

Interconnection between climate factors, welfare indicators and production parameters in fattening pigs

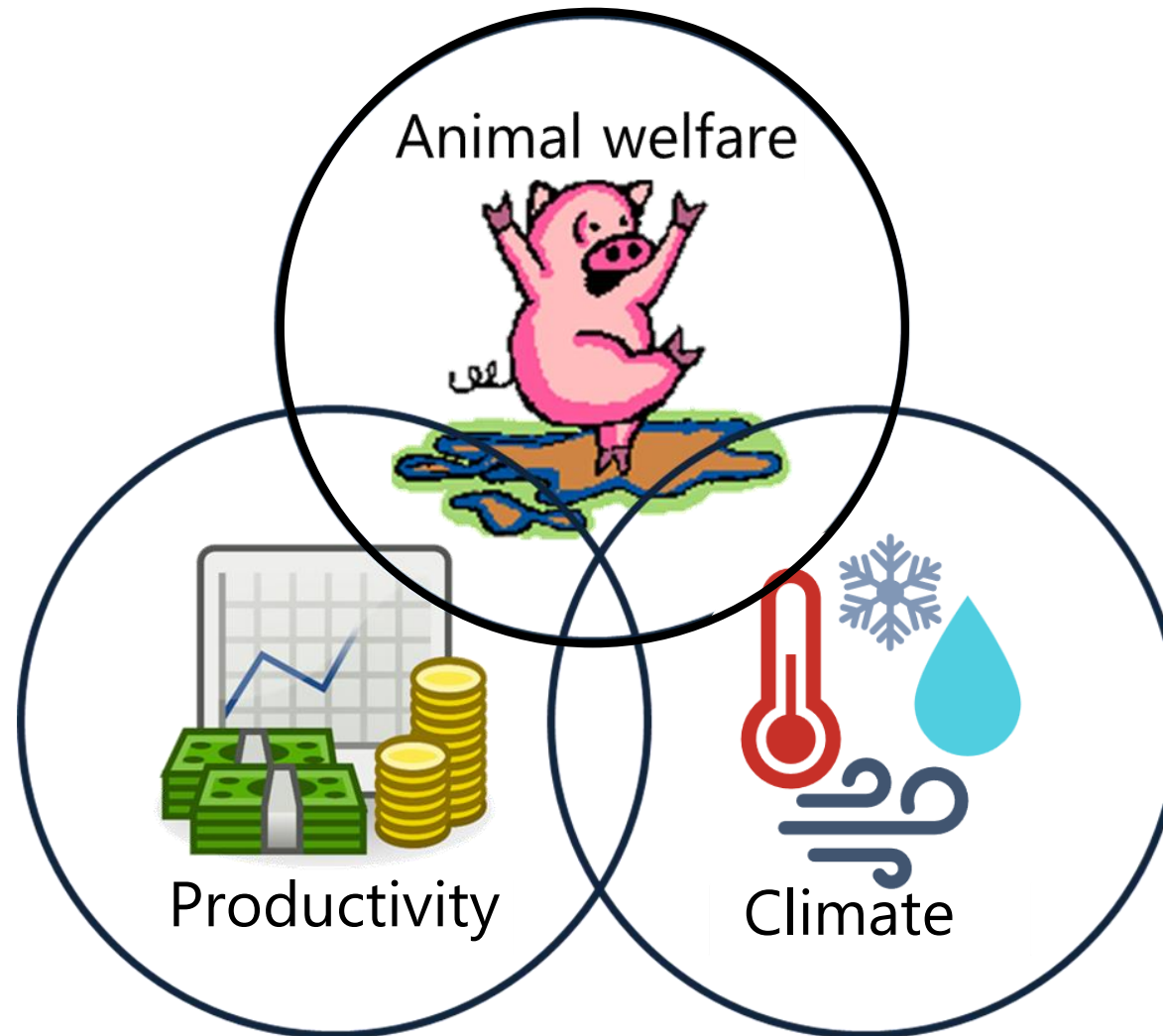
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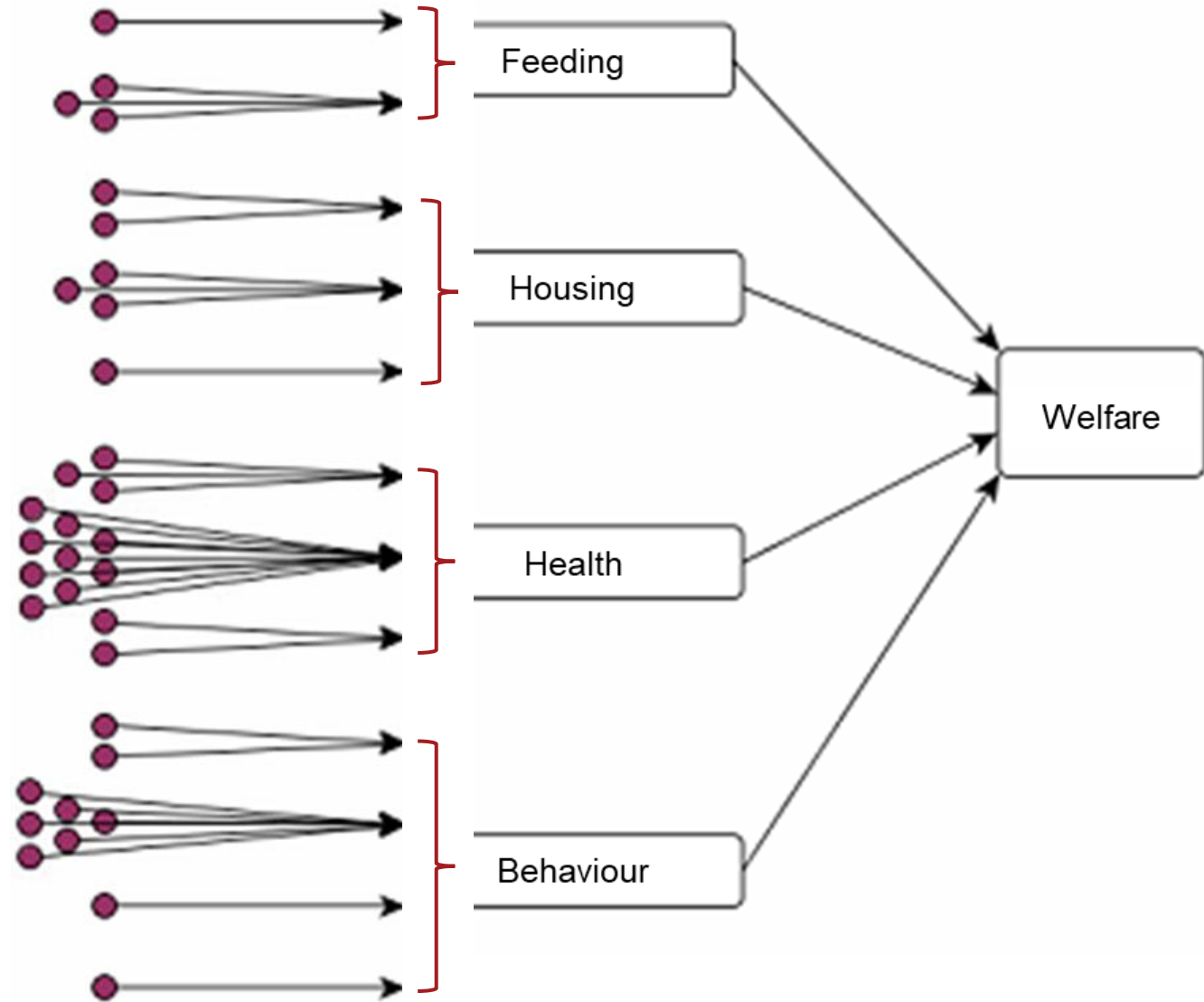


