Energy for Water from “Sun & Co”

Renewable energy innovations for Irrigation

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Source: WINROCK 2019

Energy for Water from "Sun & Co"

Renewable energy innovations for Irrigation

Moderator:

Jessica Rivas
WindAid Institute and Wind Empowerment

Energy for Water from "Sun & Co"

Renewable energy innovations for Irrigation

Panelist:

Jorge Ayarza
MinVayu and Wind Empowerment

Mission:

to empower individuals & communities

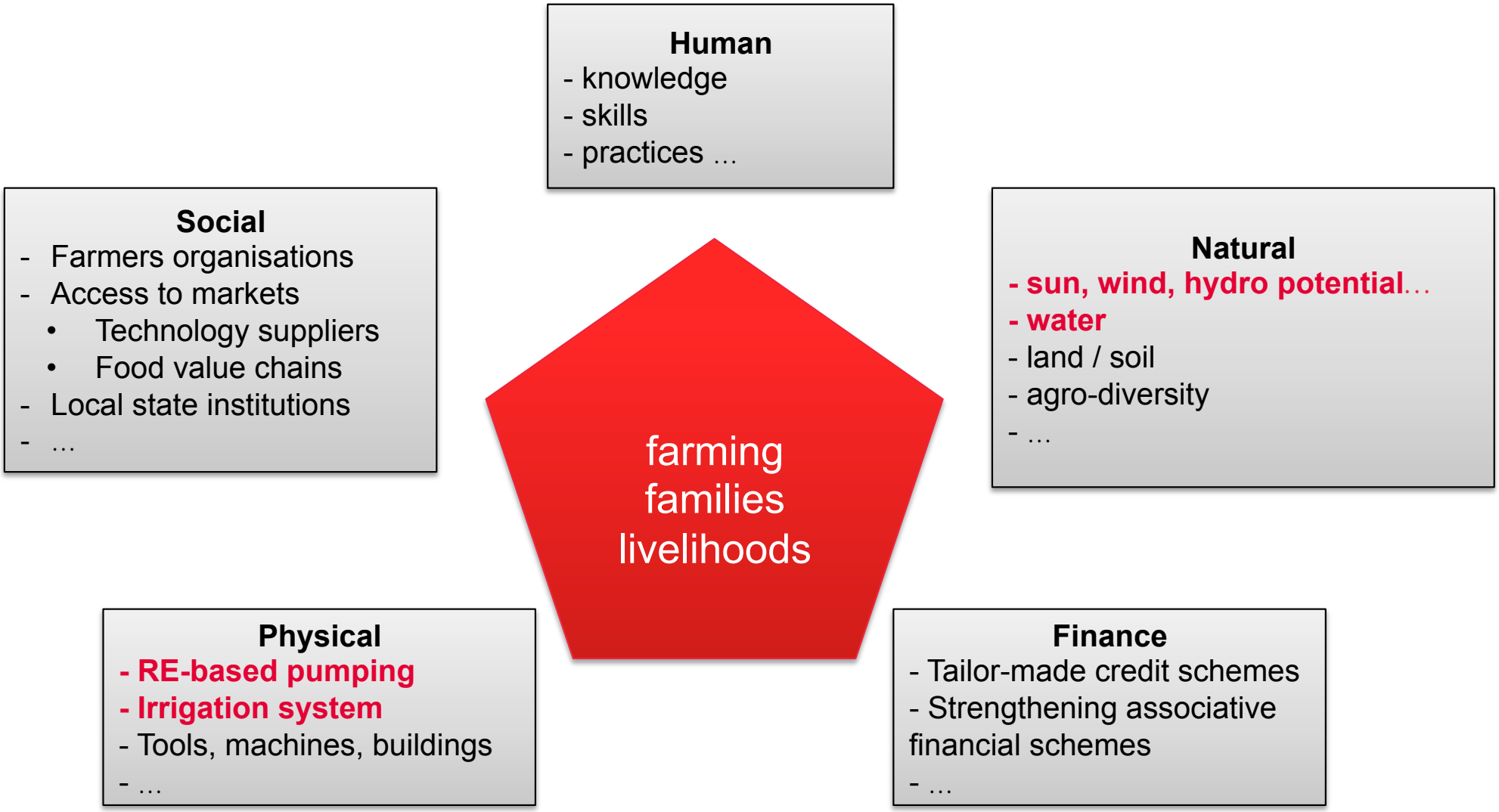
to transform the production and use of energy

so that it effectively enables sustainable development

Approach

- Need-oriented
- Focus on local agents of change
- Holistic delivery models

RE-based irrigation:
Tool for strengthening farmers livelihoods



info@wisions.net

Thanks!

