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Needs Assessment to Enhance Public-Private Partnerships in Smallholder Irrigation Development and Management in Ethiopia

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Citation

Seyoum, A.; Adamseged, M. E.; Hailelassie, A.; Ires, I.; Jacobs-Mata, I. 2025. *Needs assessment to enhance public-private partnerships in smallholder irrigation development and management in Ethiopia*. Colombo, Sri Lanka: International Water Management Institute (IWMI). CGIAR Initiative on Diversification in East and Southern Africa; CGIAR Scaling for Impact Program. 50p. doi: <https://doi.org/10.5337/2025.221>

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Cover photo

Wodesa smallholder irrigation scheme in Sidama, Ethiopia (photo: Abrham Seyoum)

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Acknowledgments

This study is delivered on basis of demand from the Ministry of Agriculture (MoA) and Ministry of Irrigation and lowlands (MILLs). The authors appreciate the support provided by focal persons and leadership from the MoA and MILLs. Specifically, our thanks go to Mr. Elias Awol, Director of Small-scale Irrigation Directorate and Mr. Sewnet Anmut, Irrigation Engineer from MoA, Mr. Hizkyas Dufera from MILLs, and Mr. Mawira Chitma Lead Technical Specialist in Water and Rural Infrastructure at the International Fund for Agricultural Development (IFAD) for their continued and valuable brainstorming and inputs. The authors are grateful to Agricultural Water Management Task Force members for their critical input of the initial draft of this volume.

Project

This work was carried out as part of the Nature-based solution for sustainable and inclusive development project (NSSID) financed by the Swedish International Development Cooperation Agency (Sida).

Collaborators



International Water Management Institute (IWMI)



Ministry of Agriculture, Ethiopia



Ministry of Irrigation and Lowlands, Ethiopia

Donors



This work was carried out as part of the CGIAR Initiative on Diversification in East and Southern Africa and finalized with support from the CGIAR Scaling for Impact Program. The authors are grateful for the support of the CGIAR Trust Fund contributors (www.cgiar.org/funders).





Contents

Summary	VII
1. Introduction.....	1
2. Definitions, Benefits and Stakeholder Requirements for PPPs.....	3
2.1. Definitions and Benefits of PPPs	3
2.2. Stakeholder Requirements for Entering into a PPP	5
3. Methodology Overview	8
4. Stakeholder Mapping and Institutional Analysis	10
5. Evolution of Institutional and Policy Frameworks for Smallholder Irrigation	12
6. Lessons from Regional and International PPP Experiences	14
7. Farmers and Private Sector Engagement Mindset.....	18
8. Enabling Private Sector Engagement in Irrigation	20
9. Challenges, Needs & Preferences, and Important Considerations in Implementing Smallholders' Irrigation PPPs	21
9.1. Current Status and Identified Challenges	21
9.2. Needs and Preferences for Private Sector Engagement in Smallholder Irrigation	24
9.3. Important Considerations in Implementing PPP in Smallholder Irrigation	29
9.3.1. Major Risks in Irrigation PPPs.....	29
9.3.2. SWOT Analysis	30
10. Concluding Remarks	31
References	34
Appendices	39
Annex A: Private Sector Requirements for Entering a PPP in Irrigation.....	39
Annex B: Government Requirements for Entering into a PPP in Irrigation	40
Annex C: Farmers Requirements for Entering into a PPP in Irrigation.....	41
Annex D: Differences of PPPs, Out-grower Schemes and Contract Farming	41

Acronyms and Abbreviations

ADB	Asian Development Bank
BCM	Billion Cubic Meter
FAO	Food and Agricultural Organization of the United Nations
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
IDC	Irrigation Development Commission
IDD	Irrigation Development Department
IEG	Independent Evaluation Group of World Bank
IMF	International Monetary Fund
IWAD	Ghana's Integrated Water & Agricultural Development Project
IWMI	International Water Management Institute
IWUA	Irrigation Water User Association
KII	Key Informant Interview
MoA	Ministry of Agriculture
MoF	Ministry of Finance
MILLS	Ministry of Irrigation and Lowlands
MoNREP	Ministry of Natural Resources Development and Environmental Protection
MOWE	Ministry of Water and Energy
MOWIE	Ministry of Water, Irrigation, and Energy
MoWR	Ministry of Water Resources
MW	Mega Watt
OMM	Operation, Management, and Maintenance
PLC	Private Limited Company
PPP	Public-Private Partnership
SDG	Sustainable Development Goal
SDRP	Sustainable Development and Poverty Reduction Program
SSA	Sub-Saharan Africa
SSI	Small-Scale Irrigation
SWOT	Strength, Weakness, Opportunity, and Threat

Summary

Ethiopia possesses significant untapped potential for irrigation development due to its abundant freshwater resources and arable land. However, the irrigation sector remains underdeveloped both in areas of irrigation development and management, primarily due to its reliance on public sector financing and management, which has constrained growth, productivity, and progress toward poverty reduction and food security goals. Recognizing these challenges, the Government of Ethiopia has embraced Public-Private Partnerships (PPPs) as a mechanism to accelerate irrigation sector development.

To support this initiative, IWMI, in collaboration with the Ministry of Agriculture (MoA) and the Ministry of Irrigation and Lowlands (MILLS), conducted a comprehensive study to assess stakeholder needs and develop viable business models for PPPs in smallholder irrigation development and management. This study aims to inform national guidelines for PPP implementation in smallholder irrigation.

Key findings reveal strong interest among private sector actors to engage in irrigation development, provided there are adequate policy incentives, infrastructure, and support systems in line with the experiences of other countries reviewed in this study. Farmers also express growing demand for irrigation water and interest for cost sharing as they recognize its potential to boost agricultural productivity.

Despite this interest, significant challenges hinder the successful implementation of PPPs in irrigation development and management. Institutional and governance challenges including overlapping mandates, and weak coordination undermine effective governance. Infrastructure and Technical Challenges comprising of Poor-quality construction, incomplete canal networks, and inadequate infrastructure limit efficiency. Financial and economic barriers which include limited access to credit and unfavorable market conditions hinder farmer and private sector participation. Addressing these bottlenecks requires improved planning, execution, and maintenance. Clear institutional arrangements and capacity building are found to be crucial. Further, incentive programs, such as tax breaks and financial guarantees, are necessary to attract investment.

Problems related to value chain and market integration such as weak market linkages and inadequate storage facilities are substantially affecting profitability for farmers. Strengthening value chains is essential to ensure increased production translates to higher incomes. Capacity and awareness gaps on the side of smallholder farmers. They lack technical knowledge of irrigation practices and risk-taking mindsets suggesting that awareness campaigns, training, and pilot projects are needed to foster acceptance of PPPs.

Irrigation Water User Associations (IWUAs) often lack capacity to manage schemes effectively. Restructuring IWUAs as independent legal entities and enhancing their institutional capacity is critical. The private sector actors have commendable interest to engaged in smallholders' irrigation development and management under PPP framework. However, they require clear roles, organizational support, and targeted government assistance to participate effectively in PPPs.

The study underscores the importance of comprehensive policy frameworks, stakeholder collaboration, and well-defined roles for government, the private sector, and IWUAs in the governance, investment, operation, and maintenance of smallholder irrigation schemes. Effective PPP implementation will not only address Ethiopia's irrigation challenges but also drive agricultural transformation, enhance rural livelihoods, and contribute to national food security goals. The recommendations provide a roadmap for overcoming systemic issues and leveraging PPPs as a pathway to sustainable and inclusive irrigation development in Ethiopia.

1. Introduction

The contribution of irrigation to food and livelihood security is paramount. Irrigated crop areas account for 40 percent of global food production while covering only 20 percent of the world's total croplands (FAO 2018b; IFPRI 2017). By 2100, Africa and South Asia are expected to be home to a total of 9 billion people (out of the projected 11 billion global population), alarming a pressing increase in food demand (FAO 2018b). This makes irrigated agriculture, which has been the main driver in increasing food production worldwide, even more essential for increasing food production in Africa and South Asia, not only to feed the growing population but also to make agri-food systems resilient to climate change and associated variability in water availability (IFPRI 2017; Ringler et al. 2020). This is particularly important in Sub-Saharan Africa in general and Ethiopia in particular, where population growth is alarming.

In Ethiopia, agriculture is the dominant economic sector and food supplier. It contributes to about 43 percent of GDP, 80 percent of employment, and approximately 75 percent of export commodity values (Bayleyegn et al. 2018; Gebul 2021). The sector is mainly rainfed and run predominantly by small-scale farmers who largely lack the means to overcome the challenges thereof. As such, climate change, which seriously disrupts rainfall patterns resulting drought frequency and water shortages in rainfed agriculture systems represents a significant risk to livelihoods and food security, particularly to the most vulnerable segments of the population. The vulnerability of the sector to rainfall amount and distribution is more pronounced as crop production dominates (65 percent) the agricultural GDP (NBE, 2020). In view of the increasing population growth and food demand and the increasing fragility of rain-fed agriculture due to land degradation and climate variability, the important role of irrigation development is indispensable (Gebul 2021).

Ethiopia has still huge untapped irrigation potential that needs to be developed to boost agricultural production for achieving its development agenda. Although the figures might vary from one study to the other and needs further detailed investigation, according to the estimation of the Ethiopian Agricultural Transformation Institute (ATI) about 11 million hectares of land would be suitable for irrigation, of which 48 percent could be irrigated using groundwater resources (Schmitter et al. 2018). The country has an estimated figure of about 124.4 billion cubic meter (BCM) river water, 70 BCM lake water, and 30 BCM groundwater resources (Melesse et al. 2013). Groundwater is a strategic resource in all climatic regions of Ethiopia, contributing about 80 percent of the domestic supply of water for urban and rural populations. The total potential groundwater of the country ranges from 2.5 to 47 billion cubic meters (Awulachew et al. 2008; Döll and Fiedler 2008; Mengistu et al. 2021; S. Kebede 2013; Tekleab et al. 2011) with a potential to develop more than 3.8 million ha of irrigation and 45,000 MW hydropower production (Berhanu et al. 2014).

As a country with an agricultural sector dominated by smallholder farmers, the development of small-scale irrigation¹ in Ethiopia would be paramount to leverage from the huge potential of the country for irrigation thereby serving as an effective strategy to mitigate climate change impacts (Amede 2015; Bedru et al. 2020), engine employment creation (Bont et al. 2019; Woodhouse et al. 2017), drive poverty reduction (Bacha et al. 2011; Mengistie & Kidane 2016) and improve nutrition and food security outcomes (Hagos et al. 2017; Passarelli et al. 2018) for the rural communities.

Modern irrigation in Ethiopia began in the 1950s with the establishment of medium and large-scale schemes in the Awash Basin (Berhane et al. 2016; Embaye et al. 2020). However, despite decades of experience, studies show that small-scale irrigation schemes often fall short of their intended performance and face premature failure due to technical, socio-economic, institutional, and environmental challenges (Berhane et al. 2016; Embaye et al. 2020). According to a study by Awulachew and Ayana (2011), watershed degradation, lack of sustainable funding for operation and maintenance, failure of hydraulic structures, and poor extension services are among the main reasons for under-performance of irrigation schemes in Ethiopia.

¹ In this study, small-scale irrigation schemes in Ethiopia are considered to include traditional small scale up to 100 ha and modern communal schemes up to 200 ha based on MoWR (2002).

A recent review of irrigation development in Ethiopia by Berhe et al. (2022) showed that the low performance of irrigation schemes in Ethiopia is even more apparent when viewed across the different stages of the project development and management phases. Specifically, this low performance is linked to several issues across project phases: Feasibility Stage: limited community participation (Berhane et al. 2016; Embaye et al. 2020); Design stage: data limitation and structural design problems (Embaye et al. 2020; Gurmu et al. 2019); Construction stage: delays and incomplete project delivery (Annys et al. 2020; Mulugeta 2019); and Operation and Maintenance: inefficient use, unfair allocation of water, inadequate water supply; poor management practices, structural failure, limited extension and credit services, lack of inclusiveness, low institutional and organization capacity as well as limited financial capacity (Awulachew and Ayana 2011; Habtu et al. 2020; Tola and Haile 2020). Moreover, the sustainability of irrigation schemes is further compromised by poor irrigation schedule practices, high cost, limited access to soil water monitoring tools, lack of localized climate and soil-water parameters (Yohannes et al. 2019). Additional challenges include sedimentation and siltation of structures, imperfect market system, insufficient technical skill, lack of awareness about the use of irrigation and benefits, environmental and social impact (Asefa & Tadesse 2023).

Ethiopia's rapidly growing population and the escalating unpredictability of rainfall due to climate change have significantly heightened the vulnerability of smallholder farmers to food insecurity and economic instability. In a country where irrigation development has historically relied heavily on public resources, addressing these challenges and unlocking the full potential of the irrigation sector requires strong private sector engagement in both the development and management of irrigation systems.

Against this backdrop, the Ethiopian government is considering Public Private Partnerships (PPPs) as a viable strategy to address the enormous challenges faced by small-scale irrigation projects in Ethiopia. To this end, it introduced the first national policy on PPP in (2017), subsequent to PPP Proclamation No. 1076 (2018), PPP Directive (2018), and PPP Guidelines (2019) as part of its commendable efforts to establish the policy and legal framework to govern such partnerships. The Ministry of Agriculture (MoA) and stakeholders subsequently developed an Implementation Strategy for PPP for SSI Development and Management (2021) to guide PPP in irrigation and help address some of the existing gaps and challenges facing the sector. The International Water Management Institute (IWMI) has actively promoted the involvement of the private sector in small-scale irrigation development in Ethiopia through collaboration with donors and other partner institutions.

However, despite the recent interest in PPPs for agricultural development and irrigation expansion, and claims that they offer great potential for stimulating innovation and investment, there is limited evidence on what works better; how the different institutional arrangements and governance structure could operate; how best to balance competing economic, social, and environmental goals; and what business models are most suitable for different contexts. The limited experiences with PPPs for irrigation, coupled with the level of risk involved, the long-term nature of the contracts, and the complexity of multi-stakeholder engagement, demand careful design and implementation of PPP models for irrigation development and management.

Against this background, IWMI, under the Ukama Ustawi - Diversification for Resilient Agribusiness Ecosystems in East and Southern Africa - initiative, and in collaboration with the Ministry of Agriculture, Ministry of Irrigation and Lowland, conducted a comprehensive needs assessment and develop sustainable business models for PPP in small-scale irrigation development and management in Ethiopia. This report presents the findings of the needs assessment exercise conducted to identify the irrigation needs, priorities, challenges, and opportunities for small-scale irrigation in selected regions including Sidama, South Ethiopia, Central Ethiopia, and Hareri Regions, as well as Dire Dawa Administration. The assessment aims to design effective and customized PPP models, to ensure sustainable and inclusive irrigation development and management in Ethiopia. It emphasized close collaboration with key stakeholders to generate valuable insights and foster policy dialogue on PPP in small-scale irrigation development and management in Ethiopia.

The needs assessment, as a foundational component of the broader irrigation PPP model, aim to:

- Assess the critical needs of stakeholders involved in Small Scale Irrigation (SSI) development and management.
- Develop viable and sustainable business models to foster PPPs in SSI development and management.

The assessment adopted the entire irrigation value chain as its unit of analysis. It examined each step in the value chain, from the demand for irrigation water to the supply of agricultural products to markets, ensuring a holistic understanding of the sector's challenges and opportunities. Although the study's primary focus is on SSI, its findings have broader implications on informing efforts to foster PPPs in medium- and large-scale irrigations.