CPH Pig Seminar; January 27th, 2026

Climate factors, animal welfare, productivity



How to assess animal welfare?



How to assess climate factors?



Temperature / relative air humidity

NH₃ sensors

CO₂ sensors

Weather data

How to assess climate factors?

AM

DA

DOL

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

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journal homepage: www.elsevier.com/locate/livsci

Comparison of three different measuring devices of ammonia and evaluation of their suitability to assess animal welfare in pigs

Johanna Witt^{a,*}, Joachim Krieter^a, Kira Schröder^a, Kathrin Büttner^b, Christina Hölzel^a, Katja Krugmann^a, Irena Czycholl^c

Comparisons

ICC



(DA)



(AM)

0.71



(AM)



(DOL)

0.16



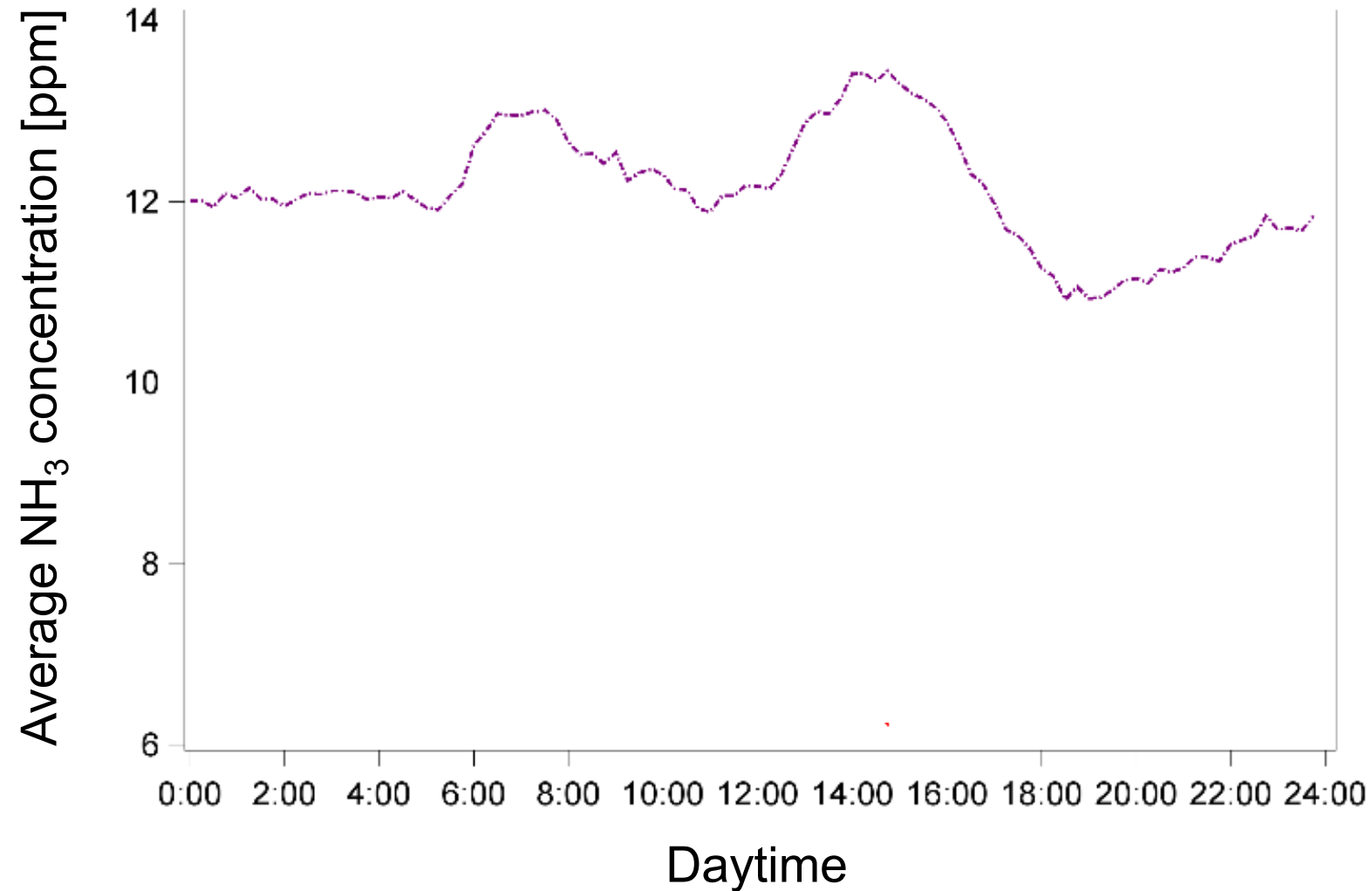
(DA)



(DOL)

0.34

Climate factors – daily patterns



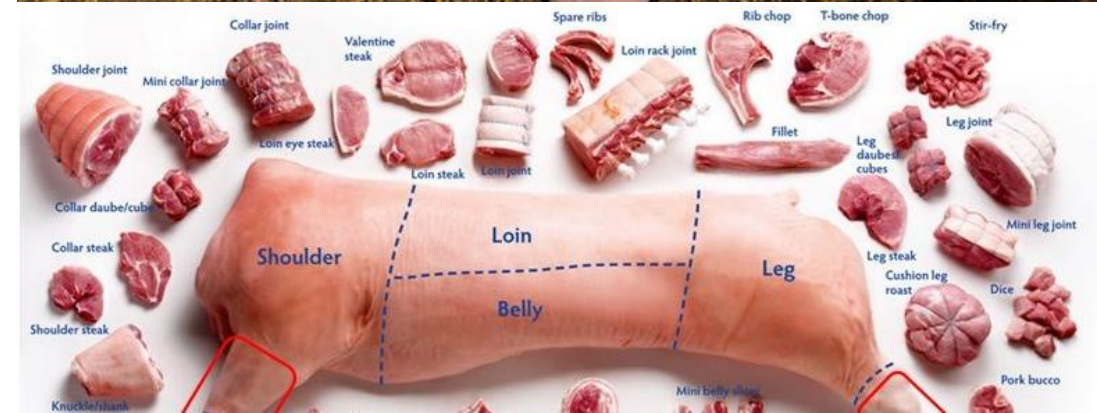
How to assess productivity?

