SWITCH to Solar Project

Solar Hydroponic Systems – Summary of Market Study Results

SWITCH to Solar | switchasia GRANTS PROGRAMME | CZECH REPUBLIC DEVELOPMENT COOPERATION | sevea (Energy)Lab

SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar

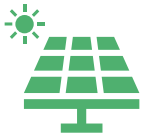
Presenting SWITCH to Solar

Mission: Adding value to the Agri-fishery market by supporting the uptake of solar technologies for productive use to improve competitiveness and resilience.

Focuses on:

5 Provinces around the Tonle Sap Region

8 value chains (rice, horticulture, aquaculture, poultry, fruit tree, cricket, pig, cattle)



10 selected solar technology solutions

A few targets:

9000 Agri-Fisheries MSMEs

20 Solar Technology Suppliers (Local and regional)

15 Financial Intermediaries/institutes

SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar

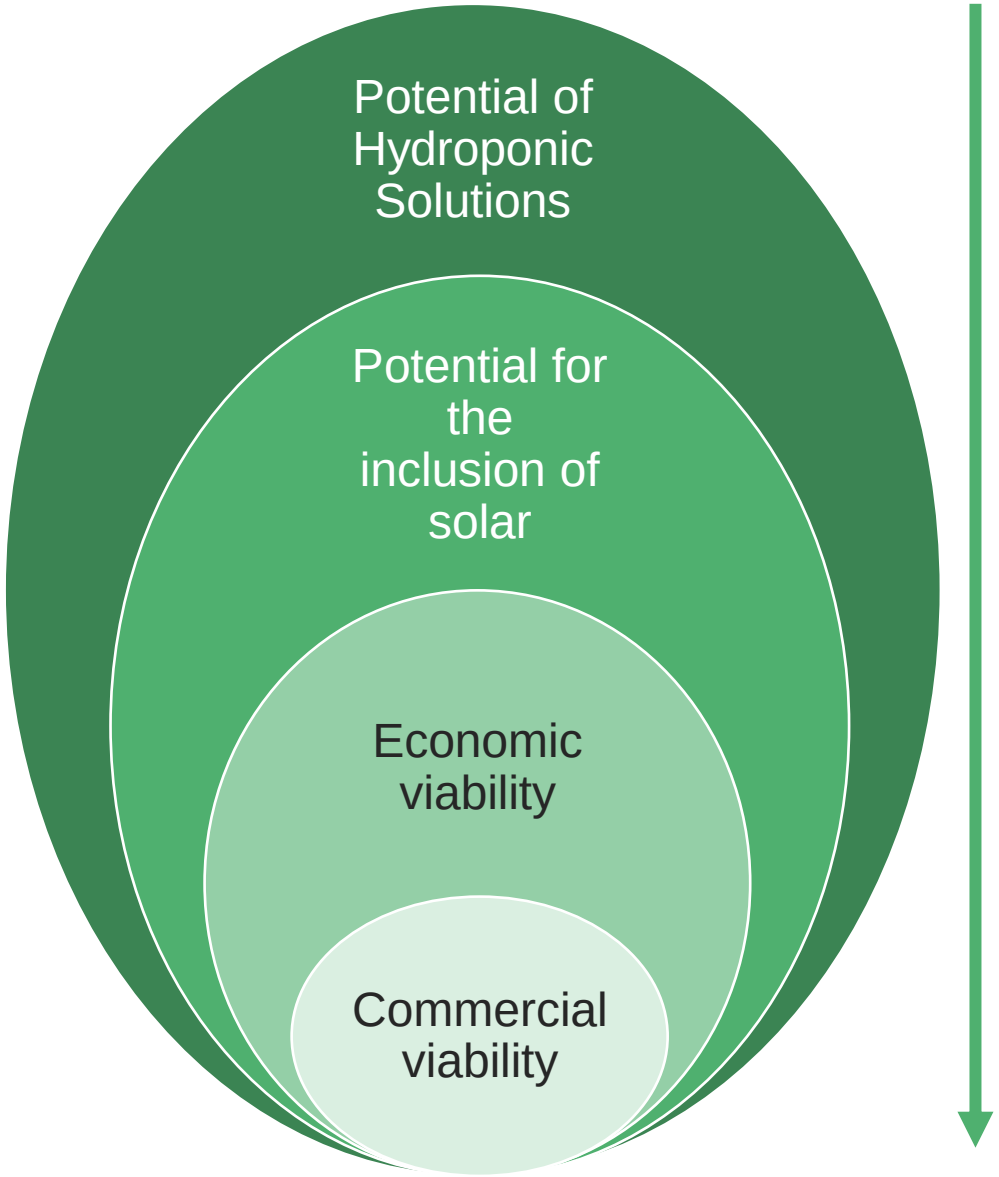
SWITCH Market Study - Deep-Dive Analyses

