Title: Essence of Life: Solving Water at the Base of the Economic Pyramid

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RURAL Paper #: 60

Keywords: Smallholder, irrigation, water access, hybrid value chain, water security, food security, poverty alleviation

Abstract

Lack of water access has direct impact on a globally important group: millions of smallholder farmers, those who farm for their own food and that own and/or cultivate less than a ½ hectare of land {approximately 1 acre}. Many farmers and their families are forced to spend half their work day carrying buckets of water – using ropes wrapped around their shoulders – from the water source to the fields. The time spent simply getting the water they need to cultivate is time taken from education, from expanding their farms, from bettering their lives.

Xylem, the world's largest pure play water company by market capitalization, is addressing the needs of these people living at the base of the economic pyramid through its Essence of Life (EOL) initiative. We're addressing the rural riddle of not only creating affordable, field-serviceable irrigation systems designed to drastically increase water access for smallholder farmers but also pairing these products with a unique distribution and engagement model.

Being able to use their land to its fullest potential via better water access has an enormous impact not only on the lives of smallholders and their families, but in ripples across the surrounding economy as well. The Essence of Life story comes down to this: Poverty alleviation is impossible without food security. Food security (and development) is impossible without agriculture. Agriculture is impossible without water. The EOL program complements Xylem's mission to "solve water;" and by doing so, engages the aspirational and entrepreneurial capability within rural communities to affect greater livelihoods.

Xylem has pioneered a "Hybrid Value Chain" of citizen sector (private and non-governmental organizations (NGOs)), government and business partnerships to accomplish this goal. We have been on the ground in these rural communities and understand the unique challenges in bringing water to them. This understanding is reflected in the "voice of the customer"-inspired design of the first product in our Essence of Life portfolio: an innovative stepping pump called "Saajhi." Designed to best meet the needs of smallholder farmers in emerging markets based on real-world testing, Xylem 's Saajhi (Hindi for "companion") pump represents the world's first major global water OEM-engineered solution for rural water management needs.

The introduction of the Saajhi pump is the end result of extensive field visits, including interviews and field tests with smallholder farmers across India, Africa, Latin America and Asia. The simple application of pressurized delivery that the Saajhi pump provides allows farmers to use a spray irrigation process. Spray irrigation substantially reduces labor over the flood irrigation methods most used in these markets, and can reduce water usage by 40 percent.

Xylem's Saajhi pump's groundbreaking design embraces "human factors" engineering, based on rural insights gained first-hand in the field. The treadle pump – no electricity needed – is field-serviceable, with a minimal number of removable parts and no required tools. Taken together, these critical design aspects meet the communicated desires of rural farming

communities, the citizen sector organizations who support them, and Xylem's agri-business partners.

Introduction

Who we are: Xylem

Xylem is the world's largest pure play water company by market capitalization, serving customers in over 150 countries with highly efficient, environmentally sustainable water management solutions solving specific applications issues. Our extensive and exciting portfolio addresses the full cycle of water from irrigation to drainage, from water purification to distribution, from quality monitoring to consumer use, and finally from waste removal to clean return to its source. We have the capability, channels and credibility to serve emerging markets – and to do so in a rigorously tested, economically sustainable manner.

Essence of Life: A logical extension of Xylem's expertise and capabilities

Our Essence of Life (EOL) portfolio extends this application expertise and embraces global leadership in the execution of a "Hybrid Value Chain" of citizen sector (private and non-governmental organizations (NGO)), government and business partnerships. The hybrid value chain leverages the technological excellence of our small form factor, DC and human-powered pumping solutions to create compelling, unique and differentiated systems. These solutions prove capable of supporting alternative energy methods and exhibit robust product designs as demonstrated by winning a 2011 Popular Mechanics award for innovation.

Based on our successful innovations in the hybrid value chain channels, Xylem is engaging specific agri-business market leaders. Through leveraging our unique water management technology with their strong channel presence and synergistic agri-business dominance, we are creating an extended market offering.

