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GENOMICS-DRIVEN BREEDING FOR LOCAL ADAPTATION OF DURUM WHEAT IS ENHANCED BY FARMERS' TRADITIONAL KNOWLEDGE

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In the smallholder, low-input farming systems widespread in the Global South, farmers select and propagate crop varieties based on their traditional knowledge and experience. A quantitative integration of their knowledge into breeding pipelines may support the sustainable intensification of local farming. Here, we combined genomics with socioeconomics to tap into traditional knowledge in smallholder farming systems, using durum wheat (*Triticum durum* Desf.) as a case study. We developed and characterized a large, nested association mapping (EtNAM) population that recombines an elite international breeding line with Ethiopian traditional varieties maintained by local farmers. EtNAM lines were evaluated for agronomic performances and farmers' appreciation in multiple locations, finding that gender and location influence farmers' preference, althogh women and men farmers can consistently identify the best durum wheat genotypes. We then trained a genomic selection (GS) model with farmer scores and found that their prediction accuracy over grain yield was higher than that of the benchmark GS model trained on grain yield. Finally, we used a genome wide association mapping (GWAS) approach

to identify marker trait associations, and we complemented it by producing genetic maps for individual EtNAM families to map quantitative trait loci (QTL) for agronomic traits and farmer scores. We identify and discuss genomic loci associated with both, supporting the integration of participatory information in breeding pipelines. Our data shows that farmers' traditional knowledge can be integrated in a quantitative framework to increase genetic gain in pre-breeding programs, supporting genomics-driven breeding for local adaptation.