- As part of the SWITCH to Solar Project, Sevea conducted Deep-Dive Analyses of 10 solar technologies to understand:
  - how each application/solution works in detail
  - how they can be integrated into the value chains
  - which stakeholders shall be targeted
  - the sales potential and under which distribution and commercialization model the technology would make the most sense

- Based on extensive field-data collection and interviews with stakeholders

Deep-Dive Analyse

- 4-level analysis:



Opportunities and Challenges for Solar Hydroponics in Cambodia

SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar

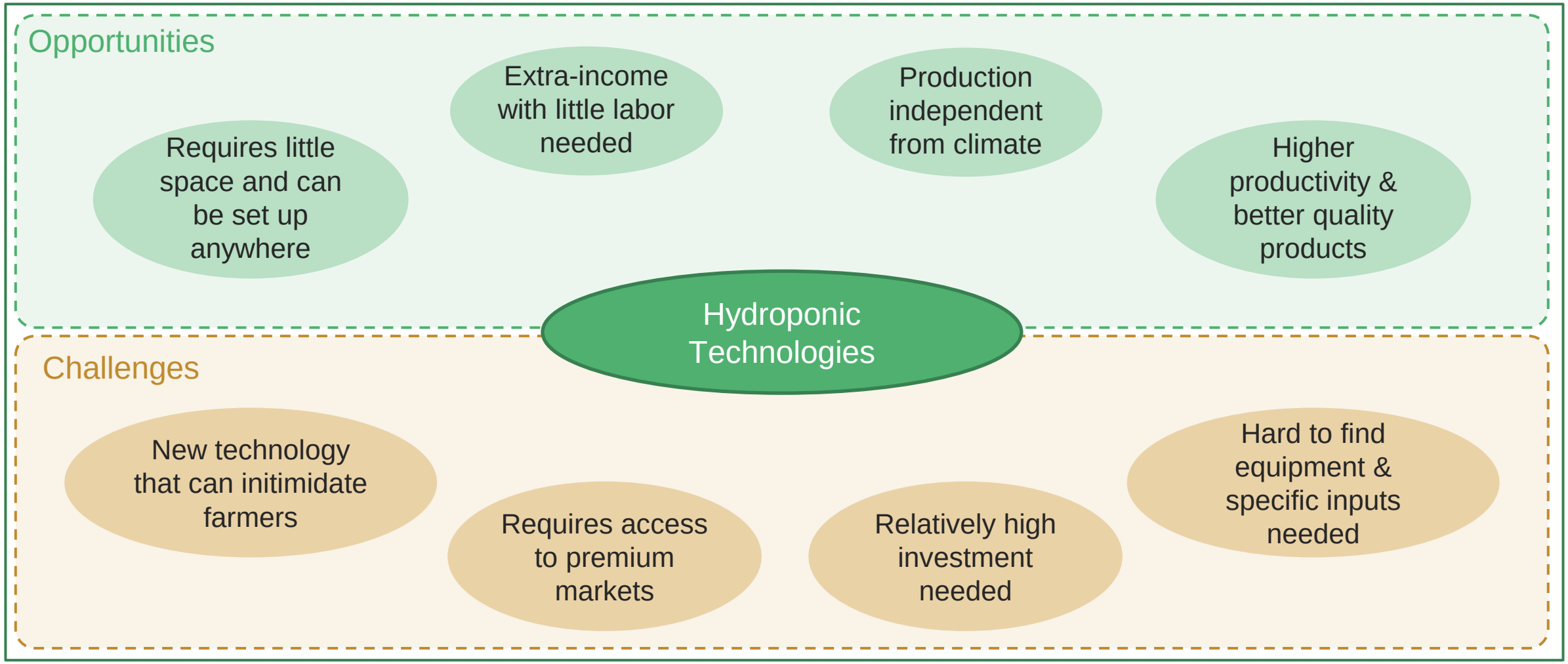
Hydroponic systems: a new & efficient way to produce vegetables

Vegetable Production

Especially suited for the production of leafy vegetebles

- Smallholder farmers
- Commercial farmers

SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar



Hydroponic Technologies allow for the production of high-quality vegetables with little time and labor needed, making them a very inclusive technology. It is a great way for farmers to generate extra-income. However, it makes more sense for **commercial farmers** who have a better investment capacity. Plus, it requires the farmer to have an **innovative mind**, willing to try new technologies.

Technological considerations: hydroponic systems

How do hydroponic systems work?

