0103

EX-ANTE ASSESSMENT OF HERBICIDE REDUCTION BY IMPLEMENTING EARLY PRECISION WEED CONTROL IN SPRING CROPS

NEBOJŠA NIKOLIĆ [1] - ROBERTA MASIN [1] - PIERRE SAULET [2] - ELISA MARRACCINI [3] - ALICIA AYERDI GOTOR [4] - DAVIDE RIZZO [3,5]

[1] Department of Agronomy, Food, Natural resources, Animals and Environment - DAFNAE, University of Padova, Italy. [2] Geolab, UniLaSalle, France. 3 InTerACT (UP 2018.C102), UniLaSalle, France. [4] AGHYLE (UP 2018.C101) UniLaSalle, France. [5] Chair in Agricultural Machinery and New Technologies, UniLaSalle, France

Use of herbicides needs to be properly managed to balance benef t of reducing harvest loss due to weeds against potential environmental risks. Precision weed control is expected to reduce the quantity of applied herbicide by better targeting the spraying. This can involve several components of weed control, ranging from strategic to tactic decision-making, up to equipment management. To this end we tested the coupling of a weed emergence predictive model (AlertInf) for spring row crops with mapping of early weed distribution. Our aim was to achieve both timely herbicide application and precise spatial weed distribution to ensure the highest herbicide eff cacy. Airborne images produced by Unmanned Aerial Vehicles provides the best trade-off for retrieving the spatial localization of the weed infested areas. Three series of images were acquired in early June 2019 over a maize f eld in the experimental farm of the University of Padova. Additional f eld surveys allowed to identify the presence of the target weed Sorghum halepense (L.) with an emergence percentage of 96%, of total f nal emergence, according to the AlertInf model, at the date of the f ight. Weed spatial distribution was assessed by the exploratory comparison of two algorithms: Artif cial Neural Networks (ANN) performed within the SAGA software, and Visible Atmospherically Resistant Index (VARI) within ArcGIS Pro. Classif cation performances were trained and evaluated against a dataset issued from visual on-screen labelling three classes, i.e. crop, bare soil, weed. ANN provided more precise weed classif cation in respect to VARI, therefore VARI missed a part of infested area compared to ANN. Based on the technical specif cations of different models of sprayers, several maps were created splitting the f eld into cells of 3m2, 2m2 and 0.25m2 and with three different thresholds for treatment decision depending on each cell infestation (i.e., >1%, >5% and >10% of pixel labelled as weed). Prescription maps showed that potential sprayed area reduction, compared to traditional spraying of the entire f eld, can vary from 42% to 87% at >1% threshold and from 65% to 93% at >10% threshold by using ANN and VARI classif cation respectively . Altogether, the results suggest that site-specif c mapping informed on emergence models can enable a substantial herbicide reduction through both timely and site-specif c weed control with ordinary section control sprayers. Further research is required to evaluate the contribution of a weed emergence model, such as AlertInf, to herbicide usage reduction, performing additional tests in different f elds and including more weed species.

Keywords: Precision agriculture, Herbicide reduction, UAV, Weed Science