International Water Management Institute

Water Policy Brief - 46
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Revitalizing community and household irrigation in Ethiopia: Policy considerations for improved performance

Key messages

- **Shift the focus from expansion to performance:** National irrigation performance averages only 31%, and three-quarters of community-managed schemes underutilize existing infrastructure. Policy should therefore balance investments in new infrastructure with measures to improve the performance and efficiency of existing schemes.
- **Address management and agronomic constraints:** Low productivity is driven more by weak agronomic practices, limited advisory services, and poor crop choices than by water shortages. Irrigation interventions should bundle water management with agronomic, input, and market support services.
- **Strengthen governance, skills, and maintenance:** Poor irrigation scheduling, limited technical capacity, and widespread canal siltation (87%) and weed infestation (60%) constrain scheme performance. Strengthening extension services, technical training, operation and maintenance, and accountability systems should be a national priority.
- **Use benchmarking to drive continuous improvement:** Large performance differences among schemes reveal substantial untapped potential. National performance benchmarks and peer-learning platforms should be established to accelerate the adoption of successful practices.
- **Unlock land and water productivity:** Community-managed schemes achieve average land and water productivity of 7.78 tons/ha and 3.18 kg/m³, respectively, compared with 12.60 tons/ha and 5.25 kg/m³ in household-managed schemes. Closing these gaps requires better on-farm water and crop management, including improved irrigation timing, crop selection, farmer decision-making, and management flexibility.

Background

In response to rising food insecurity, rapid population growth, and increasing climate variability, the Government of Ethiopia has prioritized irrigation as a cornerstone of agricultural transformation. Ethiopia's National Irrigation Strategy, as part of the country's Ten Years Development Plan (2021–2030), aims to expand irrigation infrastructure, improve water-use efficiency, and strengthen food security, with an emphasis on smallholder schemes, public–private partnerships, and sustainable groundwater management (MoA 2023). Section 4.3 of the Agricultural and Rural Development Policy (FDRE 2024) further reinforces the priority of sustainable irrigation development and enhanced agricultural water management. Smallholder irrigation schemes, particularly community-managed and household-managed schemes, have become central to this agenda due to their accessibility to smallholders, lower investment requirements, and potential to improve rural livelihoods. Community-managed schemes (CMS) serve groups of farmers through shared infrastructure and joint operation, while household-managed schemes (HMS) are owned and operated by individual farmers with direct control over water abstraction and irrigation timing.


Poor control gate at a community-managed irrigation system in Koga, Ethiopia (*photo:* Amare Haileslassie)

Despite the physical expansion of irrigation in Ethiopia, many existing schemes consistently underperform expectations (Gebul 2021). Previous performance assessments have focused predominantly on CMS, often in a fragmented and geographically limited manner, giving household-managed schemes little to no attention (Agide et al. 2016). A recent study by the Ethiopian Institute of Agricultural Research (EIAR, forthcoming), which forms the basis for this policy brief, addresses this gap through a comprehensive national assessment that covers both scheme types, generating the evidence base needed to inform targeted policy and strategic interventions.

A national project titled *Irrigation Performance Assessment of Community- and Household-Managed Irrigation Schemes in Ethiopia* was conducted by the Ethiopian Institute of Agricultural Research (EIAR) from 2024 to 2026 as a comprehensive nationwide assessment, with technical support from members of the Agricultural Water Management Task Force. The study evaluated 75 community-managed and 39 household-managed irrigation schemes selected from diverse agroecological zones and river basins of the country using a multi-criteria purposive sampling approach (Figure 1) and operational (internal indicators) and benefit-delivering (external indicators) efficiencies.