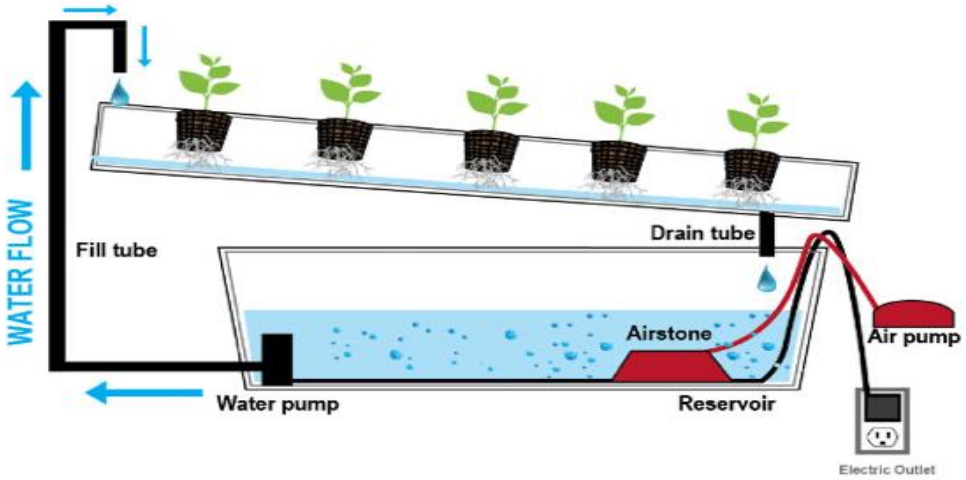
- Plants are grown in a water-based, nutrient-rich solution.
- No soil required, the root system is supported by using an inert medium.
- The system is based on a constant addition of specific nutrients in the solution.

The types of system used in Cambodia

Nutrient Film Technique

Benefits: Simple & easy, low water volume needed, little water stagnation

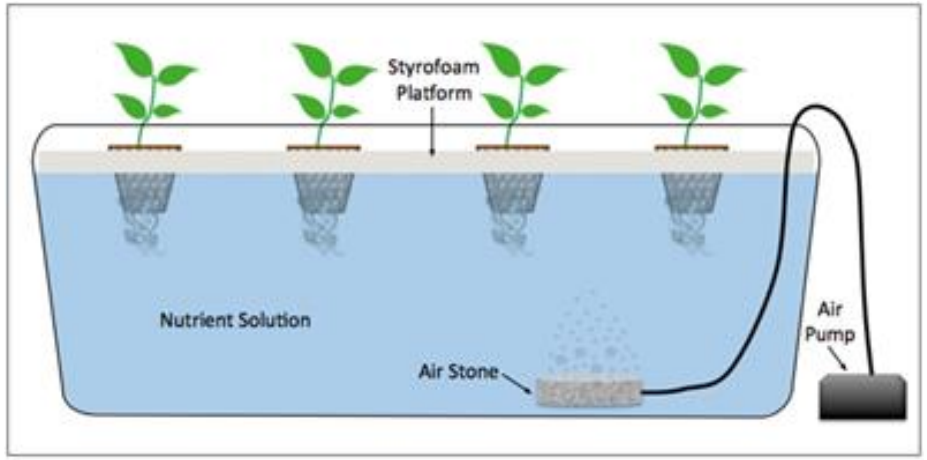
Constraints: Need nutrient fertilisers, roots can clog the channels, pump failure can ruin the production



Deep Water Culture

Benefits: Easy & low maintenance, can withstand pump failure

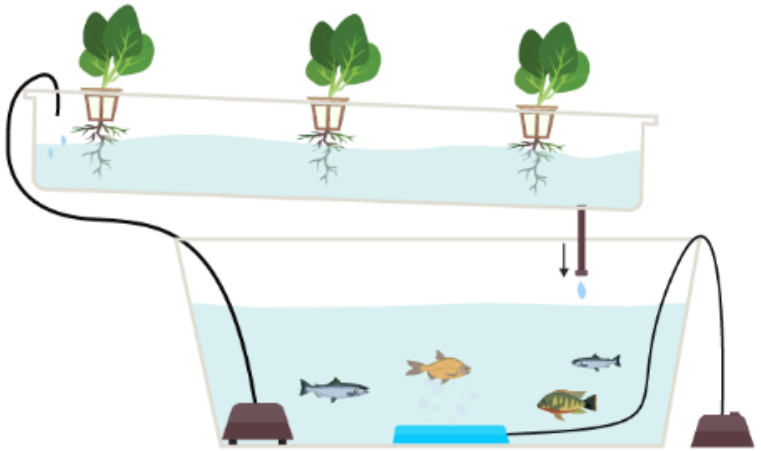
Constraints: large water volume, mosquito breeding, not suited for large plants or slow growing plants, need nutrient fertiliser



Aquaponic system

Benefits: No need for nutrient fertiliser, produces both vegetables & fish, cheap & easily available input (fish feed)

Constraints: much more labor intensive, requires careful monitoring, energy & water intensive



SWITCH to Solar | switchasia GRANTS PROGRAMME | CZECH REPUBLIC | sevea (Energy)Lab

