International Water Management Institute

Water Issue Brief - 25

Putting research knowledge into action

Adaptive Innovation Scaling - Pathways from Small-scale Irrigation to Sustainable Development

Determining the marketing margin for irrigation technologies in Ethiopia: A supply chain analysis

The context

Irrigation, particularly farmer-led irrigation, has significant potential to increase crop productivity and improve the livelihoods of smallholders (see, e.g., Burney et al. 2013; Hagos et al. 2017; Passarelli et al. 2018). In sub-Saharan Africa, only 7.7% of the total agricultural land is irrigated (Malabo Montpellier Panel 2018). Ethiopia, the focus of this brief, has concrete plans for irrigation development, aimed at raising and sustaining agricultural productivity and cushioning households against droughts and climate variability (FDRE 2010; NPC 2016). Although the adoption of irrigation technologies is increasing, widespread use is hampered by underdeveloped supply chains, weak competition and high marketing margins that prevent smallholders from accessing these technologies.

Key messages

- The supply chain for irrigation technologies is short, competition is limited and the marketing margin is high.
- Three types of motorized and manual irrigation technologies were reviewed. The estimated marketing margin ranges between 12% and 60% for solar-powered pumps, 23% and 50% for fuel-powered pumps, and is more than 70% for rope and washer pumps.
- Addressing entry constraints and designing incentives are crucial for developing the supply chain and enhancing competition to bring down the prices of irrigation technologies for smallholders.

Key issues

Irrigation development requires the design and implementation of appropriate water management interventions and the supply of affordable water-lifting, conveyance and application technologies. This may require building and improving distribution networks, and enhancing irrigation equipment repair and maintenance services (Malabo Montpellier Panel 2018). It is envisaged that the private sector will play a critical role in contributing to these areas (African Union 2020). This is based on the assumption that governments can use their resources more efficiently if the private sector provides financial support, shares risks, introduces technical expertise and increases sustainability along irrigation technology supply chains (Mandri-Perrot and Bisbey 2016). However, private sector irrigation technology suppliers have a limited presence in most developing countries. In addition, they rarely target smallholder farmers, particularly women and youth, who are seen as high risk (IWMI 2023). At the same time, most smallholders cannot afford the upfront cost of buying irrigation technologies, and few financial products are available that meet these farmers' credit needs and profiles.

In Ethiopia, the shortage of foreign currency means that suppliers, where they exist, do not hold stocks of pumps and accessories. Unclear import duties

Farmers with a solar-powered pump in Arba Minch, Ethiopia (*photo:* Desalegne Tadesse/IWMI).

and tax exemptions coupled with lengthy import procedures further slow the diffusion of irrigation technologies, contrary to the objectives stated in agricultural policies. To provide a clearer understanding of these issues, the International Water Management Institute (IWMI) analyzed the supply chain for selected motorized and manual irrigation pumps. The aim of the study was to characterize the actors involved throughout the process from importing the pumps to supplying them to end users, and to identify the effect of the structure of the supply chain on the marketing margin and sales price (Hagos et al. 2022). The study was conducted under the Innovation Lab for Small-Scale Irrigation (ILSSI) project and the CGIAR Research Program on Water, Land and Ecosystems (WLE), which ended in December 2021. The results of the study were used as a basis to make recommendations for an enabling environment that is more favorable to the supply and diffusion of the pumps reviewed.

What is a marketing margin?

A marketing margin refers to the difference between what a company pays for a product and what it charges for the product. The term 'marketing margin' is used because it is often the role of a distributor or other actor in the supply chain to market the product, even if it does not produce the product. There may be several such actors, including manufacturers, importers and retailers, each of whom incur costs and reap financial rewards as the product moves along the supply chain. A marketing margin is distinct from a profit margin, which is the percentage of the final sales price that a company earns as direct income. However, companies use the marketing margin as a way of measuring profitability. A high marketing margin reflects a high level of profitability. For end users, it also means a high purchase price.

Marketing margin and cost structure

Data for the study were collected through online, telephone and face-to-face interviews conducted with key pump suppliers in the Ethiopian capital Addis Ababa. Additional data on (import) prices and manufacturing costs were gathered from online research and by conducting a literature review. The pumps selected for this study were based on the technology's popularity in policy and development programs, and on the business and market environment. Although there is policy support for wider use of solar-powered pumps, the solar sector in Ethiopia is still nascent.

