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Market access for agro-PURE companies

October 2025

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This research explores how agro-Productive Use of Renewable Energy companies can ensure farmers have access to markets

Context

- **The agro-Productive Use of Renewable Energy (agro-PURE) sector**, positioned at the nexus of agriculture and energy, **remains nascent** with most companies operating at a small scale. A **critical challenge is enabling smallholder farmers (SHFs) to secure reliable off-takers for their increased production**. Yet, only a few companies currently ensure an enhanced market access, reflecting the inherent complexity of the issue.
- With limited recent research mainly focused on case studies or high-level business model overviews**, Acumen, BII, GOGLA, and SNV have partnered with Hystra to deliver a study addressing this key topic.**

Purpose

- The purpose of this report is to share the findings of our study on the **most effective ways for agro-PURE companies to ensure their SHFs have market access**
- It aims to **share best practices for agro-PURE companies**, which will serve as a **basis for discussion among key stakeholders across the value chain** (off-takers, investors, donors and public authorities) to develop programs addressing this challenge and helping scale PURE appliances
- Ultimately, the report seeks to **enhance the success of agro-PURE customers** and **strengthen the viability of agro-PURE business models**.

This research has a narrow focus on market access, recognizing it is only one of the success factors for SHFs and companies

Disclaimer

- **This research focuses on the specific challenge of market access, while acknowledging that it represents only one of the many challenges faced by SHFs,** such as limited access to quality inputs and training. For SHFs investing in PURE appliances, the cost of these expensive assets is another critical barrier. In this research, however, our focus is on strategies to secure revenues from outputs rather than on cost reduction
- **This research does not seek to replicate existing studies on market access for smallholder farmers,** a well-known and extensively studied challenge in the agricultural sector. Targeted primarily at agro-PURE companies, which are mostly energy access providers without agronomic expertise, it instead emphasizes the **importance of addressing market access through an agriculture-specific lens to unlock the full impact of agro-PURE appliances**
- **This research focuses on identifying models that generate enough overall value** both for smallholder farmers to adopt agro-PURE technologies and for companies to operate viably. It **does not analyze how that value is distributed** between SHFs, agro-PURE companies, and off-takers.

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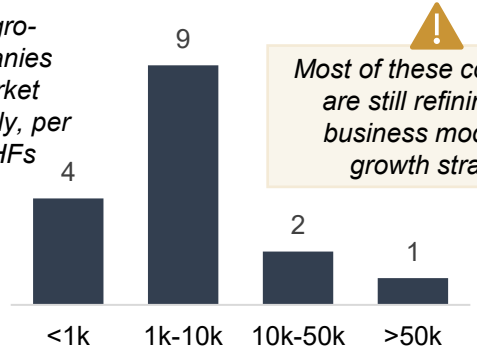
This research is informed by literature review, expert and off-taker interviews, and interviews with 18 agro-PURE companies

While the findings stem from in-depth analysis…

Literature review	Key reports on cold storage, processing and out-grower schemes, complemented our previous work on small-scale irrigation[1]
16 expert interviews	Acumen, BASE, E4Impact, EEP Africa, DWFI, Energy Saving Trust, ISF Advisors, JBQ Africa, PaygOps, Practical Action, REEEP, SAIS Accelerator, Shell Foundation, TechnoServe, Wageningen U&R, World Bank (including ESMAP)
8 off-taker interviews	Danone, EA Foods, FarmWorks, Olam Agri, Omia, One Acre Fund, Thrive Agric, Warc Africa
18 agro-PURE company interviews	aQysta, Clamore Solar, ColdHubs, Farm Warehouse, Husk, Jain, Keep IT Cool, Modern Farming Technology, Oorja, Promethean, S4S, SimuSolar, SokoFresh, SowPrecise, Stable Foods, SunCulture, Zonful Energy, Wala
2 case studies	In-depth analysis (inc. field visit) on SokoFresh and Zonful Energy

… the sector is still nascent, with most companies providing market access still small and young

Number of agro-PURE companies providing market access directly, per number of SHFs served[2]



Most of these companies are still refining their business model and growth strategy

- The **agro-PURE sector is still nascent**, with less than 700k appliances sold globally since market launch[3]. Agro-PURE companies providing market access directly are either still operating at a small scale or have only recently begun piloting such services
- Therefore, **our findings are mostly qualitative, based on early insights from market practitioners and case studies**. They offer directional guidance and emerging best practices, rather than statistically representative conclusions.

Source: 1) ISF Advisors & Hystra, Scaling Irrigation for Small-scale Producers (2024); 2) Hystra's analysis based on scanned companies from desk research and interviews. This mapping is not exhaustive. 3) Off-Grid Solar Market Trends Report 2024. Energy Sector Management Assistance Program (ESMAP), GOGLA, Dalberg. 2024

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Acronyms and glossary used throughout this report

Acronyms:

Capex: Capital Expenditures
COGS: Cost of Good Sales
CSR: Corporate Social Responsibility
FMCG: Fast-Moving Consumer Goods
IaaS: Irrigation as a Service
MFI: Micro-Finance Institution
NGO: Non-Governmental Organization
Opex: Operating expenses
OT: Off-taker
PAYGo: Pay-As-You-Go
PURE: Productive Use of Renewable Energy
SHF: Smallholder farmer
SSA: Sub-Saharan Africa
SWP: Solar Water Pump
WCR: Working Capital Requirements

Glossary:

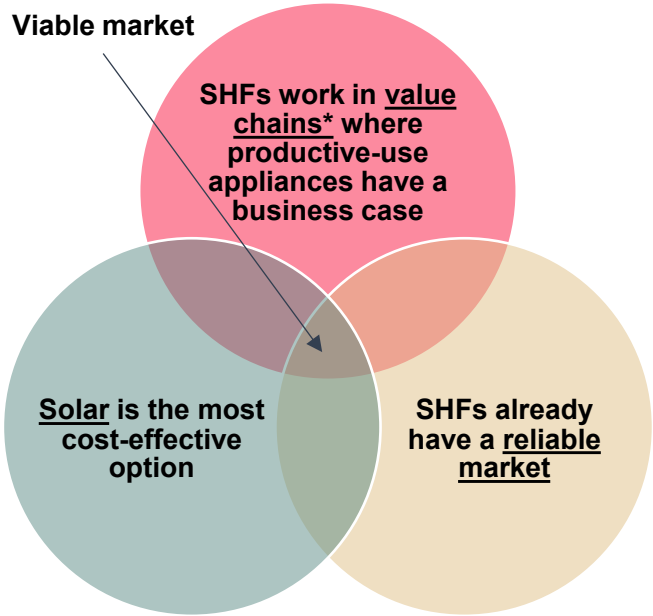
- **Aggregator:** organization aggregating produce from smallholder farmers (SHFs)
- **Agro-PURE company:** company that provides Productive Use of Renewable Energy (PURE) solutions specifically designed for agricultural applications
- **(Agricultural) produce:** outputs of smallholder farmers (SHFs), including crops, livestock, dairy, and fish
- **End-buyers:** large off-takers that typically purchase from intermediaries rather than directly from SHFs
- **Market access:** Smallholder farmers' ability to sell their output (e.g., crops, livestock products, or processed goods) in output markets
- **Off-takers:** organizations that purchase agricultural produce, either directly from SHFs or through an intermediary
- **Smallholder farmer (SHF):** farmer operating on a small scale (< 2ha), including crop growers, livestock or dairy farmers, and fisherfolk.

Content outline

The viable market for agro-PURE appliances remains limited, mainly due to lack of market access, which restricts SHFs' ability to increase their income and, in turn, adopt these products

- **In theory, dozens of millions of SHFs across sub-Saharan Africa (SSA) could benefit from agro-PURE appliances**, as they provide a compelling solution for SHFs to improve their productivity
- However, **the viable market is far smaller, constrained by three key criteria** (see graph):
  1. SHFs must operate in value chains where productive-use appliances have a clear business case,
  2. Solar must be the most cost-effective option, and
  3. SHFs must already have access to reliable markets.
- In particular, unreliable **market access has hindered SHF's ability to increase their revenue, and therefore their adoption of agro-PURE appliances**. While new payment and service models for agro-PURE appliances address affordability and maintenance challenges, they often overlook the need for reliable sales channels for SHFs' produce. Meanwhile, **off-takers**, who hold the key to reliable market access, **rarely view agro-PURE appliances as a priority**.

Key criteria of viability for agro-PURE appliances



* Crop or produce value chains

Off-takers, who by definition provide market access, see potential in PURE for addressing some of their concerns, but investing in PURE is not (yet?) a priority nor a strategic focus for them

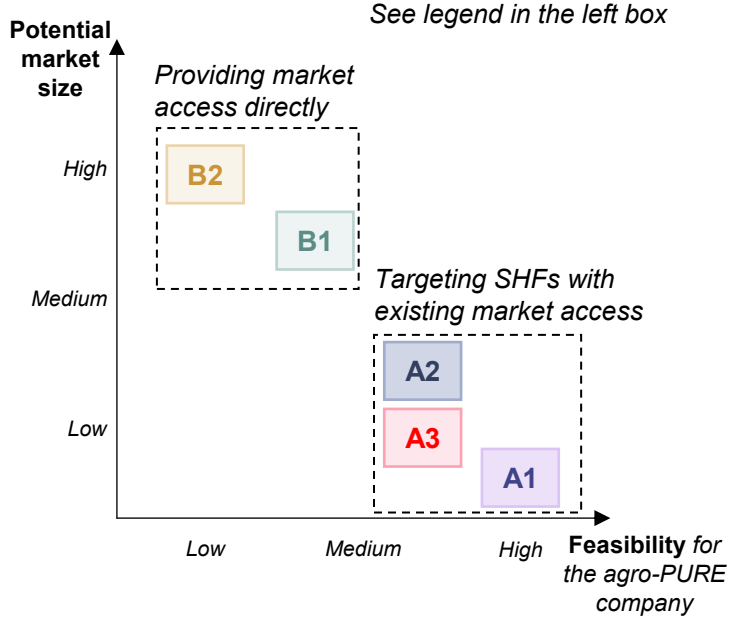
	Global FMCG* companies	Traders	Small local off-takers
Description	**Global FMCG companies** buying either from traders or SHFs through specific programs (e.g., Danone).	Trading companies with **strong local presence** buying either from middlemen or SHFs (e.g., Olam Agri).	Smaller, emerging players **buying directly from SHFs** (e.g., ThriveAgric).
Potential value-add of PURE appliances	▪ Are part of their **Corporate Social Responsibility (CSR) commitments, with a livelihoods or sustainable agriculture angle** ▪ Strengthen their **supply chain resilience** against **climate change.**	▪ Are part of their **CSR commitments**, usually more with a **livelihoods angle** ▪ Help secure **reliable volumes**.	▪ **Increase the productivity of SHFs** who work directly with them, while also encouraging higher input purchases ▪ **Improve SHF loyalty**.
Reasons for not investing in PURE appliances	They mostly rely on **large suppliers and intermediaries for their sourcing, and thus are rarely directly in touch with SHFs**. As a result, except within (often limited) direct sourcing programs, they lack both incentives and means to invest directly in SHF solutions like PURE appliances.	Given the risk of side-selling, they **avoid over-investing in individual SHFs**, prioritizing supply flexibility and cost. Further, agro-trading margins are thin, and PURE appliances are capital-intensive, making the business case tricky unless they have clients ready to pay a sustainability premium.	While PURE appliances fit their mission, they are still **not convinced** by the business case, have **limited resources (notably working capital)** to pilot these solutions, and prioritize **other critical products and services** (e.g., input provision, training).

* Fast-Moving Consumer Goods

Pioneering agro-PURE companies have secured reliable market access for their SHFs through 5 different models

- To ensure their SHFs have access to markets, **agro-PURE companies can target SHFs with existing market access (models A) or provide access directly (models B)**, using 5 models:
  - **A1: Selling/renting** collective appliances **directly to off-takers**
  - **A2: Screening SHFs with existing market access,** using different proxies
  - **A3: Integrating into existing contract farming schemes,** a relatively easy-to-serve but niche market
  - **B1: Aggregating for off-takers,** a good trade-off between increasing market potential and keeping operations simple
  - **B2: Becoming an off-taker themselves,** which has the largest potential to increase the market for their appliances, though the process is highly demanding.
- **Each model carries trade-offs between market reach and operational complexity**. **All these models rely on rigorous screening** (whether on SHFs, location, or value chain) for success, requiring targeted research.

