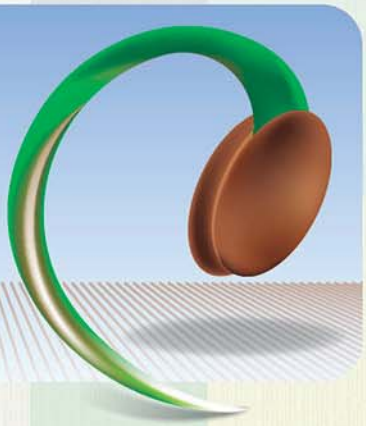
ESA 2020



XVI European Society for Agronomy Congress

1 to 3 September, 2020 - **Sevilla - Spain**

SMART AGRICULTURE FOR GREAT HUMAN CHALLENGES

BOOK OF ABSTRACTS

Organizes:

Universidad de Sevilla

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Technical Secretariat:

Viajes El Corte Inglés Congresos

HOUR	AUTHOR	TITLE
11:00 -13:30	**SESSION 3.2 CHAIRMAN: JOSE ENRIQUE FERNÁNDEZ**	**EFFICIENT RESOURCE MANAGEMENT: SOILS, WATER, NUTRIENTS, AND ENERGY**
11:00 -11:30	MIGUEL QUEMADA	**KEYNOTE:** INTEGRATED MANAGEMENT TO ENHANCECOVER CROPS BENEFITS AND RESOURCE EFFICIENCY
11:45 -12:00	MINA DEVKOTA	OPTIONS TO ENHANCE WHEAT YIELD AND WATER PRODUCTIVITY IN A MEDITERRANEAN RAINFED ENVIRONMENT BY AGRONOMIC INNOVATIONS
12:15 -12:30	MARLOES VAN LOON	AGRONOMIC NUTRIENT USE EFFICIENCY AND GREENHOUSE GAS EMISSIONS FOR CEREAL SELF-SUFFICIENCY IN SUB-SAHARAN AFRICA TOWARDS 2050
12:30 -12:45	MARCO MANCINI	EFFECT OF SOIL AVAILABLE PHOSPHORUS AND NITROGEN ON WINTER WHEAT PRODUCTION
12:45 -13:00	BJÖRN REDDERSEN	DRONE BASED PHENOTYPING OF NUE RELATED PARAMETERS OF VAROIUS WINTER RAPSEED GENOTYPES
13:00 -14:00		LUNCH
14:00 -16:30	**SESSION 3.2 CHAIRMAN: MIGUEL QUEMADA**	EFFICIENT RESOURCE MANAGEMENT: SOILS, WATER, NUTRIENTS, AND ENERGY
14:00 -14:15	ERIC BÖNECKE	PRECISION LIME MANAGEMENT: A SENSOR-BASED SOIL MAPPING APPROACH
14:15 -14:30	BETTINA EICHLER-LÖBERMANN	(LITTLE) SHORT-TERM IMPACTS OF P FERTILIZER MANAGEMENT IN A LONG-TERM FIELD EXPERIMENT
14:30 -14:45	EVA HERRERO	FERTIGATION WITH SLURRY LIQUID FRACTION IS AGRONOMIC AND ENVIROMENTALLY SUSTAINABLE
15:00 -15:15	JOSE LUIS PANCORBO DE OÑATE	HYPERSPECTRAL AND THERMAL IMAGERY TO ASSES NITROGEN AND WATER STATUS IN WINTER WHEAT
15:15 -15:30	HELENA GOMEZ-MACPHERSON	POTENTIAL OF CONSERVATION TILLAGE COMBINED WITH REGULATED DEFICIT IRRIGATION FOR SAVING WATER
15:30 -15:45	MARÍA DOLORES RAYA-SERENO	GROUND LEVEL AND AERIAL SENSORS TO ASSESS WHEAT N STATUS AND TO ADJUST N FERTILIZATION
15:45 -16:00		COFFEE BREAK
16:00 -17:45	**SESSION 3.3 CHAIRMAN: DAVIDE CAMARANO**	INSTRUMENTS FOR RESOURCE MANAGEMENT: MODELS, MONITORING, AND DECISION-MAKING TOOLS

HOUR	AUTHOR	TITLE
16:00 -16:30	BRUNO BASSO	**KEYNOTE:** DIGITAL AGRONOMY TO DESIGN AND SCALE SUSTAINABLE AGRICULTURAL SYSTEMS
16:45 -17:00	DAVID DE LA FUENTE	SMART INTEGRATED DATA ANALYSIS FOR AGRICULTURE SUPPORT DECISION - MAKING AND MANAGEMENT – SENSING4FARMING
17:00 -17:15	MARTINA CORTI	A SOLUTION TO OVERCOME SATURATION OF VEGETATION INDICES FOR CROP BIOMASS ESTIMATION
17:15 -17:30	SÉBASTIEN DANDRIFOSSE	ASSESSMENT OF THE IMPACT ON WHEAT YIELD OF THE INTERACTION BETWEEN FERTILIZATION AND YELLOW RUST THROUGH MULTI-SENSOR MACHINE VISION