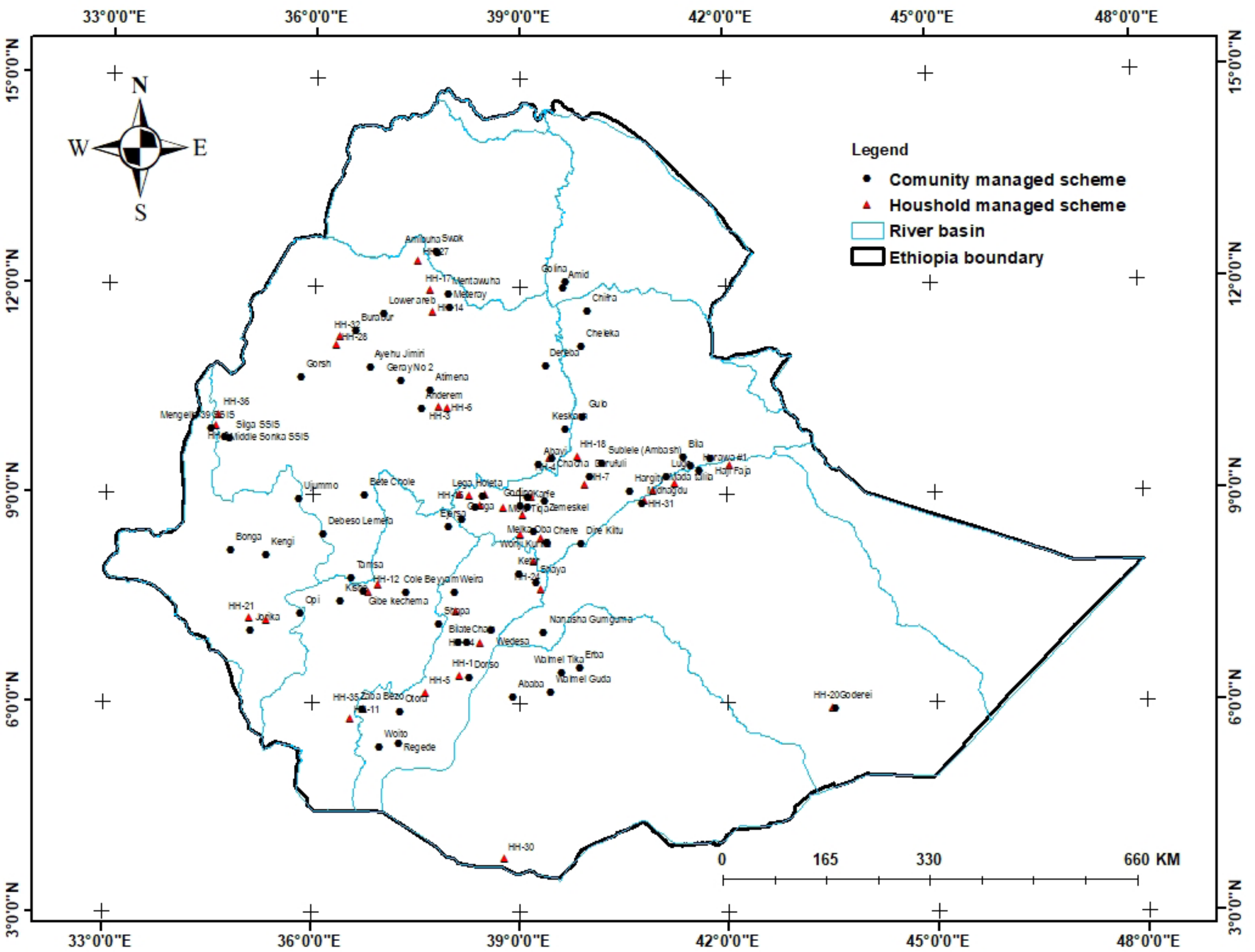

Figure 1. Distributions and locations of assessed community-managed schemes (CMS) and household-managed schemes (HMS)

What evidence shows

Operational efficiencies of irrigation systems

Internal indicators are used to understand irrigation systems' operational efficiencies (Molden et al. 1998). According to EIAR (forthcoming), the overall operational system efficiency in CMS is low and highly variable among schemes. About 96% of assessed schemes operated below 50% of irrigation efficiency, while nearly one-third performed below 20%. Water management practices were highly inefficient and inequitable. The frequency distribution of internal irrigation performance indicators presented in Figure 2 for CMS shows considerable variation among the schemes. Conveyance efficiency distribution is concentrated between 60 and 95%, indicating good conveyance performance. The fact that the median is higher than the mean shows that the distribution is left-skewed due to the existence of low-performing schemes. In terms of application efficiency, the distribution is concentrated around 40–60%, with only a few schemes exceeding 70%. Application efficiency is the lowest average among all indicators, possibly due to inadequate on-field water management practices, water loss through deep percolation, runoff, and inappropriate irrigation scheduling.

With mean and median values of 72.2% and 66%, respectively, the storage efficiency exhibits somewhat asymmetric distribution. The values are largely distributed between 45% and 90%, with most schemes falling within the moderate to high storage efficiency range. Although some schemes over- or under-irrigate their fields, this indicator generally shows that the existing practices allow a reasonable amount of water to be stored in the root zone to support crop growth. The relatively high coefficient of variation (CV) indicates significant inconsistencies in irrigation management and infrastructure conditions, highlighting the need for improved operation and maintenance, rehabilitation, and farmer capacity building to enhance irrigation performance.