Feed conversion

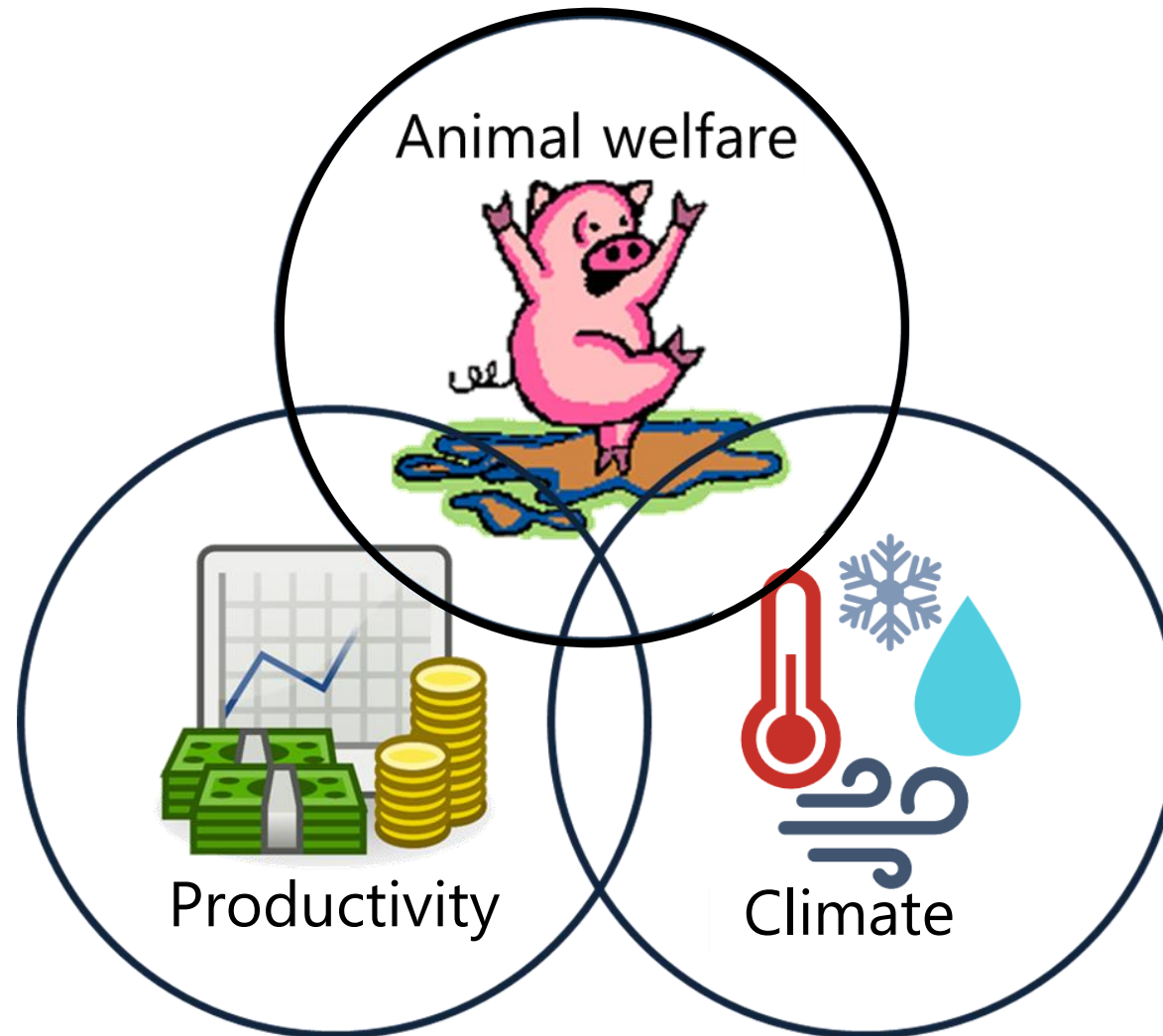
Average daily weight gain

Slaughter weight

Carcass classification (AutoFOM)



