NUTRE FARMING

UTILIZAREA IMAGINILOR SENTINEL-2A ÎN MONITORIZAREA CULTURILOR AGRICOLE

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Seminar geo-spatial.org: "Soluții open source pentru prelucrarea și reprezentarea datelor geospațiale"
31 martie – 1 aprilie 2017, Cluj-Napoca

Ce reprezintă **Nutre Farming**?

Unul dintre cei mai mari agricultori din România, aprox. 16.000 ha dintre care aproape 2000 ha dotate cu sisteme de irigații pivotante;

Județul Ialomița: suprafețe agricole în 10 comune;

Culturi principale:

- Porumb
- Rapiță
- Floarea soarelui
- Soia

Specificații Sentinel 2A

Sentinel-2 Bands	Central Wavelength (µm)	Resolution (m)
Band 1 - Coastal aerosol	0.443	60
Band 2 - Blue	0.49	10
Band 3 - Green	0.56	10
Band 4 - Red	0.665	10
Band 5 - Vegetation Red Edge	0.705	20
Band 6 - Vegetation Red Edge	0.74	20
Band 7 - Vegetation Red Edge	0.783	20
Band 8 - NIR	0.842	10
Band 8A - Vegetation Red Edge	0.865	20
Band 9 - Water vapour	0.945	60
Band 10 - SWIR - Cirrus	1.375	60
Band 11 - SWIR	1.61	20
Band 12 - SWIR	2.19	20

- Rezolutie temporara 10 zile;
- Orbita heliosincrona;
- Altitudine 786 km;
- Durata de viata estimata 7 ani;

Compozit RGB

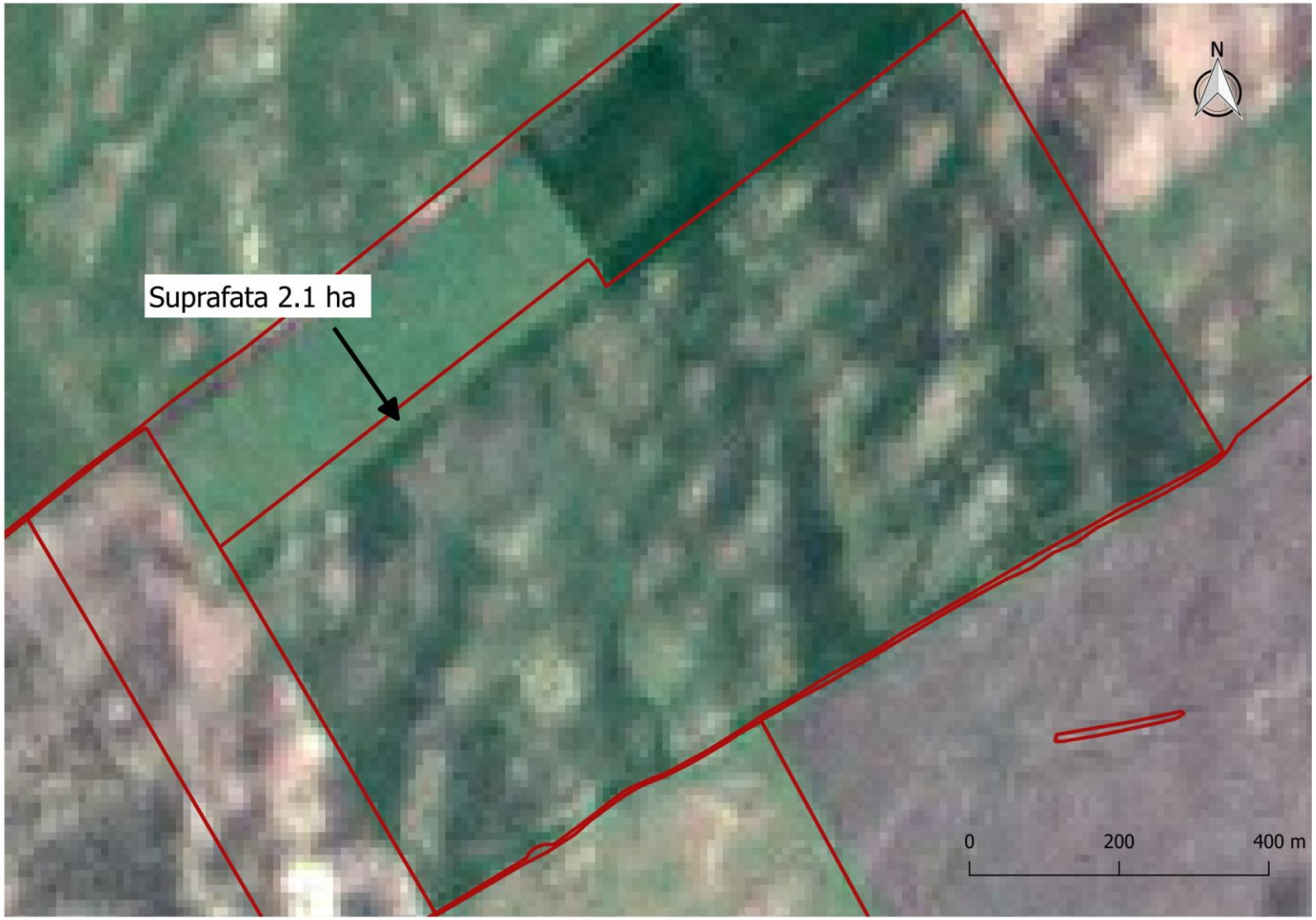
Banda 2 + Banda 3 + Banda 4

Compozit RGB

Diferență între planul de culturi si lucrarea agricolă

Compozit RGB

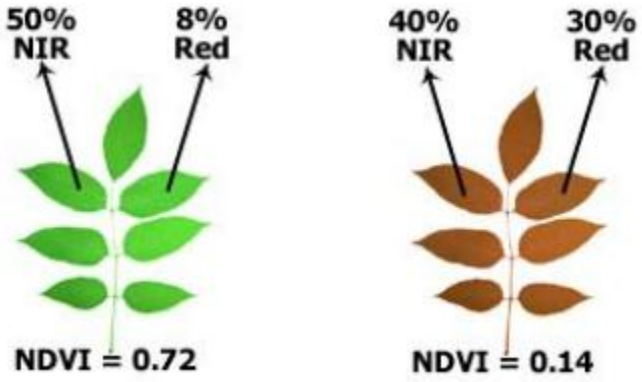
Suprapunere cu alt fermier



NDVI

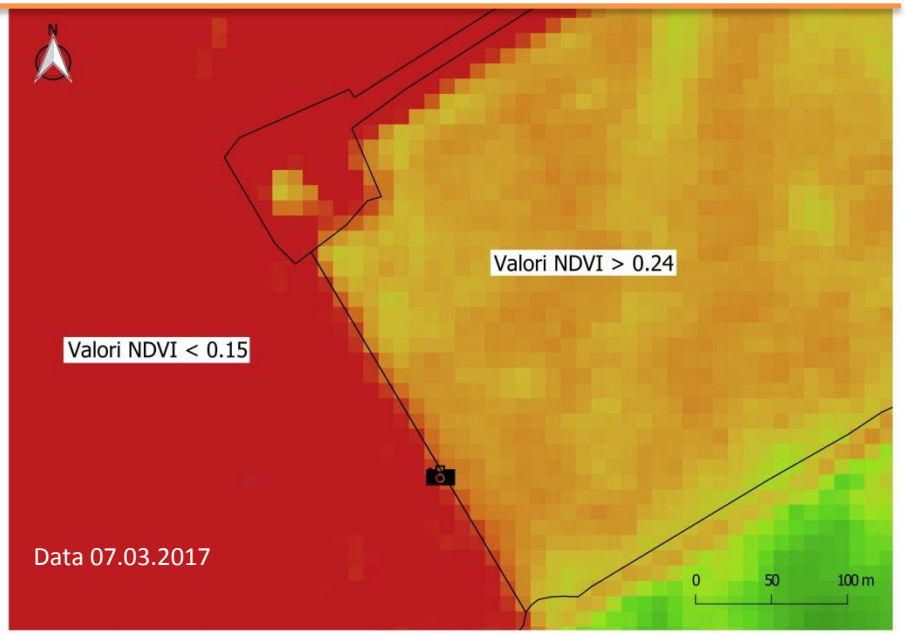
Normalized Difference Vegetation Index

Formula de calcul: $NDVI = \frac{\text{Band 3} - \text{Band 11}}{\text{Band 3} + \text{Band 11}}$

