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## Exploring Potentials for Narrowing Farmers’ Wheat Yield Gaps in Golestan Province, Iran

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### Abstract

Yield gap describes the difference between the potential yield of a specific crop genotype in a given environment and farmers’ actual yield. Narrowing yield gaps offers the opportunity to increase production without expanding cropland. Quantifying and explaining farmers’ yield gaps allows identifying the constraints that farmers face regarding productivity and evaluate opportunities to narrow yield gaps. Golestan province in northeastern Iran is an important national base for wheat production and contributor to food security. Here we collected primary production data of 540 wheat producing farm households, which we selected through a stratified random sampling procedure. Building on farmers’ reported crop management as well as site-specific soil information and daily weather data, we employed the AquaCrop model to estimate each individual farmer’s water limited and potential wheat yields under current and optimised management. With average actual yields of  $3.5 \text{ t ha}^{-1}$  and potential non-water limited yields of  $8.2 \text{ t ha}^{-1}$ , we identified a wheat yield gap of nearly 60%. By solely optimising irrigation management, yield gaps could be reduced from 60% to around 50%. If farmers could overcome all other yield limitations including weeds, pest and diseases as well as suboptimal timing of management measures, yield gaps could even be reduced to around 20% using current (suboptimal) irrigation practices. The analysis shows that the often-claimed necessity and potential of improving irrigation water supply and management is only one (relatively small) part of the solution. To narrow yield gaps in Iranian wheat production it requires a broader approach that integrates stable input supply and training of farmers in all aspects of crop management.

**Keywords:** AquaCrop, farm survey, wheat, yield gap