Aim: understand interconnections, improve management



Data collection October 2020 – February 2022: farms



Farm A

Organic

50 sows

Slaughterhouse A



Farm B

Conventional

1400 sows

Slaughterhouse B



Farm C

Conventional

60 sows

Slaughterhouse B

3-4 batches, 628 pigs from birth to slaughter

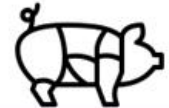
Data collection: weekly farm visits



Weekly assessments



Slaughterhouse indicators



Farrowing

Rearing

Growing

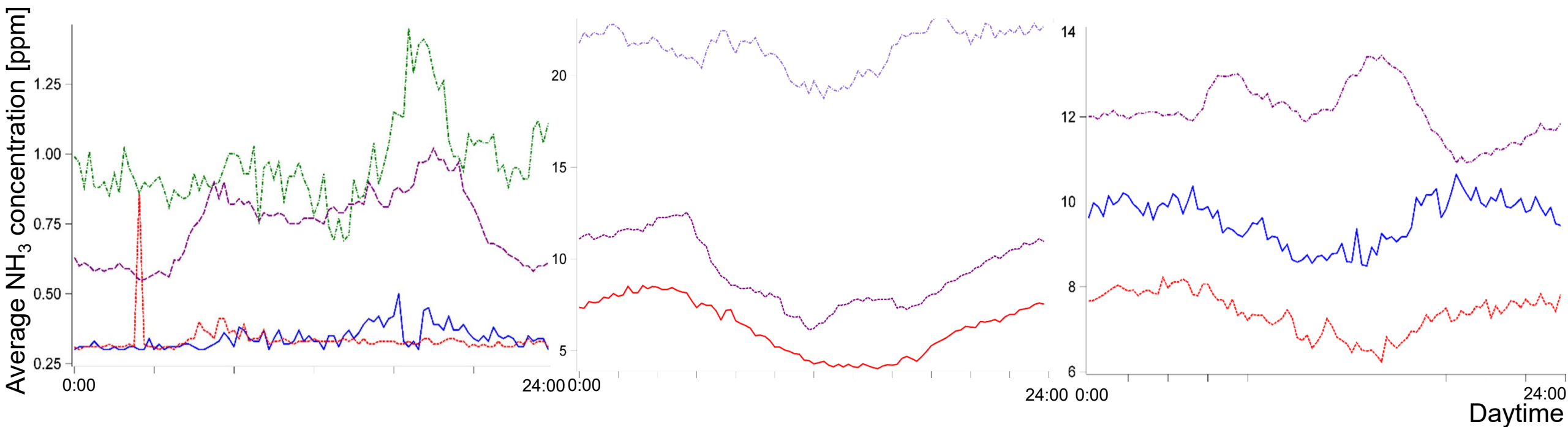
Fattening

Slaughter



Results: NH_3

Daily pattern of the average ammonia concentration of every barn for Farm A, B, C



Farm A (organic)

- Farrowing barn
- Group suckling barn
- Rearing barn
- Fattening barn

Farm B

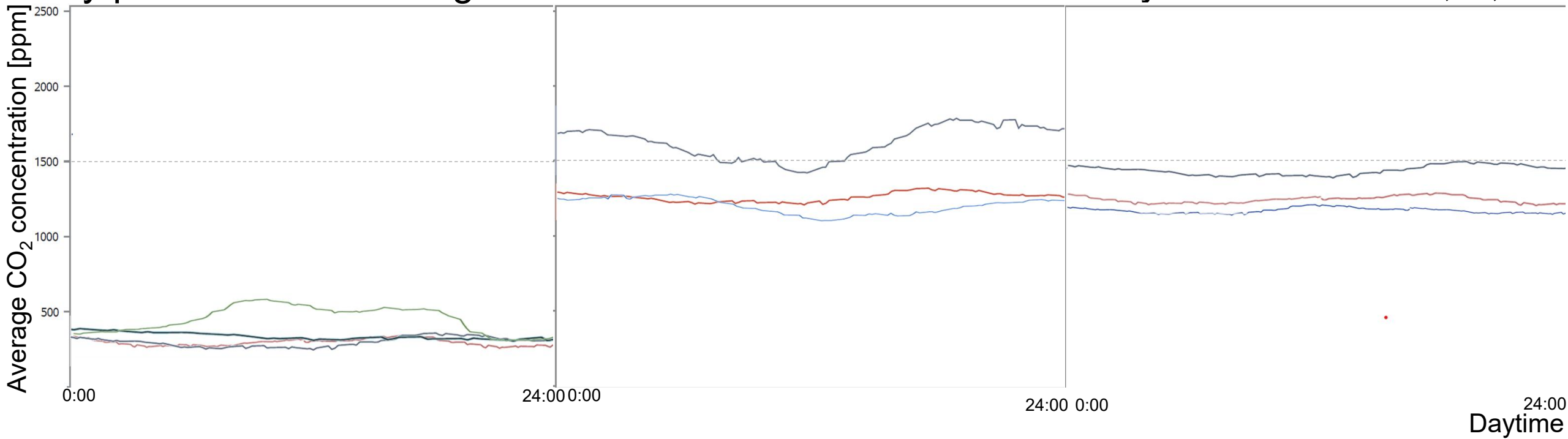
- Rearing barn
- Fattening barn 1
- Fattening barn 2

