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IRRIGATION OF AGRICULTURAL LAND IN MONTENEGRO: OVERVIEW

IRRIGATION DE TERRES AGRICOLES AU MONTÉNÉGRO: APERÇU

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ABSTRACT

In the coming decades population growth will particularly take place in the emerging and least developed countries. This implies that these countries will be confronted with the need to increase their food supply by a larger production in their own territory, may be in combination with increased imports. Having in mind the required increase in food production in combination with the need for sustainable rural development a wide range of issues is of importance. From the point of view of food production there is a common feeling that 90 % of the required increase will have to be realized on existing cultivated land and 10 % on newly reclaimed land. From the point of view of sustainable rural development, socio economic and environmental aspects play crucial roles (Schultz et al, 2005). In this paper, the focus is on irrigation of agricultural land in Montenegro. About 18% of arable land is irrigated in the world and about 40% of total food is produced on these areas, while about 13% of agricultural land is irrigated in Europe, 1.05 ³% in Montenegro. The most common type of irrigation in Montenegro is with "artificial rain", while the remaining quantities of water are affected by watercourses, submersible water, lakes, reservoirs and from the water supply network. Investing in the revitalization and construction of irrigation systems in Montenegro should focus on projects that will demonstrate the justification of investments and achieve a quick return on

invested funds, which will contribute to raising the motivation, interest and spreading of irrigation in larger agricultural areas. Activities and measures must be in function of real needs that will be based on the demands of agricultural producers.

Keywords: Montenegro, irrigation, agricultural land

RESUME

Au cours des prochaines décennies, la croissance de la population aura particulièrement lieu dans les pays émergents et les moins développés. Cela implique que ces pays seront confrontés à la nécessité d'accroître leur approvisionnement alimentaire en augmentant leur production sur leur propre territoire, ce qui peut être combiné à une augmentation des importations. Compte tenu de l'augmentation nécessaire de la production alimentaire et de la nécessité d'un développement rural durable, un large éventail de questions est important. Du point de vue de la production alimentaire, il existe un sentiment commun selon lequel 90% de l'augmentation requise devront être réalisés sur les terres cultivées existantes et 10% sur les terres nouvellement remises en état. Du point de vue du développement rural durable, les aspects socio-économiques et environnementaux jouent un rôle crucial (Schultz et al, 2005). Dans ce document, l'accent est mis sur l'irrigation des terres agricoles au Monténégro. Environ 18% des terres arables sont irriguées dans le monde et environ 40% du total des aliments sont produits dans ces zones, tandis qu'environ 13% des terres agricoles sont irriguées en Europe, soit 1,05% au Monténégro. Le type d'irrigation le plus courant au Monténégro est la «pluie artificielle», tandis que les quantités d'eau restantes sont affectées par les cours d'eau, les eaux submersibles, les lacs, les réservoirs et le réseau d'approvisionnement en eau. Investir dans la revitalisation et la construction de systèmes d'irrigation au Monténégro devrait se concentrer sur des projets qui justifieront les investissements et permettront un retour rapide sur les fonds investis, ce qui contribuera à accroître la motivation, l'intérêt et la diffusion de l'irrigation dans les grandes zones agricoles. Les activités et les mesures doivent être en fonction des besoins réels qui seront basés sur les demandes des producteurs agricoles ...

Mots clés : Monténégro, irrigation, terres agricoles

INTRODUCTION

The global water crisis has drawn worldwide attention to the urgency of achieving a more efficient use of water resources, particularly in agriculture, to increase crop production and achieve world food security. Considering that a major share of the world's water resources is used in agriculture and that food requirements are increasing while global water resources are limited, irrigated agriculture and the role of efficient irrigation systems and techniques have recently assumed greater importance in increasing food production (Dabour, 2002). According to Playán and Mateos (2006) a FAO analysis (2003) of 93 developing countries expects agricultural production to increase over the period 1998 - 2030 by 49 % in rain fed systems and by 81 % in irrigated systems. Therefore, much of the additional food production is expected to come from irrigated land, three quarters of which is located in developing countries. The question is whether there will be enough freshwater to satisfy the growing needs of agricultural and non - agricultural users. FAO expects that the withdrawal of irrigation water in the 93 countries of its study will grow during the period 1998 - 2030 by only about 14 %, a small increase compared to the projected increase in the irrigated area. Crop water consumption per unit of area is expected to decrease by 3 %, and gross crop water use by 16 %. FAO explains most of this difference by an expected improvement in irrigation efficiency that should result in a reduction in the water withdrawals per unit of irrigated area.

