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Review Paper

A Critical Review of Ethiopia's Agricultural Water Use Policies and Strategies

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Abstract
Management and allocation of water as an economic good requires the application of economic principles. This paper attempts to relate the general principles that guide the management, allocation and use of water as a key economic good to the policies and strategies of Ethiopia. These policies and strategies are meant to ensure the urgent development and efficient allocation and utilization of water resource in order to achieve the food security and poverty reduction goal of the country. The basic premise behind these policies and other related documents reviewed in this paper indicate one of the major reasons for Ethiopia being unable to feed its growing population and become net receiver of food aid was due the failure to formulate appropriate policies that enable the utilization of abundant water resources the country has for efficient productive purpose in the past several decades. Thus, it is argued that, the agricultural sector which is said to be the backbone of Ethiopian economy in terms of generating means of livelihoods and export earnings is heavily dependent on rainfall and become unable to support the economy of the country as expected. Owing to this scenario, the Government of Federal Democratic Republic of Ethiopia has formulated policies and strategies that could help the people benefit at large and started to see encouraging results particularly in the areas of small scale irrigation. This paper, therefore gives a review of water management and use policies and strategies of the country and scholarly views in the same topic based on empirical findings. The output of the review indicated that agricultural water development and use policies are embedded in provisions related drinking water supply for the rural population, provision of water for livestock in mixed farming and pastoral production systems as well as irrigation development. This has laid a fertile ground for enlightened policy implementers at national, regional and local levels to develop the abundant water resource of the country for the benefit of its growing population. It is, thus, important to efficiently take advantage of these policy initiatives of the country while planning, designing and implementing agricultural water development projects

Keywords: *Irrigation water, Water use efficiency, Water use policies*

Introduction

The world's growing population are rapidly depleting available fresh water supplies. Facing increasing severe water supply shortages in many areas of the world, social planners and government leaders are exploring ways for managing water resources sustainably. Water is regarded as an economic good and as a result policy makers have to apply economic principles to allocate and utilize it in a sustainable manner (Rogers *et al*., 1998).

The concept of water as an economic good came up during the preparatory meetings for the Earth Summit in Rio de Janeiro of 1992 (TAC, 2000). It was brought forward and discussed extensively during the Dublin conference on Water and the Environment, and became one of the four Dublin Principles. The four Dublin principles of water are: (a) Water is a finite, vulnerable and essential resource which should be managed in an integrated manner, (b) Water resources development and management should be based on a participatory approach, involving all relevant stakeholders, (c) Women play a central role in the provision, management and safeguarding of water, and (d) Water has an economic value and should be recognized as an economic good, taking into account affordability and equity criteria. The fourth principle states that water is an economic good. Water is a special good for which there is no substitute, therefore its allocation is a societal question that cannot be left to market forces alone and hence that the price of water should not be determined by the market, and water should have a price in order to achieve the objectives of recovering the cost of providing the particular water service and giving a clear signal to the users that water is indeed a scarce good that should be used wisely. The economic value of water differs depending on when, where and how it occurs (Seyam *et al*., 2003). Whereas rainfall is generally considered to be a free commodity, of all types of water it has the highest value. The high value of rainfall may also be

understood because of it being the starting point of a long path through the hydrological cycle. Rainfall therefore has many opportunities for use and for re-use: in rain-fed agriculture, irrigation, for urban and industrial use, environmental services, etc. Water flowing in rivers therefore has a lower value than rainfall. But also this "blue" water has differing values, depending on when it occurs. Water flowing during the dry season has relatively high value, because it is a fairly dependable resource just when demand for it is highest. In contrast, peak flows during the rainy season have a lower value, although these peaks provide many important services, such as recharging aquifers, providing water pulses essential for ecosystems, and filling reservoirs for later use that transport water through time. The highest peak flows occurring as destructive floods have a negative value. Thus whereas we talk about the same water belonging to the same water cycle, its value varies, depending on when and where it occurs.

Some types of water use add more value than others. The classic case is the different value water has in the agricultural and urban sectors: the value attained in urban sectors is typically at least an order of magnitude higher than in agriculture. Economists then argue that, if water is currently used in the agricultural sector, the opportunity cost may be at least 10 times higher, subject of location and the hydraulic connections possible between users. Thus, a shift towards the higher value use is often promoted. However, the water market in a basin is not homogeneous, especially between agriculture and urban and industrial water use (Biscore, 1996), i.e. (1) irrigators need a lot of water but have a low ability to pay; urban and industrial users need relatively little amounts of water but generally have a high ability to pay; and (2) urban and industrial users need water of high quality and high reliability whereas irrigators may accept water of lower quality and lower reliability. The water needed for both sectors is not completely substitutable. In other words, the opportunity cost of water currently used in agriculture is much lower than the value of water for its highest use, namely urban and industrial uses, even if one only considers raw water, and excludes the cost of treatment.

