

Grasslands monitoring in Wallonia (Belgium) using Sentinel images



SPACE4AGRICULTURE



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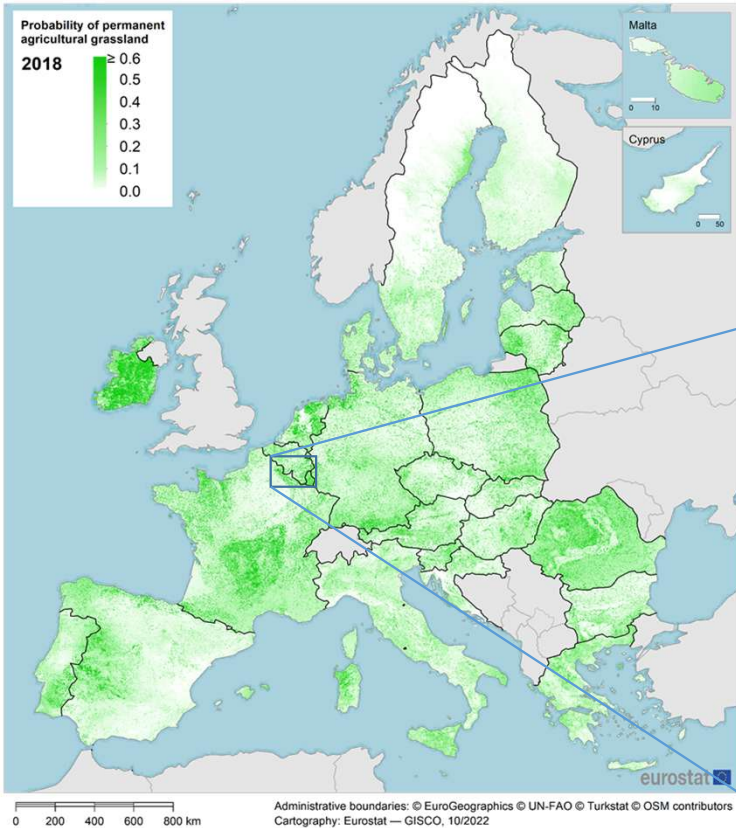


04-04-2025

Permanent grasslands represent a major ecosystem in Europe and in Wallonia

EU : ~ 30.5%

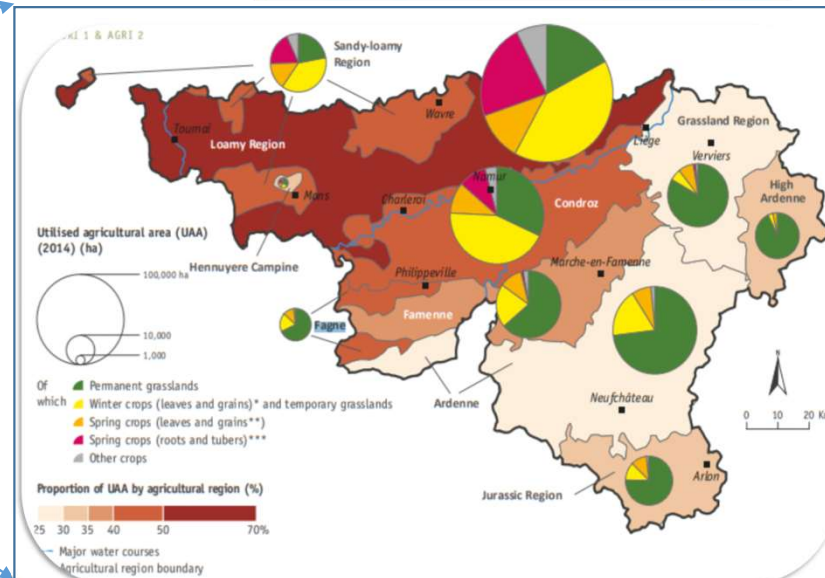
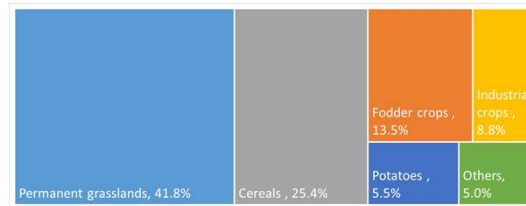
(Utilised Agricultural Area - UAA)



