2022 APRIL 27 > 29 in Namur, BE
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interreg North-West Europe
DDairy
innovations to benefit cow welfare and dairy farming sustainability

Deployment of models predicting compressed sward height on Wallonia: quality and validity of the predictions

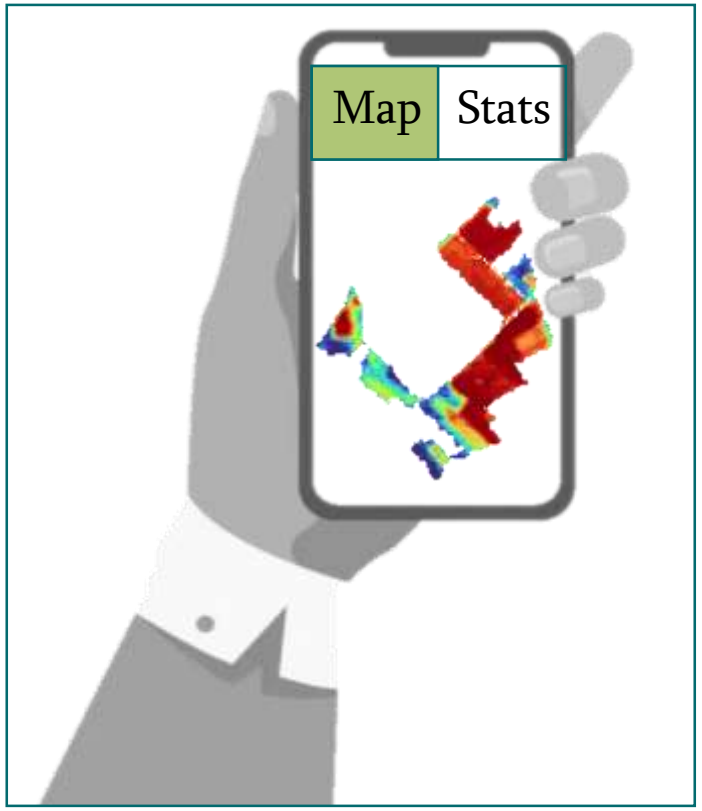
Nickmilder, C., Tedde, A., Dufrasne, I., Lessire, F., Tychon, B., Curnel, Y., Bindelle, J., Soyeurt, H.

LIÈGE université Gembloux Agro-Bio Tech
Avec le soutien de la Wallonie
eleveo together for the best breeding in Wallonia
150 ANS Wallonie recherche CRA W
cta

27 April 2022

The Objective:

Decision support system to help manage feed wedge



Map	Stats

Parcel id:

123456

Mean available CSH:

XX mm

Theoretical biomass:

YY kg

Cattle load:

XX cows

Feed need:

XX kg/cow/day

Need for diet complement?