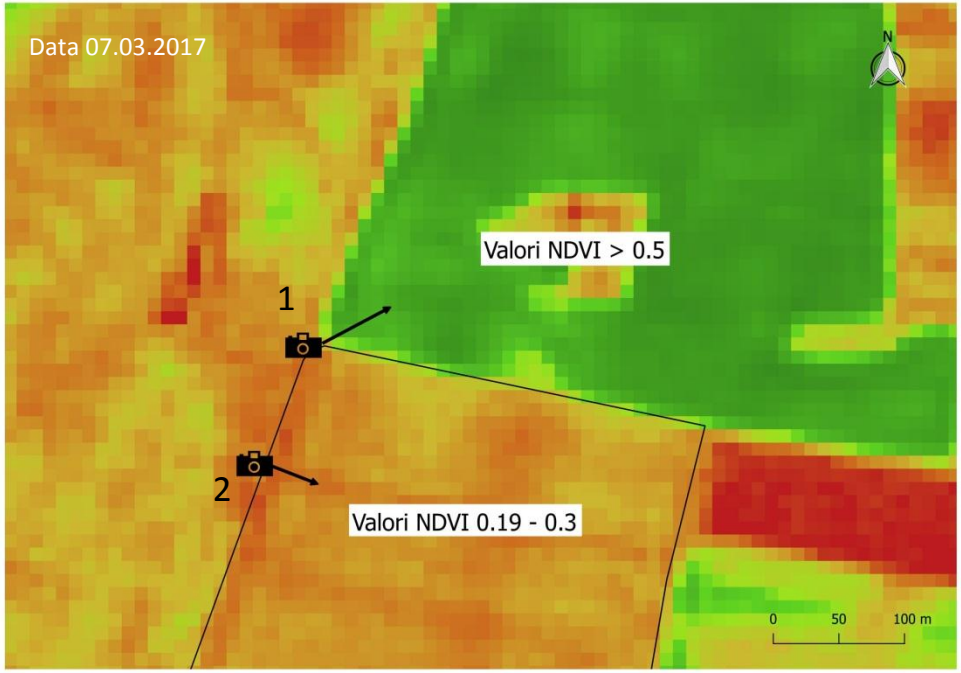


- In general valorile NDVI reprezintă:
  - -1 și 0.1 suprafetelor acvatice
  - -0.1 și 0.1 suprafețelor cu roca la zi, sol, nisip sau zapadă
  - 0.2 și 0.4 pasuni și suprafețe înierbate
  - 0.4 și 1 suprafețe cu vegetație omogenă

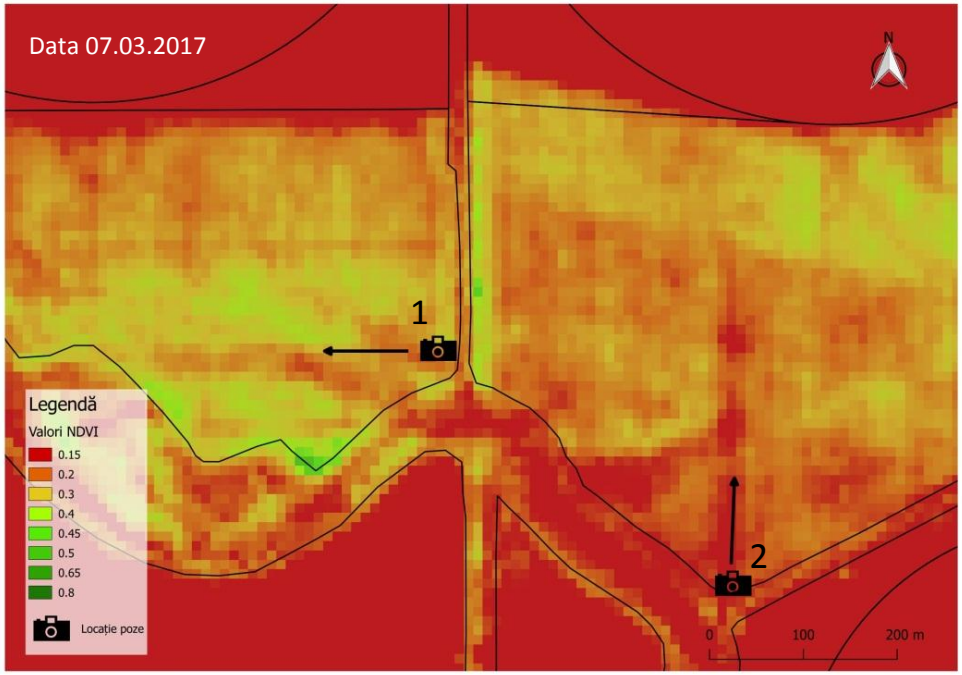
Calibrare valori NDVI



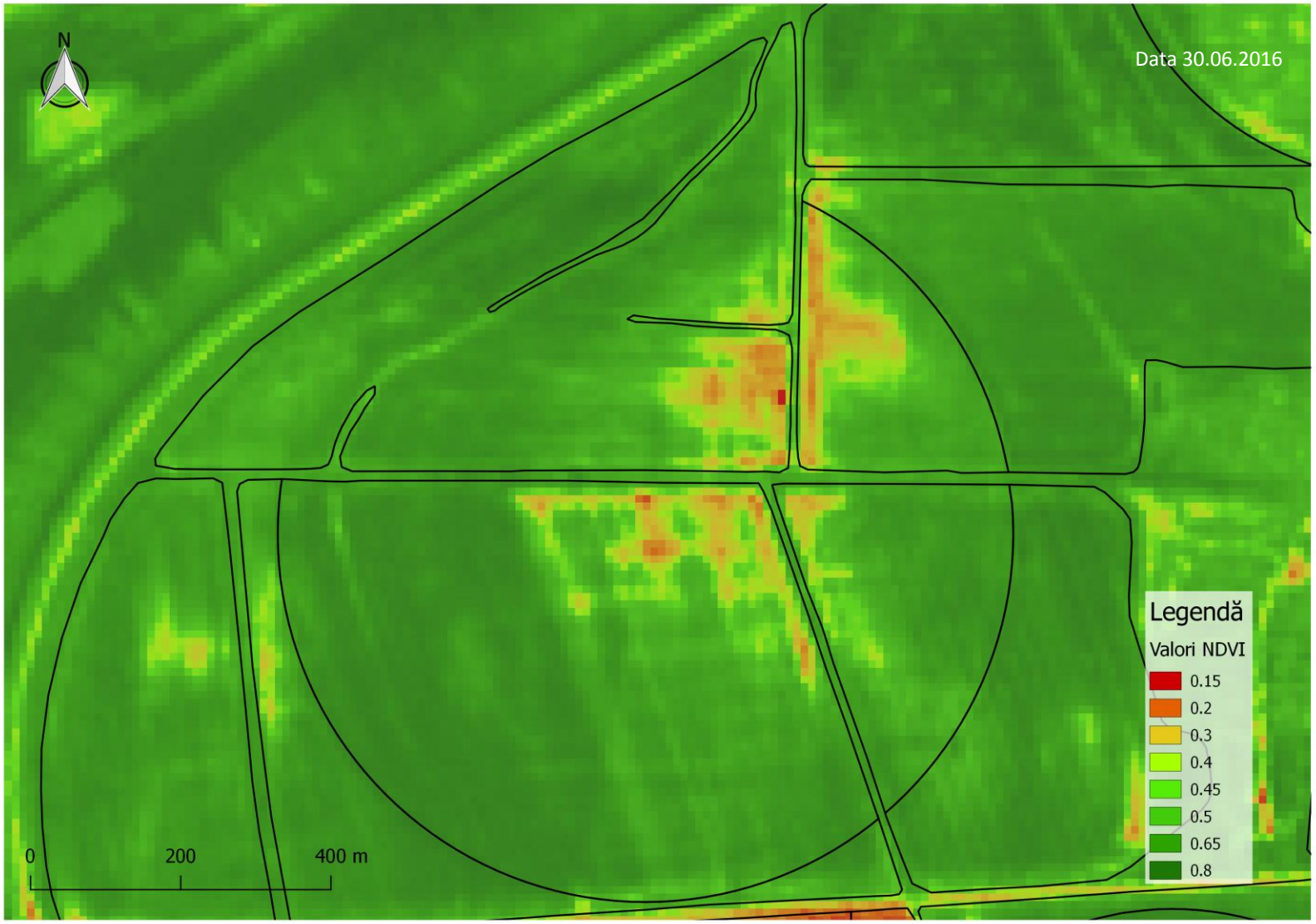
Calibrare valori NDVI pentru cultura de grâu