More information about WISIONS and our research under:

www.wisions.net
and
www.wupperinst.org

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Renewable energy innovations for Irrigation

Panelist:

Lucie Pia Pluschke
GIZ Germany, Powering Agriculture

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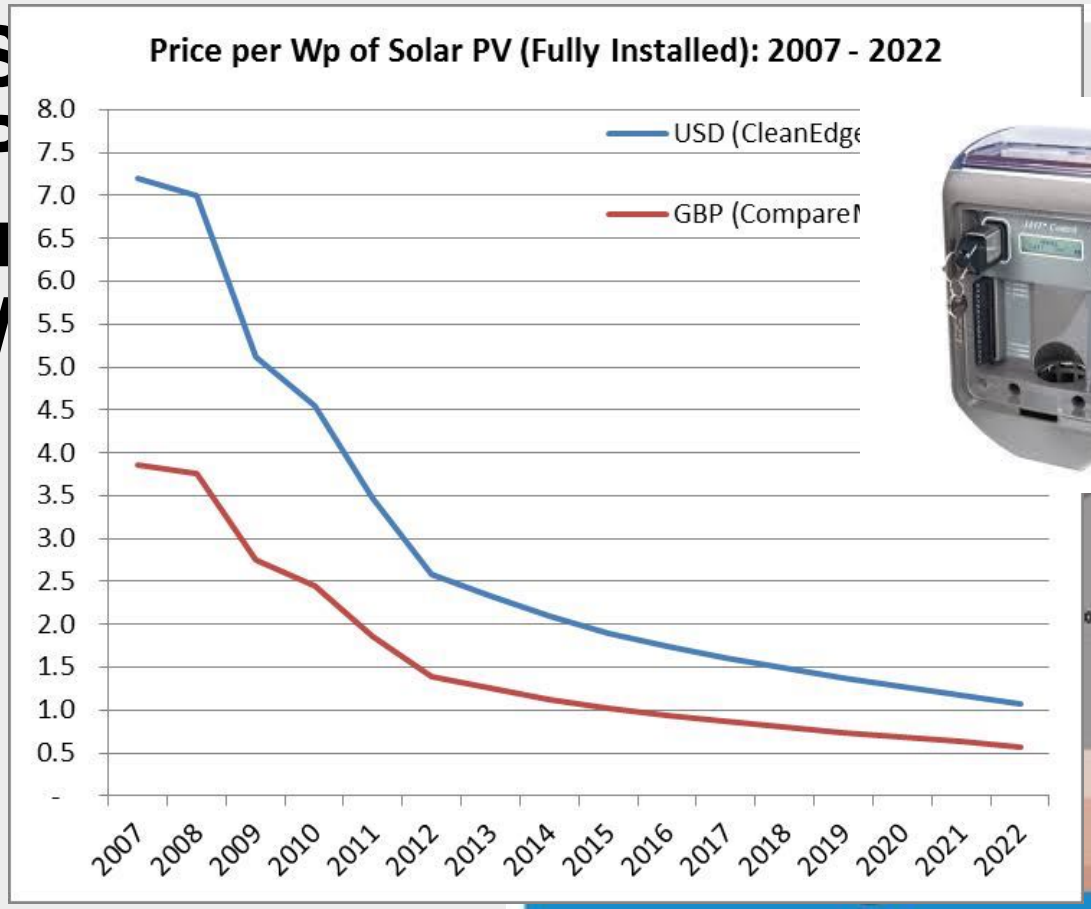
Price per Wp of Solar PV (Fully Installed): 2007 - 2022
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
-
USD (CleanEdge
GBP (CompareM
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
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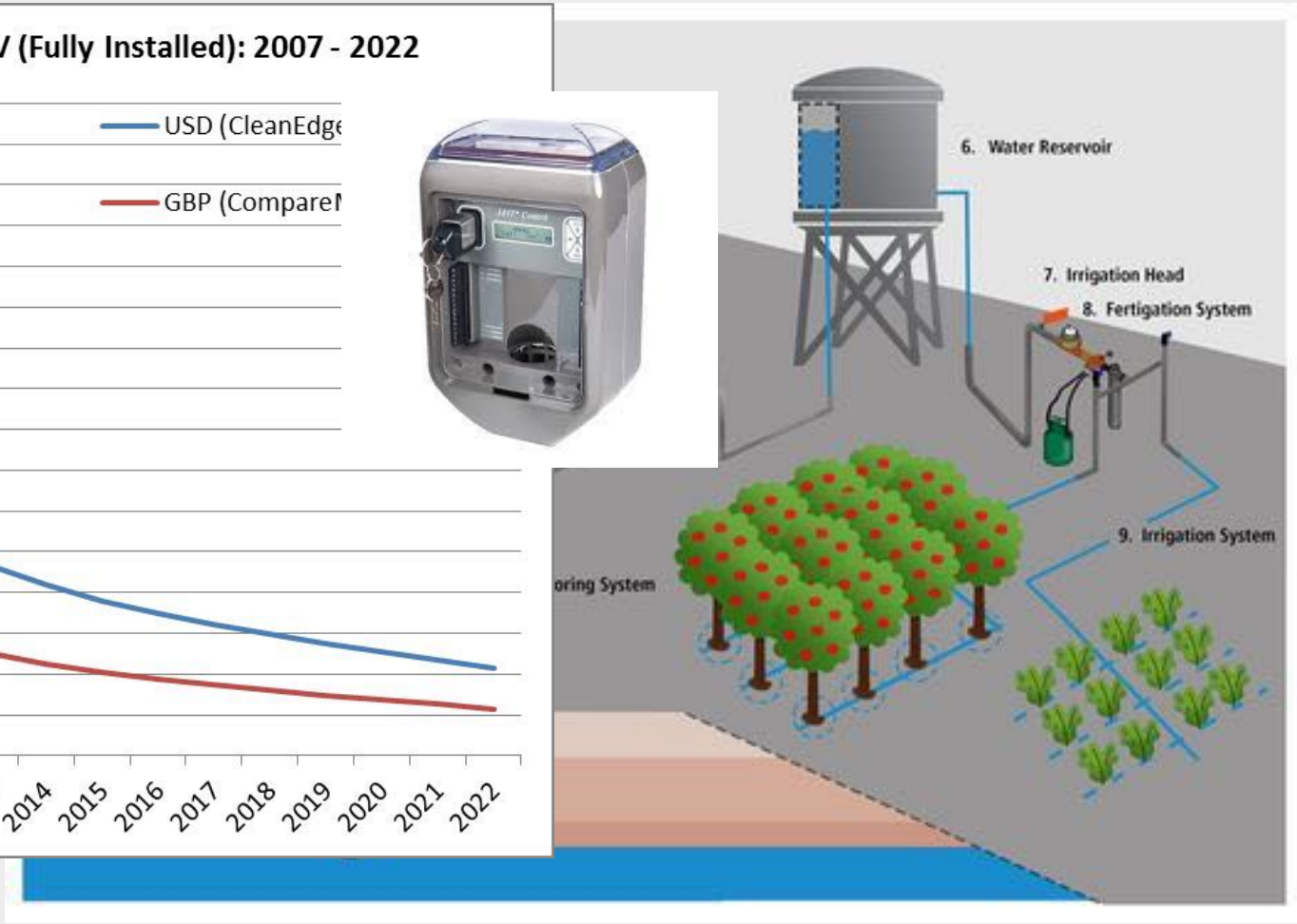
2021
2022