Various factors in the supply chain and enabling environment influence the marketing margin and its cost structure. These factors include complex financial regulations and tax regimes, complicated import rules and poor market infrastructure. Moreover, irrigation technology importers, manufacturers and distributors are confronted with the uneven application of existing regulations and standards as well as limited access to credit for developing markets (Poole 2017).

Calculating the marketing margin

Based on Mendoza's (1995) formula for calculating the marketing margin for food crops, we devised two formulae to calculate the marketing margin for irrigation technologies. The first formula was used in instances where a given actor serves simultaneously as an importer, wholesaler and retailer:

$$MMssc = \frac{(\text{sales price} - \text{marketing cost}) - IP + IC)}{\text{consumer or sales price}} \times 100$$

where: MMssc is the marketing margin of imported irrigation technology, *IP* is the import price and *IC* is the import cost.

The second formula was used in instances where the pumps are locally manufactured, e.g., rope and washer pumps, and a given actor serves simultaneously as a manufacturer, wholesaler and retailer:

$$MMlp = \frac{(\text{sales price} - \text{marketing cost}) - MC}{\text{consumer or sales price}} \times 100$$

where: MMlp is the marketing margin of locally manufactured irrigation technology, and *MC* is the manufacturing cost.

The results indicate that the supply chain – which covers importation, manufacturing, distribution and use – for motorized pumps (petrol, diesel and solar) and manual rope and washer pumps is short. In other words, an importer or supplier of irrigation technologies and the wholesaler and retailer is the same company, with the occasional use of middlemen as the final link to end users. A short supply chain can benefit end users, as there is a smaller number of actors in the chain requiring a share of the marketing margin. In the Ethiopian context, however, the involvement of only a few actors makes the market structure more monopolistic and, therefore, less competitive.

The estimated marketing margin for the pumps reviewed ranges between 12% and 60% for solar-powered pumps, 23% and 50% for fuel-powered pumps, and is more than 70% for rope and washer pumps. The basis for these estimates is described for each pump type below.

Solar-powered pump supply chain

In the case of solar-powered pumps, the supply chain is composed of five or six ***import suppliers*** (GIZ 2020). These companies import and retail these pumps, provide site selection, installation, operation and maintenance (O&M) services (or use agents), train service providers and sell pumps directly to end users or indirectly through brokers, government

agencies and nongovernmental organizations (NGOs). The structure of the solar-powered pump supply chain is shown in Figure 1.

Brokers usually provide last-mile service delivery by connecting suppliers with smallholder farmers. Brokers earn a commission for this service.

Government agencies and NGOs are important actors in the supply chain. The government (regional and federal) buys irrigation equipment via tenders and favors cheaper products. Suppliers who sell high-quality and more expensive pumps rarely participate in tender bids. There are cases where suppliers (e.g., Solar Village) sell pumps to development organizations/projects (e.g., Ethiopian Agricultural Transformation Agency [ATA]) and NGOs to be distributed to end users, sometimes for free (Gebregziabher 2019).

Farmers are the end users and mainly obtain solar-powered pumps via subsidy schemes provided by government agencies and NGOs (IWMI 2018). A very small number of farmers use these pumps, and it is estimated that 1,500 solar-powered pumps were sold in the past 5 years (GIZ 2020). More than half of the users are smallholder farmers irrigating an area less than 1 hectare while the remaining are nonagricultural (e.g., construction) companies.

Marketing margin for solar-powered pumps

Table 1 presents six solar-powered pumps that were selected for this study. Suppliers prefer submersible pumps to surface pumps because they can abstract water from various groundwater depths (GIZ 2020). All pumps are delivered with panels, a panel frame and cables, and come with a one- or two-year warranty.

The ***estimated marketing margin*** for the solar-powered pumps considered ranges between 12% and 48%, except for Grundfos, which is 60%. The latter percentage, which is exceptionally high, may be due to a lower import price and high sales price. The initial investment required to purchase a solar-powered pump is typically too high for smallholder farmers. The sales price of the Futurepump SF1 and SunCulture Rainmaker models may be favorable to smallholders, but they have limited capacity when it comes to the land area that can be irrigated.

