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SOLAR IRRIGATION MARKET ANALYSIS IN MOZAMBIQUE

Solar Powered Irrigation Systems for Small-scale Farmers in Mozambique - Status and Opportunity for the Sector

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1.1 BACKGROUND

Large interest in Solar Powered Irrigation Systems (SPIS) worldwide because of impact on food security, water access, energy and climate

Effective CO2 reduction strategy (97% less CO2 than diesel pumps in lifecycle)

SPIS can reduce out-of-pocket costs for small-scale farmers, and submersible solar pumps allow farmers to access groundwater that is too deep for fuel pumps

SPIS growth, sustainability and demand by farmers depend on the physical, socio-economic, commercial and institutional landscape. In the most successful SPIS countries solar pumps are heavily subsidized (e.g. 90% of the price in Bihar, India)

Specific country study commissioned by the Green People's Energy programme by GIZ Mozambique, to assess the state and barriers of SPIS in Mozambique

1.2 OBJECTIVE

To formulate recommendations for the promotion of solar powered irrigation systems (SPIS) in Mozambique by conducting an analysis of the actual off-grid solar irrigation technologies available and its promotion strategies in place for small scale enterprise level farmers (<2ha) in Mozambique.

1.3 METHODOLOGY

1. Stakeholder mapping : suppliers, government, NGOs
2. Online surveys
3. Key expert interviews

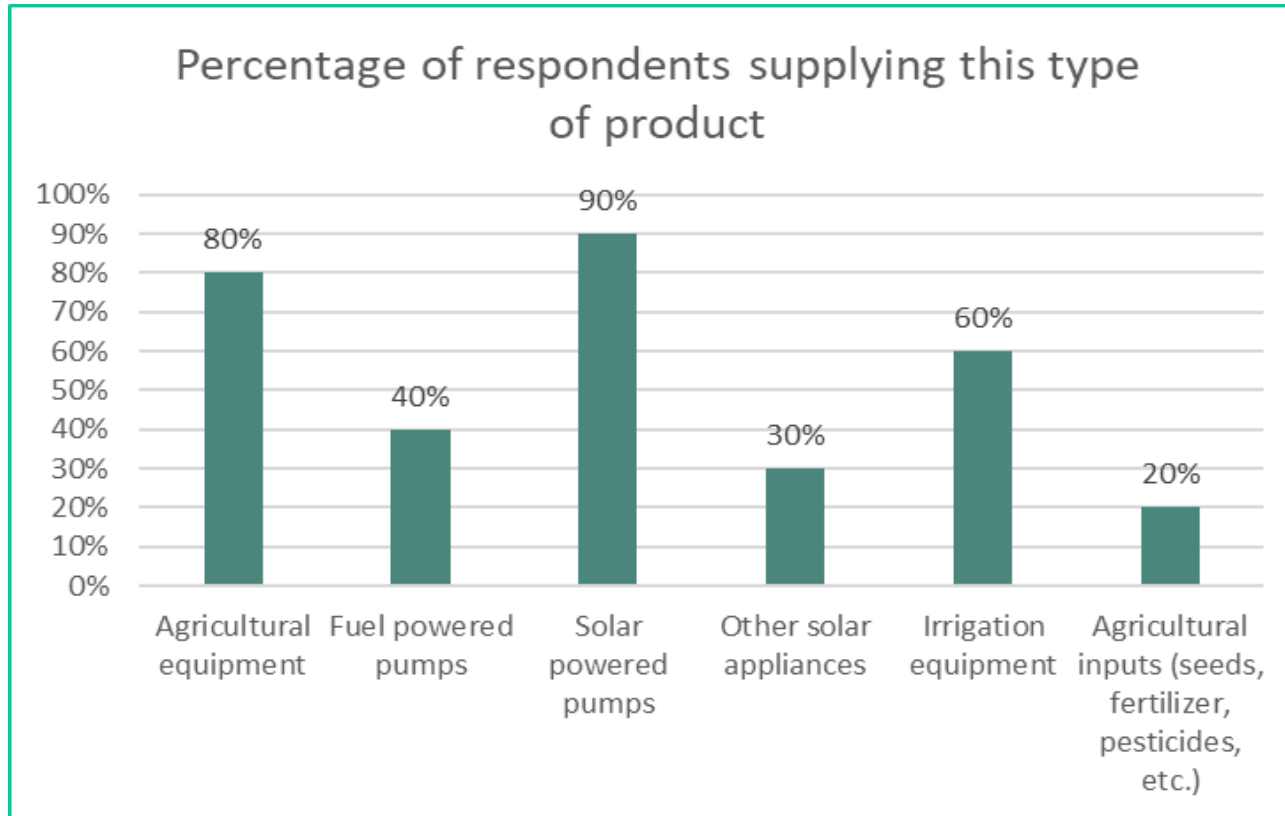
	Private sector	NGOs	Government	Total
Number of surveys sent	25	19	8	52
Number of respondents	10	9	2	21
Respondent rate	40%	47%	25%	40%

