UNIVERSITY OF HOHENHEIM

INSTITUTE OF AGRICULTURAL ENGINEERING
Tropics and Subtropics Group

Opportunities and challenges for an innovative solar milk cooling system in Zambia: a case study

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Introduction

- Cooling extends shelf life of raw milk
- Low electrification rate in rural regions in Zambia
- **SelfChill approach**: modular adaptable solar cooling systems using a vapour compression cooling unit as key component

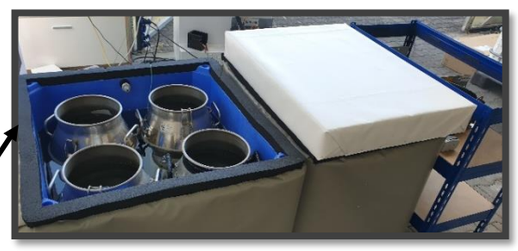
→ Investigation of the economic viability of different system sizes (milk can and tank systems)

→ Comparison of cooling cost per liter between on- and off-grid systems

Material and Methods

- **Data collection:** Survey among 43 farmers in the Zimba region in March 2022, interviews with key informants and literature
- **Economic viability:** Calculation of the net present value of different systems for cooperative and on-farm business models
- **Cooling cost comparison:** Calculation of cooling costs per liter for solar SelfChill systems, SelfChill systems run on-grid and on-grid direct expansion milk cooling tanks (DX)

SelfChill cooling unit



Milk can system (160L)

Milk tank system (500L)

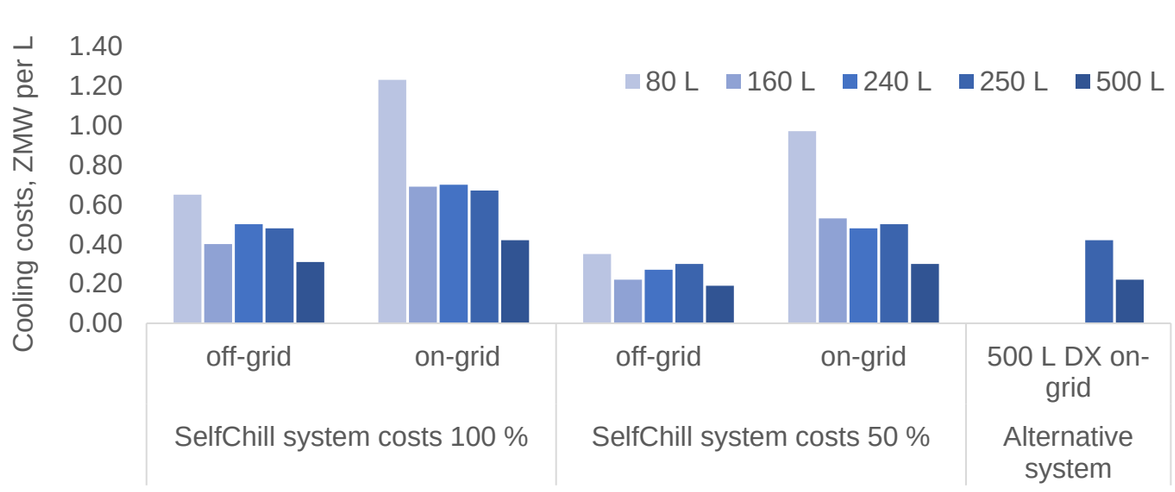
Results

Economic viability

- Viable systems for a cooperative business model:
  - With 100% of the SelfChill system costs: 240 L
  - With 50 % of the SelfChill system costs: 500 L
- Viable systems for an on-farm business model:
  - With 100% of the SelfChill system costs: 80 L

Cooling cost comparison

- With full utilization during rainy and dry season



Comparison of the cooling costs per L of the SelfChill systems (100% and 50% cost), the on-grid and alternative systems

Challenges

- Lack of processing companies collecting milk in the studied region
- Governance problems at dairy cooperatives
- Seasonality of milk production
- Lack of product diversification
- Initial investment costs

Conclusions

- Economic feasibility can be improved by local production of the SelfChill systems
- Potential of generating job and sources of income

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