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WATER ECONOMICS IN AGRICULTURE AND OTHER SECTORS: RECOMMENDATIONS FOR WATER MANAGEMENT

Serkan GURLUK

Uludag University, Faculty of Agriculture, Department of Agricultural Economics, Gorukle, Nilufer, 16059 Bursa, Turkey 16059 +90 224 2941409 Fax: + 90 224 2941402 Email: serkan@uludag.edu.tr

Corresponding author: serkan@uludag.edu.tr

Abstract

Water is a vital for humans and should be used efficiently. Yet, drought issues in some regions of the world have negative impacts for humans. Consequently, in economic system the awareness about excessive water-consuming sectors provides advantages to related community. The economic benefits of the water in the agriculture sector and general economy are computed by the logic of opportunity cost. Food security objectives are essential for many countries in the world. Economic benefits are computed by savings in foreign exchange firstly. It protects domestic producers and consumers from the fluctuations of world markets. The poverty alleviation is among prior policies of a country. All of these can increase allocations of water to agriculture at the expense of industrial and household water use. Yet, agriculture is a sector that consumes high volume of water. Industry, household consumption and environmental flowas are other sectors. If it is not know the economic benefits of the water, it cannot be managed efficiently. Therefore, all sectors using water needs a transparent system of resource evaluation with which to negotiate and regulate allocation of the resource.

Key words**:** *agriculture, allocation, economic evaluation, economic sectors, water, water pricing*

INTRODUCTION

Water is a vital for humans and should be used efficiently. While economic activities require using water to a certain level, individual sector in economic system cannot use the water in the same amount. In addition, they are not able to produce economic added value in the same amount. The competition for raw water is intensifying and agriculture is often considered as the principle user of water. Nevertheless, national agricultural policies, especially in developing world, continue to promote irrigated agriculture in order to keep the yield in a certain level. It is totally due to devastating competition policies of developed countries. Following graphical illustration depends on real data and supports abovementioned phenomenon. The graphical illustration shows that less developed countries' agricultural foreign trade balance was not problematic (Figure 1). After the years of 1990s, they started to be importer of agricultural productions whereas agriculture is essential sector in such countries. The conservative agricultural policies of developed countries and high subsidize levels had increased the international competition. In a research, it is stressed that a European Union' farmer has been subsidized 6 times more than that of a Turkish farmer (Gürlük and Turan, 2013) [4].

Other pressures coming from international area are changing meals of high developing countries such as China. High income means high per capita income, consequently the people who consume inferior goods they furthermore started to consume superior goods. Per capita red meat consumption in such countries has been doubled in the last two decades. In addition, fossil fuel need led to use industrial crops. Thus, agricultural fields that will be cultivated for human needs dedicated to fossil fuel need. All these topics create extra demand for agricultural crops and fields. It means extra irrigation water requirements.

The phenomenon of agriculture is strategic sector drive the countries to act sensitive to the agriculture. However, international issues such as the impacts of climate change are also in the same way: they are not equal the all

sectors. The sectors that use more water are the sectors that will be suffered from water scarcity.

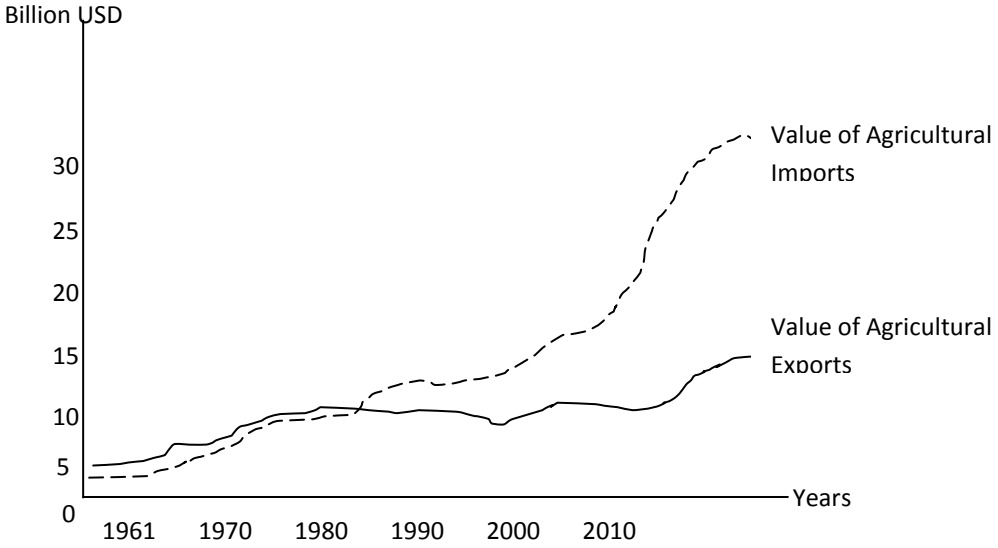

Fig. 1. Evolution of agricultural exports and imports value, 1961-2010 (USD Billion)