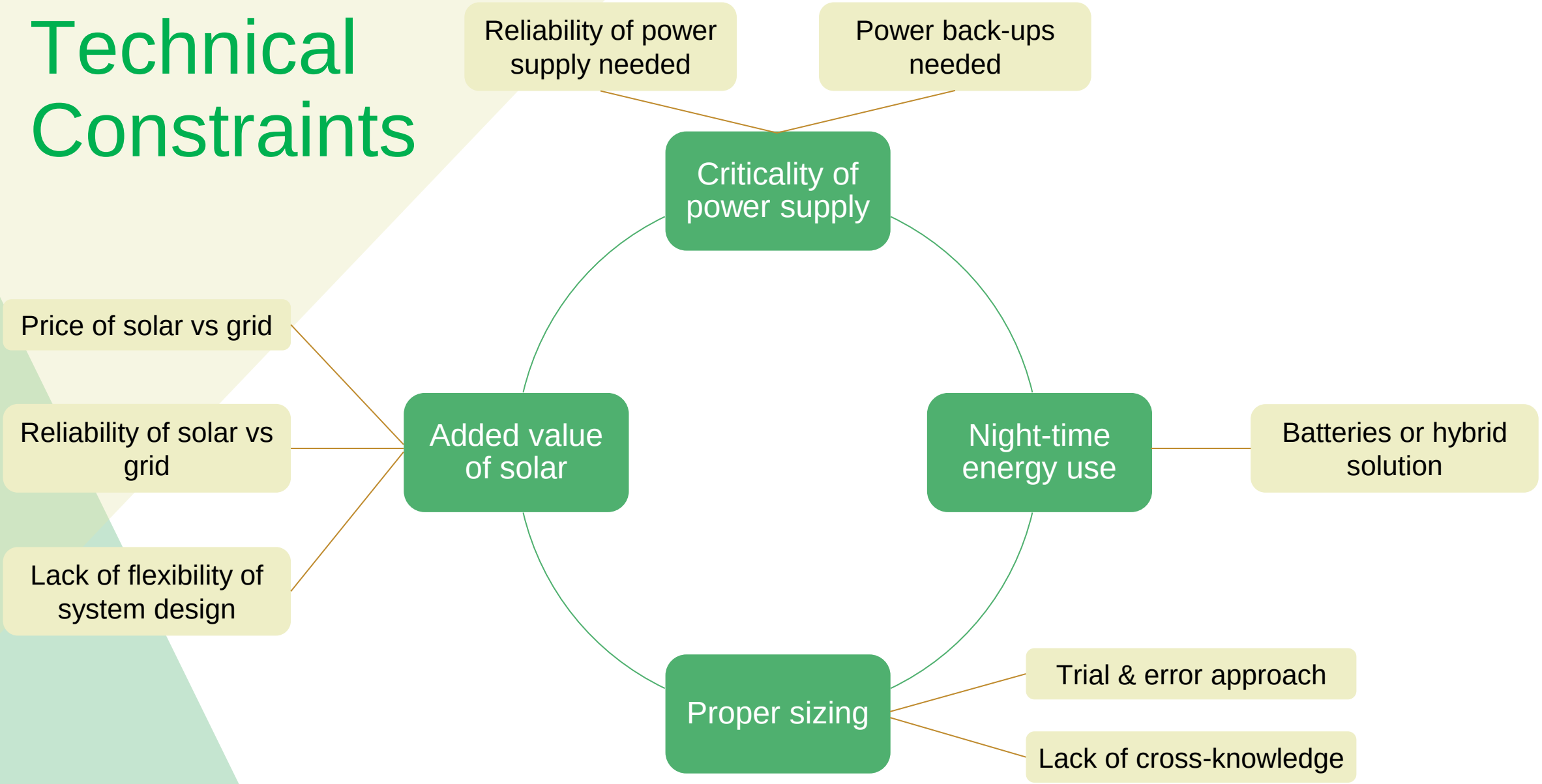
SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar

Solar Hydroponic

- Solar can be used to power the pump of the system

- Hydroponic system are quite suited for solar:
  - Energy intensive
  - Solar water pumps are developed and easily available
  - Predictable, stable & regular use of energy
  - Fixed

