Digital assessment of straw yield components

Signe M. Jensen
smj@plen.ku.dk
Department of Plant and Environmental Sciences
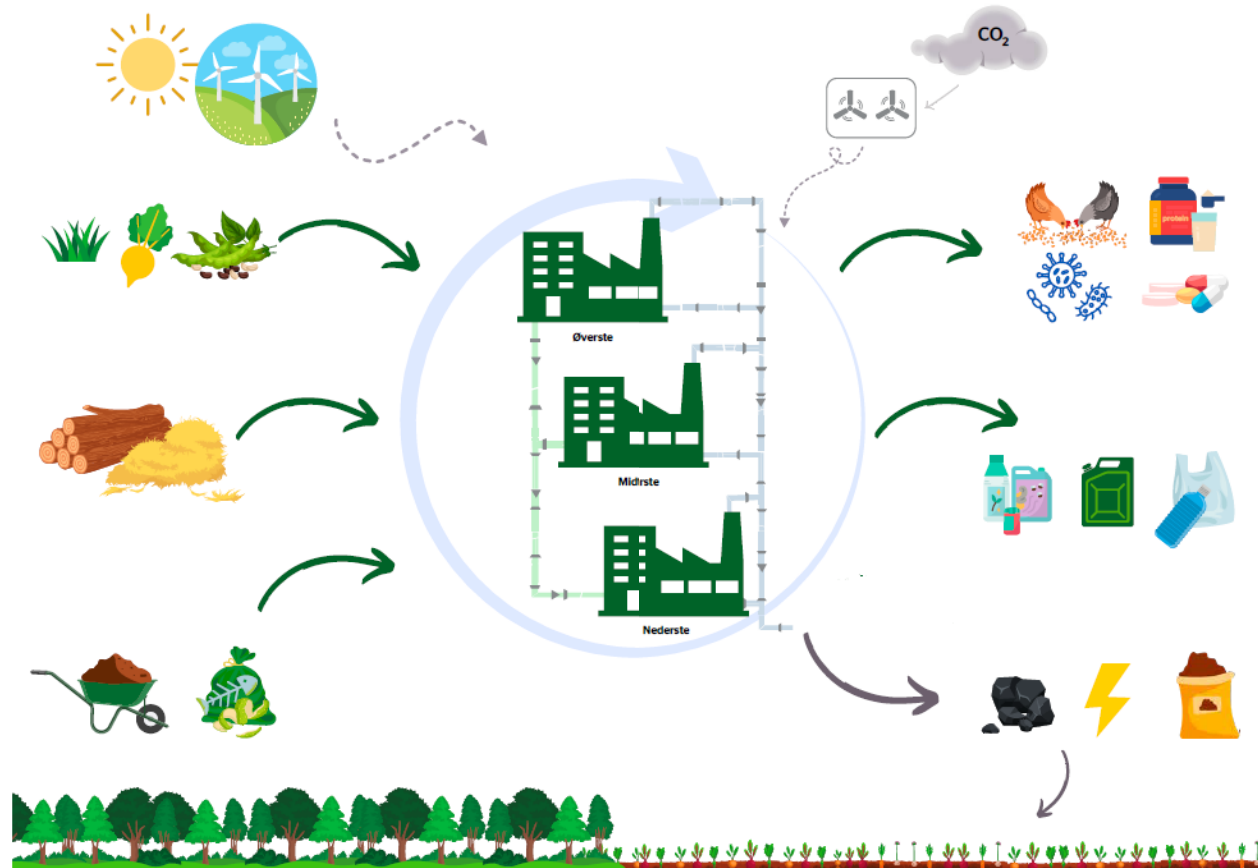
Bæredygtigt Landbrug
SEGES INNOVATION
LANDBRUG FØDEVARER
Konkurrencedygtig Planteproduktion

Promilleafgiftsfonden for landbrug

Biomass – a limited resource with many applications

And currently, we are nowhere near producing enough biomass to meet the demand of a fossil-free future!

More straw from breeding is possible...

The National Bioeconomy Panel: "Straw is one of the bioresources that can both be increased significantly and is not utilized optimally today."