In Montenegro, only 1.05% of the agricultural land is irrigated, while around 18% of the cultivated areas are irrigated in the world. The most frequent type of irrigation in Montenegro is with "artificial rain", while the remaining quantities of water are affected by watercourses, submersible water, lakes, reservoirs and from the water supply network. The assumption is that a slightly larger area is irrigated in Montenegro than official statistics show, because irrigation in greenhouses and greenhouses is not included in them. There is also a problem of the abandonment of the irrigation system according to Gulan (2017), due to which water does not arrive on areas that require irrigation. In the former Yugoslavia, conditions were created for irrigation of 180.000 ha of agricultural land, and a good part of these channels and hydro systems located in Montenegro are in the weeds today. It is very important to increase the irrigated agricultural land, because without irrigation there is no intensive agricultural production, and without it, no competitiveness, either in the domestic and international markets. The damage caused by the drought in one year, is greater than the total investment in irrigation systems. In order to solve these problems, Montenegro must first adopt the strategy on the development of agriculture in

the Parliament, and then urgently adopt a long-term plan for combating drought and a rational irrigation program for arable land, if it wants to remain a significant food producer and exporter.

Analysis of the World Meteorological Organization according to Gulan (2017) indicates that the average temperature on the global level will increase by two degrees Celsius in 2017, and Montenegro has undergone extreme temperatures during the last nine years during the last nine years. It must be borne in mind that during the past 100 years, on the territory of Montenegro, every second year was on average dry, which is another proof that it is important to solve the problem of irrigation more permanently. Even more massive irrigation could be achieved if individual producers provide cheap loans, and they will also be redeemable, which would make it easier to procure an irrigation system, whether its water aggregates or a drop - in system.

Our research evidence based on similar research Elena (2012) indicates that from the perspective of Montenegro for as a candidate EU membership, the restructuring of the irrigation system infrastructure management and use takes place according to the EU normative acts transposed into the Montenegro legislation. The adoption and application, as well as the modification and completion of the normative acts (numerous, complex and under a continuous dynamics), which regulate the activity of crop irrigation must be adapted to the needs and realities from agriculture.

METHODOLOGY

The whole information volume in this article was obtained through specific methods for the selective research, respecting all its stages from the methodological point of view: identification of the researched issue, research framework delimitation, information collection, data processing, analysis and interpretation drawing up the conclusions. Research also played an important role in the article, which consisted, on one hand, in the identification of other studies and articles on the same subject, and in the processing of some statistic data, on the other hand. Hence, the information sources used can be classified into governmental sources (statistic, ministerial and from research institutes), and into non - governmental sources (independent publications) (see Rajović and Bulatović, 2016; Bulatović and Rajović, 2017; Rajović and Bulatović, 2017).

ANALYSIS AND DISCUSSION

The beginning of the eighties last century, according to the data of the Ministry of Agriculture and Rural Development of the Government of Montenegro (2015), is a turning point in the development of irrigation of agricultural land in Montenegro. Namely, in this swing, irrigation systems were constructed using the "drop by drop" method, Sutorina (Municipality Herceg Novi) - 100 ha, Experimental section Municipality Ulcinj - 150 ha, while the "artificial rain" method is applied in the areas - Mrčevo field (Municipality Budva) on 250 ha, Lužac - Dolac (Municipality Berane) on 30 ha, Brezojevice (Municipality Plav) on 150 ha (Adriatic basin) and Doganje (Municipality Pljevlja) on 90 ha (the first of its kind in Montenegro in the Black Sea Basin area). Today - abandoned irrigation systems. The system for irrigation of agricultural surfaces with the application of "drop by drop" on 1.210 ha - Ćemovsko field (Agrocombinat "13 July"- Podgorica) (a test section of about 1.100 ha was selected as the first stage for the introduction of irrigation "artificial rain") and Pljevlja - "Doganje" - 90 ha (a modern system with "artificial rain" was built, the first of its kind in Montenegro in the area of the Black Sea Basin). Local irrigation systems, or combined ("artificial rain" and "windfall") cover an area of 13.000 ha. The sowing structure in irrigation systems for agricultural land in Montenegro was oriented to farms characterized by intensive agricultural production (fruit, citrus and early vegetables), which, with the use of modern irrigation equipment, resulted in high yields. However, our research records are based on similar research Elena (2012) indicates that after the restitution of agricultural and forest land to former owners in our country led to excessive fragmentation of land and agricultural and forestry holdings. The infrastructure that used to serve the agricultural and forestry systems (access road network, the land reclamation and irrigation systems, the flood prevention systems…), mostly designed in the period of command economy, had to be adapted to the new operation structures that resulted from this process. In the restructuring and reform process, an important part of the existing infrastructure either could not be adapted and was abandoned, or it could not be used any longer as a result of non - adapting to the new structures and in many situations it was deteriorated.

