CONFERENCE

IRRIGATION

QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?

REGARDS CROISÉS EUROPÉENS
SHARING EUROPEAN VIEWS

13 - 14
nov. 2019
MONTPELLIER
FRANCE

Remote sensing indicators of water use efficiency for the South of Ukraine

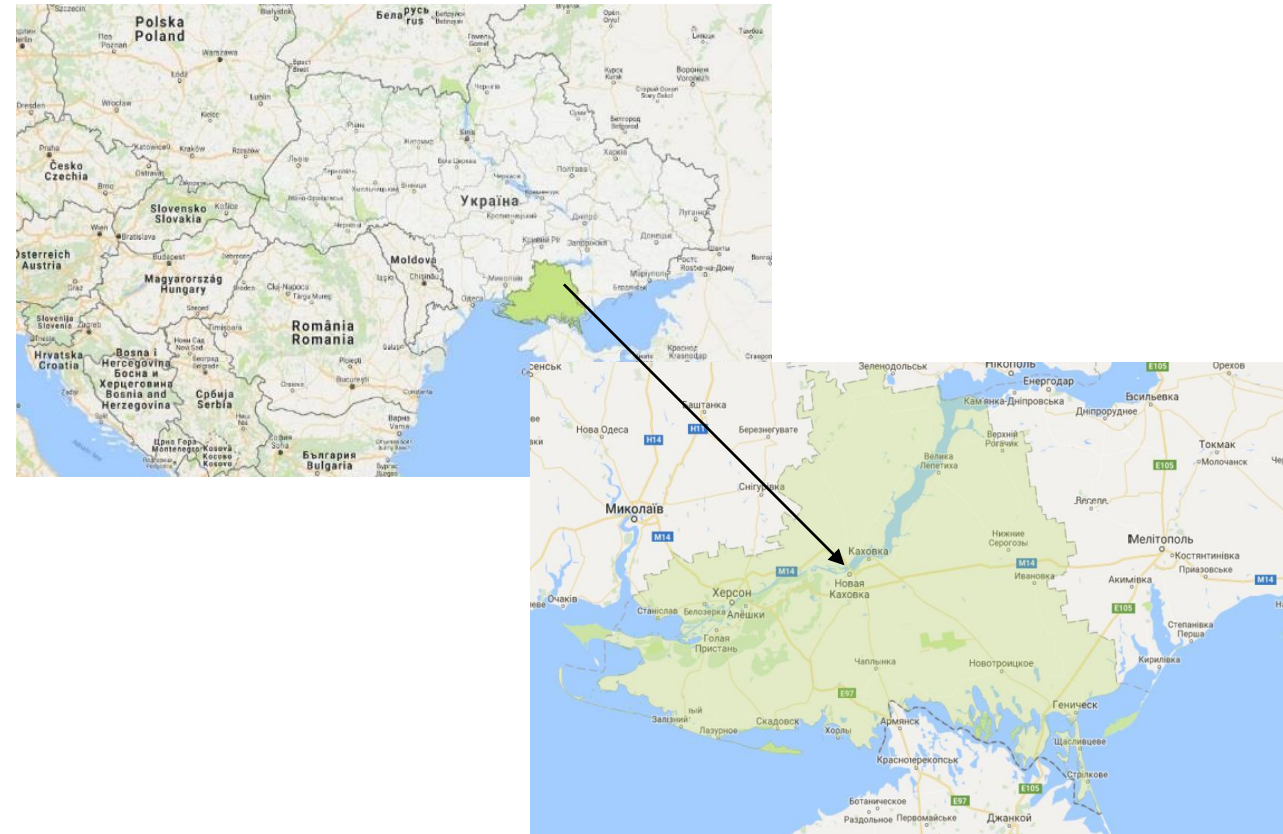**Iuliia Danylenko** [1], Vsevolod Bohaienko [2],

[1] Institute of Water Problems and Land Recalamation of NAAS, Kyiv, Ukraine

[2] VM Glushkov Institute of Cybernetics of NAS of Ukraine , Kyiv, Ukraine

IRRIGATION

QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?

