CROP SUITABILITY MODELLING IN BHUTAN

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THE PROJECT
ECOCROP & REPRESENTATIVE CONCENTRATION PATHWAYS (RCP)
BHUTAN

- by law 60 per cent of the country must have forest cover
STEEP LANDSCAPE

- Most of the country extremely steep - few areas are suitable for agriculture

- > 65% employed in agriculture sector, especially women
DRASTIC ELEVATIONAL CHANGES
Huge differences in solar radiation within the same valleys – influences the suitability for crop production.
SOIL

- Low quality soil map - accuracy 23-52% (ISRIC 2014) and FAO (1995)
SOIL EROSION METHODOLOGY

Using USLE

\[ A = R \times K \times LS \times C \times P \]

Where:

- **A**: annual soil loss rate (ton / ha / yr)
- **R**: rainfall factor (MJ.mm / ha.yr)
- **K**: soil erodibility factor (ton.ha.h / MJ.ha.mm)
- **LS**: is slope steepness and slope length factor (dimensionless)
- **C**: cover factor (dimensionless)
- **P**: conservation practices (dimensionless)
KEWA DATSHI

- Hugely popular dish in Bhutan – Potato is main ingredient
- Potato is a very important crop for ensuring food security in Bhutan
Table 2: Biophysical suitability variables for potato

<table>
<thead>
<tr>
<th></th>
<th>Slope (° degrees)</th>
<th>Solar radiation</th>
<th>Soil</th>
<th>Elevation (m)</th>
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<tbody>
<tr>
<td>Not suitable</td>
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<td>&lt;4</td>
<td>IIIA</td>
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Potato: Biophysical Suitability

Determinants of biophysical suitability: slope, elevation, solar radiation

Thimphu
POTATO – CURRENT CLIMATE SUITABILITY

Potato suitability area under present condition
POTATO – FUTURE CLIMATE SUITABILITY

Potato suitability area under future condition RCP 8.5 ensemble

Geogs
Potato suitability_RCP8.5 (%)
- Very marginal (< 20)
- Marginal (20 - 40)
- Suitable (40 - 60)
- Very suitable (60 - 80)
- Excellent (>80)

0 25 50 100 Kilometers
POTATO – CHANGE IN THE CLIMATE SUITABILITY

Change in Potato suitability area under RCP 8.5 ensemble compared to present condition using threshold of 50%
Climate change and agriculture insights:
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Quinoa: Biophysical Suitability

Determinants of biophysical suitability: slope, elevation, solar radiation
QUINOA – CURRENT CLIMATE SUITABILITY

Quinoa suitability area under present condition
QUINOA – CURRENT CLIMATE SUITABILITY

Quinoa suitability area under future condition RCP 8.5 ensemble
QUINOA – CHANGE IN CLIMATE SUITABILITY OF QUINOA

Change in Quinoa suitability area under RCP 8.5 ensemble compared to present condition using threshold of 50%
QUINOA – A FUTURE OPTION FOR BHUTAN?

- Need for investment in trials of different quinoa varieties

- Post processing of quinoa is under developed – how to store, process and also how to market and transport quinoa

- Cultural preferences – Quinoa is largely unknown in Bhutan and therefore need to understand how to encourage people to eat the super food
CONCLUSIONS

Challenges
- Warming climate pushing agricultural into higher altitudes

Opportunities
- Quinoa Datshi?

Planned activities:
- Full vulnerability assessment
- Linking farmers to the market

Outputs: Working Paper: Climate change impacts in Bhutan: challenges and opportunities for the agricultural sector

http://hdl.handle.net/10568/80918
THANK YOU!

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