Farm C

- Farrowing barn
- Rearing barn
- Fattening barn

Results: CO₂

Daily pattern of the average carbon dioxide concentration of every barn for Farm A, B, C



Farm A (organic)

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Farm B

- Rearing barn
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- Fattening barn 2

Farm C

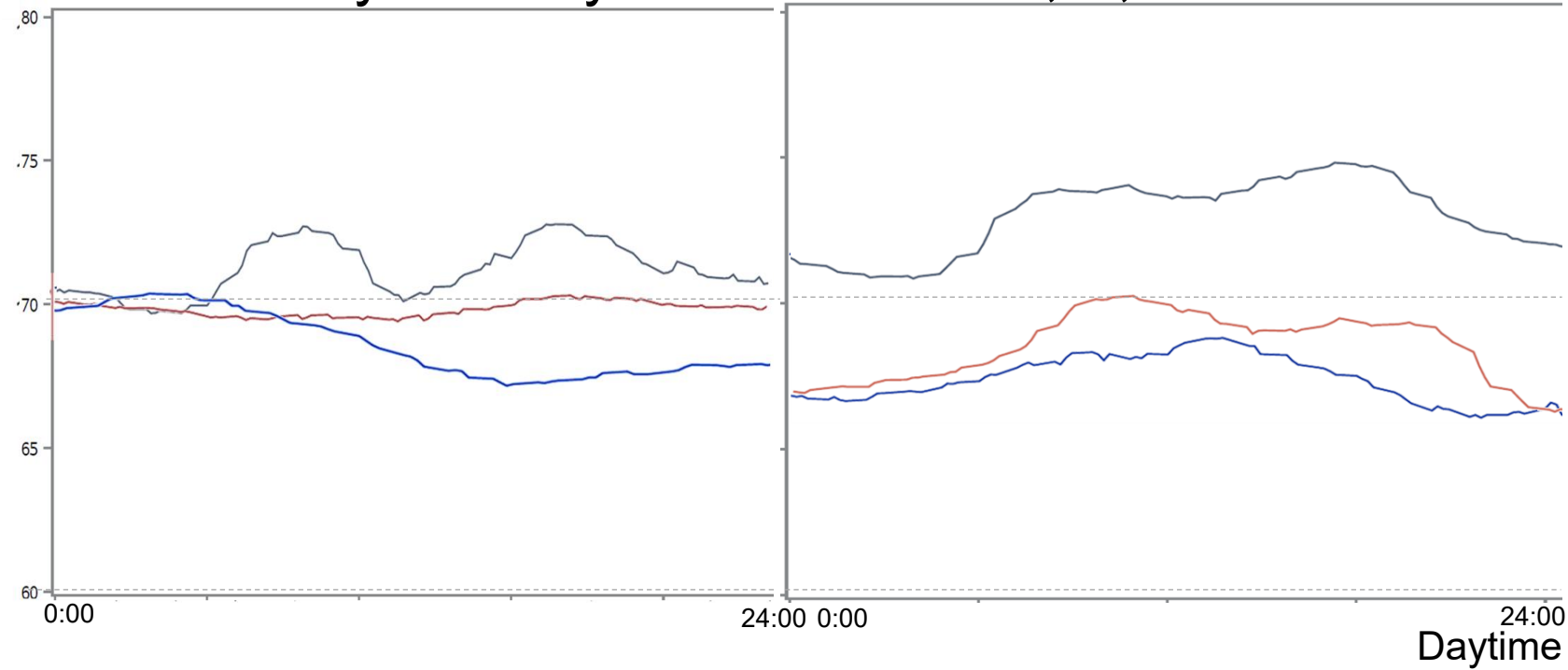
- Farrowing barn
- Rearing barn
- Fattening barn

Results: relative humidity

Daily pattern of the average relative humidity of every barn for Farm A, B, C

Average relative humidity [%]

Results not shown due to strong seasonal influences



Farm A (organic)

