2025 Edition

GOAL PROGRAMME INNOVATION FUND

INNOVATING FOR A WORLD BEYOND HUMANITARIAN CRISIS

TOKEN TAP AND DIGITAL REMOTE MONITORING TOOL

GOAL | UGANDA

Stage of innovation

- Ideation and piloting
- Validation
- Scaling ✓

GOAL | PROGRAMME INNOVATION LAB

PRACTICA

Irish Aid
An Roinn Gnóthaí Eachtracha agus Trádála
Department of Foreign Affairs and Trade

GOAL is an international humanitarian and development organisation that works to ensure sustainable and inclusive access to safe water, sanitation, and hygiene (WASH) services. Its WASH programme in Uganda focuses on strengthening rural water supply systems, improving functionality and sustainability of infrastructure, and building the capacity of local service providers. By combining innovation with systems strengthening, and through partnerships with government, communities, and donors, GOAL supports resilient health and wellbeing for rural households.

PRACTICA Foundation is a non-profit technical advisory organisation that develops and promotes affordable technologies with high potential to improve livelihoods in low- and middle-income countries. Based in the Netherlands and Madagascar, it works in more than 20 countries to integrate technical innovations into business models for sustainable water, irrigation, and sanitation access. PRACTICA invests in applied research and product development, designing technologies that are adapted to local contexts, easy to maintain, and accessible to underserved communities.

Together, GOAL and PRACTICA combine systems-strengthening expertise with cutting-edge technology development to address the long-standing challenges of rural water supply in Uganda. Their partnership has focused on the development, testing, and scaling of prepaid water meters for hand pumps and piped schemes, supported by Irish Aid and other donors. By aligning GOAL's experience in service delivery and policy engagement with PRACTICA's applied research and product design, the collaboration provides innovative, scalable, and locally adapted solutions to ensure the sustainability of rural water supply systems.

BACKGROUND

In Uganda, more than 80% of people still lack reliable access to safe drinking water. Hand pumps, the main water source for most rural communities, frequently break down due to insufficient funds for repair and maintenance. When this happens, families are forced to use unsafe water sources, threatening health, livelihoods, and dignity.

To address these challenges, **GOAL Uganda**, in partnership with the **PRACTICA Foundation**, developed the **Token Tap**, a coin-operated prepayment device that allows communities to pool small, regular contributions towards maintenance costs. The system has already demonstrated its value in promoting financial sustainability and reducing pump downtime. However, the original model relied heavily on manual data collection. Recording usage by hand was time-consuming, vulnerable to human error, and limited the ability of operators to scale management to a larger number of pumps.

To overcome these limitations, GOAL and PRACTICA developed the **Digital Monitoring Tool (DMT)**, a real-time data system that connects the Token Tap to an online dashboard. This tool automatically records and transmits water usage data, providing transparency and enabling water service providers and authorities to track pump performance remotely.

Together, the Token Tap and Digital Monitoring Tool form a complementary system that combines community financing, technology, and evidence to make rural water management sustainable and accountable.

This innovation is being developed in **Uganda**

WHAT IS THE INNOVATION ABOUT?

The **Token Tap** is a simple mechanical device that dispenses a fixed amount of water, about 23 litres per token. Each token represents a small, prepaid contribution that feeds into a community-managed fund. The money collected is used to cover the costs of repair and maintenance, ensuring long-term pump functionality.

By introducing a pay-per-use model, the Token Tap encourages shared ownership and fair cost distribution. Each household contributes only for the water it consumes, allowing even the most remote communities to sustain their own water systems.

The innovation was later expanded to modernise and strengthen water management by embedding digital monitoring technology into the existing Token Tap system.

The **Digital Monitoring Tool (DMT)** complements this model by embedding a digital sensor and SIM card into the Token Tap unit. Every time water is drawn, usage data is automatically sent to a cloud-based dashboard. This allows service providers and government partners to track real-time performance, monitor consumption patterns, detect malfunctions early, and plan maintenance or tariff adjustments efficiently.

Together, these two components create a hybrid innovation that links *mechanical reliability* with *digital transparency*. Communities benefit from reliable water services, while service providers gain accurate data for decision-making and accountability.

FIELD TESTING AND LESSONS LEARNED

Pilot installations were carried out in Namayingo District, Eastern Uganda. PRACTICA engineers worked directly with local hand pump mechanics to install and maintain both the Token Tap and the digital monitoring system, ensuring knowledge transfer and strengthening local capacity for long-term maintenance.

The pilots demonstrated that both the mechanical and digital components can be installed in less than one hour per pump, using locally available tools and with minimal disruption to daily water use. Once installed, the Token Tap effectively generated community funds for maintenance, while the Digital Monitoring Tool (DMT) successfully transmitted water usage data to an online dashboard. This verified the technical feasibility of real-time monitoring in rural, off-grid contexts.