The rest of the report is structured in 9 sections. Section 2 establishes the foundation by defining key terms, highlighting PPP benefits, and outlining stakeholder-specific requirements, setting the stage for deeper analysis. Section 3 provides an overview of the study's methodology, covering data collection, analysis, and limitations. Section 4 focuses on stakeholder mapping and institutional analysis, identifying key actors, roles, gaps, and opportunities, bridging theoretical concepts from Section 2 with Ethiopia's practical irrigation realities. Section 5 reviews the evolution of small-scale irrigation policies and institutions, linking stakeholders' roles to broader policy and institutional frameworks. Section 6 draws lessons from regional and international PPP experiences, offering actionable insights based on global best practices to contextualize Ethiopia's challenges and opportunities. Sections 7 and 8 examine the mindset of smallholder farmers and private sector engagement, focusing on policy, legal, and institutional incentives to attract investment and foster collaboration. Section 9 outlines the challenges, needs, and preferences of stakeholders in Ethiopia's smallholder irrigation sector and identifies critical factors for successful PPP implementation. Finally, Section 10 concludes the report by summarizing key findings and emphasizing actionable recommendations, underscoring the potential of PPPs to address Ethiopia's irrigation challenges effectively.

2. Definitions, Benefits and Stakeholder Requirements for PPPs

2.1. Definitions and Benefits of PPPs

The concept of Public-Private-Partnership (PPP) is defined variably in different contexts, and there is no broad international consensus on what constitutes a PPP (UNDP, 2015). Nonetheless, valuable elements can be assembled from the definitions given by various sources (Rankin et al. 2016).

Broadly, PPP refers to an agreement between private and public sector whereby some of the services that fall under the responsibilities of the public sector are provided by the private sector. Another widely used definition describes PPP as a modality used by many governments in developing countries to fulfill their responsibilities to provide infrastructures and services (Larrea and Mataix 2015). Table 1 shows some popular definitions of PPP by international organizations and countries with good track record of implementing PPPs.

The various definitions of PPP have common denominators that include long-term contracts between the private sector and government, a private funding component, provision of services/assets through the private sector, significant transfer of risk to the private sector, complex contractual responsibilities and performance standards, provision of services by the private sector on behalf of the state, and the return of the services/assets to the control of the state at the end of the contract term. Besides, PPP definitions acknowledge the need for contractual arrangements that reward the private sector with profits that are sufficient to attract private companies while maintaining the cost recovery affordability for users.

Table 1. Some selected definitions of PPP by organizations and countries.

World Bank (WB)	A long-term contract between a private party and a government entity for providing a public asset or service, where the private party bears significant risk and management responsibility, with remuneration linked to performance.
Canada	A cooperative venture between the public and private sectors, built on the expertise of each partner to meet clearly defined public needs through the appropriate allocation of resources, risks, and rewards.
International Monetary Fund (IMF)	An arrangement where the private sector supplies assets and services traditionally provided by the government, with significant risk transferred to the private sector and an emphasis on service provision.
Asia Development Bank (ADB)	A mechanism for improving the delivery of public goods and services by partnering with the private sector, while the government retains an active role to ensure national socio-economic objectives are achieved.
Organization for Economic Co-operation and Development (OECD)	An agreement between the government and one or more private partners (including operators and financiers) to align government service delivery objectives with the profit motives of private partners, depending on sufficient risk transfer.
Australia	Partnerships between the public and private sectors for designing, planning, financing, constructing, and/or operating projects traditionally considered within the remit of the public sector

Against this background of various definitions, the working definition for this study is based on the Ethiopia PPP Proclamation that defines PPP as “a long-term agreement between a Contracting Authority and a Private Party under which a Private Party:

- Undertakes to perform a Public Service Activity that would otherwise be carried out by the Contracting Authority;
- Receives a benefit by way of compensation by or on behalf of the Contracting Authority; tariffs or fees collected by the Private Party from users or consumers of a service; or a combination of such compensation and such charges or fees; and
- Is generally liable for risks arising from the performance of the activity or use of the state property in accordance with the terms of the Project Agreements.”

As per the PPP Proclamation, a public service activity denotes any activity the government has decided to perform for the reason that it has deemed it to be necessary in the general interest of the public and considered that private initiative was inadequate for carrying it out. These services are provided by the Government in the public interest, unless otherwise decided. The Private Party to enter into a PPP with the Contracting Authority is required under the legal framework to establish a “*Project Company*”, which is a special purpose vehicle established for the purpose of entering the PPP Agreement. In order to execute and implement the obligations in the PPP Agreement – and as applicable, any other Project Agreements. The Contracting authority for small scale irrigation PPP is the Ministry of Agriculture.

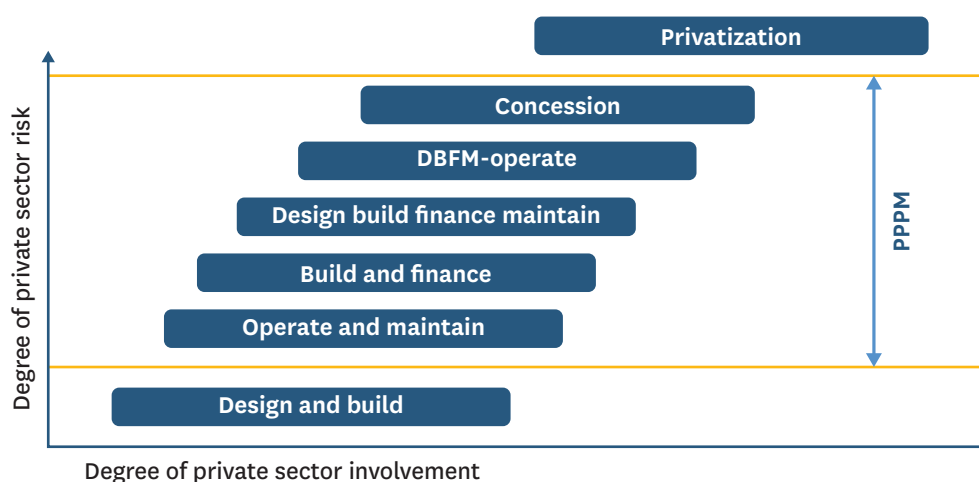
While PPPs were initially treated as derivatives of the privatization movement, there is a growing consensus today that PPPs do not simply mean the introduction of market mechanisms or the privatization of public services (Gebreu et al. 2022). Among the peculiar features that distinguish PPP from privatization is that at the end of the PPP contract, the asset usually remains in, or reverts to, public sector ownership. Thus, a PPP is not the same thing as privatization (Yescombe 2017). Besides, PPPs are different from out-grower schemes or contract farming arrangements. Though they are all collaborative models in agriculture, they differ significantly in their structure, objectives, stakeholders, and implementation mechanisms. Annex D in the appendix provides detailed descriptions of their differences.

According to the Ethiopian PPP proclamation No. 1076 (2018), PPP may involve any of the following activities or any combination thereof:

- The design, construction, financing, maintenance, or operation of new Infrastructure Facilities.

- b. The rehabilitation, modernization, financing, expansion, maintenance, or operation of existing Infrastructure Facilities; and/or
- c. The administration, management, operation, or maintenance pertaining to new or existing Infrastructure Facilities.

However, it is the mandate of the contracting authority to determine the form of contract which reflects the desired allocation of risks and responsibilities for each agreement. Figure 1 illustrates the different PPP modes (PPPM) on a spectrum ranging between low and high levels of private involvement and risk shared.



Source: adapted from Canadian Council of PPP (2009)

Figure 1. Levels of involvement and risk born by the private sector under different modes of PPP.

PPPs have now become popular worldwide for addressing the gaps of infrastructural and service provisions by inducing the greater involvement of the private sector. PPPs enable governments to procure and deliver public infrastructure/ services and leverage the resources and expertise of the private sector – through risk-sharing arrangements. When properly designed and executed, PPPs can create social value through on-time and on-cost delivery, generating efficiency gains and offering innovation in project design, incorporation of global expertise, and accessing new sources of capital (Mohammed et al. 2023).

In water and the irrigation sectors, PPPs are shown to have great potential in introducing new technology and innovation, increasing efficiency and service quality, as well as enhancing financial viability and sustainability (Mandri-Perrott and Bisbey 2016; Scheumann et al. 2017). Furthermore, PPPs can provide value for money by ensuring efficient construction supervision; specific coverage and service standards to users; rapid customer response times; adequate training and education to small landholders; and enhanced operations and management of the irrigation system (PPIAF 2012).

2.2. Stakeholder Requirements for Entering into a PPP

In irrigation PPP, the key stakeholders comprise of government, the private sector, and farmers. The introduction and successful implementation of PPPs in the irrigation sector depends largely on the extent to which the requirements of these key stakeholders are addressed.

According to Mandri-Perrott & Bisbey (2016), a PPP essentially requires:

1. One or more private sector firm(s) willing and capable of taking on the responsibilities defined in the PPP contract. They will only do so if they determine that they can recover their costs in providing the services and at the same time obtain a reasonable rate of return, taking into account the main risks associated with the implementation of the scheme.

2. A government department or institution prepared to sign off on the PPP contract with the private firm. Government will only enter into the arrangement if it is confident that the private firm can meet the requirements set out in the contract—e.g., if the interests of the farmers are protected and the firm has the necessary credentials and expertise to perform the services. From a political perspective, the government will also consider whether farmers and the broader constituency support their intention to hand over responsibility for providing irrigation services to the private sector.
3. Farmers who are both willing and able to cover the necessary service fees and accept the notion of the private sector taking over responsibility for the provision of irrigation services. Farmers will only be willing or able to pay the service fees if the irrigation services (together with other improved inputs where needed) help them to increase yields and thereby incomes to a level that enables them to afford the fees and make a suitable profit. Farmers' support for the government handing over responsibility for irrigation services to the private sector is shaped by a number of factors; chiefly the extent to which they trust that the private firm will maintain appropriate levels of service provision at a reasonable cost.

The requirements of the government, private sector firms, and farmers shape the nature and type of responsibilities shared by the three actors. Many studies limit irrigation PPPs to the domain of irrigation governance and regulatory frameworks, investment, and Operation, Management, and Maintenance (OMM) of irrigation schemes for agricultural production. However, this study argues that limiting the scope of irrigation PPPs to only those domains in developing countries like Ethiopia may hinder successful implementation as the provision of other strategic agricultural inputs and value chain integration activities need to be integrated for PPPs in the sector to bear results. Hence, this study analyzes PPPs across the irrigation value chain, as success in irrigation practices and enhanced agricultural production alone may not significantly benefit smallholder farmers. Without addressing other critical determinants of agricultural production (e.g., the supply of essential inputs through agribusiness) and ensuring effective translation of production into income (e.g., value chain integration), PPPs will fail to achieve their intended outcomes.

The allocation of roles and responsibilities among the government, private sector firms, and farmers in irrigation PPPs depends on the priorities and capacities of each party involved in the contractual agreement. Table 2 illustrates a typical scenario in small-scale irrigation in Ethiopia, where the government bears most of the roles, including governance, regulatory frameworks, and irrigation investments, while the OMM of irrigation schemes is left to IWUAs.

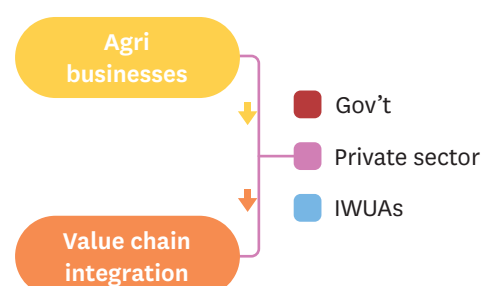


Table 2. Allocation of responsibilities in typical small-scale irrigation scheme

Activities	Water mobilization	Water conveyance	Water distribution	On-farm irrigation	Agricultural Production
Governance and regulatory framework					
Investment					
OMM					

Source: Adapted from (Mandri-Perrott & Bisbey, 2016)

In Ethiopia, the private sector has traditionally played significant roles in agribusiness and value chain integration but has been less involved in investment and operations, maintenance, and management (OMM) of small-scale irrigation (SSI). Several factors contribute to this limited engagement such as lack of favorable policy and regulatory environment, financial constraints, limited technical capacity, and institutional barriers (Gebul 2021; Melaku & Minh 2021). Hence, conducive institutional arrangements and favorable contractual agreements under PPP framework are crucial to foster the participation of the private sector in small-scale irrigation development and management practices in Ethiopia. Table 3 presents the allocation of responsibilities in smallholders' irrigation under PPP framework, where the private sector and smallholder farmers have more participation and roles as compared to that of the conventional small-scale irrigation schemes shown in Table 2.

Table 3. Allocation of responsibility in smallholders' irrigation under PPP framework.

Public Sector Role	Private Sector Role	Smallholder Farmers Role
• Policy and Regulatory Framework • Planning & Project Preparation • Funding and Co-investment • Oversight and Monitoring • Capacity Building & support • Risk Sharing and Guarantees • Dispute Resolution	• Infrastructure Development • OMM Services • Cost Recovery • Performance & Risk Management • Community Engagement & Training • Technology Integration	• Primary Beneficiaries & End Users • Active participation • Co-investment & Ownership • Adoption of best practices • System Monitoring and Feedback • Cost Sharing and Tariff Payment

Source: Compiled from Literature

The government plays a crucial role in facilitating irrigation PPPs by establishing legal and institutional frameworks, defining water rights, land tenure, and tariffs, and aligning projects with national agricultural, water, and environmental policies. It identifies irrigation needs, conducts feasibility studies, manages bidding processes, and ensures projects align with public goals. To encourage private sector involvement, the government provides financial incentives such as subsidies, viability gap funding, or concessional loans to ensure project viability. It also shares risks related to political instability, regulatory changes, or unforeseen climate events. Moreover, the government safeguards the interests of smallholder farmers and vulnerable communities by ensuring equitable access to irrigation services and implementing measures to prevent excessive tariffs or discriminatory practices. It supports smallholders by providing training, education, and resources while promoting awareness of irrigation systems and their benefits.

For effective implementation of irrigation PPPs, the government monitors private sector compliance with contractual terms, performance standards, and environmental safeguards. It also acts as a neutral mediator to resolve disputes between farmers and the private sector.

The PPP model leverages the financial resources, expertise, and innovation of the private sector to enhance investments and services. The private sector contributes capital for the design, construction, operation, and maintenance of irrigation infrastructure and ensure infrastructure safety and introduces modern technologies, such as drip and sprinkler systems, to improve water-use efficiency. It implements advanced management and monitoring systems to ensure optimal operations. The private sector also manages day-to-day operations, maintains the irrigation system, and fosters strong relationships with farmers and local communities. It provides capacity-building support and ensures financial sustainability through mechanisms for tariff collection or service charges. Under the PPP framework, the private sector is expected to meet performance benchmarks outlined in the contractual agreement and assume risks related to project design, construction, and operational inefficiencies.

Smallholder farmers, as primary users of the irrigation system, are essential stakeholders in PPPs. Farmers participate in IWUAs or cooperatives to represent their collective interests, contribute labor and resources, and help design system features, tariff structures, and service delivery mechanisms to align with local needs. Farmers also pay tariffs for water usage to support cost recovery and sustainability. Additionally, they provide feedback on system performance, holding both the private sector and government accountable for service delivery and fair practices. Smallholders engage in capacity development and collaborate with other stakeholders to ensure the irrigation system's long-term sustainability.

