Renewable energy and energy efficiency analysis in Yak Value Chain

Case study of Bhutan and China

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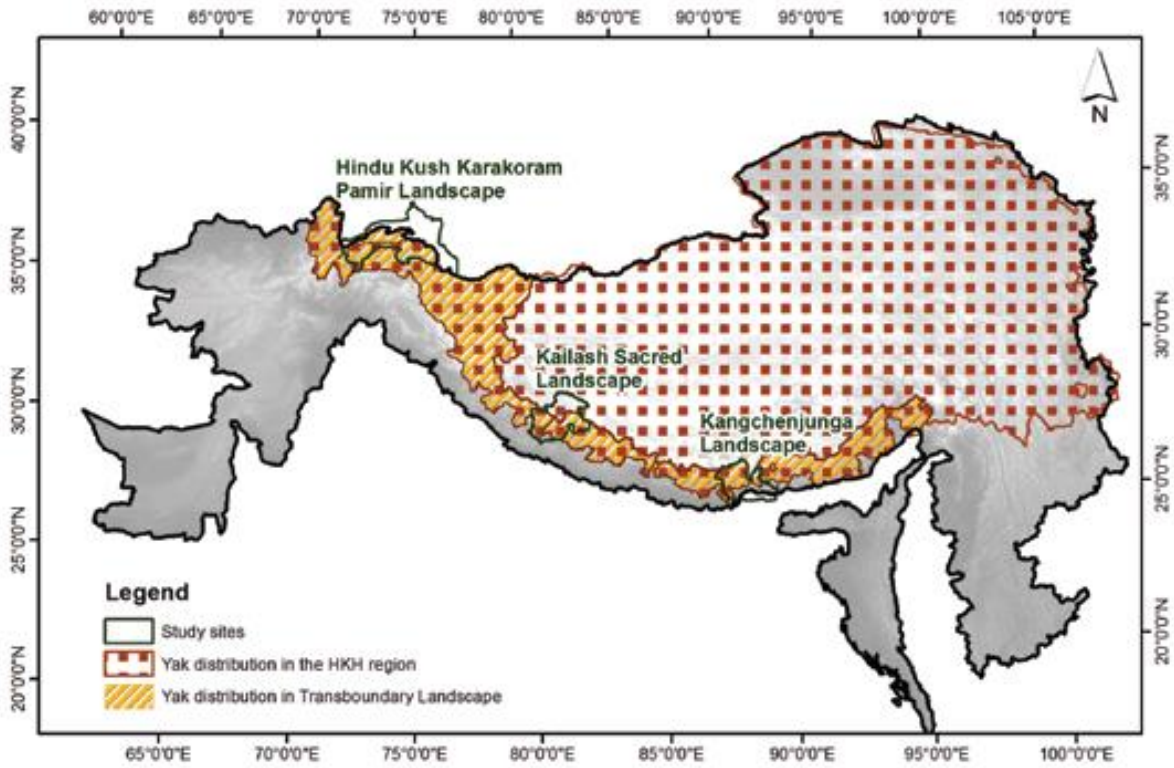
Why Yak Value Chain?

- Yak is a climate hardy mountain animal.
- 5% of the population in Bhutan are Yak herders
- In Tibetan plateau alone, about 25% of the Tibetans are Yak herders.
- It contributes to about 80% of HH income and comprise major dietary source (protein and fat).
- Yak herding manifests to cultural and migratory lifestyle of Highland mountain communities.



Rangeland is 60% of the land use in HKH

Energy flow in Yak value chain: Bhutan

Production

Dairy
Herding
Fodder
Milking

Wool
Shearing

Processing

Dairy
Boiling milk
Churning
Sun drying

Wool
Sorting & cleaning
Thread making & weaving

Marketing

Dairy
Storage
Transport
Marketing

Energy flow

- **Energy mix**
  -Portable solar PV and Kerosene for lightning
  -All other activities are manually performed
- **Energy quality**

Affordable (grants, own invest) and not reliable (lifespan of solar PV)

Energy flow

- **Energy mix**
  -Fuel wood, dung, and shrubs
- **Energy quality**

Affordable, unreliable and inefficient sources (for average yak herd of 23 milking yaks)

  - 1,800kg of firewood – 100 labour days
  - 250 kg of shrubs – 12 labour days
  - 200 kg of yak dung – 6 labour days

- **Energy cost (labour cost)**
  11 USD/day for fuel collection

Energy flow

- **Energy mix**
  -Portable solar PV for charging mobile phone
  -All activities except transportation are manually performed.
  -Yak and horses are used for transportation.
- **Energy quality**

Affordable but not reliable

Renewable energy contribution to resilient enterprise development in Bhutan

1. Less entrepreneurial orientation:
    - Low ability to anticipate and plan for climate and market shocks.
    - No product diversification/innovation.

2. Weak market orientation :
    - Compromise in quality products due to traditional energy use
    - Weak market linkages

3. Contribution to local economy:
    - Household income
    - Cost saving from kerosene replacement

Energy flow in Yak value chain: China

Production

Dairy
Breeding
Herding
Fodder
Milking

Wool
Shearing

Energy flow

- **Energy mix**
  -Fuel wood, dung, coal, off-grid solar system (3 kW capacity)
- **Energy quality**
  Reliable

Energy costs
285 USD to set up solar system (Govt. grant)

Processing

Dairy
Store/Boil milk
Churning
Pasteurization
Sun drying

Wool
Sorting & cleaning
Thread making & weaving

Energy flow

- **Energy mix**
  -Off-grid solar system, Grid energy and petrol
- **Energy quality**
  Affordable and Reliable (24 hrs)
- **Energy costs**
  Milk powder company-
  Grid: 14,300 USD per year for the (including electricity cost in marketing stage)
  Petrol: 71,150 USD per year (including transportation in the marketing stage)

Marketing

Dairy
Storage
Packaging
Transport
Marketing, ICT

Energy flow

- **Energy mix**
  -Off-grid solar system, Grid energy and petrol
- **Energy quality**
- Affordable and Reliable (24 hrs)

Renewable energy contribution to resilient enterprise development in China

1. Strong entrepreneurial orientation:
    - Better ability to anticipate and plan for climate and market shocks.
    - Product diversification and innovation (cosmetics).

2. Good market orientation :
    - Ensure volume of production and quality products (efficiency and amount)
    - Use of ICT for market linkages

3. Contribution to local economy:
    - Household income
    - Local employment generation
    - Reduced drudgery and time investment on productive uses

Ecosystem shaping RE contribution to resilient enterprise development

1. **Enabling** policy for incentivizing uptake of RE solutions

2. **Partnerships** with governments, cooperatives, private sectors, hotels and digital market place

3. **Finance** instruments: Subsidy, grants and concessional loans from Governments, Banks, Private sector

4. Access to reliable, affordable and sustainable energy flow (off-grid, on-grid) with mobile **technology** enhance productive end uses

5. Basic **infrastructure** such as roads, transport, markets and communication is vital

6. **Skill development** on processing, packaging, branding

Key messages

1. Access to reliable and affordable energy can improve EO, MO, reduce drudgery, and enable to manage risks, innovate and diversify production.

2. Off-grid and on-grid renewable energy solutions can enhance productive end uses.

3. Higher installation cost for RE use demand enabling policy for subsidy.

4. Financial institutions must assure investments on RE infrastructure