2.1 SUPPLY OF SOLAR PUMPS

Distributor > 100 pumps/year during 3 years
Retail 2-25 pumps sold per year

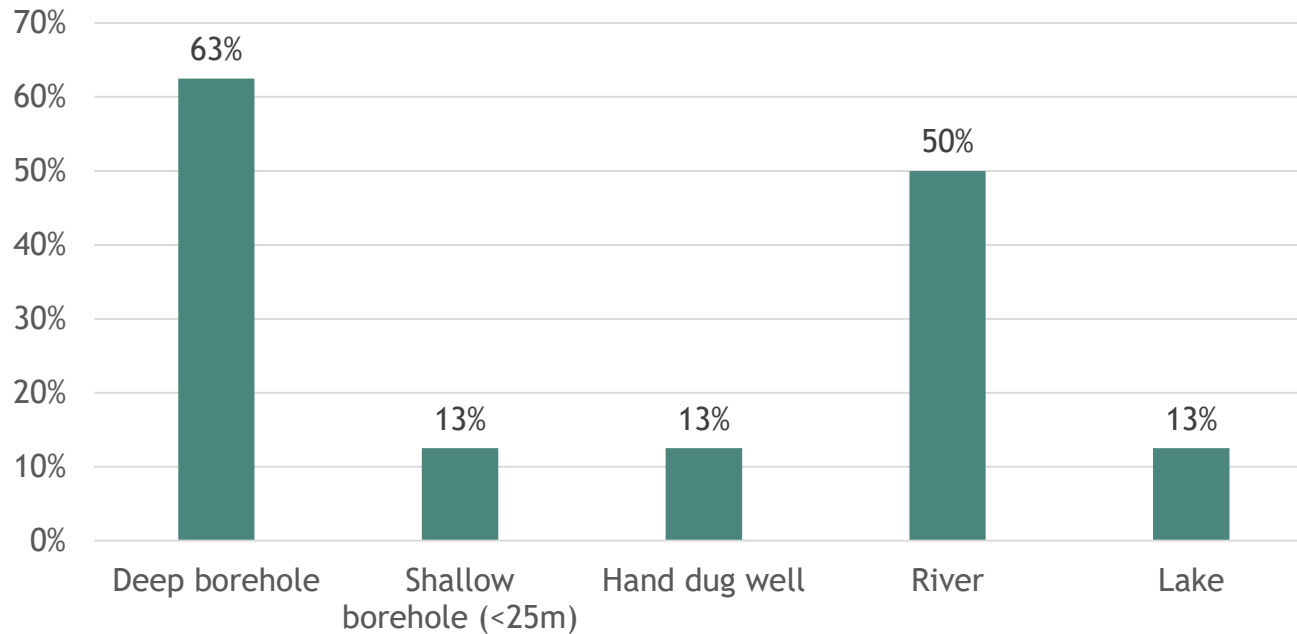
Available brands	Brands not yet available in Mozambique	Brands of which the presence is unknown
Lorentz - Retail	Ningbo	Difful
Grundfos - Distributor	Sunculture	Xinya
Solartech - Distributor	Dayliff	Mono
Futurepump -Distributor	Pumpmakers	Ennos Sunlight
Taifu - Retail	Spowdi	
Cedar Solar - Retail		
Feili - Retail		
Samking - Retail		
Shakti - Retail		
Jain - Retail		

2.1 SUPPLY OF SOLAR IRRIGATION TECH



2.2 TECHNICAL SPECIFICATIONS

Percentage of respondents considering this as the main water source for solar pumps



But : Most farmers do not have access to perennial rivers or deep boreholes

2.2 TECHNICAL SPECIFICATIONS

Supplier in Mozambique	Brand	Model	Price in Meticaís	Total Watt-age	Rated flow (m3/h)	Head at rated flow (m)	Max head (m)
<u>Metaluz Lda</u>	Taifu	4SWN205-0.8N	32,760	1280	2.2	57	70
<u>Sun Power Engineering</u>	Solartech	SPM600H	20,000	270	10		190
<u>Procampo Limitada</u>	Cedar Solar	CEVA 100	870,000	9750	24	40	60
				5.5-12kW			
<u>Water Irrigation Solutions Moz</u>	Futurepump	SF2	77,500	120	2	3-6	8
		SF1	50,778	80			
		SE1		60 or 120	1	3-6	
<u>Blue Zone Mozambique</u>	Grundfos	SQF 2.5-2	140,000	1200	2,5	100	120
		SQF & CRF					250
<u>Soelec</u>	Lorentz	PS2-100	80,000	327	2	40	50
<u>Mudumene Trading</u>	Lorentz	Hr700	390,000	800	5	120	140
		Hr200, Hr14, Hr7					
<u>F&L Lda</u>	Feili	FLD, FLA	210,000		60		100

2.2 TECHNICAL SPECIFICATIONS

Components included in the indicated solar pump prices.

Empty boxes mean the component is not included in the indicated price.

Pump	Price in Meticaís	Solar panels	Panel frame	Hose	Electrical cables	Installation	Transport	Warranty
Taifu	32,760				Yes			0.5 year
Solartech	20,000				Yes			3 years
Cedar Solar	870,000	Yes	Yes	Yes	Yes		Yes	1 year
Futurepump	77,500	Yes			Yes		Yes	1 year
Grundfos	140,000				Yes			1 year
Lorentz	80,000					Yes		1 year
Lorentz	390,000	Yes						3 years
Feili	210,000	Yes	Yes		Yes	Yes		?
	Percentage	50%	25%	13%	75%	25%	25%	100%

When comparing pumps you must know: the daily water need (m³/d) + the total head (m) and ask what is included !