Table 1: Irrigation systems

System / object	Municipality	Surface area F (ha)	Irrigation mode
A. Abandoned irrigation systems			
I. Adriatic basin			
Sutorina	Herveg Novi	100	Drop by drop
Mrčevo field	Budva	250	Artificial rain
Experimental section	Ulcinj	150	Drop by drop
Total			**5000**
II. Black Sea Basin			
Lužac- Dolac	Berane	30	Artificial rain
Brezojevica	Plav	150	Artificial rain
Doganje	Pljevlja	90	Artificial rain
Total II		270	
Σ A (I + II)			**770**
B. Systems in function			
I. Adriatic basin			
Ćemovsko field (2.310ha)	Podgorica	1.210	Drop by drop
		1.100	Artificial rain
Local	-	13.000	Combined (artificial rain and irrigation from furrows)
Total I		15.310	
II. Black Sea Basin			
Lokalno (tradicionalno)	-	3.000	irrigation from the furrow
Total II		3.000	
Σ B (I + II)		18.310	

Source: Ministry of Agriculture and Rural Development of the Government of Montenegro (2015).

According to the Ministry of Agriculture and Rural Development of the Government of Montenegro (2015) for irrigation of Grahovsko field a reservoir at the source of the Grahovska River was built around 1.000.000 m^3 for irrigation of 400 ha of agricultural land. A partially built system is out of function and requires reconstruction. Today, when it comes to irrigation of agricultural land in Montenegro, it is practically only thought of the system in Cemovski field, that is to plant grape vines and peaches in the "Plantaža" plant in Podgorica (it has the largest vineyard in one complex in Europe on over 2.310 ha and over 11 million grapevine of grapevine for the time being until the peach spreads at 85 ha).

Figure 1: Ćemovsko field - one of the largest and most beautiful vineyards in Europe (www.plantaze.com**).**

According to the Water Management Basis of Montenegro (***) under the irrigation system should be emphasized and "Boka" from Tivat, which has micro - accumulation on the river Gradiošnici (60.000 m³) from which irrigation is carried out of about 20 ha, partly under greenhouses and greenhouses, remaining in the system after the return of the land. In the coastal area, they are mostly irrigated: fruits, vineyards and gardens. Water is usually provided by interspersing from the stream and the source in Krivošija, Lovćena and Rumije. The central region is characterized by abundant reserves, dominant, groundwater of exceptional quality, both in the region of Skadar Lake and in the area of Nikšić field. There is also the catchment of water from Zeta and Gračanica for irrigation of narrow river valleys. According to the structure of irrigated areas, the most common are the plowed fields and gardens on the lower Zeta area, and with the transition to the Bjelopavlić Plain and further towards Nikšić, fruit participation is increasing. The northeastern region is related to irrigation in river valleys by catching water from the watercourse (tributary Lima, Tare and Ćehotina), and at higher locations from streams and springs. In addition to arable land and fruit, there is considerable participation of meadows in the structure of irrigation. Traditional irrigation is most prevalent in the municipalities of Berane and Andrijevica. The Beran basin is sprinkled with irrigation channels (built more than 100 years ago). Some channels are of such

dimensions that they can receive up to 1 m³/s of water, as an example, the monastery channel for water from Bistrica to Balaband (Water management base of Montenegro, ***).