Comparison of 5 models ensuring SHFs served by agro-PURE companies have market access



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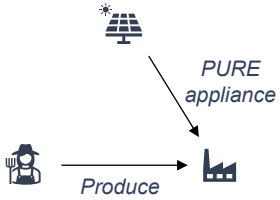
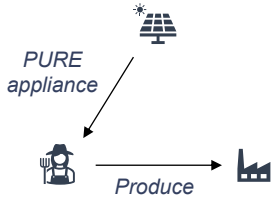
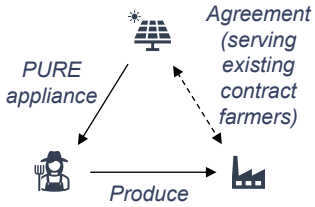
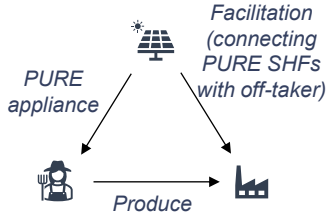
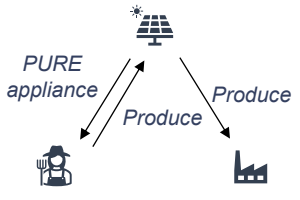
These 5 models each have their pros and cons; the best option will depend on local context

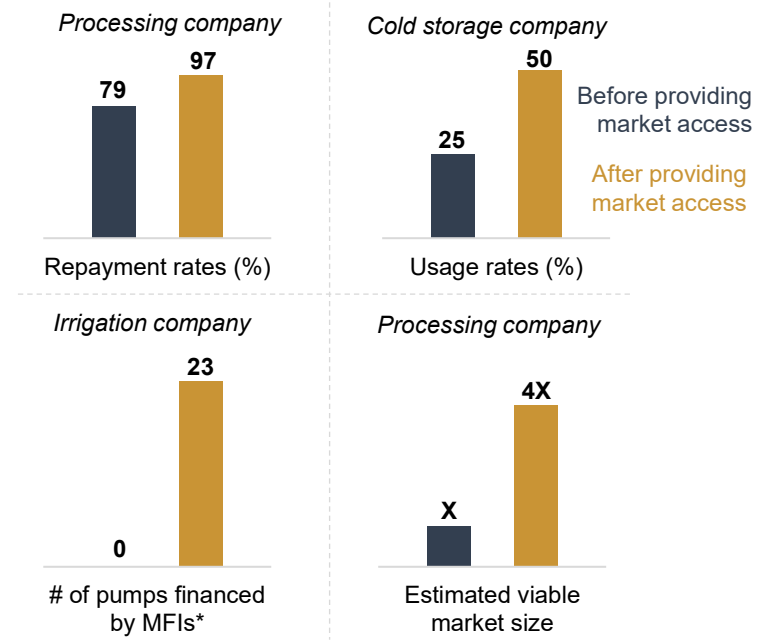
	A. Serve SHFs with existing market access			B. Facilitate market access provision	
	A1. Selling/renting directly to off-takers	**A2. Screening SHFs w/ existing market access**	**A3. Integrating into contract farming schemes**	**B1. Aggregating for off-takers**	**B2. Becoming an off-taker**
Schematic					
Pros for agro-PURE companies	✓ Simplicity ✓ Financing not always required	✓ Simplicity ✓ Possibility to serve all SHFs with existing market access	✓ Simplicity ✓ Already fully supported SHFs (by off-takers)	✓ Larger addressable market ✓ No working capital requirement for produce	✓ Very large addressable market ✓ Possibility of capturing additional value
Cons for agro-PURE companies	✗ Very limited addressable market	✗ Limited addressable market ✗ No guarantee that SHFs are supported on cultivation (e.g., access to inputs, training)	✗ Limited addressable market ✗ Indirect business case for off-takers (hard to convince) ✗ Need for clear role definition (who supports SHFs on PURE?)	✗ Need agronomic expertise ✗ High operational costs (need to get produce quality up to standards in addition to other services)	✗ Need agronomic expertise ✗ High additional costs (need to invest in logistics, warehousing etc.) ✗ High working capital requirement (for produce)

Legend: agro-PURE company; SHF; off-taker

Early evidence points to market access strengthening agro-PURE companies' business model and expanding their viable market

- Early data shows that **ensuring market access strengthens agro-PURE companies' key metrics,** and that providing market access directly expands their viable market
- **A growing number of agro-PURE companies are now providing market access directly**. **Though aggregation is costly and operationally challenging**, **emerging best practices** are keeping costs manageable for scalable market expansion:
  - **Prioritize densification of existing service areas** by targeting customers via farmer hubs or geographic clusters**, and/or incentivizing and training sales agents to focus first on deepening penetration** before moving to new locations
  - **Leverage existing resources to beef up local field capacity,** such as **agriculture extension officers**, to support SHFs on crop management, improving yields and quality; or **SHFs' cooperatives**, to aggregate produce and limit side-selling, strengthening SHF productivity and loyalty
  - **Deploy digital tools (e.g., Coldtivate, PaygOps)** for inventory and/or predictive analytics**, to enhance traceability and quality control**.

Early data points on the impact of ensuring market access for agro-PURE companies



* Micro-Finance Institutions

Agro-PURE companies should embed market access into their strategy from the start and select the model that fits the local context

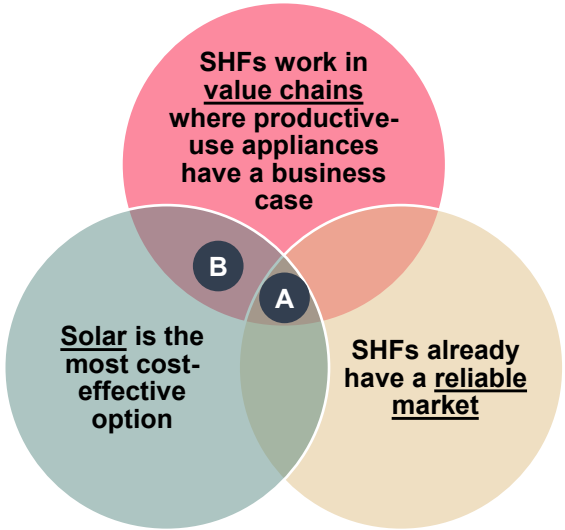
- First, **agro-PURE companies should assess the 3 key viability criteria from the start**, to design a business model with sufficiently large segments
- Then, **agro-PURE companies should choose the right strategy based on the number of SHFs with existing market access:**

A **If the market size is large enough, they should focus on serving SHFs with existing market access,** with one or several of the 3 models A described here, using robust screening processes

B **If the market size is too small, they need to expand their own market by ensuring their SHFs have access to reliable markets for their produce by:**

1. **Choosing the right level of integration with off-takers** from the outset and **validating unit economics across the value chain**,
2. **Optimizing delivery costs (see slide 53 for best practices),** and
3. **In a second stage, finding new revenues streams**, by exploring ways to monetize SHF aggregation beyond produce and appliance sales.

Key criteria of viability for agro-PURE appliances and corresponding strategies for companies



Key ecosystem actors could quantify viable markets and support partnerships between off-takers and agro-PURE companies

First, key ecosystem actors could help quantify viable markets for each PURE technology by value chain and geography, and demonstrate the business case for off-takers. To this end:

- Donors could **conduct and publish research** on the most promising value chains for each PURE technology, and **map relevant off-takers and SHF aggregators**
- Off-takers could **assess which PURE appliances offer a strong business case** in the value chains they are operating (e.g., meeting CSR goals, increasing produce volume), for both their operations and the SHFs they serve
- Investors could **encourage investees** (both off-takers and agro-PURE companies) **to carry out these assessments**.

Then, key ecosystem actors could support partnerships between off-takers and agro-PURE companies, to validate and scale PURE appliances. To this end:

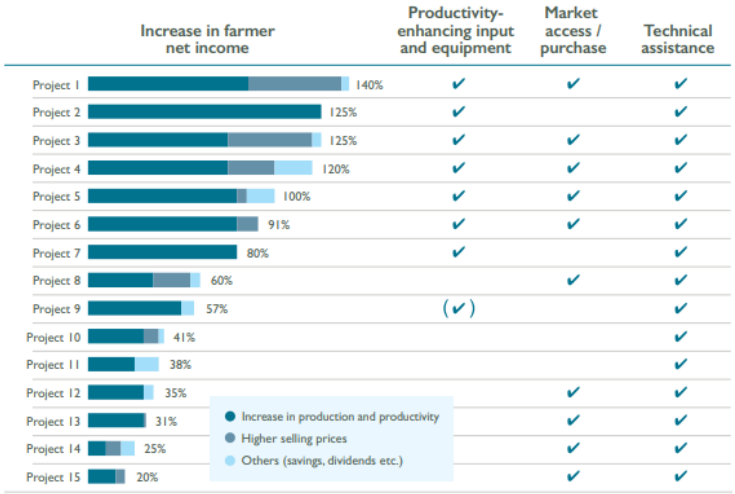
- Donors could **de-risk pilot partnerships** to validate proof of concept, demonstrate shared benefits, and encourage long-term contracts
- Off-takers could **select agro-PURE companies** that provide essential support services, including strong after-sales service and comprehensive training for users
- Public authorities could **strengthen the business case for these partnerships** by boosting demand for PURE appliances and locally sourced produce, and **foster collaboration between agriculture and energy sectors** (e.g., integrating PURE into national agriculture plans).

Content outline

In SSA, SHFs need to improve their productivity and agro-PURE appliances provide a compelling solution

Improved inputs and productive-use appliances are the most effective ways to boost SHF revenues, as productivity in SSA remains less than half the global average[1]

Drivers of SHFs' net income increase for 15 best practice market-based agriculture projects[2]



Renewably powered appliances (PURE) are among the most cost-effective and sustainable productive-use solutions for SHFs

The productive-use market is dominated by **3 technology types, each with significant impact on SHFs**:

- **Irrigation pumps,** boosting SHFs' yields by 50-400% compared to rain-fed farming[3]
- **Cold storage units** (e.g., walk-in cold rooms, fridges, freezers, ice-makers), reducing post-harvest losses by 20-50%[4]
- **Processing units** (e.g., mills, dryers), increasing produce's value by 50-200%[5].

In particular, despite their premium cost, PURE appliances offer clear benefits over diesel - or grid-powered alternatives:

- ✓ **Lower operating costs,** eliminating fuel expenses and reducing maintenance costs
- ✓ **Improved reliability and uptime,** avoiding breakdowns and fuel shortages
- ✓ **Decentralized access,** serving rural remote areas
- ✓ **Environmental and health benefits,** reducing CO_2 emissions.

Source: (1) Our World in Data, Increasing agricultural productivity across SSA is one of the most important problems this century (2022); (2) Hystra report on Smallholder Farmers and Business (2015); (3) ISF Advisors & Hystra, Scaling Irrigation for Small-scale Producers (2024); (4) Shell Foundation, The 'cold chain' opportunity (2024); (5) Factor E, Redesigning S4S' Solar Conduction Dryer to Further Empower Rural Farmers in India

In theory, dozens of millions of SHFs could benefit from these agro-PURE appliances in SSA

	Solar irrigation	Solar cold storage	Solar processing
PURE technology			
Est. potential market in SSA (# SHFs)	**~ 20-30m**	**~ 10-16m**	**~ 12-18m**
Key hypotheses	*SHFs with sufficient water resource potential[1]*	*SHFs growing perishable crops, livestock and fisheries (~25-40% of the 40m SHFs in SSA)[2]*	*SHFs growing perishable crops, livestock, fisheries, and cereals (~30-45% of the 40m SHFs in SSA)[2]*
Example of value chain usage[3]	***Coffee**: support tree watering, tree nursery, and wet milling/pulping/washing*	***Mango**: reduce waste and mitigate sharp price drops during peak harvest*	***Leafy greens**: dehydrate or powder leafy greens for higher value and reduced waste*

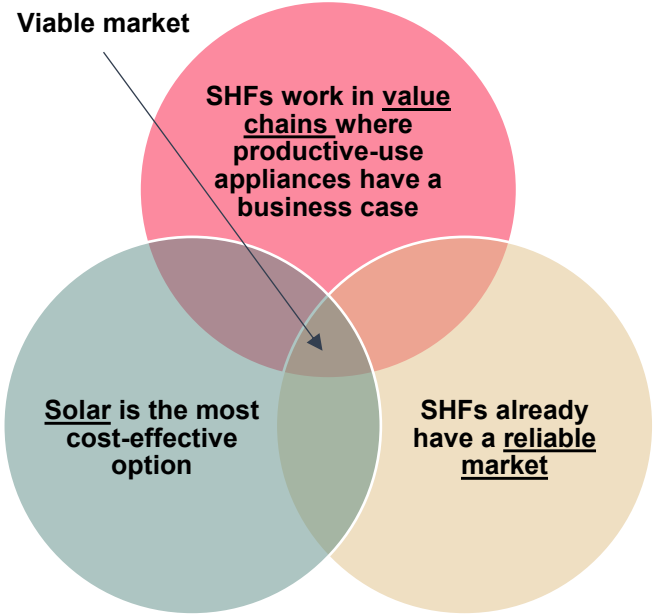
NB: While there are other PURE technologies, this report focuses on three technology types that are the most mature and represent the vast majority of the sector.
Source: 1) ISF Advisors & Hystra, Scaling Irrigation for Small-scale Producers (2024); 2) Rough estimates, extrapolating from 33m SHFs in 2013, using SSA population growth; 3) IKEA Foundation, How can energy access practitioners energise regenerative agriculture settings (2023). Using sources: EforA, lessons from the Global LEAP Awards Off-Grid Cold Chain Challenge (2020), NEPAD, Agriculture and Africa—Transformation and Outlook (2013), World Bank data

In reality, the viable market for agro-PURE appliances is smaller, constrained by 3 key criteria

Key criteria of viability for agro-PURE appliances

Alternatives to agro-PURE appliances can often better answer SHFs' needs with a lower initial investment barrier

- Diesel cheaper if low usage time (given higher initial investment cost of solar)[1]
- Solar not cost-effective if larger centralized units required
- For cold storage, using a productive-use appliance is not always the best option to reduce post-harvest losses[2].



Productive-use appliances only have a business case for a limited number of value chains and geographic contexts

- Insufficient value from staple crops
- Sometimes underdeveloped markets for cash crops
- For irrigation, potential unreliable water access.

SHFs without a reliable market cannot benefit from their appliance

- Difficulty to repay the product or service
- Need for extension services and quality inputs that SHFs without a reliable market rarely have access to
- In SSA, only ~10% of SHFs integrated into formal markets[3,4].

Source: Hystra analysis based on:
1) A2EI, Evaluation of solar powered agricultural technologies for productive-use applications (2020); 2) R.J.A. Oostewechel et al., Postharvest Assessment Methodology (2022); 3) CGAP, Segmentation of smallholder households: meeting the range of financial needs in agricultural families (2013); 4) AFDB, Boosting smallholder farmers' productivity to feed Africa against the looming food crisis (2022)

In particular, unreliable market access strongly limits SHFs' ability to increase their revenue

Most SHFs have unreliable market access, which means they:

- **Are dependent on unreliable middlemen** at the farm gate
- **Struggle to transport goods** to market due to poor road infrastructure and high costs
- **Face limited demand** from local markets.

As a result, they incur:

- **Lower** or more **volatile prices** for surplus production
- **Post-harvest losses** for produce they cannot sell immediately.

