

Status of water resources linked to climate change in agriculture

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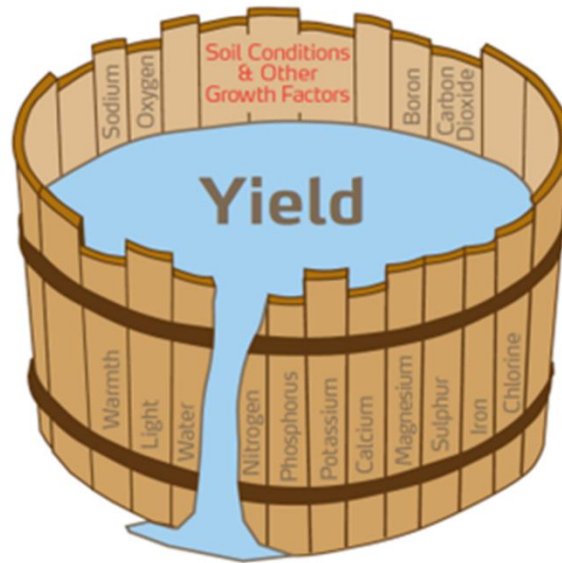
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Activities

- *Analysis of water resources and their importance for agricultural production*
- *Analysis of irrigation status in the countries of WB region*
- *Drought risk assessment and crop water requirement*
- *Overview of the existing farmer's adaptive practices for proper water use under climate changes*
- *Summary of national strategies and adaptation plans for water use in agriculture, including reports, R&D, projects and communications of the international CC (adaptation) framework (UNFCCC).*
- *Overview of the political and institutional setup, and legislative framework for adaptation activities relevant to the sector in the country.*
- *Highlight the existing data availability and quality. State if there are data constraints and data gaps.*
- *Conclusions with key recommendations and priorities referring to the proper water use and adaptation to climate change.*

Analysis of water resources and irrigation status in the countries of WB region

- Analyzes indicate that water resources mostly satisfy the needs of the WB countries (drinking water, industry, irrigation, biological minimum).
- However, countries from this region continuously been facing huge damages caused by drought of varying intensity. It is a consequence of the uneven spatial and temporal distribution of precipitation and watercourses.
- The average annual precipitation is approximately 730 mm/year in N. Macedonia to 1450 mm/year in Albania. In dried areas in the regions the annual precipitations are less than 600 mm/year (400 mm in some regions in N. Macedonia). The impact has intensified in recent years, primarily due to the atypical and extreme impacts of climate change.



Liebig Law of minimum
Limited yield by the minimum factor-water

Analysis of water resources and irrigation status in the countries of WB region

Countries/Territories*	Utilized land (ha)	Irrigated land		
		Total (ha)	% from utilized land	Comments
North Macedonia	320 738	84 434	26.3	
Albania	505 600 695 520	190 658 210 000	37.7	INSTAT- 2020/2022 30.2 from agricultural land*Zruli
Serbia	3 437 423	159 587	4.7	
Montenegro	212 724	2 447	1.2	
Bosnia and Hercegovina	132 927	26 918	20.3	20.3 from available land by holdings
Kosovo*	413 635	21 765	5.3	
Total in WB countries	4 609 412	485 809	10.6	

There is different data about irrigation land in the WB countries. It is necessary to define a standard methodology for estimating irrigated areas and possible irrigated areas, water extracted for irrigation purposes, water use efficiency of each irrigation system separately, etc.

Analysis of water resources and irrigation status in the countries of WB region

- The situation with hydro melioration systems and irrigation in general in some countries in the WB region is not satisfactory. Namely, there are large areas built and equipped for irrigation, which are not used from various reasons (the obsolescence of the irrigation systems, damaged equipment and infrastructure, reduced number of professional staff, fragmentation of the areas, institutional and technical changes, etc).
- The utilization of the hydro melioration systems for irrigation in WB countries varied in last years (24% in N. Macedonia, 60% in Albania, to 95% in Serbia).