Table 2 : Water consumption for irrigation of agricultural land

	2006.	**2007.**	**2008.**	**2009.**	**2010.**
The utilized quantities of water, thousands of m^3	8.826	6.642	1.676	1.722	1.703
From groundwater	8.800	6.603	1.633	1.645	1.641
From surface waters	26	39	43	77	62
Total surface irrigation, ha	2.159	2.210	2.211	2.414	2.412

Source: Ministry of Agriculture and Rural Development of the Government of Montenegro (2015).

According to the Ministry of Agriculture and Rural Development of the Government of Montenegro (2015), the total amount of water used for irrigation of agricultural land ranged from 8.826 (thousands of m^3) in 2006 to 1.704 in 2010. From what from groundwater 8.800 (in 2006 years), 6.603 (2007), 1.633 (2008), 1.645 (2009) and 1.641 (2010). While irrigation of agricultural surfaces from surface waters from 26 (in 2006 years), 39 (2007), 43 (2008), 77 (2009) i 62 (2010). Therefore, if we take into account that Montenegro has over 230,000 ha of arable land, then total irrigation of agricultural areas of 2,412 ha or 1.05 % is almost negligible. According to the Water Management Plan of Montenegro (***), further development and application of irrigation have good prospects in the future, but the construction of a system and the achievement of a high degree of development of agriculture, and consequently of the entire society, is closely dependent on socio - economic determinations in Montenegro. For now, there is a certain documentation for the construction of modern irrigation systems: Large Polder (Skadarsko Lake) surface 10.400 ha, Bjelopavlićka plains with 2.330 ha, Crmničko and Orahovačko field with 530 ha and Ulcinjsko field with 400 ha, which can be considered as the first step in the realization of strategic goals in irrigation of agricultural land in Montenegro.

Our research records are based on similar research Vincek and Bogović (2016) indicates that agricultural production or farming, in fact, means accepting and living a lifestyle. It is the coexistence of man and the natural environment, which sometimes goes hand in hand with the farmer, and sometimes this co-existence is very difficult (especially in the last 20 years in Montenegro). The biggest weakness of Montenegrin agriculture in relation to Europe is not related to contractual obligations as candidate countries of the European Union, on the

contrary, it rests on the unwillingness to recognize to what extent the basic value choice of the Montenegrin agricultural policy - the industrialization of the village - which is at odds with the European one. Agricultural policies in Montenegro bring plans and programs (and so are irrigation plans) that are not "compatible" with a small producer, with the expectation that overnight we become superpower in agriculture or tourism. The value compositions we compare today with Europe have been built for decades and nobody created them with a magic wand. All this time, a small agricultural household in Montenegro is left to itself, but despite this, 60 - 70 % of food is still produced in these small farms in Montenegro.

The irrigation systems are very pricey and complex undertakings and their implementation needs clear economic analysis, and no omissions should be allowed during their planning. The initial phase in planning of irrigation systems is identification of spatial limitations as defined in physical planning documentation of either Municipality or County. Physical planning documentation, apart from natural and social characteristics of the analyzed area, define the scope of economic development, including transportation, electric power, water management and other activities within the space, as well as limitations to construction in regard to protected areas (Tadić, 2012).

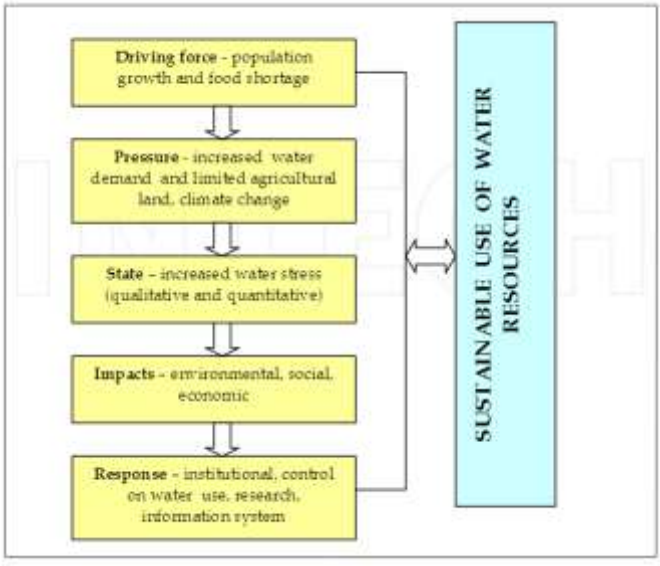

Figure 2: Scheme of sustainable approach to irrigation (Tadić, 2012 according to Boss and Burton, 2005).