Therefore, all sectors using water needs a transparent system of resource evaluation with which to negotiate and regulate allocation of the resource (Turner et al., 2004) [8]. The main aim of this paper is to produce a review on economic value of water resources in order to shed light on sectorial water allocation programs that will be employed by the different countries.

MATERIALS AND METHODS

Research material consists of science citation index published reports, proceedings and dissertations of different universities.
The research is a review of available literature on water allocation programs.
It gives inferences for water policy-makers and other stakeholders in a country.

RESULTS AND DISCUSSIONS

Water supplies goods and services that are employed by economic sectors such as agriculture, industry and households. Providing drinking water, irrigation water are important goods supplied from water. Hydroelectricity generation, recreational benefits and other benefits such as biodiversity are vital services for humans. In a circumstances of growing water scarcity and rising demands for non-agricultural use of water, reassessment of sectorial allocations of water are inevitable. Especially, in less-developed countries, irrigated agriculture plays a vital role in contributing towards domestic food security and poverty alleviation. Consequently, efficient water allocation to agriculture has impacts on policy-making in abovementioned countries which is suffered from low agricultural productivity. However, it is a reality that water is the most used in the agriculture sector. Following figure indicates water use areas in the world.
The economic benefits of the water in the agriculture sector and general economy are computed by the logic of opportunity cost. Food security objectives are essential for many countries in the world. Economic benefits are computed by savings in foreign exchange firstly. It protects domestic producers and consumers from the fluctuations of world markets.
The poverty alleviation is among prior policies of a country. All of these can increase allocations of water to agriculture at the expense of industrial and household water use. It also contributes to the over-extraction of groundwater resources.

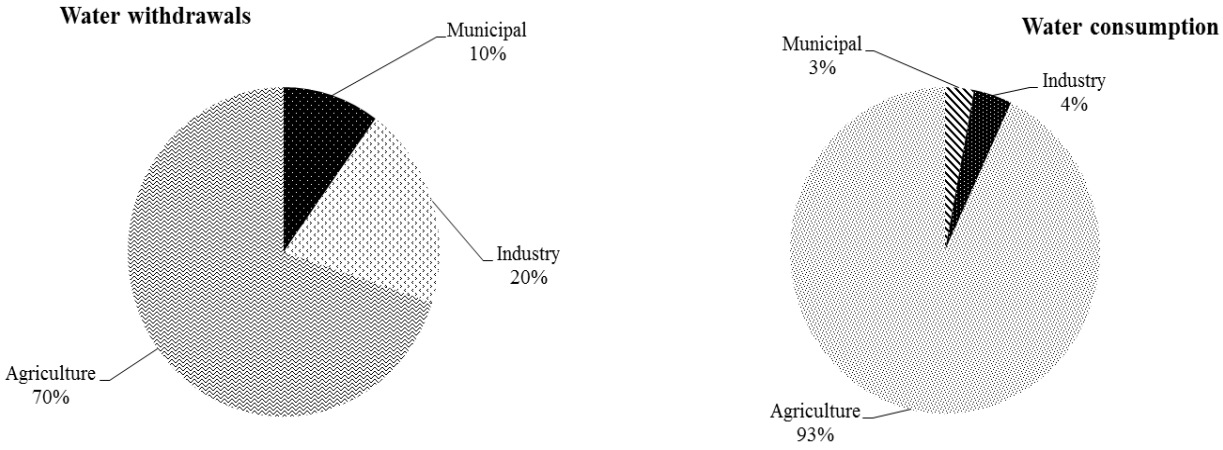

Fig. 2. Water withdrawal and consumption rates in the world (FAO 2015 AQUASTAT-database)

The household water needs are preceding in the sectorial water allocation programs applied. Yet, especially waived electricity production may create considerable opportunity costs. The increasing pressure on agricultural irrigation water is a circumstance developing at the expense of agriculture. According to the UN working report, 66 percent of the world's population will live in cities by 2050 (UN, 2015) [9]. In urban use, the willingness to pay (WTP) of related community for unit water is much more than WTP for same unit irrigation water. Therefore, increased water supply needs may have impacts on costs of increasing irrigated water in arid region.