Harvest technology can increase the amount of straw we collect – get it all.
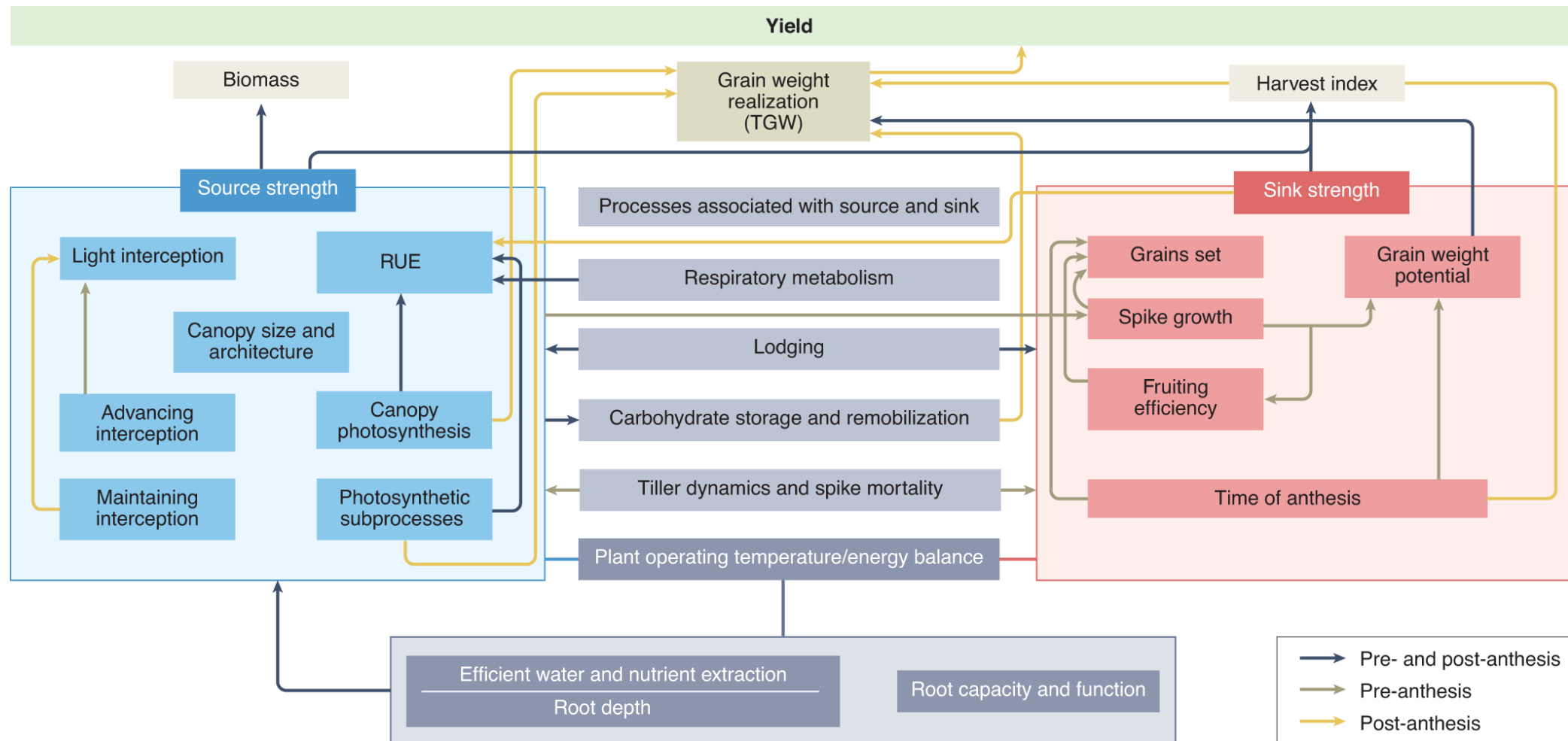But plant breeding can also increase the amount of straw we can harvest.

For years, breeding has focused on shorter straw.

Up to 20% more straw is possible (according to breeders) without causing yield losses in grain (lodging?).

However, breeders do not weigh straw at harvest, and variety descriptions do not consider straw yield—so how can we identify straw-rich varieties, and what is the potential (studies are lacking)?
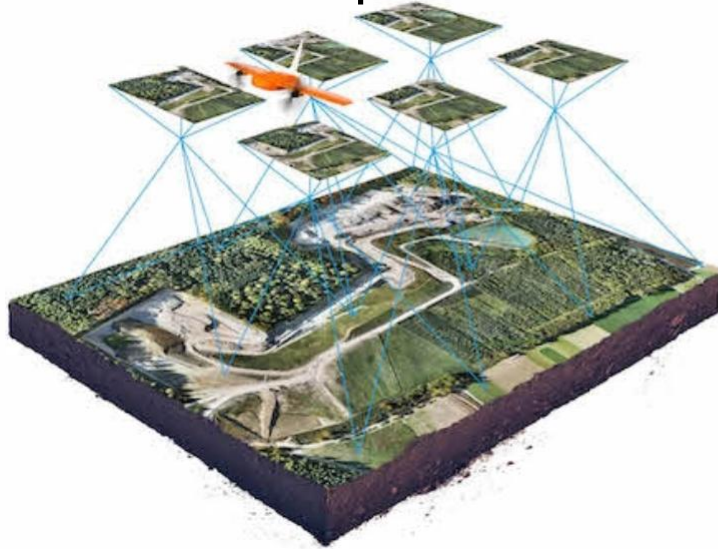
Foto: Janus Asbjørn Schatz-Jakobsen, Sejet Plan