13 - 14 nov. 2019

MONTPELLIER FRANCE

Context and area of study

- For arid conditions of Kherson region in the South of Ukraine, irrigation and shelterbelts the most influential components of agrolandscapes.

- Since the estimation of irrigation water use efficiency and shelterbelts' impact on it requires a large amount of field data, the use of selectively verified remote sensing data is relevant.

Area of study

IRRIGATION

QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?

13 - 14
nov. 2019

MONTPELLIER
FRANCE

Efficiency indicators of water resources use

We consider the coefficient of irrigation water use efficiency (CIWUE) computed from official statistical data as the main indicator of water usage practices . For vegetation season it has the following form:

$$\eta_{3} = \frac{E_{o} - X_{n}}{P_{o} - \Delta W_{o}}$$

E_{o} — optimal total evapotranspiration (estimated using meteodata);

P_{o} — gross water supply (official statistical data);

ΔW_{0} — changes in productive soil moisture content (*can be estimated using remote sensing data*);

X_{n} — precipitation;

IRRIGATION
QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?
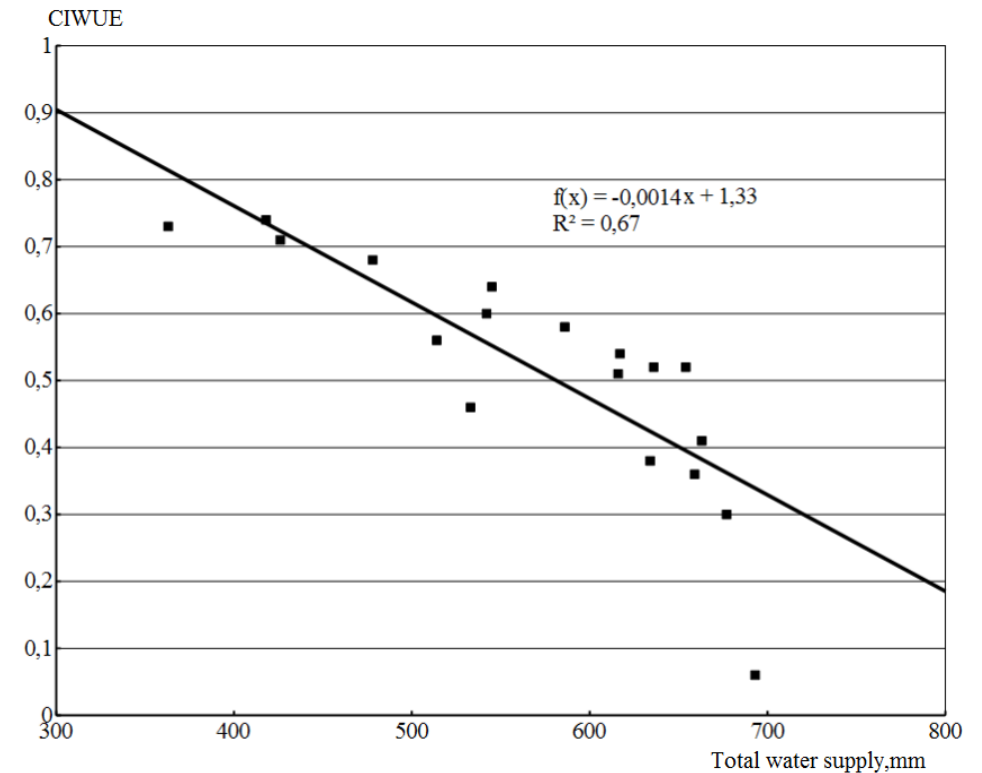13 - 14
nov. 2019
MONTPELLIER
FRANCE

Irrigated lands identification using NDVI

- Irrigated lands area is needed to transform per unit of area values of variables into absolute values;

- We analyze the districts of Kherson region where the most part of photosynthetic active biomass is located on irrigated lands.

- For them we have estimated biomass containing lands area assuming that they are represented by imagery pixels with NDVI value in the 0.3-0.8 range.

- For the studied area, such algorithm gives 25% error comparing to district-based government statistics.