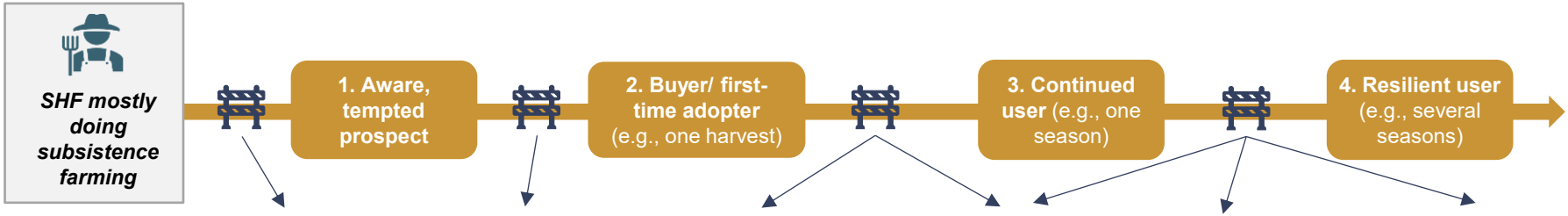
Ultimately, this lack of market access:

- Neutralizes potential **yield gains** (e.g., from quality inputs and/or productivity-use appliance)
- **Lowers their ability to increase their revenue.**

A woman uses a bicycle to take her produce to market in rural Uganda. Photo: Allison Shelley. Source: CGAP blog

SHF face multiple barriers in their adoption of agro-PURE appliances

Agro-PURE appliance customer journey and corresponding barriers, from awareness to resilient usage



	Lack of understanding and risk aversion	Lack of investment capacity	High operating cost	Need for repairs and maintenance	Unreliable access to market	Unreliable access to water (irrigation only)
Key barriers						
Description	SHF is unconvinced of the appliance's benefits, and wary of investing in unfamiliar/costly technology	SHF lacks the savings or financial means to purchase the appliance	SHF cannot generate sufficient revenue to cover credit repayments or service costs	SHF requires support to maintain and repair complex appliances effectively	SHF struggles to sell surplus produce at a fair price, limiting appliance benefits	SHF needs reliable water access, ideally without the expense of digging a borehole

Source: ISF Advisors & Hystra, Scaling Irrigation for Small-scale Producers (2024)

New payment and service models address affordability and maintenance challenges, but not market access

Agro-PURE appliance customer journey and corresponding barriers, from awareness to resilient usage

1. **Aware, tempted prospect** → 2. **Buyer/ first-time adopter** (e.g., one harvest) → 3. **Continued user** (e.g., one season) → 4. **Resilient user** (e.g., several seasons)

	Key barriers	Lack of understanding and risk aversion	Lack of investment capacity	High operating cost	Need for repairs and maintenance	Unreliable access to market	Unreliable access to water (irrigation only)
Business models*	PAYGo	~ Solar as new technology	~ Medium cost of down-payment (10-30% of total cost)	~ PAYGo monthly installments	✓ Efficient after-sales (to ensure repayment)	✗	~ Water sources can run dry (due to over-use or poor site assessment)
	As-a-service	✓ No commitment	✓ No upfront cost (or very small)	~ Service cost	✓ Service business model	✗	~ Efficient distribution systems if fixed pumps

Market access has been understudied as a key barrier for PURE adoption

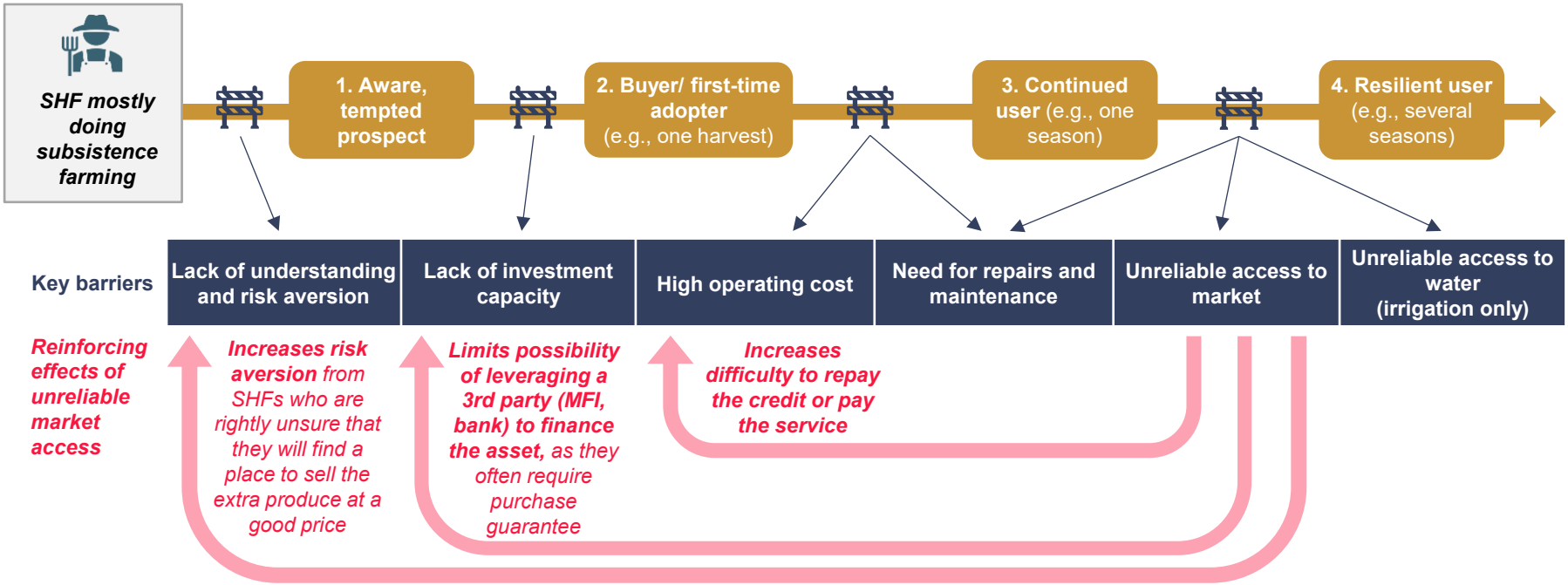
→ **Focus of this study**

*PAYGo: SHF pays for the appliance in small instalments until fully owned; As-a-service: SHF pays a service fee to use the appliance without owning it.

Source: ISF Advisors & Hystra, Scaling Irrigation for Small-scale Producers (2024)

Unreliable access to market reinforces other barriers to PURE adoption

Agro-PURE appliance customer journey and corresponding barriers, from awareness to resilient usage



Source: ISF Advisors & Hystra, Scaling Irrigation for Small-scale Producers (2024)

As a result, agro-PURE companies are facing challenges in effectively serving their existing SHFs

❌ High customer acquisition costs

Agro-PURE companies have more difficulties to sell appliances to SHFs, who are unconvinced they'll benefit without reliable market access.

- *"We had to serve SHFs already using a processing appliance, who knew they will be able to sell their processed produce"* – Farm Warehouse
- *"It was difficult to convince SHFs as they rarely want cold storage only and value having the product bought at the gate"* – Keep IT Cool

❌ Low repayment/usage rates

Agro-PURE companies are not able to achieve high repayment/usage rates, as SHFs do not generate sufficient income from produce sales.

- *"We tried many repayment plans for our solar pumps, but even with a pay-per-harvest system, SHFs were still not able to repay without market access"* – Irrigation company 1
- *"SHFs only started repaying well for the solar dryer once they had access to markets and could sell their produce at good prices"* – *S4S*
- *"Without market access, milk SHFs struggled to repay their solar cold storage unit"* – Cold storage company

❌ High working capital requirements

As agro-PURE companies struggle to leverage banks/MFIs to finance the PURE appliance, they must keep it on their books, requiring high working capital.

"Banks and MFIs would not agree to finance our pumps if SHFs did not have a guaranteed buyer for their produce" – Irrigation company 2

Source: Hystra analysis based on company interviews

On their side, off-takers, who by definition provide market access, see potential in PURE for addressing some of their concerns…

	Global FMCG brands	Traders	Small local off-takers
Description	**Global FMCG brands** buying either from traders or SHFs through specific programs (e.g., Danone)	Trading companies with **strong local presence** buying either from middlemen or SHFs (e.g., Olam Agri)	Smaller, emerging players **buying directly from SHFs** (e.g., ThriveAgric)
Potential value-add of PURE appliances	▪ Are part of their **CSR commitments, with a livelihoods or sustainable agriculture angle** ▪ Strengthen their **supply chain resilience** against **climate change**.	▪ Are part of their **CSR commitments**, usually more with a **livelihoods angle** ▪ Help secure **reliable volumes**.	▪ **Increase the productivity of SHFs** who work directly with them, while also encouraging higher input purchases ▪ **Improve SHF loyalty**.

- *"The ability to **keep produce fresh** with solar-powered cold rooms is attractive to us, especially for high-value vegetables."* – Off-taker 1
- *"Solar cold storage solutions could help us **collect milk twice a day**."* – Off-taker 2
- *"With solar irrigation, we could **increase the production** of our farmers, especially in regions affected by climate change."* – Off-taker 3

Source: Hystra analysis based on interviews

…but investing in PURE is not (yet?) a priority nor a strategic focus for them

	Global FMCG brands	Traders	Small local off-takers
Reasons for not investing in PURE appliances	They mostly rely on **large suppliers and intermediaries for their sourcing, and thus are rarely directly in touch with SHFs**. As a result, except within (often limited) direct sourcing programs, they lack both incentives and means to invest directly in SHF solutions like PURE appliances.	Given the risk of side-selling, they **avoid over-investing in individual SHFs**, prioritizing supply flexibility and cost. Further, agro-trading margins are thin, and PURE appliances are capital-intensive, making the business case tricky unless they have clients ready to pay a sustainability premium.	While PURE appliances fit their mission, they are still **not convinced** by the business case, have **limited resources (notably working capital)** to pilot these solutions, and prioritize **other critical products and services** (e.g., input provision, training).

- *"Solar cold storage is promising but **cost and maintenance concerns** mean it is not yet prioritized."* – Off-taker 1
- *"The technology looks good but is still small-scale and **requires grant or donor funding to scale**."* – Off-taker 3
- *"We are still **not convinced by the business case** of solar irrigation pumps*." – Off-taker 4

The most suitable off-taker to work with as an agro-PURE company will depend on the local context, technology, value chain, the off-taker's financial capacity, etc.

Source: Hystra analysis based on interviews

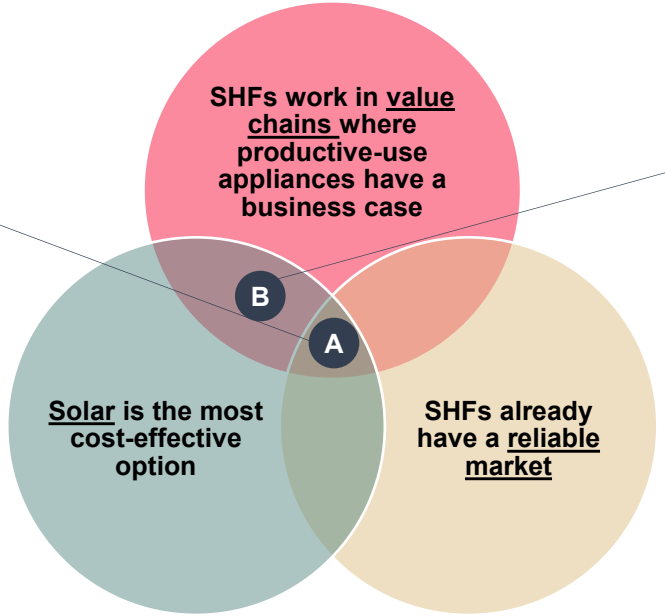
Content outline

To ensure their SHFs have market access, agro-PURE companies can serve SHFs with existing market access or provide it directly

Key criteria of viability for agro-PURE appliances and strategies adopted by agro-PURE companies to ensure market access

A. Serve SHFs with existing market access, either by:

1. Selling/renting directly to off-takers
2. Screening SHFs with existing market access
3. Integrating into contract farming schemes



B. Increase the number of SHFs with market access , either by:

1. Aggregating for off-takers
2. Becoming an off-taker

Source: Hystra analysis

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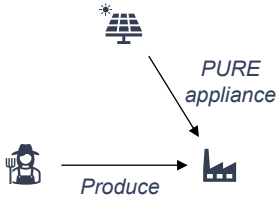
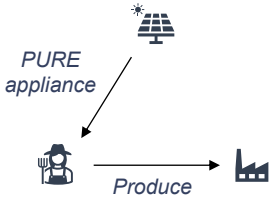
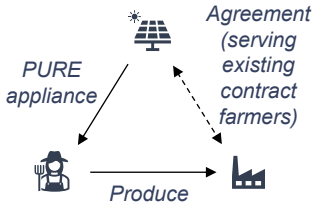
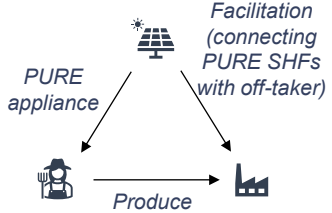
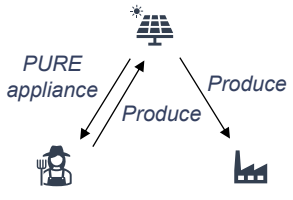
These 5 models each have their pros and cons; the best option will depend on local context

	A. Serve SHFs with existing market access			B. Facilitate market access provision	
	A1. Selling/renting directly to off-takers	**A2. Screening SHFs w/ existing market access**	**A3. Integrating into contract farming schemes**	**B1. Aggregating for off-takers**	**B2. Becoming an off-taker**
Schematic					
Pros for agro-PURE companies	✓ Simplicity ✓ Financing not always required	✓ Simplicity ✓ Possibility to serve all SHFs with existing market access	✓ Simplicity ✓ Already fully supported SHFs (by off-takers)	✓ Larger addressable market ✓ No working capital requirement for produce	✓ Very large addressable market ✓ Possibility of capturing additional value
Cons for agro-PURE companies	✗ Very limited addressable market	✗ Limited addressable market ✗ No guarantee that SHFs are supported on cultivation (e.g., access to inputs, training)	✗ Limited addressable market ✗ Indirect business case for off-takers (hard to convince) ✗ Need for clear role definition (who supports SHFs on PURE?)	✗ Need agronomic expertise ✗ High operational costs (need to get produce quality up to standards in addition to other services)	✗ Need agronomic expertise ✗ High additional costs (need to invest in logistics, warehousing etc.) ✗ High working capital requirement (for produce)

Source: Hystra analysis

Legend: agro-PURE company; SHF; off-taker

Cold storage and processing companies can serve fewer SHFs with existing market access compared to irrigation companies