Multiple drivers of grain and straw yield

Reynolds, M.P., Slafer, G.A., Foulkes, J.M. et al. A wiring diagram to integrate physiological traits of wheat yield potential. Nat Food 3, 318–324 (2022). https://doi.org/10.1038/s43016-022-00512-z
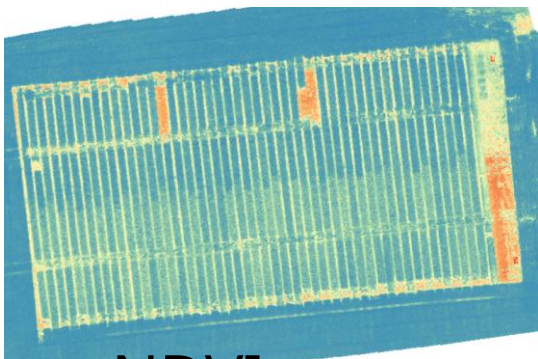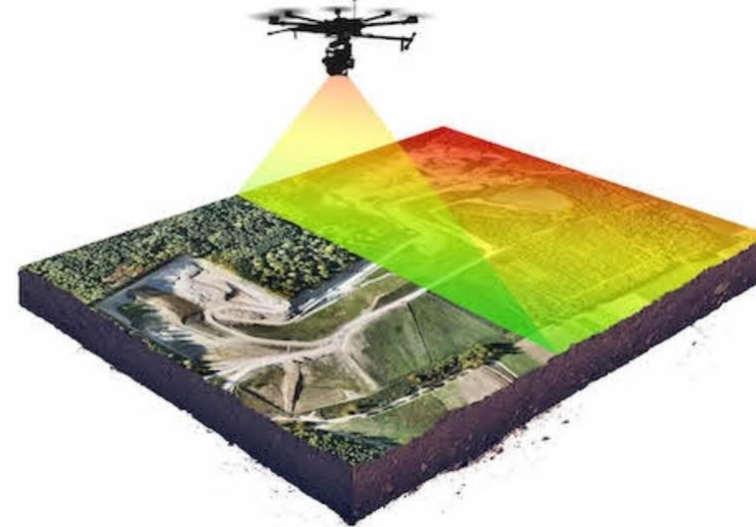