In smallholder-focused irrigation PPPs, the government ensures an enabling environment and that the project serves the public interest. The private sector brings efficiency, innovation, and financial resources, while smallholder farmers contribute local knowledge and serve as primary beneficiaries. Effective irrigation PPPs require aligning the objectives and responsibilities of all three parties, fostering mutual accountability and collaboration. Tables A, B, and C in the appendix outline stakeholder requirements for PPP participation, key considerations for satisfying all parties, and an evaluation of Ethiopia's current context with associated insights.

3. Methodology Overview

In order to achieve the objectives of the study, stakeholder mapping was conducted by IWMI experts in collaboration with experts from MoA and other key stakeholders to determine a comprehensive list of stakeholders across the entire stakeholder spectrum. The mapping exercise involved four important steps: listing relevant groups, organizations, and people; understanding stakeholder perspectives and interests; visualizing relationships to objectives and other stakeholders; and ranking stakeholder relevance and identifying issues. This process was conducted with great care, as its quality was deemed as critical as its outcomes, and it relied heavily on the expertise of participants. Therefore, lists of stakeholders from line-ministries, regional offices, development partners, knowledge centers, research institutes, users, and private actors were identified.

Accordingly, experts from relevant line-ministries, namely the Ministry of Finance, Ministry of Agriculture, Ministry of Irrigation and Lowland, and Ministry of Water and Energy, participated in the Key Informant Interviews (KIIs). Four regional states (Sidama, Central Ethiopia, South Ethiopia, and Hareri) and Dire Dawa Administration were included in the study. In each region, KIIs with regional and woreda experts and Focus Group Discussions (FGDs) with farmers were held. The irrigation schemes selected for the study included Wodesa in Sidama, Gombolozo in Central Ethiopia, Otor in South Ethiopia, Sukul in Hareri; and Gudora and Ijanneni villages in Dire Dawa Administration. The Bureaus of Agriculture and its line woreda offices, as well as the Bureaus of Irrigation and Lowlands/Irrigation Development Agency and its line woreda offices, were targeted for the KII. Besides, key private sector actors engaged in irrigation development and management at the national level were interviewed to understand the needs, preferences, and challenges of private sector engagement in the sector. Table 4 presents the experts and farmers engaged in KIIs and FGDs, respectively, for the study.

Table 4. Stakeholders involved in the study.

Stakeholders	Total
Regional Experts	14
Woreda Experts	7
Farmers	34
IWUAs	4
Cooperative Unions	3
Private Companies	7
Federal Ministries	6
Donors and Partner Organizations (WB, FAO IFAD, GIZ)	4
Universities and Research Institutes	7
Total	86

Source: Authors

The needs assessment exercise employs both quantitative and qualitative techniques of analysis and is also supported by a thorough review of existing documents and reports focused on PPPs in small-scale irrigation development and management. The comprehensive needs assessment began with a critical review of up-to-date and exhaustive lists of reports, policy guidelines, directives, and other official sources to document the institutional, legal, and policy frameworks relevant to establishing PPPs for SSI development and management in Ethiopia. This step was crucial for determining whether there were suitable and sufficient legal, policy, and institutional frameworks for running PPPs in SSI projects in Ethiopia. In addition, an extensive literature review of journal articles, books, and reports was conducted to contextualize the project background and bring clarity and focus to the issue at hand. Furthermore, successful experiences of comparator countries from the developing world, particularly in Sub-Saharan Africa (SSA), were examined to document lessons learned in framing the local contexts of PPP in irrigation development and management.

Following the identification of stakeholders, Key Informant Interviews (KIIs) were held with experts and private sector actors engaged in small-scale irrigation development and management, while Focus Group Discussions (FGDs) were conducted with smallholder farmers involved in smallholder irrigation in the selected regions of the country.

The needs assessment exercise aims to analyze existing challenges of smallholder irrigation practices, important needs and preferences, as well as key risks and considerations for private sector engagement in smallholder irrigation development and management in Ethiopia. This section utilizes a qualitative approach (more specifically, thematic and SWOT analysis) to analyze challenges as well as important risks and considerations in smallholder irrigation practices. A descriptive analysis approach is primarily used to analyze the priorities and preferences of stakeholders for private sector engagement.

The needs assessment further prioritized inclusivity by engaging marginalized groups such as women and youth to ensure their perspectives informed the proposed PPP models. Moreover, global best practices, particularly from Sub-Saharan Africa, were contextualized to account for Ethiopia's unique socio-economic and agro-ecological conditions, providing a robust foundation for tailored solutions. In addition to engaging marginalized groups such as women and youth, the need assessment included participants from both the upper and lower streams. This diversity enabled the discussions to capture a wide range of experiences, challenges, and needs related to irrigation practices.

During the need assessment, major challenges included a lack of awareness about PPPs, language barriers, and participants' reluctance to voice concerns about irrigation practices during FGDs. These challenges were addressed by providing initial clarifications on the study objectives and the nature and workings of PPPs, engaging translators familiar with the local context and the sector, and encouraging active participation in discussions. Additionally, individual interviews were conducted to allow participants to share their views confidentially.

Fostering PPP in smallholder irrigation crucially depends on the enabling environment within the sector, including the government's legal, institutional, and regulatory frameworks; availability of resources and infrastructure (such as water resources, access to facilities, essential services, and utilities); financial arrangements (credits, insurance tailored to the needs of smallholder farmers); technology and knowledge (know how, skills, and expertise required for irrigation PPPs); and capacity development (training programs, awareness creation platforms, etc.). These are important national and regional contextual factors determining the success of irrigation PPPs in Ethiopia.

The needs assessment thoroughly examines the existing national and regional contexts to develop irrigation PPPs in the country. The assessment also draws insights from the needs, challenges, and interests of farmers and the private sector. This exercise is essential to identify, classify, and rank the preferred choices and solutions of irrigation stakeholders. Ultimately, this needs assessment will inform the development of viable and sustainable business models for PPPs in smallholder irrigation in Ethiopia. Figure 2 shows the conceptual framework of the assessment.

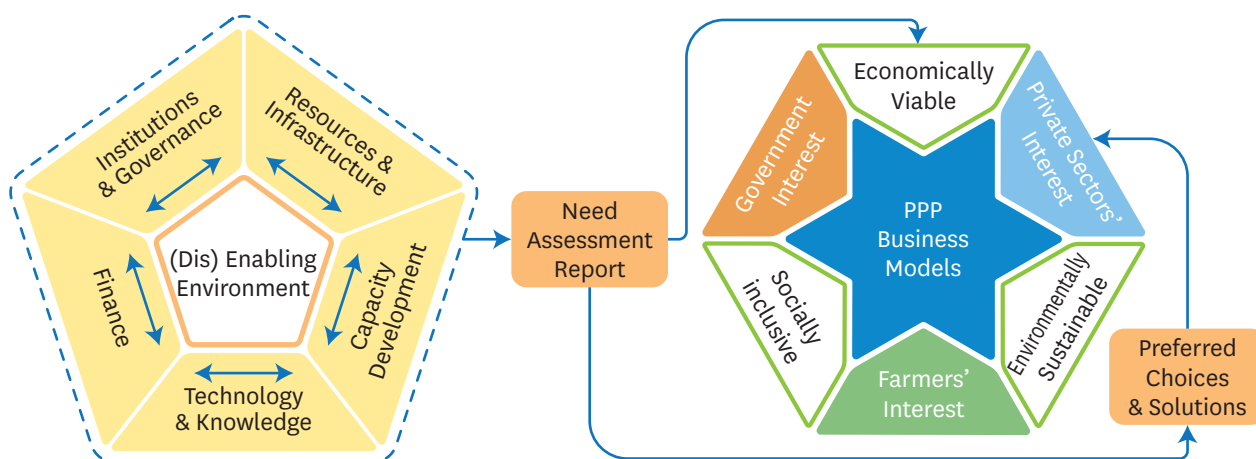


Figure 2. Conceptual Framework of the Needs Assessment.

Source: Authors

4. Stakeholder Mapping and Institutional Analysis

Stakeholder mapping was a collaborative process of research, debate, and discussion drawing from multiple perspectives to determine a comprehensive list of relevant stakeholders across the entire stakeholder spectrum. The stakeholder mapping exercise involved four important steps: listing relevant groups, organizations, and people; understanding stakeholder perspectives and interests; visualizing relationships with objectives and other stakeholders; and ranking stakeholder relevance and identifying issues. The process of stakeholder mapping was as important as the result, and the quality of the process depended heavily on the knowledge of the people participating. Accordingly, stakeholders from governmental agencies, development partners, users, and private actors were carefully identified and analyzed.

The stakeholder analysis was crucial in identifying the challenges, needs, and preferences related to private sector engagement and for informing the design of the most viable business models for PPPs in smallholder irrigation development and management in Ethiopia.

Smallholder irrigation water governance in Ethiopia operates under a three-tier system consisting of federal, regional, and woreda levels within a federal administrative structure. The Ministry of Agriculture is responsible for formulating national policies, strategies, and action plans related to smallholder irrigation PPPs in Ethiopia. Within the MoA, the Smallholder Irrigation Directorate (SSID) holds the specific mandate for managing the development of smallholder irrigation PPPs.

The Ministry of Finance (MoF) oversees the approval and implementation of PPPs across economic and social sectors in Ethiopia via its PPP Directorate General. The Ministry of Irrigation and Lowlands (MoILL) and Ministry of Water and Energy (MoWE) are closely associated with this study and are considered key stakeholders. These ministries collaborate closely in managing Ethiopia's water resources, a critical component of the irrigation sector.

For this study, primary stakeholders for smallholder irrigation PPPs include the afro-mentioned line-ministries, smallholder farmers, and the private sector actors engaged in smallholder irrigation development and management in Ethiopia. Figure 3 illustrates the stakeholder map, with the primary stakeholders shown in the light blue circle. This structure outlines the key operational relationships and mechanisms necessary to ensure the success of PPPs in addressing the challenges faced by smallholder irrigation systems in Ethiopia.

Secondary stakeholders, including other government agencies, research institutes, knowledge centers, financial institutions, and development partners, play a vital supporting role in the implementation of PPPs in smallholder irrigation and management in Ethiopia. The light orange circle represents the secondary stakeholders.

The light blue shaded box in the lower half of the graph portrays the basic structure of PPPs for irrigation development and management. The contract management team, guided by the partnership board, has the specific mandate to oversee PPP contracts in smallholder irrigation to ensure that private companies deliver services to smallholder farmers in accordance with the signed contractual agreement. In return, farmers pay a service charge for the irrigation and related services provided by the private company. The partnership board is tasked with providing strategic direction and plays an important advisory role, while the contract management team handles day-to-day operations and compliance monitoring.

The government provides both financial and non-financial subsidies to the private company to ensure they fulfill their contractual obligations effectively. Financial subsidies may include grants, tax incentives, or credit guarantees, while non-financial support could involve capacity building and technical assistance. Additionally, smallholders and private companies are connected to financial services with and without the support of government.

For irrigation PPPs to be effectively implemented, regional and woreda level government offices must collaborate closely with the stakeholders, alongside federal institutions. Regional and woreda government offices often face challenges such as resource constraints and coordination issues, which must be addressed to ensure the effective implementation of PPPs. Overall, this framework (Figure 3) provides a foundation for implementing effective and sustainable PPPs in smallholder irrigation, which will be further detailed in the subsequent sections of this report.

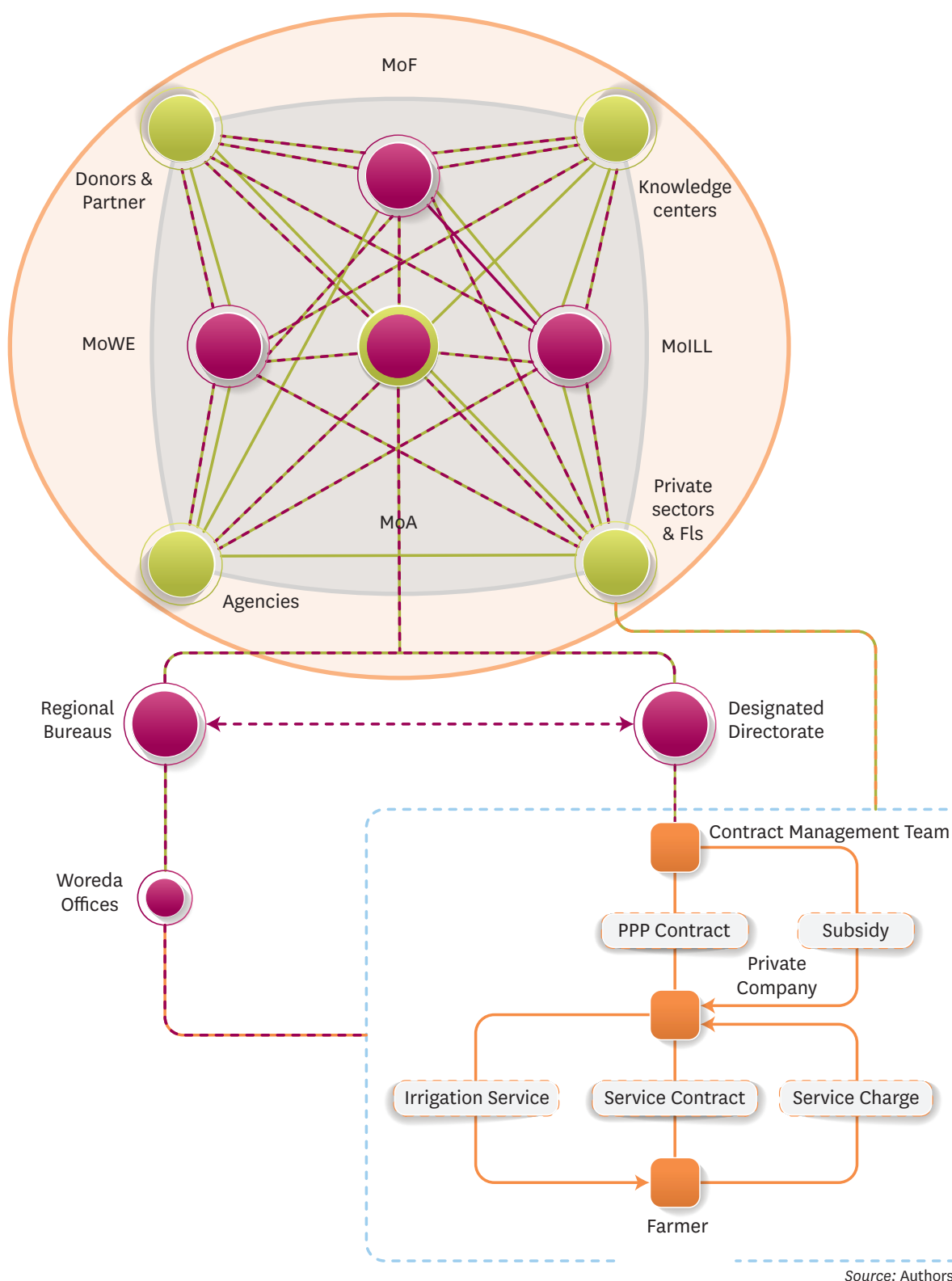


Figure 3. Map of Stakeholders for Small Scale Irrigation PPP in Ethiopia.

5. Evolution of Institutional and Policy Frameworks for Smallholder Irrigation

Ethiopia has abundant water resources. Tapping this valuable resource for national development requires appropriate and adequate institutional, governance, and legal frameworks, as well as effective implementation, follow-up, and enforcement. Water management institutions began to take shape with the advent of modern irrigation farming in the Awash Basin in the 1950s. Since the establishment of the Water Resource Department in 1956 under the Ministry of Public Works and Communication, the water sector has undergone significant institutional changes and development².