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Farm B

- Rearing barn
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Farm C

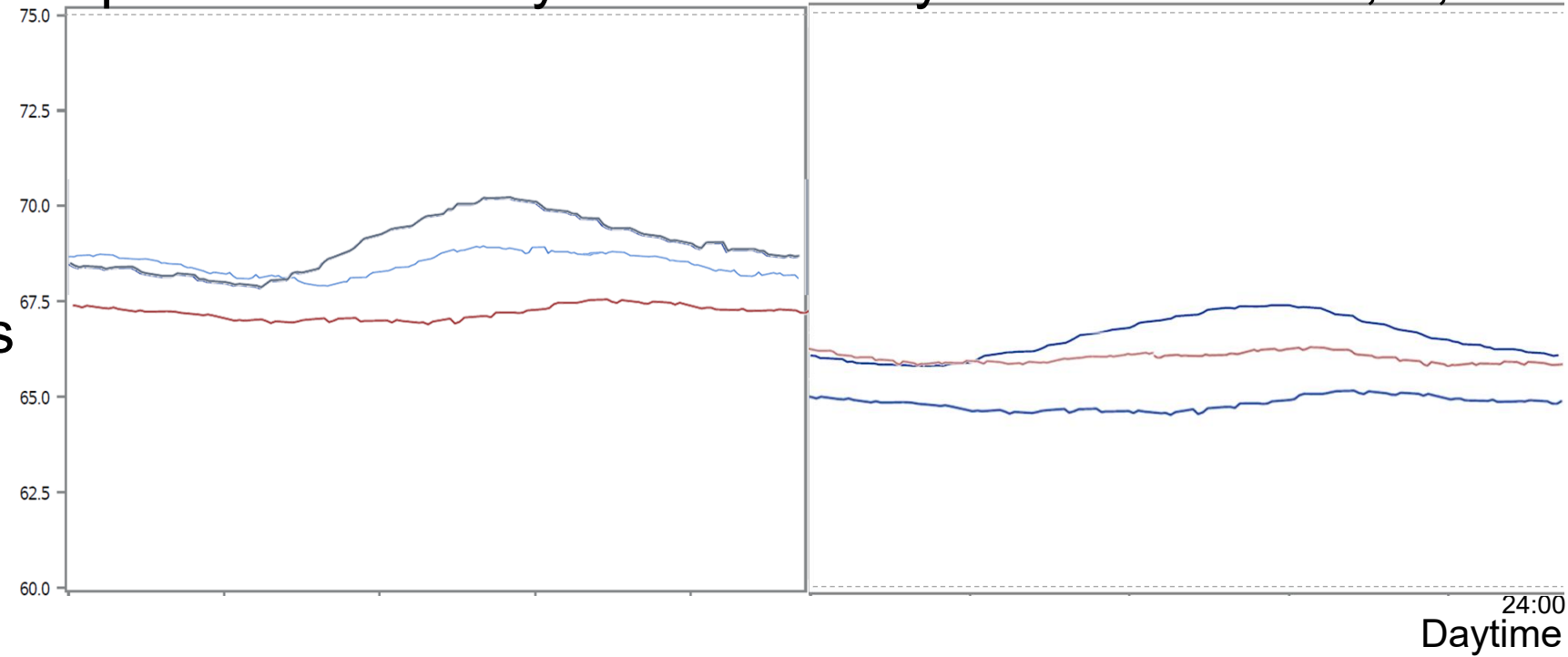
- Farrowing barn
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Results: THI

Daily pattern of the average Temperature Humidity Index of every barn for Farm A, B, C

Average THI

Results not shown due to strong seasonal influences



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Farm C

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- Fattening barn

Interim summary: results: climate factors

- Dependant on production stage (fattening more problematic)
- Dependant on activity phases
- Dependant on specific management routines
- Dependant on ventilation system
- Organic husbandry (outdoor climate) beneficial with regard to CO₂ and NH₃
- Organic husbandry (outdoor climate) can be problematic on specific days with regard to relative humidity and THI

Results: interconnections animal welfare and climate indicators

Indicator	NH ₃		CO ₂		Rel. humidity		THI	
	P-value	Cramer's V	P-value	Cramer's V	P-value	Cramer's V	P-value	Cramer's V
Coughing	<0.0001	0.89	0.04	0.24				
Sneezing							0.02	0.28
Pumping	0.04	0.14	0.05	0.19				
Tail length	<0.0001	0.81			0.02	0.54		
Tail lesions	<0.0001	0.60	<0.0001	0.70	<0.0001	0.62		
Ear lesions			<0.0001	0.60	<0.0001	0.50	<0.0001	0.45
Mycoplasma	<0.0001	1.00	<0.0001	0.91				
Pericarditis	0.05	0.13	0.05	0.14				
Pleuritis								
Pneumonia	<0.0001	0.22	0.01	0.40	0.01	0.31	<0.0001	0.30
Fever					0.03	0.24		

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Summary: interconnections

- No interconnections between animal welfare and productivity
- No interconnections between climate indicators and productivity
- Significant interconnections between animal welfare and climate indicators
 - With regard to relative humidity and THI: may neither be too high nor too low
 - Also short exceedance of the limits can significantly impact welfare

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Thank you for your attention!
Questions?

