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Water footprint assessment along the wheat-bread value chain towards the sustainable use of freshwater in South Africa

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A significant amount of water is used in food production. The current increase in demand for food and impact of climate change place much pressure on the available water resources. South Africa is soon approaching complete utilisation of its available surface water, with irrigated agriculture accountable for about 63% of the country's available water use. This poses a threat to food security. Wheat is the largest winter cereal crop produced in South Africa, approximately 80% of this wheat is used to produce Bread. Bread consumption in South Africa is estimated at 2.8 billion loaves per annum. About 62 loaves of bread are consumed per person per annum with noticeable differences in preferences. Therefore, it is important to account for the amount of water used along the wheat-bread production chain. In this paper, we examined water footprint along the wheat–bread value chain. The water footprint concept provides an appropriate framework for analysis to find the link between the consumption of agricultural goods and the use of water resources. The paper employed the Global Water Footprint Standard approach to calculating the volumetric green, blue and grey water footprint along the wheat-bread value chain. Our findings reveal that wheat production at the farm level accounts for 99.95 percent of the total water footprint of the bread, while processing and wholesale levels only account for 0.56 per cent. Our findings highlight the importance of effective and efficient water use at the farm level for wheat production. Specifically, the total water footprint of wheat bread is 937.42m3.ton-1. The green water component was found to be 190.59m3.ton-1 and that of blue water was 745.28 m3.ton-1. Grey water footprint accounted for only 1.55 m3.ton-1. The results indicate that the amount of water used at farm level is the largest contributor to the total water footprint of bread. Given the blue water scarcity situation in South Africa, it is very critical for wheat producers to pay particular attention to the large blue water usage in order to be sustainable in their production. Economically, we found that value added to water as it moves along the wheat-bread value chain varies from one stage to another. More value is added to water at the farm level, relative to the milling and bakery levels. Hence, we recommend that the economic dimension of water utilisation should be considered in the production decision of food producers.