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Water Productivity as Affected by Water Management in a Small-scale Irrigation Scheme in the Blue Nile Basin, Ethiopia

SISAY DEMEKU DERIB¹, KATRIEN DESCHEEMAER², AMARE HAILESLASSIE³, TILAHUN AMEDE³,
BERNHARD TISCHBEIN¹

¹*University of Bonn, Center for Development Research (ZEF), Ecology and Natural Resources Management, Germany*

²*International Water Management Institute (IWMI), Kenya*

³*International Livestock Research Institute (ILRI), People Livestock and Environment, Ethiopia*

Abstract

Irrigation has been practised since ancient times and, currently, it is mainly implemented in small-scale irrigation schemes, which are often characterised by low water productivity in Ethiopia. This study reports on the productivity of a typical small-scale irrigation scheme in the highlands of the Blue Nile, Ethiopia, with the objectives: to quantify canal water loss, water needed and used to produce biomass, to quantify feed and food water productivities and to identify ways to improve the efficiency and productivity of water use. Field measurements of canal water flows and the volume of irrigation water applied were done. Grain and crop residue biomass, and grass biomass production along the canals were also measured. We also closely observed the irrigation farm management and associated problems to triangulate the measurements. The average canal water loss from the main, the secondary and the field canals was 4.5, 4.0 and 26 % of the total water flow capacity of each canal type, respectively. About 0.05 % of the loss was attributed to grass production for livestock, while the rest was lost through evaporation and canal seepage. Grass production for livestock feed had a land productivity of 6190.5 kg ha⁻¹ and a water productivity of 0.82 kg m⁻³. Land productivity of straw and grain for tef was 2048 and 770 kg ha⁻¹, respectively, and 1864 kg ha⁻¹ and 758 kg ha⁻¹, respectively for wheat. Water productivities of the crops varied from 0.2 to 1.63 kg m⁻³. A significant volume of water was lost from small-scale irrigation systems mainly because of weak planning and mismanagement. Farmers' water application did not match with crop needs. Water price affected water management by minimising water losses and forced farmers to use deficit irrigation. Night storage mechanisms, optimal irrigation scheduling, empowering farmers on water management may improve food and feed productivity of irrigation water.

Keywords: Canal loss, crop residues, over irrigation, under irrigation, water price