

Managing water for livestock and fisheries development

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Introduction

Ethiopia has an agrarian dominated economy, with 85% of the total employment, 98% of the total calorie supply, 70% of industrial raw material supplies, over 45% of GDP and 90% of the foreign currency earning. Despite its important roles, however, it fails to meet the minimum food requirements of the population.

Ethiopia hosts the largest livestock population in Africa and can produce over 51,500 t of fish per annum. However, their exploitation and consequently their contributions to food security and growth in the country is minimal despite the technologies capable of resolving the problems of livestock and fisheries production.

Livestock production in the past had been almost stagnant and thus failed to keep pace with the rapid population growth and in effect leaves the demand for meat and milk considerably unsatisfied. Current per caput meat and milk productions are 8 and 17 kg per year, which were 14 and 25 kg in the early 1970s. Even under the present low level of resource use, livestock account for about 30% of the agricultural gross domestic product (GDP), and 16% of the national foreign currency earning (second to coffee). Its contribution to the entire traction power to over nine million hectares of cropped land, to rural transport, soil fertility and household energy are substantial though these benefits are not valued properly.

Fisheries production is also under-exploited whilst current demand exceeds supply by about four-fold. One of the big and immediate challenges of our country is addressing the problems of food security and poverty. Currently, about 45% of the total population are living under poverty and the level of impoverishment is worse in rural areas, where 85% of the total inhabitants dwell.

It must be noted that under-development of the country's water resources towards increasing and sustaining agricultural production, which has a two-track interaction in the whole economy, contributes to the low level of socio-economic development in the country. This paper is therefore devoted to make critical assessment of the current water resources use status, prospects, constraints and improvement measures in relation to livestock and fisheries development in the country.

General role of water in socio-economic development

Cox (1987) viewed socio-economic development as general advancement of a given society to a higher level of welfare or well-being. The role of water resources to achieve this level of development is fundamental because of the wide-range and two-track interaction between water and socio-economic activities. First and foremost, water is a basic component of welfare for people, animals and fish. From a development perspective, water supply is a socio-economic infrastructure essential to the various productive processes, such as irrigation, fisheries, industries, tourism, hydropower, navigation and waste disposal. In turn, these development activities involve modifications of the quality and flow characteristics of water. One must understand from this that the total absence or shortage of water supply is a great menace for growth and development. Water resource must therefore be viewed as a dynamic element along all the development process.

Apart from its beneficial aspects, water has adverse effect on socio-economic development when it causes flood, soil erosion, crop failure, suffering and death of people and animals. So, there must be a water management policy and administration mechanism capable of maximising the beneficial uses and minimising the non-beneficial aspects of water (World Bank 1984).

Influence of water on the livestock production system

Based on the physical and socio-economic environments, two broad production systems are distinguished: mixed and pastoral. Livestock is integrated with crop in the highlands of the country. Expansion of croplands at the cost of pastureland (reduced by 1% every year) and recurrent drought result in increasing deterioration of grazing lands. The highland areas have generally good access to alternative sources of water and receive adequate rainfall though some localities are still in short of water, and affects livestock productivity.

The situation is much different and complex in the lowland areas of the country, which broadly comprise all lands that lie below 1500 metres above sea level (masl), with some exception that goes up to 2000 masl. The pastoral farming systems are generally located in drier and fragile lowland areas, where rainfall is relatively low, poorly distributed and highly erratic thus impeding cultivation and sustainable livestock development. Despite the harsh environment and holding a lower abundance of animals than the highlands the contribution of the pastoral farming system to the national livestock economy is significant; beyond serving as basic source of livelihood for the people, it supplies 90% of the legal export of live animals and 20% of the draft animals to highlands (MOA 1996).

Shortage of water and feed, particularly during the dry season, constantly force nomadic pastorals to migrate together with their livestock long distances to maintain their sources of subsistence. The situation put the people increasingly impoverished and vulnerable to droughts and famine.

Out of the total rangeland available (781 thousand km²), 88% lies on the lowland. But this extensive pastureland remains under-utilised due to shortage of drinking water. Where permanent or temporary water sources are available for the dry season the pastureland near and around the supply sources are subjected to over-grazing and environmental degradation. Just contrary to this, in areas where water supplies are short, an extensive area of pastureland is left under-utilised. There is also a health factor that affects the efficient use of the available water and rangeland as many parts of the lowland areas are infested by a wide range of animal diseases, including tsetse and Rift Valley fever, which reduce the traction power of animals and restrict exports, respectively. The main problem for over- or under-exploitation of the ecology is lack of harmony among the different actors.

Drinking water for livestock also plays key role during transport and marketing of live animals from points of surplus to markets. In effect, individual animal lose 25 to 30% of its liveweight during the journey.

Drinking water requirement increases at a higher temperature and low humidity. Depending on season, cattle must be watered at least every second day at a rate of 10 to 40 litres/head, and camel must consume 100 to 150 litres/head at a time every 5–6 or even 8 days. Against the requirements, however, animals in the lowland drink every four days, and perhaps insufficiently. So, the impact of under-watering is very clear—poor animal health and under-productivity. When seen from the large livestock population of the country the demand for drinking water is substantial and its provision is expensive.