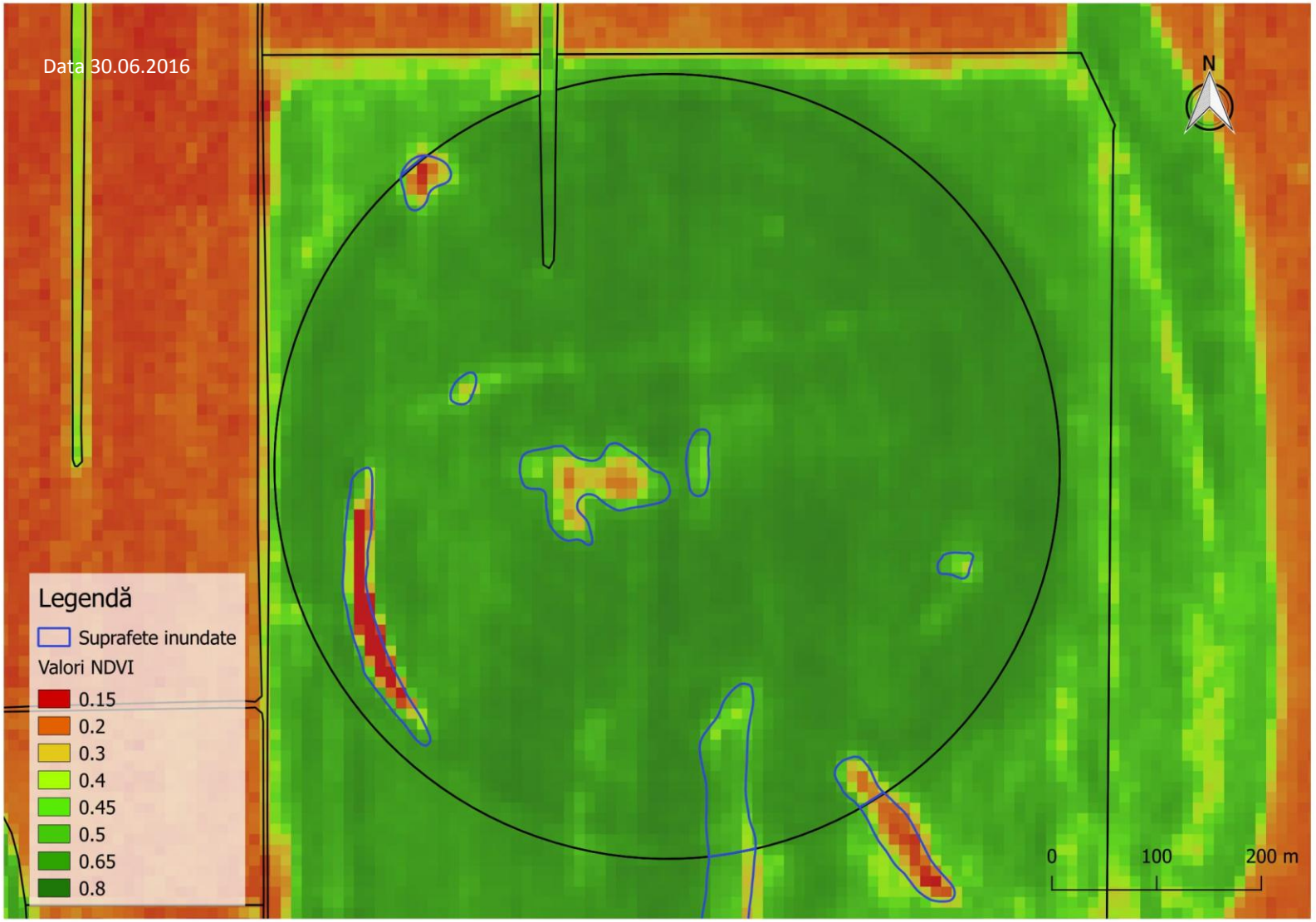
Calibrare valori NDVI pentru cultura de rapiță



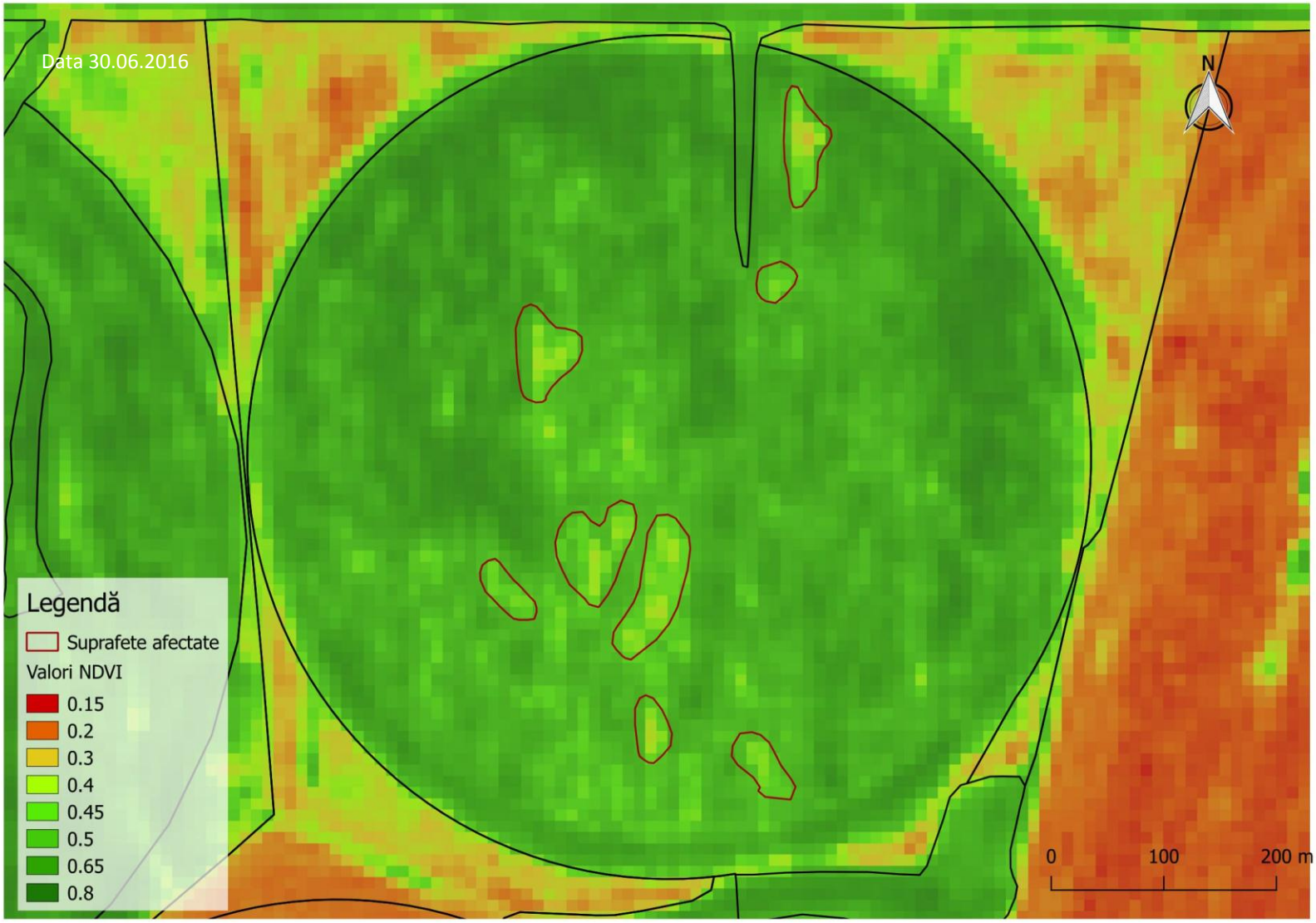
NDVI - Suprafețe cu densitate mica de plante si un grad mare de stres



