



Our World, Our Responsibility

Project Concept

SPRINKLER IRRIGATION SYSTEM (SIS)

Kowai Town, Kpaai District,
Bong County, Liberia

Abbreviations



Abbreviation	Definition
\$	United States Dollar
FTE	Full-Time Equivalent (jobs)
GdFH	Global Development for Humanity
ha	Hectare
HH(s)	Household(s)
IMC	Irrigation Management Committee
SDGs	Sustainable Development Goals
SIS	Sprinkler Irrigation System (Solar-powered)

Agenda



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Project Background and Timeline

Project Background

Key Challenges in Kowai Town, Kpaai District, Bong County, Liberia



Dry-Season Water Scarcity: Agricultural production in Kowai Town relies heavily on rainfall. During the dry season, limited water availability and the reliance on manual watering leads to significant yield losses and restricts farming activities for several months each year.



Single-Season Production: Short and increasingly unreliable rainy seasons (May–September) limit farmers to one production cycle per year, despite fertile soils and strong market demand for vegetables and crops.



Untapped Water Resources: Although nearby rivers and seasonal water sources are available, the absence of pumping systems and irrigation infrastructure prevents their effective use for agricultural production.



High Labor Burden: Manual watering using buckets is labor-intensive and time-consuming, limits farm size, reducing productivity and household welfare, particularly for women farmers.



Income Instability: Single-season production leads to low and volatile incomes. Farmers are forced to sell during peak supply periods when prices are lowest, increasing vulnerability to shocks.



SOLUTION

SPRINKLER IRRIGATION SYSTEM (SIS)



Project Background

Strategic Solution – SIS Overview



Capacity/Size: This community-managed SIS serves two hectares of communal farmland and consists of a 3-horsepower solar-powered pump and a 4.5 kW solar system (10 panels), high-density polyethylene main and sub-main pipelines, and sprinkler distribution lines.

Water Source & Storage: Water is abstracted from a nearby river source. It is then stored in two 1,000-gallon tanks, which provide stable pressure and reliable daily irrigation.

Beneficiaries: The system currently benefits 30 farming HHs (180 people). Operating under a group-based land use and production model, it has the potential to be scaled up to reach 100 HHs (600 people) through future expansion subject to additional investment.

Optimal Location: The SIS is located on community land in Kowai Town, Kpaai District, Bong County, close to both cultivated fields and the water source, enabling efficient system management and strong community ownership.



Project Timeline



#	Project Timeline – Sprinkler Irrigation System (SIS), Liberia	Month 1				Month 2				Month 3				Month 4				Month 5			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Key Implementation Milestones																					
1	Conduct introductory meetings with District authorities, water regulators, and community stakeholders																				
2	Securing project site boundaries, land documentation, and conducting environmental feasibility																				
3	Conducting technical assessment of the water source (Nearby River), flow measurement, and irrigation layout confirmation																				
4	Tendering, vendor selection, and procurement of materials (pipes, risers, sprinklers, pump, solar panels, fittings, tank, accessories)																				
5	Transport and delivery of irrigation materials, solar components, tank, and fittings to Kowai																				
6	Construction and installation works: river intake, filtration, pump house platform, solar array mounting, storage tank stand																				
7	Installation of mainline & submain pipelines, risers, sprinkler heads, valves, fertigation system, and system pressure testing																				
8	Solar pump integration, electrical control configuration, calibration, water-flow testing, and full commissioning																				
9	Community training: system operation, water management, maintenance routines, fertigation usage, governance setup																				
10	Establish Irrigation Management Committee (IMC) and finalize operations and maintenance schedules, revenue-sharing rules, logbooks, and user protocols																			✔	

Project Objectives and Economic Impact

Key Project Objectives



1

Enable Dry and Off-Season Production

A reliable solar-powered SIS that enables farmers to cultivate crops beyond the rainy season, reducing dependence on a single rain-fed production cycle.

2

Reduce Dry-Season Yield Losses

Reduce dry-season vegetable yield losses by up to 35% by ensuring consistent access to irrigation water during the dry period (November–April).

3

Increase Agricultural Productivity

Increase agricultural productivity by enabling a second cycle per year, raising total annual production from rain-fed levels to approximately 16 tons of mixed vegetables across 2 hectares.