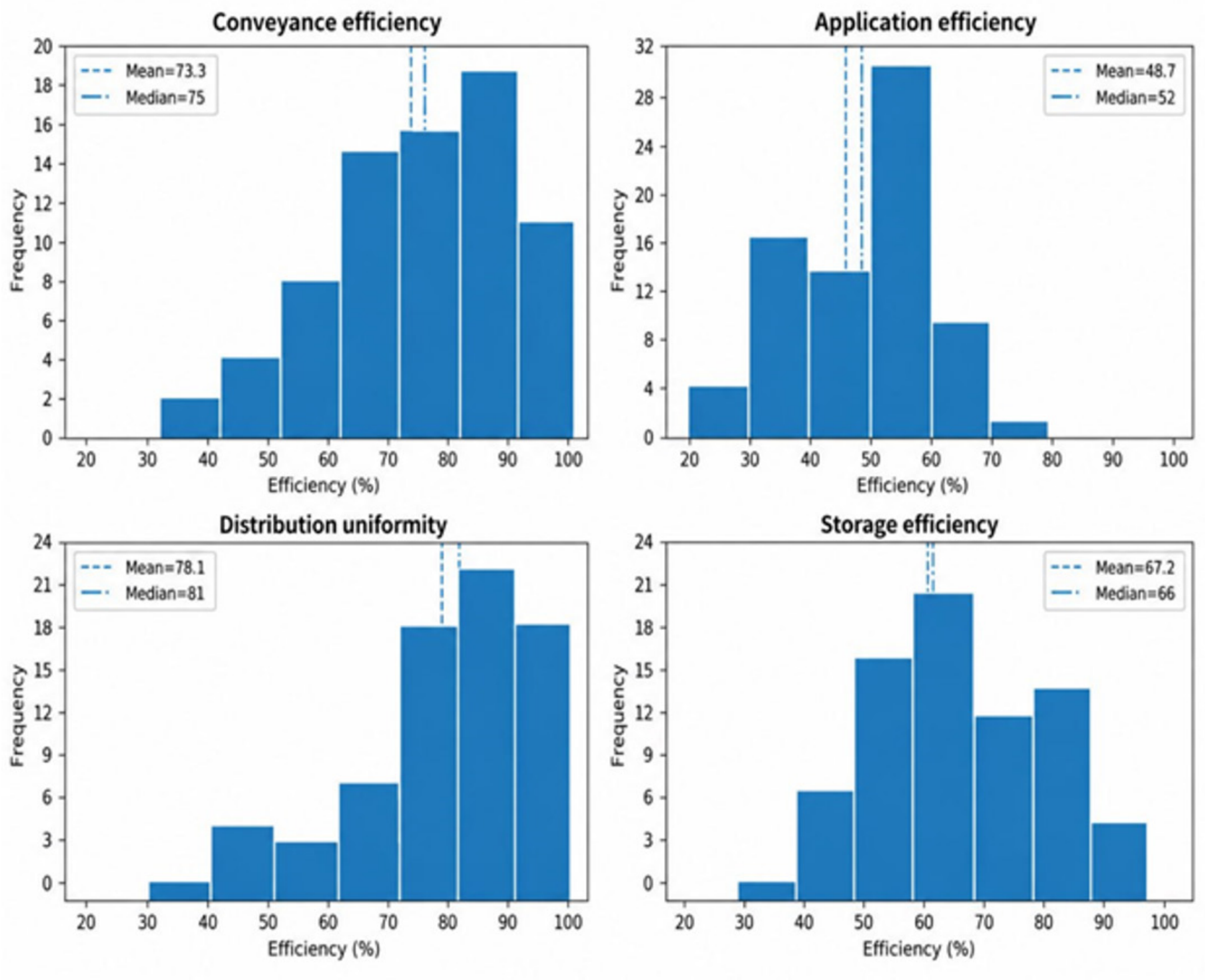

Figure 2. Distribution of internal performance indicators for community-managed systems (n = 75)

The distribution uniformity indicator values are concentrated between 75% and 100%, with mean and median values of 78.1% and 81%, respectively. The high concentration of values between 80% and 90% shows that the water distribution across the fields is consistent.

The distributions of internal performance indicators for HMS (Figure 3) show that application efficiency is the lowest component, with a mean value of 49.5%, indicating poor field-level water management. In contrast, distribution uniformity (mean 80.6%) and storage efficiency (mean 73.1%) perform relatively better across most schemes. Distribution uniformity exhibited the lowest variability (CV = 13.5%), while application efficiency showed the highest variability (CV = 21.6%). Approximately 74.4% of the schemes had application efficiencies below 60%, whereas 61.5% achieved distribution uniformity values above 80%, indicating relatively good water distribution despite low field application performance.

The slightly higher median values indicate that a few low-performing schemes are reducing the overall averages.