The ***cost structure*** of the marketing margin includes import price, import duty, value-added tax (VAT) and marketing

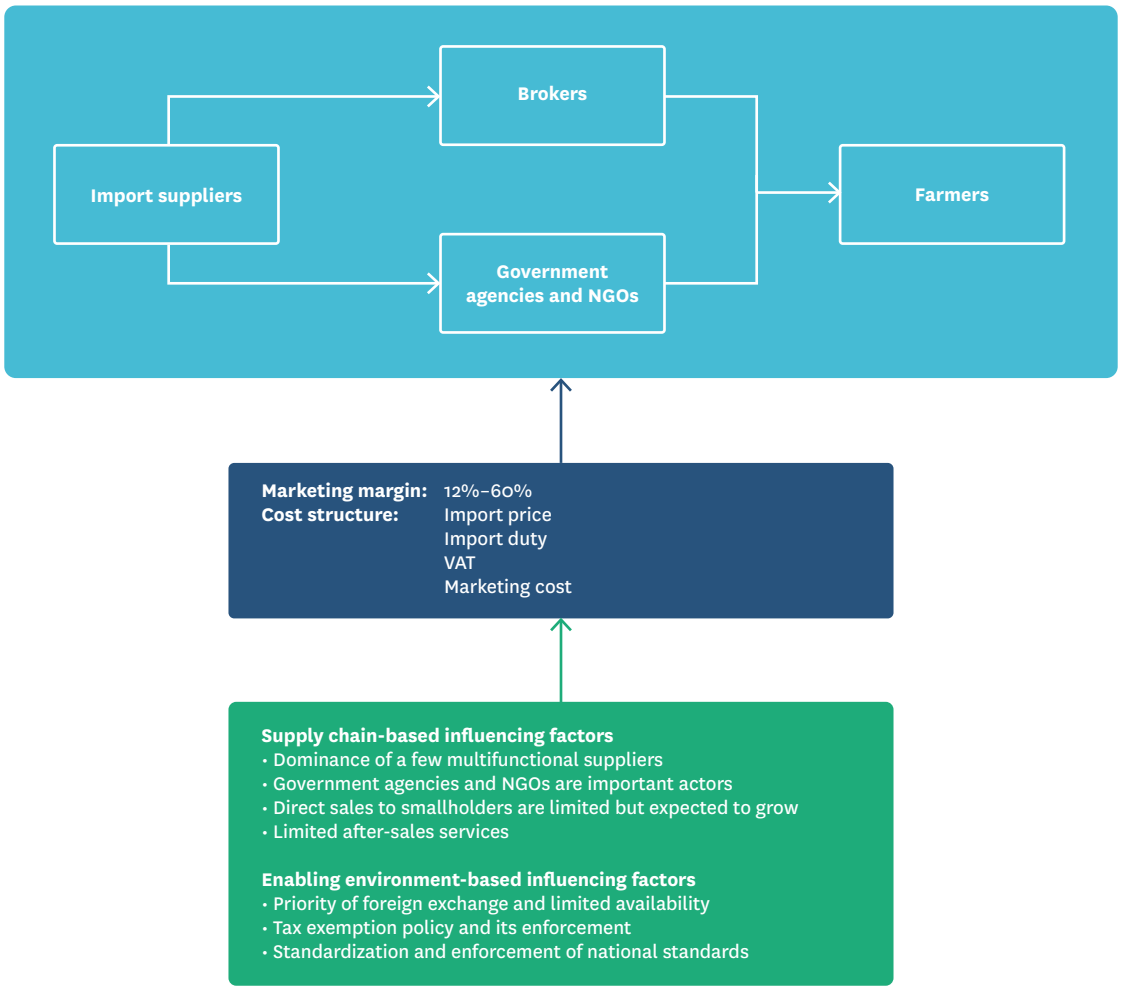

Figure 1. Solar-powered pump supply chain: structure, costs and influencing factors.