Measurement of digital heights and biomass cover

https://www.mosaic51.com/technology/lidar-vs-photogrammetry-which-is-better-for-point-cloud-creation/
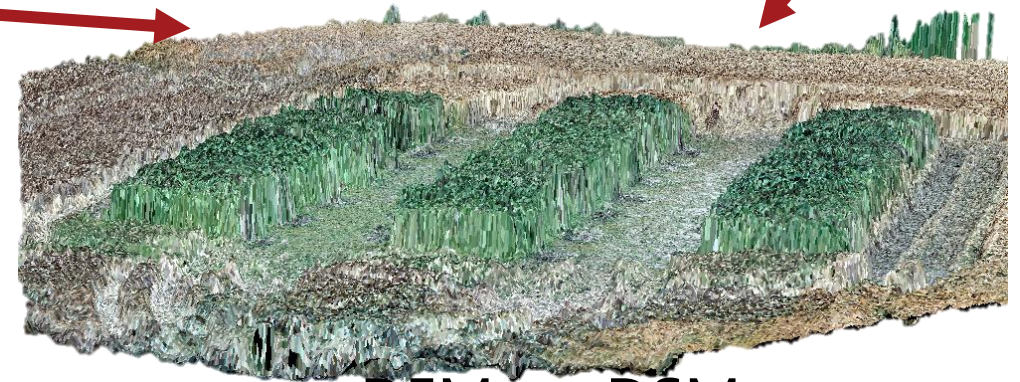
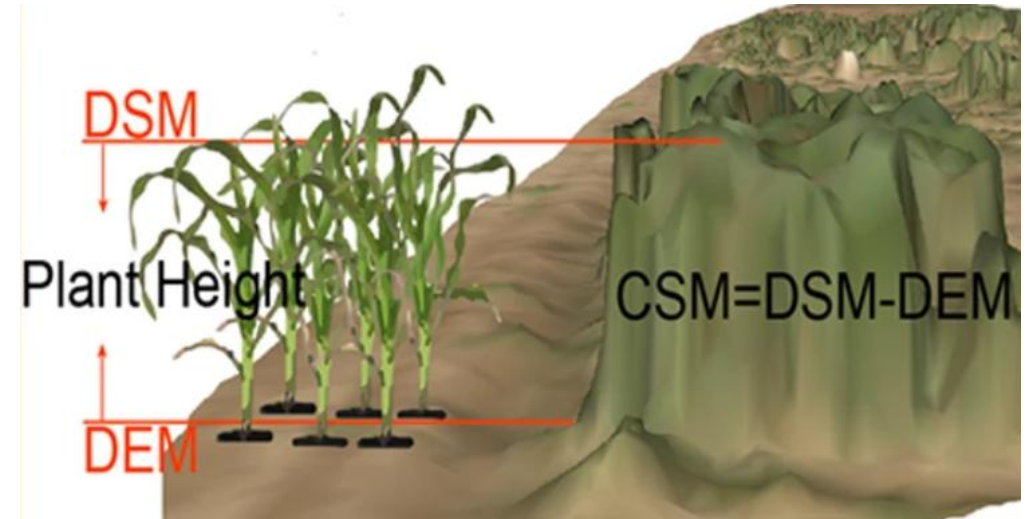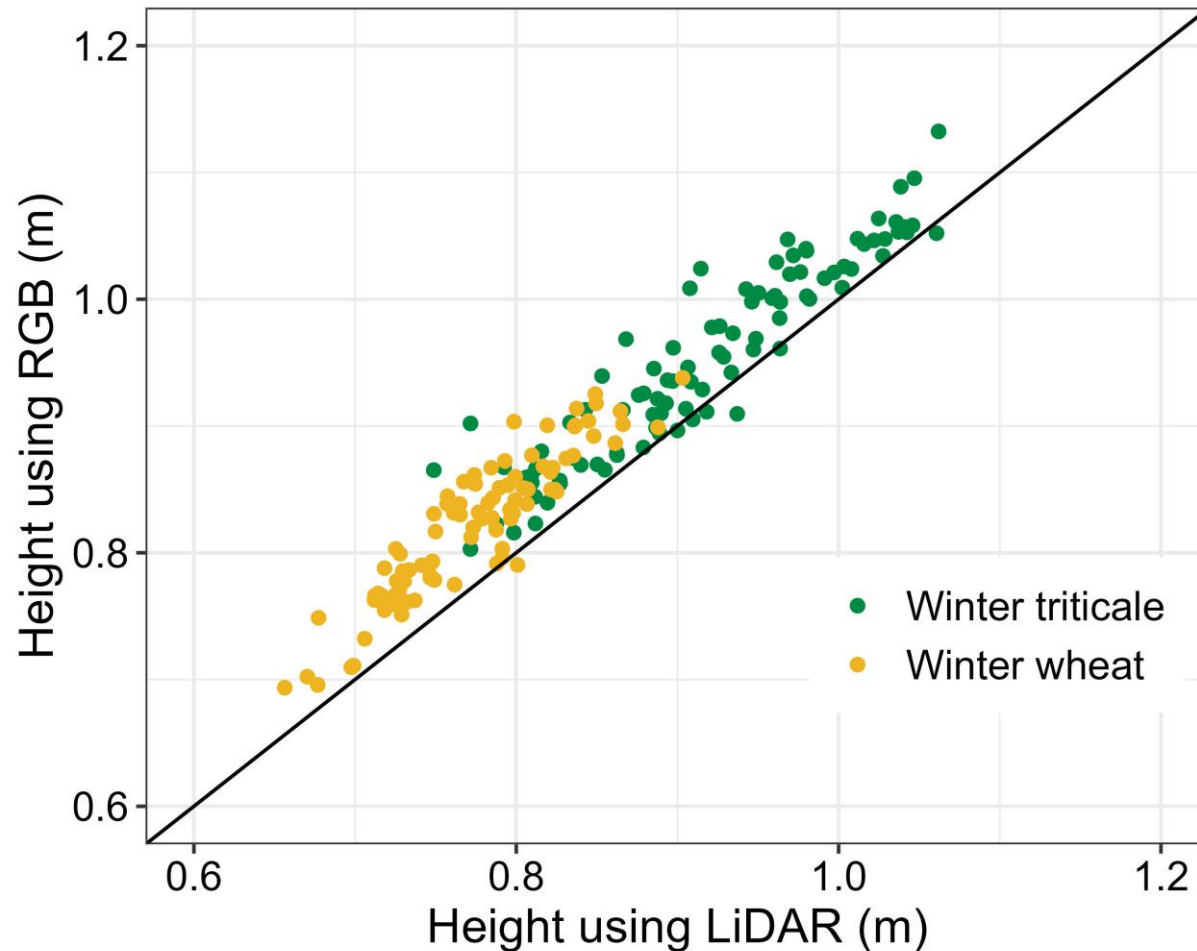RGB, Multispectral (foto)