2.2 TECHNICAL SPECIFICATIONS

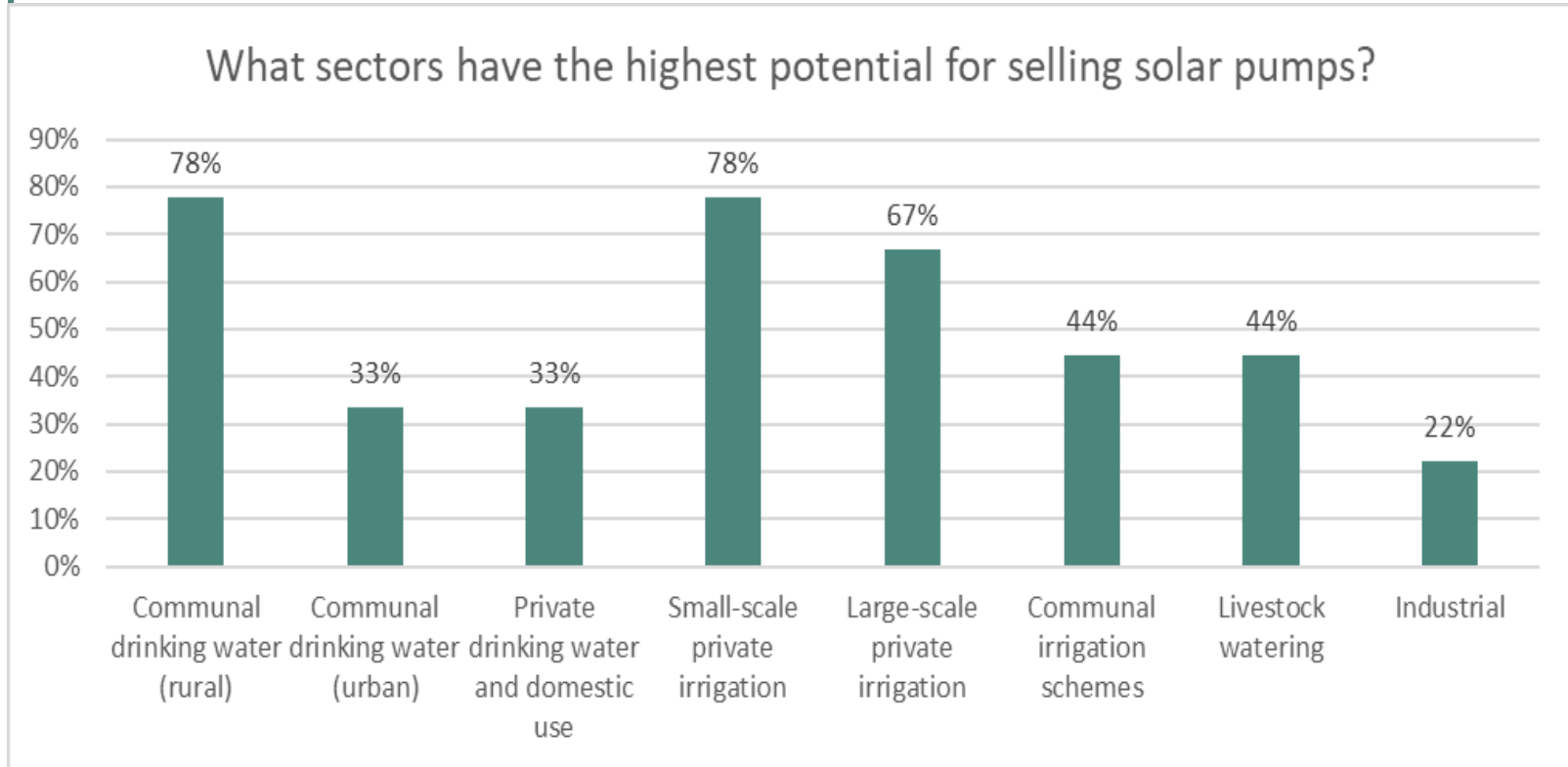
(Solar) Irrigation equipment available in Mozambique

Supplier	Type	Brand	Surface unit	Price in meticaais	Price in EUR	Price per ha in EUR
SunPower Engineering	Drip	Shakti	?	25,000	342	(6840)
Procampo Limitada	Drip	Agriplas	1 ha	350,000	4795	4795
Water and Irrigation Solutions	Drip	Drip Tech India	500 m2	20,000	274	5479
F&L Lda	Drip	Netafim	500 m2	16,000	219	4384
Mudumene Trading	Spray tubes	San Fu	250 m2	20	0.27	11

2.2 TECHNICAL SPECIFICATIONS

Components included in the indicated irrigation system prices							
Brand	Tubes	Connections	Spare parts	Installation	Transport	Warranty	Estimated lifespan
Shakti		Yes				3 years	10 years
Agriplas	Yes	Yes		Yes	Yes	1 year	>5 years
Drip Tech India	Yes	Yes	Yes			No	2 years
Netafim	Yes	Yes			Yes	1 year	2 years
San Fu				Yes		3 years	15 years
Percentage	60%	80%	20%	40%	40%	80%	

2.3 MARKET, DISTRIBUTION, SERVICES



2.3 MARKET, DISTRIBUTION, SERVICES

Number of solar pumps sold per company in Mozambique

	2020	2019	2018	2017 and before
company A	30	20	15	0
company B	450	420	435	320
Etc.	10	15	9	5
	100	100	100	0
	200	180	150	(150)
	2	3	0	0
	25	6	2	1
	3	0	0	0
TOTAL	820	744	711	476
Increase rate	+10%	+5%		

2.3 MARKET, DISTRIBUTION, SERVICES

Average downtime : 9 days
(! = lost harvest)

For those storing spare parts at
district level : 2-3 days

For those having to import: 15 days

Where are spare parts stored?