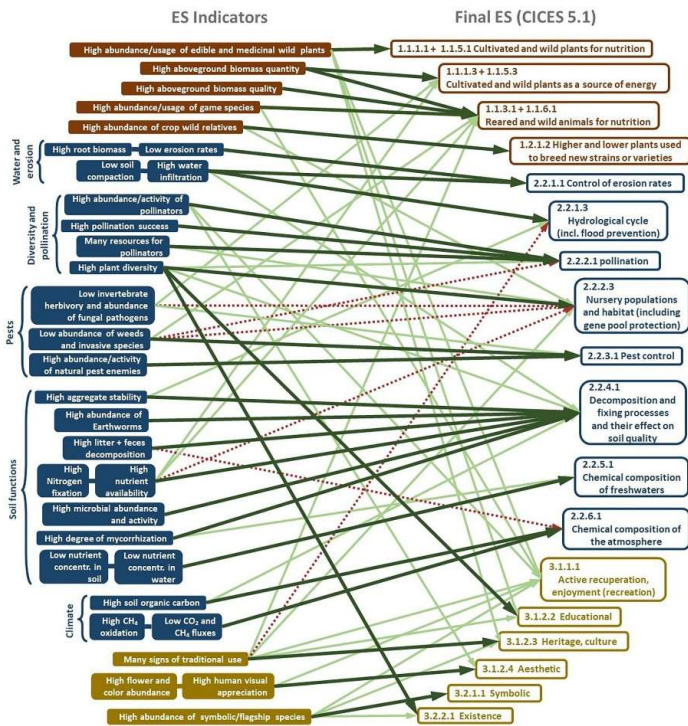
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the European Union.
Source: Eurostat (estimation based on LUCAS 2018, Copernicus HRL — Grassland 2018 and CORINE Land Cover 2018)

Wallonia : 42 % UAA
Economic Importance!

UAA: 738 927 ha
(SPW – 2022)

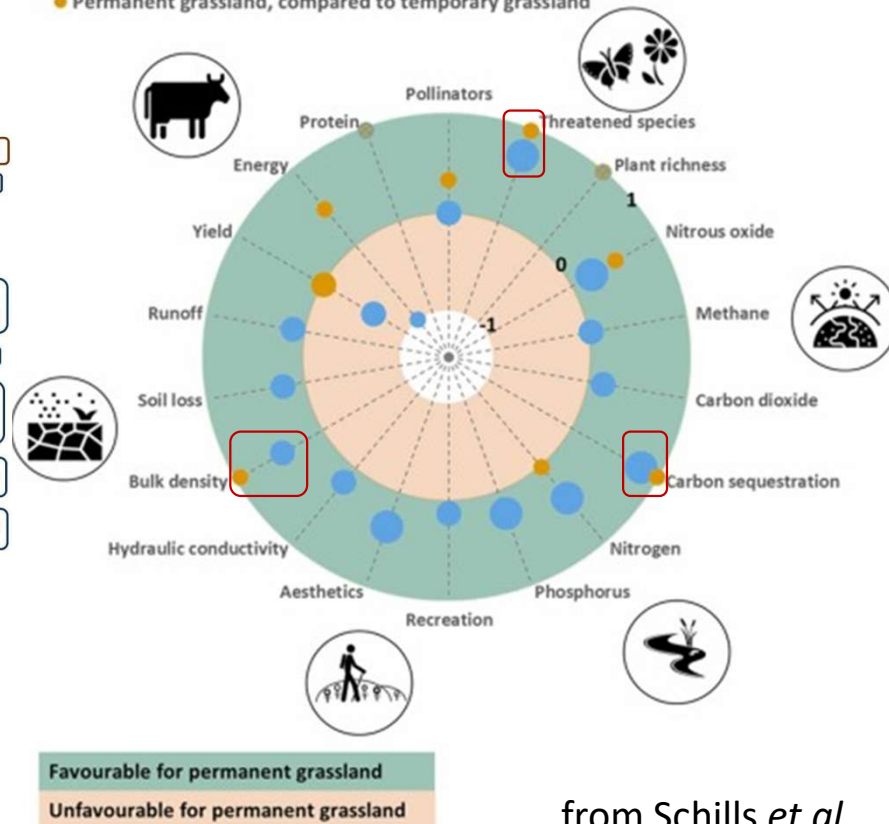


Grasslands provide many different ecosystem services



from Richter *et al.*, 2021

- Permanent grassland, compared to cropland
- Permanent grassland, compared to temporary grassland

