

4. Agricultural Water and Livestock Production

BACKGROUND AND JUSTIFICATION

Livestock keeping is one of the most important agricultural livelihoods practiced in Africa and particularly so in water scarce arid and semi-arid regions. Globally, livestock make up, on average, 45% of the agricultural contribution to GDP and more than half in some African countries (e.g., Sudan and Somalia). Not included in this indicator of economic importance of livestock are difficult to value roles such as the contribution of livestock to traction and transport that are essential for producing food crops and moving them to markets and consumers. While demand for food must grow by 50% over the next 20 years to sustain human population growth, the demand for livestock products is expected to double during the same period. This depends partly on progress in reducing poverty resulting in an increasing propensity of people to spend more disposable income on animal products particularly in urban areas. This is a phenomenon now well underway in Asia and expected in Africa.

Already, food production uses more than 70% of managed water in developing countries. Achieving a 50% increase in food production with the same amount of water is not possible without increasing water use efficiency. Because of the current importance and the higher rate of growth of livestock production, there is a great need to factor livestock production into planning for water resource development. As countries become more industrialized, livestock can use up to half of all agricultural water, and there is growing interest in using waste water for feed production. A crucial knowledge gap exists in understanding the role of livestock in overall water use and the efficiency of water use in livestock production. Animal production needs to be part of the solution and not the problem.

Water requirements for production of animal feed may be as much as 100 times greater than that needed for drinking. Animals raised on irrigated forages require much more “managed” water than those raised on rainfed grazing land. Even in rainfed mixed farming, production of water demanding feed such as Napier grass may compete with farmers’ ability to grow food crops. The challenge is to develop strategies of how, when and where to produce animal feed in order to minimize demand on irrigated water and to reduce competition with rainfed crop production. Increasing use of crop residues for animal feed and shifting feed sourcing to land unsuitable for rainfed crop production may be part of the solution. The trade-off between using irrigated water for forage production and food crops must be considered. Furthermore, strategic investments in watering points for livestock can help spread grazing pressure to areas where feed production does compete with human food production. Balanced and selected investment in water supply for livestock drinking may complement investment in water development for production of human food and animal feed.

Apart from the importance of animal production in African agriculture and food production, poorly managed livestock contribute to water contamination, degradation and depletion. Undesirable interactions of livestock with water resources aggravate the unacceptably low health standards of many Africans. Part of the solution to improved planning, development and management of water in Africa may be achieved through investment in better livestock keeping practices that are consistent with maximizing sustainable return on investments in future water resource development. Livestock grazing and watering along the edges of water bodies such as rivers and dams leads to removal of riparian vegetation, increased sedimentation, contamination of domestic water with zoonotic parasites and may create environments more favourable for mosquitoes that transmit several serious diseases especially

malaria. For example, in a recent study (Atwill et al. 2002), three metre wide buffer strips were shown to be 99.9% effective in filtering *Cryptosporidium* from agricultural run-off suggesting that this simple investment in water management could greatly reduce a ubiquitous human parasite that is a significant factor in people's capacity to cope with HIV.

Briefly, there are needs for investment in water resource development for improved livestock production and in improved livestock management as a means to ensure more efficient and effective sustainable use of water resources for other purposes. This will explicitly address the need to mitigate the negative impacts that livestock-water interactions have on environment and human health.

The International Livestock Research Institute (ILRI) will contribute to the *Collaborative Program on Trends and Opportunities for Investment in Agricultural Water in Sub-Saharan Africa* through the *Health and Environmental Impacts* component and provide insights into the need for investments in:

- in water development necessary for the future viability and profitability of Sub-Saharan livestock production; and
- better livestock management practices that will contribute to more effective and efficient use of water resources for other agricultural purposes. As a contribution to the *Health and Environmental Impacts* component, the livestock sub-component will address the following questions:
 - i. To what extent does poor animal management contribute to the degradation and contamination of water resources that have been developed through past interventions?
 - ii. What are the options for management practices (e.g., strategic spatial distribution of watering points) that may mitigate the negative environmental and health impacts of livestock keeping?
 - iii. What are the livestock-related human health risks associated with past water development in SSA, and how can these be reduced in future water resource development and management?
 - iv. What are the potential positive health impacts (e.g., zoonophylaxis) of livestock keeping and how are these best enhanced?

In addition, as a contribution to the overall Collaborative Program, this component will address the question:

- v. What are the potential additional benefits of investments that integrate livestock, crops, and agricultural water?

METHODOLOGY AND APPROACH

While organizationally, this activity will be managed as part of the *Health and Environmental Impacts* component of the overall investment study, it will also, wherever practical, work in collaboration with other components to enhance understanding of the overall role of livestock in the development of water resources for agriculture. The outputs for the livestock-water activity will result from completion of seven major tasks (see annex 4.2). They are:

1. *Review of literature and interviews with key informants.* This activity will commence with a review of existing information available in published and selected grey literature and in the experience of "key informants" from the research and development community. Anticipated sources include libraries and archives of investor organizations, African and

developed country universities, NGOs and national and international agricultural and water research organizations. This activity will be based in Addis Ababa and may require travel from Ethiopia to West and Southern Africa and to key neighbouring countries in East Africa. Whenever appropriate and relevant, information from developed countries will be obtained through electronic means.