6. Water Reservoir
7. Irrigation Head
8. Fertigation System
9. Irrigation System
oring System

The Risks and Benefits of Solar-Powered Irrigation

A climate-friendly, reliable and affordable alternative

- Rural electrification
- Access to renewable energy
- Independence from unreliable energy supply and volatile prices
- Reduced costs of production
- Improved access to water
- Potential for income diversification and increases in productivity

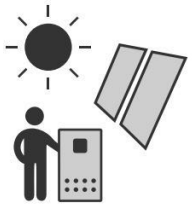
Yet it may be a curse for water resources

- May exacerbate groundwater depletion and water scarcity because of unregulated abstractions
- May not be competitive in light of energy and agricultural subsidies
- Requires access to finance, especially for small-holders
- Requires technical know-how and service infrastructure
- Scepticism whether technology is reliable

FINANCING

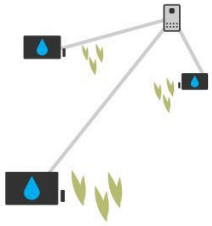
- Development Bank loan
- Microfinance
- Leasing/ repurchase
- Value chain loan
- Pay-as-you-go
- Cooperatives and informal saving group

How it works



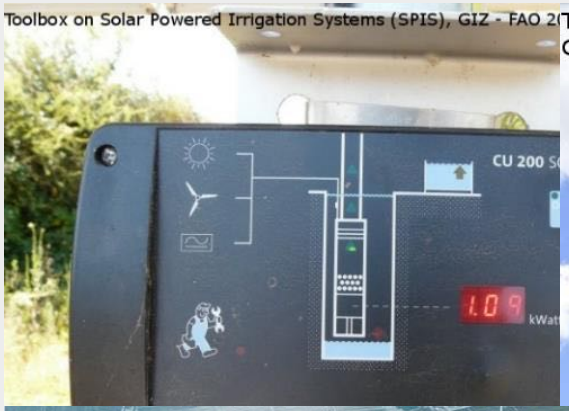
Centralized solar & monitoring
Electricity is generated centrally by a single, solar PV array. A custom-made battery-less AC smart-controller distributes and meters power consumption for 7+ farmers.

Pre-paid credit
Electricity is sold by a micro-utility to farmers using a pre-paid credit system similar to cell phone scratch card systems, only paying for what they consume.

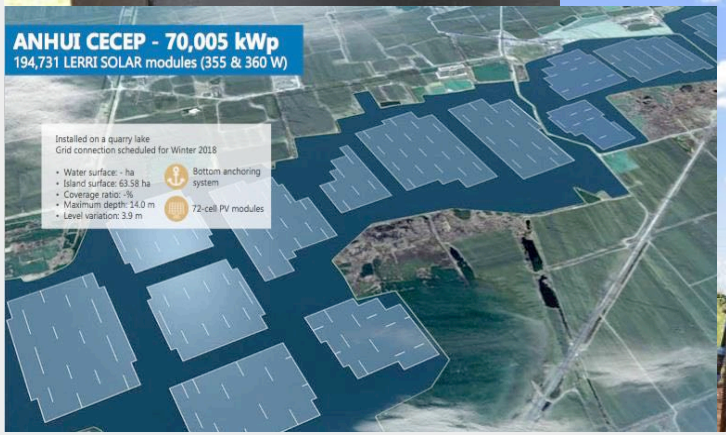


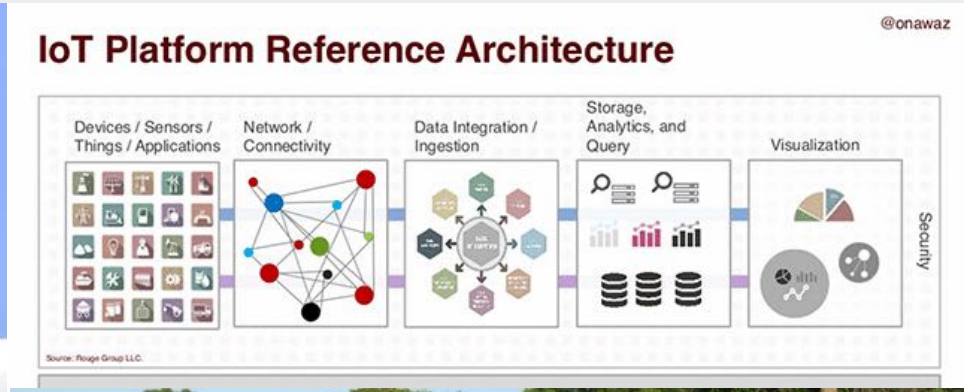
Decentralized pumps
Farmers retain autonomy of their individual wells and pumps.

