



Swiss Smart Farming

Smart Farming Workshop

30.10.2019

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Outline

- Goals of the project
- Project timeline
- Our setup
- Preprocessed outputs
- Our partners
- A case study

Goals of the Project

- Build a high quality reference dataset
- Explore limits and capabilities of precision agriculture
- Lay the foundations for the development of products and services valuable to the farmers

Project Timeline

- February - May 2019: Build setup (hardware & software)
- May - September 2019: Data collection at different locations
- September - Today: Data processing and investigation

Our Drone



DJI Matrice 600 Pro

- payload up to 5.5kg (current 2.8kg)
- flight time: ~27min
- flight range: ~3km

Our Sensors



- RGB camera: FLIR Blackfly S 5MP
- LiDAR: Ouster OS-1-64
- Thermal camera: FLIR Tau2 640
- Hyperspectral cameras:
 - Photonfocus MV0-D2048x1088-C01-HS02-160-G2
 - NIR range, 600 - 975nm
 - 25 bands
 - Photonfocus MV0-D2048x1088-C01-HS03-160-G2
 - VIS range, 470 - 630nm
 - 16 bands

Outputs: Point Cloud



Outputs: Orthophotos



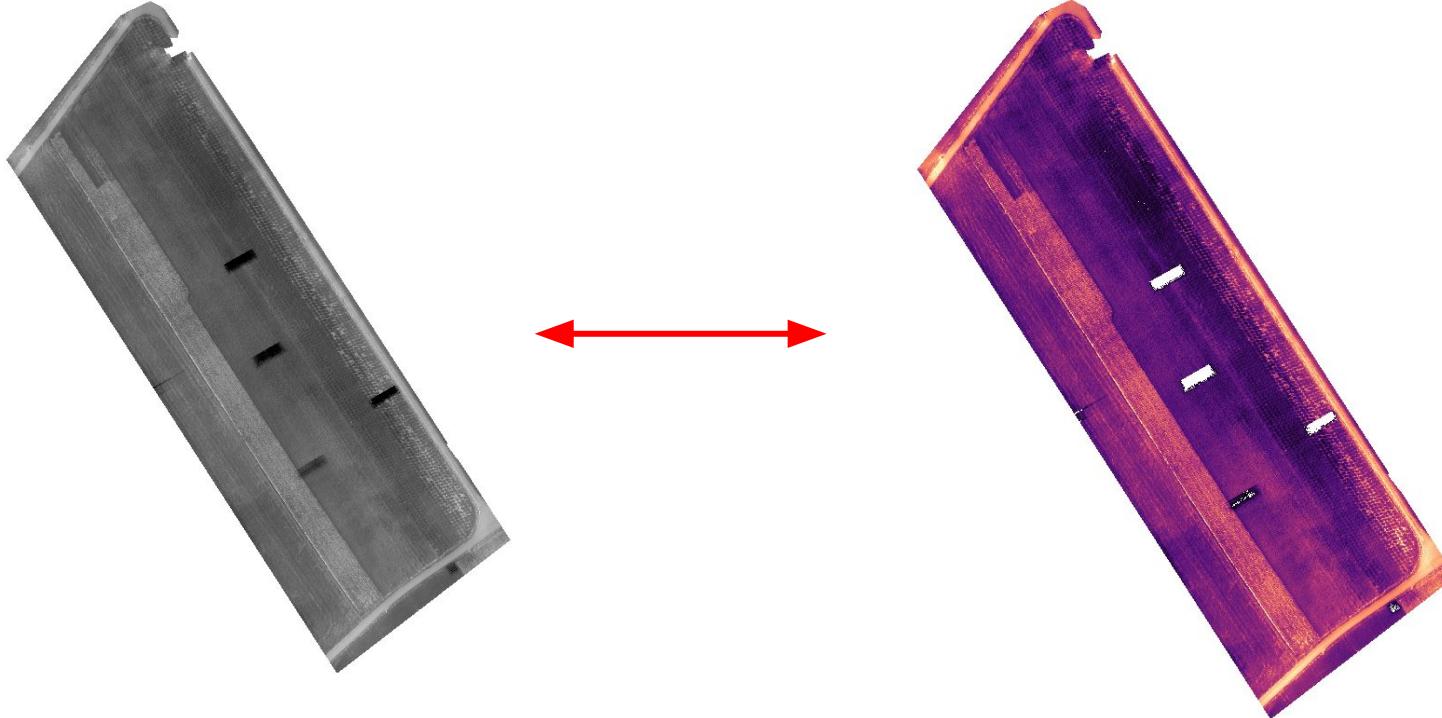
Outputs: Digital Surface Model (DSM)



