

ICARDA High Throughput Phenotyping Approach in The Context of the Modernization of Its Breeding Programs.

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During the past 40 years ICARDA has been developing germplasm for the non-tropical dry areas that lead to the release of more than 880 varieties of its mandate crops, that generated benefits worth US\$ 850 million every year. Under the umbrella of the CGIAR Excellence in Breeding initiative and partly supported by the Arab Found for Development, ICARDA developed a full plan for the modernization of its breeding programs with a unique high throughput phenotyping (HTP) approach across the CG centres. Its approach comprises a fully automated HTP machine “PhenoBuggy” located at Marchouch, ICARDA’s main breeding station in Morocco and a precision phenotyping platform located also in Morocco in Settat area, characterized by a harsh climate. Our “PhenoBuggy” combines RGB, LiDAR and a multispectral sensor that works simultaneously for determining vegetation index, green fraction, green area index, fraction of intercepted radiation, canopy and leaf chlorophyll content, plant height, biomass, spike density and stem diameter. The system allows to scan around 4000 plots per day therefore it suits the needs of the different breeding programs. The precision phenotyping platform combine the use of proxies for important physiological traits, and a rainout shelter lysimetric facility called PhysioTron equipped with a gantry carrying a semi-automated HTP system. The PhysioTron and its HTP system allows to phenotype up to 750 genotypes for both aboveground and below ground traits such green fraction, greenness, ear number, plant height and biovolume and agro-climatic traits. All these efforts were done by ICARDA with aim of continue developing climate-smart crops taking advantage of the biodiversity available a in our genebank, pre-breeding and breeding program. The aim of this work is introducing our HTP pipeline and data from different crop from the first acquisition campaign, including data related with Roo2Res and BarleyMicroBreed projects that focuses on the identification for aboveground traits related with root architecture and drought stress tolerance.