



Our World, Our Responsibility

Project Concept

DRIP IRRIGATION SYSTEM (DIS)

**Kowai Town,
Kpaai District,
Bong County, Liberia**

Abbreviations



Abbreviation	Definition
\$	United States Dollar
DIS	Drip Irrigation System (River-Fed and Solar powered)
FIMC	Farming Irrigation Management Committee
FTE	Full-Time Equivalent (jobs)
GDfH	Global Development for Humanity
ha	Hectare
HH(s)	Household(s)
HP	Horsepower
kW / kWp	Kilowatt / Kilowatt-peak
PV	Photovoltaic
SDGs	Sustainable Development Goals

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 reliance on manual river 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, storage, and drip 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.

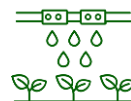


Income Instability: Single-season production leads to low and volatile incomes. Farmers are forced to sell during peak supply periods when prices are lowest, increasing vulnerability to shocks.



SOLUTION

DRIP IRRIGATION SYSTEM (DIS)



Project Background

Strategic Solution – DIS Overview



Capacity/Size: The DIS serves 10 ha of farmland and consists of an 8 HP centrifugal pump powered by a 10 kWp PV system (18 panels) with an 11-kW inverter, elevated water storage (50,000 liters), main and sub-main pipelines, and drip laterals delivering water directly to crop root zones.

Water Source & Storage: Water is abstracted from a nearby river source and pumped to multiple elevated storage tanks, providing stable pressure and reliable daily irrigation for multiple vegetable crops during the dry season.

Beneficiaries: The system directly benefits 100 farming households (approximately 600 people), organized into 4 production groups, each cultivating 2.5 ha under a cooperative land-use and management model.

Optimal Location: The DIS is located on community land in Kowai Town, Kpaai District, Bong County, close to cultivated fields and the river source, enabling efficient system operation, reduced conveyance losses, and strong community ownership.



Project Timeline



#	Project Timeline – Drip Irrigation System (DIS), 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 to confirm project scope, roles, and approvals.																				
2	Securing project site boundaries, land documentation, and conducting environmental feasibility, early discussion on the formation of the (FIMC).																				
3	Conducting technical assessment of the water source (Nearby River), flow measurement, intake location verification, and confirmation of the irrigation layout for 10 hectares.																				
4	Tendering, vendor selection, and procurement of materials (pipes, valves, pump, solar panels, tanks, fittings, and accessories)																				
5	Transport and delivery of irrigation materials, solar components, storage tanks, and fittings to the project site in Kowai Town.																				
6	Construction and installation of river intake, filtration units, pump platform, solar array mounting structures, and elevated storage tank stands.																				
7	Installation of mainline and sub-main pipelines, valves, drip laterals, fertigation system, followed by pressure testing.																				
8	Solar pump integration, electrical control configuration, calibration, water-flow testing, and full system commissioning.																				
9	Community training on system operation, water management, routine maintenance, fertigation use, and governance procedures.																				
10	Formal establishment of the Farming Irrigation Management Committee (FIMC) and finalization of O&M schedules, revenue-sharing rules, logbooks, and user protocols, followed by system handover.																				

Project Objectives and Economic Impact

Key Project Objectives



1

Enable Dry and Off-Season Production

A reliable solar-powered DIS 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 35–40% 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 more than double across 10 ha of mixed vegetable production.

4

Stabilize and Increase Household Incomes

Improve income stability and raise Household (HH) earnings by enabling at least two crop cycles per year, reducing exposure to peak-season price volatility and post-harvest losses.

5

Reduce Labor Burden

Replace manual bucket irrigation with efficient irrigation 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 Uplifting Impacts



Production Impact (tons)

The DIS will increase annual vegetable production by enabling **two crop cycles per year**, resulting in **over 60 tons** of output across 10 hectares and six different crops.



Income Impact (\$)

Annual HH income increases from \$636 to \$731 **(+\$95, +15%)** driven by dry-season production enabled by the DIS.*



Employment Impact (FTE**)

The DIS generates **30 FTE jobs** (direct & indirect) in farming, maintenance, logistics, and marketing.



Labor Time Savings

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



Climate Resilience

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



Food Security & Nutrition

Nearly 8% of total agricultural production (4.8 tons/year) 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 $\approx 92\%$ of total production marketed; the remaining $\approx 8\%$ 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 DIS increases annual vegetable production from less than 30 tons to **60 tons per year**.