Table 1. Solar-powered pumps: models supplied, quantity sold, sales price and marketing margin in 2019/2020.*

Model and brand	Quantity sold	Warranty (year)/ unit	Import price (ETB)/ unit	Import duty (ETB)/ unit	VAT (ETB)/ unit	Marketing cost (ETB)/ unit	Sales price (ETB)/ unit	Marketing margin (%)/ unit	Anticipated profit (%)	Agent's commission (%)/unit
Futurepump SF1	800	1	18,500	0	2,275	Unknown	24,500	13	20	15
SunCulture RainMaker (submersible)		2	33,896	8,000	5,084	Unknown	85,000	45	20	15
RainMaker2S with ClimateSmart battery (20 meters)	16	2	65,022	0	0	Unknown	50,000	12	20	15
RainMaker2C with ClimateSmart battery (30 meters)		2	38,235	0	0	Unknown	65,000	48	20	15
RainMaker2C with ClimateSmart battery (submersible) (500 meters)		2	49,715	0	0	Unknown	85,000	33	20	15
Grundfos SQFlex 2-5-2	5	1	45,517	0	6,828	Unknown	130,000	60	n.a.	15

Notes:
* Exchange rate was USD 1 = ETB 32.7071 in 2020.
n.a. = not applicable.

cost. Marketing-related transport and storage costs, perhaps strategically, were underreported by the suppliers in the study. Importing and marketing solar-powered pumps, per unit quantity, incur the highest costs.

Factors influencing the marketing margin

Several **supply chain-based factors** influence the marketing margin of solar-powered pumps. The main factor among them is the ***dominance of a few multifunctional suppliers***, resulting in weaker competition and higher prices even though the supply chain is short. Clearly, the benefits of short supply chains are not passed on to farmers. Another issue is market distortion through the distribution of free pumps. This reduces the number of potential customers for pump suppliers and undermines a growing niche market.

Understanding of the market and market demand. Most companies considered in this study do not import solar-powered pumps unless they have a guaranteed buyer (GIZ 2020). This indicates that their businesses mainly target institutional clients and might also lead to price uncertainty and issues regarding availability of the products.

Farmers' access to and willingness to invest in solar-powered pumps determine the growth of this niche market. The initial investment in solar-based irrigation is often prohibitively expensive for smallholders (Hartung and Pluschke 2018; World Bank Group 2018). There are few financial products, either provided by microfinance institutions (MFIs) or suppliers themselves, that address farmers' credit needs and profiles. One exception is pay-as-you-go, a financing model offered by Rensys, an IWMI partner, which allows farmers to use the pump while making regular payments until the total cost of the equipment is paid off. Financial limitations and factors such as access to irrigation technologies and related information have affected farmers' willingness to invest in solar-powered pumps, hampering the market demand and marketing margin to be captured through economies of scale.

Farmers' confidence and the presence of after-sales services are other important determinants of pump sales (UKaid and Power Africa 2019). Suppliers are responsible for the installation of pumps and provision of after-sales services. All solar-powered pump suppliers considered in this study provide a one- or two-year warranty. However, suppliers do not maintain a regular stock of spare parts because of a shortage of foreign currency to import parts in bulk. Moreover, there is a lack of local capacity to undertake regular O&M of pumps. Suppliers also disclosed that the availability of skilled technicians at the local level is a major obstacle. These limitations undermine farmers' confidence in irrigation technologies and the return on investment they can expect.

Several **enabling environment-based factors** also influence the marketing margin. Ethiopia's ***tax exemption policy and its enforcement*** influence pump imports as well as duties and

VAT rates. In 2019, the government exempted all agricultural machinery, including solar- and fuel-powered pumps, from import duties, which would otherwise range from 0% to 35% depending on the type of product. All solar products are supposedly exempted from VAT, worth 15% of the gross product price. However, the VAT exemption is only applied to solar panels, which constitute a small fraction of the cost of solar-based irrigation systems, especially when installation services are added. Despite these policy provisions, suppliers indicate that benefiting from tax exemptions is challenging and time consuming because of the bureaucracy involved.

Foreign currency policy and currency availability influence suppliers' import capacity and associated costs (e.g., operational expenses). They may also affect the sales price of pumps, import costs (Ethiopia is a landlocked country), and the market structure of the irrigation sector. Further, devaluation of the local currency and inflation have caused a 20%–30% increase in the price of solar-based irrigation products in the last 3 or 4 years (GIZ 2020).