KEY INSIGHTS FROM THE PILOT INCLUDED:

- **Sensor accuracy:** The reed switch used in the first prototype required repositioning to improve measurement precision.
- **Hardware protection:** The original casing material was upgraded to improve waterproofing and resistance to environmental exposure.
- **Antenna security:** External antennas were vulnerable to theft and vandalism, leading to a new design with the antenna integrated and protected inside the pump head.

- **Network reliability:** Mobile coverage varies across pilot sites, occasionally delaying automatic data uploads to the cloud platform.
- **Dashboard performance:** Despite connectivity limitations, data reliability and transmission rates confirmed the feasibility of remote monitoring in rural conditions.

The pilots also confirmed that the digital dashboard can serve as a valuable tool for decision-making at different levels. Local mechanics could verify pump usage data to anticipate maintenance needs, while district authorities and water service providers could review performance trends and plan technical support more efficiently.

These findings are guiding the next iteration of the system, focused on improving durability, simplifying data transmission, and exploring integration with Uganda's Operation and Maintenance (O&M) frameworks.

IMPACT TO DATE

- **700 people** now have access to clean, reliable water through digitally monitored Token Taps.
- **5 Token Taps** distributed or installed since 2023 in Eastern Uganda.
- **16 local mechanics and GOAL staff** trained to assemble, install, and maintain the devices.
- **45+ WASH organisations** introduced to the system through Uganda's national Operation & Maintenance forum.
- **7 organisations**, including **Water Compass, Wells of Life,** and **Living Water International**, have committed to pilot or adopt the model.

The DMT dashboard has been presented to over 40 service providers and development agencies, generating strong interest in real-time data solutions for rural infrastructure. Operators reported that the system reduces workload, supports timely maintenance, and helps design service-level agreements with communities based on evidence.

These results show that the Token Tap and Digital Monitoring System can deliver measurable benefits at household, community, and institutional levels.

POTENTIAL TO SCALE:

The Token Tap and Digital Monitoring System offer a sustainable, market-based model that combines affordability, transparency, and local entrepreneurship. The system has drawn strong interest from both public and private water service providers, who see prepayment and real-time monitoring as tools to reduce revenue loss and ensure pump functionality. The Ministry of Water and Environment has recognised the model's potential and is collaborating with GOAL and PRACTICA to explore integration into Uganda's national Operation and Maintenance (O&M) framework. Regional actors in Kenya, Ethiopia, and Ghana have also expressed interest in adapting the model.

Scaling this innovation can:

- Reduce operational costs by automating manual data collection.
- Improve reliability and accountability of water services.
- Empower local entrepreneurs to manage water systems sustainably.
- Support governments and partners in achieving SDG 6: Clean Water and Sanitation.

With continued partnership and investment, the Token Tap and Digital Monitoring System could serve as a blueprint for affordable, data-driven rural water management across sub-Saharan Africa.

NEXT STEPS:

Building on the lessons from the field pilots, PRACTICA has secured funding to strengthen both the Token Tap and the Digital Monitoring Tool (DMT). The upcoming phase will develop a new prototype that is more robust, waterproof, and sensor-accurate, while continuing to test the tool through a larger pilot in Uganda. Results from this phase will inform evidence-based refinements to both the hardware and the digital dashboard, ensuring the system remains practical and reliable in real-world conditions.

In parallel, the Token Tap continues to advance through successive prototypes that have made it increasingly affordable, durable, and locally maintainable. The fourth version is now being tested in Namayingo District, and interest from entrepreneurs and water utilities is growing. PRACTICA is also expanding testing beyond Uganda, with pilots underway in Ghana, and has initiated discussions with a manufacturer in India to produce the first market-ready Token Taps, with plans for eventual production in Uganda to serve the local market. At the same time, GOAL continues to work closely with policy-makers at the Ministry of Water and Environment and with civil society peers to ensure that the Token Tap is integrated into national frameworks. This next phase aims not only to finalise technical improvements but also to strengthen the business model, expand production, and embed the Token Tap and DMT in Uganda's rural water systems as practical, scalable solutions that can be sustained locally.

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The Token Tap and Digital Monitoring System demonstrate how sustained collaboration and iterative learning can deliver practical innovations that improve essential services for communities. Both innovations are supported through the GOAL Humanitarian Innovation Fund, which enables GOAL and its partners to test, refine, and scale approaches that respond directly to local needs. By partnering with GOAL, donors and stakeholders contribute to advancing technologies and business models that make safe water access more reliable, affordable, and community-driven, turning innovation into lasting impact.

Scan to visit our website

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Innovating to Overcome Humanitarian Crisis

The GOAL Programme Innovation Lab is a dynamic and collaborative unit established by GOAL to foster innovation within GOAL's programmes and to promote this work both internally and externally with the wider development and humanitarian community.

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