Taken collectively our pioneering model addresses a compelling global market, fields truly differentiated products with strong value propositions, and provides a sustainable engagement strategy.

What inspired us?

Aspiration is universal. Over 2.5 billion people currently live at the most socio-economically challenging level, a level commonly referred to as the base of the economic pyramid. Our goal: to engage this sizeable and compelling market segment.

Poverty alleviation is impossible without food security. Three-quarters of the world's poor live in rural areas. Their livelihoods – their means of supporting their families – depend on agriculture, forestry, and fisheries. For these rural poor, agriculture has an outsize role to play in the quality of their lives.

Food security (and development) is impossible without agriculture. In many developing countries, agriculture generates one-third of the national income, and employs over half of the total workforce.

Agriculture is impossible without water. Without a rational, sustainable water management system, farmers must rely on inefficient, labor intensive and unreliable methods, leaving their families and livelihoods at the mercy of weather patterns.

It all comes down to access to water. There is enormous need for – and enormous economic upside potential in – affordable, field-serviceable irrigation systems across the developing world. The benefits of innovative water management "ripple" across regions.

Key Issues and Challenges

Going where the need is greatest and the impact widest: Smallholder farmers

The EOL business model encompasses not only a robust, socio-economically tuned portfolio but also bridges the divide between the private sector (Xylem and its specific partners), the government and the citizen sector (including NGOs). This unique model articulates a pioneering value proposition, addressing those living at the base of the economic pyramid, commonly quantified as the 2.5 billion people earning less than $2.50 per day.

Entrepreneurial, aspirational, incredibly hard-working farmers make up one-third of the world's population. 1.5 billion of them are smallholders, those who farm for their own food and that own and/or cultivate less than 2.0 hectare (about 5 acres) of land (as defined by the Food and Agriculture Organization of the United Nations (FAO)).

Their economic role is significant: for example, as an agricultural nation, 50 percent of the total workforce in India is involved in farming. According to a World Bank Report[1] on investment in agricultural water, in Africa it is 70 percent of the poor that live and work in rural areas. And most are smallholders who depend on agriculture for their livelihoods. However, on a global scale, much of their arable land – and entrepreneurial energy – is underutilized for lack of water access. The aim of Essence of Life is to make a positive impact on this situation through creating affordable, field-serviceable irrigation systems that meet the needs of smallholder farmers.

Opportunities

Paramount in the fielding of the EOL execution is the belief in grounding our business model in solid value propositions to both our rural farming customers and our hybrid value chain partners. Acting in concert with an international focus on food security and water scarcity, our business plan uses Xylem's unique technology advantage to field appropriate products, addressing these vital issues. In particular, our products address the need for more productive agriculture to meet the food needs created by demographic growth.

Xylem's rural business credibility is based on a pointed understanding of local purchasing characteristics as related to smallholder farming activities and as grounded in socio-economic

livelihood modeling. We've correlated these purchasing dynamics to local economic conditions, to define specific application and product requirements. Aggregating across cross-geographical models to define an achievable and addressable customer base, we've repositioned and repurposed proven technologies to create the proper mix of capability, affordability and serviceability.

Hybrid value chain business model + voice of customer execution = a differentiated product portfolio driving unique customer value

Our business model includes defining a hybrid value chain of specific partnerships that better enable us to address the various needs for sustainable and successful agricultural innovation. These partnerships include, but are not limited to, organizations working within the areas below and reflecting a mix of governments, citizen sector groups and private businesses, each bringing their specific expertise and goal-appropriate geographical presence.

- Global Outreach: we're partnering with organizations focused on rural poverty alleviation
- Local NGO's: we work together to capture insights from people in the field and engage community influencers
- Sales & Distribution Channels: we're formalizing efficient channels for messaging, sales, and servicing
- Micro-Financing: this proven model will help us to establish a socio-economic environment suitable for product purchasing
- Product Realization: we're identifying in-the-field avenues for testing and procurement
- Education Development: we're excited to create collaborative, local, cultural partnership and pipeline activities for new employees
- Government Outreach: this is allowing us to generate local "pull" for Xylem participation
- Business Partners: we're working with both agribusiness and commercial interests to create partnerships in regional expertise, government relationship building and integrated rural system fielding

By combining what we learned through our work with these organizations with our extensive field testing, we've created a product that we can be confident meets the needs of both partners and end users.