NDVI - Suprafețe inundate



NDVI - Suprafețe afectate de animale



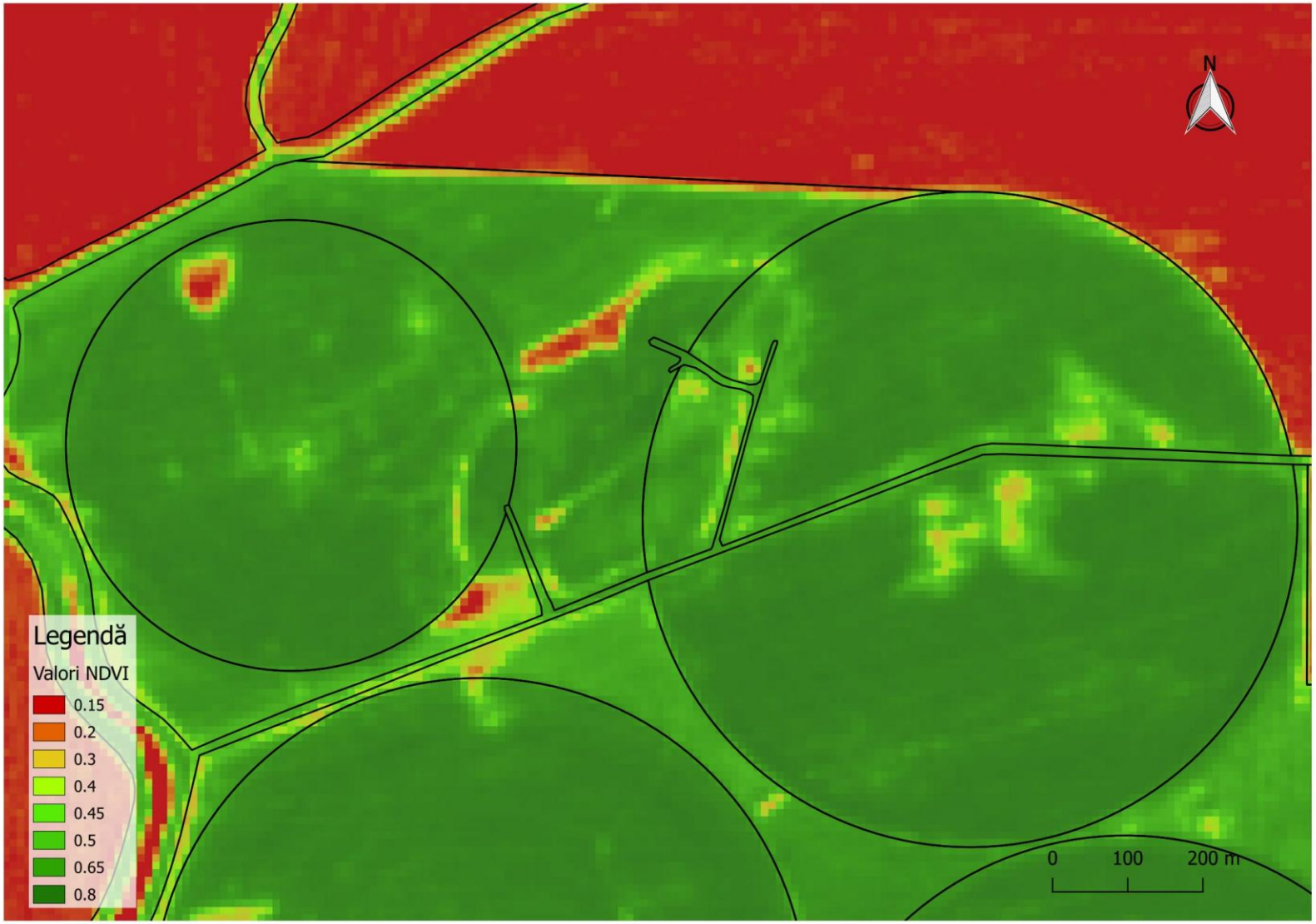
MCARI

Modified Chlorophyll Absorption in Reflectance Index

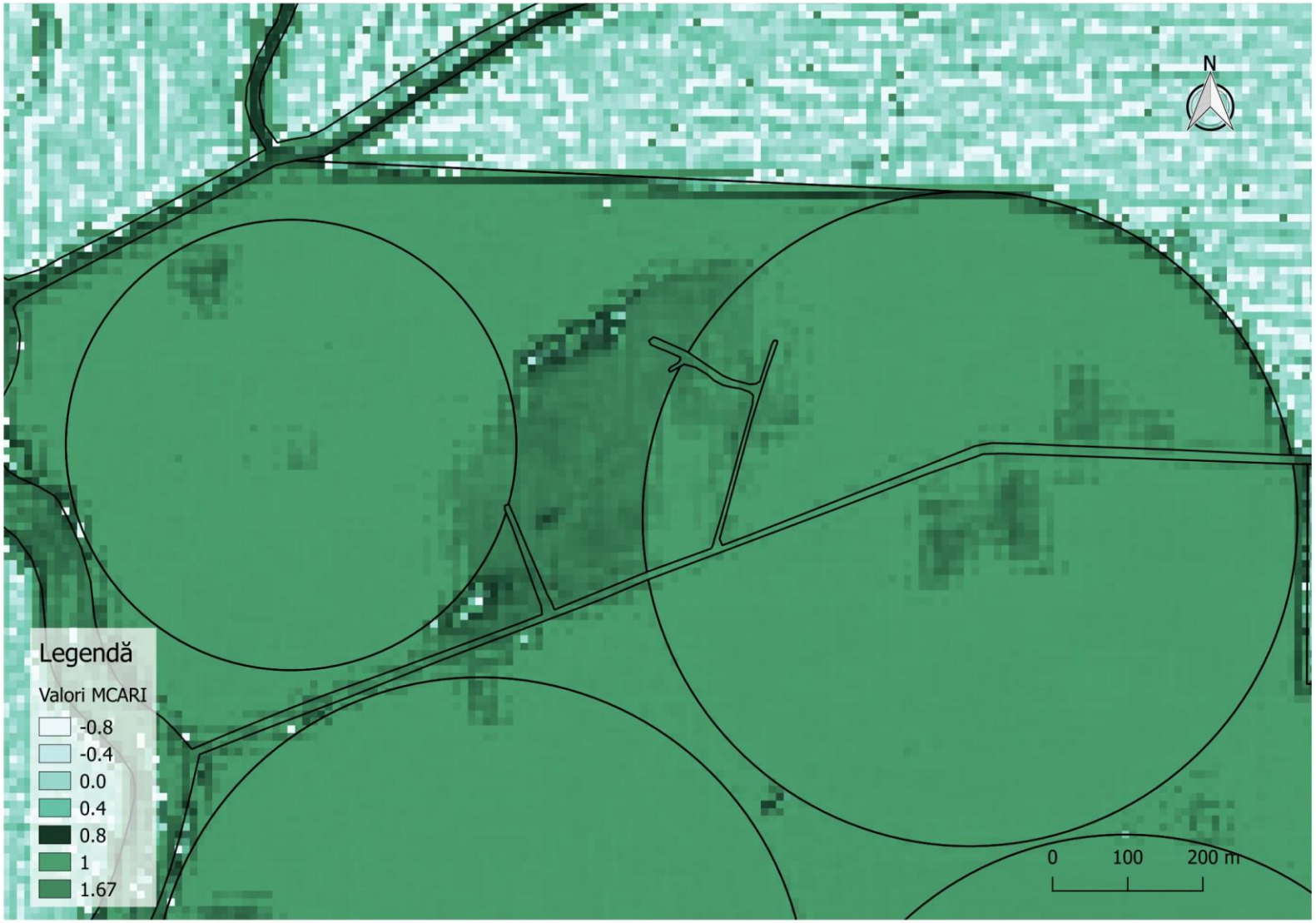
Formula de calcul: $MCARI = 1 - 0.2 * \frac{\text{Band 5} - \text{Band 3}}{\text{Band 5} - \text{Band 4}}$