THURSDAY, SEPTEMBER 3	ROOM 1

11:00 -13:30	**SESSION 1.3: CHAIRMAN: CLAS NENDEL**	MODELLING CROP-ENVIRONMENT INTERACTIONS
11:00 -11:15	DUCHENE OLIVIER	MODELLING PHENOLOGICAL DEVELOPEMENT OF THINOPYRUM INTERMEDIUM REVEALS A PHOTOPERIODIC EFFECT, AFFECTING FLOWERING EARLINESS
11:15 -11:30	SÉBASTIAN MIRA	A SIMULATION STUDY FOR STRUCTURAL EQUATION MODELS SELECTION IN AGROECOLOGY
11:30 -11:45	DIMA SABBOURA	IMPACT OF PLANT PROTECTION STRATEGY AND SOIL TILLAGE ON THE CARBON FOOTPRINT OF WHEAT
11:45 -12:00	KERSEBAUM KURT CHRISTIAN	MODELLING IRRIGATION EFFECTS IN CROP ROTATIONS ACROSS BRANDENBURG UNDER CLIMATE CHANGE
12:00 -12:15	MARÍA LUISA GANDÍA TOLEDANO	WEED DENSITY AND WEED DIVERSITY INFLUENCED BY RAINFALL, DIFFERENT SOIL MANAGEMENT AND ROTATION SYSTEMS.
12:15 -12:30	CHRISTIAN JOFRE CEKALOVIC	ESTIMATING TRANSPIRATION IN GRAPEVINES UNDER TWO WATER REGIMES USING THE TWO-SOURCE ENERGY BALANCE MODEL
12:30 -12:45	DANIEL KINDRED	THE AGRONOME: ATTEMPTING TO UNDERSTAND GENETIC X ENVIRONMENT X MANAGEMENT EFFECTS ON CROP PERFORMANCE

2018 and 110.5±31.5 in 2019). Ammonia emission in the fertigation was reduced by more than 60%. NUE raised in the pivot against the reference from 0.60 to 1.20 in 2018 and from 0.65 to 0.88 in 2019. These results were obtained thanks to a better distribution of slurry and associated lower N rates in the pivot.

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Keywords: Fertigation, slurry, NUE, ammonia, nitrate

0142

HYPERSPECTRAL AND THERMAL IMAGERY TO ASSES NITROGEN AND WATER STATUS IN WINTER WHEAT

JOSÉ LUIS PANCORBO [1]- MARÍA ALONSO-AYUSO [1]- MARÍA DOLORES RAYA-SERENO[1] - JOSÉ LUIS GABRIEL [2]-CARLOS CAMINO [3],[5]- PABLO J. ZARCO-TEJADA[4], [3]- MIGUEL QUEMADA [1]

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Remote sensing imagery is a valuable tool to detect Nitrogen (N) and water stress that allow adjusting N fertilization and irrigation to crop demand. Interaction between N and water status may affect the signal acquired by sensors covering different spectral regions. This study proposes two different vegetation indices (VIs) sensitive to N and water status with reduced interaction effects. For this purpose, a field experiment with winter wheat (*Triticum aestivum* L.) was conducted in Central Spain during 2018/2019. Four different N treatments, from non-N-fertilized (N_0) to over-fertilized (N_3), combined with two irrigation levels were established with four replications in 32 plots (22 x 22 m^2). The Nitrogen Nutrition Index (NNI) was used to determine crop N status by relating the biomass and %N of two wheat samples (0.5 x 0.5 m^2) per plot at the beginning of flowering. The water status of each plot was determined with a leaf porometer that measured stomatal conductance. The imagery was acquired with a hyperspectral and thermal camera on-board a Cessna aircraft flying 300 m above the experiment, leading to <0.3 m spatial resolution. The VI proposed to determine N status was the Canopy Chlorophyll Content Index (CCCI), a planar domain vegetation index that combines a VI related to plant structure (NDVI) with another related to chlorophyll content (NDRE). The Water Deficit Index (WDI) estimates water status, and was calculated by plotting the Vegetation Index-Temperature (VIT) trapezoid in a two-dimensional space created by the surface-air temperature differential and a VI sensitive to the ground cover (SAVI). The results indicated that CCCI described better NNI (R^2 = 0.64) than NDVI (R^2 = 0.43) or NDRE (R^2 = 0.53). No differences were found for each N treatment between water levels, except for N_0. The stomatal conductance was better described by WDI (R^2 = 0.65) than canopy temperature (R^2 = 0.60) or other VIs based on SWIR bands, like $NDWI_{1240}$ (R^2 = 0.34) or $NDWI_{1640}$ (R^2 = 0.31). Differences of WDI were found between water treatments but not between N treatments. This study concluded that N and water status can be determined simultaneously when using spectral and thermal VIs.