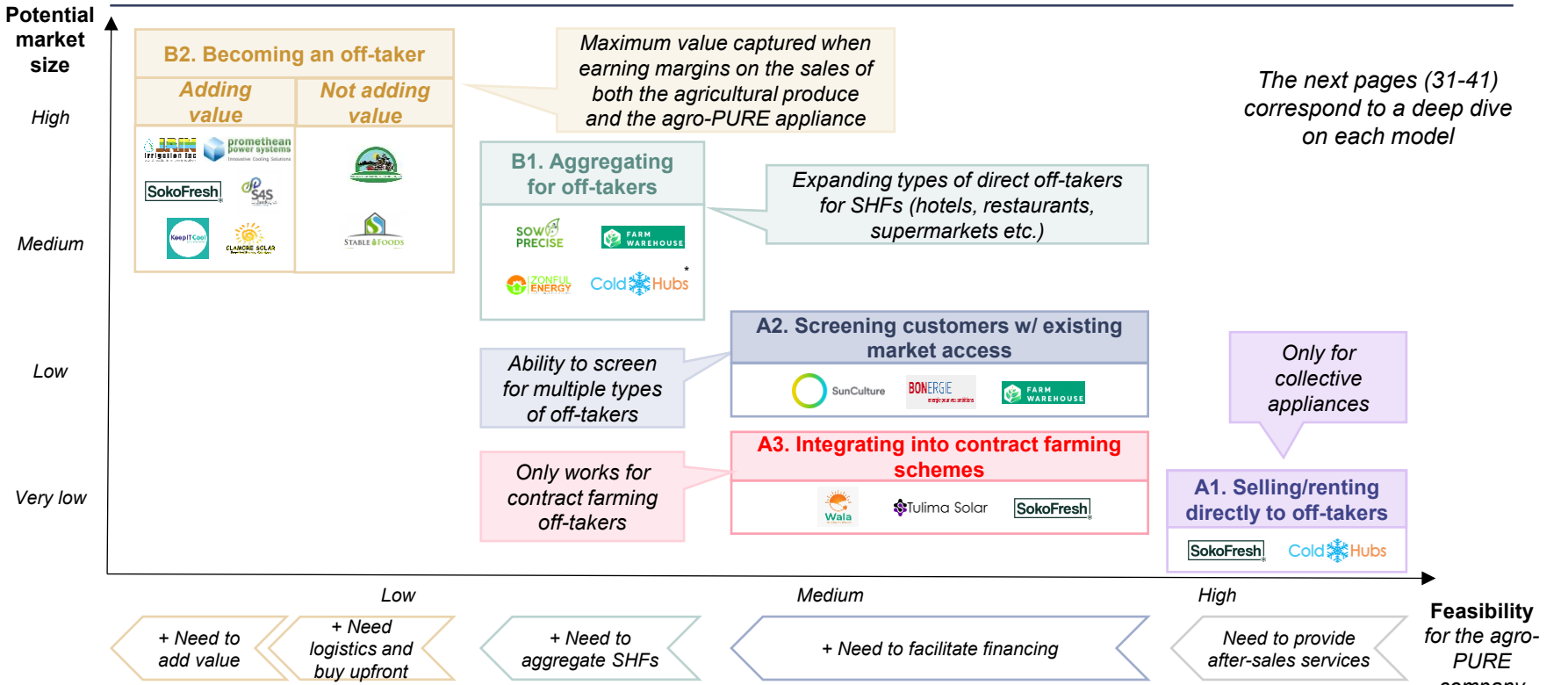
Depending on the PURE technology type, which models could have a sufficient viable market?

	A. Serve SHFs with existing market access			B. Facilitate market access provision	
	A1. Selling/renting directly to off-takers	A2. Screening SHFs w/ existing market access	A3. Integrating into contract farming schemes	B1. Aggregating for off-takers	B2. Becoming an off-taker
Irrigation	❌ *Large SWPs installed on off-taker premises are difficult to share*	✅	✅	✅ *Only if the business model drives customer densification through a strong value proposition that attracts a critical mass of customers within targeted zones (e.g., collective irrigation systems)*	
Cold storage	✅	❌ *Requires a minimum customer base, which may be achievable in niche dense markets linked to relevant value chains (e.g., fish)*			
Processing					

Overall, the viable market for cold storage and processing is expected to be smaller than for irrigation, as these appliances are more expensive and have a business case in fewer value chains.

There are trade-offs between models: market size versus model simplicity

Potential market size and feasibility of 5 models ensuring SHFs served by agro-PURE companies have market access



The next pages (31-41) correspond to a deep dive on each model

Source: Hystra analysis. * Planning to provide market access with Coldtivate app

A. Existing market access			B. Provide market access	
A1. Selling to off-takers	A2	A3	B1	B2

Agro-PURE companies offering collective appliances can directly serve off-takers

Description and market size

- Some agro-PURE companies can **directly serve off-takers**, who may buy, rent, or use the appliance as a service. The appliance will then benefit the SHFs they are working with
- However, the opportunity to sell to off-takers is **limited**. Only large, shared appliances (mainly cold storage unit) are of interest, and few off-takers operate in viable value chains (e.g., high-value perishable fruits and vegetables, and animal-based foods) and have the financial capacity to invest.

Requirements from the agro-PURE company

- **Provide after-sales services**, which is normally part of its standard offering
- **Build a strong business case for solar**, combining hands-on training with cost-benefit comparisons to alternatives
- **Target areas with unreliable or costly grid access**, where off-takers are more likely to see value in solar solutions.

Role, interest and constraints for the off-taker

- The off-taker would need to **contract with the agro-PURE company** to purchase or rent the appliance
- While the agro-PURE company should provide after-sales support, the off-taker would be **responsible for operating the appliance** and coordinating with the SHFs it works with
- The off-taker may face **financial or operational constraints** to acquiring the appliance (e.g., ~$25-30k for a container-sized cold storage unit).

SokoFresh's cold storage unit rented to an off-taker

Source: Hystra analysis, based on interviews

A. Existing market access			B. Provide market access	
A1. Selling to off-takers	A2	A3	B1	B2

Agro-PURE companies offering collective appliances can directly serve off-takers

Examples

Sales model	Service model
SokoFresh (cold storage, Kenya)	ColdHubs (cold storage, Nigeria)

A ColdHubs cooling unit used by small off-takers at a market

Zoom on SokoFresh*

- SokoFresh **provides cold storage units to off-takers** (especially those serving export markets) through direct sales, rental (mostly), or lease-to-own models. Off-takers operate the units and may extend access to SHFs, either for free or at a fee
- SokoFresh **demonstrates the business case** versus diesel or grid alternatives by emphasizing mobility, cost savings, and energy independence. It also **offers after-sales support**, including remote monitoring, maintenance, and training
- In some cases, **off-takers act as intermediaries**, reaching smaller or more remote SHFs that SokoFresh cannot serve directly.

Zoom on ColdHubs

- ColdHubs deploys cold storage units **at aggregation points,** such as specialized markets, where groups of small off-takers, like fish vendors, meat retailers, or traders, can access shared cooling services
- ColdHubs **expanded its product offering** with additional services (e.g., refrigerated transport and packaging injection machines) to meet broader needs of off-takers
- ColdHubs also **invests heavily in training off-takers** and their staff through dedicated onboarding and a 14-day Cold Room Academy, ensuring consistent usage and long-term client retention.

Source: Hystra analysis, based on interviews. * For further details on SokoFresh's business model, see case study in pages 65-68

Agro-PURE companies can screen SHFs with existing market access, using different proxies

Description and market size

- Agro-PURE companies can use a **strict customer screening process** to ensure SHFs have existing market access (often part of the credit screening process for companies offering in-house financing)
- **The market is limited** as only ~10% of SHFs are integrated in formal markets.

Requirements from the agro-PURE company

- Agro-PURE companies would need a **strict screening process for SHFs to ensure they have existing market access**. Since this information can be difficult to obtain directly, they may rely on a set of **proxies** - for example, verifying whether the SHF:
  - **Already grows high-value produce (e.g., cash crops)**
  - **Already uses a productive-use appliance** (not necessarily solar)
  - **Is relatively wealthier** (more likely to be market-oriented). According to 60 Decibels, SHFs who buy PURE appliances are typically wealthier at the time of purchase (for the PURE sector: income inclusivity rate of 0.76 and poverty reach of 39%, vs. 0.82 and 56% respectively for all SHFs)[1].
- Additionally, agro-PURE companies would need to **provide financing and after-sales services**, which are normally part of their standard offering.

Role, interest and constraints for the off-taker

N/A

SHF using a SunCulture pump after successfully passing the company's credit screening process.

Source: Hystra analysis, based on interviews. (1) 60_decibels, Why Off-Grid Energy Matters (2024) and 60 Decibels Farmer Benchmarks (2023). Income inclusivity rate = degree to which an organization's customer base is representative of the national population in terms of income level (1 = parity). Poverty reach uses the World Bank classification.

A. Existing market access			B. Provide market access	
A1	A2. Screening customers	A3	B1	B2

Agro-PURE companies can screen SHFs with existing market access, using different proxies

Examples

Sales model:

- SunCulture (irrigation, Kenya and several other African countries)
- Farm Warehouse (processing, Nigeria)
- Bonergie (irrigation, Senegal)

A Farm Warehouse processing unit

Zoom on SunCulture

- **SunCulture**, one of the leading providers of small-scale solar irrigation with financing in SSA, has achieved **industry-leading repayment rates** thanks to strict customer screening that ensures that their SHFs will benefit from the appliance
- In addition to checks on repayment capacity (including ownership of animals and crops grown), SunCulture checks if its potential customers:
  - ✓ Are already growing cash crops (~95% of its customers)
  - ✓ Have reliable access to water, first remotely then through a rigorous site assessment (100% of customers)
  - ✓ Are off-grid or can achieve significant savings over diesel or electricity use.

Zoom on Farm Warehouse and Bonergie

- **Farm Warehouse sells its processing units on credit to SHFs already using diesel or manual equipment**, leveraging their existing market access and predictable income for reliable repayment
- Similarly, **Bonergie targets SHFs with diesel irrigation pumps**, highlighting cost savings from solar while ensuring users are already familiar with irrigation practices.

Source: Hystra analysis, based on interviews

A. Existing market access			B. Provide market access	
A1	A2	A3. Int. in contract farming	B1	B2

Agro-PURE companies can integrate into existing contract farming schemes, a relatively easy-to-serve but niche market

Description and market size

- Agro-PURE companies can **serve SHFs who already have a contract farming agreement** with an off-taker, to ensure SHFs have a guaranteed buyer and access to support and inputs
- **Few SHFs can be served** with this model, as probably only 5-10% of SHF in SSA are integrated in contract farming schemes[1].

Requirements from the agro-PURE company

- **Provide financing and after-sales services**, which are normally part of its standard offering. However, companies must not underestimate the importance of customer training and reliable servicing, and not only rely on support provided by the off-taker, which will typically not cover agro-PURE technicalities
- **Strengthen the business case for off-takers** as it is still unclear for them if solar is better than other alternatives (e.g., diesel).

Role, interest and constraints for the off-taker

- The off-taker would **only need to facilitate access to its contract farming SHFs**
- Providing PURE appliances for its SHFs would help the off-taker **improve the quantity and/or quality of its produce**, ultimately increasing their revenue
- **Constraints for the off-taker are low**. They will favor turnkey solutions. In some cases, there could be an opportunity for interested off-takers to then use PURE appliance to enter new markets (e.g., expand in arid regions with solar pumps), which would require onboarding new SHFs.

SHFs using Wala's solar water pump system. Credit: Efficiency For Access

Source: Hystra analysis, based on interviews. 1) CGAP, Segmentation of smallholder households: meeting the range of financial needs in agricultural families (2013)

A. Existing market access			B. Provide market access	
A1	A2	A3. Int. in contract farming	B1	B2

Agro-PURE companies can integrate into existing contract farming schemes, a relatively easy-to-serve but niche market

Examples

Sales model	Service model
• Wala (irrigation, Malawi) • Tulima Solar (irrigation, Uganda)	SokoFresh (cold storage, Kenya)

Zoom on an irrigation company

- **The company was limited in its capacity to sell solar pumps with financing.** Thanks to concessionary funding, it started to sell pumps to groups of SHFs with in-house financing. However, in the absence of market access, the company was not able to get enough working capital to finance more pumps
- **The company recently pivoted its model to only serve SHFs integrated in contract farming schemes** who have guaranteed market access, which facilitates pump financing by a 3rd party (MFI or bank).

Zoom on an irrigation company

- **The company sells solar pumps to SHFs.** In 2025, it began piloting a cross-selling model for their pumps through **off-takers, who refer eligible SHFs and facilitate access to MFIs**
- SHFs in these schemes have more predictable income and often pay upfront or leverage external financing, reducing the company's credit exposure. The company has **experienced higher repayment rates** among these referred SHFs.

Source: Hystra analysis based on interviews

A. Existing market access			B. Provide market access	
A1	A2	A3	B1. Aggregating for OT	B2

Agro-PURE companies can aggregate for off-takers, a good trade-off between increasing market potential and keeping operations simple

Description and market size

- Agro-PURE companies can **build partnerships to aggregate produce for off-takers** (through tri-partite contracts including SHFs), meeting their requirements. Off-takers will buy from SHFs, sometimes with the support of the agro-PURE company on logistics
- **Most SHFs can be served**, as agro-PURE companies help build trust with off-takers. However, some off-takers may hesitate if agronomic support and input provisions are not guaranteed.

Requirements from the agro-PURE company

- **Provide financing and after-sales services**, which are normally part of its standard offering
- **Aggregate produce from SHFs,** with staff on the ground to support SHFs for cultivation and harvest, and control quality/volumes
- **Find and contract with off-takers**, who are willing to buy produce from its SHFs. Some off-takers are asking for a sample to check quality.

Role, interest and constraints for the off-taker

- The off-taker will **need to sign a contract** with the agro-PURE company and the SHFs
- This set-up allows the off-taker to **increase supply volumes**, with some also valuing the **opportunity to source from SHFs**
- Engaging with SHFs can be difficult. Off-takers also **sometimes have to collect the produce themselves**, which could be far from their location.