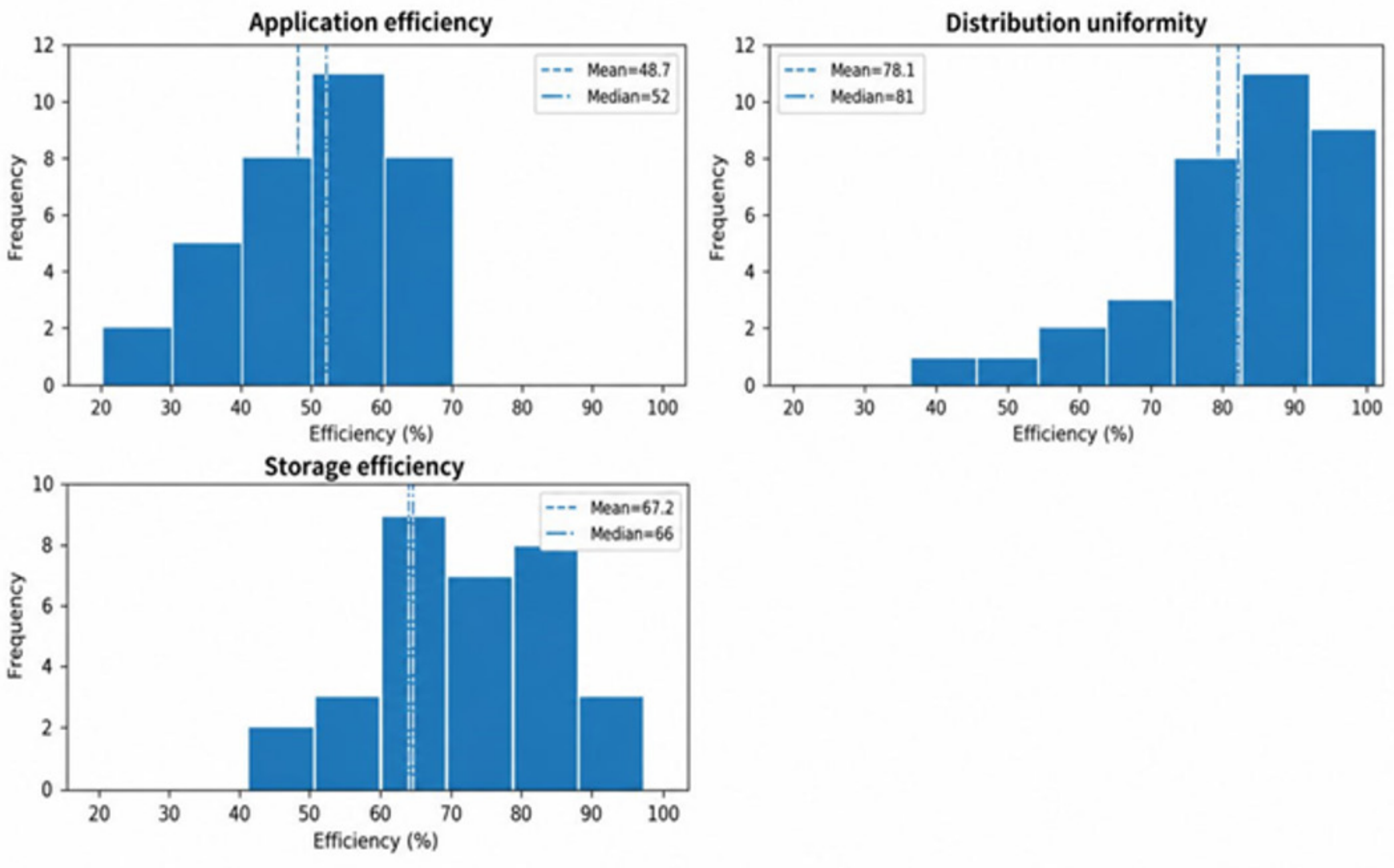

Figure 3. Distribution of internal performance indicators for household-managed systems (n = 39)

The findings suggest that CMS is relatively more efficient in conveyance and distribution than in field water application and storage.

The low performance of smallholder irrigation schemes in Ethiopia is widely recognized and has been considered a key challenge in national development planning. In response to the implications of poor scheme performance, the Ten Years Development Plan (Planning and Development Commission 2021) has set specific targets to improve irrigation productivity and efficiency. These include increasing the use of modern irrigation techniques from 2 to 20% and increasing irrigation efficiency from 30 to 50%, and increasing land use efficiency from 33 to 100%. However, EIAR (forthcoming) revealed that in 2026, the average national irrigation performance is still at 31%, which means that three times as much water as required by crops is abstracted from the sources, transported, and applied. On average, more than 25% and 30% of the water is lost during transport and distribution, respectively. At the field level, crops receive nearly twice their water requirement, with much of the excess lost through deep percolation. Inefficiencies in irrigation practices are widely recognized, and the need for improvement has been clearly articulated in national policies and strategies. However, the persistence of these challenges despite the availability of policy frameworks indicates that the main constraint lies in policy enforcement (Ashine et al. 2025; Wabela et al. 2024; Wubetu et al. 2022; Ayele et al. 2021).

The comparative analysis shows that there are 18 schemes (24%) from CMS that achieved application efficiency greater than 50% and distribution uniformity greater than 80%. The existence of such high-performing schemes demonstrates that efficient and sustainable irrigation management is achievable under CMS if supported by adequate infrastructure, institutional capacity, and effective governance mechanisms. Moreover, such schemes can serve as a benchmark for performance improvement.

How well do irrigation systems deliver benefits?

External indicators are useful to understand the overall benefits delivered by an irrigation system (Molden et al. 1998). They cover the overall effectiveness, efficiency, and productivity of irrigation schemes in utilizing land and water resources to achieve agricultural production. They evaluate how well irrigation systems convert available water, irrigated area, and infrastructure into agricultural outputs and economic benefits, while also reflecting the adequacy, reliability, and sustainability of water delivery and use at the scheme level (Agide et al. 2016; Molden et al. 1998). Nearly 85% of the CMS operate with a relative irrigation supply of less than 1, implying that diverted irrigation does not meet the schemes' irrigation water demand. About 15% of CMS schemes experience over-irrigation. Nearly 75% of the schemes fail to fully utilize their designed command areas, indicating underutilization of investments.

Land productivity for CMS showed wide variability, confirming that many schemes operate well below their productive potential. Output per cropped irrigated area (OPCIA) ranged from 1.60 to 23.10 tons per hectare (tons/ha), with a mean of 7.78 tons/ha. For HMS, land productivity was substantially higher, with a land productivity of 12.60 tons/ha. HMS benefit from a higher proportion of high-value horticultural crops, stronger individual management incentives, and greater flexibility in irrigation timing.