Xylem's "Saajhi" pump: Design that defines rural innovation

To date, we have interviewed more than 750 smallholder farmers across India, while establishing hybrid value chain relationships within Africa, South America, and Asia, adding dozens more interviews to our database. Our field visits were paired with focused technology and product testing with our hybrid value chain partners. These activities allowed us to successfully test more than 60 rapid field samples, ensuring a robust and accurate evaluation of our product prior to launch.

Coupled with product roadmaps grounded in socio-economic mappings, these tests yielded the first product: an innovative stepping pump called "Saajhi." Created through a robust rural "voice of customer" execution, Xylem's Saajhi (Hindi for "companion") pump represents the world's first major global water OEM-engineered solution for rural water management needs.

The Saajhi pump's groundbreaking design pairs international rural insights with cutting-edge human factors and material technology to provide an optimized design, specifically tuned and priced for smallholder customers. We've focused on minimizing "points of failure" in particular, creating a product that is field serviceable with a minimal amount of removable parts and the absence of required tools. Taken together, these critical design aspects meet the communicated desires of our rural farming communities and our supporting agri-business partners.

The design (see Figure 1.1) integrates suction capability, pressure head and flow rate with the self-priming capability of diaphragm technology to deliver a significant step towards "solving water" for emerging rural market communities.

Additional Saajhi pump features include:

<u>small overall dimensions</u>
A light weight 45lbs and compact size of 19.5 x 18.5 x 43 inches (handle removed) for ease of movement in rugged terrain and storage back home.

<u>tilt and transport design</u>
Ergonomically-tuned tilt angle and wheel combination provides optimum "center of gravity" placement to aid smaller users in transporting to and from the field.

<u>diaphragm-based system</u>
Low-cost, efficient, easily-serviceable and replaceable, this high-performance pumping technology has been proven by Xylem in hostile marine markets for more than 20 years.

<u>integrated, removable and replaceable filter</u>
Removes large debris which may damage the pump's diaphragms. Muddy water or small debris will not harm the Saajhi pump.

For smallholder farmers, the primary value points of the Saajhi pump include:

- Increase in revenue driven by increased crop yields and cropping cycles
- Sizable reduction in labor times to irrigate fields
- Complete portability supporting entrepreneurial engagement and repurposing

There are benefits for government organizations as well, including:

- Substantial reduction in water usage due to enhanced water management capability
- Quality-controlled, human factors design fielded by the world's largest pure play water company

Agile manufacturing that unites - and benefits - disparate geographies

The Saajhi pump originated in Xylem's Massachusetts-based Innovation Lab, where we draw on over 60 years of small form factor pumping experience to field compelling solutions tackling today's issues regarding water harvesting, dewatering and rural water management. These solutions address leading power management trends by establishing credible execution around alternative energy methodologies well-suited for our noted small form factor water management capabilities.

Partnering with our Boston team, our India Technology Center (ITC) provides a unique and specific expertise, challenging traditional product execution with a defined focus in emerging market and rural community geographies. This collaborative and creative approach provides an appropriate critique, necessary to accurately resolve products designed for emerging market communities. A synergistic strategy couples our local ITC engineering excellence with our demonstrated in-country manufacturing capability to ensure the benefit of appropriate costing and lean production methodologies. Our intensive Six Sigma and stage-gate approach defines low-cost manufacturing strategies while concurrently finalizing our targeted product designs.