4

Stabilize and Increase Household Incomes

Improve income stability and raise household earnings by enabling at least two production cycles per year, reducing exposure to peak-season price volatility.

5

Reduce Labor Burden

Replace manual bucket irrigation with efficient sprinkler systems to save time, reduce physical labor, expand cultivated area, and improve productivity particularly for women farmers.

6

Strengthen Climate Resilience & Sustainability

Enhance resilience to climate variability by providing a reliable water supply independent of rainfall, supported by community-based management and cost-recovery mechanisms.

Key Economic Impacts



Production Impact (tons)

The SIS will significantly increase annual vegetable production by 8 tons/year (from 8 tons/year to **16 tons/year**) across 2 ha land.



Income Impact (\$)

Annual HH income increases from \$636 to \$803 (**+\$167, +26%**) driven by dry-season production enabled by the SIS.*



Employment Impact (FTE**)

The SIS generates **10 full-time equivalent (FTE) jobs** (direct & indirect) in operation, transport, logistics, and market activities.



Labor Time Savings

The replacement of manual irrigation with SIS significantly reduces physical labor on watering, particularly for women farmers.



Climate Resilience

The SIS ensures a reliable water supply independent of rainfall, strengthening resilience to climate variability.



Food Security & Nutrition

10% of total agricultural production (1.6 tons) is retained for HHs consumption, ensuring access to fresh and nutritious food.

The project contributes directly to the key Sustainable Development Goals (SDGs)



* Income estimates are based on $\approx 90\%$ of total production marketed; the remaining $\approx 10\%$ contributes to household food security and non-cash welfare gains.

** FTE stands for Full-Time Equivalent, meaning a standard full-time job with 172 working hours per month or, in some agricultural contexts, employment for 12 months per year.

Impact on Production, Income, and Employment



Production (tons)

The SIS increases annual vegetable production from 8 tons to **16 tons per year**.

Farmers in Kowai Town mainly cultivate bitter balls, tomatoes, pepper, and other leafy vegetables. Under rain-fed conditions, production is limited to one season/year, with total output constrained by limited water availability.

The introduction of SIS enables off-season production, allowing farmers to cultivate crops through two cycles per year. This increases total production to 16 tons/year across 2 hectares, resulting in a substantial increase in output and reliable supply.



Income (\$)

Estimated increase in farmers' annual income is \$167 (**26% ↑**).

Under rain-fed conditions, farmers are forced to sell during peak harvest periods when prices are lowest. The SIS enables higher yields, dry-season production, and improved timing of market sales.

Average household income increases from \$636 to \$803 per year, driven by improved productivity and off-season production. According to income estimates $\approx 90\%$ of total production will be marketed, while the remaining 10% contributes to HH food security and non-cash welfare benefits.



Employment (FTE)

Creating **10 FTE jobs** in farming, logistics, and operations.

The SIS will create a total of 10 FTE jobs.

Job Created	FTE
Farmers	7.5
Transport & logistics	≈ 0.5
Administration	1
Operations & maintenance	1
Total FTE Jobs Created	10

Most of the jobs created relate to farmers, who account for a total of 7.5 FTEs, representing 75% of total added employment. In addition, 2.5 FTEs are created to support administration, logistics, and system operation.

Operational and Implementation Framework

Major Operational Aspects



Water Pressure Management

The quality and sustainability of the water pressure will be continuously monitored to ensure the smooth functioning of the system.



Distribution Pipelines

The design and layout of mains, bypasses, and the right materials are essential to minimize losses and ensure consistent coverage.



Planning and Control

A rotating irrigation schedule (2 hours per plot per day) managed by the IMC to ensure equitable access, stable pressure and a reliable daily water supply.



System Monitoring

The IMC maintains records including irrigation schedules, maintenance logs, and farmer contributions and payments to GDfH to support transparency and planning.



Capacity Building

Farmers are trained in irrigation operations, maintenance, crop planning, and water efficiency. GDfH ensures continuous technical monitoring.



Maintenance

Regular maintenance (clogging prevention, leak repair, nozzle replacement), user training and cost recovery are implemented by the IMC for long-term functionality and sustainability.