As shown in Figure 4, the values of output per unit irrigation delivered (OPID) under the CMS ranged from 0.93 kilograms per cubic meter (kg/m³) (maize) to 5.78 kg/m³ (potato), while those under the HMS ranged from 2.56 kg/m³ (maize) to 9.44 kg/m³ (cabbage). Under the CMS, potato (5.78 kg/m³), cabbage (4.48 kg/m³), onion (4.32 kg/m³), and tomato (4.02 kg/m³) recorded relatively higher water productivity, whereas maize (0.93 kg/m³), wheat (1.33 kg/m³), and pepper (1.44 kg/m³) exhibited the lowest values. Under the HMS, cabbage (9.44 kg/m³), wheat (1.12 kg/m³), tomato (5.73 kg/m³), and onion (4.80 kg/m³) achieved relatively higher productivity, while maize (2.56 kg/m³) and potato (2.73 kg/m³) remained comparatively low. Nevertheless, all observed OPID values under both management systems were below the benchmark water productivity reported for well-managed irrigated crops, indicating considerable scope to improve irrigation water productivity through enhanced irrigation scheduling, improved agronomic practices, balanced nutrient management, and better crop husbandry.

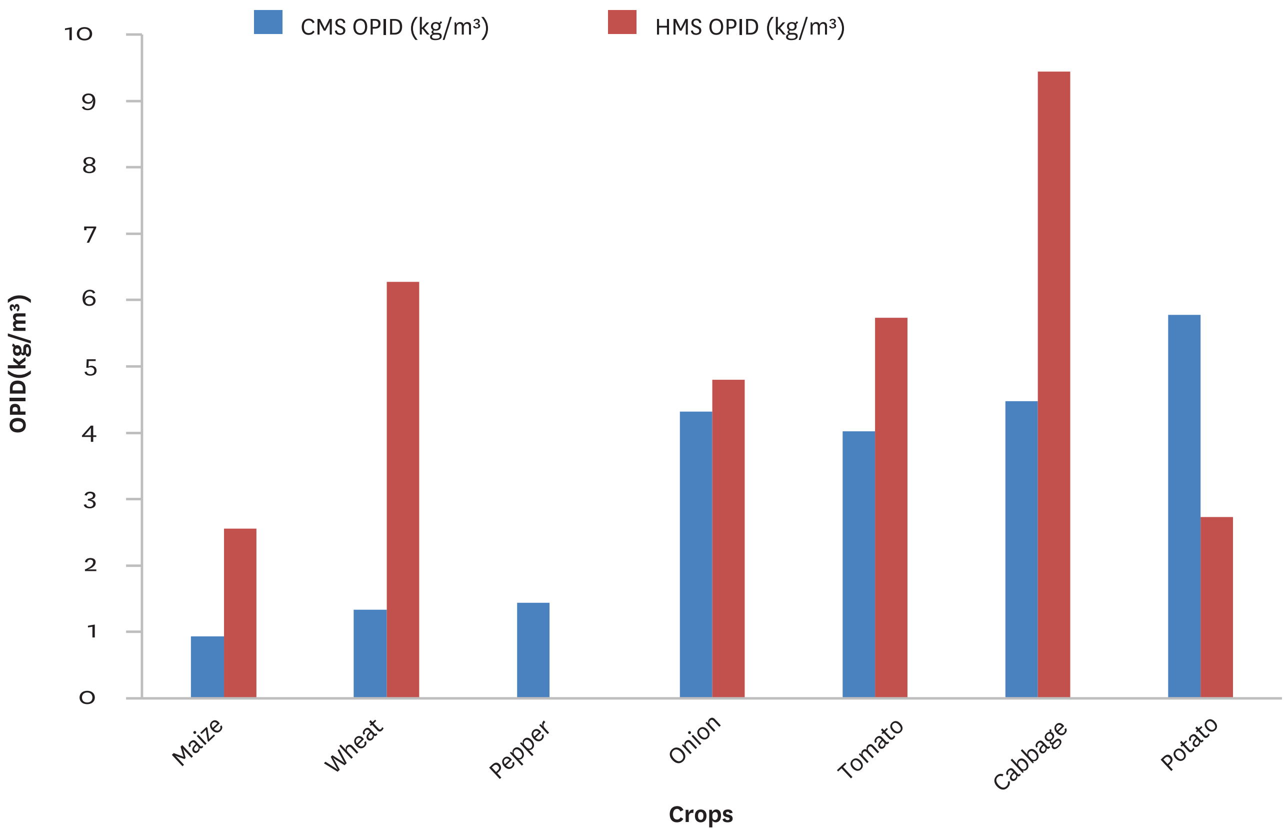

Figure 4. Crop output per unit of diverted water
Note: CMS - community-managed schemes; HMS - household-managed schemes; OPID - output per unit irrigation delivered

Drivers of underperformance in community and household irrigation systems

Several factors are responsible for the low performance of the schemes. The present study revealed interlinked infrastructural, technical, and institutional constraints that limit the efficiency and sustainability of the schemes. The identified problems can broadly be categorized into two: those related to irrigation system (infrastructure) and those related to on-farm management (Figures 5 and 6).