The review will attempt to answer a range of questions such as, but not restricted to the following:

- a. What is the importance of livestock in farming systems targeted by past water development?
 - b. To what extent and how was past livestock development promoted or constrained as a result of this investment in water resources?
 - c. To what extent and where was the investment in water resources intended to increase livestock access to drinking water, production of animal feed and processing of animal products?
 - d. What are the livestock-related human health risks associated with past water development in SSA, and how can these be reduced in future water resource development and management?
 - e. To what extent does poor animal management contribute to the degradation and contamination of water resources that have been developed through past interventions?
 - f. Given that investments in strategic spatial distribution of watering points for livestock can enable sustainable grazing in rainfed areas, what factors contribute to past successes and failure in such investment?
 - g. To what extent can livestock products based on use of water for feed production function as “a high value” crop when this is necessary to justify investments in water development?
 - h. What and where are investments in water resources needed to promote livestock development in Sub-Saharan Africa?
 - i. What and where should investments in livestock management be made to ensure that livestock keeping does not threaten investments in water development?
 - j. What policy issues must be addressed and what investment in capacity building is necessary to ensure effective integration of livestock and water development? In other words, what are the possible synergies of integrated livestock-water resources development?
 - k. What livestock related water development indicators are needed to assess the impact and performance of investments in water development for agriculture?
2. *GIS based stratification of SSA*. Numerous digital spatial data bases exist to show Sub-Saharan agricultural production systems, land degradation, human demographic and health data and livestock production statistics. Using ILRI’s GIS facility and public domain data sets, a continent-wide set of maps and related tabular summaries will be used to describe the convergence of livestock production with water resources. A key approach will be to develop a SSA-wide stratification based on agricultural production systems that takes into account diverse livestock keeping practices. This will help identify, at a macro level, key constraints to livestock that may be overcome through investment in water development and mitigation of threats to water resources caused by poor management of livestock. The stratification will be used to help identify case studies that collectively will highlight key livestock-water issues representative of SSA. The full scope of this activity will be dependent on procurement of additional funding. Wherever

possible and affordable, this activity will be carried out in a manner that contributes to the value of other components of the overall investment study and the synthesis thereof.

3. *In-strata case studies of key livestock-water development.* The livestock sub-component of the investment study will conduct desk based case studies to better understand the role that livestock management may have played in contributing to poor or good performance of past investment in water resources. These case studies will be selected to represent SSA-wide strata based on descriptions of agricultural production systems. They will give emphasis to strata where investment in water, livestock production (current and potential) and poverty intersect. Where possible, investigators will conduct interviews or surveys with key stakeholders such as decision makers, community based management groups and householders. Because of the overwhelming importance of livestock in the agricultural economy of certain countries (e.g., Sudan and Ethiopia), case studies may be selected within them where livestock development was an initial objective of the original investment in water resource development. In addition, extensive projects intended to reduce soil erosion and run-off may be included. Often, these projects were established to conserve land resources with little explicit thought to impact on down-slope water resources. However, poor management of livestock grazing frequently limits success in management of these rainfed agricultural production systems. Selected modelling of specific case examples may be undertaken to demonstrate INRM strategies needed for effective and sustainable water resource development and use. This livestock sub-study will be implemented in direct collaboration with the Environment Health and component of the investment study and the results and recommendations will be linked to recommendations emerging from the other the components.
4. *Analyses of case studies.* This activity will synthesize the lessons learned from the case studies.
5. *Preparation of the draft report.* In collaboration with other contributors to the *Collaborative Program*, the information arising from the literature review, the case studies and the GIS analyses will be synthesized and incorporated into a draft report and a PowerPoint presentation. The draft report and supporting papers (if any) will be circulated to key reviewers for comments and suggestions for improvement.
6. *Stakeholder workshop.* The draft report will be presented at one of the Stakeholder workshops planned under the *Collaborative Program*.
7. *SSA-wide synthesis and development of recommendations.* In collaboration with other components of the investment study, the livestock-water team will contribute to a coherent product to meet the needs of the World Bank, IFAD, FAO, IWMI, ADB and the Nepad secretariat. The modalities for doing this will be worked during the first 7 months of 2004.
8. *Preparation of final report.* After the workshop and in collaboration with other contributors to the *Collaborative Program*, a final report will be prepared. This will be a full technical report on findings and will include recommendations for investments as well as future research. It will be a contribution to the larger synthesis report to be produced under the Program. We may also produce a series of other documents such as policy briefs for decision makers, and materials targeting lay audiences and development organizations.

OUTPUTS

The outputs of this component will be:

- A review of the water requirements of livestock keeping and the impact of livestock keeping on water resources and water-related human health problems (e.g., malaria) in a representative set of agricultural production systems across sub-Saharan Africa. These will include extensive pastoral systems, mixed crop-livestock systems and rapidly expanding intensive industrial and smallholder urban and peri-urban livestock systems. The study will pay particular attention to the impact on poor children, women and men even where it is the relatively wealthy who own and manage the animals.
- Through spatial modelling of demographics and projected trends in poverty and demand for livestock products, the study will highlight priority regions where:
 - Investment in water for agriculture must consider livestock as an important production objective, and
 - Livestock management must be improved to enable acceptable returns on investments in water for non-livestock production objectives.
- Recommendations for effective and efficient investment options that will improve water use efficiency in livestock production and that will reduce water degradation caused by poor livestock management. These recommendations will highlight practical design and management options that individual farmers and farmers' groups can easily adopt and policies and investment options governments and investors can use.
- Identification of knowledge gaps related to livestock-water interactions that may require future investment in research.

We will try to identify innovative new approaches to investment in agriculture that integrate attention to livestock, crops and water resources development.