The Future of Water in Agriculture in the Balkans: The Irrigation & Drainage (Eco)system Approach

REPORT BRIEF AND CONSULTATION DOCUMENT

Ranu Sinha, Regassa Namara, Pieter Waalewijn, and Svetlana Valieva
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Most of the countries of the Western Balkans require major reforms to the overall institutional, policy, regulatory, and financial aspects of their water and agriculture sectors, which are at varying stages of development. In addition, to mitigate and adapt to growing climate risks and transform these sectors, they need to: (i) understand the diversity of farm types, irrigation water sources, and climatic conditions in the Western Balkans, and how they influence I&D outcomes; and (ii) based on that understanding, rethink the investment approach to the irrigation, drainage, and agriculture sectors in order to achieve greener, more sustainable, climate-resilient, and more inclusive rural development.

This region has significant potential for improving its agricultural production and productivity. The Western Balkan countries—Albania, Bosnia and Herzegovina, Croatia, Kosovo, Montenegro, North Macedonia, and Serbia—are endowed with relatively abundant water resources. However, these resources are highly seasonal and spatially diverse, making I&D indispensable for productive and sustainable regional agricultural development. These countries

1. The Western Balkan countries include Albania, Bosnia and Herzegovina, Croatia, Kosovo, Montenegro, North Macedonia, and Serbia
are characterized by economies in transition and rapidly changing demographics along with increasing urbanization. With the poor economic competitiveness of the sector, and falling incomes, agriculture tends to become an economic activity of last resort for many farmers, providing critical income only to those without other job opportunities.

Modern I&D services are a critical element for managing the risks associated with climate change, and for helping to increase crop productivity and diversification, to enable the Balkan countries to compete in European agricultural markets, thereby improving farming livelihoods.

Yet I&D sector development is at its historic low in terms of total area irrigated, and has declined from previous levels in several of the Balkan countries. Drainage and flood protection play an equally important role in extending the cropping area and the cropping season, but this also remains underdeveloped or poorly maintained in many places.

Since the early 1990s, the World Bank has been supporting I&D development in the Western Balkans. Public I&D systems are in varying states of dilapidation, rehabilitation, and modernization.

The Bank has played a major role in channelling investments to upgrade these systems, along with other sources of finance, including the European Union (EU) (in Croatia), the Abu Dhabi Fund (in Serbia) and European Bank of Reconstruction and Development (EBRD). However, underfunding in the I&D sector is a major problem due to a combination of low tariffs and limited cost recovery.

This rich history of engagement has enabled the World Bank to learn some key lessons: one of them is that to break the rehabilitate-dilapidate-rehabilitate cycle, ensure optimal use of the I&D potentials created, and respond to economic, environmental, and social inclusion goals, there is a need to complement infrastructure investments with farmer (farming system)-centered investments known as the Irrigation and Drainage (Eco)system approach. This approach customizes I&D investment solutions to the prevailing and projected biophysical context of the Western Balkans—including climate change, crop choices, and agricultural markets—and seeks to reduce environmental damage and ensure the sustainability of both water resources and I&D service delivery. However, it does not propose a wholesale alternative to an infrastructure-based investment strategy; instead, it builds on it and strives to put the sector on a more sustainable, resilient, greener, and more inclusive development path. Economic analyses show that new public irrigation systems, whether open or pressurized, will only be profitable with a high level of uptake and a substantial share of users opting to grow high-value crops; and our experience in the region shows that often these conditions are not met in practice.
The Irrigation and Drainage (Eco)system approach aligns with the World Bank’s Green Resilient Inclusive Development (GRID) approach.² The GRID framework, which aims for zero pollution and the creation of a toxic-free environment, as well as inclusive and resilient development, is highly relevant for rethinking the I&D sector. These goals require comprehensive and multipronged policy and investment responses, and enhanced pollution monitoring, prevention, and remediation in order to simultaneously address water and food security objectives while also heeding the growing calls for sustainability and “building back green” as a prominent economic recovery model. However, few countries in the Balkan region have an integrated strategy for how I&D investments can drive sustainable, resilient, inclusive, and greener agricultural growth.