Standardization and enforcement of national standards impact the import of quality solar-based irrigation equipment. Although the Ethiopian Standards Agency and other government bodies exist to develop guidelines and standards for irrigation equipment and implement a national standardization strategy, enforcement appears to be weak. Some of the companies we interviewed stated that they have their own quality management unit and, therefore, do not need to adhere to (national) standards. Better standardization and enforcement of the standards would contribute to the sustainability of (small-scale) irrigation by making it easier to import quality equipment and spare parts.

Fuel-powered pump supply chain

As with solar-powered pumps, most of the ***suppliers*** in the fuel-powered pump supply chain fulfil multiple functions. These companies import and retail diesel or petrol pumps, provide O&M services (or use agents) and train service providers. The pumps are supplied to end users through direct sales or via government agencies and NGOs. The structure of the fuel-powered pump supply chain is shown in Figure 2.

Regional and federal governments are other important actors, usually buying pumps via tenders and favoring cheaper products.

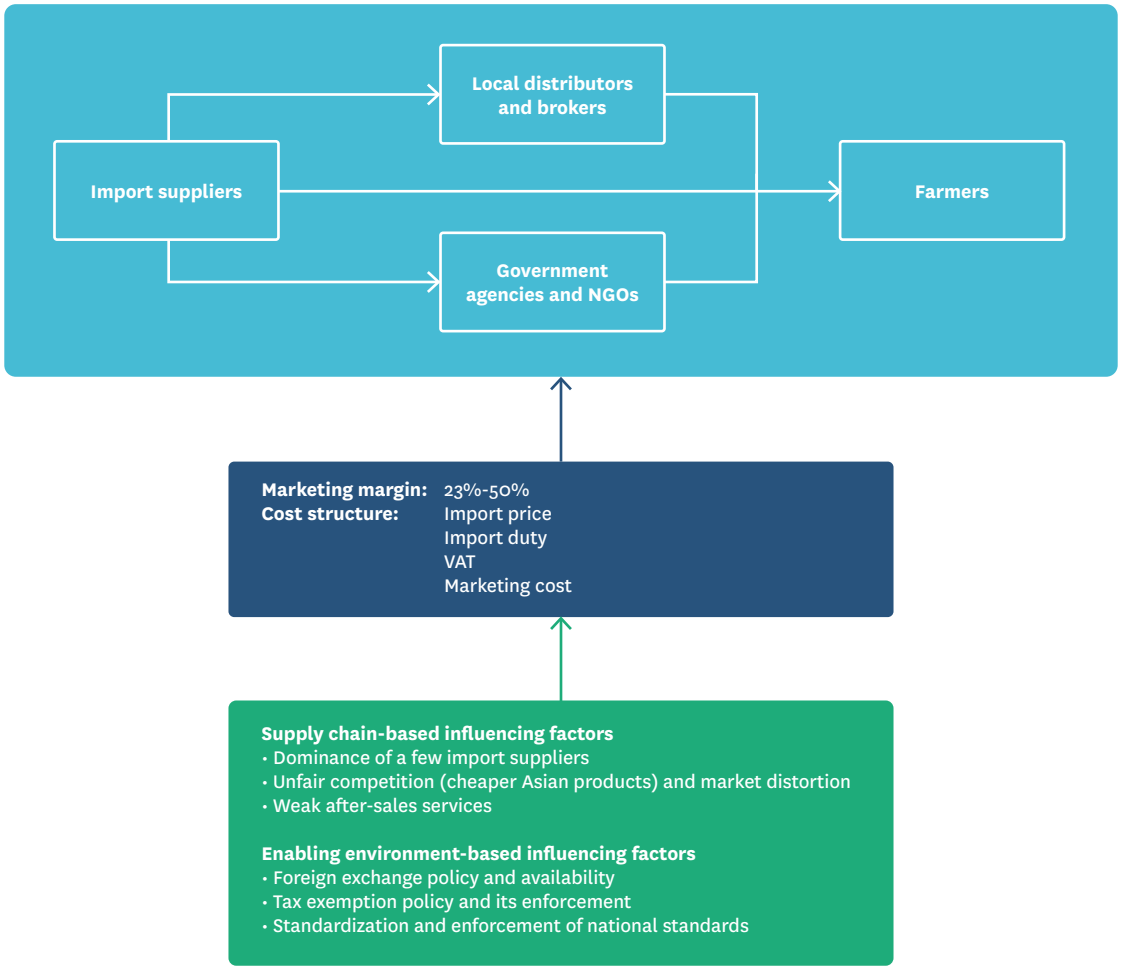

Figure 2. Fuel-powered pump supply chain: structure, costs and influencing factors.