Technical Constraints



SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar

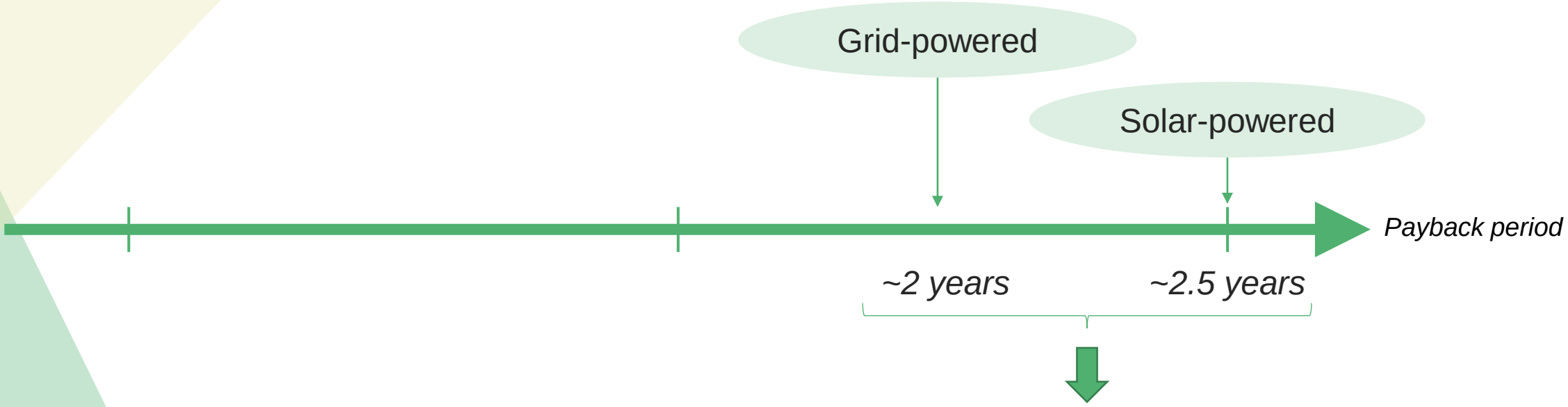
Economic viability

Hydroponic technologies are rather expensive, especially because of the cost of the greenhouse under which the system needs to be installed. Adding a solar system makes these upfront costs even higher:

Capacity	 Electric	 Solar
Per grow bed (without greenhouse)	$400	$700
Additional greenhouse cost	1000$ (per 50m²)	

Economic viability

For Hydroponic systems, it is particularly important to compare the economic viability of a solar-powered system to a grid-powered one. Despite the high upfront costs of both, they have rather short payback period thanks to the high income generation and, in the case of solar, the reduction of operational costs:



Both are viable, and solar is quite competitive

**details in annex

Conditions for economic viability

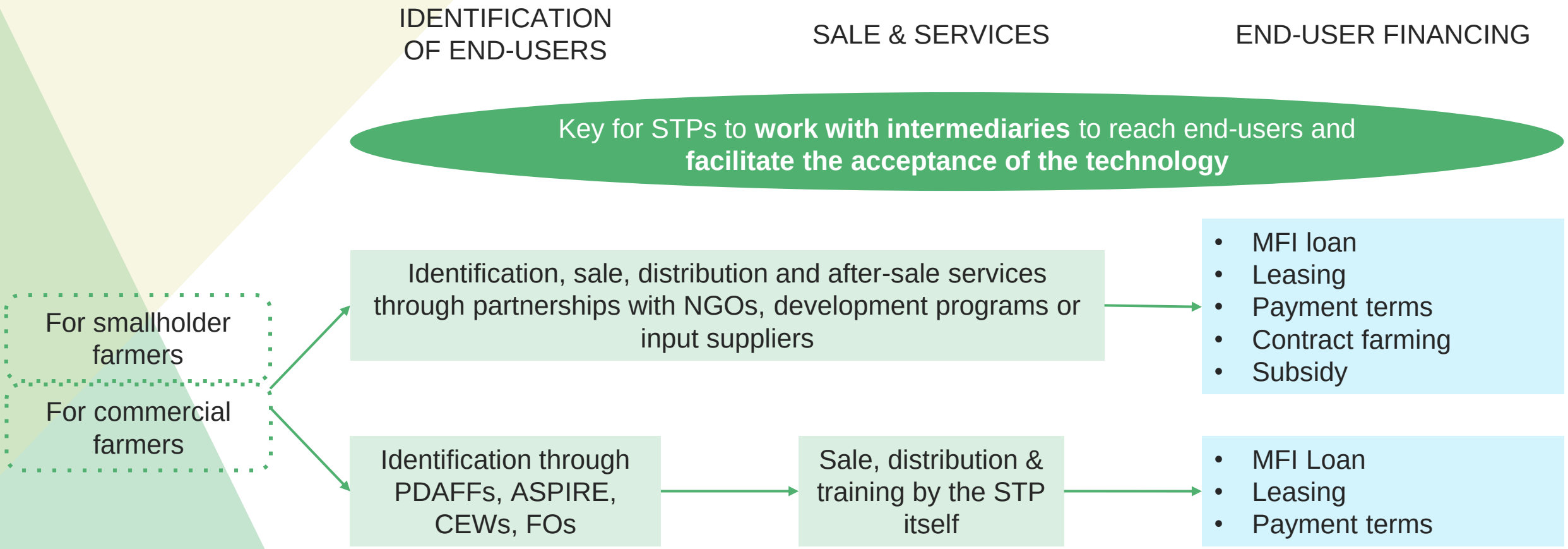
- The Cost-Benefit Analysis also reveals a monthly income of 300$ for 10 grow beds of leafy vegetables, with limited labor needed.