Anticipated change in land use of a certain area, i.e. from agricultural to construction land or intersecting of the agricultural area with the large - scale infrastructure project such as road or railway, derivative channel, navigable channel or transmission line may impact a decision regarding withdrawal of construction of the irrigation system on certain agricultural land regardless of needs and natural potential. Using physical planning documents it is possible to establish availability of water resources as well as planned activities on waterways. For determination of agricultural land suitability for irrigation and economic feasibility of the system it is very important to consider the existing access road and electric power infrastructure, which are very important aspects for the investment project (Tadić, 2012).

Pointing to research *Brouwer et al (*1988) a prominent researchers Sauer et al (2010) emphasizes that not all crop types may be irrigated by all irrigation systems. Besides the restrictions due to slope and soil type, the suitability of a particular irrigation method is determined by the crop - specific tolerance toward moisture, the characteristic planting and harvesting techniques, the specific physical habit of the crop, and its economic market value (i.e., low market value crops are excluded from being irrigated by high - cost drip irrigation) (Sauer et al, 2010).

Table 3 : Irrigation System Suitability by Soil and Crop Type

	Sandy Soil	Loamy Soil	Clay Soil
Barley	F/S	B/F/S	F/S
Cassava			
Chickpeas	F/D/S	B/F/D/S	F/D/S
Cotton	F/D/S	F/D/S	F/D/S
Dry beans	F/D/S	F/D/S	F/D/S
Groundnuts	F/D/S	F/D/S	F/D/S
Maize	F	F	F
Millet	F/S	B/F/S	F/S
Oil palm fruits	F/D	F/D	F/D
Potatoes	F/S	F/S	F/S
Rapeseed	F/S	F/S	F/S
Rice	B/F	B/F	B/F
Sorghum	F/S	B/F/S	F/S
Soybeans	F/D/S	B/F/D/S	F/D/S
Sugarcane	F/S	B/F/S	F/S
Sunflower seed	F/D	F/D	F/D
Sweet potatoes	F/S	F/S	F/S
Wheat	F/S	B/F/S	F/S

[a]B, basin irrigation; F, furrow irrigation; D, drip irrigation; S, sprinkler irrigation.

Source: Sauer et al (2010).

Unlike for land resources, according to Sauer et al (2010) citing research FAO Land and Water Development Division (2008) and Rosegrant et al (2002) emphasizes that irrigation water availability is not defined at SimU level yet. In the model, irrigation water use is currently constrained through an artificial supply function, representing the relative water scarcity through its increasing marginal cost. The upper limit on irrigation water availability is computed by considering the sustainably exploitable internal renewable water amount, and water demands from other sectors (domestic, industry, livestock, and submitted environmental flow).

Among the established strategic directions of development in Montenegro, agriculture was given one of the key positions, considering it as a potential generator of development. However, the transition from extensive to intensive agricultural production requires the application of irrigation of agricultural land and, where necessary, drainage of excess water (see Rajović and Bulatović, 2017). The precondition for the construction of melioration systems, i.e. irrigation systems, is the regulation of economic relations in this area, bearing in mind the changed ownership of agricultural land. At the same time, it should be kept in mind that the introduction of irrigation of agricultural land without changing the production structure cannot give high economic effects. Restructuring should increase the participation of agricultural production: vegetables, fruits, industrial plants and animal feed. Agricultural land suitable for irrigation is estimated at 74.090 ha. By projecting the irrigation of agricultural land, it is envisaged that by 2025, irrigation systems will be built which would cover 80%, and by 100% by 2035, 100% of the total available agricultural land suitable for irrigation (Ministry of Agriculture and Rural Development of the Government of Montenegro, 2016).

Table 4 : Agricultural land suitable for irrigation and irrigation projection (ha)

	2015.	**2025.**	**2035.**
Adriatic basin	59.675	52.660	7.015
Black Sea Basin	14.415	6.745	7.650
Total	74.090	59.425	14.665

Source: Ministry of Agriculture and Rural Development of the Government of Montenegro (2016).