- Este unul dintre indicii CARI care indică abundența relativă de clorofilă.
- Acesta a rezultat prin simplificarea indicelui CARI pentru a minimiza efectele dintre sol și vegetația moartă.

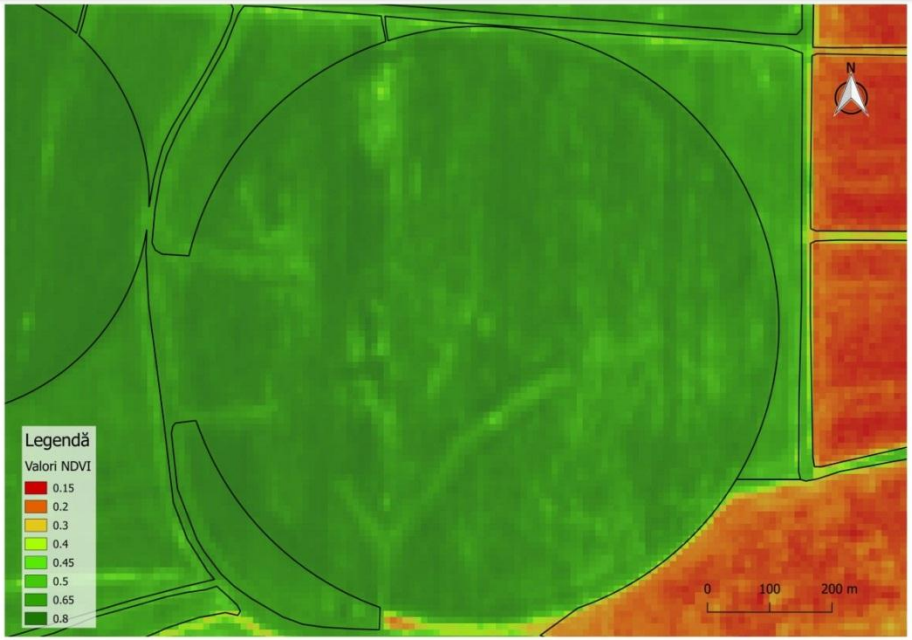
NDVI

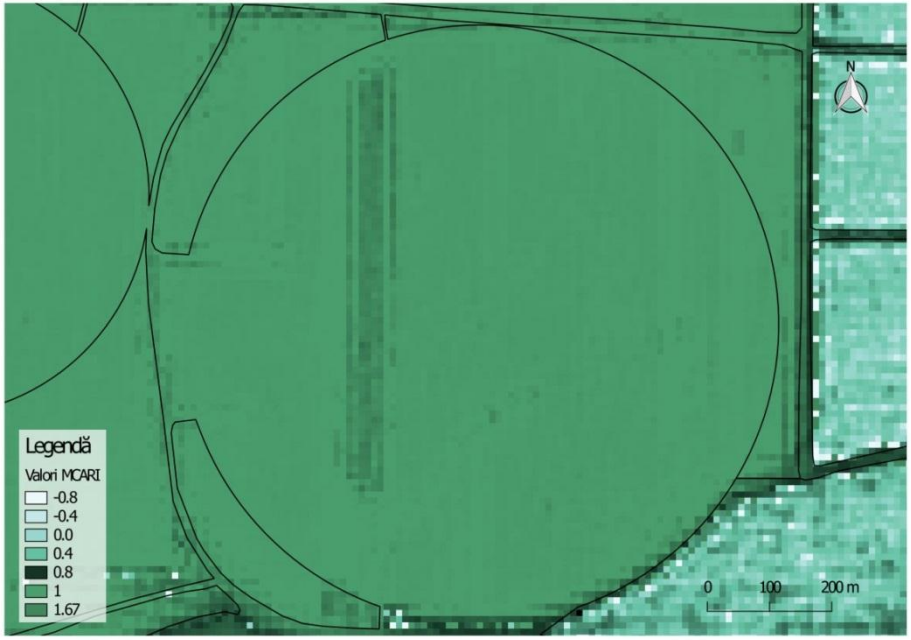


MCARI



NDVI vs MCARI