Project Implementation Framework



Community Engagement



Formation and training of Irrigation Management Committee (IMC), including farmers, local leaders, and the GDfH team to ensure ownership, transparency, and accountability.

Operations & Service Model



Farmers receive scheduled access to irrigation under a two-group system (15 farmers per hectare). They plan the water schedule, and each group retains full ownership of the crops and production decisions.

Capacity Building



Farmers will be trained in irrigation system operation, maintenance, water-use efficiency, crop planning, fertigation practices, and basic record-keeping to ensure sustainable system use.

Maintenance & Technical Oversight



The IMC oversees routine system maintenance, supported by GDfH for technical supervision, troubleshooting, and periodic system inspections to ensure uninterrupted operation.

Farmer Contribution



Farmers contribute under agreed conditions through labor, maintenance works, and compliance with water-use rules. As a group, they transfer the agreed share of sale revenue to GDfH each season.

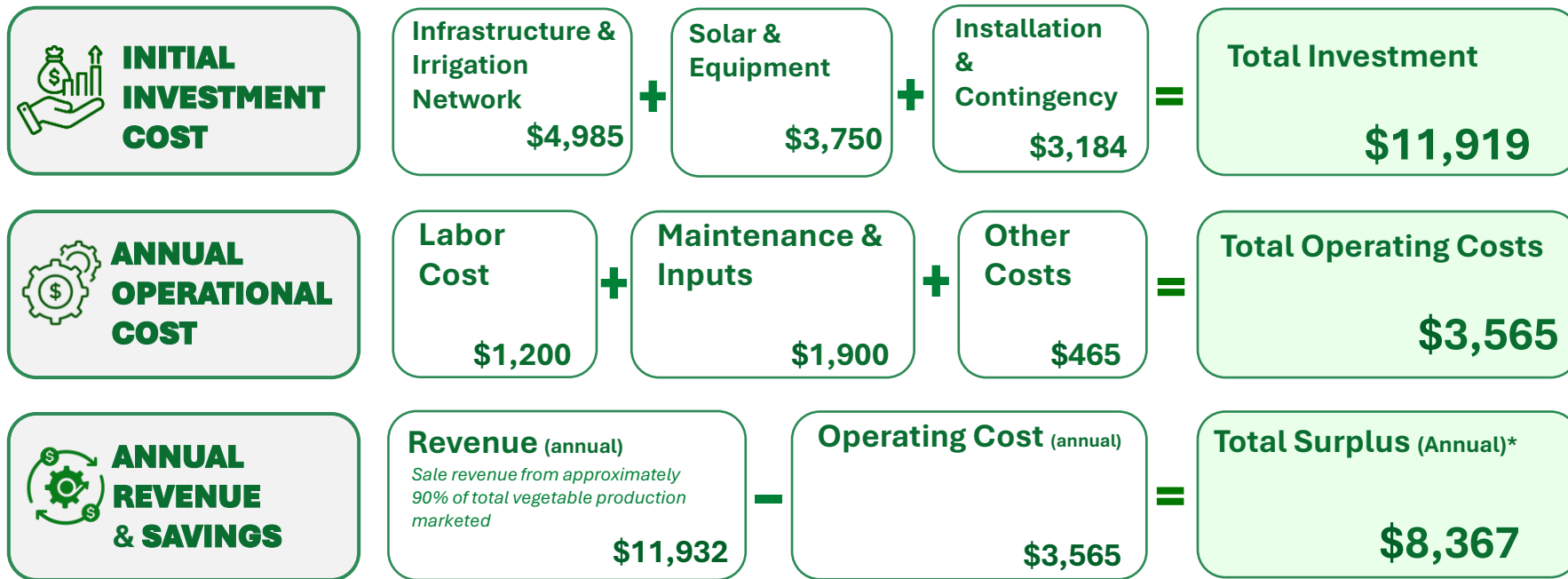
Financial Sustainability



Annual surplus funds will be used to support system sustainability, expansion, and additional development projects, reinforcing the self-sustaining character of GDfH projects.

Project Financials

Overview of Project Financials



SUSTAINABILITY

The project is financially sustainable with long-term expansion potential.