According to the Ministry of Agriculture and Rural Development of the Government of Montenegro (2016) for irrigation of the mentioned agricultural areas it is necessary to provide about 250 or 320 million m³ of water per year. On a part of the area under future watering systems - about 25.000 ha, the drainage of excess water should be done before. Coast the melioration area is

represented in the coastal zone of the Adriatic Sea, including the hinterland that includes the southern shore of the Skadar Lake. By 2025, it is planned to build an irrigation system on an area of 14.420 ha, which represents 75 % of the total land potential suitable for irrigation. The territorial division of the area was carried out in three melioration area (Boka, Budva, Bar - Ulcinj) and their associated systems that have exceptional comparative advantages for the production of southern crops and vegetables. The largest part of agricultural land, about 12.000 ha, is located in the melioration area of Bar - Ulcinj, about 2.000 ha in the melioration area of Boka and about 500 ha in the Budva area. For irrigation of the land in the coastal area, it is foreseen to use water mainly from the river Bojana, a smaller part of groundwater and water from Skadar Lake. Total water requirements in this area are about 70 million m³ per year. The central melioration area according to the Ministry of Agriculture and Rural Development of the Government of Montenegro (2016) with the greatest land potential and exceptional benefits for irrigation is located in the territory of the municipalities: Podgorica, Danilovgrad, Nikšić, Cetinje, and partly Kotor. This area is formed of four melioration areas: Zeta, Bjelopavlići, mountain hinterland and hilly - mountainous region. Spacious plain Zete, from the Podgorice and Kučkih hill towards Skadarskom Lake, then Bjelopavlićka plain, as well as Nikšić field, represent the basic agricultural and production complex in Montenegro. It is planned that by the year 2025 in this area, irrigation will cover an area of 38.260 ha (95 % of the total land suitable for irrigation), and the remaining 5 % will be covered by 2035. This area includes a modern irrigation system in function in Ćemovsko a field of 2.000 ha and about 10.000 ha of locally irrigated areas. The northeastern melioration area, whose boundary coincides with the border of the Danube basin, is related to the narrow valleys of the river, on the basis of which three composite amelioration regions have been formed: Lim, Tara and Ćehotina. In the northeast the melioration area during the observed period of time until 2025, it is envisaged that irrigation systems will cover 6.745 ha (about 47 % of agricultural land suitable for irrigation), where predominantly fruit and vegetable crops would be represented. Other areas - 7.650 ha, they would have weathered by 2035. The seasonal need for water for irrigation will be provided from surface flows, directly from accumulations that would be built on the rivers Lim, Tara and Ćehotini, in addition to local sources and potential small accumulations (see Ministry of Agriculture and Rural Development of the Government of Montenegro, 2016).

The outlook for the coming decades is that agriculture will require more water to meet the demands of growing populations. Ensuring equitable access to water and its benefits now and for future generations is a major challenge as scarcity and competition increase. With growing concern for the environment, some difficult choices will have to be made. Further tradeoffs cannot be avoided and will be politically contested. Choices about water use and management in agriculture will determine to a large extent whether societies reach the interlinked multiple goals of economic and social development and environmental sustainability (see Rajović and Bulatović,2017) as articulated in the Millennium Development Goals (Molden et al, 2007).

Table 5 : Relationship of water management in agriculture to the Millennium Development Goals

Millennium Development Goal	Role of water management in agriculture
Goal 1 Eradicate extreme poverty and hunger	Increase agricultural production and productivity to keep up with rising demand and maintain affordable food prices for the poor; improve access to factors of production and markets for the rural poor
Goal 3 Promote gender equality and empower women	Enhance equitable access to water and thus the ability to produce food.
Goal 4 Reduce child mortality Goal 5 Improve maternal health	Contribute to better hygiene and diets, particularly through the appropriate use of marginal - quality water and the integration of multiple water-use approaches into new and existing agricultural water Management systems, including domestic and productive functions.
Goal 7 Ensure environmental sustainability	Integrate the principles of sustainable development into agricultural water development to reverse the loss of environmental resources.
Goal 8 Develop a global partnership for development	Involve the diverse range of practitioners, researchers, and decision makers in the preparation of water management actions.

Source: Molden et al (2007).