LIDAR (laser scanner)

NDVI

RGB

DEM og DSM

Digital measurements of plant height (CSM)
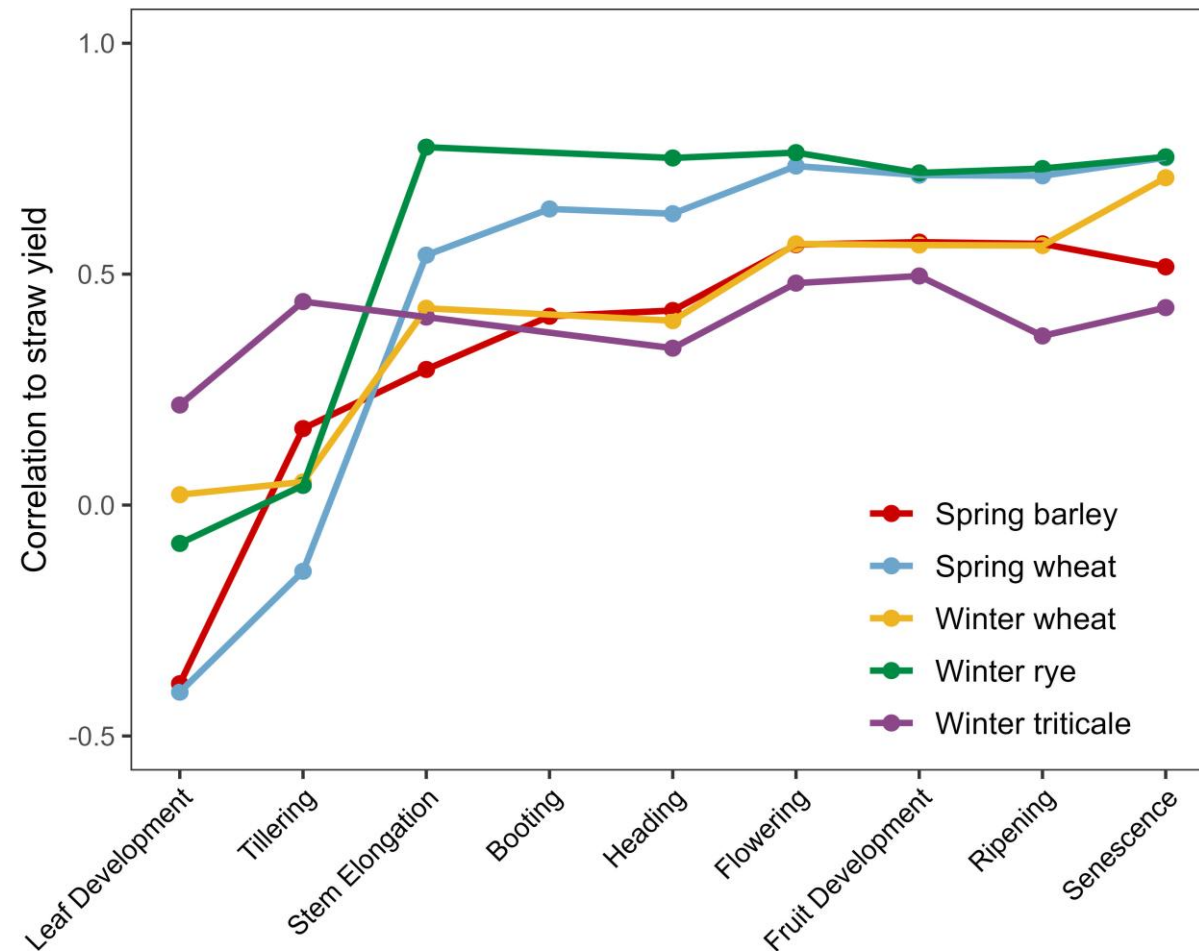