New irrigation systems should be planned continuously and built according to priorities. Of course, improvement of irrigation systems should be done not only in terms of the rehabilitation of the current systems through construction works, but through in-depth changes in the entire approach to irrigation and management of the systems, inventory of existing facilities and equipment, fully integrating and harmonizing bases and systems (LPIS, SCADA), raising the level of public awareness about the importance of irrigation systems in agriculture, etc.

Analysis of water resources and irrigation status in the countries of WB region

- Well maintenance of drainage systems is imperative, since more frequently heavy storms occurred in recent years.

	Country	Drainage area in the country according to project documents (ha)	Used drainage area (present situation)
1	North Macedonia	81 930	50%
2	Albania	about 50 000	/
3	Serbia	2082010	67% - 85%
4	Montenegro	24 519	
5	Bosnia and Hercegovina	89 599	40-45%
6	Kosovo*	/	/

Greater investments for drainage systems are needed in the future, especially in the rehabilitation and cleaning of the existing canal network.

Drought risk assessment and crop water requirement

- The drought risk in the WB countries is during July and August, when irrigation is needed for stable crop production.
- According to different scenarios of the CC for the WB countries: temperatures are expected to increase and rainfall to decrease, especially during the summer months. This will be followed by decrease in yields and higher competition for water in WB countries
- In Serbia, damaged caused due to climate change varied from none to 30 to 50 % (occasionally 100% due to hail, or extreme drought) of average profit.
- In North Macedonia, in an average of 20 years, 10 years are intensely dry, 9 are average, and 1 is characterized as wet. Due to climate change, the risk of intensification of dry periods increases, while the need for water for all purposes grows
- Water resources in Albania are predicted to decline by 14% due to climate change (most **severe drought experienced in the central and southern areas**).
- Climatic conditions on the territory of Montenegro contribute to the existence of two periods of different state of the soil water regime during the year:
 - the period of excess water in the soil, accompanied by abundant rainfall, from October to May and
 - a period of water deficit in the soil due to insufficient rainfall during the growing season.
- From the beginning of October through the end of May, there is usually no drought in most parts of BiH. The need for potential evapotranspiration is covered by precipitation. July and August are usually drier months especially in the southern parts of BiH.
- Based on projections of higher temperatures, reduced precipitation and population growth, four of Kosovo's water basins may become water stressed or water-scarce by 2050.

ETP and Irrigation water requirement (D), applied irrigation techniques and irrigation regime by group of crops

Crops	Average irrigation water requirements by season in N Macedonia (mm)	Applied irrigation techniques	Irrigation efficiency	Average irrigation application rate (mm)	Number of applications during the season
Maize (Serbia)	210±70	Sprinkler		20-40	0-8
Maize (N. Macedonia)	360	Sprinkler	60-70%	50-60	6-7
Maize (Montenegro)	345,2	Sprinkler	60-70%	50-60	6-7
Maize (BiH)	302	Sprinkler	60-70%	50-60	6-7
Orchards -apple, pear, (Serbia)	355±85	Drip irrigation	~70 %		>21
Orchards -apple, pear, (N. Macedonia)	390	Drip irrigation	70-90 %	15-18	20-26
Orchards -apple, pear, (Montenegro)	263,8	Drip irrigation	70-90 %	20	13
Orchards -apple, pear, (BiH)	320±85	Drip irrigation	~70 %		>21



*Existing adaptive
practices*



Figure 10. Some applied adaptive practices in Serbia (Irrigation, anti-hail nets, anti-frost irrigation system) (Sources: Stričević R.)



Summary of national strategies and adaptation plans for water use in agriculture, including reports, R&D, projects / Political and institutional setup, and legislative framework for adaptation activities

- Many strategies, adaptation plans, reports, projects and research are focused on adaptation measures in agriculture and in the water sector. Generally, there is still lack in implementations of many of this act and actions, as well as many results from project activities. Detailed analysis for each country will be presented in the National report.
- Albania has not signed the EU Water Directive.
- N. Macedonia still haven't adopted the National Strategy for Irrigation and Drainage.