Economists and policy-oriented social scientists utilize a wide range of valuation techniques to measure the value of non-market environmental goods and services, with the objective of demonstrating the total economic value of assets being assessed and to ensure that available resources are being optimally allocated and that calls for additional investments can be justified if they are needed. Rogers *et al.* (1998) indicated that the decisions of economic sector actors will in most countries have significant impact on water demands, water-related risks and the availability and quality of the resource. These decisions will not be water sensitive unless clear and consistent information is available on the full costs of their actions. Regardless of the method of estimation of costs and values, the ideal for the sustainable use of water requires that the values and the costs should balance each other; full cost must equal the sustainable value in use. There are three important concepts in cost estimation (Ibid). The Full Supply Cost; the Full Economic Cost; and the Full Cost. The full supply cost includes the costs associated with the supply of water to a consumer without consideration of the externalities imposed upon. Water resources exhibit externalities in the sense that they have the property of mutually interfering usage. Individuals take the valuable commodity of clean water from the same environment which they then use to dump wastes, thus interfering with the use of the no-longer-clean water by themselves and others. Full Supply Costs are composed of two separate items: Operation and Maintenance Cost, and Capital Charges, both of which should be evaluated at the full economic cost of inputs. The Full Economic Cost of water is the sum of the Full Supply Cost and the Economic Externalities imposed upon others due to the consumption of water by a specific actor. The Full Cost of consumption of water is the Full Economic Cost plus the Environmental Externalities. These costs have to be determined based upon the damages caused or additional costs of treatment to return the water to its original quality.

Allocation mechanisms can be defined as sets of institutions and predefined rules that determine the quantity (and sometimes the quality) of water that individual (sometimes groups of) users are entitled to use (Dudu and Chumi, 2008). There are three frequently used institutional settings: markets, public administration and user based administration. Any institutional setting allocates the water through some pricing mechanism. The allocation of water as an economic good is more complicated than the allocation of other economic goods because water possesses unique characteristics that make its allocation complicated.

Pricing is considered to be superior to any other method in allocating the scarce resources among competing demands (Tsur, 2005). Water pricing is considered as one of the many policy interventions that can be used to mitigate both quantity and quality dimensions of water scarcity and thus enhance efficient water use. Pricing of water plays two main roles. The first one is the financial role that is a mechanism for recovering the investment and operation and maintenance cost of the water system. Secondly, it has the economic role of signaling the scarcity value and the opportunity cost of water in order to guide allocation decisions.

Economic theory explores the conditions under which pricing efficiently works as an allocation tool (Van der Zaag and Savenije, 2006). When prices are set in the absence of taxes, subsidies and other distortions, the price that leads to an allocation that maximizes net benefits is called first best or Pareto efficient price. The first best allocation is attained by setting a price equal to marginal cost of the resource. When prices are set under distortions such as information asymmetry, institutional limitations or political constraints the price leading to that allocation is termed the second best efficient price. Prices are equalized to marginal cost only under perfectly competitive markets. However it is well known that no such market exits in real life. For the specific case of water, a set of market failures exist, such as externalities, recharge, asymmetric information, large fixed costs and declining average cost of delivery (Tsur, 2005). Evidently different pricing methods will have different political, social and economic consequences. Hence the choice is not only based on efficiency criteria. Although pricing may be a useful tool, it is not always easy to implement and raising prices can sometimes have the effect of increasing overall water use. Secondly financial cost recovery for irrigation provision for instance is

gaining more widespread acceptance, though such cost recovery is not always based on economic pricing principles. Pricing systems are generally classified as volumetric and non-volumetric. The former relates the price with volume of water used while the latter sets prices independent of the volume of water.