- Still, the economic viability of hydroponic systems depends a lot on the retail price of the products
  - It is key for producers to **secure premium markets**

Commercial viability

- Economic viability is not the only decisive factor and is not enough to understand farmers' ability and willingness to purchase the solar technology
- It is important to understand the commercial models for the distribution of the technology
- To facilitate the adoption of solar technologies, innovative models will be needed to increase the acceptance of the technology and decrease barriers to the uptake

Commercial viability



Economic Potential

Final Potential of Solar Hydroponics

Commercial farmers

Preferred targets as they have better investment capacity & access to premium markets

Smallholder farmers

Adoption Potential

SWITCH to Solar

switchasia GRANTS PROGRAMME

CZECH REPUBLIC DEVELOPMENT COOPERATION

sevea (Energy)Lab

SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar

Recommendations to increase the adoption of solar hydroponic systems:

- Start with commercial farmers, as they are more prone to take risks and have high investment capacity
- Work with greenhouse suppliers to create bundles
- Take advantage of the inclusivity and resilience of hydroponic solutions to create programs for rural income generation, with a focus on community systems
- Provide training to end-users to ensure the optimal use of the technology
- Partner with stakeholders such as aggregators as they have access to premium markets
- Introduce end-user financing mechanisms to mitigate the significant upfront costs