Farmers are given a warranty and can get after-sales services if they buy a pump directly from the major suppliers. Farmers also buy fuel-powered pumps from local markets and make a cash payment (Gebregziabher et al. 2016). These pumps are usually cheaper and substandard products. In addition, a warranty or O&M is not provided for these products, and the availability of spare parts is not guaranteed. Consequently, farmers are not assured of after-sales services.

Marketing margin for fuel-powered pumps

The estimated marketing margin for fuel-powered pumps ranges between 23% and 50% (Table 2). For the majority of the pumps reviewed, the estimated marketing margin is greater than the anticipated profit. This indicates a higher-than-expected sales price, which is advantageous for suppliers but not farmers.

Factors influencing the marketing margin

The **supply chain-based factors** influencing the marketing margin for fuel-powered pumps are similar to solar-powered pumps, namely the ***dominance of a few suppliers***, unfair competition from lower quality and cheaper (Asian) products, and market distortion caused by the distribution of free pumps.

Furthermore, the companies interviewed do not conduct formal demand assessments, relying instead on informal information regarding the demand for fuel-powered pumps. As with solar-powered pumps, a shortage of foreign currency to import pumps in bulk or maintain a regular stock of spare parts, and the lack of local capacity to undertake regular O&M are challenges faced by many fuel-powered pump suppliers.

Enabling environment-based factors for fuel-powered pumps mainly relate to fiscal policies. As indicated earlier, the government exempted agricultural machinery from import duties. In addition, diesel and petrol pumps are exempted from VAT, worth 15% of the gross product price. However, benefiting from these tax exemptions is challenging and time consuming because of the bureaucracy involved.

A ***shortage of foreign currency*** is another factor affecting import capacity and associated costs (e.g., operational expenses). Several suppliers stated that it is easier to gain access to foreign currency when supplying pumps to government institutions.

Rope and washer pump supply chain

Manual rope and washer pumps are regarded as having significant potential for both domestic uses and small-scale irrigation (Minh and Schmitter 2020). ***Manufacturers and local assemblers*** produce and supply these pumps for household and community use, and sell them to regional governments and NGOs, and directly to farmers. The structure of the rope and washer pump supply chain is shown in Figure 3.

Several ***government agencies and NGOs***, such as iDE Ethiopia and Selam, promote manual pumps and help build local

Table 2. Fuel-powered pumps: models supplied, quantity sold, sales price and marketing margin in 2019/2020.*

Model and brand	Quantity sold	Warranty (year)/ unit	Import price (ETB)/ unit	Import duty (ETB)/ unit	VAT (ETB)/ unit	Marketing cost (ETB)/ unit	Sales price (ETB)/ unit	Marketing margin (%)/ unit	Anticipated profit (%)	Agent's commission (%)
Kohler Lombardini (7.5-25 horsepower) diesel, surface pump	50	2	49,515	11,379	7,427	30,000	120,000	23	25–30	15
Kohler Lombardini (7 horsepower) petrol, surface pump (30 meters)		2	98,211	24,552	14,727	67,500	270,000	32	25–30	15
Kohler Lombardini (7 horsepower) petrol (70 meters)		2	n.a.	n.a.	n.a.	6,750	27,000	n.a.	25–30	15
Hailin HL80C Surface 3-inch	100	2	8,763	1,314	1,314	2300	23,000	50	25	15
Hailin HL100C Surface 4-inch		2	14,606	14,606	2,190	3,000	30,000	30	25	15

Notes:
* Exchange rate was USD 1 = ETB 32.7071 in 2020.
n.a. = not applicable.

capacity in assembling rope and washer pumps, certify youth who are trained in well digging/drilling, and provide services in these areas.

Marketing margin for rope and washer pumps

Various types of rope and washer pumps are available to smallholder farmers at a price ranging from ETB 5,598 to ETB 8,180 (Table 3). The estimated marketing margin for rope and washer pumps is more than 70% and higher than the anticipated profit of 10%.