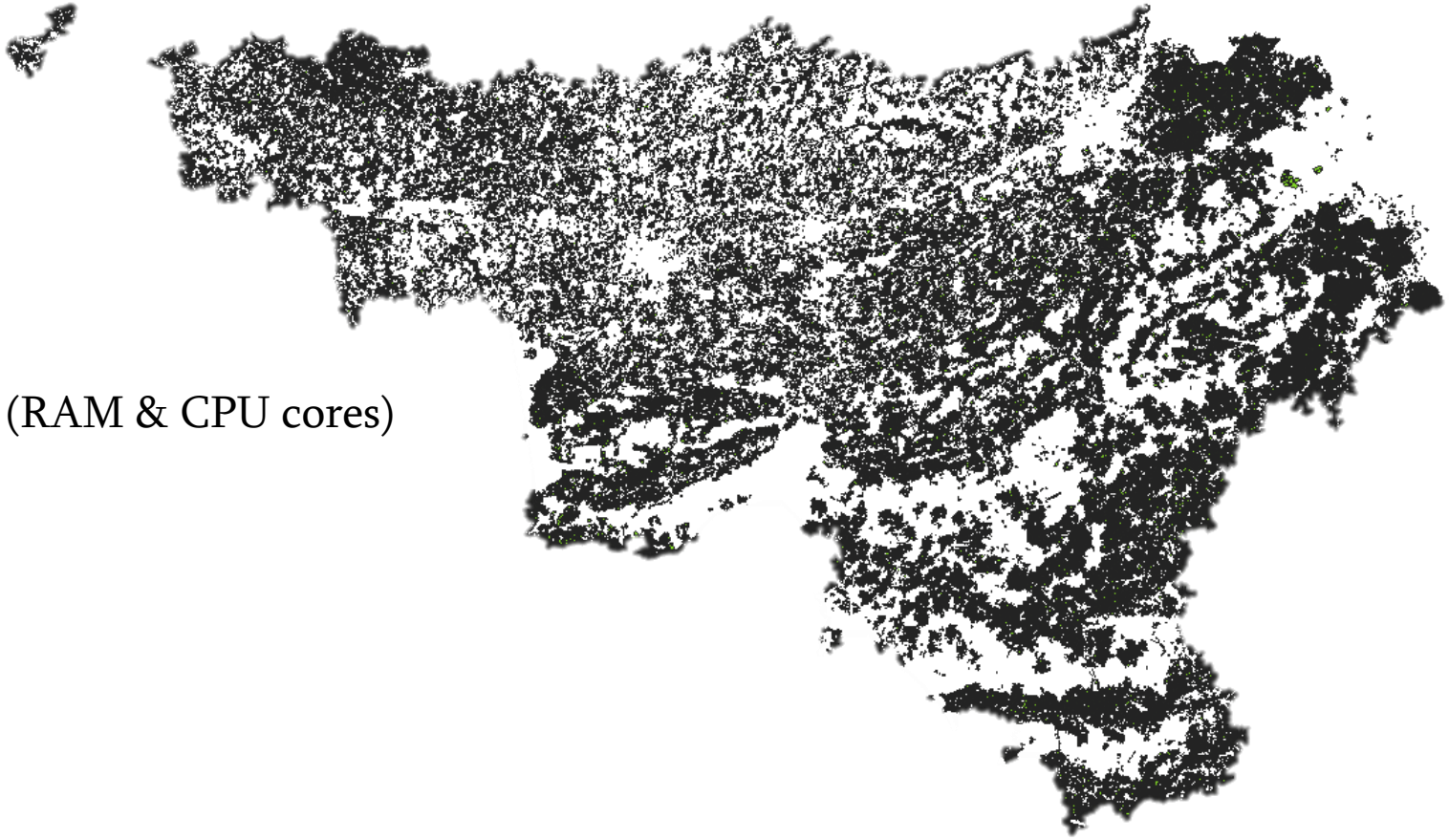
YES	NO

Image source:
Technologie vecteur créé par pch.vector - fr.freepik.com

The Problem:

How to provide consumers with predictions?
Local computing approach

- Number of pastures (in 2018): 194,657
- Spatial repartition: all over Wallonia
- Size of the original data
  - Sentinel-1: 7Gb
  - Sentinel-2: 2Gb
- Need for compute resources (RAM & CPU cores)



The Solution:

How to provide consumers with predictions? Central computing approach

- Compute needs for Wallonia
  - 250 Gb RAM
  - >16cores
  - Runtime: up to 5,5 hours

- Real time? Impossible
  - Near real-time: prediction at once in the night

- Transmission
  - predicted CSH
  - (other features)