CSM = Canopy surface model
➡ Crop height

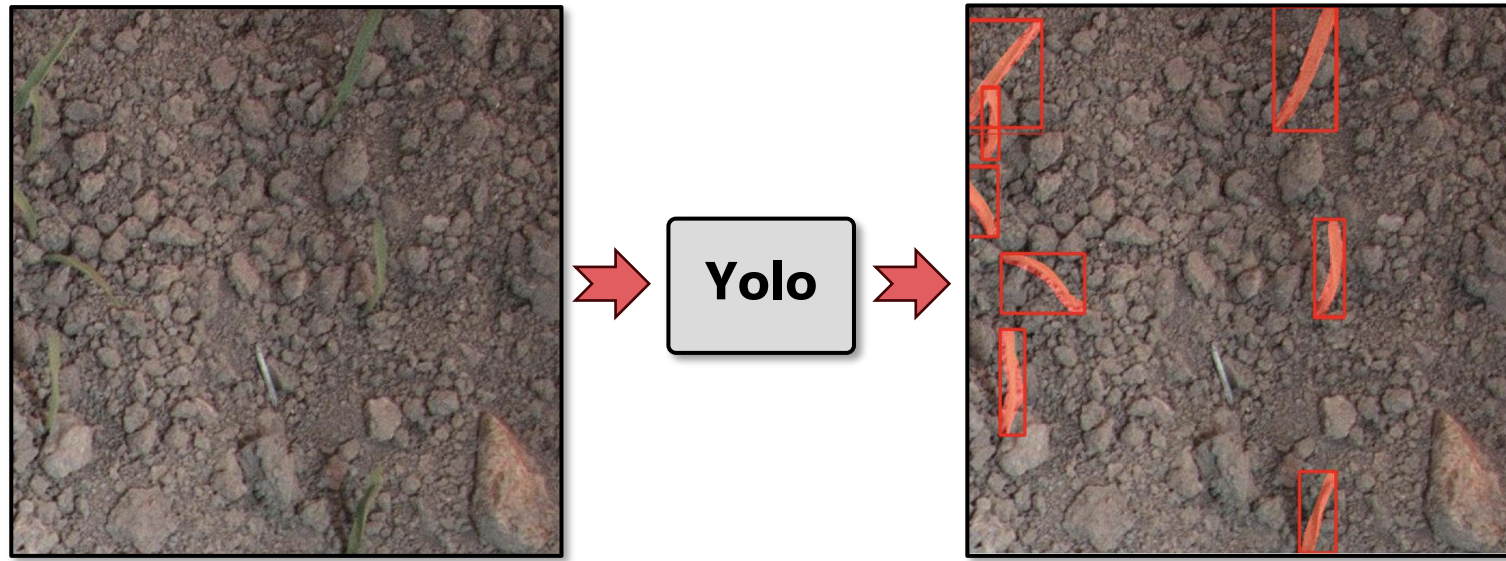DEM = Digital elevation model
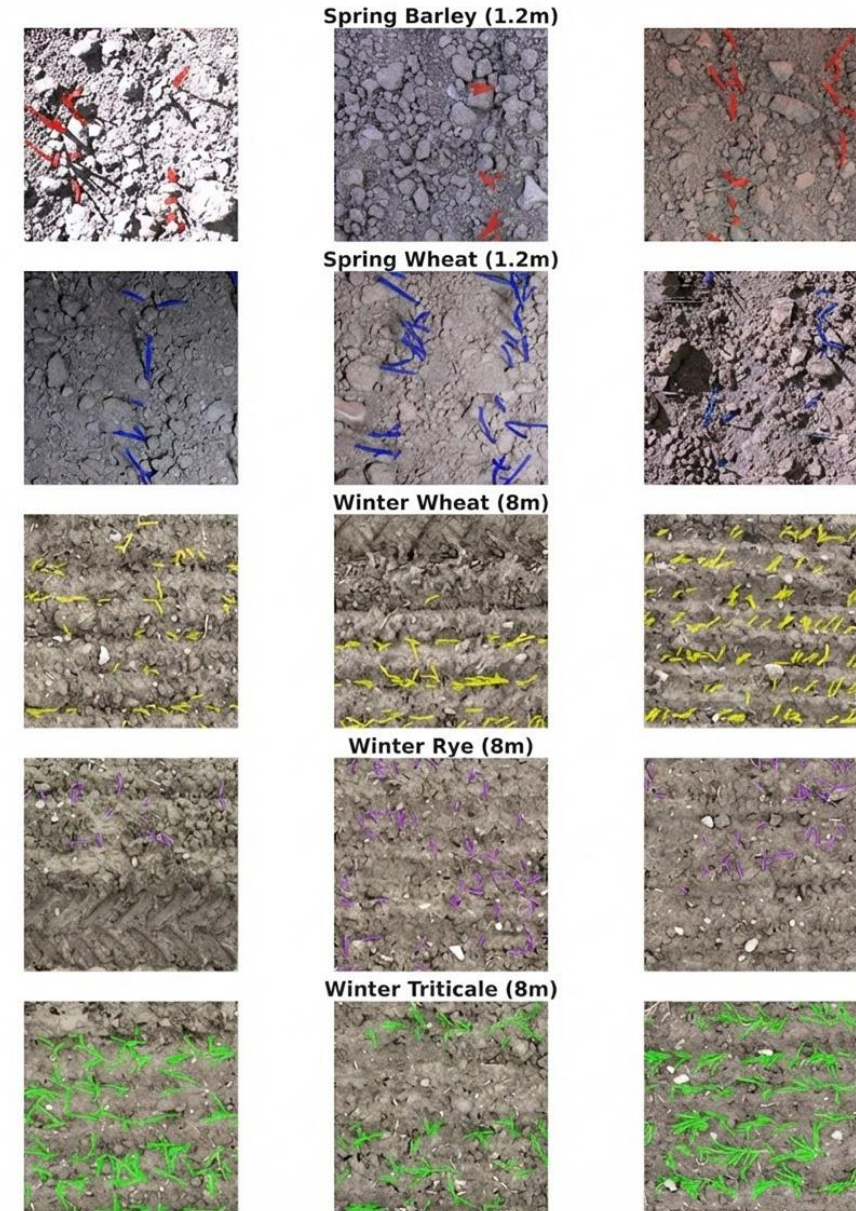
DSM = Digital surface model

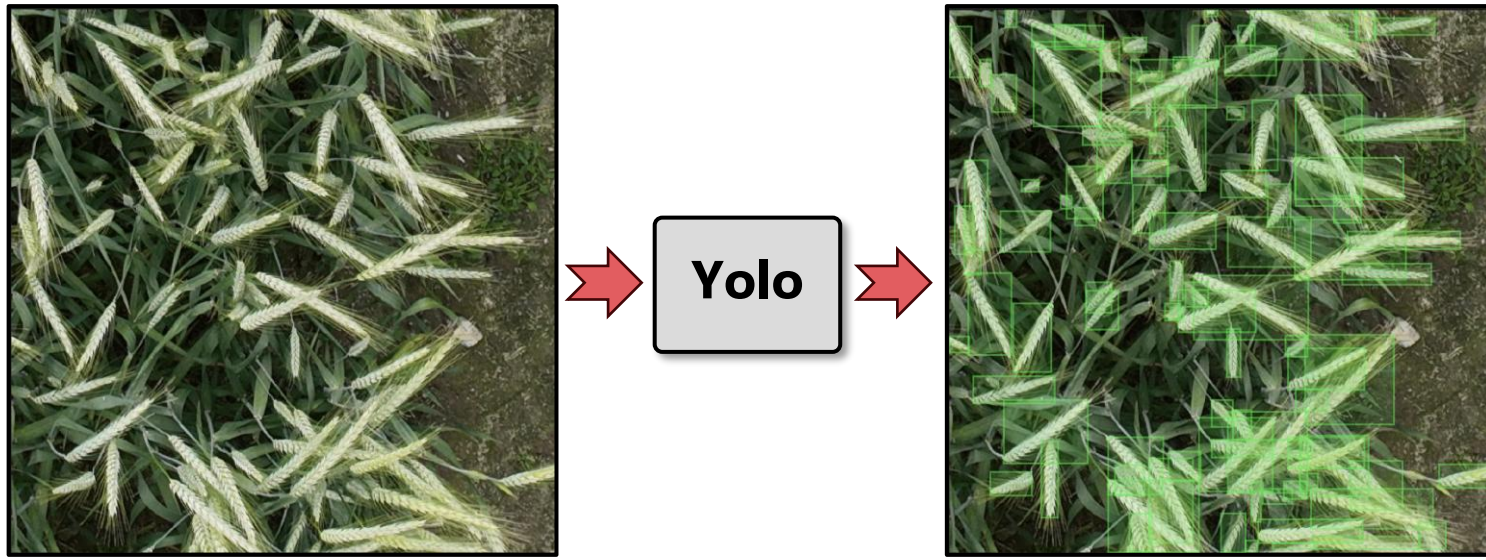# Plant height as a rough estimate of straw yield