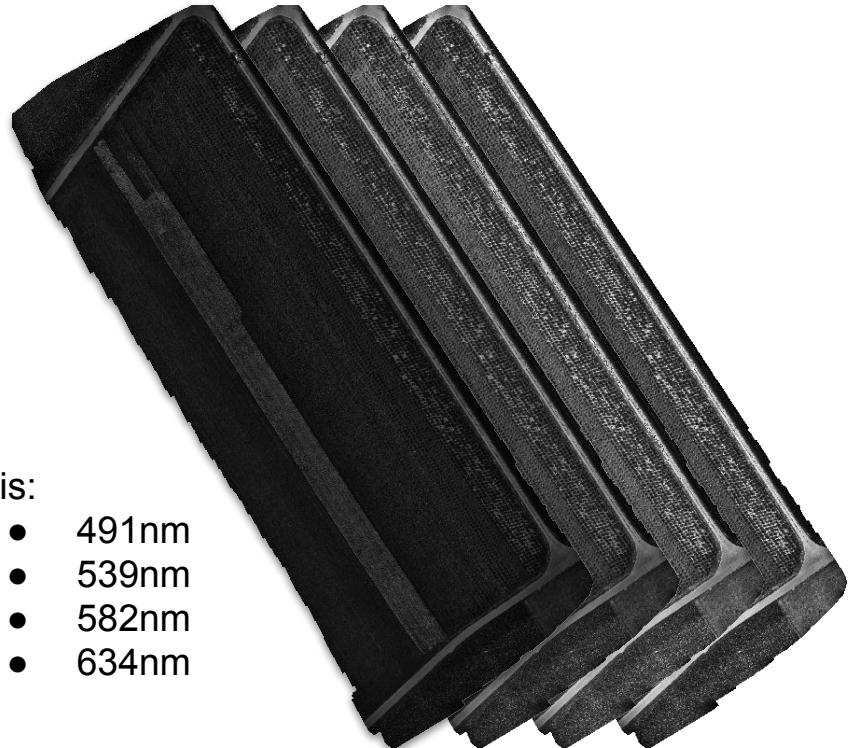
Outputs: Digital Surface Model (DSM)