A major step toward creating more equitable and effective use of water in agriculture in developing countries which belongs to Montenegro is to take stock of how water is currently managed for agriculture and of the impacts of its use on food and environmental sustainability (see Rajović, 2015). To move forward we need to combine knowledge of what has worked and what has failed and who has benefited and who has not, with information on promising and less

conventional approaches that may hold the key to future water management. And we need to identify the range of sources of potential increases in agricultural water productivity and the ways to realize them. The Comprehensive Assessment of Water Management in Agriculture was designed to come to grips with these issues on a practical level, provide a better understanding of approaches that are likely to succeed, and identify key gaps in knowledge (Molden et al, 2007).

CONCLUSION

Irrigation is a technological measure by which, according to Vincek and Bogović (2016), referring to the research Hofwegen and Svedsen (2000), Tomić et al (2013), Romić (2012) with one sides seeks to reduce the impact of extreme climatic phenomena, such as drought and extreme temperatures, while s others sides by irrigation, they yield higher yields in the cultivation of individual cultures. About 18% of arable land is irrigated in the world, and about 40 % of total food is produced on these areas, while about 13% of agricultural land is irrigated in Europe. European agriculture uses on average 30% of affected waters. In the countries of central and northern Europe, less than 1 % of the water affected is used for irrigation, as much as in Montenegro, while in Portugal, Spain, France, Italy and Greece, more than 50% of the affected waters are used for irrigation.

There is a large number of professional and scientific articles in international literature (see Blagojević et al, 2014) who deal with the topic of the benefits of the irrigation site. Many of them are of local character and here is a brief overview of those who have universal application. FAO (1985) published a Benefits Assessment Guideline, with 32 potential criteria grouped into 5 categories.

In the end, as well Savić et al (2013) we conclude that in addition to investing in the construction of basic infrastructure for irrigation purposes, it is necessary to encourage and co - finance the immediate construction of the system, the procurement of equipment and further assistance to system users, thus creating a more favorable atmosphere for the expansion of irrigation. Increasing areas under irrigation without a clear vision of economic justification, placements, subsidies, support, incentives will not give the desired results. At the same time, this is a global and strategic issue, since irrigation can only achieve significant effects if conditions are created for the establishment of rounded processes of agricultural and processing production, up to the final high - profitable products.

Revitalization of existing systems and gradual introduction of new areas under irrigation systems will enable more intensive development of other agricultural activities in Montenegro, processing capacities, greater labor engagement of the local population, economic development (see Rajović and Bulatović, 2016; Rajović and Bulatović, 2017). Priority should be given to sites and areas where there are quality resources and partly already constructed infrastructure elements necessary for the application and development of irrigation. Investing in revitalization and system building should focus on projects that will demonstrate the justification of investment and achieve a quick return on invested funds, which will contribute to raising motivation, interest and spreading of irrigation on larger areas. Activities, measures, locations ... related to irrigation must be in line with concrete plans for the development of other agricultural activities. In other words, they must be in function of real needs that will be based on the requirements of agricultural producers for irrigation that will be in line with demand and sustainability such production (see Savić et al, 2013).

Table 6 : Criteria for assessment of land suitability for irrigation

Crop (agronomic criterion)	1. Vegetation period, 2. Solar radiation, 3.Temperature, 4. Potential land for the development of the root system, 5. Aerialist of land, 6. Request crops for water, 7. Food nutrient requirement (NPK), 8. Water quality for irrigation, 9. Salinity of the land, 10. Land alkalinity, 11. pH, micronutrient and toxic substances, 12. Pests, weeds and crop diseases, 13. Floods, storms, wind, city and frost.
Restrictions in organizing agricultural production	14. Location, 15. Irrigation techniques, plot form, plot size, 16. Preliminary works, 17. Works during harvest and after harvest, 18. Requirements for mechanization.
Land Management and land improvement	19. Works necessary for soil cleaning, 20. Pollution protection, 21. Drainage characteristics, 22. Class rating classes, 23. Physical, chemical and organic land repairs, 24. Loss of water on leaching and washing the salt in the deeper layers, 25. Time needed for land reclamation (land repairs), 26. Irrigation requirements (slope of the terrain, micro relief ...)
Environmental Protection	27. Danger of salinization and soil alkalization perennial irrigation, 28. Danger of pollution of surface and groundwater, 29. Danger of erosion, 30. Danger of pollution of the environment.
Socio - economic criterion	31. The competence and position of farmers on irrigation, 32. Other requirements (water rights, availability of labor ...).

Source: Blagojević et al (2014) according to FAO (1985).

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