Farmer group using Zonful Energy's irrigation system

Source: Hystra analysis based on interviews

A. Existing market access			B. Provide market access	
A1	A2	A3	B1. Aggregating for OT	B2

Agro-PURE companies can aggregate for off-takers, a good trade-off between increasing market potential and keeping operations simple

Examples

Sales model	Service model
Farm Warehouse (processing, Nigeria)	▪ ColdHubs (cold storage, Nigeria) ▪ SowPrecise (mobile IaaS, Kenya) ▪ Zonful Energy (irrigation, Zimbabwe)

A group of Zonful Energy's SHFs, next to one of their water tanks

Zoom on Farm Warehouse

- **Farm Warehouse**, a processing provider in Nigeria, **recently started to operate its own processing hubs**, where they provide market access to SHFs who purchased their processing units on credit
- Farm Warehouse operates a warehouse in each hub to facilitate aggregation and quality control, and has partnered with urban off-takers who buy produce from SHFs. Farm Warehouse pays the SHFs only once it receives money from the off-takers*. With this guaranteed market access, **the repayment rates for the processing units have strongly increased.**

Zoom on Zonful Energy**

- Zonful Energy sells **water-efficient solar irrigation pumps on credit to SHF groups** in Zimbabwe, via a monthly subscription model
- Recognizing that many subsistence SHFs lack reliable buyers, **Zonful partnered with 8 off-takers** (e.g,. supermarkets, schools). The off-takers purchase surplus produce aggregated by Zonful, which strongly improved repayment rates
- Zonful Energy keeps its own operations relatively simple by **leveraging existing local extension officers** to supervise cultivation, facilitate crop management and prevent side-selling.

Source: Hystra analysis based on interviews. * In the pilot phase, Farm Warehouse is paying a small down payment to the SHFs to build trust. ** For further details on Zonful Energy's business model, see case study in pages 70-73

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2. Becoming an OT

Agro-PURE companies can become off-takers for most SHFs, though the process is highly demanding

Description and market size

- Agro-PURE companies can become an off-taker, **buying the produce from the SHFs themselves**. Depending on the value chain, **they can also add value to the produce** (e.g., transforming milk in yoghurt or branding the produce as organic)
- **All SHFs that can benefit from PURE appliances can be served** and benefit from this integrated market access provision.

Requirements from the agro-PURE company

In addition to providing financing, after-sales services, and supply structuring, agro-PURE companies would need to:

- **Buy the produce from the SHFs** and sell it to end-buyers
- **Operate value-addition infrastructure** (e.g., a yoghurt factory) if they want to capture more value.

See more details page 41

Role, interest and constraints for end-buyers

- The end-buyer would simply **need to sign a standard purchasing agreement** with the agro-PURE company
- This set-up allows the end-buyer to **increase supply volumes**, with some also valuing the **opportunity to source from SHFs**
- The agreement places **no additional constraints** on the end-buyer, who will buy directly from the agro-PURE company instead of leveraging unreliable intermediaries.

Avocado SHFs selling to SokoFresh

Source: Hystra analysis based on interviews.

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2. Becoming an OT

Agro-PURE companies can become off-takers for most SHFs, though the process is highly demanding

Examples

	Sales model	Service model
Not adding value	Modern Farming Technology (irrigation, Malawi)	Stable Foods (fixed IaaS, Kenya)
Adding value	• Clamore (egg incubator, Zimbabwe) • Jain (irrigation, India) • S4S (processing, India)	• Keep IT Cool (cold storage, Kenya) • Promethean (cold storage, India) • SokoFresh (cold storage, Kenya)

Zoom on a cold storage company

- The company shifted from **selling cold storage units to large dairy companies to a B2C model**, providing 200L milk chillers to groups of ~10 SHFs as a service
- To ensure high usage, **the company acts as the off-taker, buying milk directly from SHFs**. Half of the milk is sold raw, while the rest is processed into value-added products like yogurt and lassi, which have enabled the company to generate a higher margin.

Zoom on S4S

- S4S **was initially experiencing low repayment rates** for its solar dryers sold on credit, as only large SHFs were able to repay
- S4S then became an off-taker, **sourcing surplus lower-grade produce** from 300,000 SHFs via cooperatives. The produce is processed by micro-entrepreneurs who bought the company's dryers, with 30% of their processing fee (paid by the company) used for loan repayment over 7 years
- S4S **aggregates dried produce and adds additional value (e.g., blending spices)**, before selling it to a broad range of premium end-buyers.

Zoom on SokoFresh*

- **SokoFresh,** a cold storage provider in Kenya, **experienced low usage rates for its pay-as-you-store model.** SHFs were not willing to pay a service fee to store their produce, as they were not certain that they would be able to sell it later at a higher price
- SokoFresh **decided to become an off-taker,** trading at first multiple value chains. Supply fragmentation and high costs led them to focus on avocado, which increased adoption and usage rates.

Source: Hystra analysis based on interviews. * For further details on SokoFresh's business model, see case study in pages 65-68

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2. Becoming an OT

HYSTRA
hybrid strategies consulting

To become successful off-takers, agro-PURE companies will need to build key assets and capabilities

	Key assets	Key capabilities
Definition	***Resources** that the company owns and that hold value for its business model*	***Organizational skills and competencies** that the company develops and excels at to operate effectively*
Sourcing from SHFs	▪ **Aggregation channels and dense farmer networks:** partnerships with cooperatives, NGOs, or SHF groups to pool volumes across large clusters of SHFs (often organised by geography or value chain) ▪ **Trusted relationships with SHFs:** built through fair pricing, regular engagement, and technical support.	▪ **Ability to aggregate:** identifying and engaging clusters of SHFs, and organizing efficient collection and pooling of their produce ▪ **Ability to ensure consistent volumes and quality standards:** enforcing grading, quality checks, and reliable supply commitments.
Financial capacity	**Working capital reserves/credit lines:** liquidity to purchase produce upfront and bridge seasonal cash gaps.	**Good cash-flow forecasting:** providing timely payments to SHFs
Operations and supply chain	**Physical infrastructure:** warehouses, cold storage, drying facilities, produce grading facility, and reliable logistics fleet, etc.	▪ **Efficient logistics and inventory management:** minimizing post-harvest losses, ensuring timely delivery, and reducing costs ▪ **Accurate demand forecasting and planning:** using market data and buyer signals to align procurement with sales.
Sale of produce	**Partnership networks:** formal or informal connections with end-buyers.	▪ **Product differentiation:** segmenting offer to capture maximum value from produce sales ▪ **Relationship management with end-buyers:** trusted links with wholesalers, processors, or retailers, ensuring repeat demand.

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2

For all these models, screening is key, but relies on different metrics (customer, location, value chain) requiring research

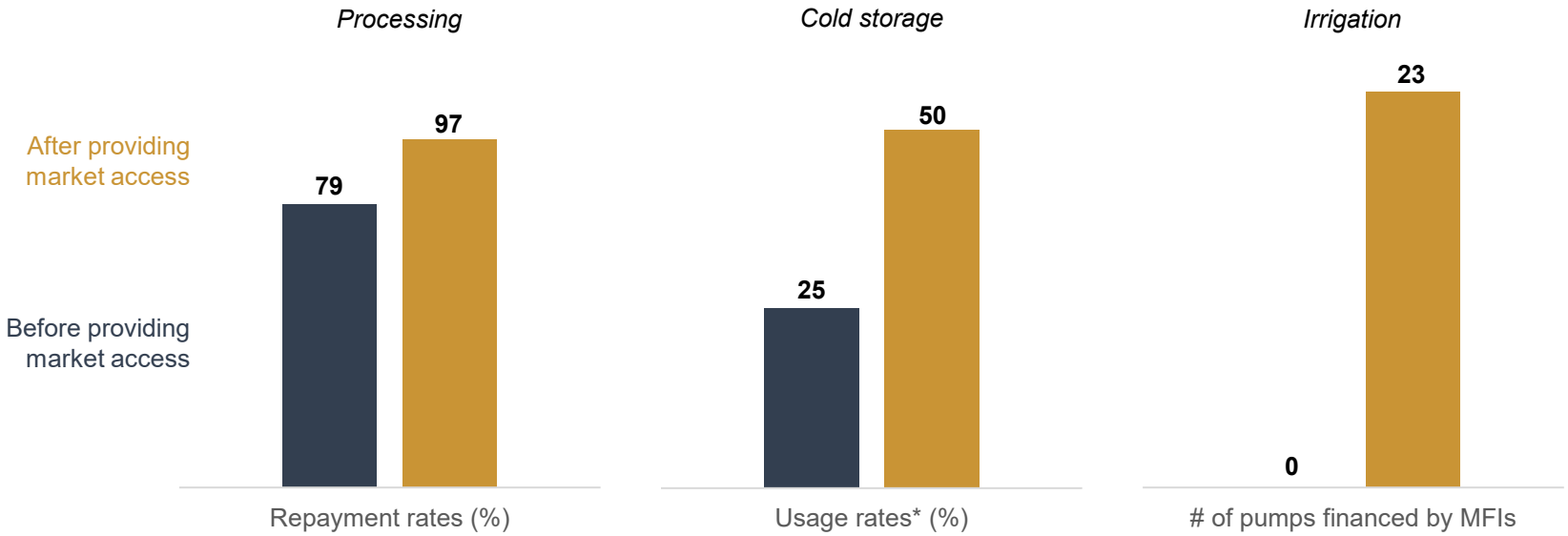
Screening metric	Models	Rationale	Example
SHF 	A2 A3	**Ensure SHFs have reliable market access** to validate long-term repayment capacity for credit or service	**SunCulture** (irrigation, Kenya and other African countries) significantly improved repayment rates thanks to its customer screening tool, originally developed with Frankfurt School and later refined with AICE*, with **USAID funding** (esp. the weighting, based on correlation with past results).
Location 	A1 B1 B2	**Deploy where off-takers are active** (e.g., specialized local markets) and/or where **facilitating market access is easier** (e.g., dense clusters of SHFs growing similar high-value crops)	**ColdHubs** (cold storage, Nigeria) conducts pre-deployment market assessments (over a period of up to 9 months) by mapping perishable crop or livestock/fish value chains and selecting local markets that are existing points of aggregation as locations for its units.
Value chain 	B2	**Ensure sufficient value can be captured** to support the business case (e.g., favorable trading conditions, reliable buyers, viable unit economics)	**SokoFresh** (cold storage, Kenya) initially operated across diverse value chains, facing high costs and unreliable sales – with **TechnoServe's support**, they focused on the avocado value chain (see case study in Appendix).

Source: Hystra analysis based on interviews. * Artificial Intelligence Center of Excellence Africa

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2

Early evidence seems to show that ensuring market access can strengthen agro-PURE companies' key metrics

Anecdotal evidence of market access provision's impact



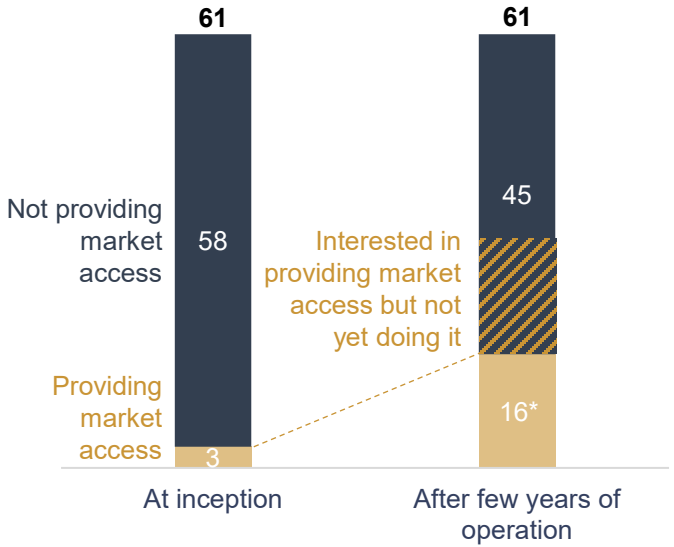
Source: Hystra analysis, interviews with 3 agro-PURE companies. * Rough estimations based on company's interview

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2

Agro-PURE companies are increasingly providing market access directly, with some early proof of viable market expansion

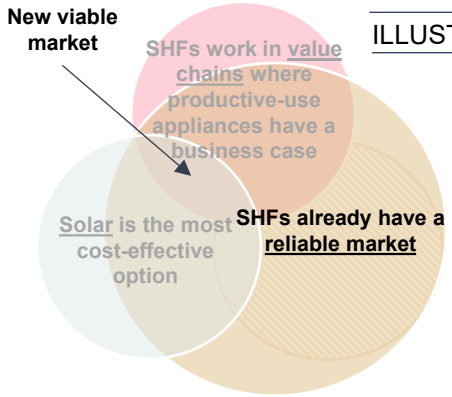
More and more agro-PURE companies are providing market access…

Evolution of number of agro-PURE companies providing market access directly



… which increases the number of SHFs they can serve

Key criteria of viability for agro-PURE appliances



While the number of SHFs with a strong business case for PURE appliances (where also solar is the most cost-effective option) remains stable, **growing number of SHFs with a reliable market is expanding the total viable market**.

Processing provider (Nigeria)

Farm Warehouse initially served SHFs with prior processing experience to increase the chance of secured buyers and reduce credit risk. By launching processing hubs with integrated market access, the company **increased its viable market size fourfold****.

Source: Hystra analysis based on desk research and interviews with sector stakeholders. While not exhaustive, this mapping is intended to be representative of the sector. It includes the largest companies, identified through extensive expert consultations. * Estimated based on interviews, ** Company's estimates

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2

To provide market access directly, agro-PURE companies need to manage the critical step of SHF aggregation

Key steps to provide market access for SHFs and corresponding responsibilities from agro-PURE companies under each model

Critical step, requiring local teams with agronomic expertise to:
- **Engage large numbers of dispersed SHFs** with inconsistent volumes and quality
- **Build trust** and incentives to reduce side-selling and ensure reliable supply.

Key steps

1. Cultivation*
- Facilitate access to adequate inputs and equipment
- Train and support SHFs.

2. Aggregation
- Facilitate crop management
- Buy produce (often at farm gate), checking quality
- Aggregate and store produce.

3. Transport

Transport produce from decentralized storage point to factory or sales point

4. Value-addition (optional)

Add value to the produce (e.g., drying, processing, etc.)

5. Sales

Sell the produce (often B2B)

Responsibilities

B.1. Aggregating for off-takers

B.2. Becoming an off-taker

Source: Hystra analysis. * Often done by 3rd party organizations (e.g., NGOs, public extension officers, etc.)