Factors influencing the marketing margin

Rope and washer pumps are locally manufactured using local raw materials. One of the **supply chain-based factors** influencing the marketing margin for these pumps is the rising cost of raw materials. In addition, poor production and installation practices may add to poor performance of the pumps and give the technology a bad reputation (Sutton and Hailu 2011). There is also a lack of installation and repair skills at the local level. Improving the quality of wells and pumps by certifying service providers and manufacturers, as done by iDE, is very important.

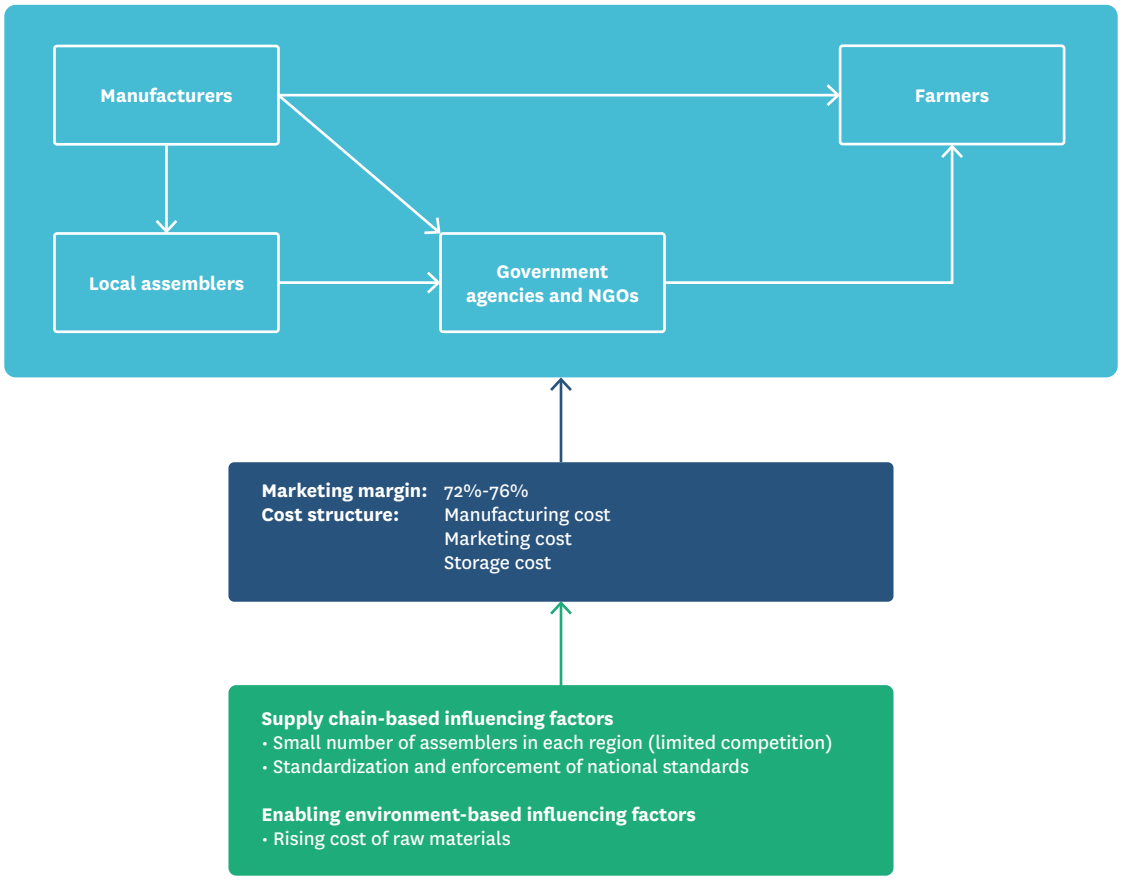

Figure 3. Rope and washer pump supply chain: structure, costs and influencing factors.

Table 3. Rope and washer pumps: models supplied, quantity sold, sales price and marketing margin in 2019/2020.*

Model and brand	Quantity sold	Warranty (year)/unit	Manufacturing cost (ETB)/unit	Marketing cost (ETB)/ unit	Sales price (ETB)/unit	Marketing margin (%)**/ unit	Anticipated profit (%)/ unit
Rope model (1)	30	6 months	1,309	Unknown	5,598	76	10
Rope model (2)		6 months	1,494	Unknown	7,465	76	10
Rope model (3)		6 months	2,066	Unknown	8,180	75	10
Imio model	110	6 months	1,950	Unknown	6,950	72	10

Notes:
* Exchange rate was USD 1 = ETB 32.7071 in 2020.
** Cost of running own store is not included in the calculation; pumps sold on the spot.