Outputs: Thermal Maps

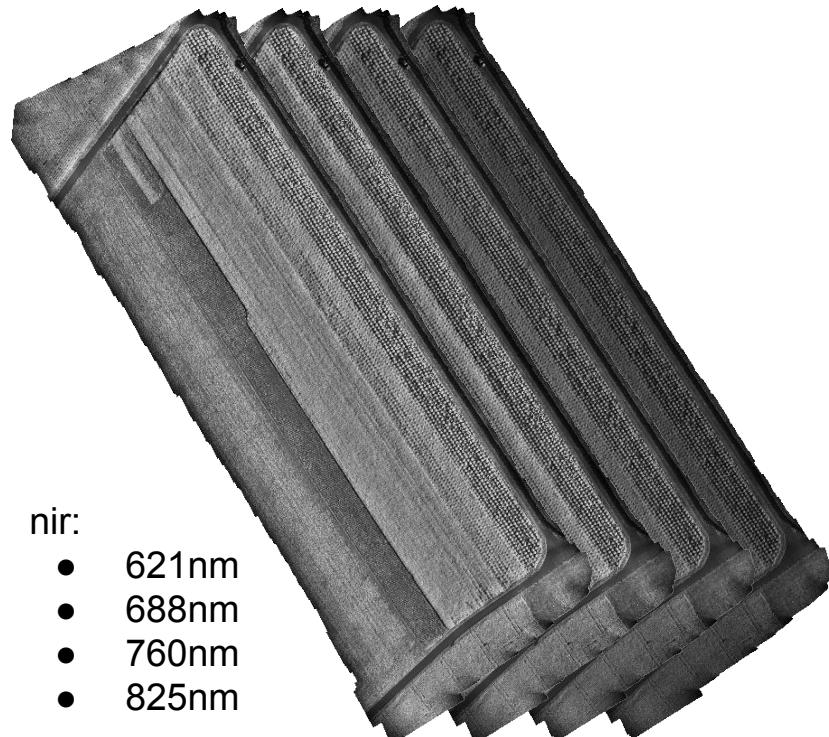


Outputs: Hyperspectral Maps



vis:

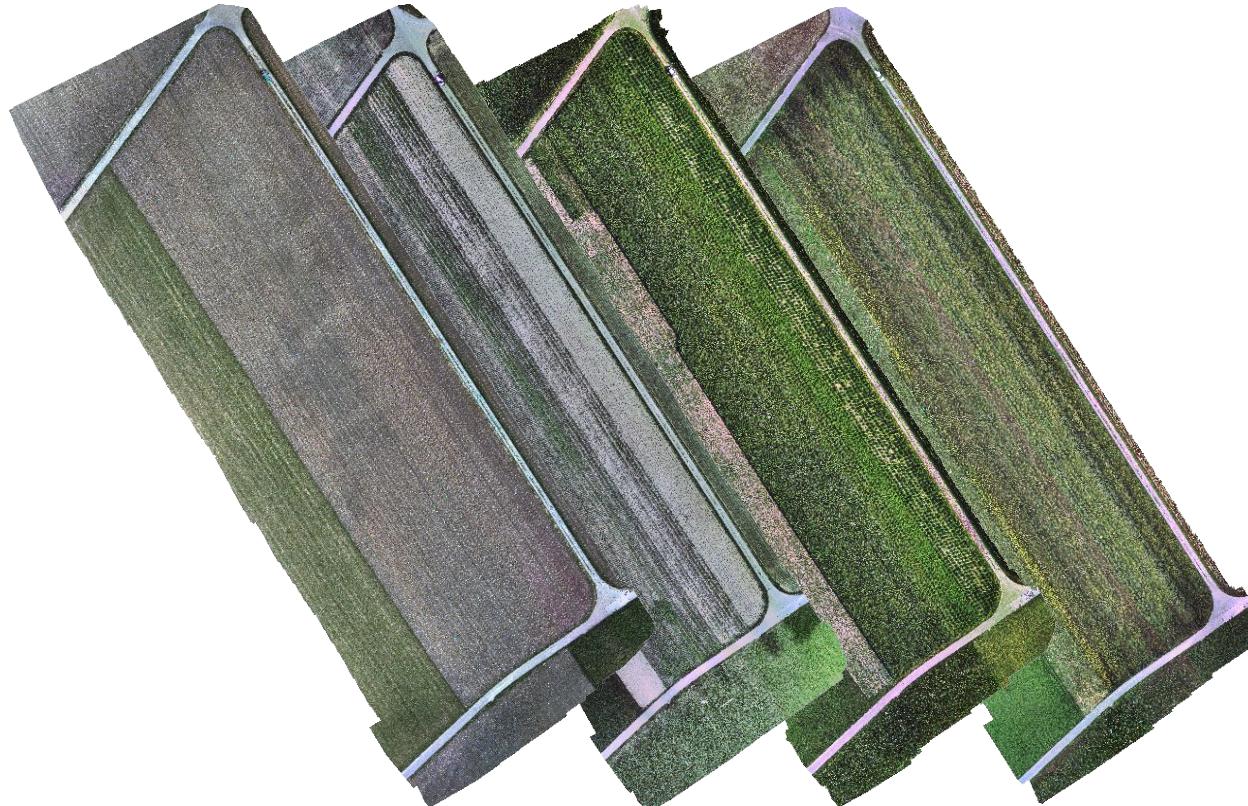
- 491nm
- 539nm
- 582nm
- 634nm



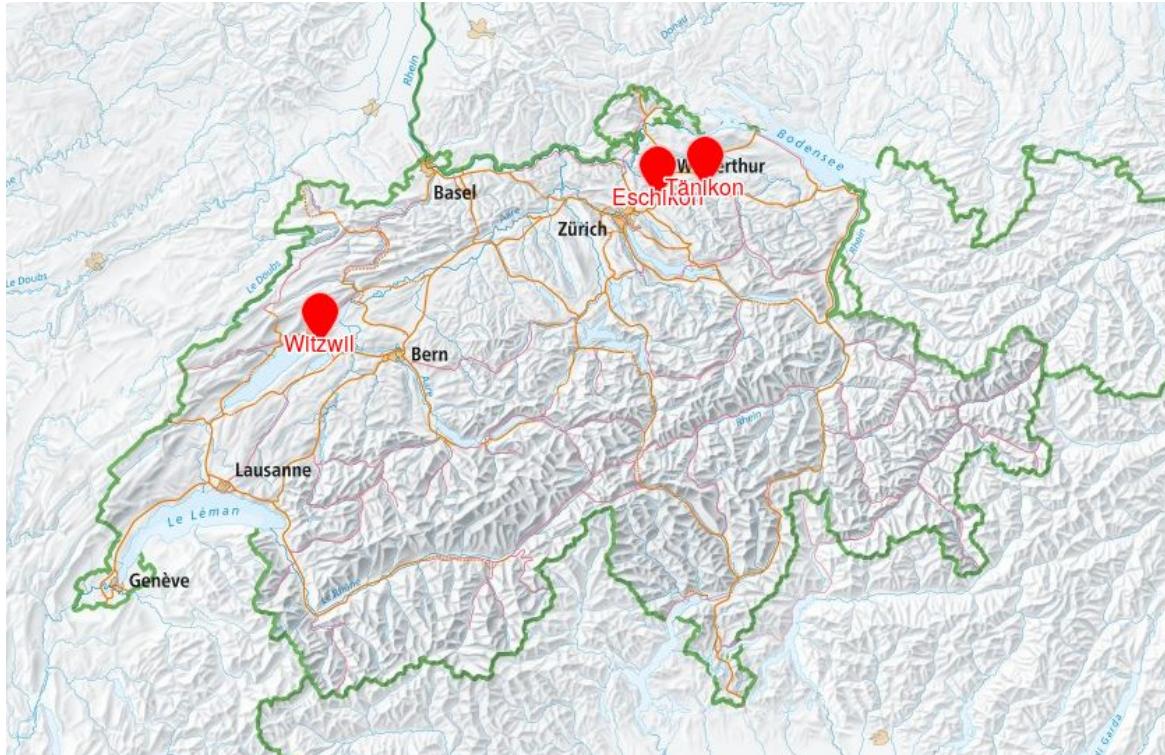
nir:

- 621nm
- 688nm
- 760nm
- 825nm

Outputs: Timeseries



Data Collection: Locations & Partners



- Agroscope, Tänikon
 - 3 Fields Winter Wheat
 - Nitrogen fertilization trials
 - Tot. surface: ~6ha
- HAFL, Witzwil
 - 2 Fields Winter Wheat
 - 1 Field Canola
 - Nitrogen fertilization trials
 - Tot. surface: ~40ha
- ETH, Eschikon
 - 1 Field Winter Wheat
 - Nitrogen fertilization trial
 - Tot. surface: ~3ha