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2

Overall, agro-PURE companies still face challenges, resulting in high costs, when providing market access directly…

	Challenges	Description
Opex	**Staff costs**	Need staff on the ground to select and onboard SHFs, assess quality, and aggregate produce
	Agronomic expertise	Need to identify viable value chains and train SHFs on good agriculture practices to meet off-takers' demanding requirements
Capex	**Warehousing and transport costs**	Need to build new warehouses to store produce collected and organize/ pay for transport from farm gate to off-taker
Overheads	**Top management dispersion**	Need time from top management to build partnerships with next level of off-takers and organize off-take operations
Financing	**High working capital requirements**	In addition to financing the PURE appliance, need to purchase produce from SHFs

Source: Hystra analysis

A. Existing market access			B. Provide market access	
A1	A2	A3	B1	B2

… but some have developed best practices that can help tackle these challenges

	Challenges	Best practices
Opex	Staff costs	✓ **Leverage digital platforms**: ColdHubs uses the Coldtivate app to manage inventory with predictive analytics and facilitate real-time matchmaking between SHFs and off-takers ✓ **Partner with SHFs' cooperatives**: Keep IT Cool collaborates with cooperatives that aggregate fish at lakeshores, earning a commission on sales.
	Agronomic expertise	✓ **Coordinate with existing agriculture extension officers**: Zonful Energy partners with local extension officers who advise SHFs on crop management, thereby improving yields and quality.
Capex	Warehousing and transport costs	✓ **Partner with SHFs' cooperatives for transport,** to turn Capex into Opex: S4S provides dispatch schedules to cooperatives, which collect produce from members for a small service fee ✓ **Bring off-takers to the point of aggregation** to limit Capex requirements: Farm Warehouse coordinates with off-takers to pick up produce directly from their warehouses once minimum volumes are reached ✓ **Saturate specific zones before expanding** to amortize Capex smartly: S4S targets regions where most SHFs are growing the same type of crops, for which S4S has already secured off-takers.
Overheads	Top management dispersion	✓ **Appoint dedicated market access staff:** Zonful Energy and SokoFresh employ full-time staff focused on market linkages, freeing up leadership to focus on operations and strategy.
Financing	High working capital requirements	**Unlock 3rd party financing by:** ✓ **Using produce purchase guarantee**: Farm Warehouse, S4S and Wala convinced banks and MFIs to finance the PURE appliance, removing the asset from their balance sheets ✓ **Enabling direct loan recovery from produce sales:** S4S works with financial institutions that deduct loan repayments from sales proceeds, significantly lowering credit risk (as long as there is no side selling).

Source: Hystra analysis

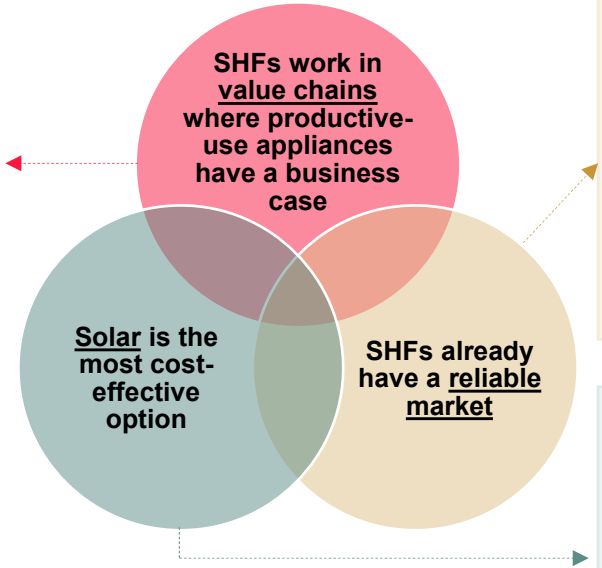
Content outline

First, agro-PURE companies should assess the 3 key viability criteria from the start, to design a business model with sufficiently large client segments to become viable

Key criteria of viability for agro-PURE appliances and corresponding assessment by agro-PURE companies

Focus on value chains where productive-use appliances create the strongest business case, considering:

- **Potential value add of the appliance** (e.g., by how much does it increase sellable production and/or price?)
- **Value chain market size** (e.g., what is the total national production by SHFs?)
- **Applicability conditions for the appliance** (e.g., for irrigation: how many SHFs have access to water nearby? Generally: how many SHFs lack access to alternatives?).



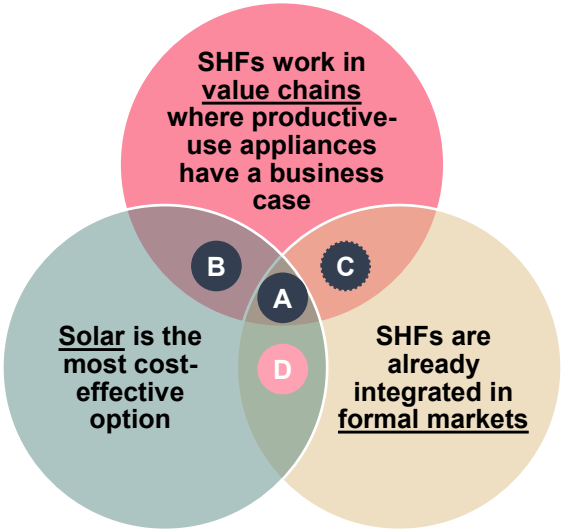
Assess the local infrastructure and market maturity, in particular **mapping relevant off-takers and potential SHF aggregators**, to determine the opportunity to only target SHFs with existing market access (if the market is large enough to justify the agro-PURE company costs over time) versus the need to provide market access directly.

Ensure solar is the most cost-effective option compared to other alternatives, **taking into account usage rates throughout the year** (and if not, consider offering alternatives).

For a list of existing studies that can be leveraged, refer to the donor recommendations on page 59. Agro-PURE companies can also seek support from existing agro- and energy-focused support programs (see list page 77)

Then, agro-PURE companies should choose the right strategy based on the number of SHFs with existing market access

Key criteria of viability for agro-PURE appliances and corresponding strategies that agro-PURE companies can adopt



A

If the market size is large enough, they can focus on serving SHFs with existing market access, with one or several of the 3 models A described here (A1: selling/renting directly to off-takers, A2: screening SHFs with existing market access, or A3: integrating into contract farming schemes), using good screening processes. – *see next page*

B

If the market size is too small, they should provide market access from the start, by:

1. **Choosing the right level of integration** from the outset (aggregating for off-takers or becoming an off-taker) and validating **unit economics across the value chain,** to ensure there is an economic case for all 3 partners - the agro-PURE company, the final off-taker and the SHFs - *see page 52*
2. **Optimizing costs across the delivery model** - *see page 53*
3. In a second stage, **improve model viability**, exploring ways to monetize SHF aggregation beyond produce and appliance sales (e.g., extending product range, providing additional synergistic services, finding impact payers). - *see page 54*

C

Expand product portfolio and/or lower product cost *(not covered here)*

D

Do not serve / shift cultivation *(not covered here)*

When serving SHFs with existing market access, agro-PURE companies should have strict screening processes

Select the right operating locations and off-takers (model A1: selling/renting directly to off-takers):

- **Identify proven demand hubs**, where off-takers already purchase at scale. For example: specialized markets where off-takers concentrate on high-value produce, processing centers where agro-processors aggregate raw produce, or export zones (near ports or border crossings), where strict quality requirements and high-volume flows attract reliable off-takers
- **Perform off-taker due diligence,** validating their track records on volume, pricing, and payment reliability through interviews, purchase records, or third-party reports.

Select SHFs with existing market access (models A2: screening SHFs with existing market access and A3: integrating into contract farming schemes) **using a comprehensive scoring tool,** to secure long-term repayment capacity for credit or service. The tool could include indicators such as:

- **Types of produce grown**, to verify that the SHF is engaged in high-value produce (e.g., cash crops) and integrated into relevant value chains
- **Previous solution used** (if any), to assess whether solar offers a cost-effective upgrade and if the SHF was already producing and selling
- **Historical sales volumes and payment records,** to evaluate the SHF's market access. Where unavailable, proxies such as **formal relationships with off-takers, storage facilities for produce beyond self-consumption** or **cooperative membership** can serve as indicators
- **Data ensuring the product is adapted to the SHFs' specific conditions** (e.g., access to water for irrigation).

HYSTRA hybrid strategies consulting

When providing market access, agro-PURE companies should first choose the right level of integration and validate unit economics

Choose the right level of integration from the outset, either aggregating for off-takers (model B1) or becoming one (model B2)

- **Agro-PURE companies should aim to build partnerships to aggregate produce for existing off-takers whenever possible (model B1)**, as this reduces operational complexity, lowers working capital needs, and allows them to focus on their core business of selling and servicing appliances. To evaluate the viability of this approach, they can:
  1. **Map local formal off-takers**, who regularly source produce in the selected value chain(s) yet still rely on informal traders and are logistically accessible from their areas of operation (e.g., large ones: agro-industry plants, processing centers, exporters, large aggregators; or smaller ones: hotels, restaurants, supermarkets, etc.)
  2. **Assess the scale and consistency of demand** from these off-takers to determine whether there is enough volume to justify investment in basic logistics infrastructure (e.g., warehouses) and play a facilitator role between SHFs and off-takers.
- **If suitable off-taker partners are not available or the demand is too fragmented, agro-PURE companies may consider vertically integrating by becoming the off-taker themselves (model B2)**. This gives them full control over the value chain, allowing them to capture additional margins from produce sales, and ensures stable market access for SHFs, though it comes with higher capital and operational requirements – and the need to find markets to sell produce themselves.

Validate unit economics across the value chain to ensure there is financial viability for all stakeholders

- **For SHFs**, increased revenues from produce sales should be sufficient to cover appliance repayments while still improving net income, to ensure both satisfaction and repayment reliability
- **For the agro-PURE company**, margins from appliance sales and any added value from aggregation must cover operational (staff, logistics), financing (warehousing, working capital), and overhead costs, while accounting for risks such as price volatility, post-harvest losses, and payment defaults. **The business case should be strong enough to attract equity investors**
- **For the final off-taker**, this new agreement must bring in significant improvements over their previous solution (e.g., lower produce costs, improved quality, improved supply consistency, better convenience).

Pilot testing and sensitivity analyses will be key to confirm that these unit economics work, and avoid scaling models that are not sustainable.

When providing market access*, agro-PURE companies should leverage existing resources and digital tools to optimize costs

Prioritize densification of existing service areas by targeting customers via farmer hubs or geographic clusters, and/or incentivizing and training sales agents to focus first on deepening penetration before moving to new locations, to streamline logistics, enable aggregation, and reduce operational costs.

Leverage existing resources to beef up local field capacity. On-the-ground presence is essential for ensuring quality, reducing side-selling, and providing training and ongoing support to SHFs. It also plays a critical role in collecting repayments and tracking appliance use. However, this is expensive to provide. To limit those costs, **agro-PURE companies can:**

- **Coordinate with agriculture extension officers** to support SHFs on crop management, improving yields and quality
- **Partner with SHFs' cooperatives** to aggregate produce and limit side-selling
- **Partner with NGOs** to provide training and ongoing support.

Leverage digital tools (e.g., PaygOps, Coldtivate). While they cannot create and replace trust, agro-PURE companies can use these to:

- **Support aggregation,** using digital inventory and/or predictive analytics (e.g., estimating shelf life of produce in cold storage without quality loss) to enhance traceability, quality control and volume management
- **Facilitate matchmaking with off-takers** through integrated digital marketplaces, where off-takers can post demand and SHFs can share available supply
- **Enhance data transparency** by systematically collecting key impact indicators (e.g., SHFs' income) to support monitoring and evaluation for investors, financiers, and donors, thereby facilitating trust, impact measurement, and future investments.

Agro-PURE companies should prioritize solutions where benefits exceed costs, and that are well-developed and require minimal training.

* While most of these recommendations are also applicable for agro-PURE companies serving SHFs with existing market access (models A), they are more critical for the business model of those providing market access directly (models B)

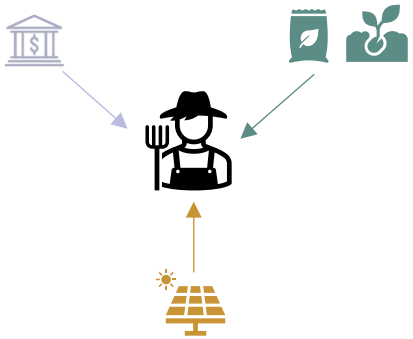
When providing market access*, agro-PURE companies can then build on their links with SHFs to provide a more holistic offer (and increase their own revenues)

Facilitate external financing by lenders (MFIs or banks), not only for agro-PURE appliances but for other beneficial products.

SHFs often struggle to access loans due to being perceived as high-risk by financial institutions. Agro-PURE companies can help de-risk these loans and become a conduit for banks/MFIs to finance SHFs by:

- **Providing produce purchase guarantees,** which give lenders visibility on the SHF's expected income
- **Directly deducting loan repayments from produce sales**.

This approach not only facilitates the sale of appliances but also increases SHFs' loyalty.



Extend product range, with different capacities of agro-PURE appliances and non-renewable alternatives

As SHFs increase their revenues, **they often expand their cultivated land and require larger or more advanced appliances**. By maintaining strong relationships with their clients, agro-PURE companies can anticipate these evolving needs and offer higher-capacity solutions accordingly.

Offer additional products and services beyond agro-PURE appliances.

Providing a broader, tailored suite of **productivity-enhancing solutions** (e.g., high-quality inputs, soil testing, agronomic advice), as well as **health and life insurance** (especially for companies providing loans to SHFs for their appliance), allows agro-PURE companies to:

- **Increase their revenue per client and boost sales force effectiveness,** by upselling complementary products that better match SHFs' diverse needs
- **Improve SHF productivity and income**, which in turn enhances their ability to repay for the appliance or service
- **Enhance produce quality and consistency**, which is critical for the agro-PURE company providing market access.

* While most of these recommendations are also applicable for agro-PURE companies serving SHFs with existing market access (models A), they are more critical for the business model of those providing market access directly (models B)

Content outline

Off-takers should assess the potential of PURE appliances to improve the efficiency and resilience of their business model

Assess which PURE appliances present a strong business case for both their operations and the SHFs they serve:

- For multinational brands: to achieve CSR targets (e.g., reducing GHG emissions, food waste) and strengthen supply chain resilience
- For traders: to achieve CSR targets and/or carbon or livelihood targets for premium buyers, secure greater produce volume and strengthen supply chain resilience
- For small off-takers: to increase produce volume and input sales, and strengthen SHF loyalty.