NDSI

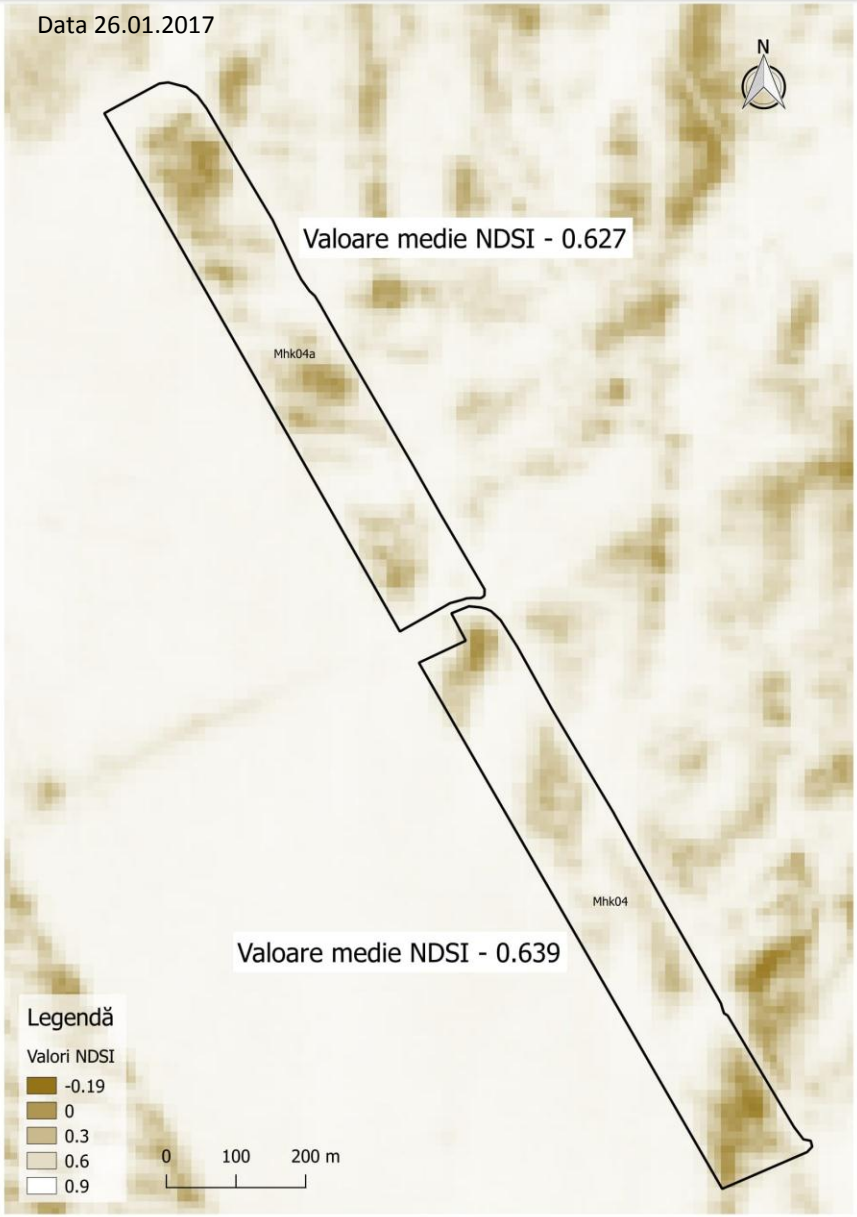
Normalised Difference Snow Index

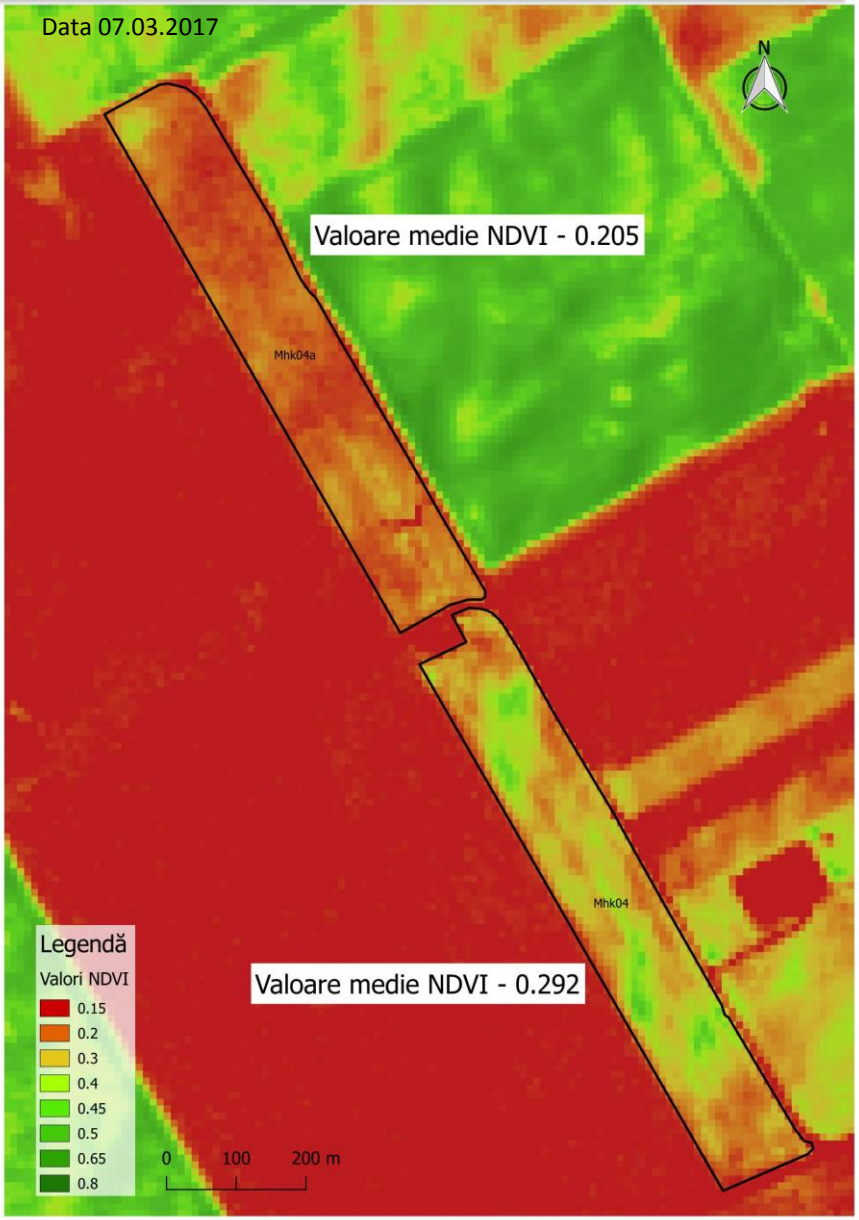
Formula de calcul: $$NDSI = \frac{\text{Band 3} - Band\ 11}{\text{Band 3} + Band\ 11}$$

- Valorile sunt cuprinse intre -1 și 1
- În general valori peste 0.4 indică prezența zăpezii