The early history of irrigation development focused on smallholder irrigation, which was overseen by different institutions such as the Surface Water Division of the Soil and Water Conservation Department under the Ministry of Agriculture (MoA). In 1984, the division was restructured into the Irrigation Development Department (IDD) under the MoA, which was entrusted with the planning and construction of smallholder irrigation (SSI) projects primarily served agricultural cooperatives [13 cited in [6]]. The establishment of a federal administrative structure in 1991 granted Regional Bureaus of Natural Resources Development more mandate to undertake SSI development. With the establishment of the Ministry of Natural Resources Development and Environmental Protection (MoNREP) in 1993, the IDD was dissolved, and its responsibilities were transferred to MoNREP.

MoNREP was dissolved in 1995, and its responsibilities were shared among the Ministry of Agriculture (MoA) and the newly established Ministry of Water Resources (MoWR). The MoWR assumed a regulatory role in water resources development and management, while regional bureaus of Water, Mines, and Energy Resources Development took responsibility for smallholder irrigation (SSI) development in their respective regions. The MoWR facilitated the issuance of several water resources regulatory frameworks, including the Water Resources Management Policy (1999), Water Resources Management Proclamation (2000), National Water Resources Development Strategy (2001), Fifteen-Year (2002–2016) Water Resources Development Program (2002), and Water Resources Regulation (2005). In 2005, the MoWR was restructured to encompass the energy sector and was renamed the Ministry of Water and Energy (MoWE). Throughout these regulatory frameworks and programs, irrigation expansion received significant emphasis. Under both the MoWR and MoWE, irrigation was represented by the Irrigation Department, which held primary responsibility for the study, design, and implementation of medium- and large-scale irrigation projects.

Later, the Ministry was further restructured and renamed the Ministry of Water and Electricity in 2010 and subsequently the Ministry of Water, Irrigation, and Energy (MoWIE) in 2015, with irrigation included in the Ministry's name for the first time. In 2018, the Irrigation Development Commission (IDC) was established under the MoWIE with the responsibility to manage medium- and large-scale irrigation projects and to conduct the appropriate study, design, and construction of such projects in areas identified for irrigation. The overall aim was to enhance national socio-economic development by ensuring food security, job creation, raw material supply to industries, and export earnings. The IDC aligned its operations to address the Sustainable Development Goals (SDGs) and the 2063 Agenda of Africa. Irrigation is emphasized in the 2063 Agenda under Target 7.6, which seeks to enhance the level of water productivity from rain-fed agriculture and irrigation by 60 percent from its 2013 baseline. Similarly, SDG Target 6.4 advocates for increased water-use efficiency and a focus on water scarcity, while Target 6.5 emphasizes integrated water resources management and enhanced involvement by local communities in water and sanitation management. Currently, the line ministries have undergone additional restructuring, with the Ministry of Irrigation and Lowlands overseeing the policies, strategies, and implementations of medium- and large-scale irrigations, whereas the MoA holds primary responsibility for smallholder irrigation development and management in Ethiopia.

² see Gebul, M.A. (2021) for detailed discussions on the chronological evolutions of water sector institutions in Ethiopia.

The priority of the country's policy agenda focuses on smallholder irrigation projects to enhance smallholder farmers' participation and leverage the significant water potential. The Ethiopian Irrigation Development Plan (IDP) places a strong emphasis on the growth of smallholder irrigation schemes by prioritizing the analysis, design, and implementation of these projects (Ibrahim 2020).

Bringing private sector involvement into irrigation development and management presents significant challenges and complexities. Applicable policies, appropriate institutional arrangements, and contractual frameworks must be put in place. Additionally, the right incentives must be established for the private sector, farmers, public agencies, and other stakeholders to collaborate effectively and achieve a sustainable scheme that benefits all parties (Alexandre et al. 2024).

The pace of irrigation development has varied since the start of modern irrigation schemes in the 1950s. However, a considerable progress has observed after 1995 with the design and implementation of development programs and plans in the country. Notable among these are the Sustainable Development and Poverty Reduction Program (SDRP, from 2002/03–2004/05), the Plan for Accelerated and Sustained Development to End Poverty (PASDEP, from 2005/06–2009/10), and the Growth and Transformation Plans (GTP I, from 2010/11–2014/15, and GTP II, from 2015/16–2019/20), which were instrumental in irrigation development in Ethiopia. Currently, the Ten Years Perspective Development Plan (2021–2030), which aligns with the spirit of the Sustainable Development Goals (SDGs), serves as a key strategy for irrigation development in the country. It emphasizes reducing agricultural production's dependency on rain, facilitating agricultural mechanization and irrigation technology, and enhancing the role of the private sector in agriculture.

The Government of Ethiopia recognizes the limitations of public resources in achieving the national development agenda alone and has therefore highlighted the need for greater private sector involvement in accelerating overall development. Accordingly, a National Policy on Public-Private Partnerships (PPP) was adopted in 2017 to create a conducive environment for private sector engagement under the PPP framework in various sectors, including irrigation. This was followed by PPP Proclamation No. 1076 and PPP Directives in 2018, and PPP Guidelines in 2019, to guide the development and management of PPP projects, including those in the irrigation sector. These initiatives aim at creating a supportive environment for PPPs and addressing the challenges of inefficient irrigation water use and management.

The Public-Private Partnership (PPP) Proclamation No. 1076/2018 provides a robust legislative framework for promoting and facilitating privately financed infrastructure projects in Ethiopia. The proclamation established a PPP Board responsible for approving PPP projects at key milestones. Based on the provisions of the proclamation, a PPP Directorate General (PPPDG) was established in 2018 under the Ministry of Finance (MoF) to achieve the country's development objectives by ensuring that public-private partnerships align with the provisions of the proclamation. The proclamation designates the Ministry of Finance as the chair of the PPP Board, while the PPP Directorate General serves as the board's secretariat. The proclamation was amended in 2023 through the Public-Private Partnership Proclamation (Amendment) Proclamation No. 1283/2023. Under the amended proclamation, the PPP Board comprises representatives from the Ministry of Finance, National Bank of Ethiopia, Ministry of Planning and Development, Ministry of Water and Energy, Ministry of Peace, Ministry of Transport and Logistics, Ministry of Urban Infrastructure, and two private sector representatives appointed by the Ministry.

In 2021, the Smallholder Irrigation Development Directorate (SSID) of the Ministry of Agriculture (MoA) developed an implementation strategy for Public-Private Partnerships (PPPs) in smallholder irrigation development and management in Ethiopia. The overall goal of smallholder irrigation PPPs was to leverage private sector capacity, expertise, and investment to increase access to affordable, quality irrigation services that contribute to the achievement of the national irrigation development program and overall economic development.

Therefore, the implementation strategy must carefully address the legal and institutional complexities associated with irrigation PPPs. By their nature, PPPs involve many legal issues, from the legal frameworks that guide their structure to the day-to-day implementation of the contract itself. These legal issues become more intricate when applied to irrigation. Several key legal challenges are specific to irrigation PPPs.

Irrigation PPPs involve the use of both land and water resources and are therefore complicated by laws and regulations governing ownership, title, and use of these resources. Multiple ministries have some sort of mandates for governing the use of these resources, which necessitates a collaborative effort to avoid unnecessary conflicts and delays. Additionally, the right to ownership of rural and urban land, as well as all natural resources, are exclusively vested in the State and the peoples of Ethiopia (Gebeyehu, 2013). Farmers have the right to obtain land without payment and protection against eviction, while private investors can use land based on payment arrangements established by law. Given that land resources are scarce and vacant spaces are limited, it is vital to clearly define how the private sector can access and utilize these resources when participating in irrigation PPPs.

Water can be used for multiple purposes and restrictions on extracting water (the key input to irrigation PPPs) can significantly affect the structure and feasibility of a transaction. Water extraction usually require permit and determining who grants permits and the process for obtaining them can be difficult and can lead to delays in project implementation (Mandri-Perrott & Bisbey, 2016). In Ethiopia, the pricing regime for the extraction and sell for irrigation water is not properly addressed. For attracting the private sector to engage in irrigation PPPs, it is vital to clearly set the price regime as the private provide need certainty regarding the price at which it can be on-sell irrigation water, as well quantities it is allowed to sell.

More importantly, complex institutional arrangements can make it difficult to determine who the appropriate institution is for irrigation PPPs both at national and regional levels. In Ethiopia, the Ministry of Water and Energy (MoWE) governs the development and management of water and energy resources while the Ministry of Irrigation and LowLands (MILLS) and the Ministry of Agriculture (MoA) have mandates for developing and managing irrigation waters for agricultural purposes. At regional levels, bureaus managing irrigation development have varying institutional arrangements. In Central and South Ethiopia regions, the bureaus have their own independent arrangements as Bureau of Irrigation Development and Low Lands while it is under the Bureau of Water and Energy in Sidama region and under the Bureau of Agriculture in Hareri region. Thus, resolving overlapping of mandates and misalignment of institutional arrangements at both federal and regional levels are important for the prompt and effective executions of their respective mandates.

More importantly, complex institutional arrangements often create challenges in identifying the appropriate authority for managing irrigation PPPs at both national and regional levels. In Ethiopia, the Ministry of Water and Energy (MoWE) governs the development and management of water and energy resources, while the Ministry of Irrigation and Lowland (MoILLS) and the Ministry of Agriculture (MoA) have mandates for developing and managing irrigation waters for agricultural purposes. At the regional level, the institutional arrangements for managing irrigation development vary significantly. In Central and South Ethiopia regions, the bureaus operate independently as the Bureau of Irrigation Development and Lowlands, while in Sidama, they fall under the Bureau of Water and Energy and in Hareri, they are under the Bureau of Agriculture. Thus, resolving overlapping mandates and institutional misalignments at both federal and regional levels is critical for the prompt and effective execution of their respective mandates.

6. Lessons from Regional and International PPP Experiences

Global experiences show the PPP is on the rise particularly after the 2008 global economic crisis due to its contribution in enabling governments to procure and deliver public infrastructure/services and leverage the resources and expertise of the private sector through risk-sharing arrangements(World Bank, n.d.). It is a best option compared to exclusive privatization or public provision of services as it combines the know-how, skills, and expertise of the private sector with the public sectors regulatory action and its protection of public interest. PPP arrangements can play a vital role in driving economic growth by providing well-planned, well-funded, and well-maintained infrastructure and public services (Ibrahim A. Zeidy, 2020).

Most of the global PPP experiences are concentrated in Asia and Latin America and are limited in Africa. Chile and South Africa are two countries with substantial PPP experiences and well-defined PPP frameworks. According to latest report, eight seven percent of African countries have adopted and established some form of regulatory framework that provides guidelines for developing PPPs (Alexandre et al. 2024). In most African countries, PPPs have been widely used for financing and operating a range of public services such as energy, infrastructure, transportation, and telecommunications (TechTarget, 2022). Specific to the irrigation sector, however, there are only few examples of PPPs in the developing world, and this is even more noticeable in Africa where only 6 percent of the arable land is under irrigation (compare to 14 percent in Latin America and 37 percent in Asia) (Scheumann et al. 2017).



(photo: Abraham Seyoum)

Ethiopia faces significant challenges in improving agricultural productivity and managing water resources efficiently, particularly for smallholder farmers. Public-Private Partnerships (PPPs) have emerged as a promising solution to address these challenges in the irrigation sector. Lessons from regional and international experiences provide valuable insights for Ethiopia's efforts.

Government facilitation through supportive policies and financial incentives is critical for fostering effective PPPs. Mechanisms for risk-sharing and financial incentives play a vital role in attracting private sector investment, while capacity building and community engagement ensure successful adoption and ownership of irrigation systems by smallholders. Transparent water pricing models, an efficient regulatory framework for supporting and monitoring PPPs, and strong market linkages further enhance the sustainability and profitability of smallholder irrigation projects.

Long-term sustainability is best achieved through scalable and adaptable irrigation solutions, which can be tested and refined through pilot projects. By integrating these lessons into its approach, Ethiopia can design and implement PPPs that improve the productivity and resilience of smallholder irrigation systems, contributing to food security, economic growth, and better livelihoods for smallholder farmers. Table 5 highlights key lessons from regional and international experiences that can be applied to smallholder irrigation in Ethiopia.

Table 5. Key Lessons from Regional and International PPP Experiences Relevant to Smallholder Irrigation in Ethiopia.

Aspect	Lesson Learned	Implication/Relevance to Ethiopia
Policy and Regulatory Frameworks	Lesson: Clear and consistent policies and regulations are crucial for PPP success. Approach: Develop clear regulatory frameworks that define roles, responsibilities, and accountability mechanisms for both public and private stakeholders. Examples: 1) Morocco's Guerdane Irrigation Project included contractual obligations for private companies to deliver water services transparently, with government oversight. 2) India's Andhra Pradesh Micro-Irrigation Project: established a clear legal framework to promote drip & sprinkler irrigation, supported by policies to regulate water use & define roles for private sector partners.	- Ethiopia needs to refine and enforce its PPP Proclamation and align it with irrigation development goals. - Ethiopia needs to develop clear regulatory frameworks to regulate participation of the private sector in irrigation PPP. - Ethiopia can strengthen its PPP frameworks by adopting clear policies for irrigation schemes, especially for defining water rights and tariff structures.
Stakeholder Engagement	Lesson: Early and transparent stakeholder engagement ensures buy-in from farmers and private investors. Approach: Maintain participatory, transparent and continuous dialogue with stakeholders Examples: 1) Egypt's West delta irrigation PPP: known for effectively involving users & water users' council from design to execution. 2) Kenya's Tana River Irrigation Scheme in Kenya: Community involvement & continuous dialogue with stakeholders was key to resolving conflicts over water use and ensure equitable access.	- Building trust among Ethiopian smallholder farmers and private actors is essential for improved PPP acceptance and outcomes.
Training and Capacity Building	Lesson: Building the technical and managerial capacities of farmers, public officials, and private entities ensures sustainable project outcomes. Approach: Conduct training programs to familiarize farmers with new technologies & build confidence in their use. Examples: 1) South Africa's Vaalharts Irrigation Scheme: Collaboration between local universities, the government, and private companies introduced advanced irrigation methods, leading to improved water use efficiency. 2) Smallholder Irrigation PPPs in Kenya: Training programs for farmers on efficient water use and maintenance improved project sustainability.	- Ethiopia should integrate capacity-building programs into irrigation PPPs, focusing on IWUAs and cooperative management.
Risk Sharing	Lesson: Balanced risk-sharing mechanisms attract private sector participation. Approach: Design PPPs that share risks between public, private, and farmer stakeholders, such as through insurance schemes or shared ownership models. Examples: 1) Mexico's Irrigation Districts: farmers shared costs and risks with private operators, supported by government-backed insurance for crop failures. 2) Morocco's Green Plan: Under this initiative, government provided subsidies for irrigation infrastructure and shared risks related to climate variability, attracting private investment.	- Ethiopia must define clear risk-sharing roles, especially for long-term contracts in irrigation. - Ethiopia needs to explore risk-sharing mechanisms and offer viability gap funding to encourage private investment in smallholder irrigation projects.

