AGR1611: Crop Water Footprints and Virtual Water Flows: A comprehensive evaluation of crop water use in Saskatchewan

The water footprint (WF) of crop production is a user-friendly means to analyze the consumption of the water resource in agricultural production systems. This study assessed the inter-annual variability of the total WF of three types of main crops: cereal (spring wheat and barley), oilseed (canola and sunflower), and pulse (lentils and chickpeas), both from a yield and protein perspective, and determined the major factors influencing the WFs in the province of Saskatchewan. Over the period of 1965 to 2014, the annual precipitation in Saskatchewan fluctuated greatly, but increased slightly with time. The yield-based WF ranged between 1.08 and 1.80 m^3 kg^{-1} for spring wheat, 0.90 and 1.38 m^3 kg^{-1} for barley, 1.71 and 2.58 m^3 kg^{-1} for canola, 1.94 and 4.28 m^3 kg^{-1} for sunflower, 1.47 and 2.37 m^3 kg^{-1} for lentils, and 1.39 and 1.79 m^3 kg^{-1} for chickpeas. In contrast, the protein yield-based WF ranged between 7.69 and 10.44 m^3 kg^{-1} for spring wheat, 8.27 and 16.47 m^3 kg^{-1} for barley, 3.79 and 7.75 m^3 kg^{-1} for canola, 4.86 and 11.17 m^3 kg^{-1} for sunflower, 5.09 and 7.42 m^3 kg^{-1} for lentils, and 5.51 and 10.69 m^3 kg^{-1} for chickpeas. All WFs of crops generally decreased with time, which was likely driven by scientific and technological advances. Pulse crops had a higher grain yield-based WF, but a lower protein yield-based WF than cereal crops. Under conditions of improved protein consumption and healthy living in the future, pulse crops may be a preferred crop.