The practice of using water bodies for fisheries

One of the primary tangible benefits which water can offer is the living asset—fish stocks. Fishing activities contribute directly to human welfare, for example, by providing source food (animal protein), which is urgently needed particularly by the poor rural population.

Almost 120 thousand km² of the total land constitutes water and water courses, which may be exploited for fisheries directly or through enhancement. However, knowledge on their stock sizes and the means to exploit them are still to be known for each fishery waters. Despite this limitation, as indicated before, empirical estimates put the country's total fish potential to 51,500 t per year, with a current exploitation of 30%. This leaves considerable potential for expansion.

Under-exploitation of existing fisheries potential contained in the natural water bodies of the country is a great concern. Even if the available stocks of these fishery waters will be fully exploited in the near future, both current and future demand for fish by the population cannot be met. For instance, current total demand for fish is about 67 thousand tonnes, which is envisaged to grow nearly to 95 thousand tonnes in 2015, and 118 thousand tonnes in 2025. To fill this gap, therefore, new alternative fish supply sources must be found.

In the country, small to large size man-made water bodies have been and will continue to be built for drinking water supply, hydropower generation, irrigation and fisheries. In practice, however, almost all those multi-purpose water development programmes and projects overlook fisheries as a component whilst it would be possible to bring additional

fish supply for local consumption and is capable of improving the overall efficiency of the programme at large.

Integration of fisheries with other components may only require minor engineering modifications to meet biological requirements of the important fish stocks, in return to provide a wide range of socio-economic benefits, which include food, income and employment.

Almost entirely, all pertinent institutions which are active in water resource or watershed area development and management unintentionally neglect the roles and conservation requirements of the fisheries because they are either little aware of the significance or lack the necessary knowledge in the field of aquatic living resources, in general, and in fisheries, in particular.

Despite the technical limitations, efforts have been made in the past to stock or enhance known creator lakes, reservoirs and other small water bodies in different parts of the country, and are shown success, for instance at Lugo, Koka, Fincha and Ashengie. Yet there are several water bodies of similar kind, which need stocking or enhancement with good performing fish species, but data on the geographic distribution, physico-chemical characteristics and socio-economic features of these water bodies are lacking. The Ministry of Agriculture, due to lack of capacity, has not undertaken a baseline survey, nor do the developers of these water bodies communicate the information to the Ministry.

If current practices are allowed to continue, the country's water bodies, which exist now and those to be developed in the future will remain under-exploited for fisheries. Integration of water development schemes with fishery requires developing capacity for stocking, enhancement and monitoring. Parallel to this, emphasis must be given to further increase the awareness and fish consumption levels of the public at large. Unless this is done, fish production, which will come from new water bodies, will lack adequate and effective demand, and thus the envisaged benefits will not be fully realised.

In addition to extensive fish culture system on reservoirs and ponds, there are greater possibilities to introduce and expand rural and commercial aquaculture within controlled environment. Technically, the diverse ecological zones, availability of by-products as feed, and the genetic resource (the three top cultured fish species in the tropics are found in Ethiopia) provide the opportunity for aquaculture development in Ethiopia. The present and future socio-economic conditions in the country equally support fish development. However, aquaculture practice is almost new to the country and hence this remains to be addressed to allow fish culture in the country to take off. Aquaculture requires sufficient water supply of the required quality.

Recreational fishing is an additional opportunity that water resources can provide and to be integrated with tourism. This however requires introduction of fish species into natural or artificial water bodies, which are deemed to be suitable for sporting purposes.

Water related and water management constraints

Water management—dealing with scarcity or abundance of water with some objectives in view—faces problems ranging from inadequacy to supply water for drinking and agricultural

use to inadequate control over water related problems which cause suffering and death of people and animals, and ecological degradation from abuse of watershed areas.

Severe water supply shortage in the lowlands and some pockets of the highland areas call for water management activities, of course, along side other complementary activities. However, the activities and capabilities of water management system are generally constrained by technical inadequacy, fund limitation and institutional weakness.

In livestock and fisheries production the following constraints are identified:

1. Drinking water and pasturelands are not available harmoniously, which results in under-utilisation of the extensively available pastureland, on the one hand, and over-grazing and environmental degradation, on the other.
2. The unpredictable, infrequent and low rainfall patterns on most of the semi-arid areas limit agro-pastoral farming systems. Even certain pockets of land along the river basins, which have the potential for mixed farming, remain unused, and prevent the possibility for sedentarisation. The situation leaves most of the lowland population relatively dispossessed of socio-economic infrastructures or disadvantaged from public investment programmes.
3. The capital outlay required to improve the condition of water supply and rangelands management is substantial. In addition, available water-harvesting technologies and knowledge are limited.
4. Past and present policies and programmes in livestock system lack effective co-ordination and integration inter- and intra-institutions. So, returns from investment on rangeland and water supply management were not only low but also not sustained.
5. Socio-cultural factors in water resources development or even improvement of the livestock system are not sufficiently considered due to lack of understanding.
6. A large number of, small- to large-size, man-made water bodies of good potential for fisheries have been built but knowledge about them is scanty. Besides, they seldom consider the needs and requirements of fisheries in their design and construction. Low awareness and lack of technical capacity in the field are identified as major drawback.
7. Lake and river fisheries as part of the watershed system are not sufficiently considered by watershed area developers and managers, and therefore the aquatic system, in general, and the fisheries, in particular, absorbs various unintended adverse effects from other water or watershed area users. These are related dam construction, diversion, irrigation, deforestation and release of toxic effluents. As said before, the root cause of the problems are weak institutions with absence of the required technical capacities in the field of living aquatic resources.