* 60% of the total surplus is divided among the farmers in cash (\$167 per HH), and the remaining 40% is repaid as cost recovery and expansion of similar projects by the GDfH.

Project Financials

Total Initial Investment Costs

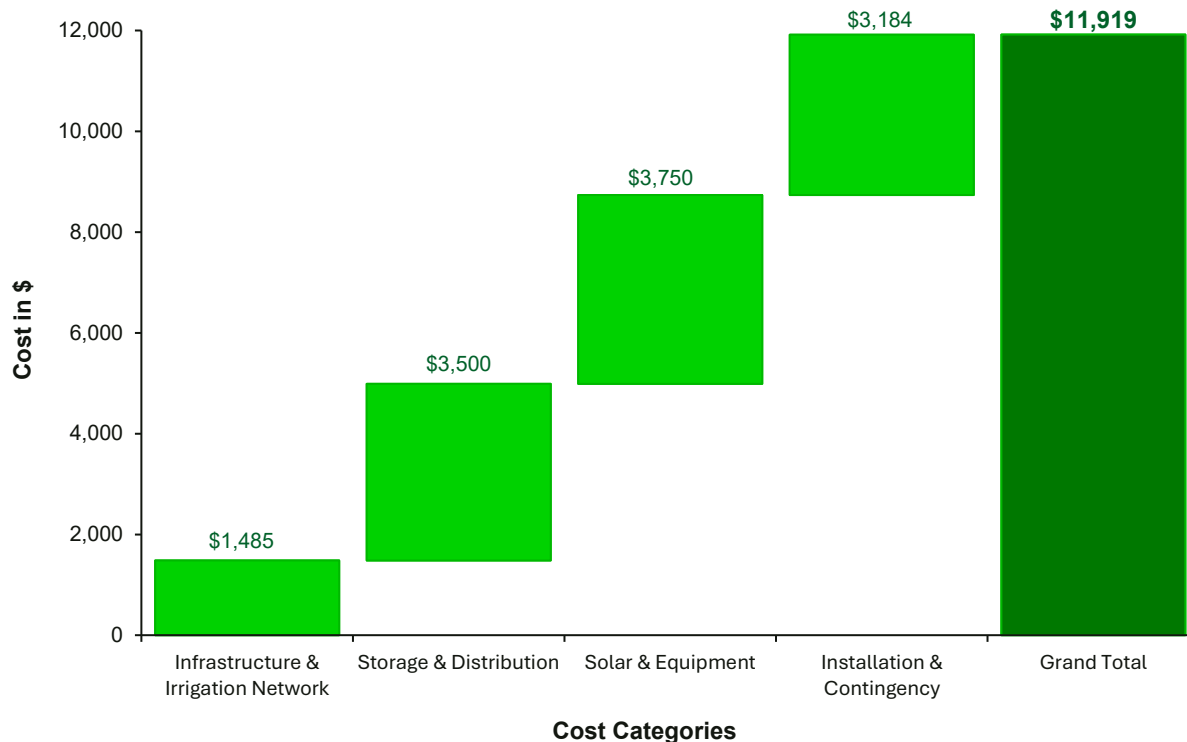


The chart illustrates the initial capital investment required to establish a solar-powered sprinkler irrigation system (SIS) on 2 hectares of community land in Kowai Town, Kpaai District, Bong County, Liberia.

The **total** initial investment amounts to **\$11,919**, covering irrigation infrastructure, storage and distribution systems, solar-powered pumping and control equipment, and installation costs.

Major cost items include **infrastructure and irrigation network (\$1,485)**, **storage and distribution systems (\$3,500)**, **solar pumping and control equipment (\$3,750)**, and **installation, permits, and contingency costs (\$3,184)**.

All cost estimates are based on supplier quotations and local market rates. Community land contributions and collective labor inputs further enhance project affordability and long-term financial viability.



