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“Can agroecological farming feed the world?  
Farmers’ and academia’s views”

## Do agro-ecological practices improve water productivity in irrigated vegetables crops?

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### Abstract

Performance of irrigation systems are suggested better crop yield and irrigation water use efficiency (IWUE) when combined with agroecological practices. These practices aim at a sustainable soil, water, and crop management by improving soil root zone environment and increasing crop water and nutrient absorption. However, the effects of agroecological practices on crop yield and IWUE are variables. This study presents the results of meta-analysis of 25 peer reviewed scientific publications on irrigated vegetables that met eligibility criteria. A total of 282 observations extracted was used with random-effects model to compute response ratio (RR) of vegetable yields and IWUE. It aims to assess whether irrigation application methods, relative irrigation amount, season, and crop types significantly improve crop yields and IWUE under deficit irrigation (DI) and over full irrigation (OFI) compared to full crop water requirement (100%ETc) as the control. Both gravity and pressurized irrigation have a negative impact on vegetable yields under DI or OFI. IWUE is improved when DI is applied under pressurized irrigation compared to gravity application while in OFI, both water application methods lead to a significant decrease of IWUE by 240 %. Over full and deficit irrigation have a significant negative impact on vegetable yield (RR DI=-0.1388,  $p<.0001$ ; RR OFI=-0.0437,  $p<.0001$ ). The effect is 200 % more severe when DI is applied compared to OFI and under 50 % of ETc. Among the different irrigation amount applied, only an application between 50 and 80 % of ETc resulted in the best IWUE. Yield is negatively affected as opposed to IWUE regardless the fertiliser source used under DI and OFI. Indeed, IWUE is most improved when organic fertiliser is applied alone or in combination with mineral fertilisers. Crop types and production season also negatively impacted yield under DI or OFI, but water productivity is improved under fruit vegetables and spring-summer season. Our findings highlight the potential of agroecological practices under irrigated vegetable to increase yield and WUE and identify in which conditions these results can be achieved. These practices can be used successfully around the world.

**Keywords:** Agroecological practices, irrigation methods, relative irrigation amount, vegetable, water use efficiency