The water footprint of milk in comparison of twelve international farming systems: an implication for global food security and improve food nutrition

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ABSTRACT

A consequence of increasing water scarcity has to impart challenges to global food security. This is due to possible inter-linkage and competition between the water and the food production where food provision is fundamentally guaranteed. Water use (WU) by dairying leads to impacts on ecosystems but milk and other milk products used to support and heighten human life. However, there is lacking awareness of method selection to assess impact and adequate consideration of heterogeneity in production Therefore, this study compared two methods on 12 regional typical case farms from International Farm Comparison Network that represent three production systems for assessing impacts of consumptive WU and degradative WU of a kg energy corrected milk (ECM) production. The first is the virtual water concept customarily used to consider the volumes of water consumed, and second, a life cycle impact assessment method is applied for WU which describes the impact contributing to freshwater scarcity. The virtual water content (VWC) results ranged from 787 to 4242 L/kg ECM while the life cycle impact results for WU, referred to the water footprint (WF), ranged from 3 to 1520 L H2Oe (water equivalent)/kg ECM at farm gate. As an example, the VWC and the LCA (life cycle assessment)-based WF on the Bangladeshi-two cow farm contained 2579 L/kg ECM and a 24 L H2Oe/kg ECM, respectively. The WF results are very heterogeneous due to diverse farming practice geographically, high variation in local water scarcity, and milk production intensity. The results also indicated that minimum input use in relation to consumptive blue water and a pasture-based dairy production system where lower water stress index have a lower impact on freshwater scarcity. VWC as a method of WU is unsuitable to measure the potential to contribute to freshwater scarcity but the LCA-based WF provides a useful dimension to assess impact of consumptive WU contribution to freshwater scarcity. This study suggests that changing production systems in low water stress region and improve their blue WU efficiency, i.e. irrigation services, is to reduce freshwater scarcity for implementing operational plans to sustain food security and food nutrition of people around the world.

Keywords: Water scarcity, water footprint, life cycle assessment, milk production, food security