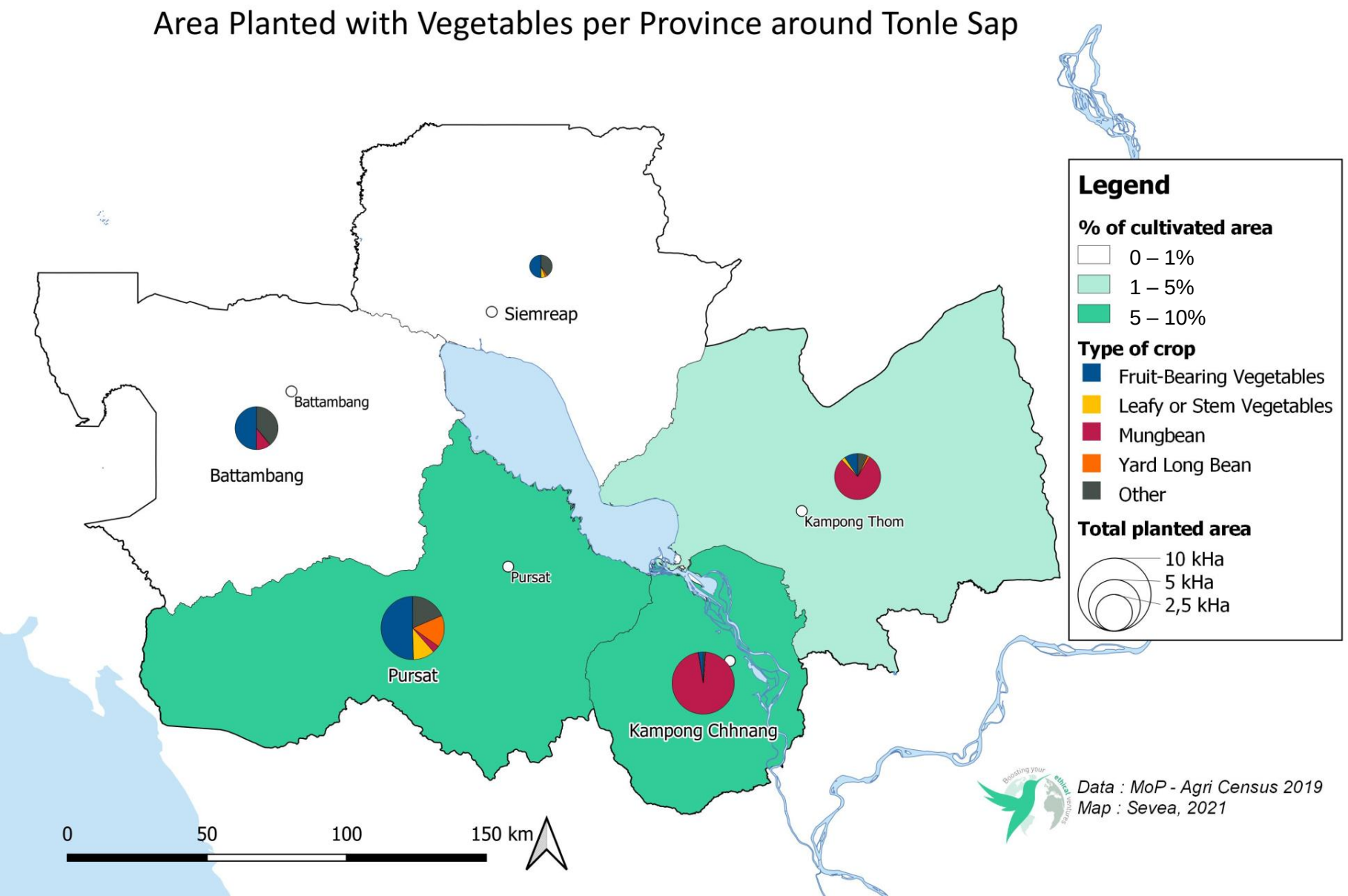
SWITCH to Solar

switchasia GRANTS PROGRAMME

CZECH REPUBLIC DEVELOPMENT COOPERATION

sevea (Energy)Lab

Market Sizing – Solar Hydroponic



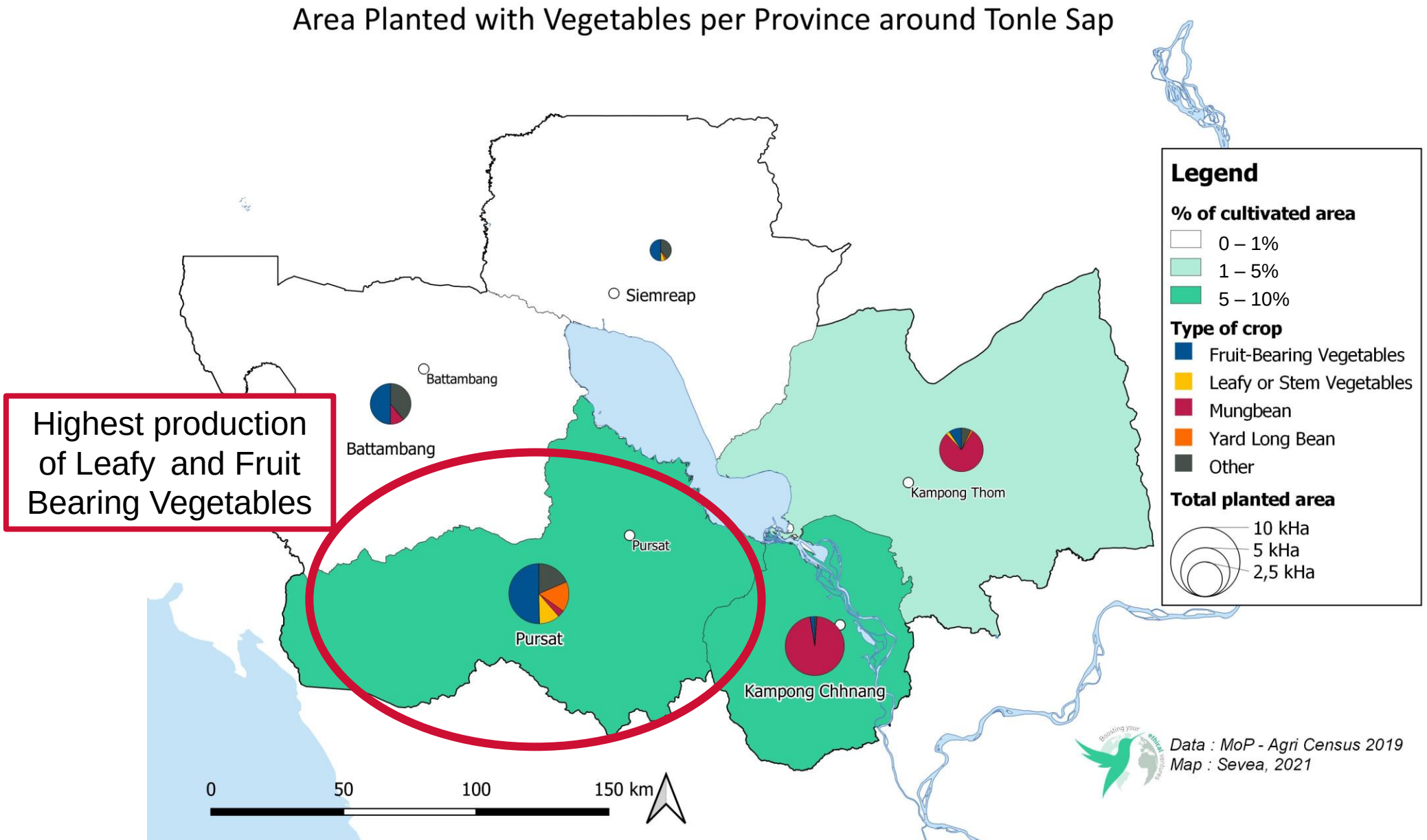
Vegetable Sector in Cambodia

Only 1.3% of total cultivated area
57,000 ha in 2019

700,000 MT produced
in 2020

30% of fresh vegetables imported
From Thailand and Vietnam.