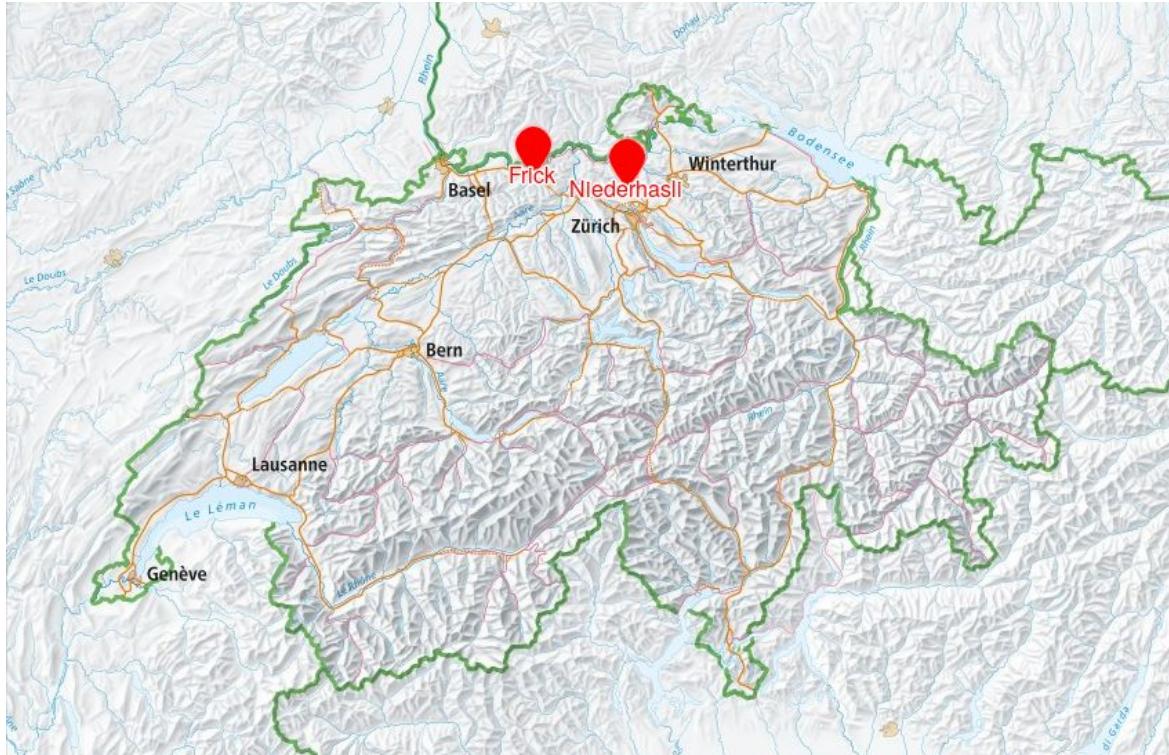


ETHzürich



Berner Fachhochschule
► Hochschule für Agrar-, Forst- und
Lebensmittelwissenschaften HAFL

