Institutional REFORM in Small-Scale Irrigation Development System in Ethiopia:

Lessons from Agricultural Growth Program (AGP)

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Executive Summary

- In Ethiopia, despite huge resource potential for irrigation development & policy support, the performance of small-scale irrigation development (SSID) is extremely low.
- Ineffective institutional arrangement, characterized by both market and government failures, is a binding constraint responsible for the poor performance of irrigation development.
- Using evidences from the performance evaluation of AGP and Asian experiences, this policy brief identifies gaps that fundamentally contributed to these institutional failures.
- The findings revealed that improving the performance of SSID to enhance its contribution for food security and employment generation in Ethiopia requires a public – private partnership (PPP) with the following essential features:
  - That maximizes the available comparative advantages of the state-owned enterprises and private firms;
  - That clearly defines the roles and responsibilities of key actors along the value chain of SSID system that significantly improve the effective, efficient & sustainable SSID system; and
  - Feasible organizational arrangement, with appropriate incentive structure and check - and - balance system embedded in it for accountability, for the effective implementations of the partnership

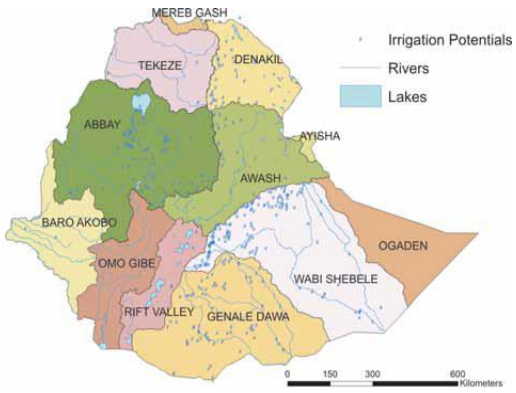
1. Background

Ethiopia's population is about 110 Million, the second most populous country in Sub Saharan Africa (SSA), with nearly 30% of the Population between 15 and 29, 70% of the population under 29 and a population growth rate as high as 2.5% in 2019[1]. The country achieved impressive progress in economic growth and poverty reduction with in the last one and half decade[1]. However, there has been limited structural transformation in terms of value - addition in sectoral share of GDP and occupational structure. The agricultural and service sectors account for 33.3% and 39.8% of GDP, respectively, whilst the industry sector accounts for only 28.1%, which in turn is dominated by the construction sector in 2018/19[2]. Agriculture, service and industry employment accounted for about 73%, 20% & 7% of total employed persons in the country, respectively[3]. Given that the agriculture sector remained a dominant sector and an important source of economic growth in the country, it could not match with the faster growth in domestic demand for food and contributed to increase in employment in the service and manufacturing sectors. This implies the need for giving due emphasis on how to enhance the contribution of agriculture to the overall economic development of the country.

Ethiopian agriculture is dominated by smallholder rain-fed farming, which makes it vulnerable to various shocks such as variable and erratic rainfall distribution. Experiences from Asian countries revealed that Irrigated agriculture can contribute to food security, has direct benefit to employment generation and present opportunities for reducing poverty[4,5,6,7]. Despite Ethiopia's huge potential for irrigated agriculture, its performance is still very low. Its total potential irrigable land is estimated to be around 3.7 million hectares[8]. See figure 1. However, the country developed about 4% of its potential. Even the performance of the existing irrigation schemes is on average 30% below their design estimation[8,9]. This indicates that both inadequate irrigation infrastructure and operational problems are major features of SSID in the country. Because of such low level of irrigated agriculture development, Ethiopia could not maximize the benefits from its sustainable development.

Evidences revealed that major issues contributing to operational problems in SSID system are related to problems in design, construction, and/or management of irrigation schemes[9,10]. However, these technical problems are still one side of the problem and are not the root causes for the poor performance of SSID in Ethiopia. Lack of appropriate institutional arrangement caused by inefficiency and ineffective service delivery is the key binding constraint contributed for the poor performance of SSID and for the technical problems. This calls for the need to identify the gaps that are fundamentally responsible for these institutional failures.

Figure 1: Irrigation potential of the river basins in Ethiopia



Source: Awulachew et al, (2007)

[1] Real GDP has been growing on average 10% per year between 2005 and 2018 and poverty reduced from 45% to 23% within the same period.