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

The introduction of the DIS enables dry-season production, allowing farmers to cultivate crops around the year. This increases total output to over 60 tons per year across 10 ha, resulting in significant increase in supply, productivity, and production stability.



Income (\$)

Estimated increase in farmers' annual income is \$95 per HH (**15% ↑**) for **100 households**.

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

Average household income increases from \$636 to \$731 per year, driven by improved productivity and off-season production. According to income estimates $\approx 92\%$ of total production will be marketed, while the remaining $\approx 8\%$ contributes to HH food security and non-cash welfare benefits.



Employment (FTE)

Creating **30 FTE jobs** in farming, logistics, maintenance, and marketing.

The DIS will create a total of 30 FTE jobs.

Job Created	FTE
Farmers	22
Transport & logistics	3
Administration	3
Operations & maintenance	2
Total FTE Jobs Created	30

Most of the jobs created relate to farmers, who account for a total of 22 FTEs, representing 73% of total added employment. In addition, 8 FTE jobs are created to support administration, logistics, and system operation.

Operational and Implementation Framework

Major Operational Aspects



Water Pressure Management

Water pressure is regulated through storage tanks and control valves to ensure uniform drip flow and protect the system from damage and clogging.



Distribution Pipelines

The main, sub-main, and drip pipelines are operated and managed to deliver uniform water supply across all 4 production plots.



Planning and Control

A rotational irrigation schedule is implemented by the FIMC to ensure seasonally adjusted equitable access, stable pressure, and reliable daily irrigation.



System Monitoring

The FIMC regularly monitors system performance and maintains records on irrigation schedules, maintenance, and user contributions.



Capacity Building

Farmers are continuously trained in system operation, basic maintenance, fertigation practices, and efficient water use. GDfH ensures continuous technical monitoring.



Maintenance

Routine maintenance activities—including filter cleaning, leak repairs, and partial drip line replacement—are carried out to ensure long-term functionality.

Project Implementation Framework



Community Engagement



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

Operations & Service Model



Farmers receive scheduled access to irrigation under a four-group system (25 farmers per 2.5 ha). They plan the irrigation schedule, and groups retain full ownership of the crops and production decisions.

Capacity Building



Selected farmers from each group will be trained in system operation, maintenance, water-use efficiency, crop planning, fertigation practices, and basic record-keeping to ensure sustainable system use.

Maintenance & Technical Oversight



The FIMC 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 net sale revenue to GDfH each season.