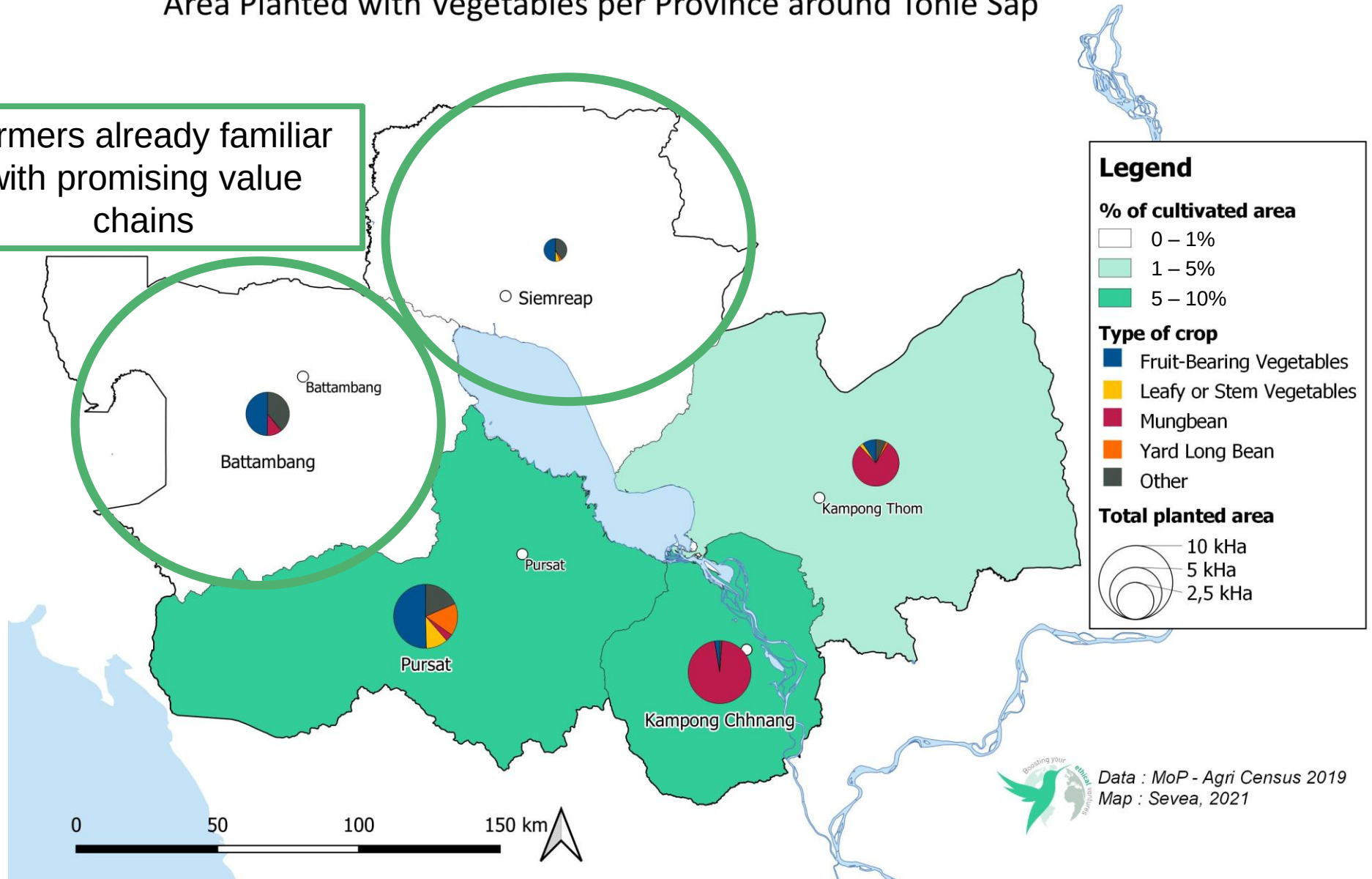
Market Sizing – Solar Hydroponic



Market Sizing – Solar Hydroponic

Area Planted with Vegetables per Province around Tonle Sap

Farmers already familiar with promising value chains



Thank You

Feel free to contact any member of the Sevea team if you have questions:
abouchane@seveaconsulting.com
cdahome@seveaconsulting.com

SWITCH to Solar, for a thriving agri-fishery market
www.switchtosolarkh.org
SWITCH to Solar

Annex: Detail of the economic analysis

*The prices displayed on slide 11 indicate the range of price of solutions currently available in Cambodia for one grow bed (in the case of solar for one-grow bed + the solar system), knowing that farmers rarely buy only one grow bed.

**The ROI has been calculated for the following scenarios (assumptions taken from a pilot project):

1) A farmer invests in a DWC hydroponic system installed in a greenhouse to produce leafy vegetables. They invest in 10 grow beds, each with 300 plants (=13m²). Each grow bed costs 400$ + 1000$ of greenhouse per 50m². One production cycle is 38-day long and enables the production of 446kg of vegetables sold at 1.25$/kg. The system is grid-powered, with a consumption of 150kWh per cycle, at 0.12$/kWh. The payback of the investment is 1.9 years. But it is highly dependent on the retail price and can go as high as 4.8 years for a retail price of 0.75$/kg.
2) A farmer invests in the same system as above, except it is fully solar powered. This adds 300$ of solar system per grow bed, but removes operational costs. The payback of the investment is 2.7 years. It is similarly very dependent on the retail price and can go as high as 6.2 years for a retail price of 0.75$/kg.