In volumetric methods the price of water is set per volume of water used. An important deficiency of volumetric pricing is the difficulty of monitoring the actual amount of water consumed. This difficulty can be overcome only by implementation of measurement accessories such as water meters. However, installation and maintenance of these accessories are relatively expensive and can be economically infeasible for most cases. Most common non-volumetric method of pricing in irrigation water provision is per area pricing. In per area pricing, users are charged according to the area irrigated. Charged price generally depends on the crop choice, season and irrigation method. This method is easy to implement and administer. The method only requires collection of data about the farm size and crop choice which is likely to be available in most cases. Since per area prices are fixed costs for farmers, it is not likely to determine effectively the amount of water demanded. This is likely to bring about an inefficient allocation of water. On the other hand per area pricing will affect the crop choice of farmers given that price changes according to crop choice. In the absence of implementation costs non-volumetric pricing will almost always be inferior to volumetric pricing since the former will result in a second best solution while the latter will reach a first best allocation. However, implementation cost prevents volumetric pricing to achieve a first best allocation. Thus, depending on the case specific factors, non-volumetric methods may produce higher welfare compared to volumetric methods.

Ethiopia is endowed with vast water resource base and development potentials. However, the main water resources problem in Ethiopia is the uneven spatial and temporal occurrence and distribution (MoWR, 1999). It has been indicated that between 80 to 90 percent of Ethiopia's water resources is found in the four river basins namely, Abay (Blue Nile), Tekeze, Baro Akobo, and Omo Gibe in the west and south-western part of Ethiopia where only about 30 to 40 per cent of the population reside. On the other hand, the water resource available in the east and central river basins is only 10 to 20 per cent whereas the population in these basins is over 60 percent. Giving a due recognition of this situation, the Government of Ethiopia has formulated water resources management policies and legal grounds for efficient conservation, development and utilization of water resources for the benefit of the people of Ethiopia. This paper relates the general principles that guide the management, allocation and use of water as a key economic good to the policies and strategies of Ethiopia. The review was carried out with the following objective of assessing the basic principles and the agricultural water use policies and strategies of the country, and drawing policy implications for efficient development and utilization of agricultural water.

Methodology

As this a review work, the paper is entirely based on secondary sources of information. Water management and use policies and strategies of the country were carefully reviewed in this material. Policy documents such as water resources management proclamation, water resources Management policy, Ethiopian water sector strategy, rural development policy and strategy (RDPS), and a plan for accelerated and sustained development to end poverty (PASDEP) were assessed and critically reviewed. In addition to these water policy documents of the country, other sources relevant to agricultural water use policies such as basic principles and past empirical studies were included in the review. The materials reviewed were critically assessed and presented using a descriptive approach.

Results and Discussion

Ethiopian Water Use and Management Polices in the Context of Agriculture

The water resources management policy of the Government of Federal Democratic Republic of Ethiopia was issued in 1999 with the overall goal of enhancing and promoting all national efforts towards the efficient, equitable and optimum utilization of the available water resources of Ethiopia for socioeconomic development on sustainable basis (MoWR, 1999; 2001). To realize this goal, the Government of Ethiopia has spelled out a wide range of policies to achieve the following five major water management policy objectives.

1. *Development of the water resources of the country for economic and social benefits of the people, on equitable and sustainable basis.*
2. *Allocation and apportionment of water resources based on comprehensive and integrated plans and optimum allocation principles that incorporate efficiency of use, equity of access, and sustainability of the resource.*
3. *Managing and combating drought as well as other associated slow on-set disasters through, inter-alia, efficient allocation, redistribution, transfer, storage, and efficient use of water resources.*
4. *Combating and regulating floods through sustainable mitigation, prevention, rehabilitation and other practical measures.*
5. *Conserving, protecting and enhancing water resources and the overall aquatic environment on sustainable basis.*

The country's water management policy gave due emphasis to sectoral policy issues. Agricultural water management is given considerable coverage in the sections dealing with drinking water supply, livestock water supplies and irrigation policies. Supply of clean drinking water has of paramount importance to agricultural development through its contribution in maintaining the sanitation and health of the rural population. Policy dealing with the supply of drinking water emphasizes on finance and tariff, research and

technical issues, and enabling environment including institutions, stakeholders and capacity building. The livestock water supply policy focuses on the following issues.