What are the factors driving transition & transformation of the I&D sector in the Western Balkan countries?

CLIMATE CHANGE

Arable agriculture in the Western Balkans is practiced in four distinctive agroclimatic zones:

<table>
<thead>
<tr>
<th>ZONE 1</th>
<th>ZONE 2</th>
<th>ZONE 3</th>
<th>ZONE 4</th>
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<tbody>
<tr>
<td>The Pannonian Plain, which is in the northern and northeastern parts of the Balkans, covering large areas of Croatia, Serbia, and the northern parts of Bosnia and Herzegovina.</td>
<td>The Adriatic Coast, in the southwestern part of the region, includes significant areas of agricultural land in Albania, Croatia, and some areas of Bosnia and Herzegovina, and Montenegro.</td>
<td>The hills, which cover Central Serbia and parts of Bosnia and Herzegovina; and</td>
<td>The isolated plains of Kosovo and North Macedonia.</td>
</tr>
</tbody>
</table>

The region is generally well endowed with water resources, though with shortages at specific times and in specific places. The impact of climate change is expected to be modest in the short term but to accelerate markedly from the mid-century on, making the entire region hotter, the north wetter, and the south drier. By 2050, the following changes are expected:

- **Average temperatures** will rise by 0.5-1.5°C, slightly less in the north and more in the south. Maximum temperatures will also rise, and there will be fewer cold days. With a predicted temperate continental climate, this may lead to increasing snowmelt, resulting in the potential for floods. This will also lead to higher

² The World Bank Group’s corporate Climate Change Action Plan strategy for 2021-25 presents a paradigm shift of the World Bank toward a Green Inclusive Resilient Development (GRID) approach, which is responding to the triple crises of poverty, climate change, and inequality.
consumptive requirements of crops and more erratic water availability in the summer, particularly in the Southern Balkans.

Precipitation will increase in the north and decrease in the south, with higher levels of precipitation in early spring and late autumn, and lower levels in summer. There will also be more drought days (see Figure 2.1).

Inflows from the Danube, Sava, Tisa, and Drava rivers will be determined by climate changes further north in Europe; average flow is not expected to decrease significantly over this period, but the risk of flooding may increase. Flows for the other rivers will be influenced by precipitation changes within the region, including increased seasonality and variability.

FIGURE 2.1 Projected Change in Annual Precipitation in the Balkans 2071-2100 Compared to 1971-2000

There is large spatial and temporal variation within these countries and, in addition to the type and scheduling of crops, the need for irrigation will depend on the current and expected changes in climate and rainfall patterns across the region. This underscores the importance of having adequate I&D throughout the region to enable crop intensification and the production of higher-value crops. Although I&D services are needed in all the Balkan countries, the northern
parts of the region will require I&D more as insurance, and to extend the season in the wet months. In the southern regions I&D will be needed to allow cropping in the hot and dry months, and to provide insurance in the spring.

ACCESSION TO THE EUROPEAN UNION, THE GREEN AGENDA, AND STRUCTURAL TRANSFORMATION OF THE AGRICULTURAL SECTOR

Some of the Balkan countries are undergoing the process of accession to the EU and aligning with the Green Agenda; and the agricultural sector in the region is in the process of structural transformation. All of these are contributing factors that underscore the need to rethink investment approaches in the I&D sector. These factors, and the transition requirements and enablers for these processes are detailed in Figure 2.2.

FIGURE 2.2 Summary of the Major Drivers of Transition in the Western Balkans

**DRIVERS OF TRANSITION IN THE WESTERN BALKANS**

The Western Balkan countries are in a process of transition driven by the accession to the EU, the Green Agenda and climate change.