Inclusive Business Models	Lesson: Inclusive models ensure equitable access to irrigation services benefits to marginalized groups. Approach: Inclusive models empower smallholders through organized cooperatives or IWUAs. Examples: 1) Zambia's Manyonyo Irrigation Scheme and Egypt's Dina Farm: more inclusive approach of integrating smallholder with large private irrigating enterprises. 2) Uganda's Agricultural PPPs: Projects emphasized gender equity, with specific programs designed to increase women's access to irrigation resources.	- Ethiopia should strengthen IWUAs and cooperative capacity to engage in irrigation system management. - Ethiopian PPPs should integrate equity-focused policies to ensure access for smallholders, particularly women and vulnerable groups.
Value Chain Integration	Lesson: PPPs that include agribusiness services and market linkages ensure sustainability. Approach: Integrate market linkages into PPPs to ensure stable prices and guaranteed buyers for crops. Examples: 1) Ghana's Integrated Tamale Fruit Company (ITFC): operates a nucleus estate model for organic mango production, integrating smallholder farmers as out-growers. 2) Ghana's Integrated Water & Agricultural Development (IWAD) Project: private companies provided market access, enabling smallholders to confidently adopt modern irrigation practices & shift to high-value crops.	- Ethiopia should integrate PPPs with value chain services to address low farm-gate prices and market access.
Innovative Financing	Lesson: Leveraging subsidies or blended finance makes PPPs viable in agriculture. Approach: Offer subsidies, low-interest loans, or grants to reduce the financial burden on smallholders. Examples: Swaziland's Usuthu Project 1) Swaziland's Usuthu Project: integrates innovative financing mechanisms to develop irrigation systems for sugarcane production while ensuring benefits for smallholder farmers. 2) Peru's Olmos Irrigation Project: A PPP that utilized a blend of public subsidies and private financing, making irrigation affordable for smallholders.	- Blended finance and targeted subsidies can attract private actors to smallholder irrigation projects.
Environmental Sustainability	Lesson: Mitigating environmental risks enhances project outcomes. Approach: Establish strict guidelines for water abstraction limits, waste management, and pollution control as well as adoption green certification programs and eco-labeling. Examples: 1) Mexico's Tehuacán Irrigation Project: Integrated environmental safeguards, such as water-saving irrigation technologies, to balance agricultural needs with resource conservation. 2) Israel's Negev Desert Irrigation: relies on treated wastewater and advanced technologies like drip irrigation. Strict policies on water use ensure sustainability in arid regions.	- PPPs in Ethiopia must address soil salinity, water scarcity, and resource depletion risks proactively.

Source: Adapted from (Becker and Ward 2016; Chinsinga and Chirwa 2018; Eberhard 2014; FAO 2016; Hainmueller and Hiscox 2018; IDB 2018; IFC 2013; Ministry of Food and Agriculture 2020; Mwangi 2006; Narain 2003; Njonjo and Ero 2015; Nsubuga et al 2014; Scott and Shah 2004)

7. Farmers and Private Sector Engagement Mindset

The agriculture sector in Ethiopia is predominantly characterized by smallholder farming of less than 2 hectares of land. Smallholder farmers have low productivity, low-level of commercialization and technology adoption. Most smallholder farmers produce predominantly staple crops for subsistence production in their fragmented plots with low level of input utilization and technology adoption as well as poor integration with markets and actors in the agricultural value chain. To change this vicious circle of underdevelopment, the Ethiopian government and development partners have made efforts to help smallholder farmers work with private companies with mutually agreed contractual agreements.

Consequently, over the past few decades, there has been a growing momentum toward contractual agreements between farmers and private companies throughout-grower schemes, contract farming, and other joint ventures. Successful experiences from many countries, including Ethiopia, demonstrate the potential of such arrangements. These contractual agreements have provided significant opportunities for smallholder farmers, including easing access to production inputs and services, introducing new technologies, enabling farmers to acquire new skills, reducing price risks, opening up new markets, and generating higher incomes (Unver & Ercan 2013; World Bank 2017a). However, a major criticism of contract farming is the unequal power dynamics, where farmers often provide a form of cheap labor, and companies shift production risks to smallholder producers. This dynamic has the potential to trap smallholder farmers in cycles of debt (Gharbi & Amara 2014; IFAD 2015). Therefore, there is a need for institutional arrangements that support equitable partnerships between companies and farmers involving the government. This is why PPPs have become a critical focus for many countries and the development community, aiming to tap the private sector's potential to enhance agricultural and rural development worldwide.

However, the mindset and attitudes of smallholders must be considered to ensure the success of PPPs in the agriculture sector in general and irrigation in particular. The following are some of the key features that characterize the mindset of smallholder farmers, based on insights from literature, Key Informant Interviews with experts, and focus group discussions with farmers in selected regions of Ethiopia.

- 1. Dependency on public services:** Smallholder farmers have long depended on public services for input supply, extension and agronomic services, technology adoption, access to utilities and finance, and other essential services. As a result, farmers expect and trust the government to provide these services and invest in infrastructure. However, there is a consensus among the development community that the provision of such services and infrastructure by the public sector alone falls short of satisfying the needs and demands of a growing economy and population in many countries. Hence, such mindset of smallholders creates hinderance on their participation in PPP limiting successful PPP implementation. Private sector engagement is essential to leverage private funds, expertise, technology, and management skills. Building trust is crucial and can be achieved through pilot projects, such as Tanzania's Kilombero Valley Irrigation Scheme, which demonstrated private sector benefits in irrigation management (World Bank 2017a). Similarly, Turkey's Water User Associations under the Southeastern Anatolia Project empowered farmers to manage irrigation systems, reducing state dependency (Unver & Ercan 2013). Clear regulatory frameworks defining roles, responsibilities, and accountability mechanisms are vital for trust-building. Morocco's Guerdane Irrigation Project exemplifies this approach, with private companies delivering water services transparently under government oversight (Gharbi & Amara 2014). These models offer valuable lessons for fostering trust and improving PPP participation in Ethiopia.
- 2. High level of risk aversion:** Smallholder farmers are characterized by low production and low income, which hinders their motivation for long-term investments and limits their willingness to take risks. They prefer working with their small plots of land for self-sufficiency rather than undertaking uncertain risks. This has forced farmers

to live under a vicious circle of poverty, thereby deterring their engagement in new farming systems that require different commitments and approaches to their agricultural activities. Smallholder farmers often exhibit high risk aversion due to limited resources, lack of financial buffers, and dependence on stable income. This can hinder the success of irrigation PPPs by creating resistance to change and poor adoption of new technologies. To address these challenges, PPPs must align with smallholders' risk profiles, offering support and building trust. Ghana's IWAD project is a good example, integrating market linkages to provide stable prices and guaranteed buyers, which encouraged smallholders to adopt modern irrigation practices and shift to high-value crops (IFAD 2015). Similarly, Kenya's Galana Kulalu Project used pilot phases to demonstrate tangible benefits, such as improved productivity and incomes, fostering wider participation MoALF (2016).

- 3. Lack of trust and fear towards private companies and their investments:** Smallholder farmers have low bargaining power in selling their products and services. They are usually at a disadvantage in their interactions with private sector actors, whether in agribusiness or across the value chain. This unequal power relationship between smallholder farmers and private sector actors has created a sense of exploitation and lack of trust toward the latter. Smallholders' lack of trust and fear towards private companies and their investments can significantly impact the implementation of irrigation PPPs. These negative perceptions, often rooted in past experiences, lack of transparency, or misunderstandings, can create resistance, reduce participation, and ultimately undermine the success of the PPP model. Therefore, an enabling environment and institutional arrangements, such as PPPs, are needed to improve these relationships and ensure mutual benefits for both parties. Moreover, these problems can be mitigated through thoughtfully designed PPPs that fosters transparency, equitable benefits, and strong community engagement. Morocco's Guerdane Irrigation Project is a good example, where initial mistrust was overcome by providing financial support, guaranteed service standards, and involving farmers in oversight. This approach enabled irrigation for over 10,000 hectares, with farmers gradually accepting the system (Gharbi & Amara 2014). Similarly, Egypt's Nile Delta Modernization Project overcame skepticism by facilitating third-party oversight, holding community consultations, and demonstrating efficiency gains, which helped build trust and improved water delivery (World Bank 2017b).
- 4. Hesitant to changes and new ideas:** Smallholder farmers are usually dependent on their traditional farming systems, which they have practiced for years and have found to yield modest results. In many parts of the world, farmers are known to be reluctant to adopt changes or new innovations. Overcoming smallholders' hesitance or resistance to changes and new ideas through PPPs involves strategic interventions that build trust, reduce risks, and provide clear benefits. Farmers usually learn from practical demonstrations rather than theoretical explanations. They learn from life observations and livelihood changes experienced by other farmers they know. This is evident in many parts of Ethiopia, where smallholders increasingly demand more water for irrigation in areas where irrigation practices have been visibly demonstrated to improve the lives of their fellow farmers. In Kenya's Galana Kulalu Food Security Project, initial pilot phases demonstrated improved productivity and incomes, fostering wider acceptance (MoALF 2016). Similarly, India's Jain Irrigation Systems addressed challenges by offering hands-on training in drip irrigation, alleviating concerns about complexity and building farmers' confidence in new technologies, which significantly boosted adoption rates (Jain Irrigation Systems Ltd. 2015).

In general, PPPs in irrigation address the mindset challenges discussed above by creating an environment where mutual benefits, transparency, and shared responsibility are at the forefront. Through these mechanisms, PPPs can address smallholders' mindset challenges and create long-term, sustainable benefits that benefit both farmers and private sector participants.

8. Enabling Private Sector Engagement in Irrigation

The private sector in Ethiopia is predominantly composed of micro and smallholder enterprises with limited capital and experience to operate complex business activities. Medium and large-scale enterprises are relatively fewer in number. Contracting firms are typically large processors, exporters, or supermarket chains with the capacity to ensure a steady supply of raw materials, provide credit, and absorb the risks associated with offering fixed prices. Smallholder traders or wholesalers rarely offer farmers pre-planting contracts due to their limited capacity to establish networks of trained field agents for recruiting farmers, providing advice, monitoring compliance, and organizing harvest collections (MoALF 2016).

Ethiopia's private sector largely consists of smallholder, informal, and service-oriented businesses that primarily operate in domestic markets, where returns are higher and quicker (World Bank 2017b). Many private sector actors prioritize quick profits and avoid sectors that demand advanced technology, specialized expertise, or higher levels of risk. For instance, during the Growth and Transformation Plan I (GTP-I) period, of the 123 operational domestic private investment projects licensed by regional governments, 88 (71 percent) were in the service sector, 21 (17 percent) in manufacturing, and only 14 (11 percent) in agriculture (Jain Irrigation Systems Ltd, 2015). This highlights the need to address barriers limiting private sector engagement in productive sectors, particularly agriculture and irrigation.

Key factors influencing agribusiness investment in Ethiopia include investors' motivations and experiences, market potential for growth and profit, access to suitable agricultural land and water for irrigation, and infrastructure availability (Debebe et al. 2023). Besides, Debebe et al. (2023) restricted access to input markets (e.g., financial services, land, and skilled labor), weak institutional frameworks (e.g., ineffective regulations, corruption, and informal market malpractice), and political instability leading to social unrest in different parts of the country (World Bank 2017b). Addressing these barriers is essential to attract private sector investment and drive rural development in Ethiopia.

The following points would help summarize some of the key aspects of the private sectors' need for engagement and possible partnerships with government in agricultural activities including irrigation development and management.

Establish Clear policy and legal frameworks: A significant bottleneck for private sector participation in agriculture is the absence of clear and transparent policies and legal frameworks. These frameworks should define property rights, delineate roles and responsibilities, and provide safeguards for private investors engaging in agriculture and irrigation.

Put infrastructural facilities in place: Establishing and maintaining essential infrastructure is crucial for thriving investments, whether in urban or rural settings. In developing countries like Ethiopia, private sector participation in the agricultural sector could be significantly improved if there were more developed and efficient infrastructural facilities, such as roads, telecommunications, electric power, water, and other essential services in rural Ethiopia distributed equitably.

Provide appropriate incentives and supports: Businesses in the agricultural sector are largely characterized by lower profits, longer repayment periods, and inherent risks, making them less attractive for engagement. Agricultural entrepreneurs are often driven more by necessity than opportunity. Attracting the private sector to agriculture requires providing appropriate incentives and supports, such as lowering tariffs on inputs and agricultural technologies, offering short-term tax holidays on land and business activities, providing credit incentives, and ensuring institutional support to protect their assets and investments.

Good governance and institutional arrangements: More than other factors, good governance and efficient institutional arrangements are key to the success of businesses in the agriculture sector. Bureaucratic red tape, slow payment processes, and a lack of clear and non-overlapping institutional mandates are some of the key impediments to private sector investments in developing countries like Ethiopia.

Therefore, increasing private sector participation in agriculture and the irrigation sub-sector, under the framework of PPPs, requires understanding the mindsets of the private sector, creating an enabling environment, and establishing appropriate incentives and supports.

9. Challenges, Needs & Preferences, and Important Considerations in Implementing Smallholders' Irrigation PPPs

9.1. Current Status and Identified Challenges

The Ethiopian government has considered irrigation development as a priority for intensifying agricultural production, increasing farmers' income, as well as meeting the food demand of the country's growing population. As a result, several irrigation projects, mainly smallholder community irrigation schemes, have been developed with the aim of reducing food insecurity (Larreae and Mataix 2015).

However, several studies have shown that irrigation development in Ethiopia faces significant challenges that prevent it from realizing its potential impact. Evidence from desk reviews, empirical literature, surveys, Focus Group Discussions (FGDs), and field observations provides detailed insights into the challenges faced by farmers in regions of the country practicing smallholder irrigation in different irrigation schemes (e.g., river diversion, dams, and shallow wells). Moreover, the challenges raised by farmers practicing smallholder irrigation were triangulated through consultations with experts with extensive experience in irrigation development in Ethiopia.

Finally, understanding the challenges faced by private companies engaged in the sector is crucial for grasping the full picture of factors impeding private sectors involvement in irrigation development and management in Ethiopia. Table 6 summarizes the major challenges faced throughout irrigation development and management across the irrigation value chain.

The results of the need assessment reveal that Ethiopia's irrigation sector faces a range of challenges that hinder its potential for growth and sustainable development. These challenges span across institutional governance, infrastructure, financial constraints, capacity gaps, and value chain integration. The following analysis examines these areas with respect to Ethiopia, highlighting key issues and potential solutions.

Institutional and Governance Challenges: There is a lack of coordination between key stakeholders, including IWUAs, the private sector, and government bodies, leading to fragmented decision-making and inefficiencies in irrigation scheme management. The division of mandates between the Ministry of Irrigation and Lowlands (MILLs) and the Ministry of Agriculture (MoA), along with overlapping responsibilities and inconsistencies in regional and woreda-level organizational structures, complicates communication and accountability. A study by Beyene and Gebreselassie (2018) highlighted that the Ministry of Water, Irrigation, and Energy (MoWIE) often struggles to provide clear leadership, and regional governments' overlapping mandates create confusion in responsibility allocation.

Corruption and political interference, especially in the allocation of water resources, further complicate the situation. Local government officials often face conflicts of interest, leading to unfair distribution of water, particularly between upstream and downstream farmers. This has resulted in dissatisfaction and conflicts among water users (GIZ 2020; World Bank 2020).

Table 6. Challenges across the irrigation value chain.