■ At district level

■ At province level

■ At country level

■ I have to import them

2.4 FINANCE SOLUTIONS IN PLACE

Only two companies provide solar pumps on credit:

- 1) to trusted known customers only
- 2) to clients with salary > 10,000 meticaais per month

The problem?

60% of the companies say the problem is not having enough cash flow to prefinance

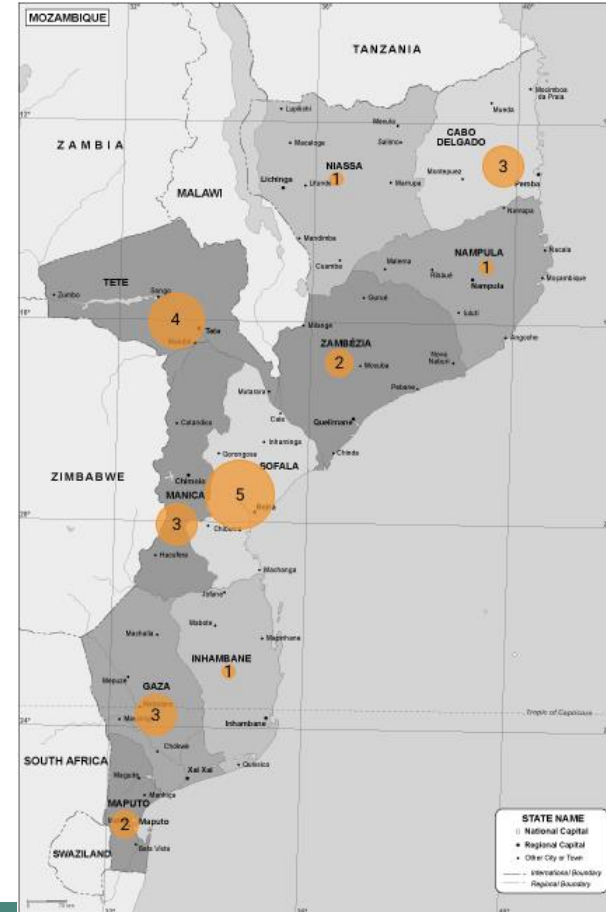
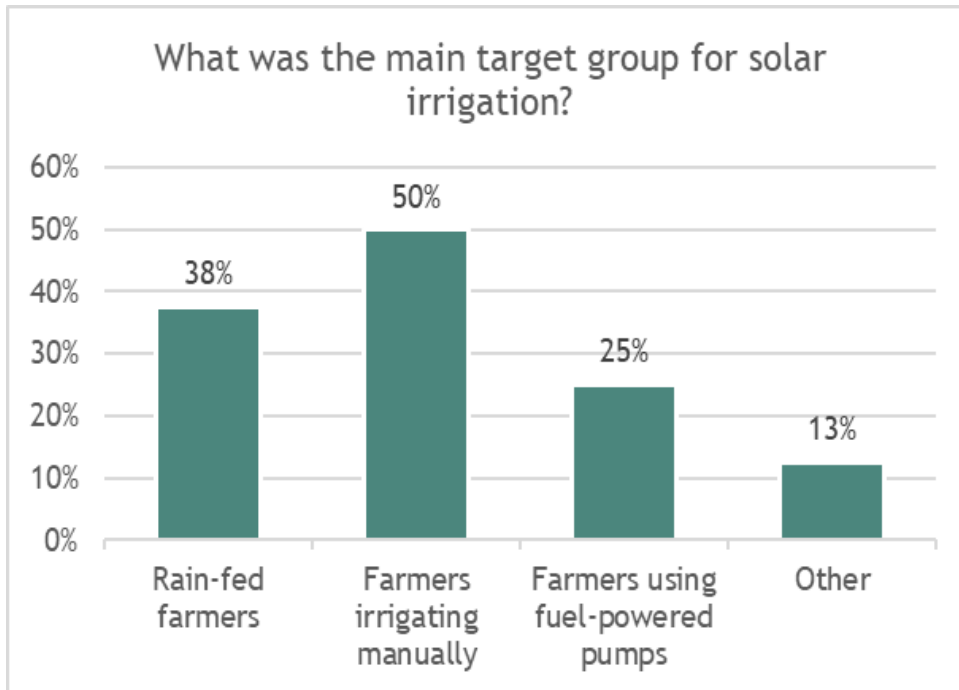
The solution?