Regarding irrigation infrastructure, the most critical challenges identified are canal siltation, which affects over 73% of schemes, the absence of water control gates and division boxes (64%), canal weed infestation (59%), and unauthorized water abstraction in about 53% of the schemes. Physical damages, such as cracks and malfunctioning water control and measurement structures and division boxes, further aggravate these issues. These challenges are largely attributed to weak institutional and governance systems, as well as inadequate regular maintenance.

Moreover, several management-related constraints were observed, including weak operation and maintenance services, poor irrigation scheduling, inadequate field leveling, ineffective Water Users Associations, inadequate extension services, limited technical capacity, low-value cereal-based cropping systems, and weak market integration.

Figure 6 shows problem areas that constrained the on-farm performances of HMS: poor irrigation scheduling and field leveling, and improper furrow layout. Moreover, lack of flow control structures, limited technical support, unreliable access to irrigation equipment, high energy costs, and inadequate access to agricultural inputs are among other constraints affecting HMS performance. Low-value cropping systems and weak extension support further limit the economic performance of most household-managed schemes.

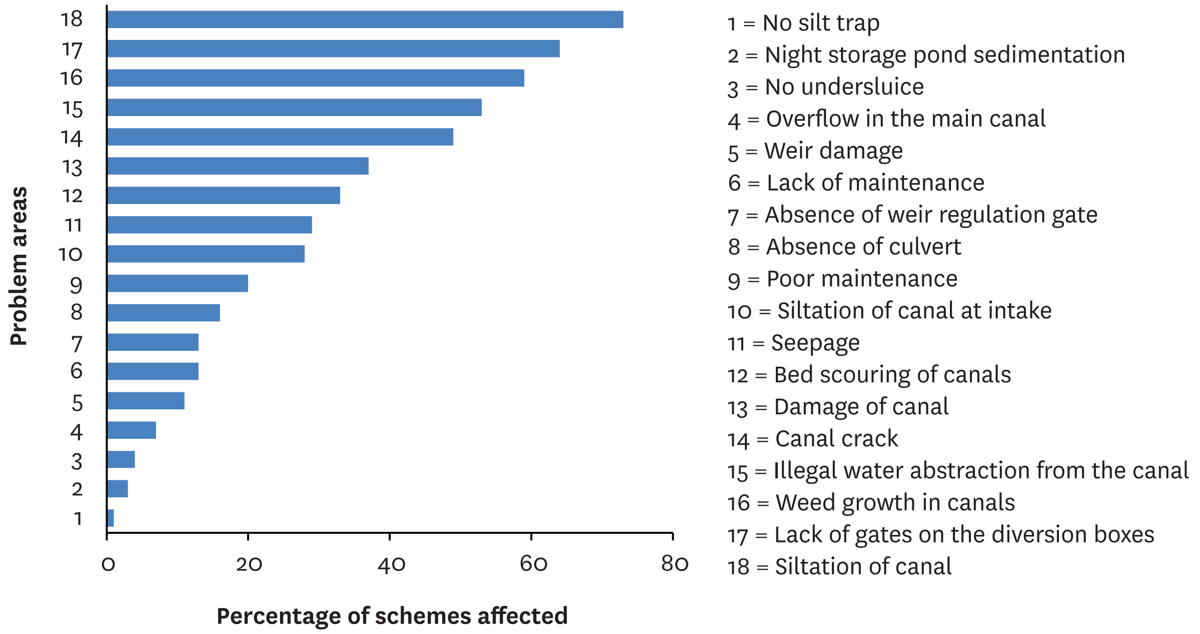

Figure 5. Problems related to infrastructure in the community-managed schemes (CMS)

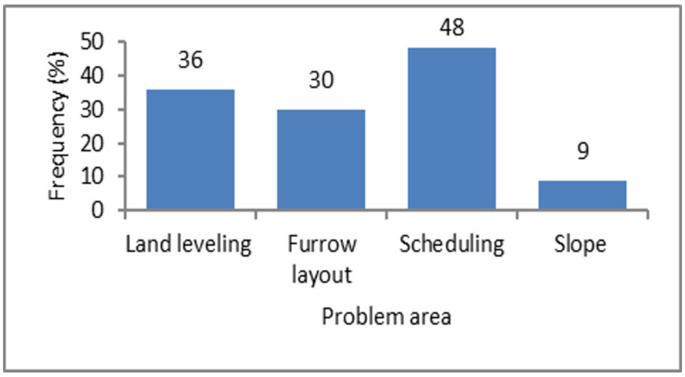

Figure 6. Problems related to on-farm management in the household-managed schemes (HMS)

Policy priorities to revitalize irrigation systems

EIAR (forthcoming) provides detailed results, including the causes and effects of the identified challenges facing both CMS and HMS, as well as actionable recommendations. This policy brief focuses only on five key areas requiring policy intervention.