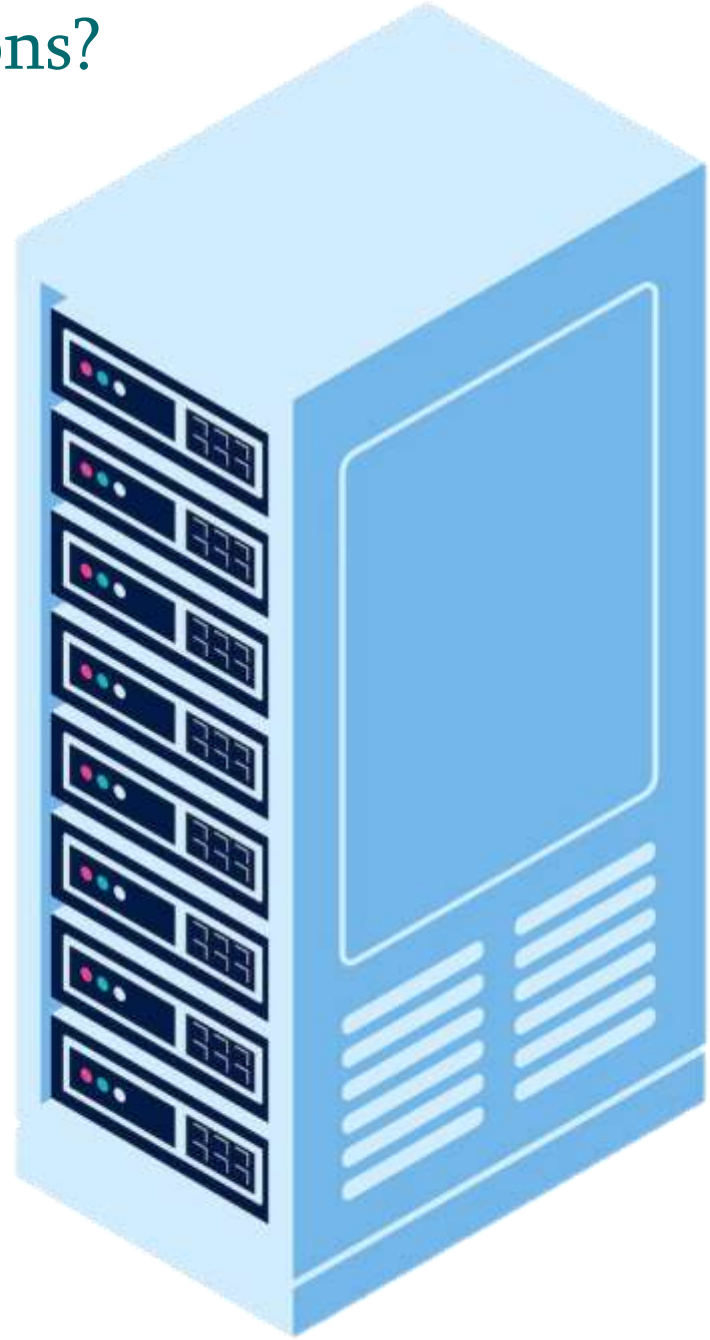
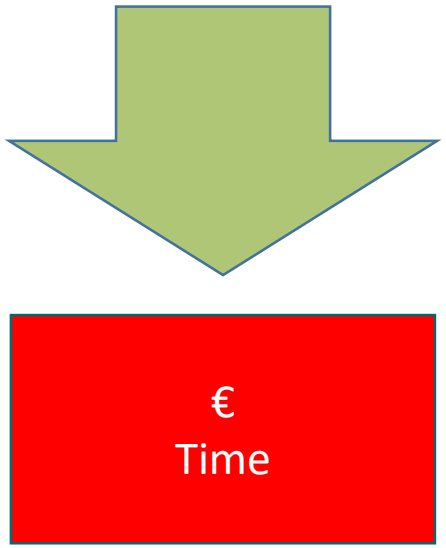


Image source: Technologie vecteur créé par upklyak - fr.freepik.com

The Solution:

Can you trust the predictions?

- Classical validation:
  - External dataset
  - Study of metrics translating the error
  - Study predictions VS original values



Your cattle rely on it…

- "Unsupervised validation"
  - Range of predictions
  - Statistical descriptors
  - Stability/variation of the values
  - Spatial consistency

The Study:

Unsupervised validation through the study of the population of predictions

- Descriptive « population » parameters (year 2021)

Criterion	Observed value	Note
N obs	537,601,345	w/o non-finite values & w/ extreme values

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- Descriptive « population » parameters (year 2021)