Hydrologic characteristics supply many economic benefits to related community. Firstly, the economic value of the flood control may become important in the regions having strong precipitation rates. Therefore, the economic value is the value of goods and services that will be affected by flooding (Perry et al., 1997) [7]. Energy related benefits are other benefits that produce economic value arising from hydrologic resources. Increasing energy demand with the changing consumer patterns is also another factor which put pressure on the water.Hydropower plants work twofold by storing the water in a certain time period and flowing system. Opportunity cost of keeping the water in reservoir is the loss of yield due to insufficient water in irrigation districts (Barbier, 1994) [1]. The water may have impacts on fostering of local industries. It is easy to compute the economic value of industrial productions because they have regular market prices. Economic values of water ecosystems are due to provision of overall habitat structural diversity; provision of microsites; and provision of plant and habitat diversity (Costanza et al., 2006; Gürlük, 2006, Zaag and Savenije, 2006) [2, 5, 10]. Such benefits are indirect benefits for humans, and there is no market for marketing such benefits. Mostly survey studies are applied to related residents. Contingent valuation, hedonic price method and travel cost method are such of valuation methods (Hanneman, 2004) [6]. Yet, those methods are not widespread in less-developed countries and developing countries because environmental policies are not in the first place of governmental policies.

The water allocation programs are the best method if it convinces the related community. In this method, administrative allocation of water is determined by the state. It enables intersectoral allocation of water by considering economic considerations (Dinar et al., 1997) [3]. The state can control allocation within sectors through various subsidizing instruments such as water permits for abstraction or water use right. In agriculture, the state commonly administers allocation of water to large-scale irrigation schemes and to sections within the schemes.

The state is less commonly involved in allocation at the farm and field levels. Under such allocations, the price of water is usually subsidized, low and charged on a flat-rate (e.g. per hectare) or fixed-charge basis (not according to the amount of water consumed). In this circumstance, water use must be well-priced. Pricing mechanisms can be designed with all stakeholders on behalf of providing equity. In addition, technically hydrologic modeling and environmental studies can support water allocation programs. The volume and quality of fresh water systems and the functions that they provide are determined by the abstraction of water, recharge of water resources and processes of the hydrological system. An assessment of options for water allocation requires consideration of these processes and therefore requires the adoption of an extended geographical perspective. Such a perspective incorporates surface water processes at the catchment scale, ground water processes at the aquifer scale, interactions between surface and ground water, and socio-economic drivers in the wider environment that impact on water resources. Sustainability of water resources also requires a longer i.e. intergenerational, time scale for planning and management, with due regard for precautionary motivations (Turner et al., 2004) [8].

CONCLUSIONS

The agricultural sector is a priority sector in every country. Developed countries want to keep the food supply at a certain level where less developed countries face problems of self-sustainability. Since agriculture is the sector which uses the most water, there is need for planning for the existing consumption. Agricultural policies in developing countries continue to promote irrigated agriculture to minimize risks in food supply and distribution. In addition, the promotion of agricultural activity is considered strategic in fixing and developing rural economies and in many cases the existing systems of water use rights has reinforced the seniority of agriculture user rights. The agricultural sector therefore needs a transparent system of resource evaluation with which to negotiate and regulate allocation of the resource. Water allocation programs may help in this context.

Choosing less water-consuming production patterns, breeding species that are drought-resistant and adapting technologically advanced irrigation systems to agriculture are among important policies. Water allocation system is a successful methodology if it can be managed with the stakeholders' input. Sectoral water allocation can also be made by estimating the future needs of the country and the local areas. Another digger instrument that can support sectoral water allocation is water pricing. Volumetric method is used in many countries in water pricing. Other countries price water per land. However while irrigation systems are available in large lands, in smaller lands techniques that are not modern are used. This causes an increase in water consumption. Industrial and domestic water consumption is the sectors that use less water. Water consumption for energy production is very important for countries that have an energy deficit. While this reduces foreign dependency it also helps industry to work with fewer costs. However power plants that will be constructed in areas that have fragile ecosystems should have social cost-benefit analyses that have been prepared carefully. Another sector that needs water is environmental flows. Especially in areas where biological diversity is important, water flow needs to be as close as possible to its original level. Since services that are obtained from environmental flows are not a part of economic systems, by using existing alternative markets or creating new alternative markets valuation studies can be done. Because, in every sector the economy that is created by water is clear and calculable.

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