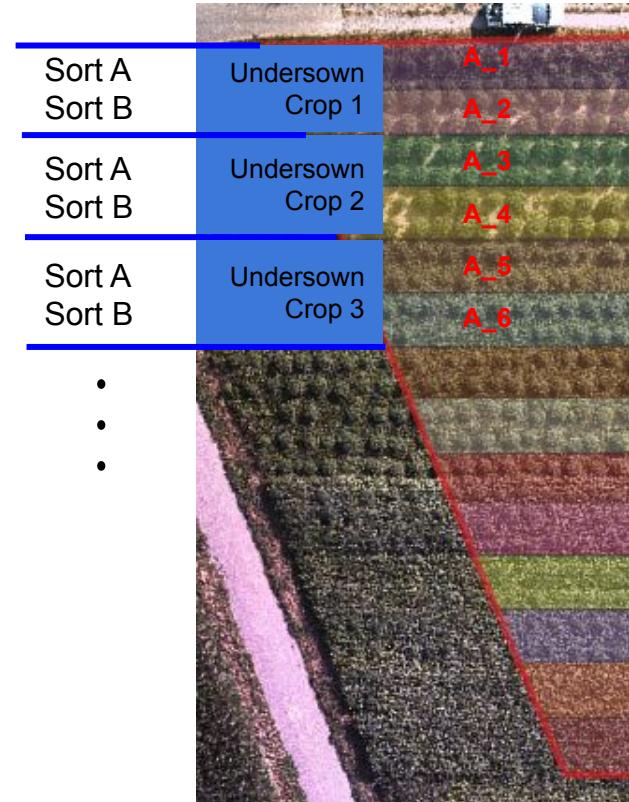
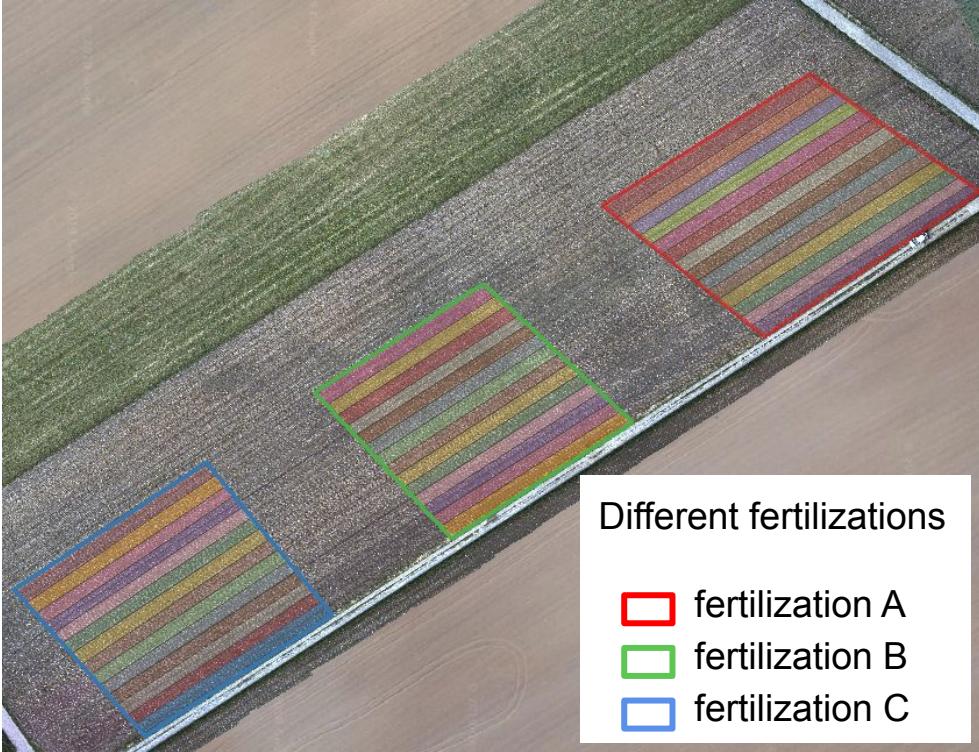
Data Collection: Locations & Partners



- FiBL, Frick
 - 1 Field Potatoes
 - Diseases Experiment
 - Tot. surface: ~200m²
- Agricircle, Niederhasli
 - 1 Field Hemp
 - Plant Phenotyping
 - Tot. surface: ~1.5ha

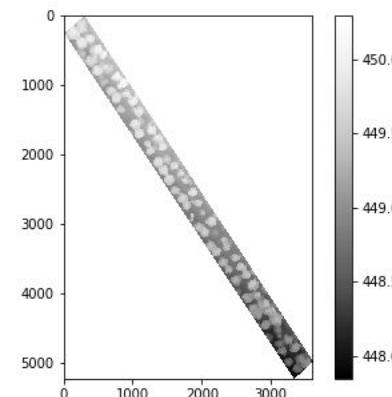
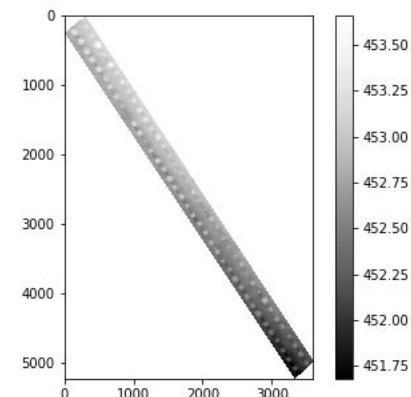
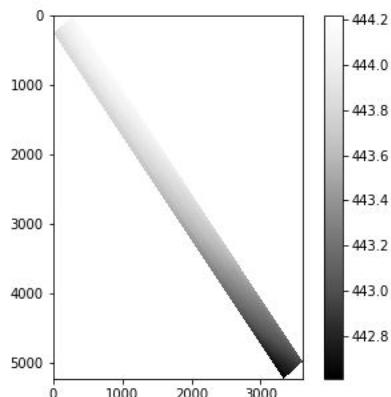