Estimation of water resources use efficiency using remote sensing
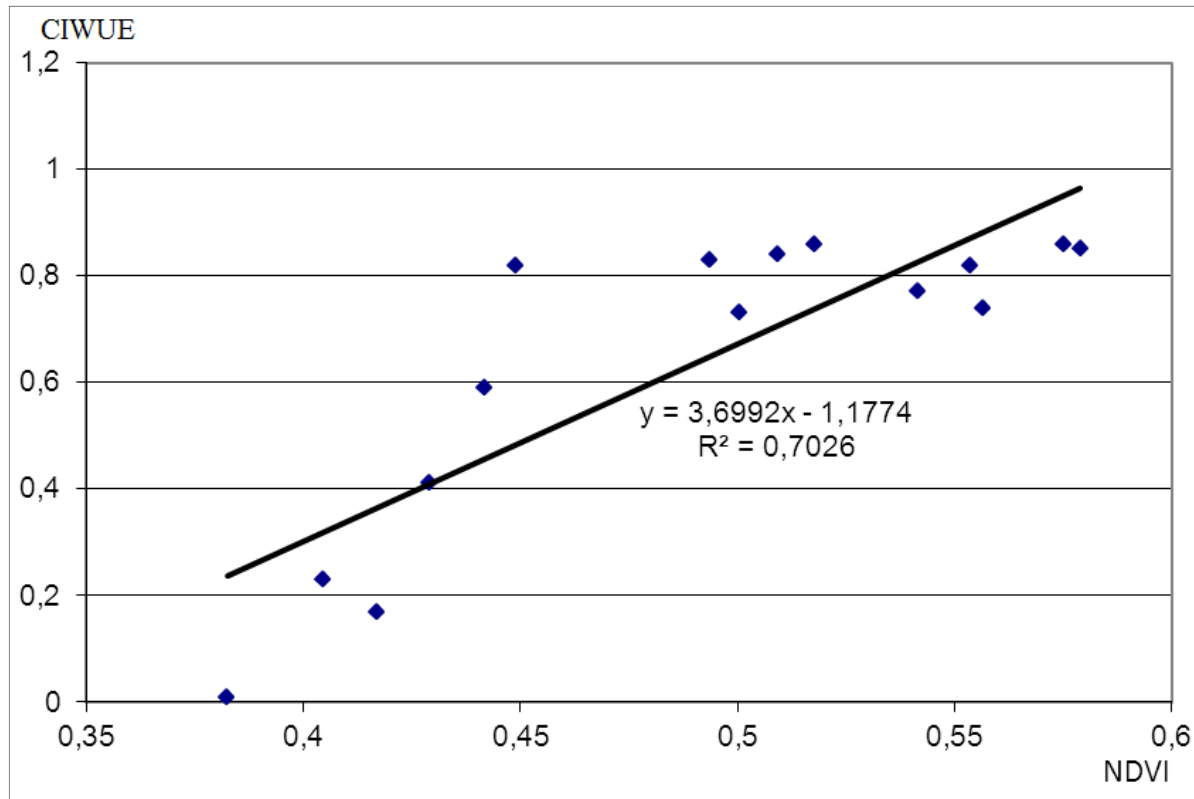
CIWUE to NDVI correlation

CIWUE to total water supply correlation
Can be used to assess reliability of official statistics

IRRIGATION

QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?

13 - 14
nov. 2019

MONTPELLIER
FRANCE

Soil moisture content estimation using VTCI drought index

- We obtained the correlations between VTCI (Vegetation Temperature Condition Index) values and the average moisture content in the layer of soil with the depth up to 50 cm.

- A linear correlation with R^2=0.48 was observed between the values of VTCI and NDVI indices. The similar correlation between VTCI and moisture content has R^2=0.65.

- VTCI also allows identifying the influence of agrolandscapes components on soil moisture content within a single field.

IRRIGATION

QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?

13 - 14
nov. 2019

MONTPELLIER
FRANCE

Variations of moisture content to biomass dependencies in time

- For images acquired on May, July, and August, 2018 the correlations between NDVI and VTCI were obtained for areas that have up to four shelterbelts.

- In May, correlations between NDVI and VTCI is inverse linear (Fig.1).