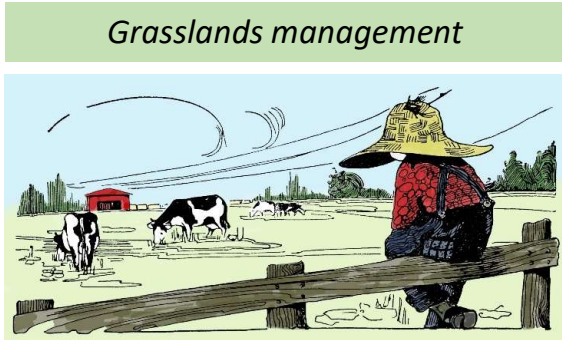


from Schills *et al.*, 2022

Protection and **sustainable management of grasslands** is critical for both the protection of biodiversity and climate.



Estimation of the grass biomass at the parcel/farm scale



Grasslands management

Challenging / tricky especially in changing climate

Time consuming...



Grasslands growth

Managing grasslands fields is therefore complex and challenging especially in the climate change context.

The **W@llHerbe** decision support system has been designed to assist farmers in their daily management and public authorities for the assessment of extreme weather events impact on yearly yields.



Partners



Founded by
Walloon
Recovery Plan



RESEARCH PROJECT
(2022-2025)