Project Financials

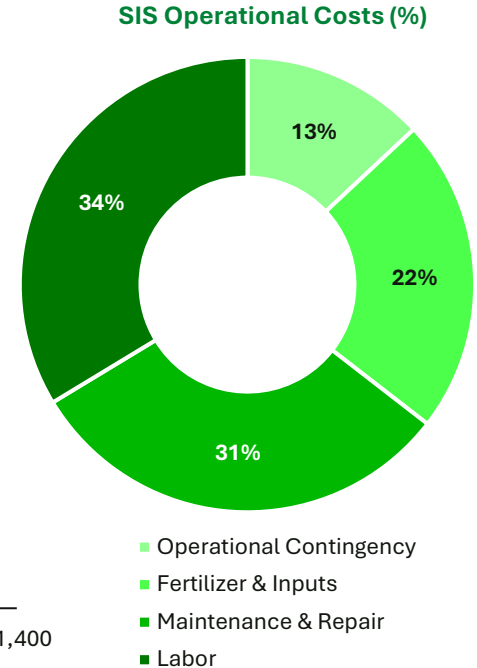
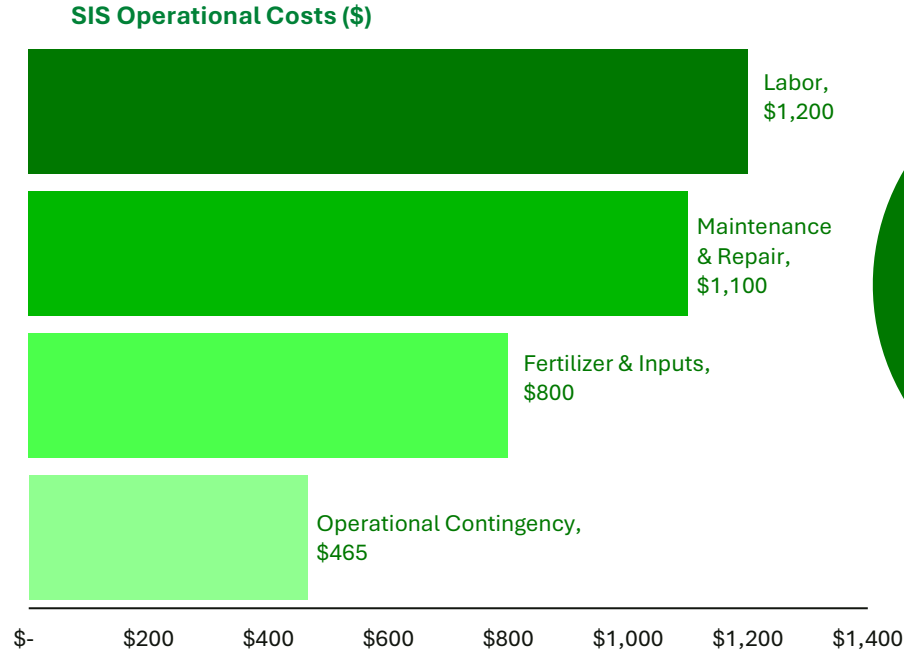
Annual Operating Costs



The charts illustrate the **annual operating costs** of the Sprinkler Irrigation System (SIS), totaling **\$3,565**.

Labor represents the largest share of operating costs (**\$1,200; ~34%**), covering routine system checks, security, and technical support. **Maintenance and repair** costs amount to **\$1,100 (31%)**, ensuring the upkeep of pumps, pipelines, and sprinkler components. **Fertilizer and production inputs** total **\$800 (22%)**, supporting two annual cultivation cycles. An operational **contingency** provision of **\$465 (13%)** is included to address unforeseen maintenance and operational needs.

Together, these costs ensure the reliable, efficient, and sustainable operation of the SIS.