The findings suggest that Ethiopia's irrigation sector has reached a stage where greater gains can also be achieved through improving the performance, efficiency, and sustainability of existing irrigation systems alongside the expansion of irrigated areas. Significant variations in irrigation performance across schemes demonstrate that substantial opportunities exist to increase irrigated agricultural productivity and service delivery by upgrading infrastructure and strengthening institutions, management practices, and technical capacity. Based on the broader key results highlighted above, the following policy considerations are proposed to revitalize the performance of community- and household-managed irrigation schemes.

Institutionalize a national Irrigation Performance, Monitoring and Benchmarking System

The large variation in irrigation performance among both CMS and HMS (Table 1) demonstrates that substantial performance gains can be achieved by learning from the best-performing schemes. The assessment identified 22 CMS and 14 HMS that consistently outperform others in irrigation efficiency, and land and water productivity (Table 1). Examples of these benchmark schemes are presented in Figure 7.

The performances of these schemes should be well documented to serve as national reference sites, allowing successful irrigation management practices to be systematically captured, shared, and replicated. Institutionalizing routine irrigation performance monitoring using standardized technical, operational, and productivity indicators through digital systems would enable evidence-based investment decisions, early identification of underperforming schemes, and continuous performance improvement. EIAR should lead the establishment of a national irrigation benchmarking framework, while the regional research systems and Regional Agriculture Bureaus provide technical support for data collection, analysis, documentation of best practices, and dissemination of lessons learned.

Table 1. Cluster-based classification of the assessed community-managed schemes (CMS) and household-managed schemes (HMS) for benchmarking

Cluster	Number of schemes	Internal performance indicators (%)		
		Mean Ec	Mean Ea	Mean SIE
COMMUNITY-MANAGED SCHEMES (CMS) n = 75				
Cluster 1: **Lowest productivity**	13	51.9	36.3	17.3
Cluster 2: **Low–moderate productivity**	15	66.5	54.5	20.0
Cluster 3: **Moderate productivity**	16	80.7	38.1	22.5
Cluster 4: **Highest productivity**	31	81.5	56.2	38.8
HOUSEHOLD-MANAGED SCHEMES (HMS) n = 39				
Cluster 1: **Lowest productivity**	11	-	36.8%	-
Cluster 2: **Moderate productivity**	13	-	36.7%	-
Cluster 3: **Highest productivity**	14	-	61.7%	-
Cluster 4: **Extreme outlier**	1	-	-	-

Note: Ec - Conveyance efficiency; Ea - Application efficiency; SIE - Scheme irrigation efficiency

Cluster	Number of schemes	External performance indicators (%)	
		Mean OPID (kg/m³)*	Mean RIS
COMMUNITY-MANAGED SCHEMES (CMS) n = 75			
Cluster 1: **Lowest productivity**	14	0.64	2.51
Cluster 2: **Low–moderate productivity**	37	1.73	0.88
Cluster 3: **Moderate productivity**	16	2.67	1.74
Cluster 4: **Highest productivity**	8	7.02	0.44
HOUSEHOLD-MANAGED SCHEMES (HMS) n = 39			
Cluster 1: **Lowest productivity**	11	1.09	1.04
Cluster 2: **Moderate productivity**	13	1.84	1.87
Cluster 3: **Highest productivity**	14	6.17	1.29
Cluster 4: **Extreme outlier**	1	0.94	7.74

Note: OPID – output per unit irrigation delivered; RIS – Relative Irrigation Supply

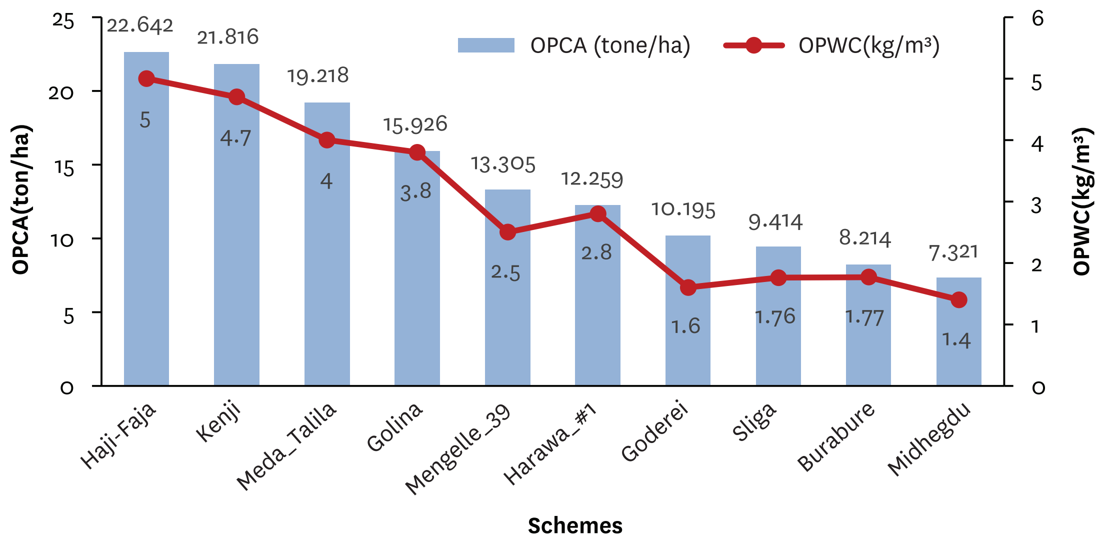

Figure 7. Examples of the top ten high-performing schemes for benchmarking
Note: OPCA - Output per command area; OPWC - output per consumed water

Prioritize rehabilitation and modernization of existing irrigation infrastructure

Field assessments revealed that deterioration of irrigation infrastructure, including damaged diversion wires, poorly maintained canals, sediment accumulation, and inadequate water-control structures, has become a major contributor to poor irrigation performance (Figure 5). Many schemes receive little or no rehabilitation after construction, resulting in declining conveyance efficiency and unreliable water delivery.