50% wants a bank facility with low credit rates

50% wants a project or subsidy to reduce the costs

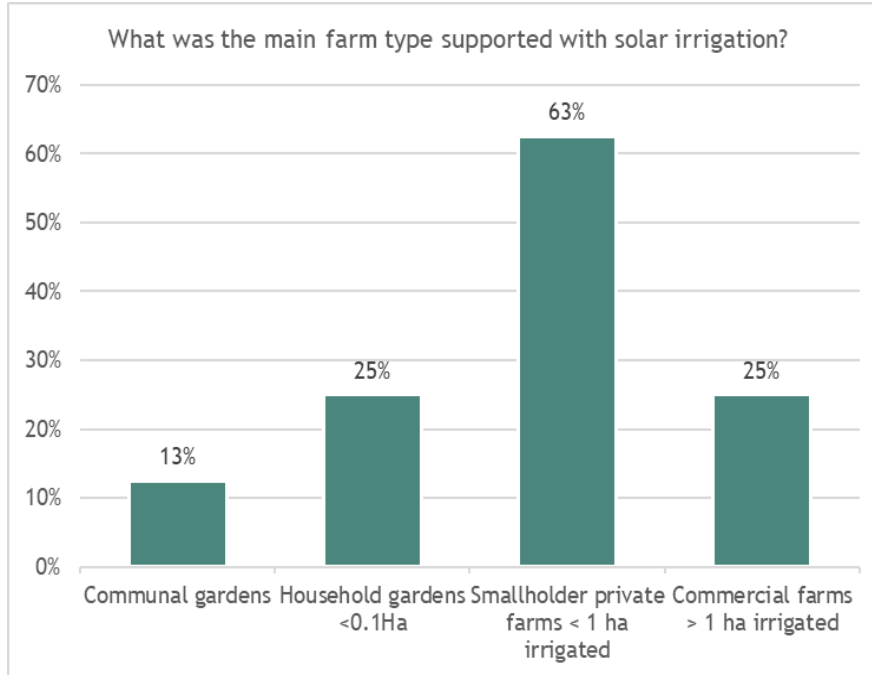
3 SPIS SUPPORT INITIATIVES

NGO and government initiatives

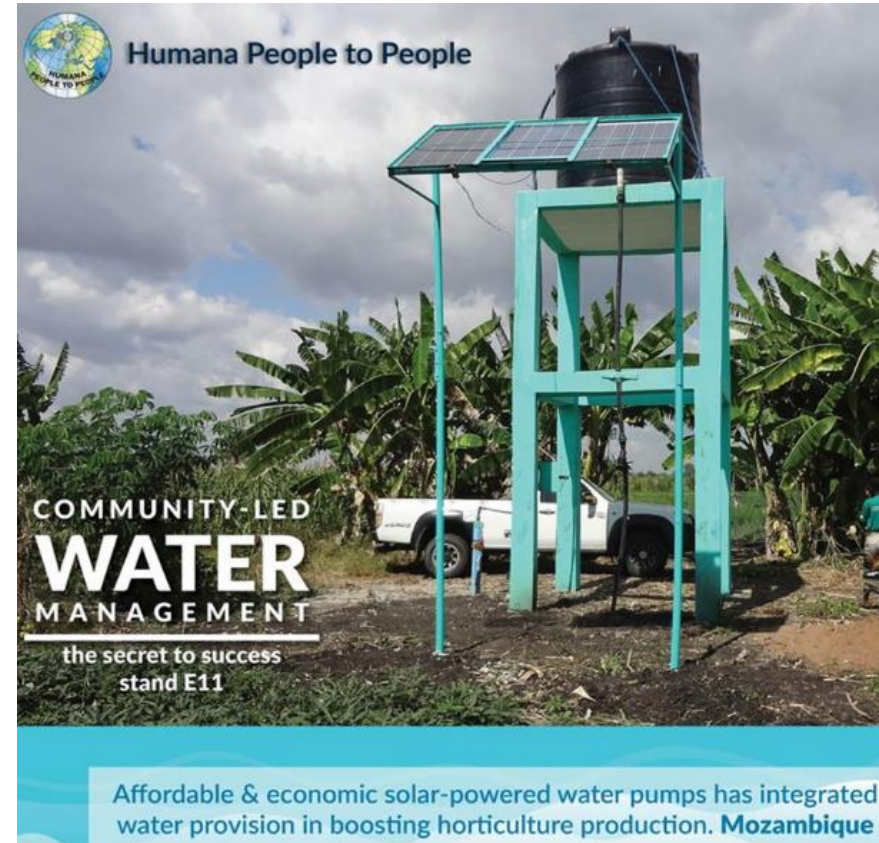


3 SPIS SUPPORT INITIATIVES

NGO and government initiatives



▪ Source: ADPP/UNIDO ->



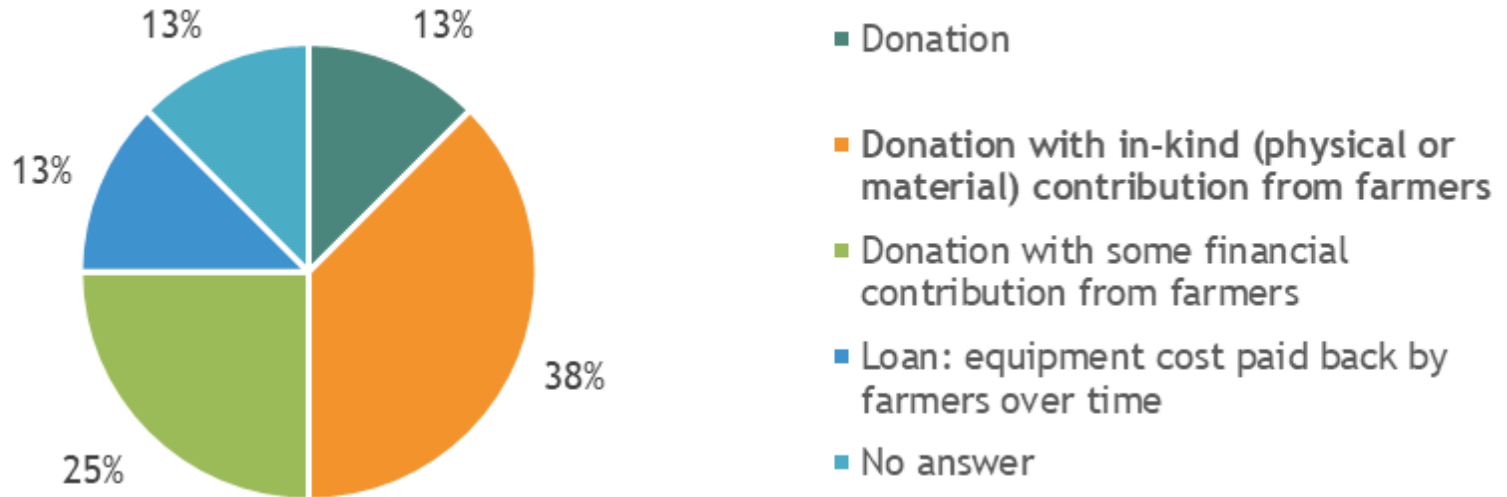
3 SPIS SUPPORT INITIATIVES

Project	Number of beneficiaries	Number of solar pumps distributed in the project?	