Keywords: Critical Nitrogen Dilution Curve, Interaction effects, Precision agriculture, Remote sensing, Soil background

0144

POTENTIAL OF CONSERVATION TILLAGE COMBINED WITH REGULATED DEFICIT IRRIGATION FOR SAVING WATER

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Several studies around the world have shown that conservation tillage is effective protecting the soil against water and wind erosion. However, other claimed benefits like water conservation or yield improvement are less clear. In general, soil water infiltration is improved while residues on the ground reduce soil water evaporation. On the other hand, regulated deficit irrigation aims at conserving irrigation water without penalizing crop yield by reducing the applied amount during the less drought-sensitive crop phenological periods. In this study we explored the potential of combining conservation tillage and regulated deficit irrigation and evaluated its impact on maize performance in southern Spain. The experiment was carried out during three campaigns (2015-2017) in a long-term trial established in 2007 to compare conservation and conventional tillage. 1.8m access tubes to a neutron probe allowed measuring soil water content regularly. The regulated deficit irrigation treatment was effective and used 100 mm less irrigation water than the reference irrigation treatment, which was established to cover full requirements. Moreover, drought was avoided during crop establishment and during the flowering period so that the small negative effect on crop growth and grain yield was not significant. The expected compensation to reduce this small negative effect thanks to conservation tillage was not observed. The reasons will be discussed.

Keywords: zero tillage, water productivity, water saving, irrigation strategy

0170

GROUND LEVEL AND AERIAL SENSORS TO ASSESS WHEAT N STATUS AND TO ADJUST N FERTILIZATION

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The use of mineral fertilizers has increased in the last decades, but >50% of N applied is not assimilated by crops, contributing to environmental pollution (Tilman et al., 2002). Sensoring crop performance could contribute to adjust N fertilization and to increase N recovery. The objective of this work was to evaluate the ability of ground level sensors and remote sensing to assess crop N status and to adjust fertilization. Specific objectives were: i) to evaluate the successful detection of different N levels, and ii) to compare the N fertilizer residual effect with and without nitrification inhibitors. A two-year field experiment (maize/wheat rotation) was established in Central Spain. Maize was sown in sixteen plots (8 x 10.5 m) randomly distributed in 4 treatments: calcium ammonium nitrate enriched with sulphur (CAN(S)), ammonium sulphate nitrate (ASN) blended with 3, 4-dimethylpyrazole phosphate (DMPP) (ASN+DMPP), CAN(S) blended with 3,4-dimethylpyrazole succinic (DMPSA) (CAN(S)+DMPSA) and not-fertilized, with 4 replications. After maize harvest, wheat was planted and each plot was split into three subplots, that received CAN(S) either at a recommended N rate (N_2), a reduced rate (N_1) or no N (N_0) applied. The residual N effect was evaluated by comparing the wheat response (N content (kg N ha^{-1}) and grain yield (kg ha^{-1})) at flowering and harvest. Vegetation indices obtained at ground-level (Dualex®, Greenseeker®) and from an airborne hyperspectral sensor covering the visible and near-infrared regions were compared with wheat parameters. Differences in wheat response to N rates were detected by ground and aerial sensors at various growth stages, yielding significant differences already at stem elongation. Residual N effect was observed in wheat at flowering in N_0 treatments, as the biomass and N content were higher following maize fertilization with CAN+DMPSA and ASN+DMPP compared to the control. At wheat harvest, the residual effect was observed in grain N content and %N. This residual effect was detected by ground level sensors at stem elongation, but not by narrow-band spectral indices calculated from the aerial sensor. Ground level and aerial sensors detected differences in wheat N status at stem elongation, opening the opportunity to adjust N fertilization rates to crop demand. However, only ground sensors detected differences in N fertilizer residual effect. Further research is needed to identify spectral-based indices and traits more sensitive to crop N status.

Keywords: remote sensing, vegetation indices, fertilizer, wheat

0202

EFFECT OF PRECEDING CROP ON NITROGEN EFFICIENCY FOR SOFT WINTER WHEAT IN SAIS REGION, MOROCCO

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Efficiency in use of non-renewable resources is becoming critical to favor sustainability and resilience goals of agricultural systems. In Southern Mediterranean countries, agricultural development leads to environmental concerns such as water-table decrease due to over-irrigation, and water pollution, together with issues related