Recommended pathways for integrated water resource management

The objective of managing multi-purpose water resources is beyond reduction of hunger and poverty through its effects on increasing agricultural production, including livestock

and fisheries. Its role as socio-economic infrastructure helps achieve establishment of agricultural settlements, industrialisation and economic growth. The return from multi-purpose water development programmes is commutative and much higher than from single purpose scheme. This can best be achieved through effective co-ordination and integration between the various activities using common resources—water and the watershed area. This approach can only provide the possibility to achieve resource use efficiency and environmental sustainability.

Under this general framework, the following specific recommendations are drawn to make better use of water resources to the needs and requirements of livestock and fishery development.

1. Research. Sufficient and accurate data is seldom available to base sound planning and informed decision on natural resources and their uses. We know for sure that we lose our natural resources but the degree of the loss, the root causes and mitigating measures are rather less clear. This implies that existing researches and studies poorly meet the needs of resources management, water, agricultural land, rangeland, livestock and fisheries. In addition to limited expertise and fund, research management either lacks focus, continuity, coherence, participation, or the research outputs themselves are not effectively disseminated to ultimate users.

Therefore, strengthening research management capabilities that recognises the interdependence between water supply and water use activities, and the interaction between these activities should deserve priority. More specifically, assessment of both the ecological, technical, economic and socio-cultural environments within which the country's livestock system can realise its potential needs to be researched. The problems, needs and potentials of water supply to meet current and future requirements by the livestock system should be critically evaluated.

Baseline survey. Identification and characterisation of the present and future man-made water bodies for further stocking or enhancement is essential. Based on the knowledge from the study, fish seed supply and propagation centres must be created at strategic areas of the country.

2. Policy and planning. Policies and plans that address the underlying cause than the symptom of environmental degradation are effective. So to meet food requirements and preserve the future resources base urgent action is required to the livestock development, and the actions should combine education and motivation, local level institutional building and empowerment, zoning and property right regime.

In addition, clear objectives, target groups and priorities must be set for livestock and fisheries within the broad multi-purpose water management policies and programmes. Because resource is scarce, the choice and decision between competing water use activities must be based on good technical and economic justifications and stakeholders participation. To achieve this, horizontal linkages between pertinent sectors and departments having interest in water and watershed area must be established or strengthened and implemented with the aim to exchange information and discuss matters of common interest.

3. Beyond the convention. Socio-cultural environment within which the development processes take place determines success. Initially, the development effort will be influenced by culture, which will, at a later stage, affect the culture in return. However, such a two-track interaction remains the missing element in most development activities, including efforts to supply water for agricultural use, animal drinking or for integrated activities. This must be corrected through increasing understanding and capacities on how to integrate this sensitive and powerful factor.
4. Water harvesting. Drinking water from natural pools will dry out in a short period. So, temporary water courses must be exploited by creating and improving water-retaining structures, and must be complemented with artificial pools to allow herds to graze the dry pasture within a walking distance. In areas where the rains are rare but heavy, it is advantageous to harvest the runoff water at a lower point, the surface of which is established by a bed of concrete and then the water will be pulled to water trough by pump or gravity for the herd. Where drinking water from permanent and temporary surface water sources are difficult or insufficient then ground water should be exploited by establishing wells and bore holes.
5. Integration. There must be harmony among water supply, feed, and herd size, and an equitable distribution of the opportunities among the target communities. These avoid encroachments, promote peace and settlement among the pastoralists.
6. Transformation. Pocket lands suitable for irrigation development along the rivers should be developed, and the productivity of dry land farming can be improved using water-harvesting techniques. However, the backbone of the economies of the lowland area will remain extensive livestock system till the available rangeland is exhaustively utilised and calls for a change towards mixed or intensive farming. Developing a system for a gradual transformation of the nomadic pastoralists towards sedentarisation helps build assets for relatively rapid and sustained development for the well-being of the population and rejuvenation and balance of the ecology.
7. Early warning. Establish an early warning mechanism for combating possible events of natural catastrophe.
8. Assistance. The hope to realise the potentials of the country's livestock and fishery productions demands external assistance in addition to government support. The assistance may be extended to meet the need for integrated water supply infrastructure, improved rangeland management, effective veterinary service, research and extension, and credit and marketing services.

References

- Cox W.E. 1987. *The role of water in socio-economic development of rangelands*. UNESCO (United Nations Educational, Scientific and Cultural Organization), Paris, France.
- World Bank. 1984. *Towards sustainable development in sub-Saharan Africa*. Joint program of action. The World Bank, Washington, DC, USA.