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SUSTAINABLE WATER MANAGEMENT AND WATER SUPPLY

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Abstract: In all over the world in consequence of the global warming the water use became very much increasable demanded. At present the agricultural sector remained as the biggest user for the water. At the national economic level of the developing countries, the water use for agricultural sector was 80% of all amount of the water coming from the rivers. This portion was about 65% at national economic level of the highly developed countries, in which the agricultural sector had share between 3-5% of the GDP. The other 35% were used by the industrial sector, service sectors and population water consumption. Also about 40% of the world's food came from the irrigated 20% areas of all cultivated lands. The water use of agricultural sector was very considerable. In this case the development of the irrigation system is demanded at the international and Hungarian national levels because of its strong connection with food production. There are two kinds of irrigation systems, namely the large scale and small scale irrigation one, both of which are also public and private sectors, as well. The national governments provide the planning, financial supports, and investment activities, but in most of cases the farmers get subsidies. In private field farmers, as carrying the risk, realise economic activities including the developing irrigation system based on governmental supports. This case study analyzes the importance of large and small scale irrigation systems, because both of them are equally important based on the available capital amount and the production structure of farms.

Introduction

The global warming resulted in increasing the role of water and in this case we try to discovering the water resources and the efficient water use. The increasing population of the world combaines with sharply increasing water scarcity in dry areas (Figure 1. and Figure 2.). This case – study focuses on the water management and its connections between difficulties of *soil degradation* and the *land and water integration* in arid areas.

The object of the research are water management with water supply and water resources, soil erosion and water content of soil, increase water productivity, land and water integration. According to the water management there are some possible indicators in water use based on the increasing *renewable water resources*. Naturally the main water resources are surface and groundwater (FAO/UNFPA/ILASA 1984). Land and water development division is to promote *better integration* (FAO-TCP 1993 and FAO TSS-1 1993). Also the *land qualities* concerning the *water issue*, namely groundwater level and quality in relation to irrigated land use (Sombroek 1994).

The general question can emerge, that the scarcity difficulty can be solved by water use efficiency, international cooperation and large scale farming systems (Falkenmark 1986). Other question that there is any possibility to decrease the negative influences of human activities on environmental conservation in field of water management.

Also this case-study focuses on the *influences of human activities* concerning the water management on the environmental conservation issues

The *solution for the water scarcity* can be water use efficiency within large scale irrigation farming systems, also the international cooperation between countries lying in common river basen areas, for example Nile – river or Danube – Tisza river basen, renewable water use, and develop the wasta water cleaning. Startegy is for remaining the conservation farming based on the goal for sustainable agricuture (Ligetvári et al. 2008, Mughram and Zsarnóczai 2008).

Materials and Methods

This study applies the research methods, namely compare collected data, analysing connection the water use efficiency and demands of environmental conservation. The analyse for the water use efficiency is concerning to the work of Gregory, P.I. (see detailed in Gregory 1989), which means producing biomass per unit of water based on the actual rainwater supplied, namely yield per unit of water supplied, accounting all water flows connecting with biomass production.

Results and discussion

In order that water use can be efficient, this needs *land and water integration*, which also results in decreasing the *soil degradation*. By the hand this integration originally is *vertically on*e, which contents some main elements of different levels, namely qualiy of groundwater, qualities of different kinds of soil, soil surface, slope position, vegetative cover and climatic qualities. The vegetative cover depends on the agro-ecological and socio-economic conditions. The soil conditions provide possibility to product such kinds of different economic plants, and the market conditions stimulate farmers to produce these one. These conditions mean such a balance between the natural possibilities and market demands. The land and water integration should provide sustainability for the soil against the degradation and for water to be stored in soil.

By the other hand there are *horizontally* conditions for the landscape, when the land conditions are analysed from point of view of physical, geographical situations, elements of terrains, top or platou, lower or upper slope, main slope, bottomland or flood plain, natural or under current land use.

Falkenmark describe the internal hidrology, when rainfall moves into the soil of the plateaux and surfacing at the springline, including the lateral movement of chemical materials, for example salt or silica. Also Falkenmark emphasizes the importance of surface transport of soil materials through erosion from upper slopes to bottomland or flood plain (Falkenmark 1986).