1. *Recognize that livestock water supply is an integral part of the overall water sector and incorporate its development plans with comprehensive water resources management undertakings.*
2. *Promote the availability of water nearer to pastoralists as much as possible by providing livestock water supply to all the regions, particularly to the lowland areas.*
3. *Foster efficient and sustainable development, operation and maintenance of livestock water supply systems.*
4. *Harmonize and promote the "user pays" principle with the willingness and ability to pay for livestock water supply.*

In Ethiopia rain-fed agriculture is the backbone of the country's economy and rural livelihoods. Agriculture is heavily reliant on rainfall and productivity and production are strongly influenced by climatic and hydrological variability that are reflected as dry spells, droughts and floods. Droughts destroy watersheds, farmlands, and pastures, contributing to land degradation and causing crops to fail and livestock to perish. Although Ethiopian agriculture is heavily dependent on rainfall, there are four major categories of productive use of water in agriculture, i.e., rain-fed agriculture, supplementary irrigation, irrigated agriculture, and livestock. The dependence of most of the farmers on rain-fed agriculture has made the country's agricultural economy extremely vulnerable to the adversities of weather and climate. Agriculture in the country is exposed to the effect of failure of rains or occurrence of successive dry spells during the growing season, which could lead to food shortage (Perret, 2006).

Irrigated agriculture started in Ethiopia in the 1960 with the objective of producing industrial crops (sugar and cotton) on large scale basis. Local farmers however, had already been practicing irrigation by diverting water from rivers in the dry season for the production of subsistence food crops as traditional irrigation. The experience in modern small scale irrigation development and management started in the 1970s by the Ministry of Agriculture, in response to major droughts, which caused wide spread crop failures and consequent starvation. Currently government gives emphasis to develop the sub-sector to fully tap its potentials by assisting and supporting farmers to improve irrigation management practices and the promotion of modern irrigation systems (Teshome, 2006).

According to the national investment brief paper presented in the High-Level Conference on Water for Agriculture and Energy in Africa (2008), the gross and net irrigation potentials of Ethiopia have been estimated to be 3.73 and 2.23 million hectares, respectively. The area under irrigation in the country has increased from 176,015 ha in 1991 to about 289,530 ha in 2001. The maximum irrigation area quoted to be currently under irrigation is about 10 percent of the gross irrigation potential. This means that the irrigation sub-sector, despite its huge potential, is grossly under-developed accounting for merely 3 percent of the country's total food production.

The present irrigation policy is formulated to enhance the contribution of water to the national economy through the development of the country's water resources and expanding irrigation schemes so that agricultural production is improved by solving the problem of water shortage caused by the unpredictability of the rainfall. It has been formulated to foster the realization of reliable and sustainable irrigation development which is harmonious with the capabilities and realities of the country and the development strategies designed. Hence, the overall objective of irrigation policy is to develop the huge irrigated agriculture potential for the production of food crops and raw materials needed for agro industries, on efficient and sustainable basis and without degrading the fertility of the production fields and water resources base. Policies formulated to realize this broad objective are:

1. Ensure the full integration of irrigation with the overall framework of the country's socioeconomic development plans, and more particularly with the Agricultural Development Led Industrialization (ADLI) Strategy.
2. Promote the development of irrigation on two pronged approaches of strategic planning for achieving socioeconomic goals and participatory-driven approach for promoting efficiency and sustainability.
3. Recognize that irrigation is an integral part of the water sector and consequently develop irrigation within the domain and framework of overall water resources management.
4. Earmark a reasonable percentage of the GDP as committed resource towards the development of irrigated agriculture, especially in capacity building and infrastructures.
5. Promote decentralization and users-based-management of irrigation systems taking account of the special needs of rural women in particular.
6. Develop a hierarchy of priority schemes based on food requirements, needs of the national economy and requirements of raw materials and other needs.
7. Support and enhance traditional irrigation schemes by improving water abstraction, transport systems and water use efficiency.
8. Ensure the prevention and mitigation of degradation of irrigated water and maintain acceptable water quality standards for irrigation.
9. Establish water allocation and priority setting criteria based on harmonization of social equity, economic efficiency and environmental sustainability requirements.
10. Integrate the provision of appropriate drainage facilities in all irrigated agriculture schemes.

11. Enhance greater participation by the Regional and Federal Governments in the development of large scale irrigated farms in high water potential basins but with low population density.

The RDPS of Government of the Federal Democratic Republic of Ethiopia issued in 2003 emphasizes the importance of reliable supply of water and water management system for agriculture to be effective. It acknowledges that a reliable water supply and management system is essential for accelerated agricultural development. It is based on the belief that if water is made available all year round, it is possible to more productively engage in the agricultural labour force and, as such should be an important policy target. Thus, major focus is given to improving the utilization of water resource through improving the farmer's agronomic practices.