Stakeholders	Challenges related to design and construction	Challenges related to operation and maintenance	Challenges related to Agribusiness Services	Challenges related to Value Chain Integration
Farmers	• Improper gates for the offtakes, leading to soil erosion and water loss. • Earthen canals cause excessive water loss especially during dry seasons. • Limited outreach of the distribution canals • Rivers running down the gorge requiring huge resources for irrigation. • Missing gates/stop logs on turnouts. • Several issues with siltation in deeply cut and covered canals • Incomplete construction of secondary and tertiary canals and water storages facilities. • Resentment among non-users of irrigation who were not adequately compensated during construction	• Corruption and conflict of interest between the upper and downstream farmers • Lack of equitable and timely distributions of water • Gaps in farmers' knowledge in terms of practicing irrigation, recommended inputs and optimal land use • Unfair practice by IWUA committee members in water distribution and scheduling • Inadequate and untimely maintenance, leading to water loss. • Lack of adequate training and skills among IWUA members	• Lack of timely, fairly priced, and adequate agricultural inputs. • Inadequate extension services and agronomic advice. • Lack of access to credit facilities. • Poor treatment of black soils (koticha) and sandy soils, causing significant water loss due to cracking in dry seasons.	• Lack of market linkages, especially for perishables. • No standard or transparent weighing techniques for harvests. • Poor infrastructure, including all-weather roads. • Low farmgate prices due to uncompetitive market structure on the upstream or lack of alternative market options.
Private Sector	• Delay in payments and bureaucratic system bottlenecks • Lack of skilled manpower for irrigation development and management • Security issues as irrigation equipment are not movable • Gaps in land tenure and institutional arrangements for effective PPPs implementation	• Farmers' lack of knowledge of irrigation practices and input application Dispute and conflict may result in damage to irrigation equipment.	• Limited access to credit. • Shortage of hard currency.	• Poor or lack of infrastructure. • Weak market linkages, reducing private sector confidence to invest in the value chain.
Experts	• Inadequate preparation and institutional arrangements for efficient scheme management and maintenance • Lack of technical knowledge about irrigation design by experts at regional and woreda levels • Rivers running down the gorges require significant resources for irrigation. • Poor coordination and integration with partners in the design and construction of irrigation projects • Poor quality construction of irrigation schemes	• IWUAs lack the expertise and capacity to fulfill their responsibilities. • Poor watershed-level integration, leading to inequitable water access for up- and downstream users. • Poor scheme follow-up, management, and under-capacity operations. • Poor irrigation water scheduling. • Weak enforcement of by-laws for water use and distribution. • Inadequate collection of water user fees.	• Farmers' lack of awareness about irrigation practices and input application. • Limited access to agricultural inputs and services. • Lack of credit for maximizing irrigation benefits.	• Lack of standard and transparent weighing techniques for harvests. • Limited storage facilities, especially for perishable products.

	• Irrigation schemes fail to consider specific local contexts	• Poor rehabilitation of existing schemes. • High water scarcity during dry seasons, particularly for downstream users. • Corruption and conflicts of interest between upstream and downstream farmers.		
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Source: Survey Results (2024)

The enforcement of water use by-laws and collection of user fees is another significant challenge. IWUAs and local authorities often lack the necessary institutional arrangements, expertise, and financial resources to effectively enforce regulations and collect fees, impacting water distribution and the sustainability of irrigation systems. This aligns with MoWIE (2020) findings that poor governance has led to insufficient maintenance and management of irrigation systems, resulting in water wastage and inefficiencies.

Infrastructure and Technical Challenges: the results of KIIs and FGDs indicate that Ethiopia faces numerous infrastructure and technical challenges that impede the effectiveness of irrigation systems. Many irrigation schemes have suffered from substandard construction and poorly designed systems. In some cases, irrigation canals and related infrastructure have not been adequately constructed, resulting in inefficiencies in water distribution and loss (Beyene & Gebreselassie 2018). This includes issues such as missing gates and under-dimensioned canals, which lead to uncontrolled water flow and significant water losses. The result concurs with GIZ (2020), which showed that incomplete schemes, such as missing secondary and tertiary canals, mean that water distribution is often inefficient and unavailable to all farmers within the system.

The lack of essential infrastructure, such as feeder roads, storage facilities, and telecommunication networks, has hindered the performance of irrigation systems, diminishing their economic viability. Inadequate transportation infrastructure limits farmers' ability to access markets and sell their produce (FAO 2020). The use of earthen canals and untreated soils (e.g., koticha and sandy soils) leads to substantial water loss, particularly during dry seasons. Moreover, the absence of control gates in irrigation canals exacerbates water wastage (MoWIE 2020).

Financial and Economic Barriers: Ethiopia's irrigation sector faces serious financial and economic barriers that hinder development and private sector participation. Delays in payments for services related to irrigation, such as construction and land compensation, have discouraged the private sector from investing in irrigation schemes (World Bank 2020). Farmers and private investors have limited access to affordable credit, which prevents them from making the necessary investments in irrigation technology and infrastructure (Beyene & Gebreselassie 2018). The absence of loan facilities tailored to agricultural projects is a major constraint.

Ethiopia's foreign exchange shortages also make it difficult for private sector companies to import irrigation-related materials, limiting access to modern irrigation equipment and technology (GIZ, 2020). Moreover, the lack of strong market linkages and price transparency discourages farmers from adopting irrigation technologies. Poor infrastructure and access to markets result in low prices for irrigated crops, leading to poor returns on investment (FAO 2020).

Capacity and Knowledge Gaps: A critical barrier to efficient irrigation development is the lack of capacity and technical knowledge at multiple levels. Many Ethiopian farmers lack the technical knowledge required for effective irrigation practices and the optimal use of inputs (FAO 2020). This lack of understanding leads to inefficiencies in water use and reduced yields. IWUAs often lack the training necessary to manage irrigation systems effectively. They are also insufficiently equipped to enforce rules and manage conflicts between farmers (Beyene & Gebreselassie, 2018). Regional

and woreda-level experts often lack the technical skills to design and manage efficient irrigation systems, resulting in poorly executed schemes that do not meet the needs of farmers (MoWIE 2020).

Value Chain and Market Integration: Ethiopia struggles with poor market integration and value chain development, which impedes the profitability of irrigated agriculture. Farmers have limited access to formal markets, and the absence of transparent pricing mechanisms leads to low prices for their produce (GIZ 2020). Inadequate storage facilities, lack of cold storage, and poor transportation infrastructure hinder farmers from storing and selling their produce effectively (FAO 2020). Weak market incentives and inadequate infrastructure make the private sector hesitant to invest in the agriculture value chain, including irrigation (Beyene & Gebreselassie 2018).

9.2. Needs and Preferences for Private Sector Engagement in Smallholder Irrigation

Farmers interviewed in selected regions expressed a high demand for irrigation water to improve their livelihoods by increasing production intensity, frequency, and productivity. Their exposure to irrigation practices and awareness of its benefits have amplified their demand for irrigation water. However, government endeavor to expand SSI didn't meet this growing demand. This strong demand for irrigation requires the establishment of PPPs to address smallholders' needs.

However, successful PPPs require, among other prerequisites, a thorough understanding of the needs and preferences of stakeholders involved in the design and implementation of contractual agreements. In this study, stakeholders in the irrigation sector—including irrigating smallholder farmers, private sector actors, and experts with extensive experience in the field—were purposefully interviewed to identify their needs and preferences for private sector engagement in irrigation development and management in Ethiopia. Table 7 presents emerging patterns from Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) conducted in selected regions.

The findings from Table 7 indicate that technology adoption and agribusiness services should be prioritized in PPP implementation to address immediate productivity and market linkage challenges. In contrast, areas like cost recovery and water user fee management require phased approaches, as the private sector currently lacks capacity and resources to

Table 7. Preferences of Stakeholder on possible private sector engagement.

No.	Areas of Engagement	Ranking by Private Sector	Ranking by Experts	Overall Ranking
1	Investment in Infrastructure	7	5	5
2	Operation and Maintenance	4	2	3
3	Technology Adoption/supply	3	1	1
4	Agribusiness services	1	3	1
5	Value Chain Integration	2	4	3
6	Financing and Investment	8	6	7
7	Capacity Building	5	7	5
8	Research and Development	9	8	9
9	Cost recovery	10	10	10
10	Water user fee management	6	9	8

Source: Survey Results

engage effectively in these roles. Understanding these priorities allows PPPs to be designed in a way that balances immediate needs with long-term sustainability, ensuring alignment between stakeholder preferences and national objectives.

Since the private sector in countries like Ethiopia often lacks adequate capacity and resources, their engagement in infrastructural investment, capacity building, and financing should be phased in over time. As shown in Table 8, the private sector is not yet ready for full involvement in these areas and requires additional time and capacity-building support to engage effectively. Water user fee management, research and development, and cost recovery are areas where the private sector is unlikely to be effective, given their current capacities, local contexts, and existing policy and legal frameworks in the country for irrigation development and management as discussed in section 8.

The consolidated preferences of experts and farmers regarding the entities best suited to manage activities across the value chain yield insightful findings. IWUAs are preferred to take the lead in system operations and management, system maintenance, and water user fee management as their primary responsibilities in line with their mandates but with adequate support as indicated in (Hagos et al. 2022). Private sectors are entrusted and preferred to carry out a broad range of activities, including system construction, distribution networks, credit and technology supply, availing processing units, providing transportation facilities, and purchasing outputs at the farm gate. However, as discussed from the findings to table 7 above, private sectors engagement in investments requiring high-capital and expertise should be phased in over time and requires adequate support from stakeholders in the sector. Meanwhile, cooperatives are believed to be better suited for managing input supply and the building of storage facilities. According to KIIs, the government should remain at the forefront of providing technical and agronomic advice, building water storage facilities, offering training and capacity building, facilitating access to markets, cost recovery, and information and communication provision.

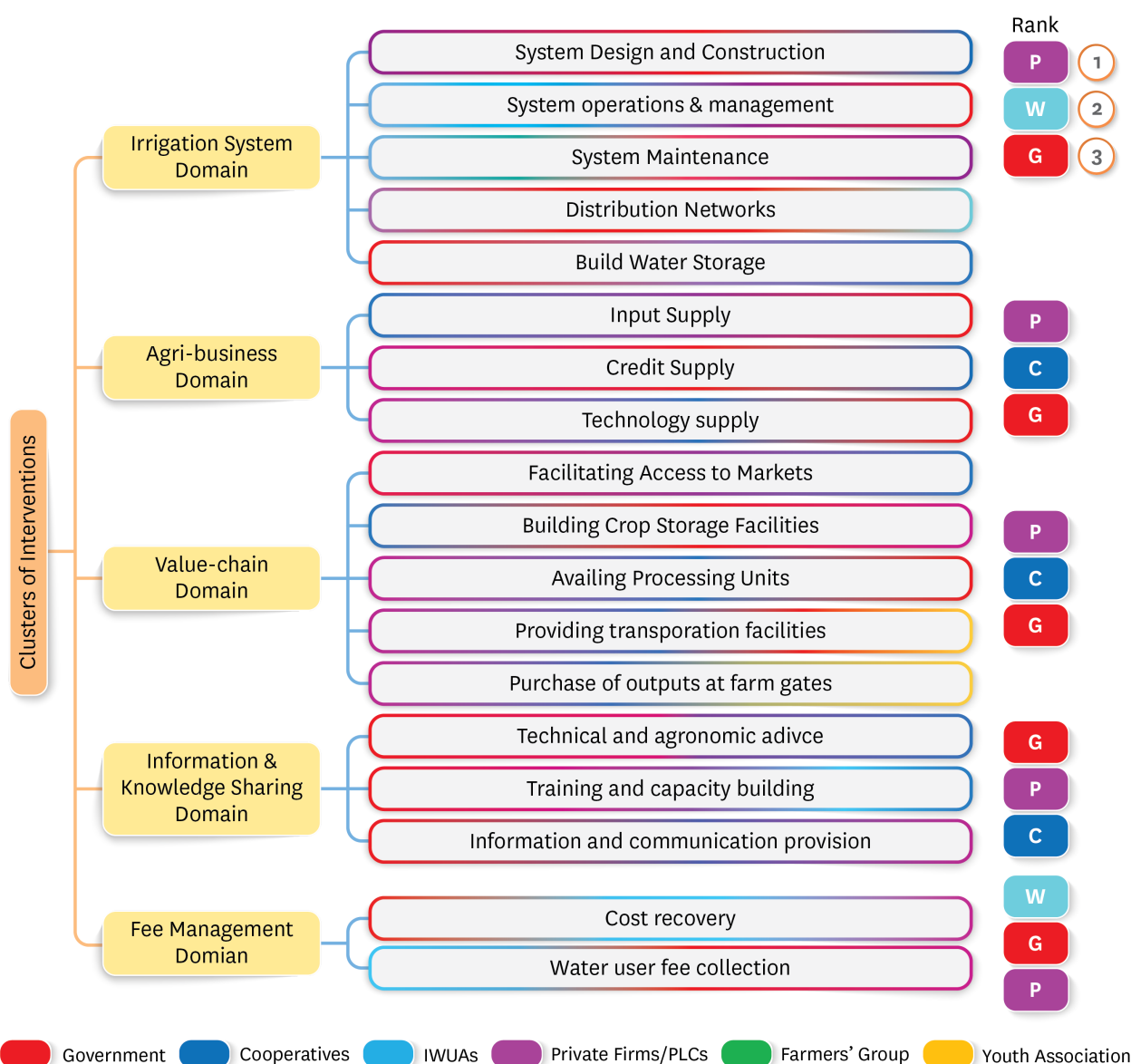
Table 8. Preferences of Stakeholder on possible private sector engagement.

Activity	Farmers			Experts			Overall		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd
System Design and Construction	P	C	G	G	P	Y	P	G	C
System operations & management	W	G	P	W	P	F	W	P	G
System maintenance	G	W	C/Y	W	P	F	W	G	P
Input Supply (for crop production)	C/G		P	P	C	G	C	P	G
Credit supply	G	P	C	P	C	G	P	G	C
Technology Supply	P	G	C	P	C	G	P	C	G
Technical and agronomic advice	G	W	P/C	G	P	C	G	P	C
Build Water Storage	P	G	W	G	P	C	G	P	C
Distribution networks	W	G	P	P	G	C/Y	P	G	W
Training and capacity building	G	P/C/W	G	P	W		G	P	W/C
Facilitating access to markets	G	C/W		P	C	G	G	P	C
Cost recovery	W	G		G	P	W/C	G	W	P
Water user fee collection	W	G		W	G	P	W	G	P
Building crop storage facilities	C	P	G	C	G	P	C	G	P
Availing processing units	P/C/Y/G			P	C	G	P	C	G
Providing Transportation facilities	P	C	G	P	C	Y	P	C	G/Y
Information & communication provision	G	W	C/Y	G	P	C	G	C	P
Purchase of outputs at farm gate	P	C	F/G	P	C	Y	P	C	Y

Source: Survey Results. Note: G = Government, P = Private Firms, W = IWUAs, C = Cooperatives, F = Farmers' Group & Y = Youth Groups

The findings in Table 6 underscore the critical importance of aligning stakeholder roles with their existing capacities and comparative advantages. With adequate support and guidance, IWUAs are well-positioned for localized tasks such as system management and maintenance, leveraging their proximity to end-users and community trust. Meanwhile, Private sectors are favored for high-capital and technology-intensive activities such as system construction and technology supply. However, the preferences reveal capacity gaps among cooperatives and private entities for roles such as financing, research, and water user fee management, which require additional support and regulatory clarity. By addressing these gaps through targeted interventions, PPPs can achieve a more balanced and efficient value chain for smallholder irrigation.”

Figure 4 categorizes the 18 activities listed above into five clusters, namely irrigation systems, agribusiness, value chain, information and knowledge sharing, and fee management domains. The results shown in Table 6 have been clustered into these five groups, and the preferred actors to be engaged in each domain have been ranked (1 to 3) based on their frequency of selection across the elements of the domain.



Source: Data from KII

Figure 4. Domains of Preferred Interventions for Private Sector Engagement.

In the irrigation systems domain, private firms and IWUAs ranked first and second, respectively, as preferred entities to run the activities according to the views of farmers and experts, followed by the government. Similarly, in both

the agribusiness and value chain domains, private firms and cooperatives ranked first and second, followed by the government. In contrast, the information and knowledge sharing domain is primarily entrusted to the government, followed by private firms and cooperatives.