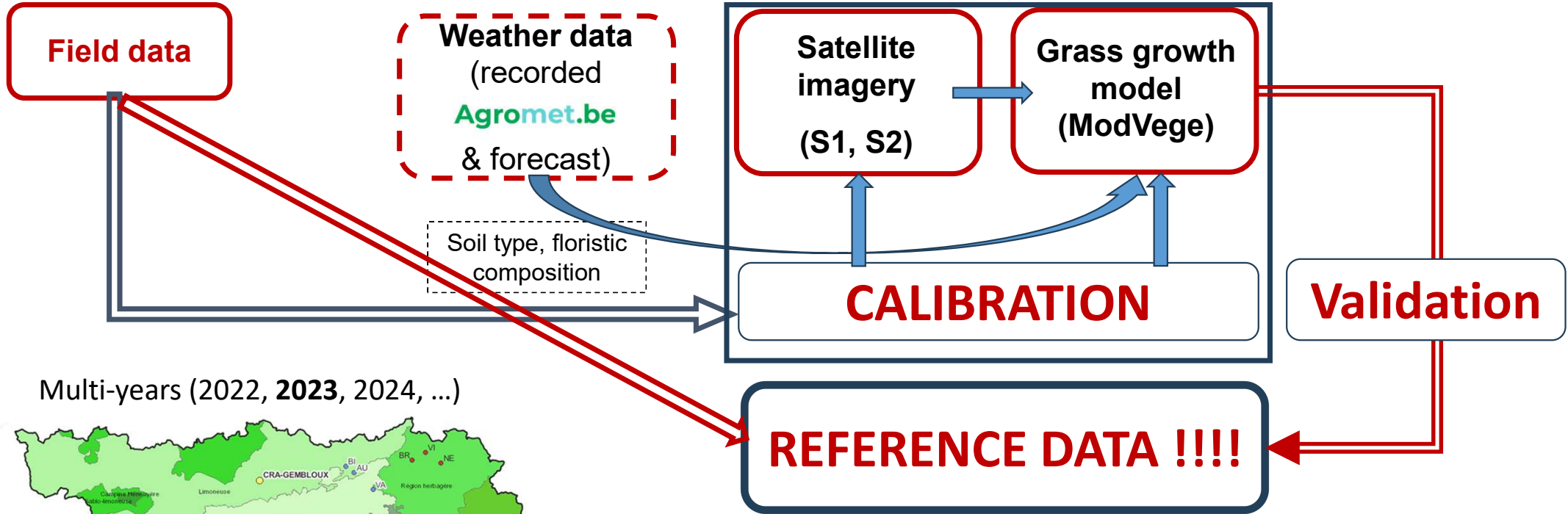


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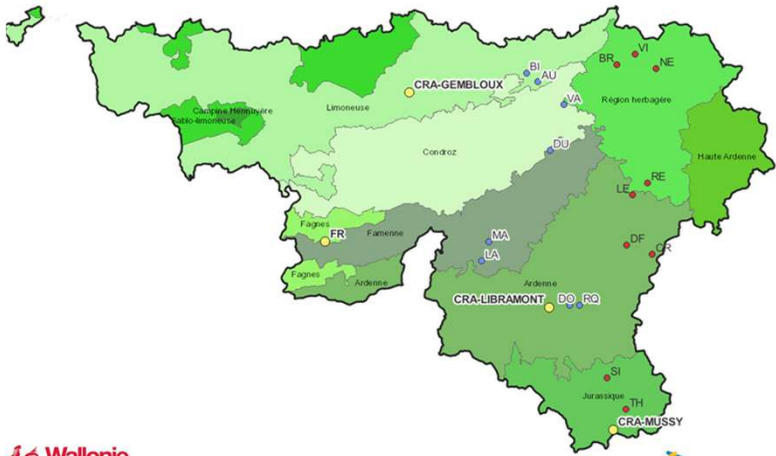
4/04/2025



Data used for estimation of the grass biomass at the parcel/farm scale



Multi-years (2022, 2023, 2024, ...)



Geolocalized compressed sward height (CSH) on a weekly basis

Fresh and dried biomass monthly (+ grass quality)

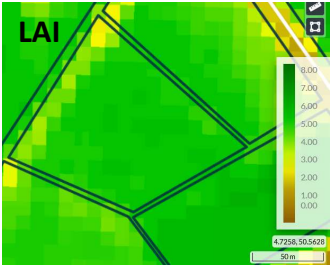
Management calendar
.....

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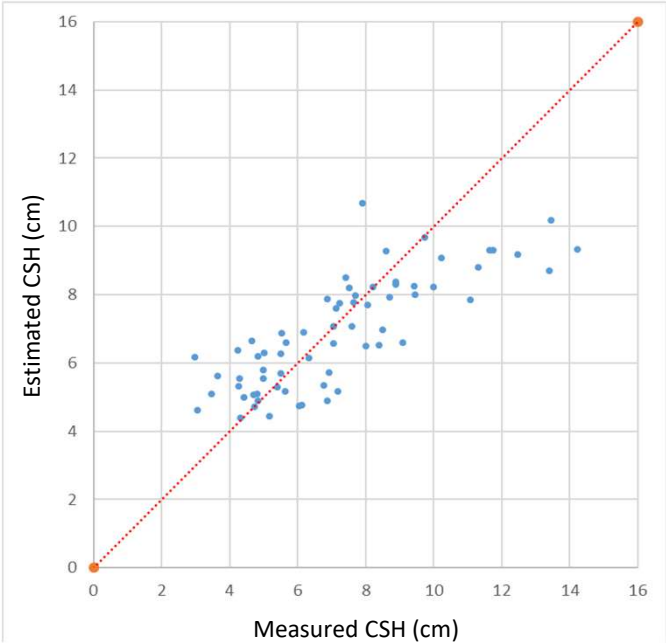
4/04/2025

Estimation of the grass biomass at the parcel/farm scale – Sentinel 2 images

Sentinel 2
(LAI)



20/04/22



MAE = 1,3 cm
RMSE = 1,7 cm



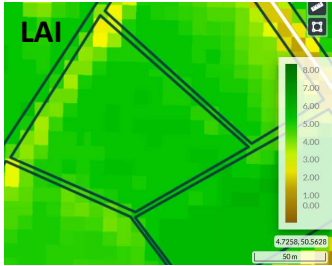
MAE = 280 kg DM/ha
RMSE = 370 kg DM/ha

Estimation of the grass biomass at the parcel/farm scale (Sentinel 1+2 images + ModVege)

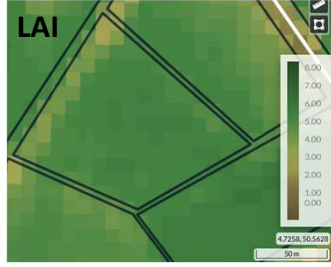
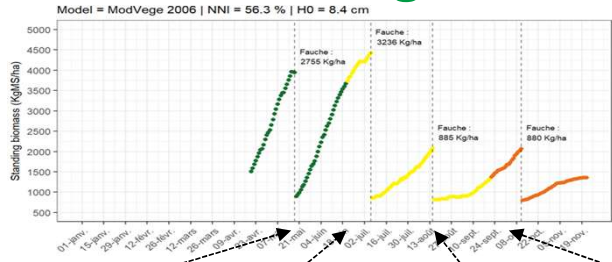