Total cost of the solar pumps and irrigation systems	Estimated total area (ha) covered by solar irrigation in the project	Estimated Cost EUR/ha
A4Labs	3	5	3375 (EUR)	0.5 ha	6,750
Sustainable Energy for All	4000	80	406000 (MZN)	47 ha	9,466
INIR	4200	4100	USD 4 million	210 ha	15,613
APSAN-Vale	15	15	OVER 2000 USD	> 3ha	8,197
PROSUL	2 associations		5,229,921 MZN	4 ha	17,910

Cost benefit analysis done by two NGOs : Return on investment in 2 - 3 years

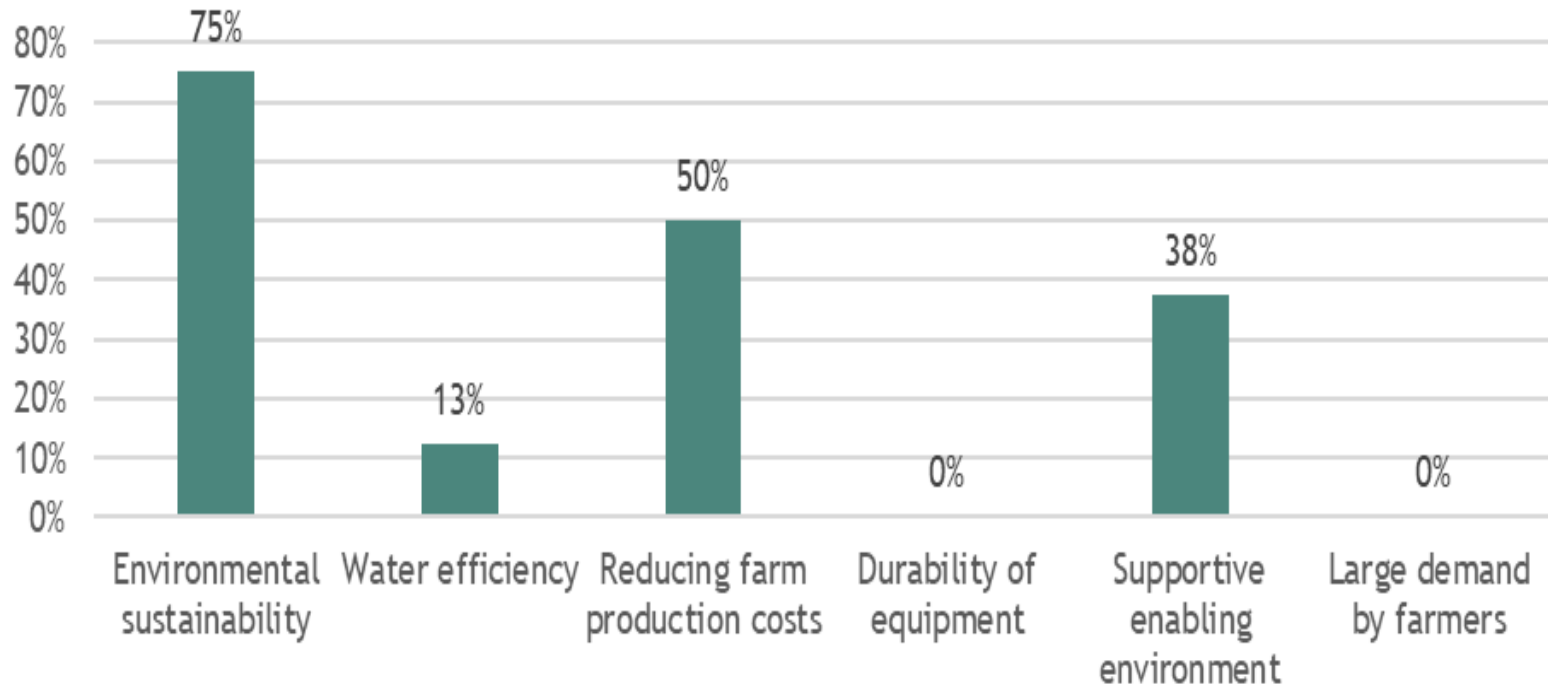
3 SPIS SUPPORT INITIATIVES

What was the arrangement made with farmers when supplying equipment?