Project Financials

Annual Revenues and Savings

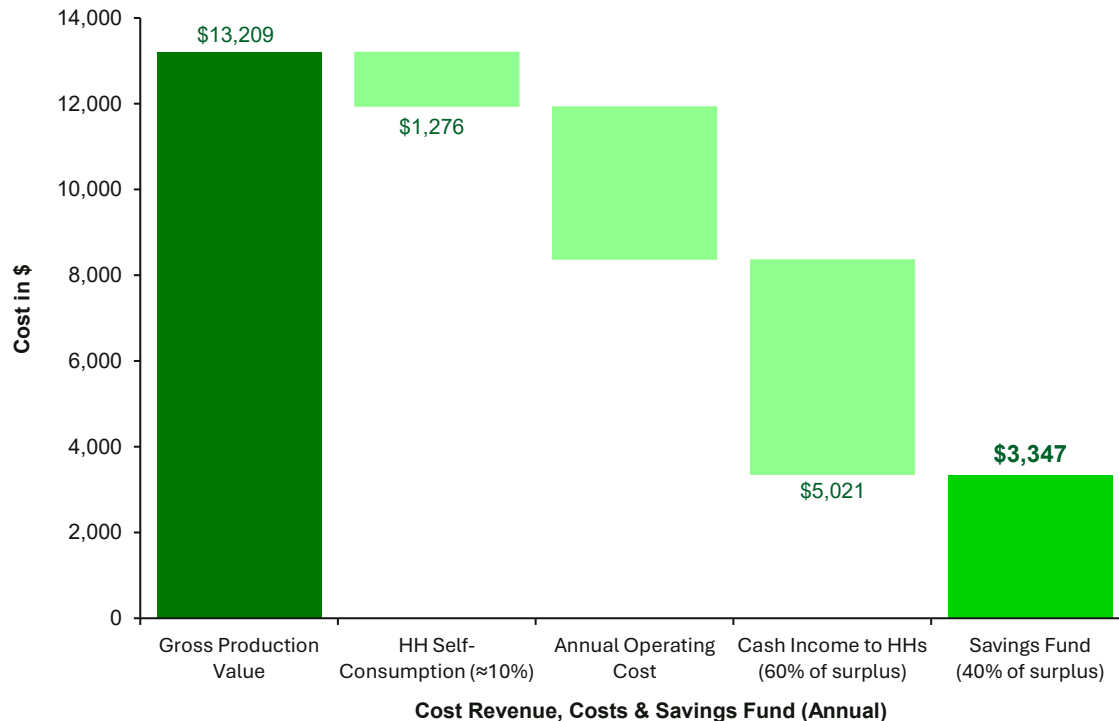


The chart presents the project's annual financial performance and long-term sustainability.

Annual total revenue is generated from year-round vegetable production on 2 hectares of irrigated land, totaling **\$13,209**. Of this, **10% (\$1,276)** is retained for **direct HH consumption**, delivering important food security and nutrition benefits. The main expense is the **annual operating cost** of **\$3,565**, covering labor, maintenance, inputs, and contingency to ensure reliable SIS operation.

After these deductions, the project generates a **net annual surplus** of **\$8,367**, of which **60% (\$5,021)** is distributed as **cash income** to 30 households, while **40% (\$3,347)** of surplus is retained as **savings fund**.

This annual surplus demonstrates the project's financial sustainability and its capacity for cost recovery, system expansion, and support to similar development initiatives.



Note: Annual surplus (\$8,368) is calculated as sale revenue (\$11,932.55) minus operating costs (\$3,565), of which 60% (\$5,021) is distributed as cash income to farmers and 40% (\$3,347) is retained for cost recovery and reinvestment.

Key Impact

Overview Project Impact



Local Agro-Food System

The SIS enables year-round vegetable production on 2 hectares of communal land, increasing output from 8 to about **16 tons per year** and reducing dry-season crop losses through reliable irrigation.



Income Growth for Farming Households

With two cropping cycles per year, household incomes increase by 26% compared to rain-fed farming, generating **\$167** per household annually in cash income, plus food consumption benefits.



Job Creation and Labor Productivity

The project creates approximately **10 full-time equivalent (FTE) jobs** across farming, logistics, and system management, while reducing manual watering labor, particularly for women farmers.



Food Security & Nutrition Improvement

About 10% of total production is retained for direct household consumption, ensuring year-round access to fresh vegetables and improved nutrition for the participating HHs and surrounding community members.



Financially Sustainable and Scalable Development Model

The SIS generates annual sales revenue of **\$11,933**, an annual surplus of **\$8,368**, and a savings fund of **\$3,347**. It achieves cost recovery in approximately 3.5 years and can be expanded to serve up to 100 households through phased system scaling.

Thank You!



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Get in Touch

 www.gdfh.org	 info@gdfh.org	 +49 211 90997744
 Brehmstraße 3, 40239 Düsseldorf Germany	 Monday – Friday 8:00 AM - 6:00 PM	