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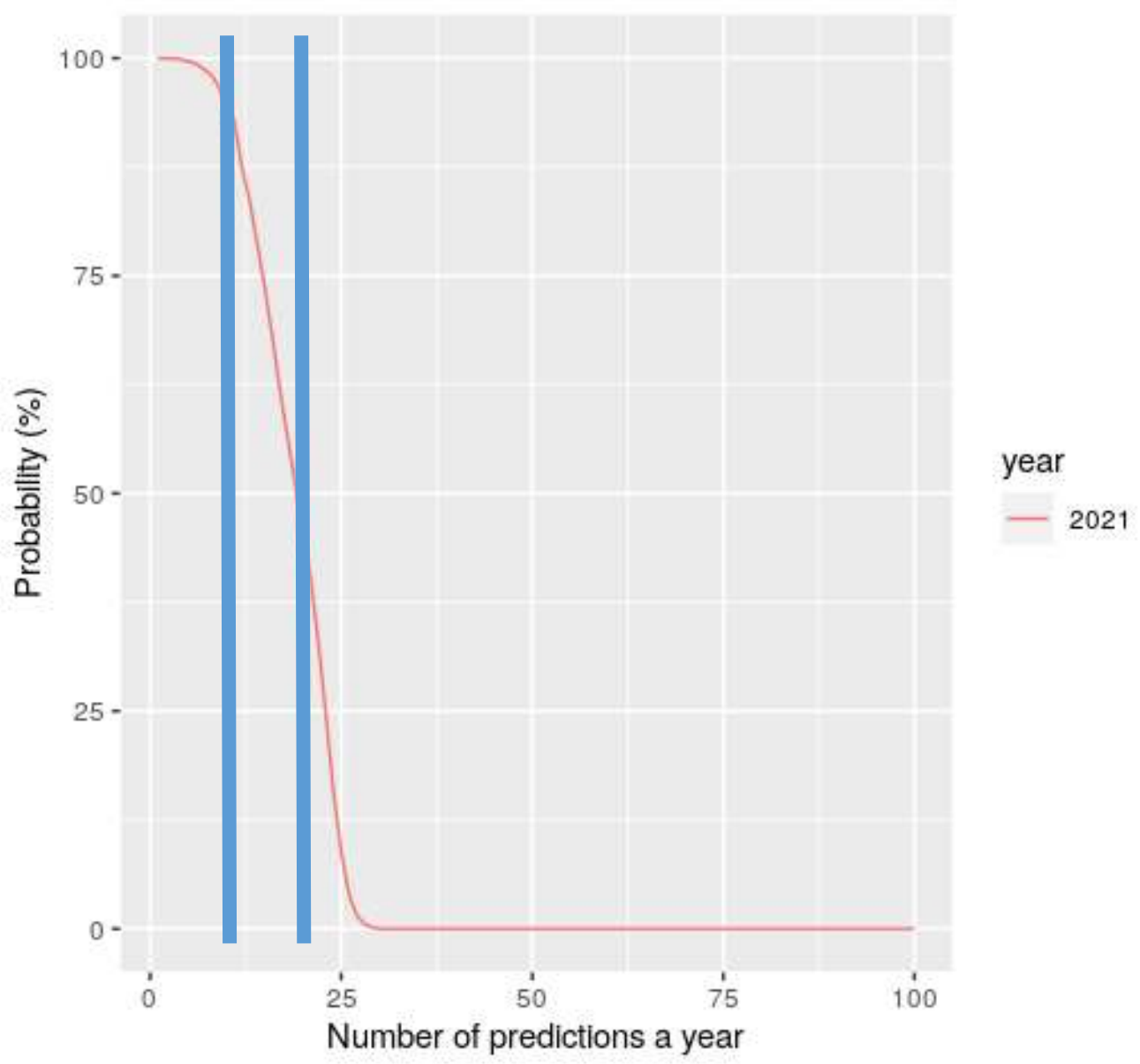
cv / date*parcel	From 0 to 986%	w/o extreme values: from 0 to 303%
Frequency	From 1/month to > 10/month	Major constraint: clouds

The Study:

Unsupervised validation through the study of the population of predictions

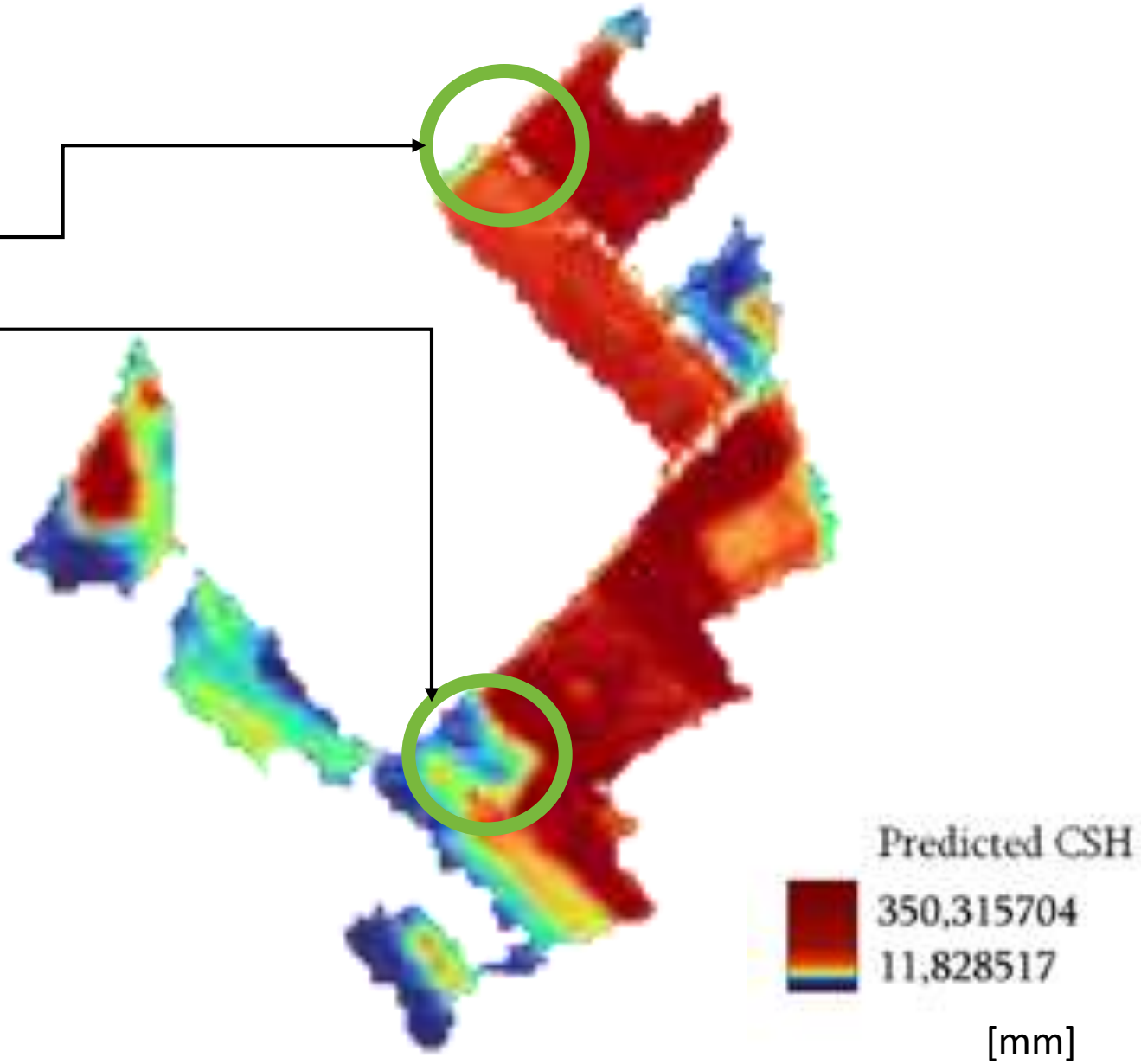
- Descriptive « population » parameters
  - Focus on the frequency



The Study:

Unsupervised validation through the study of the population of predictions

- Spatial continuity
  - Gaps/holes?
  - Changes
- Spatial meaning
  - Is a parcel one parcel?



It worked…

… if you try it at home, be cautious to:

- The amount of compute power needed
- The range and repartition of the predicted values
- The availability frequency
- The spatial quality of the predictions

Take home message

Thank you for your attention

Questions?

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Thanks to our partners

Thanks to the walloon Region for funding the ROAD-STEP project

Development of Machine Learning Models to Predict Compressed Sward Height in Walloon Pastures Based on Sentinel-1, Sentinel-2 and Meteorological Data Using Multiple Data Transformations

by Charles Nickmilder [1,*], Anthony Tedde [1], Isabelle Dufrasne [2,3], Françoise Lessire [3], Bernard Tychon [4], Yannick Curnel [5], Jérome Bindelle [1] and Hélène Soyeurt [1]

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Accuracy

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