Plant density/ germination

Yolo

- ML model ttrained to segment and identify leaves in the early growth stages
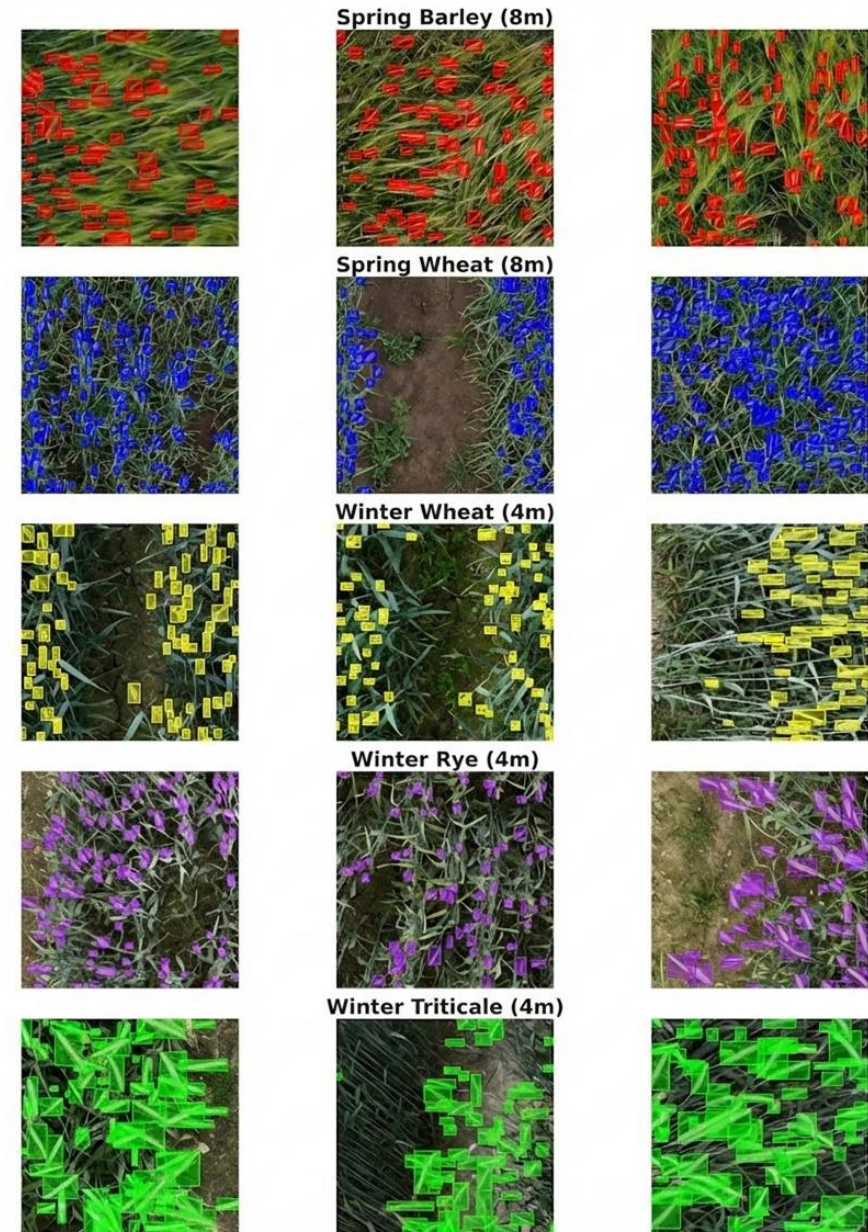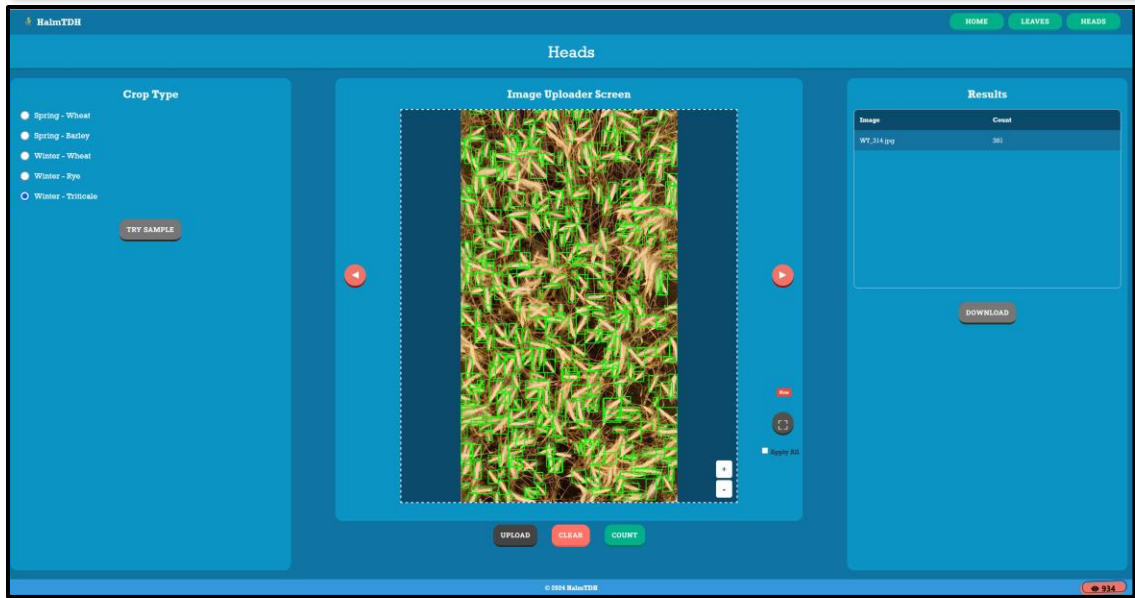- Possible use for germination assessment