The results indicate that private firms and cooperatives are perceived as capable and ready to engage in agribusiness and value chain integration activities, while the government is expected to continue providing information and knowledge sharing activities. These findings align with the views expressed by private sector actors regarding their preferred areas of engagement. Finally, IWUAs ranked as the first-choice actors to manage fee management domains, followed by the government and private sector.

The results are consistent with government policy support and experiences from other countries. However, the existing capacities of the ranked actors, along with inadequate support, incentives, essential rural services, and infrastructure, may constrain their effective engagement in these activities.

The private sector actors are not homogenous and found in different shapes. They have different visions, diverse interests and areas of business engagements. In this study, we have considered the private sectors to comprise of private companies, cooperatives/cooperatives' Union, IWUAs, Farmer groups and youth associations. However, the latter two are not common and, when they are present, they do not have stronger institutional and financial capacity to run businesses. Hence, the preferred points of entry for the private sector actors in smallholder irrigation is focused on private companies, cooperatives' Union and IWUAs. The private sector actors were asked about their preferred areas of engagement in PPPs for smallholder irrigation and development in Ethiopia.

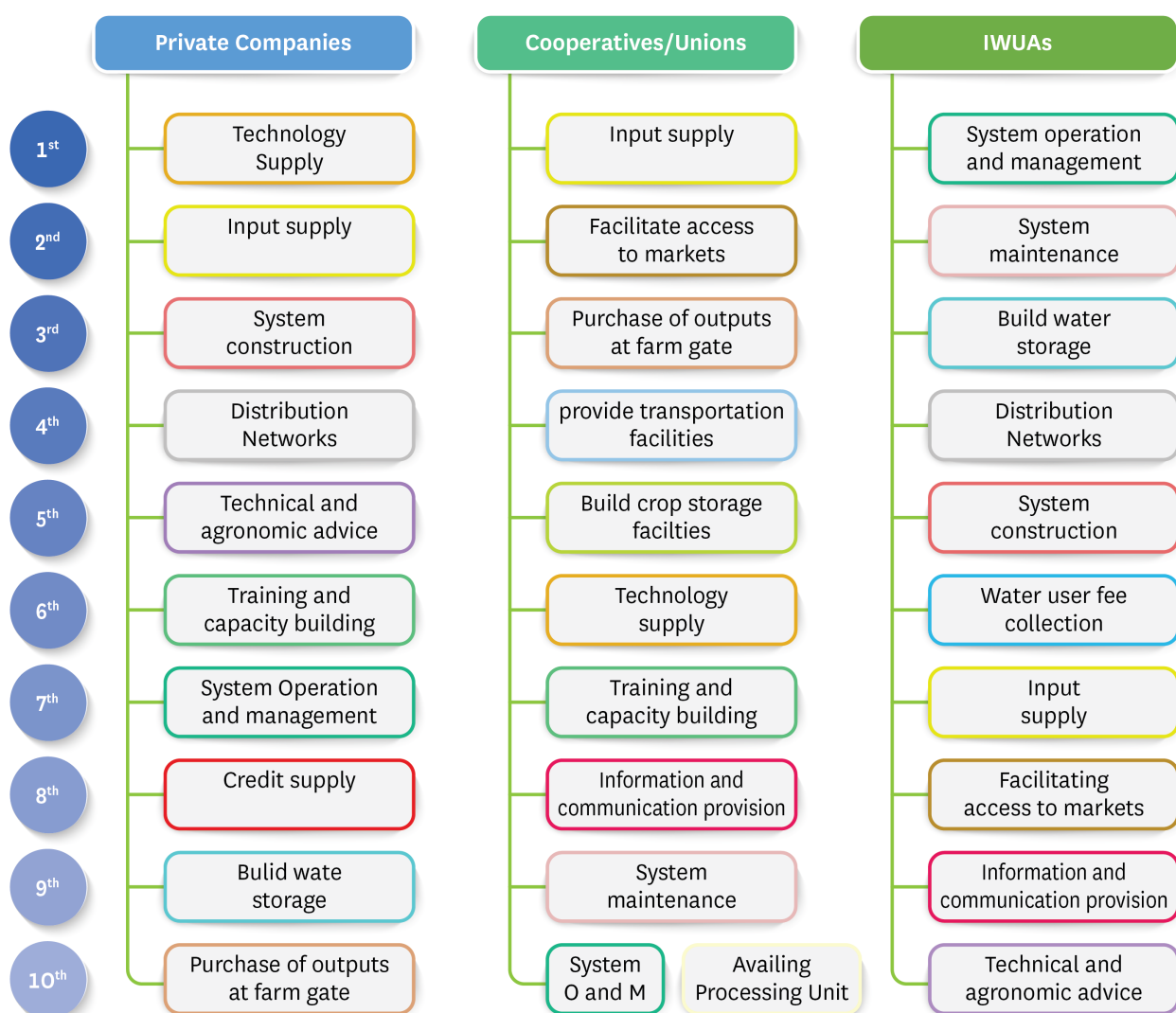
The private sectors are not homogeneous and consist of diverse actors. They have varied structures, visions, interests, and areas of business engagement. In this study, the private sector includes private companies (PLCs), cooperatives or cooperatives' unions, IWUAs, farmer groups, and youth associations. However, the latter two are less common and typically lack the institutional and financial capacity to operate as businesses.

Hence, the preferred points of entry for private sector actors in smallholder irrigation focus on private companies, cooperatives' unions, and IWUAs. The private sector actors were asked about their preferred areas of engagement in PPPs for smallholder irrigation development and management in Ethiopia. Figure 5 presents the private sector actors' ranking of their preferences for engagement in smallholder irrigation.

Figure 5 shows that the preferred areas of engagement are aligned with each actor's mission, mandates, and cumulative experience of engagement. Out of the 18 detailed points of entry included in the study, none of the three actors mentioned cost recovery as one of their top preferred areas for future engagement related to smallholder irrigation. This is likely because cost recovery is a new venture for the private sector and poses significant risks and challenges without strong legal and institutional frameworks, as well as an enabling environment. Lessons from successful pilot projects on cost recovery from smallholders for assets and services provided should be shared with private sector actors to encourage them to engage in this area.

Input supply and system operation and management are among the top ten preferred areas for future engagement under the PPP framework by all three parties. Ten other points of entry were mentioned by two of the three actors, while the remaining five activities were uniquely mentioned by one of the three actors.

Private companies preferred technology supply, input supply, irrigation system construction, distribution network construction, and technical and agronomic advice as their top five areas of engagement under the PPP framework for smallholder irrigation development and management, according to information from KIIs. However, private companies indicated potential interest in training and capacity building, credit supply, building water storage facilities, and purchasing outputs at farm gates in the future, provided they are supported with adequate incentives and an enabling environment in the irrigation sector. Among the top ten preferred areas of engagement, credit supply is unique to private companies.



Source: Data from KII

Figure 5. Preferred Points of Entry for the Private Sector in irrigation by private sector actors.

For cooperatives/unions, the top five preferred areas of engagement are input supply, facilitating access to markets, purchase of outputs at farm gates, providing transportation facilities, and building crop storage facilities. Cooperatives also expressed interest in engaging in technology supply, training and capacity building, information and communication provision, system operation, management and maintenance, and availing processing units.

For IWUAs, the top five preferred areas of engagement are system operation and management, system maintenance, building water storage, distribution networks, and system construction. While IWUAs may lack the institutional and financial capacity to engage in the latter three areas, the top two priorities align with their mandates and current responsibilities. Water use fee collection is also a key responsibility of IWUAs and ranks as their sixth preferred point of entry. Field observations and KIIs revealed that proper and regular water use fee collection has not yet started in the irrigation schemes visited, nor is it likely in other smallholder irrigation schemes in Ethiopia. Additionally, water measurement techniques are not currently in use.

Our KIIs indicated that IWUAs are currently collecting small amounts of money annually from users for maintenance purposes. However, this collection is based on users' willingness to contribute rather than the actual amount of water utilized. The funds collected by IWUAs have fallen short of covering the budget required for sustainable system maintenance. With better capacity and incentives, IWUAs expressed interest in expanding their roles to include input supply, facilitating access to markets, information and communication provision, and technical and agronomic advice.

However, field observations revealed that IWUAs lack the necessary institutional arrangements, office setups, and staffing to fulfill their responsibilities in an organized manner. Efforts to ensure the efficient utilization of water resources, particularly for effective irrigation system operation, management, and maintenance (OMM), require capacity-building initiatives. This includes strengthening the institutional and financial capacity of IWUAs and equipping and staffing their offices to meet required standards. Experiences from other countries, such as the Manyonyo smallholder irrigation scheme in Zambia, provide valuable lessons. In this scheme, users established a farmers' liability company, staffed it with appropriate expertise, and successfully managed the operations and maintenance of the irrigation system.

The preferences of stakeholders indicate a clear division of roles across the irrigation value chain. Private companies are best positioned for activities requiring technological expertise and financial investment, such as system construction and technology supply. Cooperatives excel in areas related to collective action, including input supply and storage management, while IWUAs are trusted for system operations, maintenance, and water fee collection. However, all actors face challenges related to capacity, infrastructure, and incentives, which must be addressed to ensure the success of PPPs in smallholder irrigation.

Policy interventions should prioritize building the capacity of IWUAs and cooperatives, addressing infrastructural gaps, and creating a conducive environment for private sector investment. Lessons from successful models, such as the Manyonyo scheme in Zambia, can provide valuable insights for implementing PPPs that balance stakeholder strengths and address systemic weaknesses.

9.3. Important Considerations in Implementing PPP in Smallholder Irrigation

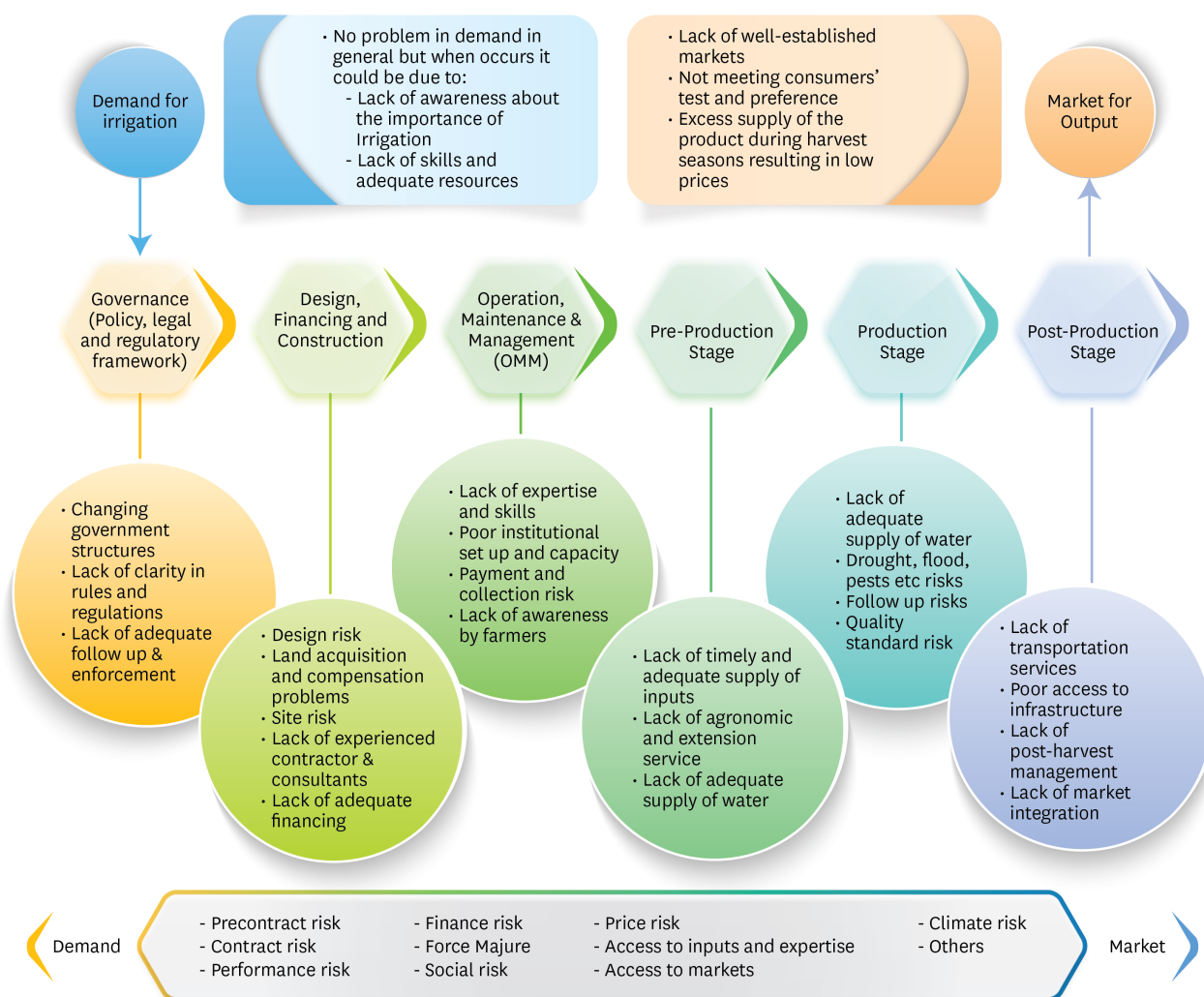
For the successful implementation of PPPs in smallholder irrigation development and management in Ethiopia, understanding the potential risks and assessing important factors and local contexts influencing their implementation is crucial. Hence, a comprehensive risk assessment must draw on literature, Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), and field observations. Besides, this section aims to clarify the potential strengths, weaknesses, threats, and opportunities related to the implementation of PPPs in smallholder irrigation through SWOT analysis.

9.3.1. Major Risks in Irrigation PPPs

The key factor that determines the successful implementation of PPPs in smallholder irrigation development and management is the way in which various risks related to the PPP arrangement are identified, allocated, and managed. Below are some of the important risks that should be given due consideration in the sector, based on KIIs, FGDs, empirical literature, and experiences of comparator countries around the world.

Irrigation PPPs can be constrained by many risks, starting from demand for irrigation water to the final production stage and markets. In Ethiopia, there is high demand for irrigation water. The demand is higher in areas where the benefits of irrigation are realized compared to where irrigation practices are unknown, indicating that awareness creation regarding irrigation practices and benefits is vital.

Understanding, evaluating, and managing risks related to governance; design, financing, and construction of irrigation systems; operation, management, and maintenance (OMM); pre-production, production, and market integration stages is crucial for the successful introduction and implementation of smallholder irrigation in Ethiopia. Details of risk taxonomy for irrigation PPPs in Ethiopia are discussed along the irrigation value chain in Figure 6.



Source: Author's Illustration based on findings of KIIs, FGDs and Literature

Figure 6. Important risks to be considered in the implementation of PPPs in irrigation.

9.3.2. SWOT Analysis

This analysis highlights the various factors that influence the implementation of PPPs and private sector engagement in Ethiopia's smallholder irrigation sector, providing insights into potential strengths, weaknesses, opportunities, threats, and contextual considerations. Table 9 summarizes the findings.

The successful introduction and implementation of Irrigation PPPs depends on various factors and existing contexts and capacities of stakeholder in the sectors. Understanding the strengths, opportunities, weaknesses and threats for irrigation PPPs is vital for their implementations.