Grass growth model
ModVege

Sentinel 2
(LAI)



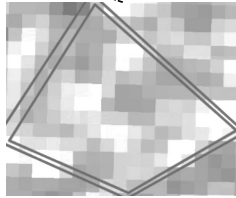
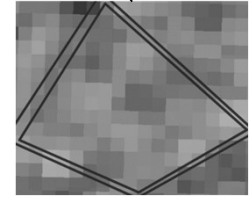
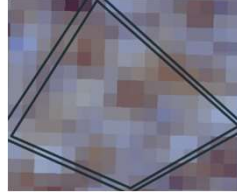
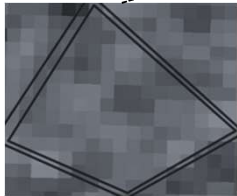
20/04/22



04/06/22

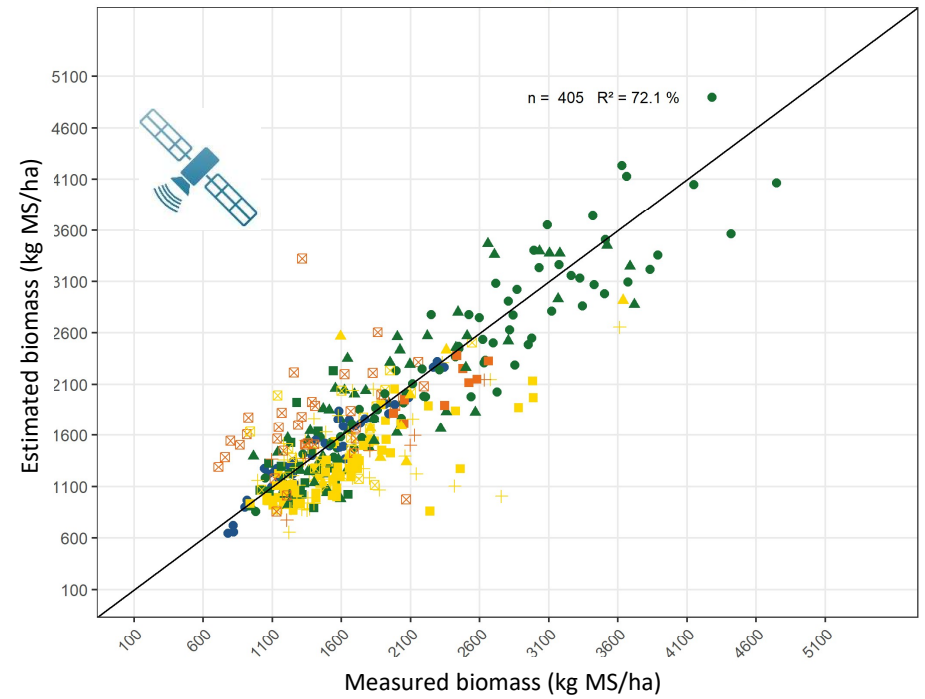
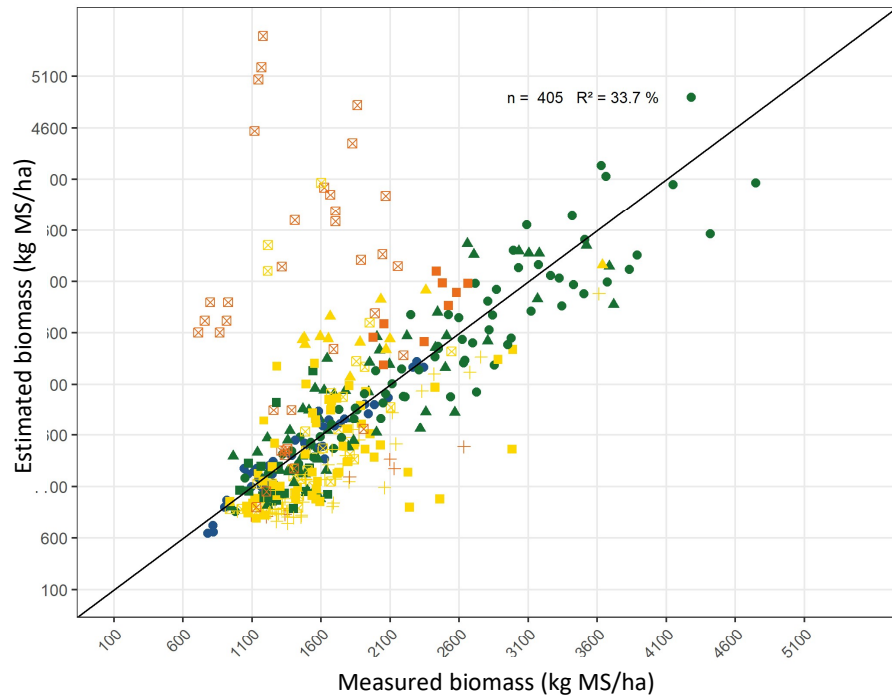
MOWING / GRAZING