DESIGN

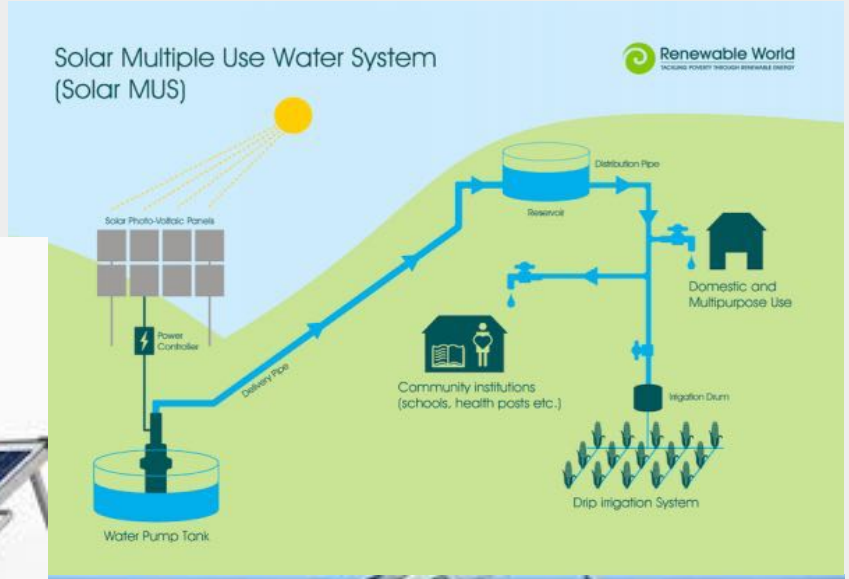

Toolbox on Solar Powered Irrigation Systems (SPIS), GIZ - FAO 2(
CU 200 S
kWatt

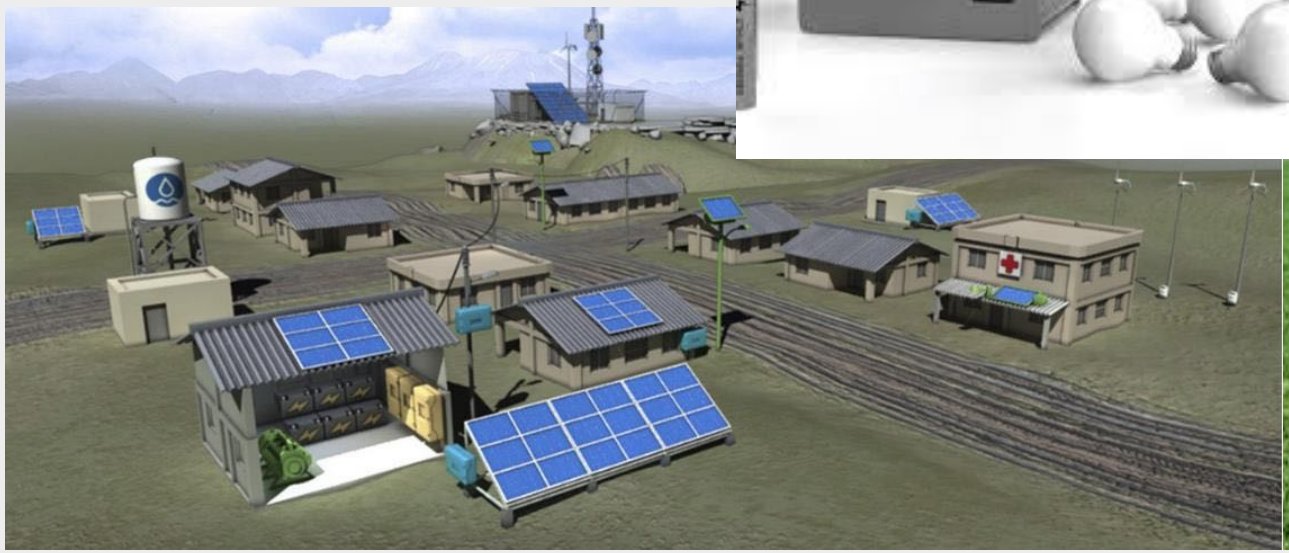
Toolbox on Solar Powered Irrigation Systems (SPIS), GIZ - FAO 2017


ANHUI CECEP - 70,005 kWp
194,731 LERRI SOLAR modules (355 & 360 W)
Installed on a quarry lake
Grid connection scheduled for Winter 2018
• Water surface: - ha
• Island surface: 63.58 ha
• Coverage ratio: -%
• Maximum depth: 14.0 m
• Level variation: 3.9 m
Bottom anchoring system
72-cell PV modules


@onawaz
IoT Platform Reference Architecture
Devices / Sensors / Things / Applications
Network / Connectivity
Data Integration / Ingestion
Storage, Analytics, and Query
Visualization
Security

MULTIPLES USES





POWERING AGRICULTURE:
AN ENERGY GRAND CHALLENGE FOR DEVELOPMENT

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Actions [Expand]