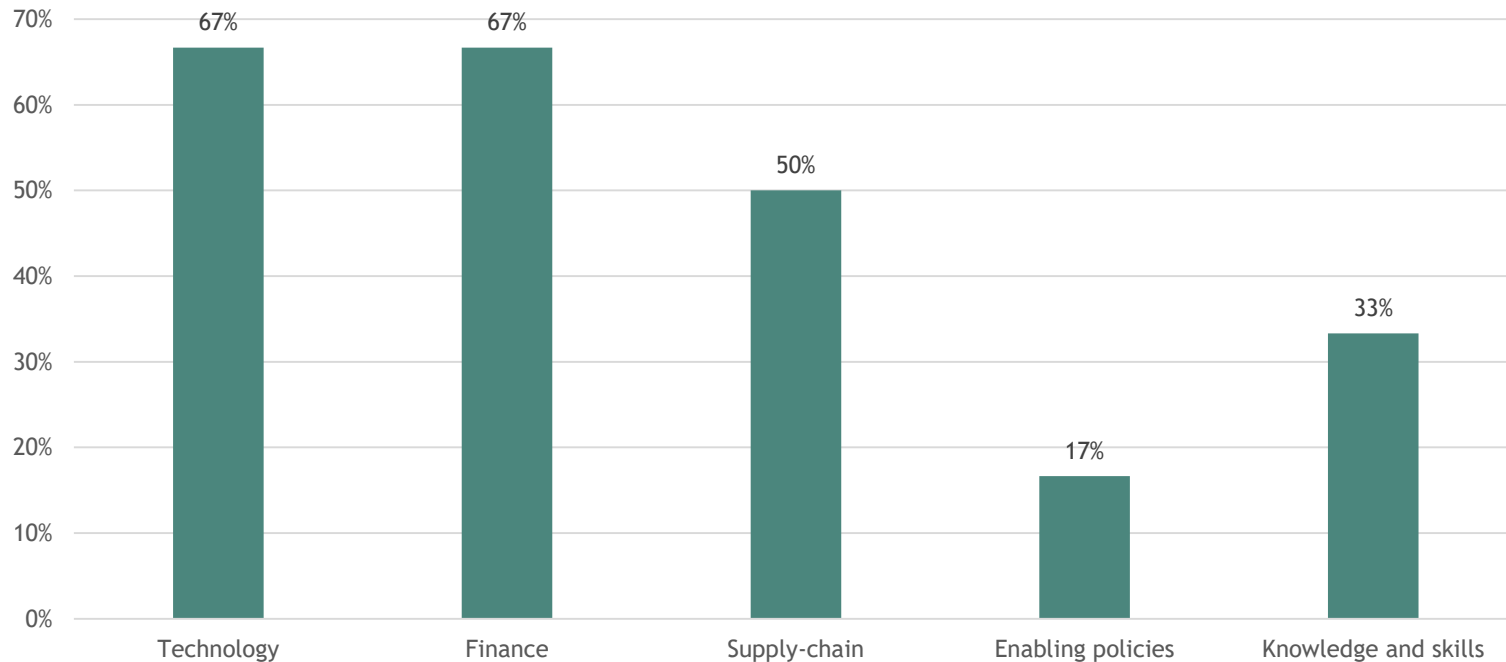
3 SPIS SUPPORT INITIATIVES

What are the reasons to engage in solar irrigation?



4. BARRIERS FOR UPSCALING

Main challenges of solar irrigation according to supporting organizations



4.1 TECHNICAL BARRIERS

- ❑ Available water sources : go beyond rivers and deep boreholes
- ❑ Limited capacity (flow + head) compared to fuel pumps
- ❑ Higher capacity solar pumps exists, but direct relation :

Required pump capacity -> Required energy -> Cost of the system

- ❑ Lack of optimal irrigation technologies for SPIS
(only drip is widely available in Mozambique, but the cost is high)
- ❑ Risk of theft. Need for protection or portable solutions
- ❑ Repairs are challenging due to :
 - Limited knowledge and experience with SPIS
 - Installation by supplier, difficult to access and repair by local technicians
 - Spare parts not widely available due to limited market development
 - Only 40% of suppliers provide training to the users

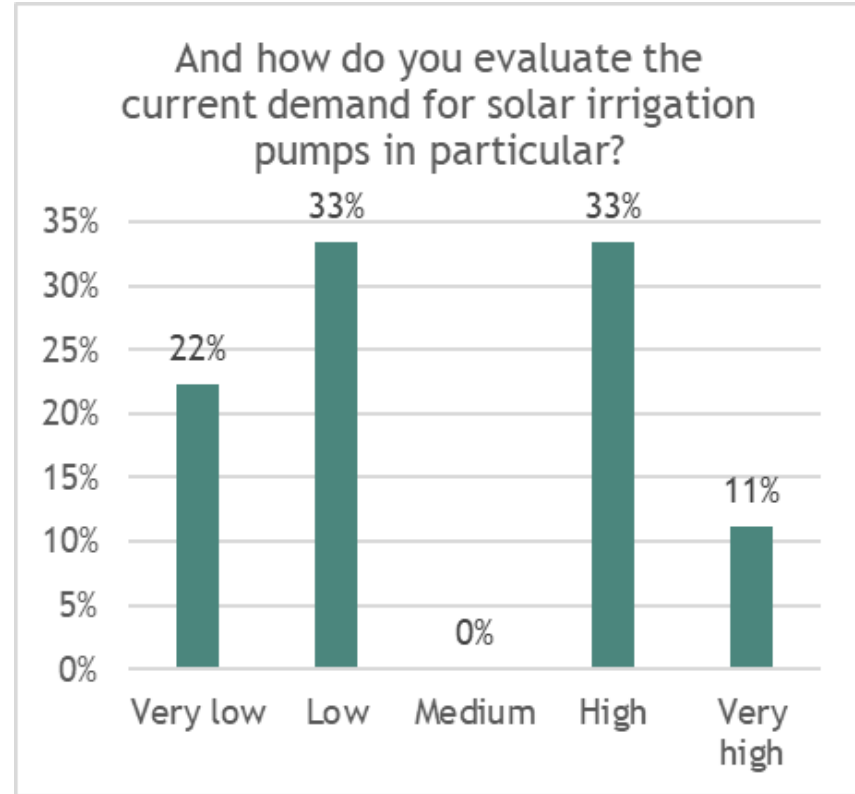
4.1 TECHNICAL BARRIERS



Source :
ADPP/
UNIDO

4.2 COMMERCIAL BARRIERS

- ❑ Private sector divided on the demand of solar pumps
- ❑ Yet, 44% is planning to invest a lot in solar pumps in the near future
- ❑ According to the private sector, challenges are a lack of knowledge (27%) and finance (64%)