Accordingly, based on the experiences of Asian countries and the performance of AGP that has been implemented since 2011 in Ethiopia, this policy brief identifies fundamental institutional gaps that contributed to the poor performance of SSID in Ethiopia[2]. Based on the findings, it recommends that Public Private Partnership (PPP), with an effective incentive structure for the proper and effective implementation of SSID and which has check – and – balance system embedded in it, is the right institutional arrangement. Such arrangement does not only effectively fill the existing institutional gaps but it can also be efficiently implemented since it builds upon the current institutional capacity that takes into account the existing comparative advantages of the public and private sector. Besides, it is designed to enhance the contribution of SSID for attaining food security and employment generation.

2. Discussion: SSID performance and gaps

***Performance*:** AGP is a collaborative program between the government of Ethiopia and its development partners. It is majorly implemented by the federal and regional agricultural Bureaus[3]. The program, under its small-scale irrigation development component, is designed to address major challenges that the SSID faces: *inadequate irrigation infrastructure and inefficient utilization of irrigation water of smallholder farmers*. It does these by increasing areas of irrigated land and support to Irrigation Water Users Associations[9,10].

Towards these ends, various activities have been performed by the program over the last seven years[11,12,13]. To increase areas of irrigated land, a number of new small-scale irrigation schemes are constructed from surface and ground water sources and existing irrigation schemes are rehabilitated and upgraded. However, looking into the effectiveness of the program's implementation, the actual implementation of the program for increasing areas of irrigated land remains far behind its target[9]. For instance, only 31% of the target for construction of new irrigation schemes are completed in its second phase after two years of the program implementation. Besides, 13% of the target for construction of new irrigation scheme is under construction whilst about 56% of the target for new irrigation projects are under feasibility study, design or bidding phases[11]. On the other hand, the program performs better in improving utilization of irrigation water due to the establishment of new IWUAs and of improvement in skill of farmers to utilize irrigation water efficiently (11). However, this improvement did not significantly increase the proportion of farmers using irrigated-farming after seven years of the program implementation compared to before the program implementation[12]. Overall, the size of newly developed irrigated land is only 5% of the program's target. Consequently, the effectiveness of small-scale irrigation infrastructure development is rated as highly unsatisfactory by direct beneficiaries & subject matter specialists[11]. Generally speaking, despite huge investment, wide

[2] In this policy brief, small-scale irrigation development refers to the development of irrigated agriculture by smallholder farmers on total irrigable land of maximum of 300 ha in group, or with average land holding sizes per household is around 1 ha.

[3] AGP is a multifaceted investment program focusing on high agricultural potential areas. Its overall objectives are increasing agricultural productivity and commercialization of smallholder farmers and contributing to dietary diversity and consumption at household level. AGP is being implemented in more than 165 woredas selected from 7 national regional states (Tigray, Amhara, Oromia, SNNP, Benshangul Gumuz, Gambela and Harari) and Dire Dawa since 2011 in two phases. The first phase was implemented between 2011 and 2016, and its second phase is between 2016 and 2020 (9,10). Development partners of the GoE contributed the financing of the program and closely follow its performance under the umbrella of the World Bank

geographical coverage, high demand from direct beneficiaries and its potential benefit for agricultural productivity and employment generation, the performance of the Irrigation development component of the program is ineffective and rated as below average by beneficiaries[4].

Institutional gaps in SSID: A number of gaps are identified for the low performance of the SSID component of AGP. The gaps are generally related to both market and government failures. Understanding the sources of these failures are necessary for designing feasible policy to address the problem. These are summarized as follow:

(i) *Missing market originated from the shortcomings related to the program design*. Despite the fact that the country is endowed with huge and diversified potential for irrigation development at various scale, the program only focuses on river potentials, and excludes underground and micro-dams. Besides, it does not allow irrigation development beyond 15-meter dam height, indicating that the program ignores the topographic diversity of the country in determining the height dam for irrigation development.

(ii) *The missing market problem can also be explained from absence of irrigation technology and their services*. Despite huge demand from smallholder farmers for mechanized irrigation technology, absence or shortage of mechanized technology is a severe problem all program areas. This problem affects the productivity and food security contribution SSID. Besides, it hinders its contribution for generating employment opportunity for the unemployed urban and rural youth. Moreover, where there are such technologies, the market could not deliver and, thus, affects the linkage between irrigation development and the non – farm economy. On the other hand, missing of such irrigation technology in the market could be due to government failure since the state could not create incentives for the private sector to supply the technologies despite huge demand. Another example for government failure is that even if many technologies are demonstrated at Farmers' Training Center, farmers are not adopting them due to low-quality in-service provision by the local governments because of lack of motivation among government staffs due to poor incentive mechanism.