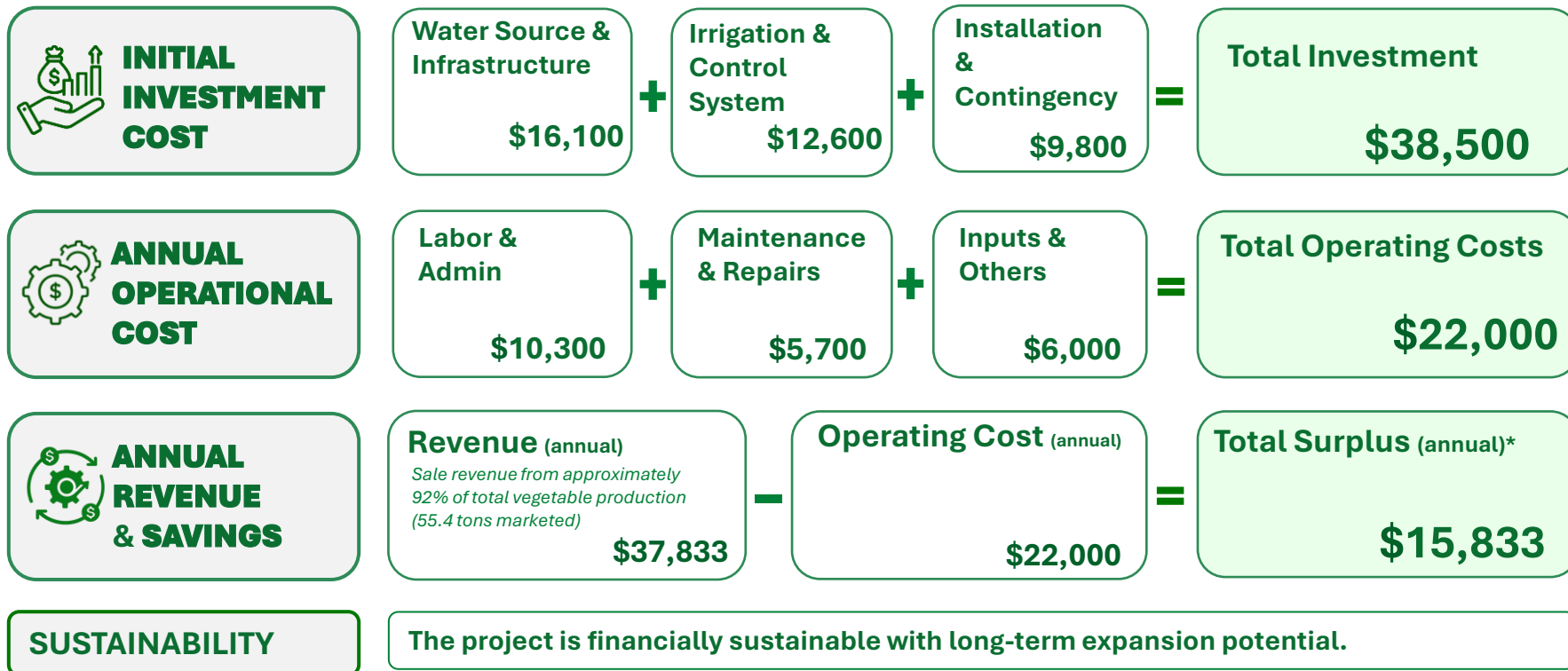
Financial Sustainability



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



* 60% of the total surplus is divided among the farmers in cash (\$95 per HH), and the remaining 40% is repaid as operational cost recovery and expansion of similar projects by the GDfH.

Project Financials

Total Initial Investment Costs

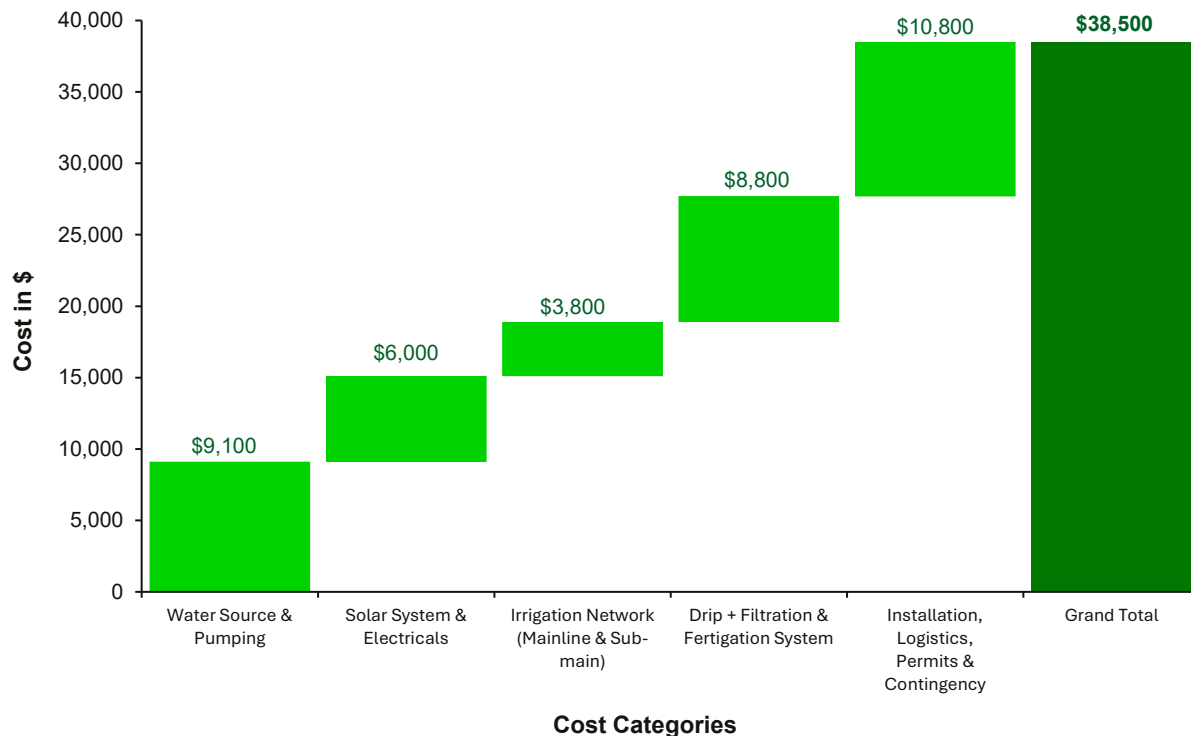


The chart illustrates the initial capital investment required to establish a solar-powered Drip Irrigation System (DIS) on 10 ha of community land in Kowai Town, Kpaai District, Bong County, Liberia.