Comparație NDSI și NDVI

Cultura de rapiță





Comparație NDSI și NDVI

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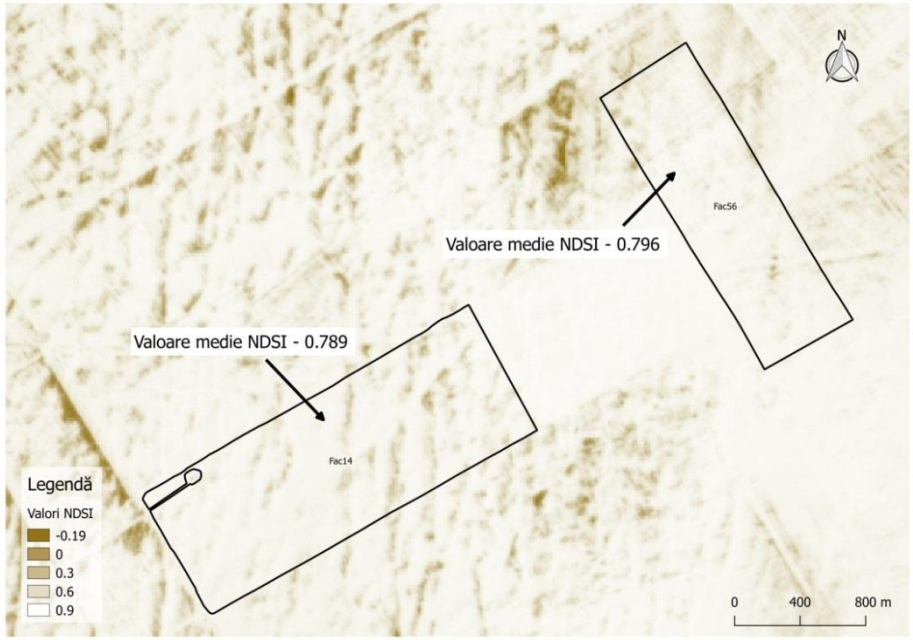
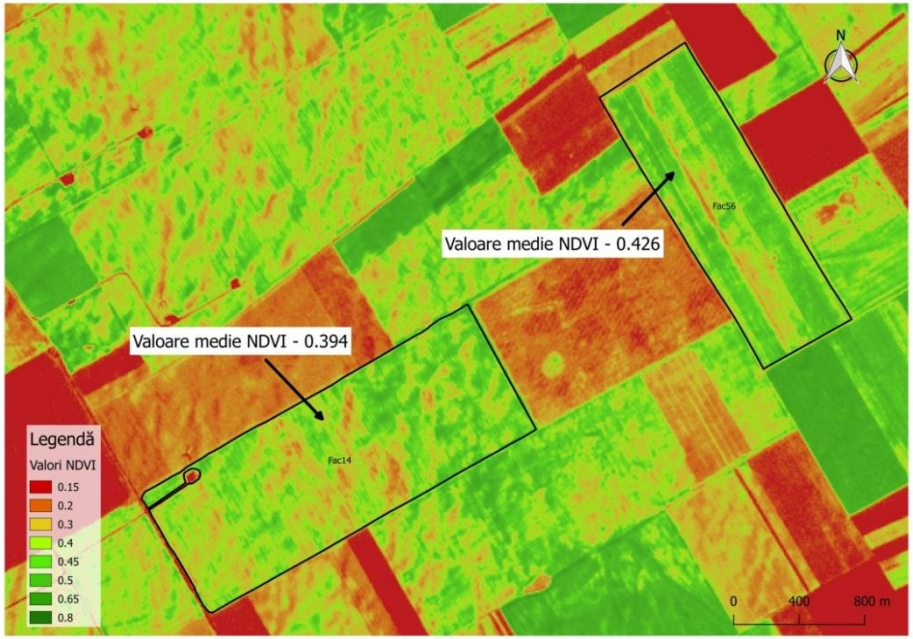
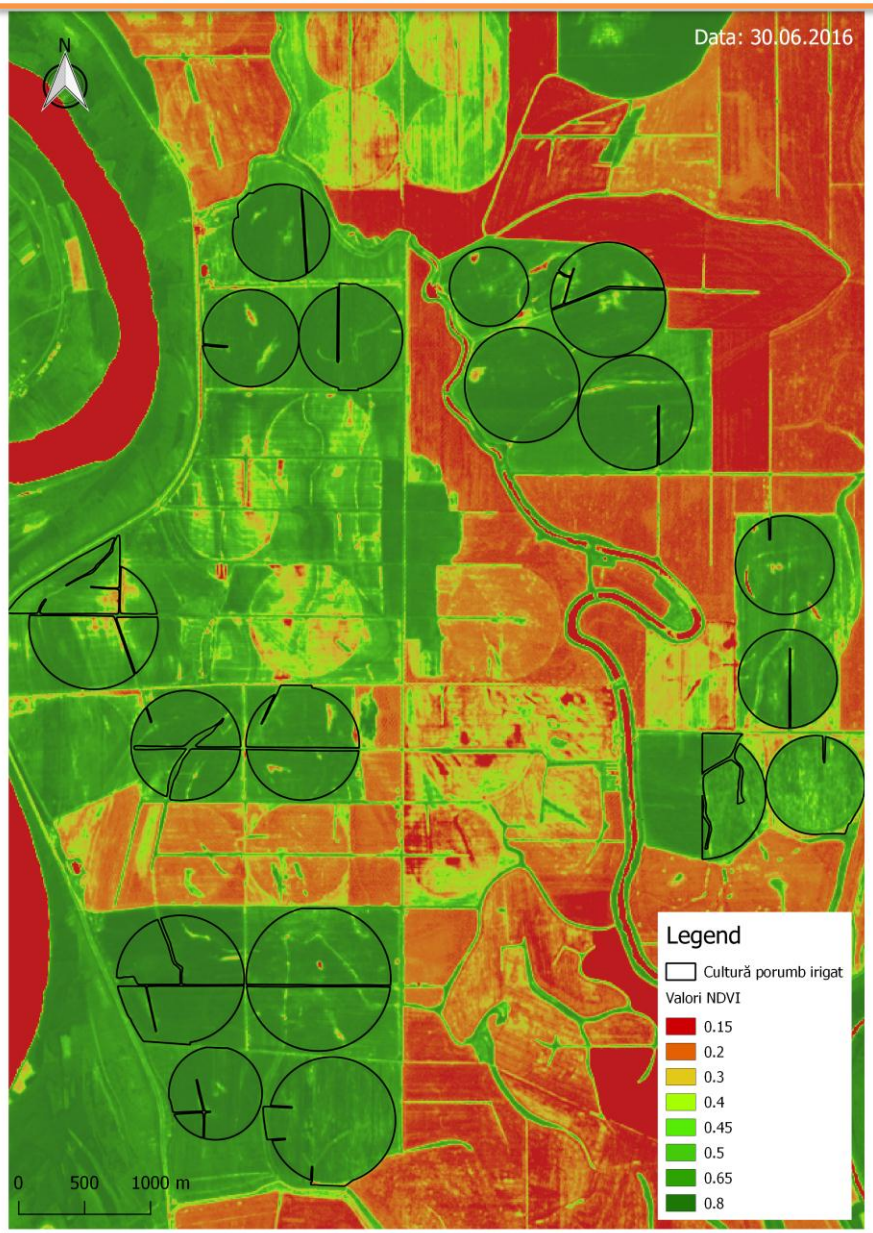
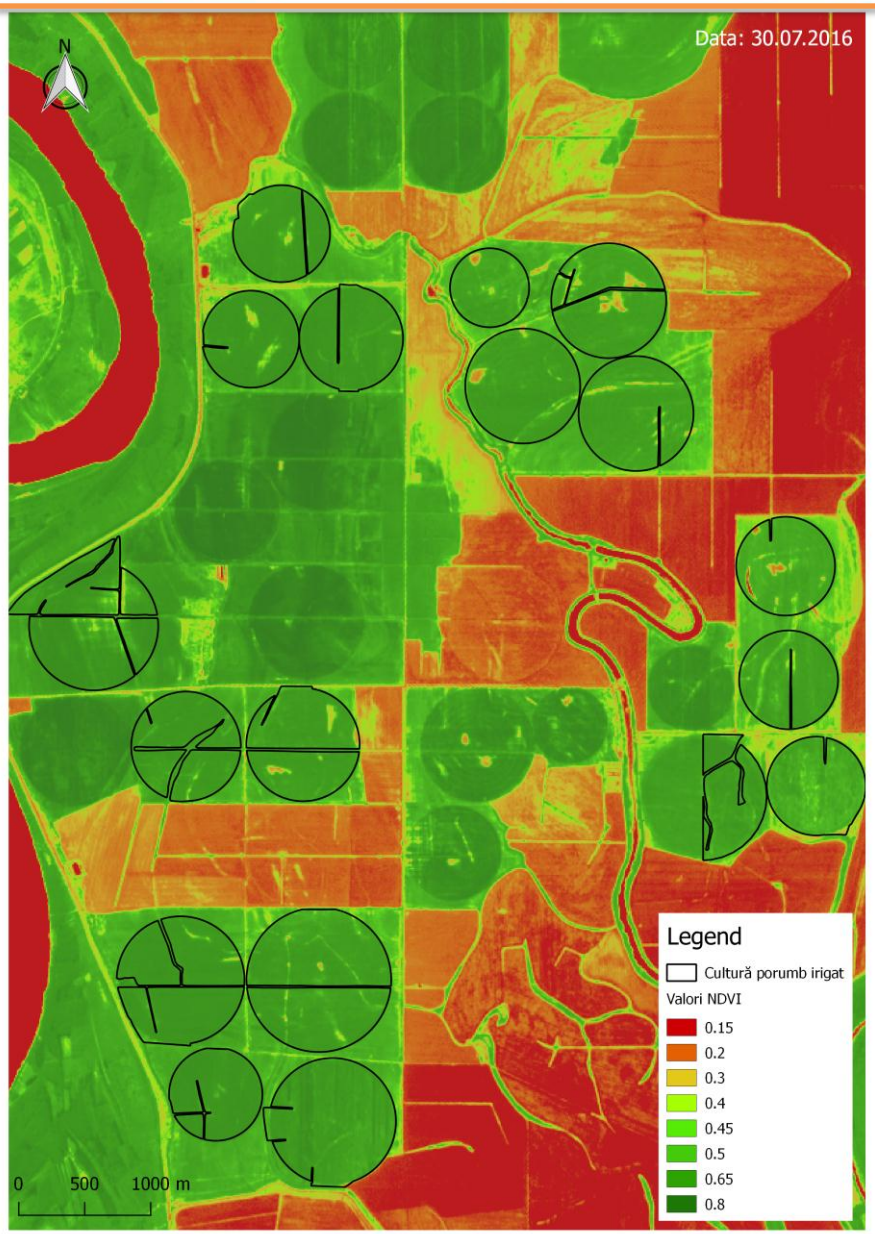


