



Detection of Water Stress in Cereals Using the UAV Thermography

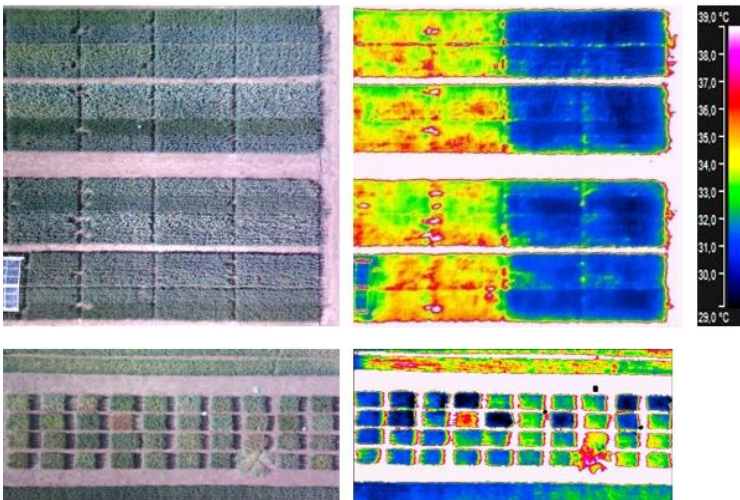
Availability of water for crops and their resistance to shortages during growth affect the overall yield, quality and profitability of field production in changing climate. Plants affected by drought stress close their stomata, the process of transpiration that cools vegetation gets down and the surface temperature of the leaves increases up.



Thermal imaging camera Workswell WIRIS mounted on a drone

Quick detection and quantification of elements of varietal resistance to stress and quick detection and quantification of elements of surface variability of weak moisture are essential for the management of field crops. The data can be used for selection and delimitation of species and varieties of crops within enterprises. They can also be used for the purposes of precise farming, clarification of the moisture needs in irrigations, etc.

For scanning the temperature condition of experimental varieties, we used a thermal camera **Workswell WIRIS** supported by UAV platform of DJI s1000. The flight was pre-programmed using UGCS Ground Station.



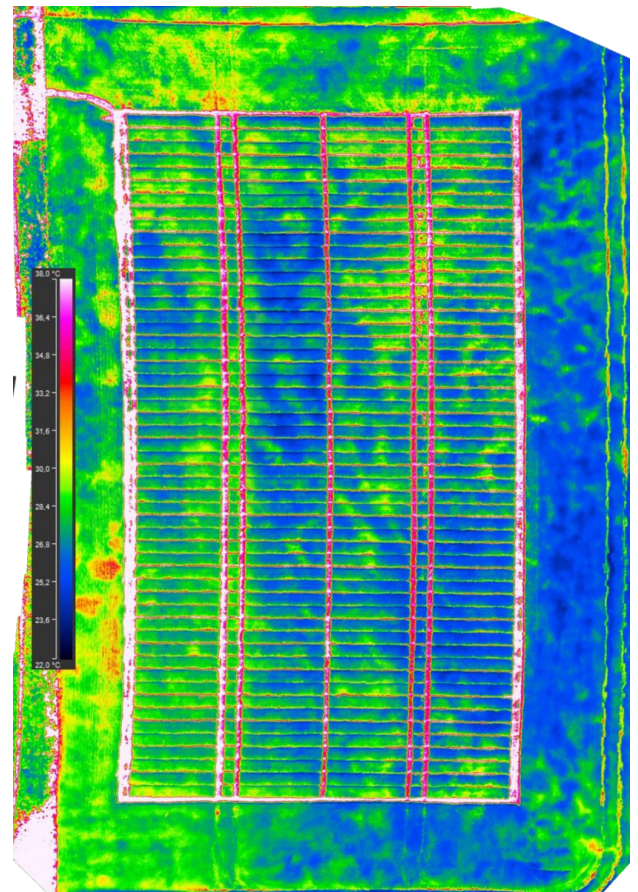
Experimental lands and areas

The data have been processed in the program Pix4D and analyzed by software **Workswell CorePlayer** and **Workswell Thermoformat**.

Figure on the left shows the experimental lands and the experimental areas (the latter in detail) (1500 m²), with tests aimed to the lines of winter wheat with different sizes of root system that would affect drought tolerance. Stress is induced by shading; the optimum content of water is maintained by dripping irrigation.

Analysis of data and their validation in semi-operating conditions suggests new options for quantitative and qualitative evaluation of abiotic stress induced in the cereals due to lack of moisture.

For the future application, there will be models based on exact measurements on the ground; the data that are scanned from the air shall be easily, quickly and reliably interpretable even when based on the index of water stress in plants (CWSI) specific for particular varieties in the area of cultivation.



Whole area thermogram was composed by software Pix4D



WIRIS 2nd Gen, Thermal imaging camera