<table>
<thead>
<tr>
<th>Transition Drivers</th>
<th>Transition Requirements</th>
<th>Transition Enablers</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union Accession</td>
<td>Harmonization and negotiation of 35 separate “chapters” of the Acquis Communautaire</td>
<td>Rethink regulatory, institutional, and infrastructure investment approaches in water, food, energy sectors.</td>
</tr>
<tr>
<td>The Green Agenda</td>
<td>Policy and grant alignment with Green Agenda themes:</td>
<td>Active national harmonization to Water Framework Directive, and related EU green directives.</td>
</tr>
<tr>
<td></td>
<td>Shift to integrated water management on a basin-scale.</td>
<td>An (eco)system approach is needed that recognizes the different dimensions of the farming systems in the region, the agro-climatic and structural elements.</td>
</tr>
<tr>
<td>Climate Change</td>
<td>Shift to integrated water management on a basin scale and establish criteria for environmental protection and the management of water quantity and quality.</td>
<td>Better match needed between diverse farm system needs with appropriate irrigation options.</td>
</tr>
<tr>
<td>Farm-scale Structural Transformation</td>
<td>Agriculture across the Balkans is undergoing a process of structural transformation. Irrigation can play a critical role in supporting this process and improve production efficiencies on the farm and beyond.</td>
<td></td>
</tr>
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</table>
DIVERSITY OF AGROCLIMATIC ZONES, AND TYPOLOGY OF FARMS IN THE BALKANS

The Balkans are characterized by three distinct typologies of farms, dominated by the small family farm. The three types are:

Small household farms:
- Small farms producing largely for consumption by the household and the extended family (typically < 1 hectares (ha); covering mostly Albania, Kosovo, and North Macedonia);

Mixed-income commercial farms:
- Medium-sized farms (typically 1-5 ha), producing crops partly or mainly for sale, but gaining most of the household income from non-agricultural jobs or pensions (Albania, Kosovo, North Macedonia); sometimes spread over two or even three adjacent farm plots (for example, Adriatic Croatia);

Full-time commercial farms:
- Large farms producing almost entirely for commercial sale, and often providing the majority of farm household income. (There are now 6-30+ hectare farms in all regions, usually accounting for 20-40 percent of the land, for example in Adriatic Croatia, where more than 65 percent of the land lies on holdings of more than 100 hectares; as well as in Montenegro and Vojvodina, where nearly 40 percent of the land lies in holdings of more than 100 hectares).
PRIVATE IRRIGATION, AND THE ROLE OF MUNICIPALITIES IN IRRIGATION SERVICE DELIVERY

Across the Balkans, more than 60 percent of irrigating farmers use groundwater, and almost 40 percent use surface water. One conclusion that emerges from this data is that multiuser irrigation systems, an area of investment upon which governments and donors tend to focus, represent only around a third of the irrigated farms in these countries.

Private irrigation, where just one farm is responsible for irrigating their farm plot, from abstraction through to application, is the dominant system in the region. The data for four countries (Croatia, Kosovo, Montenegro, and Serbia) indicate that more than 150,000 farms use this approach, and the total for the region may exceed a quarter of a million farms, the large majority operating without any formal permit. Individual irrigation tends to be institutionally simple and economically profitable and is widely used to produce high-value crops that can easily cover the costs of irrigation. However, in some places unlicensed groundwater withdrawals are creating a risk of overexploitation of scarce water sources.

Municipalities and their I&D units are active in many countries of the Western Balkans. Municipalities act as the central point for identifying needs, as well as for promoting and financing preparatory studies, supervising and financing the construction of infrastructure, and managing irrigation facilities. Sometimes the management is undertaken directly by the municipalities’ Irrigation & Drainage Units (IDUs), as is the case in Albania; in other cases, this is handled by water utility companies (WUCs). The role of these institutions as service providers needs to be strengthened and incentivized to be able to improve overall I&D services across the region.
Enabling Green, Climate-Resilient, Sustainable, and Inclusive Agricultural Transformation in the Western Balkans: The Irrigation & Drainage (Eco)system Approach.

