Water and livestock

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Introduction

Projected increased demand for food in developing countries over the next 30 years implies a correspondingly great need for additional agricultural water unless integrated research and development can achieve much higher water-use efficiencies. Without appropriate innovations in water management, poor access, quality and supply will continue to constrain food production. A global consortium recently completed the *Comprehensive Assessment of Water Management and Agriculture* (CA 2007) and identified many options for overcoming water-related constraints to sustainable food production in developing countries. Historically, research and development of water resources has neglected the potential benefits and impacts of livestock. Apart from drinking water, livestock professionals have not given adequate attention to the use of and impact of domestic animals on water and related environmental health. In the absence of good science, popular literature is often highly critical of livestock production because of its perceived excess depletion of vital water resources. The CA uniquely attempted to address this issue (Peden, 2007). This paper summarizes the CA's findings about livestock for the benefit of this meeting on Livestock and Climate Change and the wider livestock research community.

Livestock water productivity (LWP)

LWP is the ratio of the net beneficial animal products and services produced in an agricultural production system to the amount of water depleted as a cost of producing them. Production system scales can vary in size ranging from farms and fields to watersheds and river basins. Depleted water is water lost from production systems such as evaporation, transpiration and downstream discharge. Figure 1 presents a simplified version of the LWP assessment framework (Peden 2007) used to estimate the amount of water depleted in diverse livestock systems. While much is known about drinking requirements of animals, direct consumption of water does not contribute to water depletion because water drunk remains in the production system even though drinking may be vital to animal survival. Strategic feed sourcing, conserving of water and enhancing animal productivity provide multiple options for increasing LWP. The first two strategies help ensure that feed and pasture supplied to animals makes best use of available water and, where appropriate, shifts water depletion pathways from unwanted run-off or discharge and evaporation to transpiration and infiltration. The productivity-enhancing pathway is the traditional domain of the animal sciences. Collectively, we can help increase LWP by maximizing the value of animal products and services produced with available feed that is produced where transpiration is high and other forms of water depletion are low.

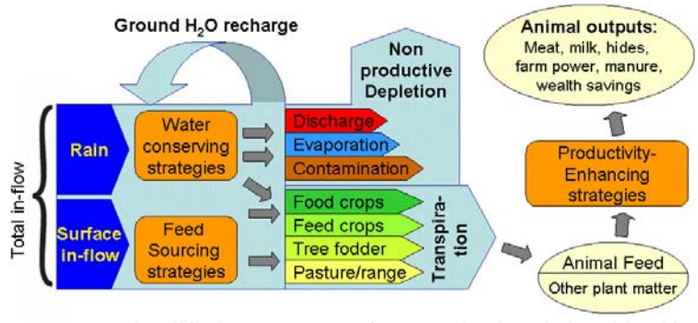

Figure 1 Simplified assessment framework that helps identify strategies for improving livestock water productivity
(Source: Peden, 2007)

Implications for Sub-Saharan Africa

Livestock production is an important part of African agriculture and animal densities are higher and lower respectively in irrigated and pastoral areas than in mixed crop-livestock systems. Africa is vulnerable to drought, waster scarcity and water-borne animal diseases including zoonotic ones. Increasing LWP through better management of livestock-water interactions holds promise for sustainably improving livelihoods of the continent's poor and making more fresh water available for other human needs and ecosystem services. Evidence from the CA (Peden, 2007) indicates that investments in agricultural water development are often not sustainable and do not achieve potential returns on investments due to lack of integration of livestock. Contrary to much popular opinion, LWP compares favourably with marginal returns arising from investments in irrigated horticultural crops and is higher than observed in rain-fed grain crops. Water used for production of animal source food is currently the most effective means to meet protein, Vitamin B12, Iron and Selenium requirements of millions of malnourished Africans. The overarching message of the CA is that livestock-water interactions are important and under-researched and that huge opportunities exist to improve the productivity of water associated with livestock production. To achieve this will require active engagement of animal scientists in research and development of agricultural water in developing countries. Through an appropriate mix of technologies, management practices and policies, we estimate that current levels of animal production can be maintained while reducing water depletion by more than half in Sub-Saharan Africa.

Acknowledgements
Funding and other support for this research was generously provided by the CGIAR *Comprehensive Assessment of transpiration Water Management and Agriculture*, the CGIAR *Challenge Program on Water and food* and the International livestock Research Institute.

References
CA (Comprehensive Assessment of Water Management in Agriculture), 2007. Water for Food, Water for Life: the Comprehensive Assessment. Earthscan, London, UK and International Water Management Institute (IWMI) Colombo, Sri Lanka.
Peden D,. Taddesse G, and Misra AK. 2007. Water and livestock for human development. In Water for Food, Water for Life: the Comprehensive Assessment (Ed D Molden), pp. 486-514. Earthscan, London, UK and IWMI, Colombo, Sri Lanka.