Sentinel 1
(S1B) S1C



+ Sentinel 2 : CropSAR (<https://terrascope.be>)

Estimation of the grass biomass at the parcel/farm scale (Sentinel 1+2 images + ModVege)



- C0 ▲ C1-2 ● fall ● spring
- C2-3 + C3-4 ● summer ● winter
- ⊠ C4-5

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- C2-3 + C3-4 ● summer ● winter
- ⊠ C4-5

Estimation of the grass biomass at the parcel/farm scale (Sentinel 1+2 images + ModVege)

ModVege

season	ND	RMSE	RMSEr	EF
fall	0.72	1857.75	1.14	-11.31
spring	-0.02	342.48	0.16	0.84
summer	-0.09	586.63	0.36	-0.61
winter	0.00	109.70	0.08	0.93



ModVege + S2

season	ND	RMSE	RMSEr	EF
fall	0.08	522.92	0.32	0.02
spring	-0.02	340.96	0.16	0.84
summer	-0.15	440.09	0.27	0.09
winter	0.00	109.70	0.08	0.93

dRMSE = -70%

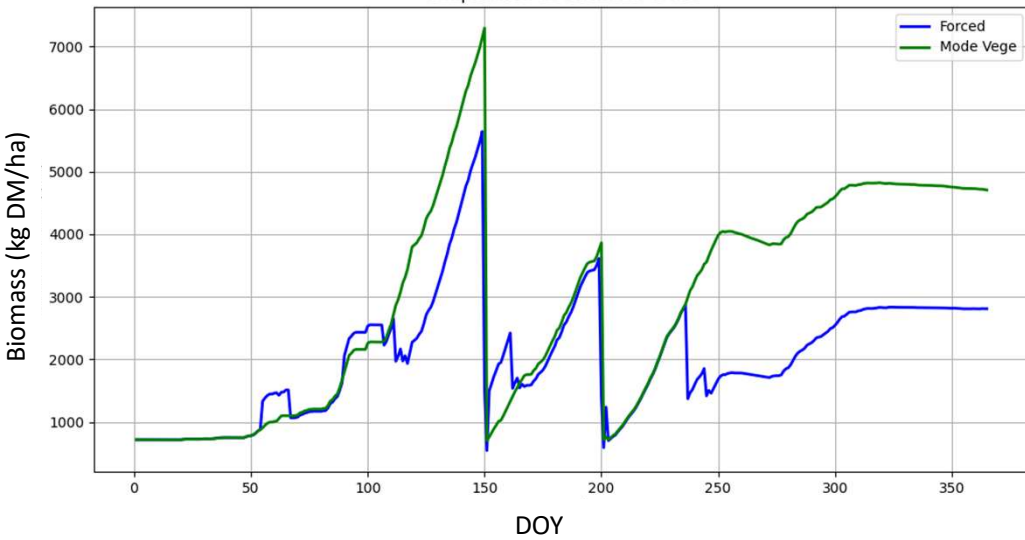


dRMSE = -25%

Estimation of the grass biomass at the parcel/farm scale (Sentinel 1+2 images + ModVege)



Simulated biomass



Estimation of the yearly yield at the farm scale (Sentinel 1+2 images + ModVege)