Part of the accessibility of the Saajhi pump to its target markets stems from the location of its manufacture: Vadodara in Gujarat, India. There, Xylem has built the world's largest vertical pumps manufacturing and test facility including the Technology Centre and Saajhi Innovation Lab. This facility is the first in India to showcase toilet-to-drinking water technology. Xylem India currently employs 207 and is a strong regional presence.

In it for the long run: Sustainability

Sustainability, in terms of business commitment, investment, and profitability, proves an essential component of our strategy. We encourage the entrepreneurial spirit found so abundantly in the rural communities with whom we work. By meeting with smallholder farmers directly and by listening to their input regarding their water access needs, we've developed a product that can help increase their self-sufficiency. Through extensive interviews, we've observed that the aspirational nature and vision of many rural farmers is similar to ours: the hope of providing a greater educational experience for their children and supplying them with a better life, outside of poverty. As noted by many NGO's, the key is developing these farmers' inherent capability for self-reliance, noting the historical adage; "if you give a person a fish, you feed them for a day, if you teach a person to fish, you feed them for life."

In developing specific products, suitable for harsh rural environments, Xylem's Essence of Life program delivers affordability and applicability to these targeted rural customers, while also ensuring a level of business profitability necessary to maintain the growth and longevity of the EOL business model. This strategy couples directly with the aforementioned hybrid value chain relationships, ensuring not only a strong sales position but an innovative and customer-pleasing service position.

Enabling a robust and timely service position proves as critical in rural markets as in developed region markets. The cost of a smallholder farmer's investment in a water access product can be as much as one-third of their harvest revenue. The result: for these farmers and their families,

experiencing product failure at a crucial point in the crop cycle is simply not an option. This critical eye on service position and offering remains of paramount importance to brand growth, product field resilience, and customer acceptance.

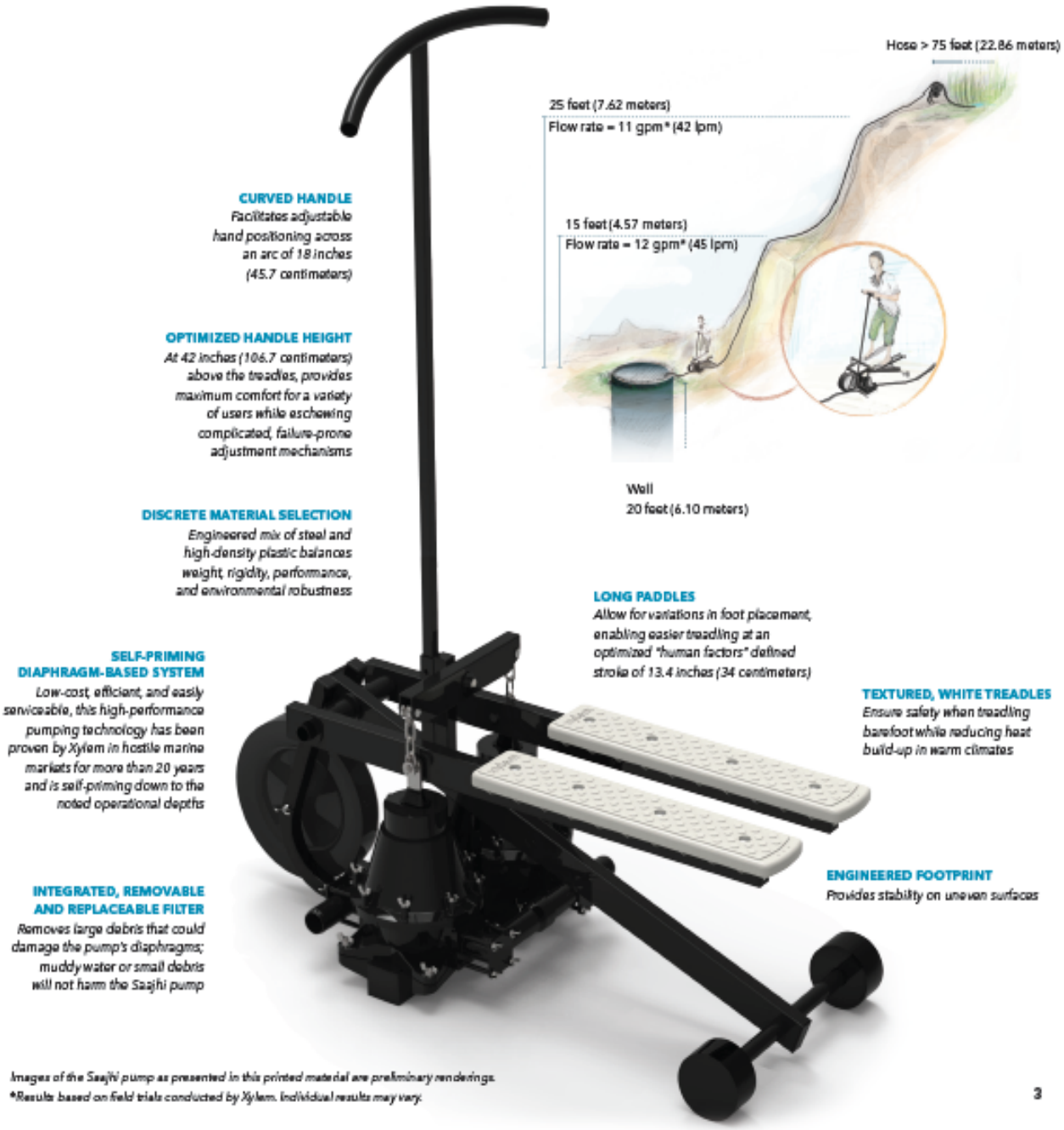
The Essence of Life program ensures we're developing the fundamental, first step customers whose communities will engage with Xylem's extended portfolio of water management products as they grow. The challenges faced by smallholder farmers are many; the responsibility to help them meet those challenges is global. We are honored to be a part of the solution.