The **total** initial investment amounts to **\$38,500**, covering water source and pumping infrastructure, solar power systems, irrigation and drip distribution networks, filtration and fertigation equipment, and installation-related costs.

Major cost components include **water source and solar systems (\$15,100)**, **irrigation networks, filtration (\$12,600)**, and **installation, logistics, permits, and contingency provisions (\$ 9,800)**.

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

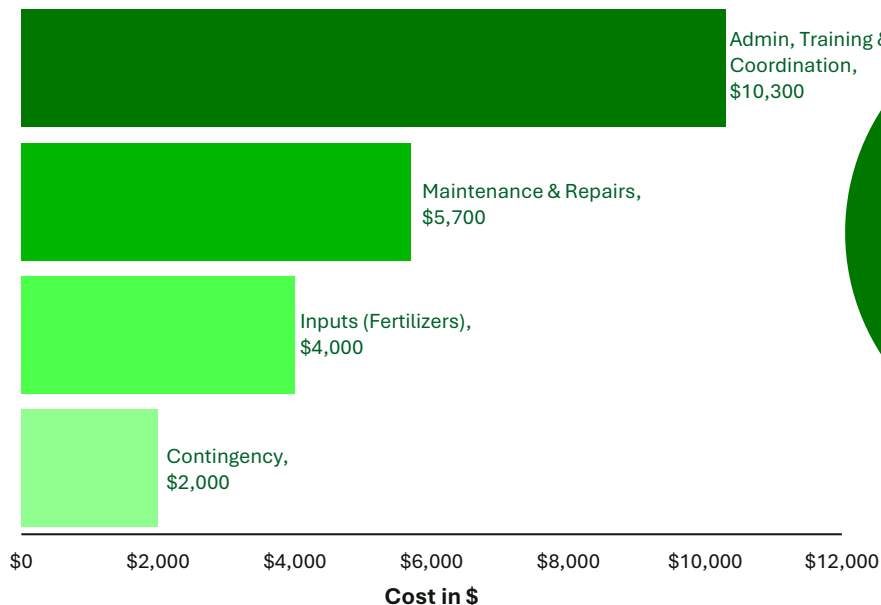


The charts illustrate the annual operating costs of the Drip Irrigation System (DIS), **totaling \$22,000** per year.

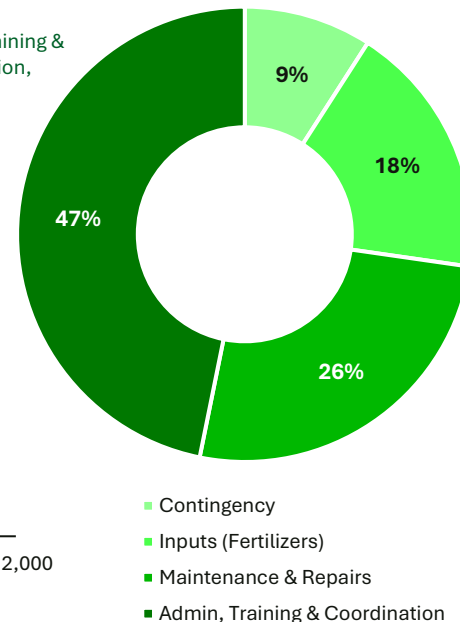
Admin, training, and coordination represent the largest share (**\$10,300; 47%**), covering system management, scheduling, coordination, and technical support. **Maintenance and repairs** amount to **\$5,700 (26%)**, ensuring the upkeep of pumps, pipelines, filters, and drip lines. **Fertilizers and inputs** total **\$4,000 (18%)**, supporting two cultivation cycles. An operational **contingency** of **\$2,000 (9%)** is included to address unforeseen maintenance and operational needs.