Land-water integration is described by the UNCED Agenda 21, that land use and freshwater show little appreciation of water related to determinants of land use or a *land use practices as determining water pathways, water flow and water quality*. Also the UNCED Agenda 21 emphasizes the integraty of the water cycle, which makes the river basin or catchment the appropriate spatial unit for such integration, as decisions on upstream land use also effectively equaty to decisions on downstream water resources, reflecting upstream-donwstream interdependencies.

The *land-water integration can be seen within the farming systems*, where there are two sides, namely the *strategy* of farmers to ensure the conservation farming and the *goal* of farmers to keep the sustainable agriculture. The strategy for conservation farming is based on the water management, soil erosion control, crop rotation, residue management, permanent cover, reduced fallow, organic recycling, and integrated plant deffence. All of these elements are according to the *soil quality*, which is the base for keeping sustainable agriculture, as goal of farming systems. The goal for sustainable agriculture concerns good-quality food, realistic crop yields, environmental health, energy conservation, natural resource conservation, economic viability, safety. The soil and water management should be changed. Naturally these costs can return based on the larger yield. Also it is important to extend farmer-participation in irrigation, water and soil management, in order that farmer plays more active role in improving and developing the management (Várallyay et al. 2007).

Table 1. Magnitude of soil erosion by water and wind (*Sources:* Walling, *1987 and* Oldeman, *1994*)
1. táblázat A víz és szél által okozott talajerózió nagyságának összehasonlítása

Region	*Water erosion*		*Wind erosion*	
	Area (10^6 *ha*)	*%* *of total area*	*Area* (10^6 *ha*)	*%* *of total area*
Africa	227	46	186	38
Asia	441	59	222	30
South America	123	51	42	17
Central America	46	74	5	7
World	1,094	56	548	28

Some other experts declared about the agricultural production that "Keeping partly the function of food production, agriculture may play a significant role in *energy production* or industrial raw material production. For this, a good example can be the utilization of biological materials (biomass) for heating." (Fogarassy et al. 2007). During the working out Hungarian strategy concerning the *large and small scale irrigation systems*, the international experiences should be followed by the decision-makers also emphasizing the efficiency of the large scale irrigation system for agricultural production and water use (also see in detailed in Dobó et al. 2006).

The soil erosion has impacts on productivity due to loss of available water capacity, which can result in declining in soil fertility and deterioration of soil structure. The soil management is based on the principle elements of soil quality and health, so therefore the farmers should measure the effects of their human activities and management on soil quality in order to decrease risk on the land, to keep natural resources and environmental conservation. The farmer should keep balance between his needs and resource conservation. Farmer needs acceptable yields, price income to cover the cost of production and his family's livelihood, decreasing risk. In order to keep the sustainable agriculture the resource conservation needs adequate soil organic matter, soil depth and soil cover.

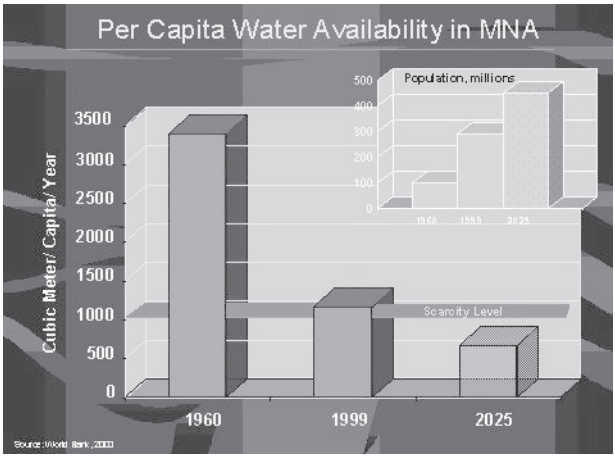

Figure 1. Per Capita Water Availability in Middle East and North Africa (*Resource: World Bank 2000*)
1. ábra Egy főre jutó rendelkezésre álló vízkészletek a Közel-Keleten és Észak-Afrikában

