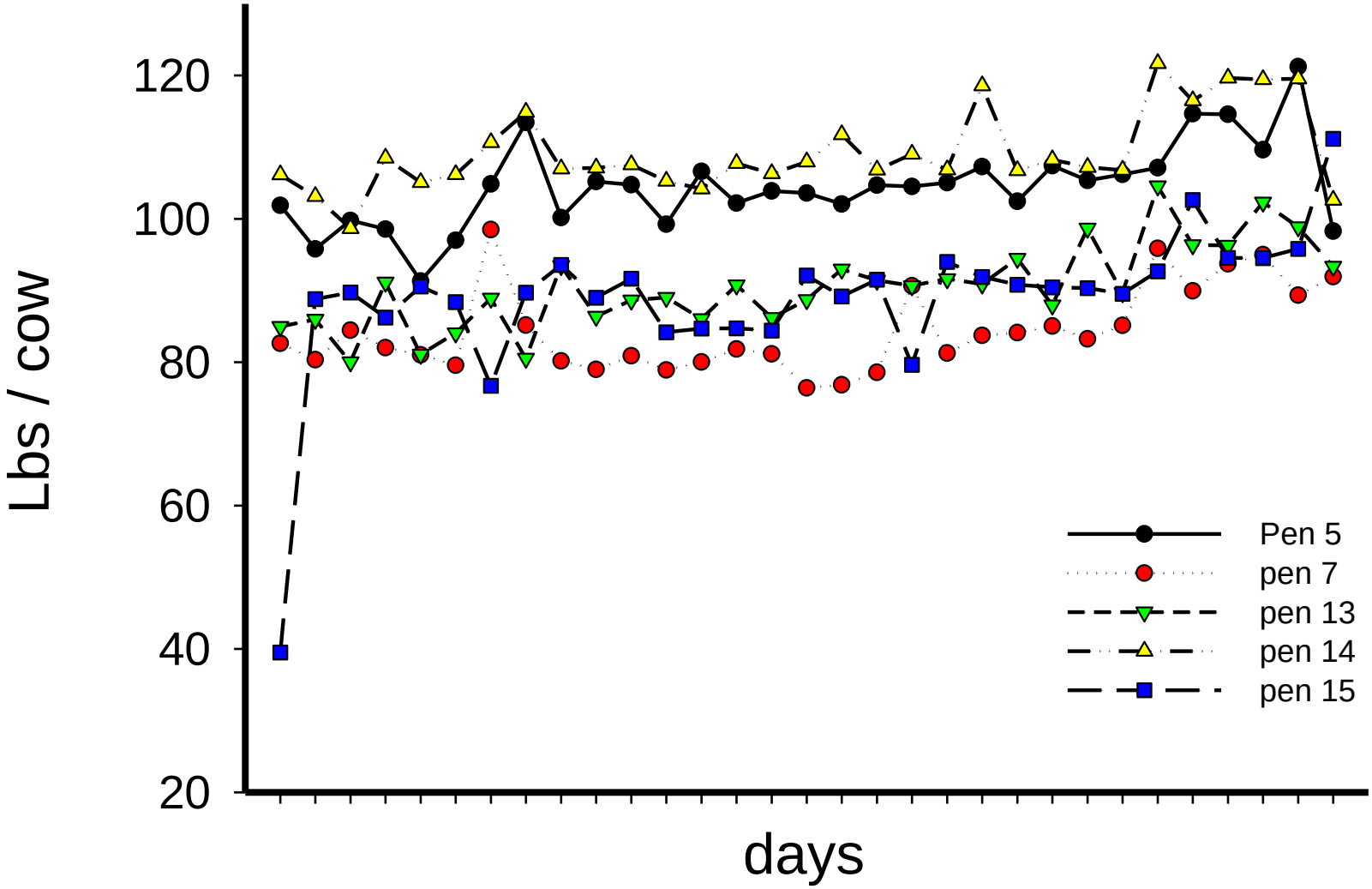
Day-to-day variation on first recipe delivery



Time elapsed from the last delivery



As fed (lbs) – cows /pen /day



Summary

Through our feeding management assessment, based on farm observations and feeding management software records, we were able to identify opportunities to improve the feeding process:

Dairy 1

- Green chop alfalfa management
- Re-evaluating the tolerance level assigned per ingredient

Dairy 2

- Training feeder
  - Understand the implications of his work
  - Arrive on-time every day
  - Be more careful with the equipment

Goals and Future Work

1. Develop a feeding management assessment and monitoring program that can be implemented on dairies.

Future work:

Conduct feeding management assessments in as many dairies as *financially* possible– “each dairy is a new learning experience”

2. Establish benchmarks for the dairy industry based on feeding management software data.

Future work:

We are finalizing the report from the initial 26 dairies. We would like to gather a larger data set and summarize information from many more dairies.

Thanks

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Valley Agriculture Software

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Questions?