TOOLBOX ON SOLAR POWERED IRRIGATION SYSTEMS (SPIS)

INFORMATION AND TOOLS FOR ADVISING ON SOLAR WATER PUMPING AND IRRIGATION

GET INFORMED	PROMOTE & INITIATE	SAFEGUARD WATER	INVEST	FINANCE	DESIGN	SET UP
IRRIGATE	MAINTAIN					

ABBREVIATIONS | TECHNICAL GLOSSARY | FINANCIAL GLOSSARY | TRAINING MATERIALS | DOWNLOAD

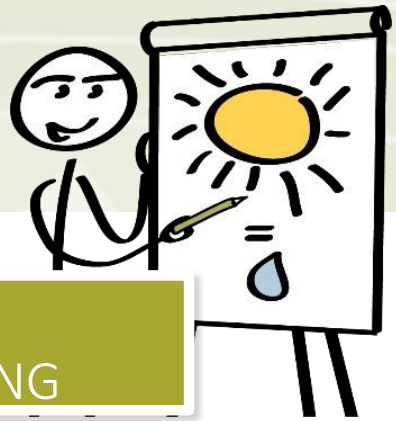
Introduction

The Toolbox on Solar Powered Irrigation Systems (SPIS) is designed to enable advisors, service providers and practitioners in the field of solar irrigation to provide broad hands-on guidance to end-users, policy-makers and financiers. Risks related to system efficiency, financial viability and the unsustainable use of water resources can thus be minimized. The Toolbox comprises informative modules supplemented with user-friendly software tools (calculations sheets, checklists, guidelines). Modules and tools touch upon:

- assessing the water requirements,
- comparing the financial viability,
- determining farm profitability and payback of investment in SPIS,
- sustainably design and maintain a SPIS,
- highlight critical workmanship quality aspects,
- and many more.

POWERING AGRICULTURE:
AN ENERGY GRAND CHALLENGE FOR DEVELOPMENT

Content of the Toolbox



1 PRECONDITIONS

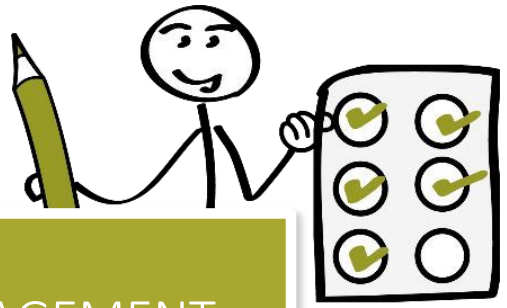
- GET INFORMED
- SAFEGUARD WATER

2 PLANNING

- PROMOTE & INITIATE
- DESIGN

3 ECONOMICS

- INVEST
- FINANCE
- MARKET



4 MANAGEMENT

- SET UP
- IRRIGATE
- MAINTAIN

POWERING AGRICULTURE:
AN ENERGY GRAND CHALLENGE FOR DEVELOPMENT

Accessing the Toolbox

https://energypedia.info/wiki/Toolbox_on_SPIS

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Panelist

Pooja Sharma
Practical Action Nepal

Community-managed energy service for vegetable market-chain (CEVeM)

Pooja Sharma
Thematic Lead - Energy

PRACTICAL ACTION
Technology challenging poverty

Understanding the challenge

PRACTICAL ACTION
Technology challenging poverty

- 2 million farmers in Nepal suffer from poor yields as they solely rely on rain for irrigation
- Electricity consumption is the lowest in Agriculture