- For July and August, the inverse correlation persists only when no shelterbelts are present.
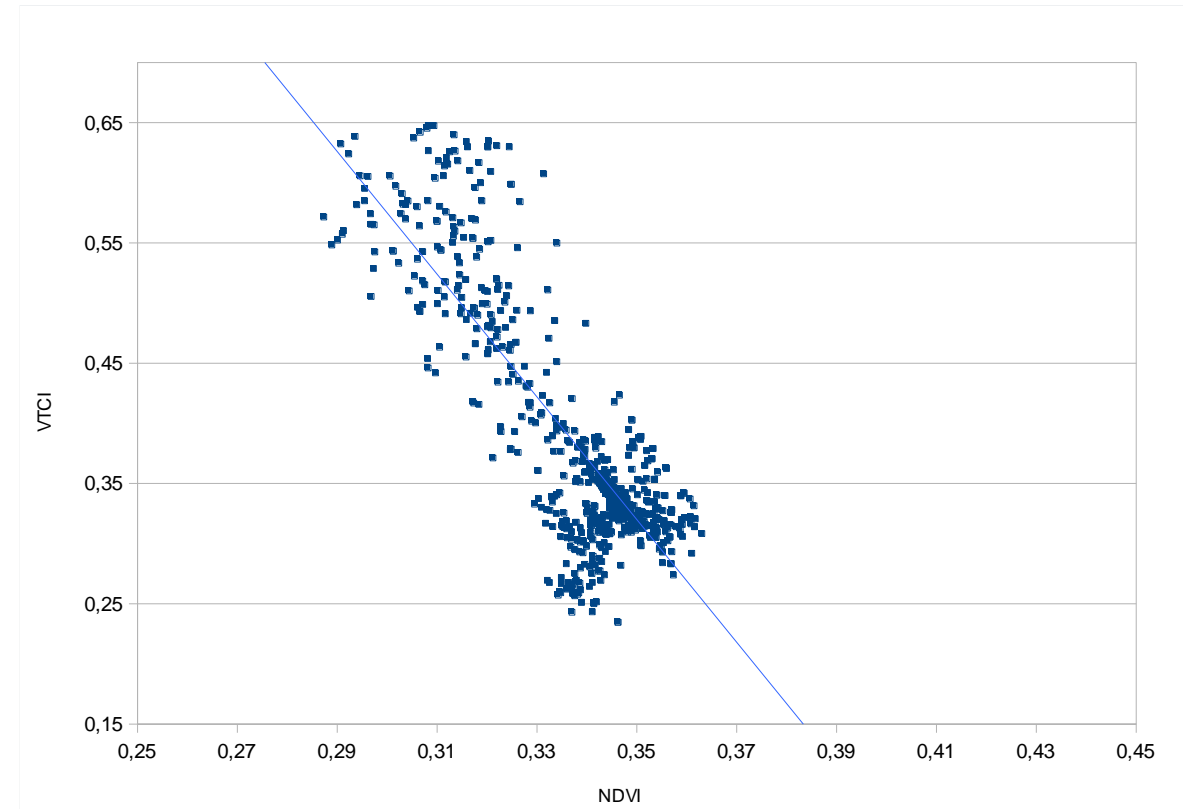

Figure 1

Variations of moisture content to biomass dependencies for different number of shelterbelts

- The distribution of indices values differs for areas of weak or absent vegetation (NDVI<0.3), areas of rainfed crop cultivation (0.3<=NDVI<0.6) and irrigated areas.

- The correlations in the case of absent or weak vegetation are close.

- In the case of rainfed crop cultivation, the number of shelterbelts influence the slope of correlation: it is negative for <2 shelterbelts and positive when there is a complete or almost complete contour of shelterbelts.

- The correlations for irrigated fields are close in all cases of shelterbelts presence as irrigation is levelling other factors' impact.

Conclusions

The obtained results can form a base for elaboration of recommendations for agrolandscape's spatial planning in arid conditions of the South of Ukraine

It might help to decrease irrigation water losses due to high evapotranspiration, save moisture in root layer of soil, smooth or even prevent droughts, thus creating comfortable conditions for crops development

IRRIGATION

QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?

13 - 14
nov. 2019

MONTPELLIER
FRANCE