1. *World Bank Report – Investment in Agricultural Water for Poverty Reduction and Economic Growth in Sub-Sahara Africa, 2007*

Questions

- How can we collaborate to realize a robust and consistent hybrid value chain partnership towards solving the water needs of smallholder farmers?
- Where do you see the largest impact for smallholder farmer development and consequent livelihood increase?
- Noting that our Essence of Life execution is a portfolio strategy, what opportunities do you feel exist to field a next level of portable solar water management solutions?

Figure 1.1


Hose > 75 feet (22.86 meters)
25 feet (7.62 meters)
Flow rate = 11 gpm* (42 lpm)
15 feet (4.57 meters)
Flow rate = 12 gpm* (45 lpm)
Well
20 feet (6.10 meters)
CURVED HANDLE
Facilitates adjustable hand positioning across an arc of 18 inches (45.7 centimeters)
OPTIMIZED HANDLE HEIGHT
At 42 inches (106.7 centimeters) above the treadles, provides maximum comfort for a variety of users while eschewing complicated, failure-prone adjustment mechanisms
DISCRETE MATERIAL SELECTION
Engineered mix of steel and high-density plastic balances weight, rigidity, performance, and environmental robustness
SELF-PRIMING DIAPHRAGM-BASED SYSTEM
Low-cost, efficient, and easily serviceable, this high-performance pumping technology has been proven by Xylem in hostile marine markets for more than 20 years and is self-priming down to the noted operational depths
INTEGRATED, REMOVABLE AND REPLACEABLE FILTER
Removes large debris that could damage the pump's diaphragms; muddy water or small debris will not harm the Saajhi pump
LONG PADDLES
Allow for variations in foot placement, enabling easier treadling at an optimized "human factors" defined stroke of 13.4 inches (34 centimeters)
TEXTURED, WHITE TREADLES
Ensure safety when treadling barefoot while reducing heat build-up in warm climates
ENGINEERED FOOTPRINT
Provides stability on uneven surfaces
Images of the Saajhi pump as presented in this printed material are preliminary renderings.
*Results based on field trials conducted by Xylem. Individual results may vary.
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