Our Motivation

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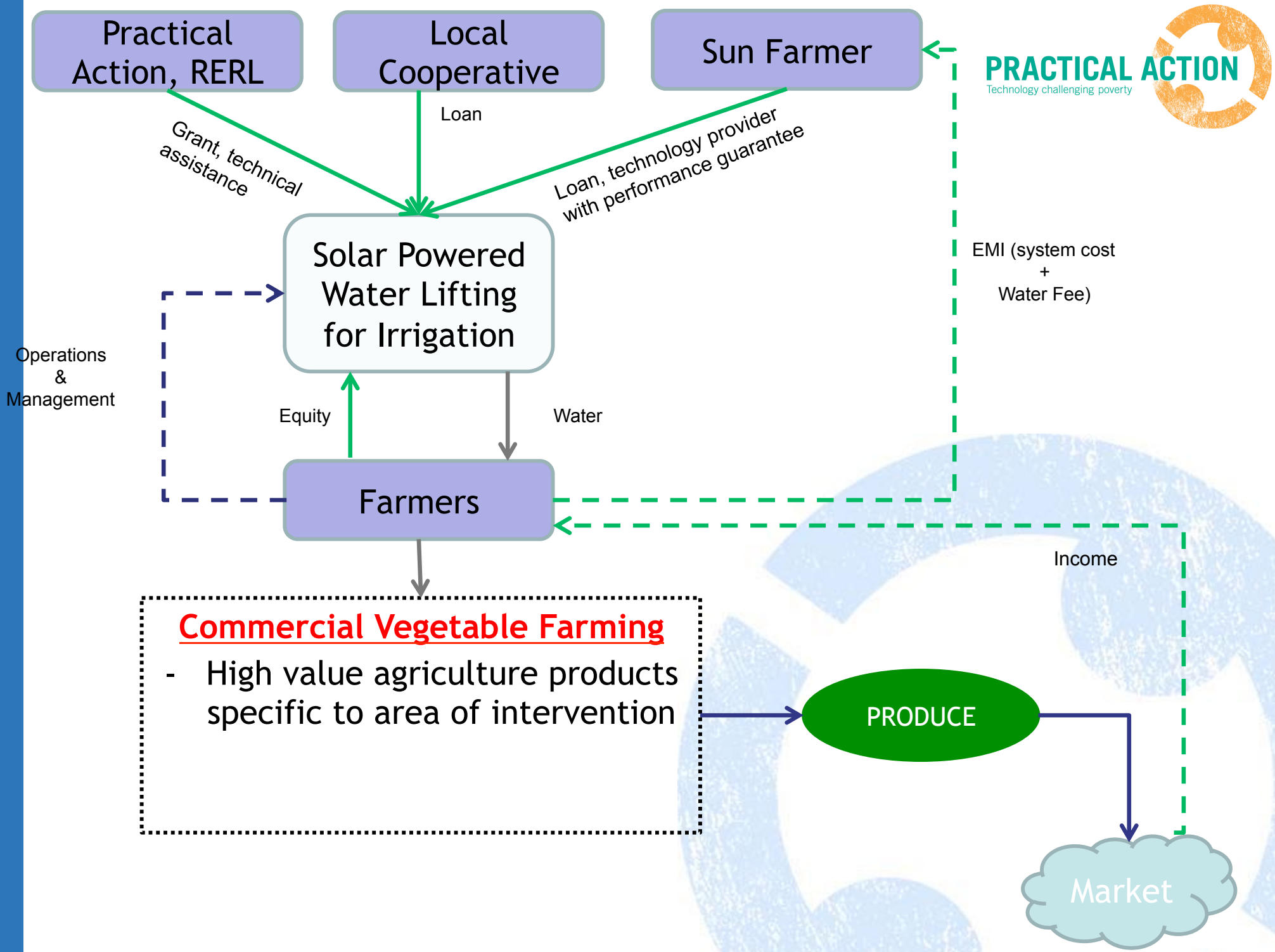
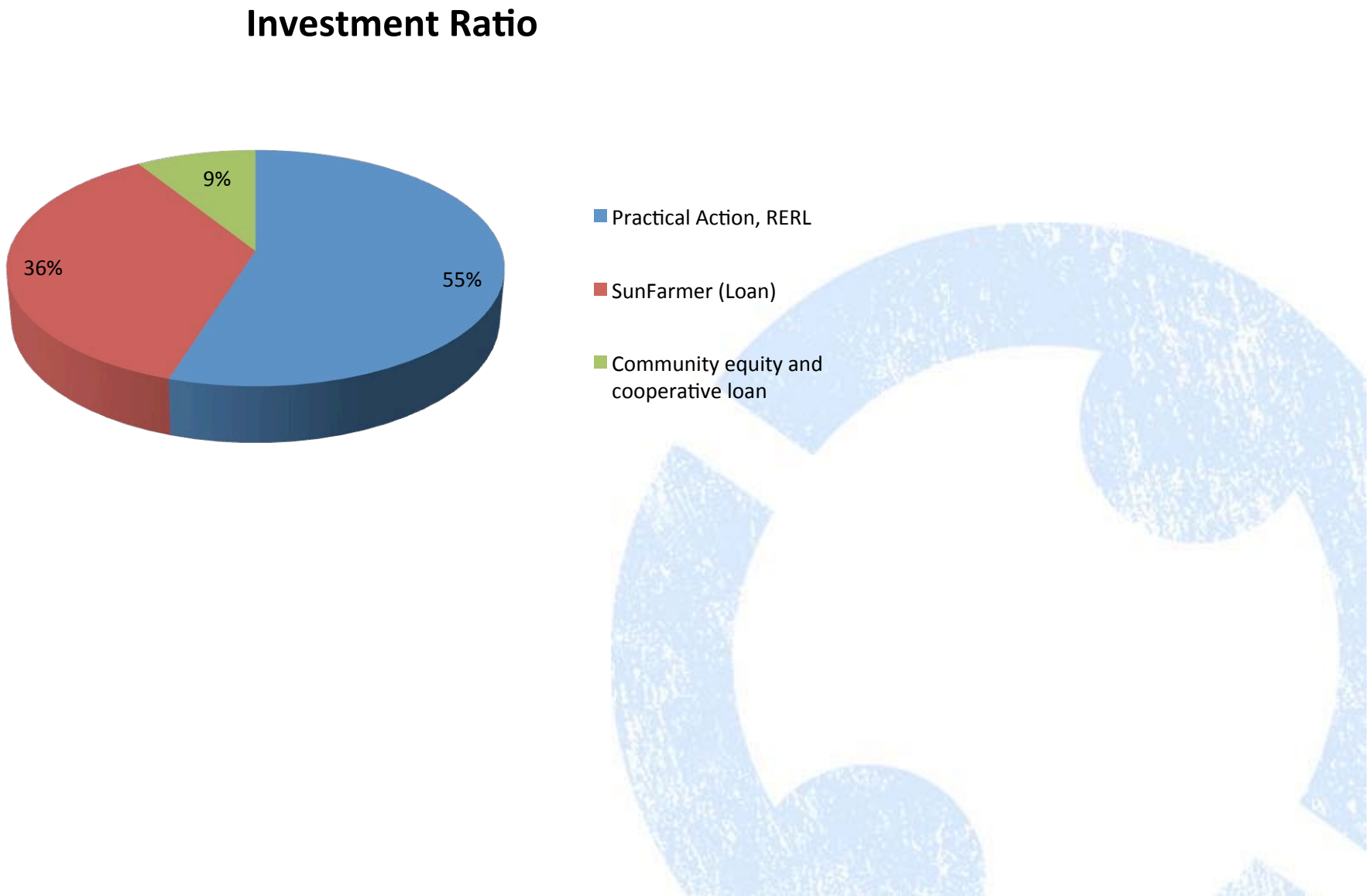
Technology challenging poverty