If needed, seek support from agro- and energy-focused support programs*. Off-takers can also leverage existing resources (e.g., VeraSol database on certified PURE products) to validate product suitability.

Work only with agro-PURE companies who provide the support services required for long-term success, using as criteria: proven product reliability, strong after-sales service, and comprehensive training and user support. Off-takers can leverage agro- and energy-focused support programs* to de-risk selection and access vetted suppliers.

Carefully select SHFs who are most likely to succeed with a PURE appliance, using data on farm size, (re)payment records, and sales volumes.

Facilitate PURE financing, providing guarantees to lenders (either banks/MFIs or PURE company) and enabling direct loan recovery from produce sales. For shared appliances, off-takers could finance the asset directly and deduct usage fees or repayments at the point of purchase.

* See list of relevant programs in page 77

Content outline

Investors can guide both their agro-PURE and off-taker investees to foster collaboration in providing reliable market access

For those who invested in agro-PURE companies:

Ensure these agro-PURE companies have conducted a thorough assessment of their viable market and selected an appropriate business model that guarantees SHFs reliable market access (see recommendations for agro-PURE companies pages 49-54).

Provide affordable and flexible working capital solutions to help agro-PURE companies buying from SHFs bridge cash flow gaps, particularly between immediate payments to SHFs and delayed payments from buyers, which can extend up to 90 days.

For those who invested in off-takers and/or aggregators:

Encourage these off-takers and/or aggregators to explore opportunities in agro-PURE appliances. This includes assessing the business case for these appliances and facilitating strategic matchmaking with relevant agro-PURE companies to support deployment and scale.

For those who can offer Technical Assistance, see recommendations for donors in the next pages (59-61)

Donors can help agro-PURE companies select the right business model that embeds market access from the start

Conduct and publish research on the most promising value chains for each PURE technology, quantifying viable markets by value chain and geography, and assessing off-taker business cases. Existing studies that partially address these needs can be leveraged, including:

- A2EI's assessment of the PURE business case in selected value chains[1]
- For cold storage, Wageningen U&R's analytical framework[2], Cool Move Initiative catalyzing cross-stakeholder data collection[3] and SEforALL's open-source tool to evaluate communities that would benefit from cold storage facilities[4]
- Country-specific studies on the potential of PU(R)E appliances within specific value chains – *NB: not all are publicly available yet.*

Map off-takers and SHFs' aggregators relevant to each value chain and facilitate connections between those and agro-PURE companies.

Provide strategic advisory support to help agro-PURE companies choose suitable models, leveraging insights from previous research and stakeholder mapping.

1) A2EI, Evaluation of solar powered agricultural technologies for productive-use applications (2020); 2) R.J.A. Oostewechel et al., Postharvest Assessment Methodology (2022); 3) Cool Move Initiative; 4) SEforALL, Agricultural Cold Chain Access Planning Tool (AgCAP).

Donors can provide holistic support to strengthen the business model of agro-PURE companies who often lack agricultural expertise

De-risk pilot partnerships between off-takers and agro-PURE companies, either for contract farming schemes (model A3) or for purchasing contracts (model B1), to validate proof of concept, showcase shared benefits, and incentivize long-term contracts.

Support business model optimization to ensure companies fully help SHFs succeed (vs. just selling a product), and to improve unit economics across the value chain. Ideally, this would include funding early-stage pilots to confirm suitability of offer and sustainability before scaling, thereby avoiding unsustainable roll-outs.

Provide operational support to agro-PURE companies providing market access directly (e.g., on aggregating SHFs and controlling produce quality), by matchmaking with existing organizations able to provide these services (e.g., NGOs, cooperatives) or de-risking setup of own staff until revenue streams can sustain these roles.

Donors can also strengthen the broader agricultural ecosystem, indirectly supporting agro-PURE companies

Engage large off-takers (multinational brands, traders) to assess the business case for PURE appliances in their value chains and identify the conditions that would drive their investment (e.g., appliance price and capacity, required volumes).

Ensure support programs around PURE also integrate support for organizations that specialize in aggregating SHFs. Then, **help agro-PURE companies identify and partner with these organizations.** Coordinate interventions at the regional level to maximize synergies and avoid duplication (e.g., an aggregator and an agro-PURE company partnering to expand into a new geography).

Fund national multi-stakeholder platforms or mechanisms across sectors (agriculture, climate, energy and finance), to facilitate coordination between off-takers, agro-processors, financial institutions, energy and agro-focused donors, and agro-PURE companies. Use these platforms to align supply and demand, unlock financing, and co-design policies that address ecosystem bottlenecks (e.g., building on the work of ILSSI[1] for irrigation).

1) ILSSI, Farmer-led irrigation multi-stakeholder dialogues (2021)

Content outline

Policymakers can integrate PURE into national agriculture strategies and strengthen local sourcing mandates

Institutionalize PURE within national agriculture strategies and foster coordination[1]

- Explicitly integrate PURE in national agriculture plans, building on continental ambitions (e.g., Kampala Declaration)
- Facilitate coordination between energy and agriculture policies and programs, ensuring policy coherence and efficiency
- Support multi-stakeholder platforms or mechanisms across sectors, ideally leveraging existing national associations.

Coordinate with agro-PURE companies when deploying agriculture public extension services

- Include agro-PURE awareness in SHF training, and share options based on locally-available technologies
- Include good agricultural practices to comply with existing off-takers' quality and safety standards (e.g., integrated pest management, post-harvest handling)
- Support supply chain structuring and aggregation for agro-PURE companies.

Strengthen local sourcing mandates

- Implement progressive local sourcing policies that set minimum local procurement quotas for public institutions and apply targeted import restrictions on specific products with local alternatives (e.g., fish imports during peak local fishing season in Kenya)
- Explore potential to establish traceability schemes to facilitate local sourcing at scale, independently of PURE.

Enforce food safety standards to unlock cold chain demand

- Mandate cooling and storage timelines (e.g., milk cooled to 4°C within 2 hours post-milking) aligned with international best practices
- Prioritize capacity building for local inspectors and field officers to ensure consistent enforcement, especially in rural areas.

1) GOGLA, Beyond Silos: Strengthening Nexus Collaboration to Power Food Systems with Off-Grid Solar (2025)

Content outline

SokoFresh provides cold storage solutions and avocado off-take services to SHFs in Kenya

SokoFresh is a Kenyan social enterprise, established in 2019, focused on reducing post-harvest losses for SHFs. The company operates through two main business lines: cold storage (since 2020) and avocado and soybean trading (since 2024) - *we will focus here on avocados as soybean does not require cold storage.*

Product offering and value proposition

Cold storage

Offering mobile, solar-powered cold rooms (5-ton capacity, 20-foot containers, that can be grid-powered and have a lifespan of ~15 years), through 3 value propositions:

1. **Rental** (70% of business, 18 units): Farmers pay a 1-month deposit and a monthly rental fee of ~$700. SokoFresh targets:
   - Commercial farms: long-term contracts that can be paused in low season (no payment but the farmer is responsible for the unit safety)
   - Groups of SHFs: short-term contracts (min. 6 months), usually during high season. Payments between SHFs based on kgs stored. In low season, idle units transferred in urban centers for local traders.
2. **Lease-to-own** (15%): ~$600 per month per unit, 20% deposit, 60-month repayment plan
3. **Outright sales** (15%): $25k–30k per unit, mainly for large-scale/commercial farms.

Outright sales include a 12-month warranty covering key components and excluding solar panels. For rentals and leases, full coverage is provided for the entire period.

Avocado trading

Purchasing avocados from smallholder SHFs (SHFs) and small businesses, storing them in their 3 cold storage units, before exporting them to Europe and Middle East.

Operations

Cold storage

1. Assembling the units locally, sourcing parts mostly from India
2. Finding commercial farms and cooperatives (with existing buyers, *see next page*) via social media, events, or through partners
3. Performing a cost-benefit analysis to convince the prospect, based on crop type, payment capacity, financing options, etc.
4. Installing the units for a fee (or for free if the SHFs are selling avocados to SokoFresh), with only maintenance provided thereafter.

Avocado trading: *see next slide*

Key figures

- 26 units deployed across Kenya, serving 3k SHFs. 6 more units to be deployed in the coming month
- 3 units for avocado trading in Nakuru, Kiambu, and Muranga
- ~1,000 tons of avocados traded in 2024 (40% grade 1, 60% grade 2)
- 42 staff on payroll (end 2024).

Source: Hystra analysis based on interviews with SokoFresh management and field visits in Nakuru, Kiambu, and Muranga, Kenya (June 2025)

SokoFresh guarantees market access for SHFs using its cold storage units, creating synergy between its two models

SokoFresh began offering market access as SHFs were unwilling to pay for cold storage services without price guarantees. It also reduced reliance on middlemen, promoting structured aggregation. At first, SokoFresh traded multiple value chains, but supply fragmentation and high costs led them to focus on avocado.

"We're trying to change the behavior for crops like avocado, similar to how tea and coffee SHFs accept going to collection centers for better prices." – SokoFresh staff

SokoFresh has two ways of providing market access to SHFs:

Cold storage: SokoFresh has "integrated in contract farming schemes" (Model A3)

SokoFresh is targeting group of SHFs with existing buyers, to ensure good repayment rates. Buyers are able to offer better prices for the preserved produced, increasing SHFs' income. For example, in 2021, a French bean cooperative in Kenya secured a $30k cold storage unit through an off-taker already linked to SokoFresh. With improved prices (from 50 to 70 KES/kg), the community has repaid the unit in 3.5 years at $700/month.

Avocado trading: SokoFresh has "become an off-taker" (Model B1)

Process

1. **SokoFresh partners with farmer organizations** to aggregate produce cost-effectively from SHFs within a 100km radius of each hub
2. **Lead SHFs and agronomists supervise SHFs' engagement**, ensuring their success and produce quality
3. **Harvesters, paid on commission, collect produce at farmgate**. The hub operator sorts, weighs, and pays SHFs based on the set price per avocado grade. Avocadoes are stored in the cold storage unit
4. **SokoFresh transports avocados to its packhouse**, with non-refrigerated trucks rented from a 3rd party. Avocadoes are stored in another solar cold storage unit, and a 2nd avocado sorting occurs:
   - Grade 1 avocados are exported after packaging and quality checks. To meet exporter demand, SokoFresh also buys from small local businesses (up to 50% of supply, buying price ~15% higher than from SHFs), inc. in priority those who rented its units
   - Grade 2 avocadoes and surplus are sold to local processors (e.g., to produce oil).

Best practices

- **Dual revenue streams** from unit rentals *and* avocado trading
- **Strong value proposition to SHFs**, with timely harvesting, competitive pricing, direct payments, agronomic training and purchase of both grades of avocados; seen as real value add by SHFs, who are less prone to side-selling
- **Cost-efficient delivery model** via:
  - **Aggregation through partners** already working with SHFs (NGOs, government agencies)
  - **Commission-based lead SHFs** for sourcing, monitoring, and SHF engagement.

Source: Hystra analysis based on interviews with SokoFresh management and field visits in Nakuru, Kiambu, and Muranga, Kenya (June 2025)

SokoFresh strongly increases farmer incomes in both models, while achieving breakeven after 3 years

Impact of cold storage rentals on SHFs

✓ Preserved crop quality → ✓ Ability to meet buyers' standards → ✓ Reduced losses and increased prices → ✓ Improved livelihoods

Impact of avocado trading on SHFs

SokoFresh increased SHFs' income by ~60% on average, thanks to:

- ✓ **Reduced post-harvest loss,** by ~60%
- ✓ **Better prices,** ~20% higher than other channels (middlemen or local markets).

Some SHFs have also been able to grow more avocados:

> *"Thanks to SokoFresh, I have been able to double my number of trees"*

Most SHFs would recommend SokoFresh's services to others

They value better prices, post-harvest loss reduction, trust, transparent and precise system of weighing and sorting, and instant payment.

> *"Prior to SokoFresh, I was selling my avocados for less than half of the current price and was using banana leaves and shade to preserve them"*

> *"Brokers were not trustworthy and would damage my trees"*

Economics of the cold storage model

Rental to off-takers (CAPEX payback for one unit)

- **Actual annual revenue**: $5.9k (utilization rate: 70%)
- **Landed cost**: $18.5k

Payback: 3.2 years

SokoFresh unit used for aggregation services

Source: Hystra analysis based on interviews with SokoFresh management and field visits in Nakuru, Kiambu, and Muranga, Kenya (June 2025)

SokoFresh needs support to identify other viable value chains and secure year-round reliable buyers

Remaining challenges

Cold storage

- **High unit costs:** expensive parts keep unit prices out of reach for individuals and most SHF groups
- **High customer acquisition costs:** difficulty in finding farmer groups that are well organized with an existing buyer, as contract farming schemes are rare.

Avocado trading

- **Unreliable demand:** heavy reliance on export demand for avocados, with few local off-take for grade 1
- **Seasonality:** no activity during low season
- **Operational margins:** high cost of providing boots-on-the-ground
- **Reliance on partner organizations:** variable reliability of cooperatives in charge of aggregation and service delivery.

Growth strategy for the next 5 years

- **Regional expansion:** expanding across the East-African region through partnerships.

Cold storage

- **Flexible financing:** expanding lease-to-own and rental models to increase affordability
- **Contract farming focus:** targeting off-takers with existing contract farming schemes to equip their farmer groups.

Avocado trading

- **Value chain integration:** expanding its trading services to high-value complementary crops (e.g., mangoes, herbs, French beans).

Group of SHFs selling avocados to SokoFresh

Support needed

- **Value chain analysis:** finding new value chains to increase cold storage unit usage, especially in low season (e.g., rotation crops)
- **Off-taker matchmaking:** connecting with year-round reliable buyers (esp. for avocadoes), who value organic/fairtrade certifications
- **R&D funding:** for cheaper cold storage solutions tailored to smaller groups
- **Partner capacity building:** providing technical assistance to partners who aggregate and train SHFs
- **Working capital requirement:** financing CAPEX to meet rising demand for cold storage units and scale deployments
- **Advocacy support:** maintain favourable trade policies for avocado exports.