(iii) *Market imperfection due to low capacity* of the private sector to participate in the construction of irrigation schemes is also another major feature of market failure in irrigation development. This not only creates problems in delaying the construction of irrigation schemes but also that it makes the quality of irrigation schemes to be below standards and thereby creating inefficiency in resource utilization and technology use. Evidence shows that irrigation schemes have problems in design and structure, implying that the very objective of the program in addressing such problems could not be met. Besides, the market for private contractors particularly in irrigation development is characterized by oligopolistic nature.

[4] This low performance of the program is only related to the Small-Scale Irrigation component of the program. It does not show the actual impact of the program on its development objectives (agricultural productivity and commercialization)

Few numbers of private companies exist in the market and the firm size is also small. In addition, high transaction cost arise from lengthy process in the procurement of private contractor characterizes the market. This creates inefficiency in delivering the required output. High transaction cost is also associated with the inefficiency in the legal system in handling any contractual breakage. The system is also vulnerable to rent seeking behavior. These features of both the public and private sector expose the SSID system to malfunction and corruption.

(iv) *Inefficiency in resource use*: The current model shows that the public sector involves both in regulatory and operation work SSID in Ethiopia. Relative to the private firms engaged in SSID, the public sector has better capacity in terms of human resources, materials and financial resources. In all regional states, there are water works and design enterprises, which have been operating in water works including SSID for many years. Consequently, they have rich experiences with well-structured organizational structure. They have also better capacity in technical experts, irrigation development equipment such as construction machineries, wheel diggers, excavators, compactors, concrete machines, vehicles and measurement equipment, etc and financially. However, they are characterized by full of inefficiency in their operation and regulating the SSID system majorly due to poor incentive mechanisms and performance evaluation system. These public enterprises are also suffering from principal – agent problem. On the other hand, the private sector by its nature is efficient due to its profit motives. It has also attractive incentive mechanisms to its employees and better monitoring and evaluation system. These behaviors are essential elements that make the private sector more efficient. However, it has poor capacity in terms of executing projects that have various scales and size due to lack of qualified manpower, capital and financial capacity. These existing features of the public and private sector show that resources are used inefficiently due to misallocation of public resources, which significantly contributed to the poor performance of SSID system.

(v) *The externality and public good nature of irrigation water is an essential element in the institutional arrangement of the SSID system*. First, the cost of delivering irrigation water is not fully covered by the users[14]. Rather, it is the operation and maintenance of the irrigation schemes that will be covered by the users. Second, construction of irrigation schemes has negative externality to the environment and health. Third, inefficient use of irrigation water by the upstream users has negative externality to the downstream users as it reduces water availability for the later particularly in river diversion irrigation schemes. Such public good nature of irrigation water implies that its development requires active state interventions with well – designed operational rules and the required capacity to monitor its

implementation and enforce when there is incompliance from its efficient and sustainable use. However, the existing situation shows inefficiency in regulating the overall system including irrigation water utilization that resulted in conflict among users.

3. Policy options and recommendations

As described above, both market and government failures are responsible for the poor performance of SSID in Ethiopia, implying that the binding constraint for improving the performance of SSID is lack of the 'right' institutional arrangement. That is, absence of institutional arrangement that (i) enhance the role of the private sector along the value chain of increasing access to irrigation infrastructure including feasibility study, design & supervision, construction & maintenance of SSI schemes and supply of irrigation technology; (ii) improve the effectiveness of service delivery by the state as a regulatory body with an effective incentives structure that can monitor and regulate the quality and effectiveness of irrigation infrastructure; (iii) that promote the supply of the right irrigation technology with an effective incentives structure; and (iv) regulates the proper implementation and efficient use of irrigation water and its practices to minimize the negative externalities associated with public nature of SSID system. In this regard, the WRM policy for irrigation development promotes developing appropriate institutions that builds the required capacity in the SSID system[14].

With the findings of the study discussed above and their implications, the right and appropriate institutional arrangement should, therefore, be seen from the perspective of efficient, effective and sustainability of (1) improving the performance of SSID system; (ii) utilizing the existing human resource, physical capital and institutional capacities; and (iii) with the overall goal of enhancing the contribution of SSID for attaining food security and employment generation in the country. Seen from these three perspectives, the *right institutional arrangement is to adopt a Public Private Partnership (PPP) with the following essential features*:

(i) *Clear and focused role that improve the efficiency & effectiveness of the regulatory & operational work of SSID*. This requires that the partnership should have feasible organizational arrangement with clear roles and responsibilities and improve accountability for the key actors. That is, improve the public sector to deliver effective services and minimize the negative externalities associated with irrigation development by making its role more focused and creating appropriate incentive structure, on the one hand, and enhance the role of the private sector along the value chain of operational part of the SSID, on the other hand. Accordingly, for the full and meaningful participation of the public & private sector (as promoted by the water sector policy of Ethiopia), three models can be identified. The first option is for the public sector to focus its scope of responsibility on a regulatory work (& fully or partially financing of SSID) whilst the private sector to focus on the operation part of the SSID system. The second option is for the public sector to focus on irrigation office facility management and regulatory work while the private sector will work on the technical part of the operation. That is, out - sourcing only the technical aspect of the operation part of SSID for private firms. The third option is a modification of the existing model in that the public sector keeps both the regulatory and operation part of the work but creates an internal motivational mechanism for its staffs by

designing appropriate incentive structure. Table A1 in annex outlines the major roles under the 'regulatory' and 'operation' part of the SSID system as defined in this policy brief. Accordingly, we recommend the following on the role of the public & private firms

1. The roles of the Public sector should be (a) Serve as bank for irrigable land[5]; (b) Initiate access to irrigation infrastructure and make available a menu of irrigation development projects for the local community; (c) develop rules/regulations for operational part of the SSID system, provide license for private firms engaging in operation of SSID and monitor and regulate its implementation; (d) develop irrigation water use regulation, and monitor and regulate its implementation; (e) develop rules for water users' associations, provide license to WUAs and regulate its operation; (f) develop regulation for and approve kind of irrigation technology appropriate for the local areas based on their economic, environmental and water – use rights.
2. The role of the private sector should be on operation part of SSID. These include (a) feasibility studies, Surveying and design & supervision the construction of irrigation projects; (b) Construction of irrigation schemes; (c) Multiplication and distribution of irrigation technologies; and (d) Repair and maintenance of SSI schemes and/or irrigation technologies[6].

(ii) *Improve the capacity of the private and public sector to effectively perform their duties and responsibilities by maximizing the existing comparative advantages of the state-owned enterprises and private firms*. In this respect, the institutional model for an effective PPP should be the one that builds the capacity of the private sector with minimum additional cost. Evaluated from these criteria, three options (capacity transfer/building models) are identified. The first model is to fully transfer the existing irrigation facilities and equipment to private sector, with access to credit market (*Full Model*)[7]. The second model is to partially transfer irrigation facilities and equipments to private sector, with access to credit market (*Partial Model*); and the third option is to arrange an internal fee sharing mechanism for internal staffs for the use of irrigation facilities and equipment on top of their basic salary (*Fee Sharing Model*). See Table 2 for their description.

(iii) *Creating a competitive market for operational part of the SSID.* This means that the PPP arrangement should also have a self – regulatory system for efficient, effective and sustainable improvement of access to SSI infrastructure, irrigation water utilization & service delivery and generating employment by creating a competitive market for operation of the SSID. Such arrangement will have an internal check and balance system built in it since there are three agents involved in the SSID system, each with its own objective function and constraints to make optimal decision. This makes each of them accountable for their actions. These are (a) the public sector act as a regulatory body; (b) the private firms that engage in the marketing/selling of services (e.g. feasibility study, design and

[5] This role will have advantage in minimizing the incapability of local community to access adequate SSI schemes due to their current socioeconomic situation. That is, creates equal opportunity for all local communities given their resource potential.

[6] The private sector can also engage in generation of irrigation technologies if such technologies have no a public good nature/can be freely traded in the market.

[7] The Water sector policy for irrigation development also promotes access to credit facilities and bank loans for the development of irrigation schemes in Ethiopia (13).

supervision of irrigation projects) and goods (e.g. construction of irrigation schemes, supply of irrigation technologies); and (c) the local community as consumers (upstream smallholder farmers/ final users of the scheme and irrigation water with their own objective of maximizing the benefit from accessing irrigation schemes and downstream who have the same objective with more concerned with the efficiency of irrigation water use by the upstream).

Table A2 in annex describes the three models and the existing model with the advantages and disadvantages of the models from four perspectives in building efficient, effective & sustainable SSID (i) role and responsibility, (ii) capacity, (iii) competitiveness and (iv) outcome of the SSID system (Access to quality SSI infrastructure, efficiency in irrigation water utilization and creating opportunity for employment generation). Evaluating the four institutional options from these perspectives, the most preferred model is institutional model one (The full model). This is followed by model two and model three. The least preferred model is the baseline model which is the existing one.

