



The role of Alberta in global food security through virtual water trade

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Ensuring food demand for a growing population while shrinking water demand (WD) for crop production is becoming a great challenge. Freshwater scarcity has been increasing at an alarming rate due to climate change and socio-economic development, and threatening crop production at the local and global scale. Water challenges are becoming ever more important in Alberta that impacted agriculture, energy, and urban sectors. Therefore, understanding the dynamics of WD associated with crop production is essential for sustainable food planning and regional water management. This study investigated the WD of rainfed and irrigated cereal (wheat, barley, and canola) production at a high spatial and temporal resolution. The physically process-based Soil and Water Assessment Tool (SWAT), which has been extensively calibrated and validated using yield time series, was used to simulate crop consumptive water use (ET) in order to derive regional water balance of supply and demand. After meeting local demands of cereal grain, our projections revealed an annual average export potential of ~138 billion m³ of virtual water through the export of these cereal crops in the form of both grain and other processed foods. This amount is expected to outweigh the total historical provincial water yield of 66 billion m³ and count for 47% of total historical precipitation. This study establishes a solid base to assess the dynamic relationship of water-food security in Alberta and understanding the local to global water-food trade policy for sustainable agriculture.