The unit economics of irrigation as a service

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Summary

- Irrigation as a service (IaaS) business models have different revenues and costs compared to individual pump ownership.
- The nature and magnitude of these differences determine the likelihood of a given model being profitable and scalable.
- Observed IaaS systems in Uganda and Rwanda use the following strategies relative to farmers' pump ownership to create profits:
  - Increasing equipment lifespan and decreasing operations and maintenance costs through economies of scale
  - Decreasing equipment costs through bulk purchasing discounts or through leveraging manufacturer or distributor relationships
  - Increasing crop revenues for farmers through providing wholesale input prices, agronomic advisory services, and links to offtakers

Motivation

Irrigation as a service (IaaS) encompasses multiple business models where fixed or mobile irrigation equipment is used to deliver water to smallholder farmers without those farmers owning the equipment. There is growing interest in IaaS as a potentially scalable approach for smallholder irrigation. Key motivations include the hypothesis that IaaS can address credit access and gender equity concerns around equipment ownership.

Introducing a new class of entrepreneurial actors as irrigation service providers has advantages and disadvantages. Operating and maintaining fleets of irrigation equipment offers potential economies of scale. A fleet-based approach might also help funders to measure and incentivize performance regionally, rather than just at the field level.

Financially sustainable IaaS business models thus require sufficient value to be generated to compensate for both human capital and technology requirements of providing irrigation services. A simple way to gain insight into the potential profitability and scalability of a business model is to analyze its unit economics. Unit economics refers to the revenues and costs of delivering a single unit of a good or service.

In this brief, we consider several IaaS business models through the lens of unit economics. These models each operate differently and have different cost and revenue profiles relative to individual pump ownership. Our goal is to understand the source and nature of cost and revenue advantages of each business model as a starting point for analyzing the scalability and sustainability of the various enterprises.

Key components of unit economics for irrigation as a service

Costs include:

- Purchase and/or depreciation of equipment such as pumps, pipes, and other hardware, or related debt service
- Customer acquisition costs
- Operations and maintenance costs such as servicing, repairs, and upkeep of irrigation equipment; energy costs for petrol or diesel pumps; and salaries for operating, security, and service personnel. Some business models may also require paying specialized personnel like agronomic advisors

Revenues are the fees collected for providing farmers with access to a pump, or to irrigation water. These may be generated on a transactional per-irrigation basis or through subscription or leasing models offering access for an extended period (weekly, monthly, seasonal, or multiyear).

From a unit economics perspective, and relative to the status quo of individual pump ownership by a farmer, viable IaaS schemes must either reduce the costs of acquiring and operating irrigation equipment, increase farmer revenues sufficiently so that IaaS operators can in turn profit from irrigation service provision, or improve both margins.

To illustrate the different potential pathways to profitability from irrigation as a service business models, we present three examples of unit economics from enterprises currently operating in Rwanda and Uganda. Our analysis is not intended to be exhaustive but rather to showcase a range of strategies for improving unit economics for irrigation as a service.

Examples

Entrepreneurial farmers

Sapu, a farmer in Nyagatare district in northeast Rwanda, owns multiple small irrigation pumps and runs an entrepreneurial business renting these pumps to his neighbors. He has several distinct customer segments and pricing strategies including daily and seasonal rentals, as well as a pond-filling service for livestock owners.

Even though Sapu uses identical irrigation equipment to what his customers would purchase themselves, he is able to provide his services at a competitive price. He does this primarily through a focus on reducing his operations and maintenance costs, by regularly maintaining pumps, and by patching and repurposing old hosepipes. He has adopted a scheduled preventative maintenance strategy for his pumps. He carefully patches and reuses hosepipes, which are a significant expense for smallholder irrigators in Nyagatare district. Overall, this means that his equipment depreciates at a slower rate than if it were owned and operated by an individual farmer. Additionally, because he owns multiple pumps, his per-unit labor hire costs for machinery repair are lower than they would be for a single pump.

Credit: N. Brozović

Finally, each of Sapu's customer segments (daily rentals, seasonal rentals, pond-filling rentals) has slightly different equipment and timing needs. By having multiple customer segments, Sapu is able to increase the asset utilization rate of his pumps and hosepipes relative to what his customers could achieve by acting individually. This increases his revenue generation potential per unit of time and per unit of irrigation equipment.

Reference: Akaliza, N., et al., 2023. "Current state of irrigation-as-a-service for smallholder farmers in Rwanda." Daugherty Water for Food Global Institute, https://go.unl.edu/iaas-rwanda.

Multisided market makers

Agriworks is an irrigation startup based in Uganda, whose business model involves renting custom irrigation pumps to smallholder farmers on demand. The company uses independent motorbike *(boda boda)* drivers to deliver the pumps and provide irrigation services to farmers. As a multisided market maker, Agriworks must provide value to both *boda boda* drivers and to farmers while also creating profit for itself. The company uses several strategies to do this.

Agriworks has contracted directly with an equipment manufacturer to produce custom irrigation pumps at wholesale prices. The pumps have a small capacity because they are designed to attach to a motorbike engine to boost their output. By using *boda boda* drivers – who are not company employees – to transport and provide additional horsepower for the pumps, Agriworks reduces its costs per unit of pumping capacity. The company maintains a large pool of potential *boda boda* drivers, allowing it to capitalize on underutilized capacity and quickly adjust to changes in demand, without needing to maintain a large, high-capacity equipment inventory. Because the business model allows rapid transport of irrigation equipment, one pump is able to provide irrigation services to multiple farmers each day, increasing asset utilization and revenue per unit of capital invested in equipment.

Reference: Urujeni, R., et al., 2023. "Agriworks Business Model Canvas." Daugherty Water for Food Global Institute, https://go.unl.edu/agriworks-bmc.

Irrigation dealer side hustles

Pay-N-Pump is a subsidiary of Aptech, a solar pump irrigation dealer based in Uganda. Pay-N-Pump offers long-term rentals of solar pumps

Credit: N. Akaliza

mounted on a custom-built wheeled frame. The company worked with a local software developer on a hardware and software solution that allows the irrigation pump to be shut down remotely if monthly payments are not made.

Because Pay-N-Pump is a subsidiary of the irrigation equipment dealer, which will get wholesale equipment prices and holds inventory, it may pay little or no money for the pumps it uses. Pay-N-Pump can simply take unused inventory and rent it out. When rentals are complete, the pumps can be refurbished and sold, likely still above the wholesale price and potentially at full retail price. Similarly, Pay-N-Pump benefits from having trained service technicians already on the payroll of the parent company and accessible for zero or little incremental cost. An additional benefit of the close relationship between dealer and IaaS provider is that some customers who start by renting a pump may eventually purchase equipment from the dealer. Thus, the irrigation as a service company provides a marketing funnel for the sale of irrigation equipment.

Reference: Mukarusagara, G., et al., 2025. "Pay-N-Pump Business Model Canvas." Daugherty Water for Food Global Institute, https://go.unl.edu/pnp-bmc.

Credit: Pay-N-Pump

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