Annex

Table A1: Key Activities of Regulatory and Operational Part of SSID System

Regulatory works of SSID	Operational works of SSID
a) Serve as bank for irrigable land in collaboration with the local community; b) Initiate access to irrigation infrastructure and make available a menu of irrigation development projects for the local community; c) Develop rules/regulations for operational part of the SSID system, provide license for private firms engaging in operation of SSID and monitor and regulate its implementation; d) develop irrigation water use regulation, and monitor and regulate its implementation e) develop rules for water users' associations, provide license to WUAs and regulate its operation f) Develop regulation for and approve kind of irrigation technology appropriate for the local areas based on their economic, environmental and water – use rights;	a) Feasibility studies, Surveying, design and supervision of irrigation projects; b) Construction of irrigation schemes; c) Multiplication and distribution of irrigation technologies d) Repairing and maintenance of irrigation schemes/technologies.

Table A2: Comparison of Institutional modals for PPP arrangement in SSID system in Ethiopia

Model	Model definition	Role of the Public sector	Roles of the private sector	Capacity	competitiveness	Outcomes
Baseline model:	Existing situation	- Operational and regulatory work	- Engage in operation of irrigation development with little technical and resource capacities	- The SOEs have better capacity in terms of (i) irrigation facilities, (ii) human power & (iii) financial resource as the government directly procures services from the SOEs. - The private sector has low capacity	- Inefficient: The market structure for operation of SSID is imperfect due to few numbers of private firms and direct procurement of the service from SOEs	- Inadequate SSI infrastructures & Low quality of existing SSI schemes due to low capacity of the private sector in design, scheme construction - inefficiency in Irrigation water use - low contribution for food security & employment gene.
Model One: Full Model	Full transfer of the irrigation facilities such as construction machineries, wheel diggers, excavators, compactors, concrete machines, vehicles and measurement equipment, hand tools as well as drips, sprinklers, plastic geo-membrane, motorized pumps, etc through open and transparent bid. this modality is to fully transfer the operation part of irrigation development, with access to credit market.	- Focus only on regulatory works - Creating demand for goods and services along the value chain of SSID by identifying SSI infrastructure development lands with local community	- Operational work of SSID is sole responsibility of the private sector/market	- The public sector will have a more focused role with appropriate incentive structure, which will build its monitoring and implementation capacity. This will enable it to deliver effective service. - The private sector will have better capacity and market – based incentive mechanism will be built in. These will enable to deliver efficient service	- The competitive power of private firms will be improved due to the improved capacity; - The market for operation of SSID will be competitive since many firms will entry the market - Low transaction cost because of effective service delivery from the regulatory body	- Improved access to better quality SSI infrastructure due to better market efficiency & effectiveness in service delivery by the public sector and - improve efficiency in use of irrigation water due to better regulatory capacity - better employment opportunity created from improved market for operation of SSID and improved access to SSI schemes
Model Two: Partial Model	Partial transfer of irrigation facilities through Renting. This transfers only the technical part of the operation of irrigation development to group of individual consultants or firm, which will pay rent for the use of irrigation facilities. with access to credit market	- Focus on irrigation facility management - Regulatory work including identifying SSI infrastructure development lands with local community	- Engage only in the technical part of the operation	- The Capacity of the public sector will be incrementally improved and service delivery will be effective in the short term but not in the long run due to risk of principal – agent problem & inefficiency in facility management - The capacity of the private sector will also be incrementally improved only in the short term due to cost minimization motive of the firms	- The market will be imperfect since only the existing firms will compete	- Access to better quality of SSI schemes may be improved in the short term. - Efficient use of irrigation water may be regulated better in the short term - There may be little chance of improving employment opportunity in the short term

				- there may be inefficiency in service delivery since irrigation facility management is the role of the public sector		
Model Three: Fee sharing model	This is creating incentive structure to the employees of the SoE based on fee – sharing modality. The staffs who engaged in the operation of irrigation development will earn X% of any component of the investment cost (e.g. the professional fee) or net revenue based on a predetermined agreement between the employee and the employer.	- Engage in both operation and regulatory works including identifying SSI infrastructure development lands with local community	- Individual consultant may be engaged in part of the operation work as needed. This happen if the SOE has shortage of experts	- Motivates the staffs of the SOE, which may have little improvement in service delivery - No change in the capacity of the private sector	- The market will remain uncompetitive and thus inefficient - Little change in regulating and monitoring of the implementation of SSID system	- Even if this model is better than the existing one, both the management of the operation work and regulatory is still under the SOE. Thus, the overall effect may be only little change in access to SSI infrastructure; and irrigation water use efficiency. - No change in employment opportunity

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