Source: Hystra analysis based on interviews with SokoFresh management and field visits in Nakuru, Kiambu, and Muranga, Kenya (June 2025)

Content outline

Zonful Energy distributes solar-powered irrigation pumps and facilitates market access for SHFs in Zimbabwe

Zonful Energy (Zonful) is a Zimbabwean social enterprise, established in 2017, providing solar solutions to rural households. Zonful started with Solar Home Systems and recently expanded into solar-powered irrigation in 2021, helping smallholder SHFs access affordable irrigation and connect with reliable off-takers.

Product offering and value proposition

Zonful sells water-efficient solar irrigation systems to SHF groups

Zonful offers 1.5 HP solar-powered irrigation pumps (with solar panels, water tank, fencing and drip lines) to groups of 35-55 SHFs clustered around a shared water source, at a cost of $2.1k-8k depending on farm size and existing equipment.

Zonful sells the pumps on credit through a monthly subscription model

- Zonful tailors credit terms to SHFs' financial capacity. SHF groups repay $150-270 per month (SHFs contribute $3-6 each depending on the size of their group), based on the size of the irrigation system. Zonful typically requires a 20–40% deposit and targets a loan duration of 1 to 1.5 years
- Zonful includes pump installation, after-sales service, and support to access inputs, market linkages (retaining a 10% commission during repayment), and optional insurance via a mobile partner
- Once SHFs finish repaying the initial system, Zonful can provide additional equipment on credit, with a minimum deposit of 20% (e.g., $750 water tanks).

SHFs can also purchase the equipment outright with a 10% discount.

Operations

1. Communities learn about Zonful through demo farms, peer networks, or markets. They organize into groups and request for government land for agricultural use, where an assessment of its suitability is done by an extension officer. Zonful also leverages a network of local agents to find new communities
2. Zonful reviews land and water access. While ~90% already have NGO/government-dug boreholes for domestic water usage, Zonful can leverage a third-party provider to dig one, which adds ~$1.8k
3. Zonful installs the irrigation system. Communities can use existing equipment (e.g., fence), to reduce price (85% choose to buy the full package)
4. An extension officer guides land preparation and entire cultivation process, while Zonful's field team manages installation and maintenance
5. During repayment, Zonful facilitates produce sales – *see next page*.

Key figures

- ~140 units deployed across Zimbabwe, serving ~5k SHFs
- 8 partnerships with off-takers
- 15 tons of produce traded directly in 2024
- 30 staff on payroll, leveraging 200+ extension officers.

Source: Hystra analysis based on interviews with Zonful management and field visits in Chivi, Zimbabwe (June 2025)

Zonful facilitates market access for its SHFs by providing initial connections to off-takers

Zonful started offering market access because many subsistence SHFs lacked reliable buyers for their surplus crops and were therefore unable to repay the pump every month. Guarantee of market access is also a key selling point for SHFs to buy an irrigation system.

"We realized SHFs struggle to repay when there was no one to buy their crops, so we stepped in to help them sell." – *Zonful staff*

Zonful aims to "aggregate for off-takers" (Model B1)

Zonful is in the early stages of its market access strategy, partnering with off-takers to sell SHFs' surplus crops. However, limited surplus in the first year (due to subsistence farming, domestic water use, and the learning curve of moving from rainfed farming to drip irrigation) makes it hard to guarantee volumes. Over time, as SHFs increase production, they reduce subsistence from ~70% to around 50%, improving market potential.

Zonful aims to scale this model by formalizing off-take partnerships and strengthening support on quality control, aggregation, and transport.

Process

1. **Surplus focus:** SHFs liaise with Zonful's district coordinator (on payroll, with bonuses for sales and facilitation of market access) when they have surplus to sell beyond their communities
2. **Sales support:** district coordinator connects SHFs to bulk buyers (60-70% of off-take quantities), mainly in neighbouring communities (mining) and local markets, to minimize transport costs. Rest is sold in larger urban markets (e.g. schools, campuses, restaurants, in Harare)
3. **Quality/quantity control:** The extension officer (paid by the government), in liaison with the district coordinator, oversees both quality and quantity control throughout cultivation and during harvest
4. **Transport:** most SHFs handle transport themselves by pooling resources, sometimes supported by off-takers.

To facilitate linkages, Zonful is piloting a farmer-buyer app for associations and organized groups of SHFs.

Best practices

- **Partnering with several off-takers** able to buy a broad variety of crops when SHFs have surplus
- **Leveraging existing resources** to reduce costs and provide holistic farmer support (e.g., extension officers, boreholes)
- **Using community-based repayment models** to lower default risk, with flexible monthly payment terms
- **Prioritizing local sales** in nearby towns or road-side markets to reduce logistics costs.

Source: Hystra analysis based on interviews with Zonful management and field visits in Chivi, Zimbabwe (June 2025)

Zonful strongly increases SHFs' income by ~60% on average

Impact of Zonful's value proposition on SHFs

Irrigation

Increased crop quality and quantities

+

Market access

Ability to meet buyers' standards + Access to better prices

→

Improved livelihoods

Zonful transforms previously unproductive land:

> *"Without the pump, this land was dry and useless. Now it's giving us a living."*

Zonful's value proposition increases SHFs' income by ~60% on average:

- *"We used to farm only when it rained, and only for our families. Now we can grow all year and even sell."*
- *"We sold 5 tons of maize, something we never imagined before."*
- *"Now we can feed our families and still afford school fees."*

Community field irrigated by Zonful's pump and water tank

Source: Hystra analysis based on interviews with Zonful management and field visits in Chivi, Zimbabwe (June 2025)

Zonful needs support to expand reach and strengthen aggregation for off-taker access

Remaining challenges

Solar irrigation pumps

- **Insufficient water:** borehole yield and/or water tank capacity often fall short, as SHFs prioritize domestic usage
- **Government exposure:** SHFs cultivate government-owned land that can be reclaimed at any time
- **Slow customer acquisition:** SHFs need time to gather deposits
- **Organizational challenges:** small operations team stretched across mobilization, installation, and support.

Market access

- **Low surplus volumes:** SHFs prioritize subsistence farming
- **Market barriers:** high transport costs reduce access to buyers.

Growth strategy for the next 5 years

- **Regional expansion:** expand pump installations to new communities
- **Boost surplus sales:** improve aggregation and crop planning to channel greater volumes to off-take markets
- **Digital tools:** roll out app to connect and support SHFs
- **Add-on sales:** introduce flexible financing on water tanks and add-ons once pump is repaid.

Third-party partner testing the capacity of a borehole

Support needed

Solar irrigation pumps

- **Borehole expertise:** technical support to test existing boreholes and assess water table sustainability to ensure sufficient yield
- **Working capital:** financing solutions for irrigation system costs to accelerate scaling
- **Matchmaking with local partners:** collaboration with local NGOs to find new communities and build staff capacity.

Market access

- **Cold storage support:** investment in cold storage facilities as off-take volumes grow, to serve urban areas
- **R&D funding:** for app development and tech support, to facilitate market access.

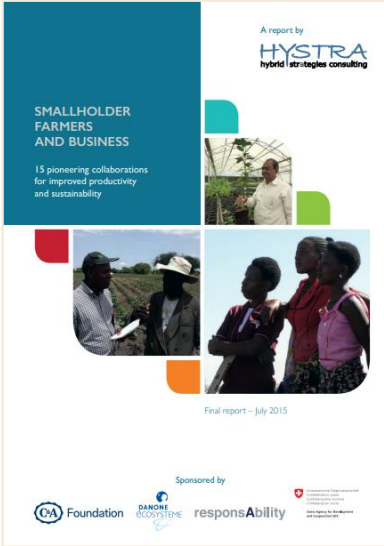
Source: Hystra analysis based on interviews with Zonful management and field visits in Chivi, Zimbabwe (June 2025)

Content outline

Lessons on market access provision can also be drawn from non-solar productive-use technologies

3 studies mentioning impact of market access on productivity-use appliance (not solar)

1. *Kirui & von Braun (2018)*[1] shows a strong positive correlation between growth in mechanization along agricultural value chains and produce output, especially in regions where SHFs have better access to commercial markets that make equipment investments profitable.
2. *Kamara (2010)*[2] in Kenya, found that proximity to output markets significantly increased SHFs' use of productivity-enhancing inputs such as fertilizer and improved seeds. Market access incentivizes more intensive production.
3. *FAO (2008)*[3] highlights that in SSA, SHFs only invest in mechanization when they can reliably sell produce. For example, in Ethiopia, the development of wheat markets helped stimulate demand for combine harvesters.



Smallholder Farmers and Business – Hystra (2015)

- **Market access drives input and technology adoption:** when smallholders have assured buyers, they are more likely to invest in inputs and technologies like irrigation or improved seeds
- **Buyer relationships reduce risk and unlock financing:** buyer guarantees lower perceived sales risk and help unlock credit or financing for equipment, especially when repayments can be tied to harvest revenues
- **Aggregation and structured models enable uptake:** group-based models (e.g., cooperatives, hubs) help SHFs access markets and justify investment in equipment by reducing transaction costs and boosting bargaining power
- **Without market certainty, adoption stalls:** in areas with poor or uncertain market linkages, SHFs are reluctant to adopt new technologies due to high risk and limited perceived returns.

Source: 1) O.K. Kirui & J. von Braun, Mechanization in African agriculture: A continental overview on patterns and dynamics (2018), (2) A.B. Kamara, The impact of market access on input use and agricultural productivity: evidence from Machakos district, Kenya (2010), (3) FAO, Agricultural mechanization in sub-Saharan Africa: time for a new look (2008)

Several studies document best practices on sourcing from SHFs and building lasting relationships with them

World Bank – Working with smallholders: a handbook for firms building sustainable supply chains

This handbook provides guidance for companies on building sustainable partnerships with SHFs by aligning incentives and supporting capacity. Companies should **demonstrate the benefits of collaboration, provide training, and maintain strong communication to build trust**. Payment systems should be fair and flexible, and working through producer organizations can improve efficiency, accountability, and access to services. Continuous monitoring and adaptation help maintain trust and create lasting shared value.

Hystra – Smallholder farmers and business

This report draws lessons from 15 pioneering businesses on working profitably and sustainably with smallholder farmers. **Companies should provide productivity-enhancing technologies with hands-on training, target early adopters while allowing flexibility, and use reward or penalty schemes to incentivize performance and loyalty**. Supporting SHFs beyond inputs, through planning, services, and quality improvement, strengthens long-term engagement.

IFAD – Smallholder access to markets: evaluation synthesis

This report looks at how targeted interventions in specific geographies and value chains are crucial for effective market access. **Tailoring approaches to local contexts enhances the success of market access initiatives**.

FAO – Identification of best practices to ensure market access for smallholder farmers in Kenya

This report dives on **how to organize farmers into groups or cooperatives to enhance their bargaining power and access to markets**. This collective approach can lead to better market outcomes for SHFs.

3ie – Studying the effects of market access on smallholder farmers

This study emphasizes that **there is no one-size-fits-all model and success depends on commodity, context, and support**. Case studies show that commitment, transparency, fair pricing and finance access make linkages work and create lasting partnerships.

Several agro- and energy-focused support programs are supporting the PURE sector

PREO
Powering Renewable Energy Opportunities

PREO Program

Provides grants, technical support, and partnership opportunities to help PURE companies pilot and scale renewable-energy solutions that boost incomes and climate resilience.

EFFICIENCY FOR ACCESS

Kenya Cold Chain Accelerator (EST & CLASP)

Supports sustainable cooling innovators in Kenya, focusing on off-grid cold chain technologies to enhance agricultural value chains.

Power for Food Partnership
Renewable, Regenerative, Resilient.

Power for Food Partnership (IKEA Foundation & SNV)

Supports PURE companies by piloting renewable-energy technologies with SMEs and farmers, building partnerships, and generating evidence to scale sustainable food and energy solutions.

REEEP
Developing Clean Energy Markets

PURE Growth Fund (REEEP)

Provides grants and technical support to help renewable-energy and agri-SMEs* scale, improve profitability, and expand in agri-food value chains.

EEP Africa

EEP Africa

Provides early-stage catalytic grant financing to innovative clean energy projects, technologies, and business models in 17 countries across Southern and Eastern Africa.

* Small and Medium Enterprises

HYSTRA
hybrid strategies consulting

We thank the following stakeholders for their time and valuable insights shared during interviews conducted for this study

Experts

Organization	Persons
BASE	Dimitris Karamitsos , Rebecca Botello, Roberta Evangelista, Simran Singh
E4Impact/Mercy Corps	Herbert Njiru Nyaga
EEP Africa	Chiedza Mazaiwana, Christian Maguchu
DWFI	Nicole Lefore
Energy Saving Trust	Jakub Vrba
GeoCode International GmbH	Georgia Badelt
ISF Advisors	Hayden Aldredge
JBQ Africa	Bruce Hillier
PaygOps	Thibault Lesueur
Practical Action	John Chettleborough
REEEP	Alexandra Chupina, Andrew Loebus
SAIS Accelerator	Fares Seaidi
Shell Foundation	Shankha Lahiri
TechnoServe	Alex Hurst, Ana Herrera
Wageningen University & Research	Bas Hetterscheid, Jan van der Lee
Senior energy specialist consultants, ESMAP / World Bank	Aaron Albert Leopold, Georgia Badelt, Leo Blyth

Agro-PURE companies

Organization	Persons
aQysta	Lennart Budelmann, Tim van der Linden
Clamore Solar	Tafi Chikwakwata
ColdHubs	Nnaemeka Ikegwuonu
Farm Warehouse	Kuma Mede
Husk	William Brent
Jain	Kishor Rawale, Somnath Jadhav
Keep IT Cool	Hillary Mbithe, Moses Mandila
Modern Farming Technology	Kevin Simpson
Oorja	Audrey Fillon
Promethean	Jiten Ghelani
S4S	Nidhi Pant
SimuSolar	Vincent Sseremba
SokoFresh	Evans Komen, Stephen Katingima
SowPrecise	Linda Kamau
Stable Foods	Andrew Massaro
SunCulture	Hack Stiernblad, Mikayla Czajkowski
Zonful Energy	Valarie Chibange, William Ponela
Wala	Priscilla Sani-Chimwele

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Warc Africa	Cathrin Schriever

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GOGLA	Anne Waburi, Carlos Sordo, Oliver Reynolds
SNV	Claire Belilos, Sarah Alexander, Zita De Pooter