DEFINING THE APPROACH

Irrigation and drainage are inherently part of a complex socio-technical-ecological system that is influenced and affected by climatic, agroecological, socioeconomic, technological, governance and policy, as well as behavioral factors. These factors are referred to as the (eco)system\(^3\) of the I&D sectors. They play a powerful role in influencing the outcomes from investments in irrigation, drainage, and agriculture; therefore, they need to be considered when designing and prioritizing interventions. This approach has redefined the investment framework for identifying, designing, prioritizing, sequencing, implementing, and monitoring I&D sector interventions in a holistic and targeted manner in order to address agricultural water management constraints for a variety of farm types and contexts. It is oriented toward supporting governments in meeting the triple objectives of green, inclusive, and climate-resilient irrigation and agricultural growth.

WHAT ARE THE KEY CHARACTERISTICS THAT DISTINGUISH THE IRRIGATION & DRAINAGE (ECO)SYSTEM APPROACH FROM “BUSINESS AS USUAL”?

The irrigation & drainage (eco)system approach is an integrated “farm-centric” investment strategy that targets specific I&D infrastructure and non-infrastructure solutions to address the constraints and needs of various farming systems. As Figure 3.1 shows, the (eco)system approach focuses on targeting I&D solutions by:

(i) making a deliberate effort to ensure that optimal use of the improved or new I&D potential that is created by investments in I&D matches the way various farm systems actually use irrigation water;

(ii) providing all farming systems, from small-scale to commercial producers, with tailored approaches to food production;

(iii) linking climate risk management to other forms of risk management (insurance, trade, phytosanitary, and agro-environmental measures, and other market-based mechanisms);

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3. The term “(eco)system” is not limited to the natural ecosystem of living and nonliving organisms, but instead is a broader term to describe the socioecological systems that comprise irrigation. That is, it is a combination of the hydrological, environmental, social, economic, governance, and human systems that interact upon and influence I&D outcomes.
(iv) instituting policy reform of delivery mechanisms, for example **creating better coordination mechanisms between different tiers of government**, as well as between sectors; and between government and the private sector; and

(v) integration from the farm to the basin scale, with an emphasis on water security and climate resilience (see Figure 3.1).
This approach requires strong “environmental stewardship.” To align with the Water Framework Directive, EU Accession, and the Green Agenda policy priorities of the Balkans, all future I&D investments should be coupled with improved environmental standards and practices that meet the requirements of reduced water pollution and the negative environmental impacts of increased irrigation.

**It offers a diversified irrigation service delivery model, which includes support to private irrigation.** In multiuser or public irrigation systems, a move toward on-demand irrigation water services is encouraged in order to enable the flexibility, reliability, and adequacy of irrigation water supply. This includes support to private irrigators who are making investments and innovating to valorize the I&D infrastructure through the conjunctive use of surface and groundwater resources. It also focuses on creating clear institutional responsibilities, accountability, effectiveness, and regulations. (See Annex 1 for a brief overview of the types of institutional and policy reforms that it will be necessary to make in the irrigation management systems in the Western Balkan countries.)

**It promotes new performance monitoring standards and metrics of success.** Identification and application of holistic performance indicators goes beyond narrow physical criteria to account for the realities of the I&D (eco)system: this includes agricultural productivity, environmental sustainability, climate resilience, flexibility, reliability and adequacy of the irrigation water supply, and customer satisfaction, with a particular focus on gender inclusivity. This can set service providers on a path toward providing reliable, safe, inclusive, transparent, and responsive services that align well with the World Bank’s ongoing work of developing performance assessment tools for the Irrigation Operator of the Future tool.
It relies on the application of innovative financing models, including performance-oriented fiscal transfers to municipalities and results-based financing of individual projects or programs, and promotes partnerships at the local and national levels of administration to leverage financial resources, harmonize policies, coordinate investments, and ensure the principle of financial additionality.

It offers flexibility in terms of timelines. Proposed interventions could be either short-term (setting the stage and preparing for longer-term investments) or long-term, spanning five or more years. To achieve better outcomes, the choice of interventions should be grounded in local realities for what farmers need to better manage their use of irrigation water; but the broader lens does not have to make interventions more complex. By understanding local complexities and leveraging opportunities, simple interventions can be crafted in such a way that they deliver high impact at low cost. (Box 5.1 describes such an approach being tested in Africa.4)

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**BOX 3.1 On-Farm to Catchment Management in Ethiopia**

- The management of a catchment was successfully demonstrated in Northern Ethiopia, Tigray, illustrating how on-farm strategies are connected to broader catchment conditions.