Case Study: Hemp Phenotyping



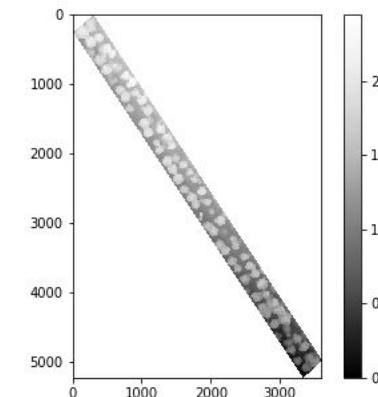
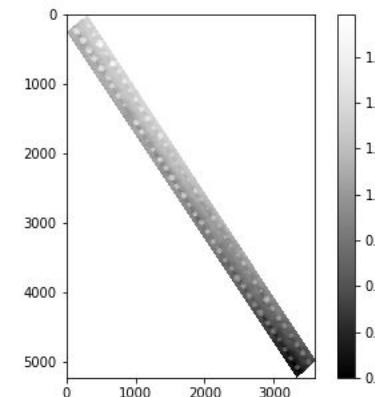
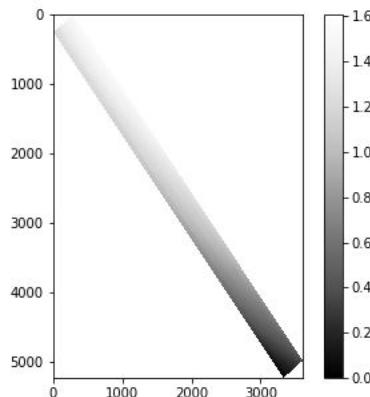
Case Study: Hemp Phenotyping - Plant Biomass

- Plot C_9
- Dates: 27.05.19, 19.07.19, 07.10.19
- DSMs with absolute altitudes



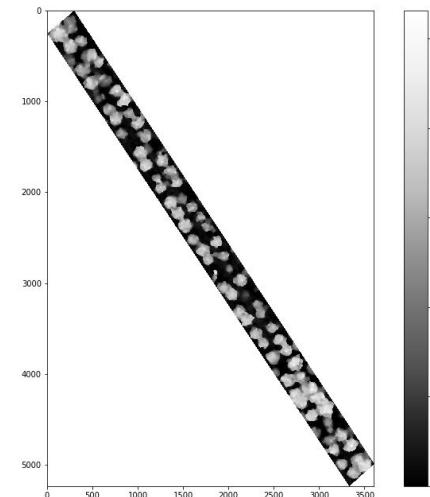
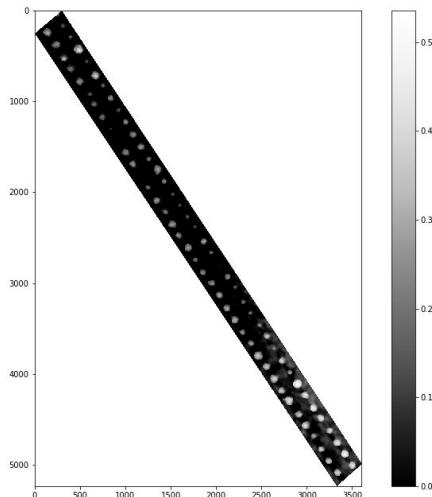
Case Study: Hemp Phenotyping - Plant Biomass

- DSMs with relative altitudes
- Field slope doesn't allow volume/biomass evaluation



Case Study: Hemp Phenotyping - Plant Biomass

- First date as “field bare soil”
- Subtract DSM 1st date from the others



Case Study: Hemp Phenotyping - Plant Biomass

- Total plant volume per plot (fertilization C)
- Units: m³

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_10	C_11	C_12	C_13	C_14
19.07.19	0.57	1.59	4.06	0.19	16.06	19.40	5.09	9.24	6.29	7.81	20.17	24.81	19.81	20.40
07.10.19	34.24	72.97	45.12	54.87	67.67	38.13	55.53	50.21	46.55	20.49	101.53	39.95	47.43	38.84

Sort B can't bare
its own weight!!



Current Status

- ✓ Build a reliable, high quality setup
- ✓ Collect various high resolution agricultural datasets
- ≈ Preprocess all datasets and start exploring them
- ✗ Start developing possible valuable products and services

Thank you very much
for your attention!
:-)