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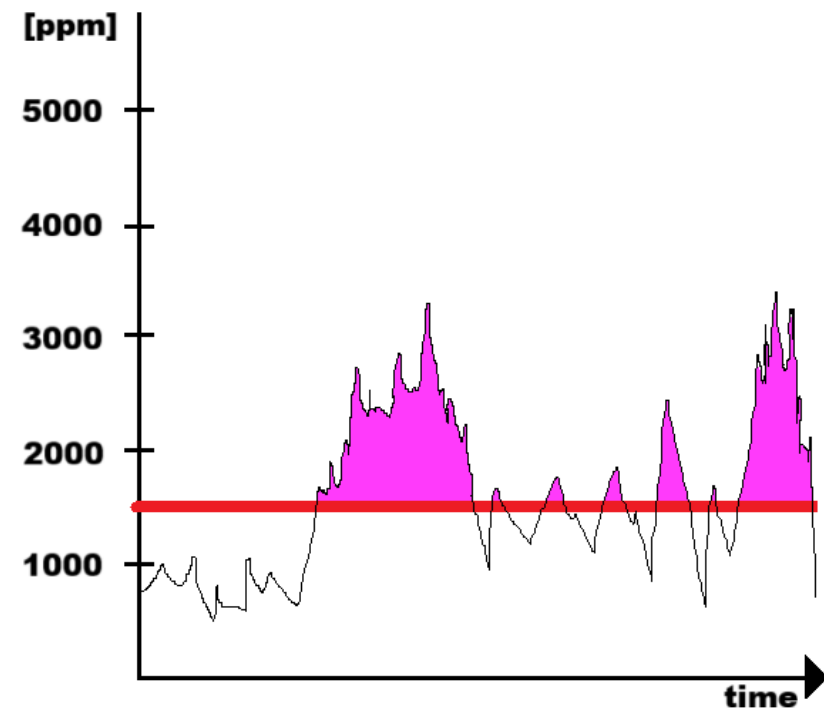
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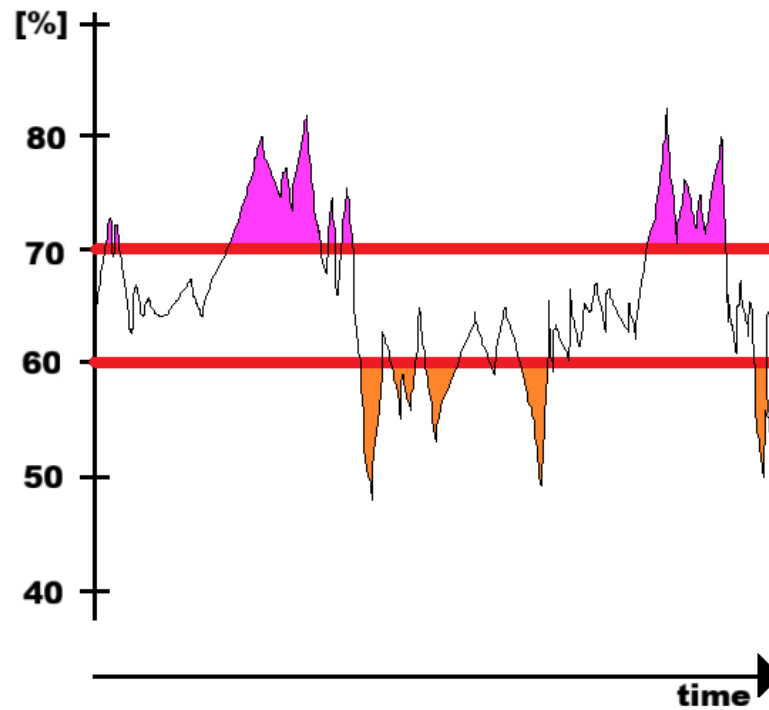
Results: CO₂, relative humidity, THI

Statistical analysis: loads

CO₂ concentration 



humidity 



THI 