- A series of small dams (see photo), runoff-stopping structures, and reforestation were implemented following a rural diagnostic of water user economic, infrastructure, social, and environmental conditions.

- As a result, flooding in the valley was reduced and the water storage in the catchment, especially in the valley floor, was improved.

- This led to an extension of the growing time and enabled the production of alternative crops.

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4 Implementation Options for the Irrigation & Drainage (Eco)system Approach

IMPLEMENTATION AREA 1: Strengthening I&D governance structures, improving irrigation service delivery and management with multiagency coordination.
This can be done by creating new opportunities to break silos across agricultural, water resources, environmental, and related agencies; reform irrigation institutions; and enhance performance via modernization and innovative measures for I&D service delivery. It is important to monitor the performance of agencies against green, resilient, inclusive, and gender-sensitive services and the degree of technological innovations applied, as well as by addressing the information gaps inherent in irrigation scheme capacity, functionality, and sustainability. This in turn can better support farmers as they transform their productive capacities. Next, it is vital to respond to the diverse needs of different farming segments and water users by increasing accountability, creating autonomy in the service delivery chain, and separating functions.

IMPLEMENTATION AREA 2: Green and decarbonize irrigated agriculture.
Some of the region’s irrigation systems need repurposing to catalyze nature-based solutions, power generation, pollution prevention, and circular economy approaches to the adoption of wastewater reuse for irrigation. When investments are made to upgrade drainage systems, soil health in irrigated agriculture can be improved. It is also important to encourage farm advisory services to adopt new crop varieties that can adapt to climate stress; to target small producers and female decisionmakers; and to increase investment in training farmers and ministries on climate-resilient agricultural water management practices.

IMPLEMENTATION AREA 3: Incentivize Farmer-Led Irrigation Development (FLID).
Since a large majority of farmers are “individual” irrigators, this is an opportunity for governments to support their development, consolidation, and sustainability through regulations that allow for FLID, which requires a different government support model than those in which farmers use irrigation from public schemes (Izzi et al 2021). (See Annex 1 for specific steps on how to operationalize FLID in appropriate farming systems and agroclimatic zones in the Western Balkans).

IMPLEMENTATION AREA 4: Activate and strengthen agricultural knowledge services and inclusive access to markets and value chains for irrigated agriculture.
This can include interventions such as: (i) promoting partnerships with the private sector (connecting farmers to off-takers); (ii) promoting and scaling existing opportunities for youth agro-
entrepreneurs; (iii) improving and enhancing marketing and agricultural input support to these farms, which increases their opportunities to market and sell their commodities; and (iv) training and coordinating farmers to organize around specific commodities in order to enable small household farms and medium mixed-income farms to transition from low-value subsistence to higher-value agriculture.

IMPLEMENTATION AREA 5: Multipronged and customized infrastructure solutions for collective and bulk water supply schemes.

These are to be selected, depending on the targeted farm type, to address core infrastructure and water access constraints: (i) modernization and improved management of poorly performing multiuser irrigation systems; (ii) rehabilitation, expansion, and decommissioning of dilapidated multiuser irrigation systems; (iii) rehabilitation of drainage systems; (iv) construction of new multiuser irrigation systems; (v) investments in storage, flood protection infrastructure, and river works to mitigate the impacts of climate change; and (vi) separate service delivery functions and business models for different types of infrastructure, outcomes, and timelines, which will determine the cost, time frame, technology choices, financing solutions (PPP or not), and integration with other infrastructure services.

IMPLEMENTATION AREA 6: Invest in basin-to-farm “smart” irrigation and climate services.