Strengths: Irrigation PPPs benefit from favourable governance and policy frameworks, including high government commitment and incentives for private sector engagement, such as duty-free imports of agricultural equipment. Stakeholder consultations have also increased awareness of PPPs. Ethiopia's relatively abundant labor, arable land, and water resources create a conducive environment for irrigation PPPs.

Opportunities: Opportunities include increased investment in agriculture, job creation for rural youth, risk sharing, and capacity building through knowledge and technology transfer. PPPs also align with sustainable development goals by promoting efficient water management practices.

Table 9. SWOT analysis results.

 STRENGTHS	 OPPORTUNITIES
• Favourable Governance and policy Framework • Improved access to inputs, services, and technologies • Availability of abundant resources for irrigation • Huge demand and markets for agricultural products • Conducive social institutions and acceptance for PPP • Increasing capacity and interest of private investors to invest in irrigated agriculture.	• Enhancing investment and employment in Agriculture • Risk Sharing, Efficiency, and Innovation • Enhanced Management Expertise and capacity building • Transfer of knowledge, skills and technology • Market Integration and potential for creative finance • Contributes to sustainable development • Increased food security and rural income • Availability of International Funding and Technical Assistance for PPP • Increased opportunities for scaling up successful models
 WEAKNESSES	 THREATS
• Governance and regulatory challenges • Inherent Problems with PPPs in irrigation such as complex contractual arrangements, water right and land tenure issues, concerns of equity and accessibility • Low level of private sector development • Limited access to inputs, facilities and services • Lack of awareness and expertise on PPPs • Conflict of Interests among irrigation Stakeholders • Mental setup of smallholder farmers and attitude towards private sector • lack of well-defined special incentive modalities other than made for agriculture & agroindustry.	• Political instability or policy changes • Social resistance for private sector engagement • Risk of environmental degradation and over-extraction of resources & siltation of water structures • Specific PPP contracts may not be implemented • Potential for Inequity • Potential for water conflicts between commercial and subsistence users • Economic and market uncertainties • Freshwater scarcity and climate change • Potential for corruption and lack of transparency throughout the PPP implementation

Source: Compiled from KIIs, FGDs and Literature

Weaknesses: Key challenges include weak regulatory frameworks, limited institutional capacity, and a low level of private sector development. Limited access to affordable financing, inadequate rural infrastructure, and social resistance to private sector engagement further hinder progress.

Threats: Political instability, environmental degradation, and economic uncertainties pose significant threats. Lack of developing specific business model for PPP to appraise its feasibility in any specific irrigation project affects feasibility and sustainability. Corruption and lack of transparency in procurement and implementation also jeopardize long-term success.

10. Concluding Remarks

The irrigation sector in Ethiopia remains underdeveloped despite the country's significant potential in terms of freshwater resources and arable land. For many years, the public sector has been the primary financier and developer of irrigation projects, which has constrained sector growth, production capabilities, and the achievement of poverty

reduction and food security goals. However, recent efforts by the government and its partners to open up and encourage Public-Private Partnerships (PPPs) in the irrigation sector are commendable. The Government of Ethiopia has ratified policy guidelines and frameworks to promote PPPs across various sectors. The Ministry of Agriculture is currently drafting guidelines for PPP implementation in smallholder irrigation development and management in Ethiopia.

In this context, IWMI, in partnership with the Ministry of Agriculture and Ministry of Irrigation and Lowlands, conducted a study to assess stakeholder needs and guide the development of viable business models for PPPs in smallholder irrigation development and management, aiming to inform the PPP implementation guidelines for smallholder irrigation in Ethiopia.

The feedback from stakeholders—including government experts from relevant line ministries, government agencies, knowledge centers, development partners, private sector actors, and farmers—has provided valuable insights. Overall, there is consensus that the implementation of PPPs in the irrigation sector is both timely and relevant for fostering irrigation development and management in Ethiopia. The demand for irrigation water among farmers is high and continues to grow as they become more aware of the benefits of irrigation agriculture. The private sector has expressed strong interest in engaging in the irrigation sector, provided that the necessary policy incentives, infrastructure, public services, and financial services are in place.

Current smallholder irrigation practices in Ethiopia face numerous constraints, including gaps in governance, regulatory and institutional arrangements, limited private sector participation, insufficient access to agricultural inputs, public services, and rural infrastructure, lack of awareness and skills in irrigation practices, conflicts of interest among irrigation users (e.g., upstream and downstream farmers), weak institutional capacity within IWUAs, and negative attitudes toward private sector involvement in agriculture.

Given these challenges, PPPs could serve as timely and effective solutions to address the issues plaguing the sector. However, the success of PPP implementation in smallholder irrigation will depend on addressing the following key issues:

- **Comprehensive Policy and Legal Frameworks:** Irrigation PPPs involve numerous legal complexities, ranging from the frameworks that guide their structure to issues arising during implementation. These partnerships require coordination among diverse stakeholders with varying interests and the utilization of resources such as land and water. Greater clarity and refinement regarding ownership and user rights are essential. These resources often fall under the jurisdiction of different line ministries and agencies, further complicating coordination. To address these challenges, a comprehensive policy and legal framework must be established, drawing insights from global and regional experiences.
- **Institutional Setup and Capacity Building:** Addressing policy and legal frameworks alone is insufficient. The institutional setup managing irrigation PPPs must feature clear lines of command, innovative structures, efficient communication channels, and mechanisms for stakeholder coordination at federal and regional levels. Institutional capacity building—through expertise, resources, and technology—is essential. Corruption, bureaucratic inefficiencies, and lack of transparency must also be addressed to preserve institutional integrity.
- **Provision of Agricultural Inputs and Services:** Enhancing agricultural production requires more than irrigation water. Access to improved seeds, fertilizers, agro-chemicals, affordable rural credit, extension services, agronomic advice, and rural infrastructure (e.g., roads and electricity) is indispensable for successful PPP implementation.
- **Private Sector Incentives:** Irrigation investments often entail substantial initial costs and long repayment periods, potentially deterring private sector involvement. To attract private participation, governments should offer incentives such as tax holidays, land leases, financial guarantees, and duty-free import allowances for agricultural equipment and machinery.
- **Value Chain Integration:** Strong value chain integration is critical to realizing the benefits of smallholder irrigation PPPs. Without reliable market linkages, increased agricultural production may not translate into higher incomes, leading to dissatisfaction and skepticism about the value of irrigation practices.

- **Awareness and Capacity Building for Farmers:** Limited awareness among farmers and the public about irrigation PPPs can hinder acceptance and implementation. Pilot projects, awareness campaigns, workshops, and experience-sharing initiatives are essential. Training farmers to adopt investment- and risk-taking mindsets will also be key.
- **Effective Regulation and Monitoring:** Proper oversight is vital to prevent undesirable outcomes in PPPs. Without effective regulation, PPPs risk prioritizing profits over social and environmental goals, leading to inequality and potential exploitation of smallholders.
- **Strengthening IWUAs:** IWUAs play a pivotal role in irrigation PPPs but often lack the capacity to fulfill their responsibilities. Revisiting their organizational and staffing structures, improving financial resources, and providing professional expertise are necessary. IWUAs should function as independent legal entities, not merely as user committees. The government and development partners should establish clear standards, milestones, and timelines for IWUA institutional growth, with a focus on transitioning to cooperatives or unions.
- **Private Sector Readiness:** The private sector, comprising firms, cooperatives, unions, IWUAs, and other entities, varies in focus, capacity, and structure. Their roles in irrigation PPPs should be clearly defined and strategically managed. Private actors must organize themselves, identify business opportunities, and build institutional capacity. Simultaneously, the government must evaluate each actor's comparative advantages and provide targeted support for their involvement in smallholder irrigation development and management.

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Appendices

Annex A: Private Sector Requirements for Entering a PPP in Irrigation

Key concerns and dependencies	Scope to mitigate?	Remarks
Is it feasible to provide the services specified in the PPP service contract? Depends on the specification of services that government wants to be provided on a given scheme.	• The specification of service requirements needs to reflect the technical realities (e.g., the enabling engineering infrastructure) as well as the physical & social environment of the existing/ proposed scheme location. • The requirements have to be developed following negotiation between the government, private sector firms, and the users/farmers. • Private firms will only take on risks that they have some control over, the design of the contract/specification of services will need to take this into account.	Our assessment of the private sector is that many private firms have experiences in agri-business & value chain integration activities and are ready to join PPPs in such areas given favorable contractual arrangements. However, PPP for other points of entry might require capacity building, enabling environment and incentives: - Private firms may join PPPs in Design and system construction, OMM, water user fee management in the short run given capacity building, technology and system for water use and measurement, incentives and financial services. - However, private firms may join PPPs in training and capacity building, technical and agronomic advice, information and communication provision, and cost recovery in the medium term by working on both the firms and users such as capacity building, experience sharing, and other services & incentives. - Cost recovery for large investments may take a while and government needs to partly cover the cost/the gap.
Is it possible to obtain a reasonable rate of return from providing the services specified in the contract? Depends on the willingness and ability of farmers to pay for the services and the capital and O&M costs that it expects to incur to provide the services.	• Government may need to provide subsidies to cover the shortfall between what farmers are willing to pay and what is required to cover costs. • Depending on the capacity and willingness of the farmers there may be need for technical and financial support from government/ development partners to improve the quality of their farming practices and access to other inputs and markets to increase their incomes. • There may also be need for government to provide additional investment in supporting infrastructure to enable farmers to access markets.	
Are the risks of relying on farmers to pay service fees too high? Depends on the type of farmers being provided irrigation services by the scheme and the nature of the crops that they are producing.	• Government can agree to pay subsidies to provide some cover for the risks that the private firms would ordinarily face. • Potential to formalize a contractual agreement with an agribusiness that will agree to offtake a proportion of the farmer's agricultural produce for pre-defined prices. • Potential to provide technical support to the farmers to improve their farming practices.	It depends on where and for whom the service is provided. Large scale farmers may be able to pay for the services but not smallholder farmers at least in the short run.

Can government be relied upon to pay any subsidies on a consistent and timely basis? Willingness and ability of government to pay	- Does the government have a track record of adhering to the terms of PPP arrangements, if not government could consider providing guarantees and/or establishing a dedicated fund that could be used to provide the necessary payments. - Government may need to implement reforms to improve the existing enabling environment for the implementation of sustainable PPPs.	This depends on the availability of expertise, quality of administration, institutional and financial capacity of the regulatory body. This should be seriously taken into considerations.
Can I rely on government to enforce the terms of the agreed PPP service contract? The ability of government to design, implement and enforce a sustainable arrangement.		Enforcement is another challenge given the existing security and legal system, and institutional capacity. It might be necessary to have a different arbitration system for violations and enforcement than using the mainstream legal system.

Annex B: Government Requirements for Entering into a PPP in Irrigation

Key concerns and dependencies	Scope to mitigate?	Remarks
Are there enough potential private sector firms with track record to deliver required services to the necessary standard? Availability of private firms with a track-record/capacity to deliver services.	- Ensure that the service requirements for the PPP are realistic and specified clearly to attract relevant private sector participants. - Develop an effective procurement process that ensures that potential private firms are aware of the opportunity and can understand what is being requested.	Not many but it is possible to qualify/graduate many firms given government support/incentives, experience sharing, access to finance, rural infrastructure and other important preconditions
Will the private sector provide the services at the agreed level of quality on a sustainable basis? Provisions specified in the service contract and the ability of government to monitor and enforce those provisions.	- Develop an appropriate enabling environment in which it is possible to define and enforce a suitable service contract. - Identify a relevant government institution that can play the role of monitoring and enforcing the terms of the contract.	It requires strong commitment, institutional and regulatory capacity, transparency and accountability, expertise and others on the side of government.

Annex C: Farmers Requirements for Entering into a PPP in Irrigation

Key concerns and dependencies	Scope to mitigate?	Remarks
Are the farmers willing and able to pay service fees at the level specified in the service contract? Ability to generate enough income from farming activity to make it worthwhile to pay the required tariffs for accessing irrigation services. Ability of the private firms working with government to deliver the services specified in the contract.	- This is dependent on the market price that the farmers can get for their produce and the quantity of the produce that they are able to generate. The farmers might therefore need assistance to consider appropriate cropping plans and intensity (depending on whether it is feasible to do so given the agronomic conditions and whether markets and other supporting services are available) and more general support to improve the productivity of their agricultural practices. - Government may need to provide investment to support the improvement of the supportive infrastructure necessary to enable the farmers served by a potential scheme to access markets, research and innovation, market information systems etc.	There is no good experience of fee management and cost recovery in Ethiopia. This could be due to the low-income profile of smallholders and absence of water usage measurement. Hence, there is a need to create awareness about water resources management and strengthen institutional capacity, experience sharing and expertise on the side of private firms to carry out the service.

Source: Adapted from Mandri-Perrott and Bisbey (2016)

Annex D: Differences of PPPs, Out-grower Schemes and Contract Farming

Themes	PPPs	Out-grower schemes	Contract farming
Nature the Partnership	A formal collaboration between the public sector and the private sector to develop, finance, operate, or maintain agricultural infrastructure or services, such as irrigation systems.	A business arrangement where an agribusiness engages smallholder farmers to produce specific crops under agreed terms, often near a central processing or collection point.	A specific type of out-grower model where a buyer and farmers enter a formal agreement to produce and sell a particular crop.
Focus	Usually involves long-term agreements and includes a broader focus on public goods and infrastructure development.	Focuses on agricultural production rather than infrastructure, and smallholders maintain ownership of their land and farming operations.	Often, the agreement specifies quantities, quality standards, input provision, and pricing mechanisms.
Stakeholders	- Public Sector: Provides funding, policy frameworks, and regulatory oversight. - Private Sector: Invests in, develops, and/or operates infrastructure or services. - Farmers/Communities: Benefit from improved services (e.g., irrigation, access to water).	- Agribusiness: A central company organizes farmers to grow crops for its processing or marketing needs. - Farmers: Act as out-growers but retain autonomy over their land.	- Buyer/Contractor: Sets terms and provides inputs or technical support. - Farmers: Commit to producing crops under specified conditions.

Objectives	• Develop public infrastructure (e.g., irrigation systems, dams, roads). • Improve access to water, enhance food security, and boost agricultural productivity. • Promote sustainability through resource sharing and long-term planning.	• Secure a reliable supply of raw materials for a central business. • Enable smallholders to access markets and resources. • Focus on enhancing production efficiency for specific crops.	• Ensure a predictable supply of crops meeting specific requirements. • Reduce risks for both farmers (market access) and buyers (supply security). • Focus on aligning production to market demands.
Financial and risk distribution	• Public Sector: May provide funding, subsidies, or land and bear some risks (e.g., policy changes). • Private Sector: Shares investment risks, often earning through tariffs or service fees. • Farmers may pay for services (e.g., irrigation water fees) but don't directly bear infrastructure risks.	• Agribusiness often provides inputs (e.g., seeds, fertilizers) on credit, expecting repayment after harvest. • Farmers bear production risks but have market certainty for their crops.	• Farmers receive financial and technical support from buyers but are typically obligated to sell crops to the contractor. • Risks include price volatility if contracts aren't well-defined/honored.
Scale & Scope	• Typically, larger scale, focusing on infrastructure, technology, or resource management benefiting a wider community or region.	• Medium scale, often centered around a processing plant or agribusiness hub.	• Narrower in scope, focused on specific crops and individual farmer contracts.
Legal and Institutional framework	• Governed by detailed contracts between public and private partners, often with formal regulatory oversight.	• Managed informally or semi-formally by agribusiness entities, sometimes without legal contracts.	• Governed by legally binding contracts outlining roles, responsibilities, and penalties for non-compliance.



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