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

DIS Operational Costs (\$)



DIS Operational Costs (%)



Project Financials

Annual Revenues and Savings

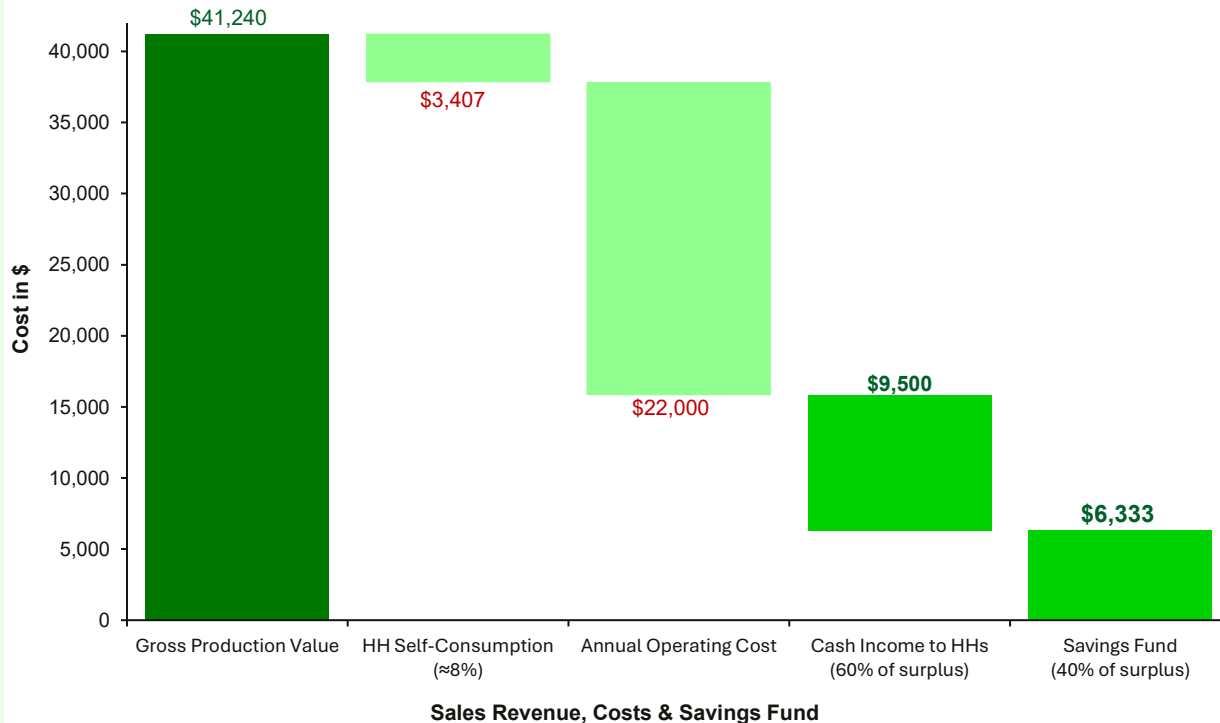


The chart presents the project's annual financial performance and long-term sustainability.

Annual value from mixed vegetable production on 10 ha totals **\$41,240**. This figure includes **8% self-consumption (\$3,406)** and **marketed income of 92% (\$37,833)** generated through product sales.

Major expenses include annual **operating cost of \$22,000**, covering administration, training & coordination, maintenance & repairs, inputs (fertilizers), and contingency. After these deductions, the project generates an annual **surplus of \$15,833.33**, of which 60% (**\$9,500**) is distributed as **cash income** to 100 farmers and 40% (**\$6,333.33**) is retained as a **savings fund** for cost recovery and reinvestment by GDFH.

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



Key Impact

Overview Project Impact



Local Agro-Food System

The DIS enables year-round vegetable production on 10 ha of communal land, increasing output from less than 30 tons to approximately **60 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 about 15% compared to rain-fed farming, generating **\$95 per household per year** in cash income, in addition to **food consumption benefits** for 100 households.



Job Creation and Labor Productivity

The project creates approximately **30 full-time equivalent (FTE) jobs** across farming, logistics, and system management, while significantly reducing manual watering labor, particularly for women farmers.



Food Security & Nutrition Improvement

About 8% of total production is retained for direct household consumption, ensuring year-round access to fresh vegetables and improved nutrition for the 100 participating HHs and surrounding community members.



Financially Sustainable and Scalable Development Model

The DIS generates annual sales revenue of **\$37,833**, an annual surplus of **\$15,833**, and a savings fund of **\$6,333**. It achieves cost recovery in approximately 6 years and can be expanded to serve up to 150 households in the next step.

Thank You!



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