This entails modernizing how agencies observe, forecast, model, and disseminate real-time climate, water, land, and agronomic data such as precipitation, evapotranspiration (ET), temperature, wind pressure, humidity, soil, and river flow data services to help irrigation service providers design, plan, adapt, and modernize infrastructure, and efficiently allocate water to end users. It is also necessary to improve access to digital and mobile technologies to help farmers manage climate risks by direct citizen engagement in providing climate data services to end users.

This approach, and its related areas of implementation, provide a platform for partners in the Western Balkans to dialogue about transformative investments in the I&D sector. Application of the I&D (eco)system approach offers governments a menu of investment options that are tailored to scale the potential of diverse farming systems to tackle climate risks and accelerate innovation in the I&D sectors for more green, inclusive, and resilient growth.
### ANNEX 1: Institutional & Policy Actions Matrix for the I&D (Eco)system Approach

<table>
<thead>
<tr>
<th>Dominant Farm Typology by Zone</th>
<th>Dominant Irrigation Management System</th>
<th>Suggested Irrigation Service Delivery Reforms &amp; Action(s) (common to all zones)</th>
<th>Suggested Irrigation Service Delivery Reforms &amp; Action(s) (specific to zone)</th>
</tr>
</thead>
</table>
| **Zone 1: Pannonian Plains** (full-time commercial farms with low-value crops; average 6-10 ha in Croatia/Vojvodina) | Water utility companies (majority are public, some are private) | **Water pricing policy for irrigation:** Assess existing tariff policies, or design a new tariff policy that aligns with provisions of the European Commission Directives including cost recovery of water services; adequate incentives for users to use water efficiently; reduction in environmental degradation using a “polluter pays principle” (for example, a two-part tariff area + volumetric fee); (Actor: National regulatory authority or line ministry). | **FLID for private irrigators:**  
**Step 1:** Conduct a beneficiary diagnostic to define FLID eligibility criteria for male/ female farmers (Actors: Donors & national/local agencies).  
**Step 2:** Infrastructure assessment, prioritization of private infrastructure development (Actors: Donors, public sector agencies, farmers).  
**Step 3:** Assess potential to scale – financial, technical capacity, types of crops grown, etc. for private irrigators (Actors: Donors and public agencies).  
**Step 4:** Create a multistakeholder alliance (Actors: public officials, financial institutions, irrigation equipment suppliers, value chain actors, farmers).  
**Step 5:** Enable the flow of funds: examine different procurement options to help farmers to afford infrastructure/equipment (Actors: govts, donors, equipment suppliers, value chain actors, farmers). |
| **Zone 2: Adriatic Coast** (Full-time commercial farms (6-30+ ha); mixed-income commercial farms (1-5 ha)  
57% of high-value crops in Adriatic Croatia, Albania, some parts of Montenegro & BiH) | **Albania & Montenegro**  
Municipalities, through I&D units, cooperatives, municipal multiutility companies; **Croatia**  
Water utility companies; **BiH**  
Municipalities, water utility companies, WUAs, cooperatives. | **Coordination capacities:** Assess the capacity of multiple agencies and develop strategies to establish common regulatory frameworks for the use of European funds to fulfill pre-accession criteria in a coordinated manner across multiple line agencies. | **Legal:** Prepare and adopt a WUO act if it is not yet available (Actors: National governments) |
| **Zone 3: Hills** (mixed-income commercial farms in Central Serbia & parts of BiH) | Actors: Water utility companies | **Regulatory instruments:** Develop policies that encourage cost reduction of service provision by increasing the levels of operational, conveyance, and energy efficiency, based on proven and solid technologies for improved metering, regulation, and control of flows and hydraulic heads. | **FLID for private irrigators** (Same steps as in Zone 1) |
| **Zone 4: Isolated Plains of Kosovo & North Macedonia** (Household plots (0-1 Ha); mixed-income commercial farms (3 ha)) | Kosovo Water utility companies; **North Macedonia**  
WUAs, water utility companies, water management enterprises |  | **Legal:** Prepare and adopt WUO act if it is not yet available (Actors: National government) **FLID for private irrigators** (same steps as in Zone 1) |