- Demonstrate viability of “impact financing” “rent to own model” for increased production and income for farmers
- Learn what works and does not in the partnership
- Inspire for upscaling


Practical Action, RERL
Local Cooperative
Sun Farmer
PRACTICAL ACTION
Technology challenging poverty
Grant, technical assistance
Loan
Loan, technology provider with performance guarantee
Solar Powered Water Lifting for Irrigation
EMI (system cost + Water Fee)
Operations & Management
Equity
Water
Farmers
Income
Commercial Vegetable Farming
- High value agriculture products specific to area of intervention
PRODUCE
Market

Investment Ratio



PRACTICAL ACTION
Technology challenging poverty

“In most rural areas, people are mostly familiar with solar home lighting systems only, but, to see its other beneficial applications, especially in irrigation, has expanded their knowledge and confidence in the technology – Sun Farmer

I was fascinated by the pictures in social media. We will include this in our upcoming plan – Vice Chair, Rural Municipality

Some stories

PRACTICAL ACTION
Technology challenging poverty

Key Features

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Technology challenging poverty

- affordable monthly instalment
- knowledge transfer to locals
- quality and reliable energy services
- risk mitigation through insurance and impact financing
- participatory planning and engagement

What would we do differently

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- planning for underutilised water during monsoon
- use of digital technologies such as smart meters for monitoring and improved service efficiency
- multi use of water and electricity
- use existing structures around agriculture value chain such as using agriculture cooperatives

Thank you

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PRACTICAL ACTION
Technology challenging poverty

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Wind Electrical Water Pumping Experiences in Argentina and India

MinVayu

500 RPM

WISIONS of sustainability

Wisions Webinar 2019

The need in rural India

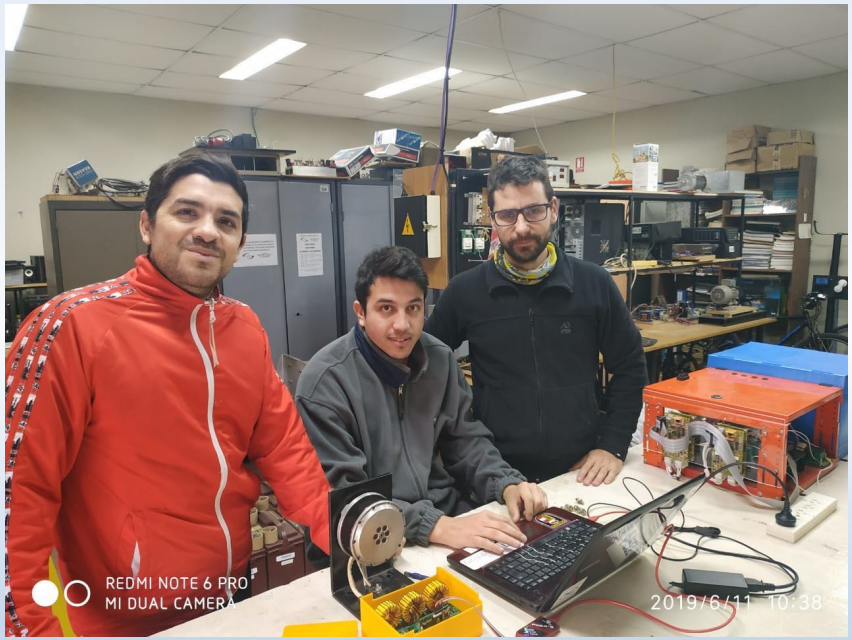
- 26 million diesel pumps used in farming
- Typical size 3-5 Hp pumps
- Free electricity to farmers if they have a grid connection
- Indian Government wants to switch to pumps using renewable energy
- Subsidies of 6 Billion USD/year to sustain farmer's diesel demand
- Investment of 1.6 Billion USD to replace 200,000 pumps in 5 years