- In Serbia the last two decades, and recently about 100 million euros were invested or allocated in the development of irrigation, and several new systems.
- The Government of Albania considers rehabilitation and modernization of irrigation systems to be a high and urgent priority. In the short term it intends to mobilize funds from the state budget to enable rehabilitation of irrigation systems serving 90,000 ha. Out of the 210,000 ha of existing irrigation systems, 90,000 ha needs rehabilitation and 120,000 ha need improved maintenance.
- According to Water Management Strategy, land suitable for irrigation in Montenegro is estimated at 74,090 ha. The irrigation projection of irrigation systems is to cover 80% by 2025, or 100% by 2035, of the total available land suitable for irrigation.
- World Bank in coordination with the Kosovo Government is financing rehab and modernization of two irrigation schemes Radoniqi-Dukagjini and Iber-Lepenci.
- Based on the previous experience, it is a realistic projection that by 2034, it is possible to irrigate new 15,032 ha of arable land in BiH.
- According to the National Strategy for Agriculture, the short term vision of the MAFWE is to increase irrigated areas to 95,000 ha to 2027, and over 100 000 ha to 2031 in North Macedonia (including rehabilitation, new irrigation systems and small irrigation systems).

Conclusions and recommendation

- A number of national reports, policy documents, and research papers indicate that irrigation is considered the best available adaptation option, achieving significant yield increases.
- According to the data, surface irrigation is still dominant in the countries from WB region, but also they practiced drip and sprinkler irrigation.
- Also, a common problem among producers is the tendency to over-irrigate, even with a drip irrigation systems. On the other hand, yield potential and quality of production are lower than they should be, primarily because a significant area irrigated by drip irrigation is not equipped with injectors (fertigators), namely farmers still using classical spreading of fertilizers on the soil.
- Anyhow, according to the results of the WB countries analysis (North Macedonia, Serbia, Montenegro, Albania), there are regions that a several number of farmers are trained by different (domestic and international) project for proper use of drip fertigation and drip fertigation programs, data loggers and soil moisture sensors, weather stations, mulch materials, UV nets, as well as other types of equipment for rational water use, its conservation and adaptation to climate change.

Conclusions and recommendation

- It can be concluded that many stakeholders are in charge of managing the waters in WB countries. Therefore it is important to carry out institutional mapping, determine overlapping functions, possible opportunities for cooperation, and even propose legal changes to improve inter-institutional cooperation.
- In order to improve the hydro meliorative irrigation and drainage system in the future, the most significant and priority step is to adopt the National Strategy for Irrigation and Drainage for those countries who still haven't adopted.
- Moreover, the harmonization of the water management sector with all EU strategic and projection documents, determining the compatibility of policies in this sector with other sectors, improving the use of appropriate state programs, etc. are of great importance for improving the situation with irrigation and utilization of irrigation and drainage systems.
- It is also necessary to properly motivate farmers and other parties in the sector (additional subsidies) to increase the use of measures projected in the national programs, IPARD program. Namely, these programs support many projects that will directly improve the irrigation and drainage system in WB countries. Also, there are many other international funds which can be used for improving the capacities, resources and policy in this sector.
- Formal and informal education, sharing informations, tranings are also relevant for improving of adaptation measures in water sector in agriculture (Higher Educational and Research institutions, Extension services, Hydrometeorological services, etc.)

Important dates and milestones

Date	Milestone
May 15 th -17 th , 2023	Introduction, guidelines and templates for National Report sections
September 25 th , 2023	First draft National Report sections by national experts
October-December, 2023	Comments on National Report sections from regional coordinators, interventions by national experts
December 15 th , 2023	Final version National Report by national experts
March 1 st , 2024	Final draft of Cross-country synthesis and full study