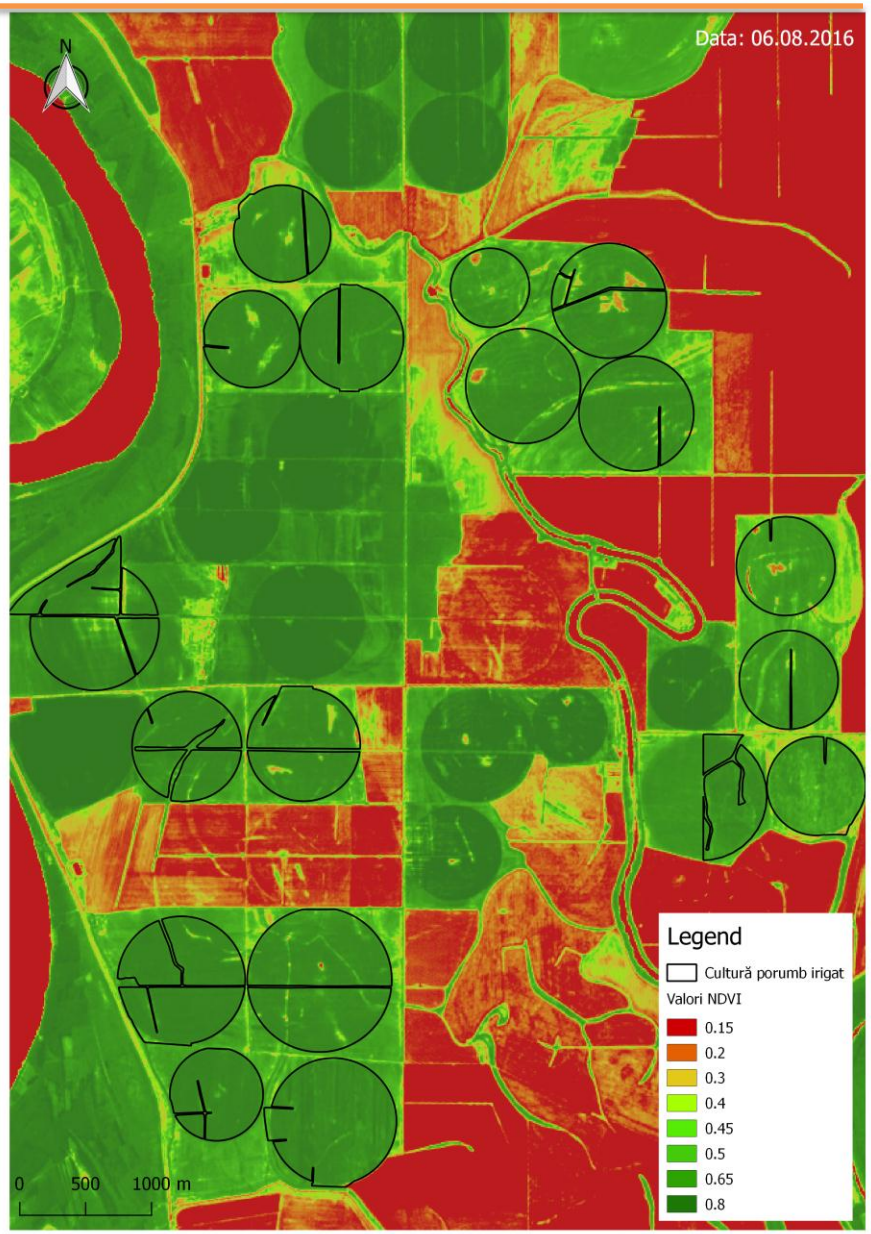


Valori NDVI porumb irigat

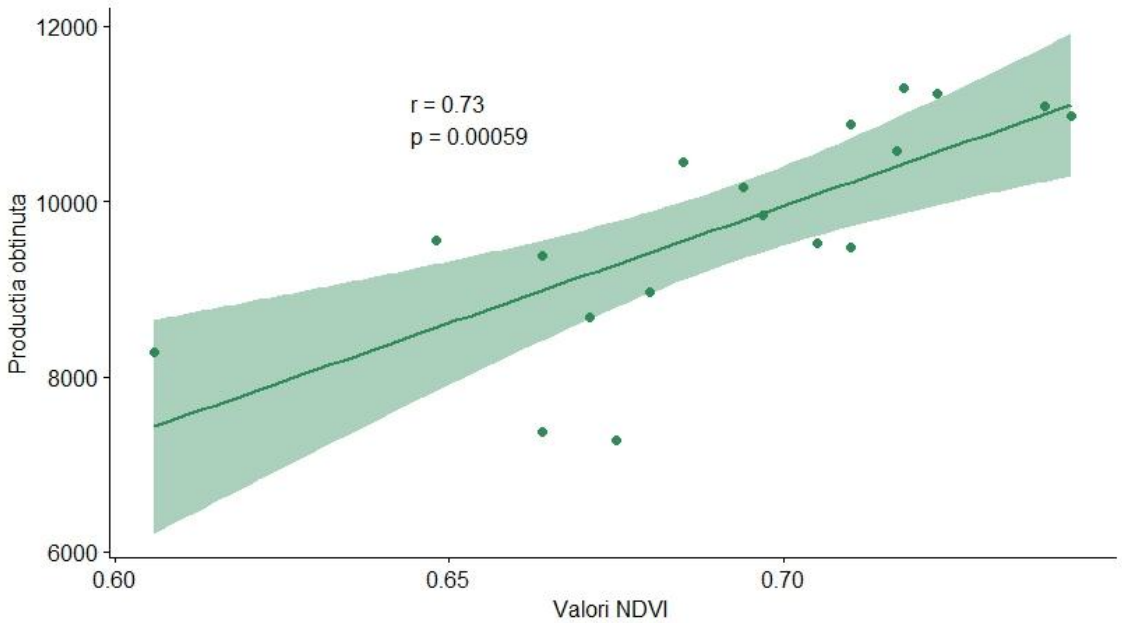


Valori NDVI porumb irigat





Corelație valori NDVI – producție



Corelație Pearson (r)

Parcele	Valoare medie NDVI	Productie kg/ha
ZimP21	**0.606**	8274.08
ZimP23	**0.648**	9561.18
ZimP14	**0.664**	9374.76
ZimP30	**0.664**	7370.17
ZimP29	**0.671**	8677.57
ZimP0	**0.675**	7281.23
ZimP38A	**0.680**	8972.84
ZimP07	**0.685**	10448.78
ZimP03	**0.694**	10159.51
ZimP28	**0.697**	9848.34
ZimP27	**0.705**	9529.29
ZimP01	**0.710**	9484.11
ZimP08	**0.710**	10880.14
ZimP18	**0.717**	10577.86
ZimP10	**0.718**	11304.66
ZimP17	**0.723**	11238.53
ZimP04	**0.739**	11093.82
ZimP02	**0.743**	10985.48

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