Wind-Electric Waterpumping

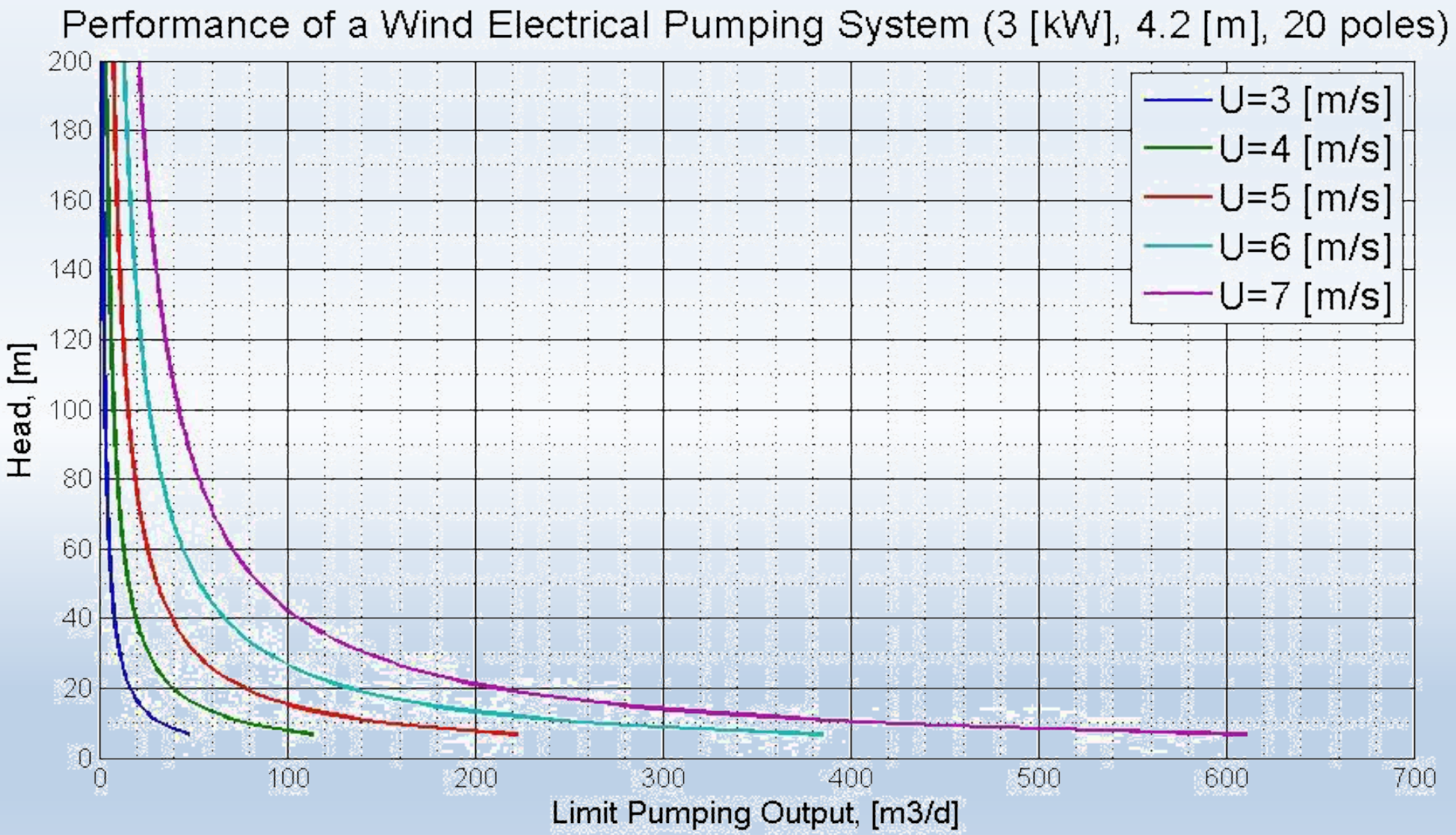
- Direct connection High Voltage stator to pump set
- Wind turbine-------) Pump (2Hp to 3HP)
- Wind/Solar direct connection to Pump set

Wind Turbine
Solar PV → OwnWall Controller → Pump

OwnWall – Testing in Argentina



Pumping curves



Ongoing projects

- 1st Systems installed in Maharastra
  - (Hybrid Solar/Wind 3Hp submersible waterpumper
    - 4.2m diam /2.5kW
    - 30m and 75m pumping depth
    - First direct-drive project using hybrid VFD
    - Locally manufactured VFD

- 2nd System installed in Andra Pradesh/Telangana
  - Wind-electric 3Hp surface and submersible pumps
  - 4.2m diam/ 2.5 kW
  - Turbine also can run drill press, oil extractor and some carpentry machinery when sufficient wind is available.
  - All Applications are direct-drive with no inverter or battery bank

Argentina Test site in south and Buenos Aires
First controller was tested and needed improvements
Second Controller is open source (OwnWall) and can be programmed

2019 India Update

3 years of drought at project site
Second driest area of India (Telangana State)
Wells are drying, including well at project site

Wind waterpumping system is needed because during drought there is a lot of wind, but cloudy Conditions making PV system not operational

Hybrid Wind/Solar Pumping for dry areas

Solar pumping ONLY pumps at highest evaporation time
Hybrids can work at night, if wind is available
Less evaporation at night-time
Moderate water consumption is FIRST priority
Challenges in water management:

Saving water must be number one priority
Designing equipment must be accompanied with drip irrigation and some smart control mechanism
Successful projects are not one-off, but region-wide
Bio-region

Follow-up required

- Management of renewable energy is needed
- Management of water output is needed

- Limit water use, but encourage productive use of energy
- Use water scarcity to implement water management restrictions
- Use optimization software for water use
    - CropWAT from FAO

Market Forces

- 40% of India is under severe groundwater shortages
- Understanding market/resource/income triangle
- would help optimize crop selection

- Farmers focus on crops easy to sell – rice, sugar cane
- Drought resistant crops have low cost in market (millet)
- Developing better market and encouraging healthy eating could help develop this

Thank you for listening !

Manufacturing:

MinVayu Project
Windarra Farm
Auroville 605101
Tamil Nadu

Office:

MinVayu Project
CSR Building
Auroshipam
Auroville 605101
Tamil Nadu

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Panel Discussion

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GIZ Germany, Powering Agriculture

Pooja Sharma,
Practical Action Nepal

Jorge Ayarza,
MinVayu, India

Jessica Rivas
WindAid Institute, USA
Wind Empowerment

Willington Ortiz
Wuppertal Institute, Germany