4.2 COMMERCIAL BARRIERS

- ❑ Government tenders not accessible for most suppliers
- ❑ No general tax exemptions for solar pumps, but exemptions for some projects
 - Suppliers pay 7.5 % import tax and 17% VAT
 - In comparison: import tax agricultural technology is 5%
hand pumps are VAT exempted
- ❑ No import problems : only 2-3 days needed in Maputo with new pre-warning system
- ❑ Import process is expensive due to obligatory charges. Total cost 30-40% of CIF cost (!)
- ❑ Prices in surrounding countries more competitive: South Africa, Zimbabwe

4.2 COMMERCIAL BARRIERS

General recommendations by the private sector to scale solar irrigation in Mozambique includes a focus on:

- Information and training (44%)
- Investment (22%)
- Access to finance for farmers (22%)
- Reducing importation costs (11%)

Source: ActionAid Mozambique ->



4.3 FINANCIAL BARRIERS

- ❑ Cost of small solar irrigation systems (min 1000 EUR) too high for most farmers
- ❑ Access to credit is limited. Commercial interest rate is 19.3%
Eligibility criteria and processes of banks and MFIs cannot be met by most farmers:
 - Upfront payment and/or collateral required
 - Need to have a bank account, submit salary slips, technical and financial business plans, submit requests online, etc.
- ❑ Additional issue in Mozambique : land is owned by the state and does not count as collateral
- ❑ Large pump suppliers preferred solution is bank loans, as the suppliers have no experience in managing credit arrangements.
How: Donor to sign contract with bank to provide low interest loans. Banks to deal with the farmers and pay the supplier 100% after installation of the solar pump.

4.3 FINANCIAL BARRIERS

- ❑ Alternative : full donation not an option for supporting organisations:
 - Lack of ownership and real interest -> compromises use and maintenance
- ❑ Partial subsidy to end users also recommended by suppliers.

Example: farmers to pay 20% and donor to pay 80%, all upfront to avoid loan and credit complications.

- ❑ Potential solution for the commercial farmer segment :

Learn from approach with 50/50 subsidy as done by SolTrain project to promote solar heating systems. Approach easy to copy and apply to solar irrigation systems according to supplier, despite lot of paperwork that was required.

Recommended criteria by supplier :

- 3 clients in the same area
- owning at least 1 hectare of land
- farm registered with an association or as a company.

4.3 FINANCIAL BARRIERS

- ❑ A potentially more inclusive alternative are Pay-As-You-Go solutions by pump suppliers
- ❑ Not yet available in Mozambique for solar pumps, but soon to be launched
- ❑ Advantages: less paperwork, direct relation between farmer and supplier, more accessible financial product that is linked to the cost and benefits of solar irrigation, mutual interest to succeed
- ❑ Most successful case is the Kenyan company Sunculture : offering solar pumps and domestic appliances with mobile payment solutions. They recently raised 25M USD to expand into West Africa, but are not yet operational in Mozambique.
- ❑ Stakeholder meeting in Mozambique on solar productive use systems pointed out challenges related to **payment collection** (lack of mobile network), the **duration** of payback time (customers need over a year to pay back solar home systems), difficulties to assess **credit profiles** of customers, **fiscal issues** (high VAT and import taxes), the risk of market distortion by grant providing programmes (due to a **lack of coordination**)

5 RECOMMENDATIONS

Address the three main barriers to SPIS development :

- ❑ Technical :
 - Increase **access to water** (well drilling, submersible pump jackets) and optimise systems
- ❑ Supply chain :
 - Invest in supply chain development and knowledge (**training** technicians, advisors, users)
 - Timely reparation and maintenance even more critical when using credit
- ❑ Financial :
 - Promote a dual strategy including **partial subsidies** to accelerate market development and **inclusive credit mechanisms** to increase access in the long term:
 - Subsidies can be justified when **external interests** are served (environment)
 - Targeting specific **vulnerable groups** (women and youth) increases the base, justification and resources for financial support.
 - Depending on the target group, donors can **provide guarantees** to the financial sector (to support commercial farmers or registered associations) or provide direct support (start capital) to suppliers to pre-finance **pumps with PAYGO**.

5 TENDER CALL FOR SPIS AND PAYGO SUPPLY IN GAZA PROVINCE

PRACTICA signed a grant agreement with GIZ to accelerate the SPIS market for smallholder farmers in Gaza province.

Project components : establish manual drilling teams, provide SPIS trainings to companies and other stakeholders (call will follow), pilot a PAYGO solution for SPIS in Gaza.

Early 2022 a tender call will be launched by PRACTICA for the supply of 100 solar pumps:

- ❑ Pump and irrigation system for usage by smallholder farmers. Minimum head 10m
- ❑ Installation possible in a low-cost borehole (diameter 75 mm, donated by project)
- ❑ Solar pumps to be sold with a subsidy to catalyze the market. Subsidies will be reduced over time during the project (2022-2023).
- ❑ Supplier to provide a functional PAYGO solution for farmers to pay back remaining cost over time

Please contact berry@practica.org if you'd like to stay up to date!