Spring Barley (1.2m)

Spring Wheat (1.2m)

Winter Wheat (8m)

Winter Rye (8m)

Winter Triticale (8m)

Ear counting

ML model trained to count ears
- In five crops
- From a drone – up till 8 m altitude
- Only visible heads

Online tool

https://halmtdh.atkhan.info/

- Freely accessible website
- Crop-specific models
- Plant counting
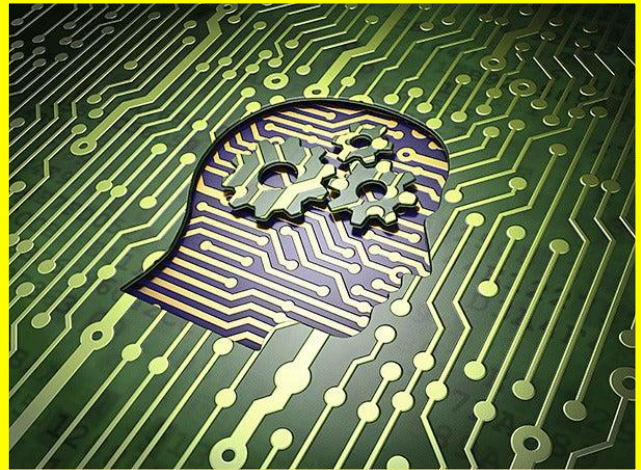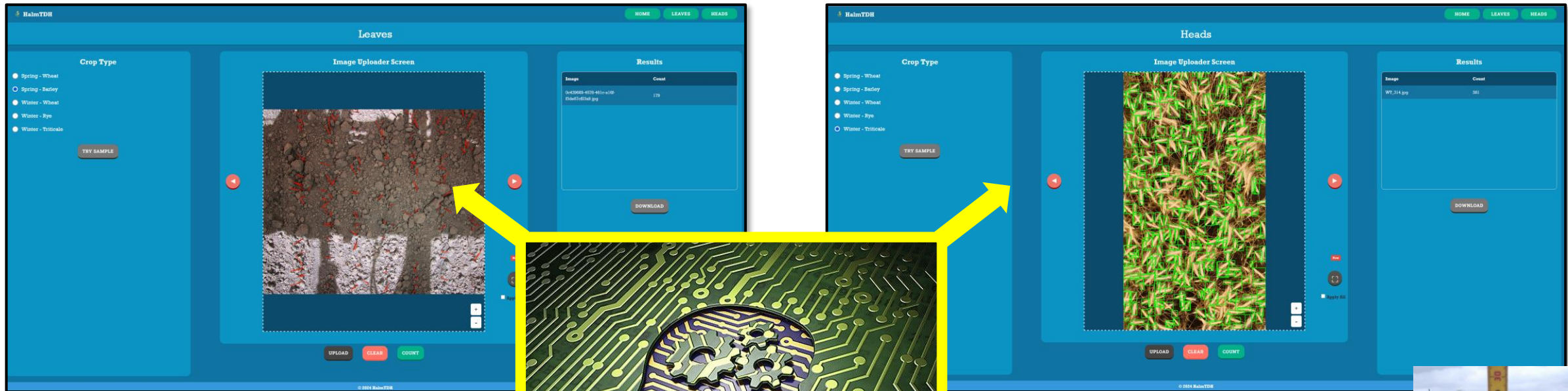- Ear counting

Next step – the stubble

- Stem number

- Stem diameter

- Stem wall thickness

More tools to look at yield components

Questions??

Signe M. Jensen
smj@plen.ku.dk
Department of Plant and Environmental Sciences

KØBENHAVNS UNIVERSITET