PASDEP which was prepared for 2005/06-2009/10 enumerates major activities in the areas of natural resource management including sustainable land use and forests development, soil and water conservation, and water management for irrigation development (MoFED, 2006). In watershed development, the activities involved and the issues planned include scaling up of activities in watershed management proven to be appropriate and productive through practice and experience gained in the past; strengthening the capacity of regional states through activities involving training of trainers in watershed management; and preparing relevant packages in watershed management technologies and distribute to users. During the plan period, effort envisioned was to promote and strengthen small scale irrigation schemes, and improved water use efficiency, including strengthening water harvesting and utilization practices through provision of appropriate technologies which are priority areas in water resources management policy of the country.

The principal objective of the irrigation development strategy is to exploit the agricultural production potential of the country to achieve food self sufficiency at the national level, including export earnings, and to satisfy the raw material demand of local industries, but without degrading the fertility and productivity of country's land and water resources base. More specific strategic objectives are to:

1.Expand irrigated agriculture and rehabilitate the existing schemes.
2.Improve irrigation water-use efficiency and thus the agricultural production efficiency, maximizing returns to water by allocating the water to its highest value use; and promoting the use of alternative irrigation options such as sprinkler and drip irrigation.
3.Establish water allocation and priority setting criteria, as well as fair and transparent management systems.
4.Consider development of groundwater resources.
5.Develop irrigation systems that are technically and financially sustainable.
6.Give emphasis to water harvesting methods and expand small scale irrigation schemes.
7.Create conditions conducive to the construction of medium and large scale irrigation schemes.
8.Address waterlogging problems in irrigated areas.

However, it is argued that these policies were pro-poor rather than being pro-prosperity as well as textbook based and donor driven that did not led to actions that consider water as a key priority input to agricultural commodities production as compared to that reflected in repeated seed-fertilizer based green revolution (Demese, 2008). This implies that there is further need to consider a paradigm shift and undertake policy decisions which will help embark on water-led green revolution suggested by the same author. Girma and Pendon (unpublished) produced a document for effective management of water and livestock resources for community based irrigation in Ethiopia. The document covers policies related to water pricing, institutions involved, irrigation technologies, irrigation and livestock, integrated water management, water harvesting and gender. In this document, it was argued that water is free in Ethiopia for most of small scale projects. In some areas there is wastage of irrigation water and mismanagement that has lead to land management problems. Already some irrigation projects have created favorable condition for malaria mosquito breeding sites.

Conclusion and Policy Implications

The availability of water that can be used for human consumption and undergoing economic activities has been facing a severe pressure due to population growth. Diverse policy initiatives have been taken internationally and by respective countries to make the optimal use of available water resources through efficient management and allocation mechanisms. Several principles have been developed in response to the increased recognition of water as a scarce economic good so that its management and allocation or utilization decisions have to take into account the basic economic principles. Capturing the value of water taking into account the full cost of water is sought to be important in decision making with regards to water allocation which has direct implication on pricing and thus transferring proper signal that water is a scarce resource that should not be offered for free.

Water use policies and strategies of Ethiopian are comprehensive and cross-sectoral. The agricultural sector policies and strategies gave emphasis on development of huge irrigation potential and availability of water for livestock for increased agricultural production and productivity. High emphasis has been given to the promotion of small scale irrigation schemes mainly by government funded initiatives with limited involvement of non-governmental organizations. Smallholder farmers are highly encouraged to adopt water harvesting technologies for small scale and/or supplementary irrigation.

The strength of these policies is that the issues set by the government of Ethiopia are intact with the general concepts and internationally recognized policy issues. However, the drawback of these polices is that the cost recovery mechanisms of investment

in publicly funded agricultural water development projects are not explicitly stated. It can be deduced that due emphasis is given to social equity. As a result, water in small scale irrigation schemes developed by public institutions is regarded as a free good in general. This could be one of the major causes for the inefficiency in water use and improper management practices that make the irrigation structures malfunctioned. In this regard, it is important to device an appropriate pricing mechanism to mitigate problems related to both quality and quantity dimensions of water resource. There has to be a need to have flexibilities in policies and strategies in response to needs of farmers/pastoralists and all other relevant stakeholders so that there can be integration of policy with those who implement it including smallholder farmers. Considering policy initiatives from within having pro-prosperity is sought to be important. Moreover, promotion of coordinated development and management of water, land and related resources to maximize the economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystem is crucial.

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