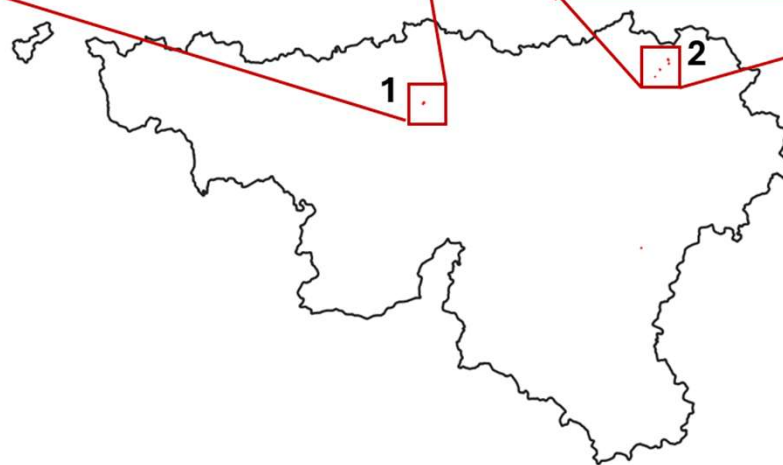
Farm 1:

- Three parcels of permanent grasslands - 22,5 ha.
- Mowing, grazing



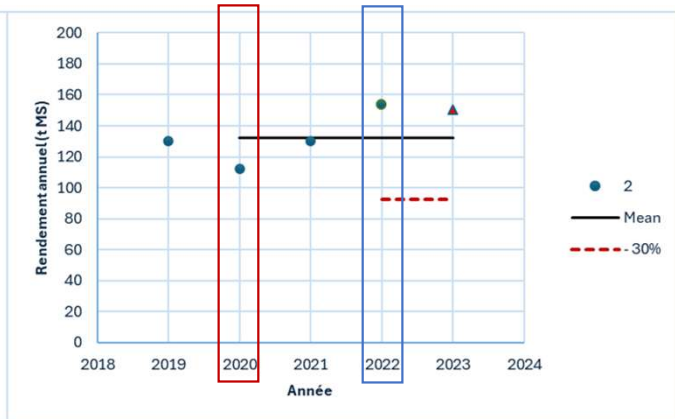
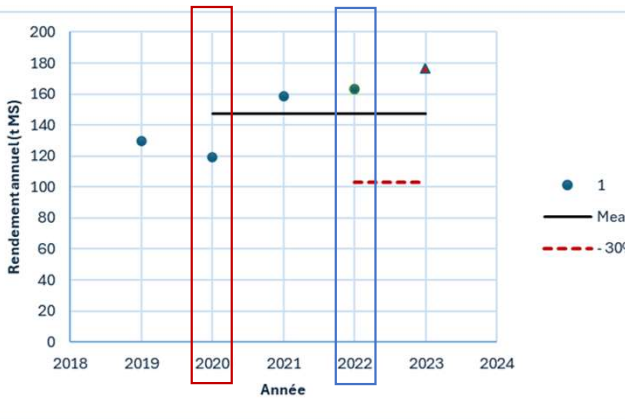
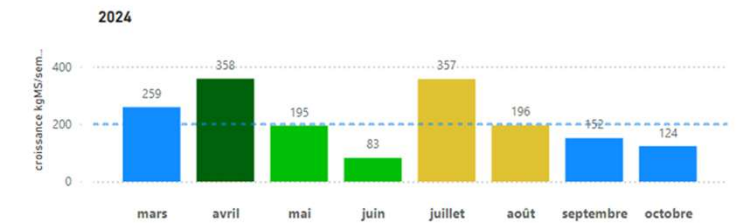
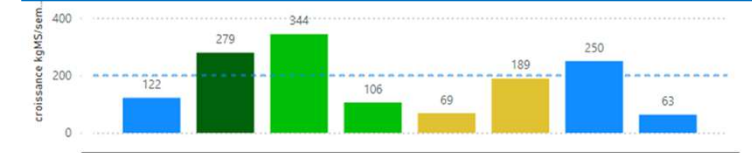
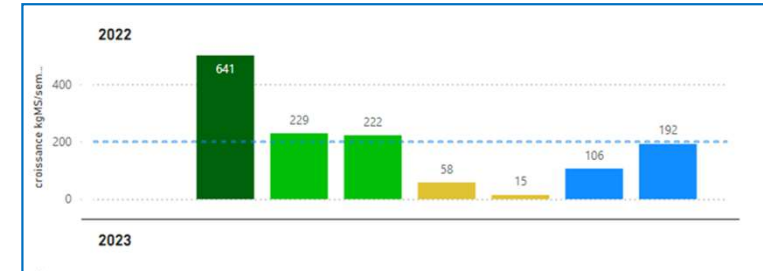
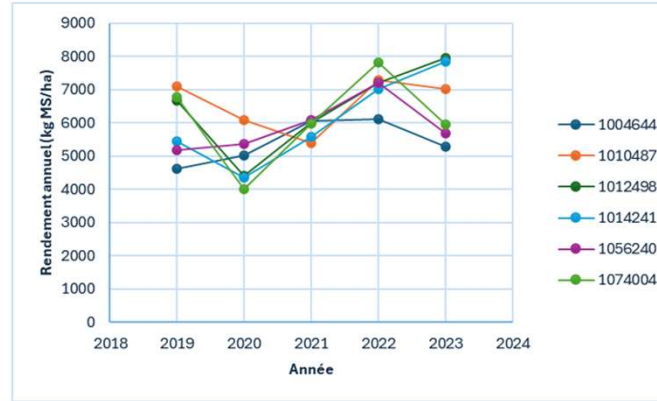
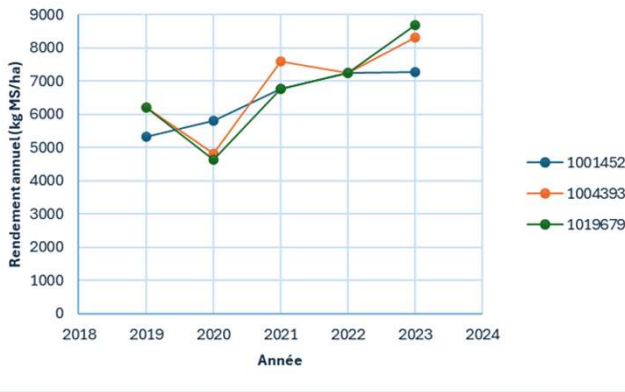
Farm 2:

- Six parcels of permanent grasslands - 22,4 ha.
- Mowing, grazing



Estimation of the yearly yield at the farm scale (Sentinel 1+2 images + ModVege)

Reference data (field measurements)



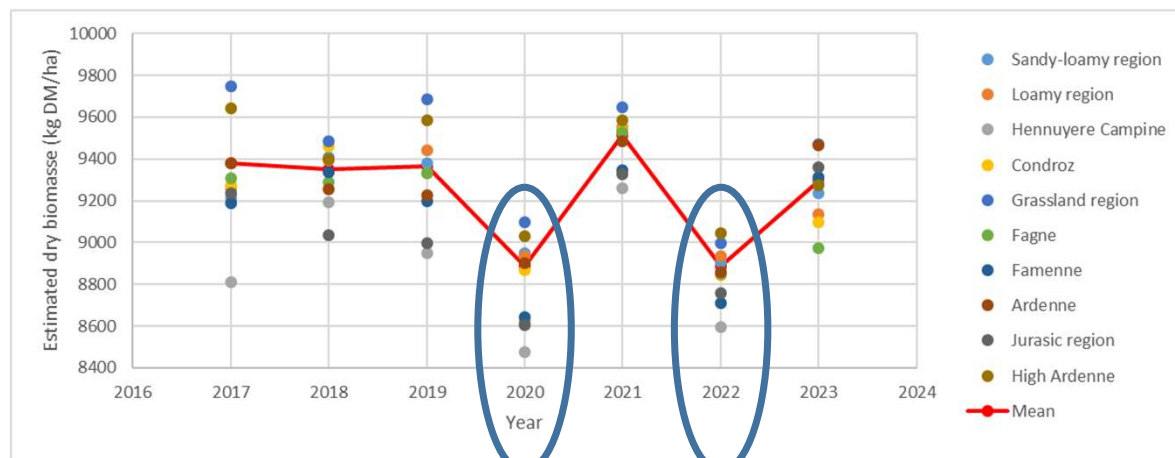
Estimation of the yearly yield at the regional scale (Sentinel 2 images)

85504 permanent grasslands parcels

- same crop type since 2017
- ± same areas since 2017
- > 0.5 ha

Région	Nb de parcelles
Sablo-Limoneuse	4189
Limoneuse	15699
Campine Hennuyère	81
Condroz	10123
Région herbagère	11146
Fagne	2388
Famenne	9112
Ardenne	17239
Région jurassique	6320
Haute-Ardenne	9207

Agricultural regions



* - not calibrated values !

2020 and 2022 officially recognised as disasters for farmers in Wallonia....

THANK YOU FOR YOUR ATTENTION!



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