Aregash Bacha using a rope and washer pump near Meki, Ethiopia (*photo:* Apollo Habtamu/ILRI).

The issue of low quality can be attributed to the **enabling environment** as well. Although our study focused on companies based in Addis Ababa, there were others operating in the major regional towns that are engaged in the manufacture and supply of rope and washer pumps. These companies reportedly do not adhere to the nationally stipulated quality standards.

The way forward

The findings of this study show that the actors involved in the supply of motorized and manual pumps fulfil multiple functions but do not directly target smallholder farmers. The supply chain is short, competition is limited and the marketing margin for irrigation equipment is high. The estimated marketing margin ranges between 12% and 60% for solar-powered pumps, 23% and 50% for fuel-powered pumps, and more than 70% for rope and washer pumps. This has a knock-on effect on the sales price. Developing the supply chain by addressing entry constraints and designing incentives is crucial for enhancing competition and bringing down the prices of pumps for smallholder farmers. To achieve this, the following actions need to be taken:

Address import restrictions

The government can lower import costs and provide import companies with better access to foreign currency and working capital. This will enable pumps to be imported in bulk. As these factors are key determinants of the sales price, cost savings at this point in the supply chain can be passed on to end users.

Set and enforce quality standards

Setting and routinely enforcing quality standards will support the sustainability of small-scale irrigation by making it easier to import high-quality technologies and protect suppliers from being undercut by suboptimal products. Moreover, adding small-scale irrigation technologies and equipment to the list of priority import goods of the National Bank of Ethiopia and facilitating customs clearance will make these products readily available and more affordable to smallholder farmers.

Clarify and simplify tax rules

The current policies regarding import duties and tax exemptions for irrigation equipment are often unclear, inconsistently applied and administratively cumbersome. Clarifying and simplifying these rules will accelerate import procedures and reduce costs for import companies.

Improve access to suitable financing

MFIs provide farmers with small loans at high interest rates. The loan amounts are insufficient to buy irrigation equipment. The state-owned Development Bank of Ethiopia (DBE) could provide larger and more attractive loans. However, these loans

are dependent on having adequate collateral, which most smallholders cannot provide. MFIs can address smallholders' needs by offering alternative collateral requirements, for example, by using land certificates or moveable assets such as the pumps themselves as collateral. Shared ownership may also be a viable option, with three or four farmers jointly purchasing an irrigation technology.

For suppliers, DBE and private banks can introduce innovative financing schemes like public-private sector collaboration and partial risk guarantees (Bryan et al. 2020). Such schemes can enhance suppliers' bulk purchasing capacity, thereby increasing their stocks and supporting their working capital needs.

Assess market demand

The companies interviewed have no formal information regarding market demand. Typically, they respond to the immediate demands of government agencies and NGOs, usually through tender bids. Government agencies and NGOs play an important role in the diffusion of irrigation technologies and practices. However, regularly assessing and addressing the demands of other customer segments, notably cooperatives and individual farmers, would provide a more complete picture of the market and open up new and potentially lucrative business opportunities.

Incentivize farmers' investment in irrigation

Enhancing the economic feasibility of pumps by providing farmers with marketing opportunities for high-value irrigated crops is critical for scaling up/out (innovative) irrigation technologies. Subsidies to reduce the initial purchase price of these technologies could also help.

Establish multi-stakeholder platforms

Establishing multi-stakeholder platforms that bring together suppliers, service providers, development actors, farmers and other irrigation stakeholders can enhance information exchange, raise awareness of available technologies and lead to mutually beneficial partnerships, as experience in Ghana has shown (Minh et al. 2020).

Multi-stakeholder platforms, like this one in Ethiopia, can enhance information exchange and lead to mutually beneficial partnerships (*photo:* Rahel Mesganaw/IWMI).

Etenesh Asro using water supplied by a solar-powered pump to irrigate her crops in Ethiopia (*photo:* Maheder Haileselassie/IWMI).

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