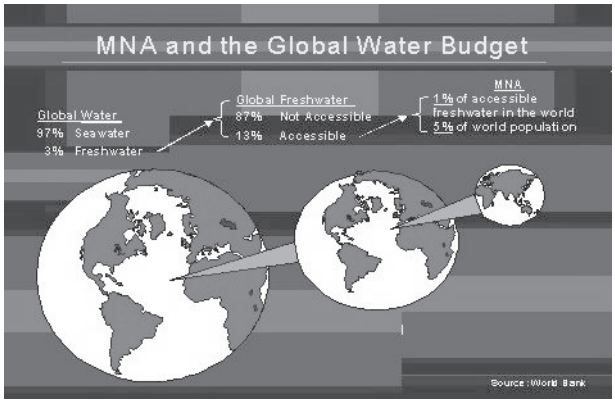

Figure 2. MNA and the Global Water Budget (*Resource: World Bank 2000*)
2. ábra A Közel-Kelet, Észak-Afrika és a globális vízháztartás

Strengthen cooperation of farmers' associations, co-operatives and companies based on the wider legal framework. This cooperation provides better positions for farmers to avail input of agricultural production, like credits, machines, fertilise, and pesticide. The bank credit can ensure to avail innovative technologies, training and education even for the small farmers. This cooperation strengthens rural savings for rural population and agricultural producers. Introduction of irrigation strategies can provide a major opportunity for water savings concerning the interest of farmers.

Naturally the small scale irrigation system can be integrated to the large scale irrigation one, for example within a governmental investment-project concerning the private small or large scale farms; or within a financial support system, where farmers obtained supports to improve the water irrigation on their owned farms, but their irrigation systems can also connect with water irrigation network at county-side or national economic-side levels.

When farmers improve their water irrigation system on farms, in this case they carry the risk. In any way the governmental role is needed for developing either large scale water irrigation system or small scale water irrigation one.

Also the water can be used as renew-able energy resource, For example dams or water energy centres can be used for producing water energy, which do not increase plant production as renew-able energy resource, so much more arable lands can be used for human food production. It should focus on importance of integration between small and large scale irrigation systems in order that use of irrigation system can be successful, also within the their integrating use the financial supports and investments can be provided by the national Government. Singly supports and investment to each small even large scale irrigating farm are so difficult. Also the considerable expanditures of maintining the irrigation equipments can not be covered by the each farmer.

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FENNTARTHATÓ VÍZGAZDÁLKODÁS ÉS VÍZELLÁTÁS

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Kulcsszavak: Vízgazdálkodás, Öntöző rendszerek, Termelékenység, Környezetvédelem

Absztrakt: A világ minden táján, a globális felmelegedés következtében, a vízgazdálkodás egyre fontosabb kérdéssé válik. Jelenleg a legnagyobb vízfelhasználó a mezőgazdasági szektor. A fejlődő országokban, nemzetgazdasági szempontból is vizsgálva, a mezőgazdasági szektor vízfelhasználásának alapját 80%-ban a folyókból származó vizek adják. A fejlett országokat tekintve, a vízgazdálkodással összefüggésben, a mezőgazdasági szektor 65%-ot jelent az éves GDP 3-5%-ból. A további 35% az ipari szektor, a szolgáltató szektor és lakosság vízfelhasználását jelenti. A mezőgazdasági szektorban a víz nagyon jelentős tényező. Számos más tevékenységre van hatással. Többek között az öntözési rendszerek magyar és nemzetközi szintű fejlődése is hatást gyakorolt az élelmiszeriparra. Állami és magánszektori szinten is elterjedtek lettek a világban a nagy és a kisméretű öntözési rendszerek. A nemzeti kormányok biztosítják a terveztetést, a különféle pénzügyi és beruházás támogatásokat, és sok esetben a gazdálkodók külön támogatást is kapnak. Ez a tanulmány a kis és nagyméretű öntözési rendszerek jelentőségét elemzi a rendelkezésre álló források és kis és nagygazdaságok termelési struktúrájának viszonylatában.