Rehabilitation and system upgrading require investment. Future public investments should therefore prioritize the rehabilitation and modernization of existing irrigation schemes, particularly those that are of significant social, economic, and environmental importance. The high variability observed in performance indicators suggests that improvement needs differ considerably among irrigation schemes. This variability should be considered when prioritizing and making decisions on schemes to be rehabilitated.

Most importantly, priority interventions should include rehabilitation of headworks, canal improvement and lining where appropriate, installation of water-control and measurement structures, sediment management at intake points, and integration of irrigation rehabilitation with watershed and catchment management to reduce erosion and sedimentation.

Improve irrigation service delivery through sustainable operation and maintenance

The relatively low application efficiencies and scheme irrigation efficiencies observed across many irrigation schemes (Table 1) indicate that operation and maintenance (O&M) remain one of the major constraints affecting irrigation performance. Common operational problems include sediment and weed accumulation, damaged hydraulic structures, water losses, inequitable (non-uniform) water distribution, and poor irrigation scheduling.

Strengthening O&M should combine routine maintenance with science-based irrigation scheduling, improved water allocation, land leveling, and improvements to field layout. Innovative service delivery models, including contracting organized youth enterprises or private service providers (PPP) to undertake O&M in partnership with Water Users Associations (WUAs), should be piloted and scaled where appropriate.

In this regard, the legal framework for Irrigation Water Users Associations (IWUAs) is established under Proclamation No. 841/2014. Article 51 stipulates that irrigation water and related services should be provided by service providers responsible for the operation and maintenance of the main irrigation and drainage systems. It further requires regulations to guide the establishment of public enterprises or the licensing of private entities for service provision. However, these regulations have not been established, and the provision remains unimplemented. Therefore, outsourcing services such as water delivery, headworks operation, and maintenance of the main irrigation system could reduce the burden on government institutions and improve service delivery to farmers.

Sustainable financing mechanisms, including transparent and affordable irrigation service fees linked to improved service quality, should be introduced to ensure long-term financial sustainability.

Strengthen irrigation governance and water user institutions

The substantial performance differences among irrigation schemes operating under similar agroecological and infrastructure conditions suggest that institutional arrangements and irrigation governance play an important role in determining irrigation outcomes. Strengthening WUAs can improve accountability, collective action, equitable water allocation, conflict resolution, and financial sustainability (Haileslassie et al. 2016).

The wide variation in irrigation efficiencies and water productivity across schemes also reflects significant differences in farmers' irrigation management skills and access to technical support. Existing agricultural extension systems often provide insufficient irrigation-specific advisory services, limiting the adoption of science-based irrigation scheduling, water management, and agronomic practices (Derib et al. 2011).

Addressing this gap requires the establishment of dedicated irrigation training and demonstration centers, strengthened irrigation curricula within Agricultural Technical and Vocational Education and Training (ATVET) institutions, and development of specialized irrigation extension services at regional, zonal, and *woreda*[1] levels. Practical training should emphasize irrigation scheduling, agronomic water management, system operation and maintenance, water measurement, and climate-smart irrigation practices.

Accelerate the adoption of appropriate irrigation technologies and innovations

The significant differences in water productivity and irrigation performance among schemes (Table 1) demonstrate considerable potential for improving performance through wider adoption of proven irrigation technologies and management innovations already used by the better-performing schemes.

Priority technologies include efficient irrigation methods such as low-pressure drip and sprinkler systems where feasible, solar-powered irrigation technologies, simple water-control and measurement devices, and digital decision-support tools for irrigation scheduling and performance monitoring. Solar pumps can modernize inefficient canal irrigation schemes by improving water delivery reliability, reducing conveyance losses, lowering

[1] Woreda is the third-level administrative division of Ethiopia.

energy costs, and supplying pressurized irrigation systems. They enhance water delivery and access to tail-end users, increase irrigation intensity, and complement existing infrastructure rather than replacing them, resulting in more efficient, climate-resilient, and sustainable irrigation services for smallholder farmers. Technology promotion should be accompanied by adaptive research, farmer demonstrations, private-sector engagement, and extension support to ensure technologies are locally appropriate and financially viable. Strengthening collaboration among research institutions, universities, extension services, government agencies, and private-sector suppliers will be essential for scaling irrigation innovations across Ethiopia.

Irrigated onion in community-managed scheme in Gonder, northwest Ethiopia (*note the poor land leveling*) (*photo*: Amare Haileslassie)

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Shallow groundwater wells for household irrigation in the Tigray Region, Ethiopia
(*photo*: Amare Haileslassie)

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