

Definition and Determination of Water Productivity Management Index (WPMI) and Its Application for Forage Maize in Moghan Plain

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Abstract

In order to complete and differentiate various water productivity indexes according to the actual situation, it is necessary to provide a measure to evaluate the suitability of the productivity index and extend the results to other areas. Therefore, in this study, through a process view of the agricultural production system and considering climate, land, and plant capabilities and constraints in the complex cycle of water-soil-plant-atmosphere and human, different water productivity (WP) researches were grouped and analyzed. Indices of Potential Climatic Water Productivity (PCWP), Potential Land Water Productivity (PLWP), Actual Water Productivity (AWP), Water Productivity Gap (WPG), Water Productivity Management Index (WPMI), and Water Productivity Management Level (WPML) were all defined and their methods of determination were presented. The indices were determined and analyzed for three forage maize farms in Moghan Plain. The results showed that changes in agronomic calendar and field soil conditions variation affected the PCWP and PLWP indices, such that the PCWP varied from 31 to 46 kg.m⁻³ in farms 1 and 3 and PLWP varied from 26 to 42 kg.m⁻³ in farms 2 and 3. The AWP was always less than the PLWP and was affected by farm management on yield, and the proportional of allocation and consumption of water to actual yield. The AWP was 27, 24 and 39 kg.m⁻³ for farms 1, 2 and 3, respectively, in the best condition. Where water allocation was location-specific and according to crop calendar and actual production, the WPG was drastically reduced and it was equal to 0.2, 2.2 and 3.5 kg.m⁻³ for farms 1, 2, and 3, respectively. Practically, using simply the AWP index cannot properly judge, analyze, and compare the status of water productivity management in different field conditions. However, The WPMI and WPML dimensionless indices presented in this article are suitable for this purpose[‡].

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