The rice yield gap in Nepal today and under multiple scenarios of climate change

Amit Kumar Basukala[1*], Livia Rasche[2]

[1,2]Research Unit Sustainability and Climate Risks, Center for Earth System Research and Sustainability, Universität Hamburg, Grindelberg 5, 20144 Hamburg, Germany

* Correspondence: amit.basukala@uni-hamburg.de

BACKGROUND:

- Nepal is one of the most vulnerable countries to climate change.
- Nepal's current yield gaps for major crops are very large. Due to this the country is importing foods to meet domestic demand.

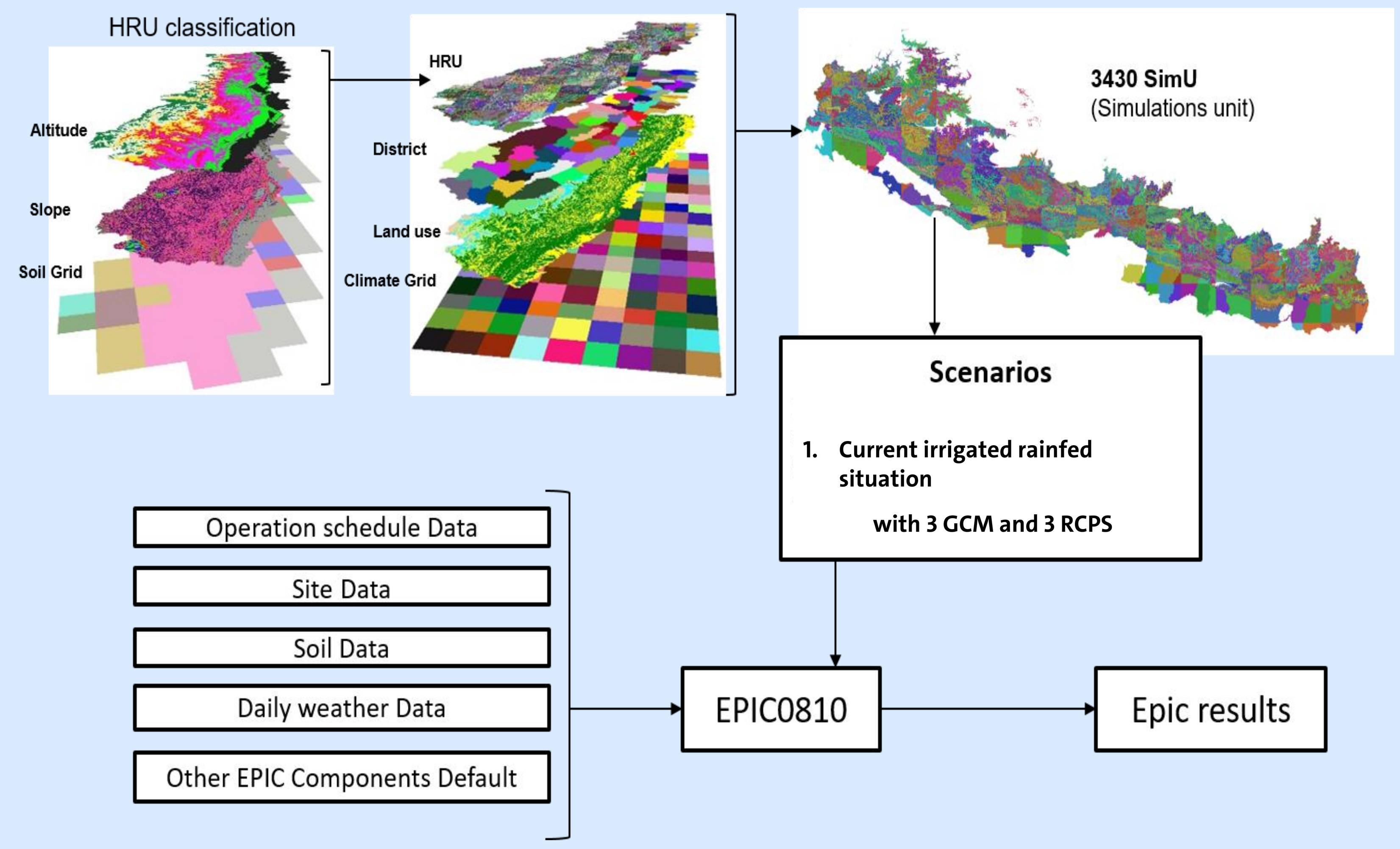
→ Sustainable intensification of Nepal's agricultural system is needed. Effective strategies should be developed to adapt to climate change.

RESEARCH QUESTIONS

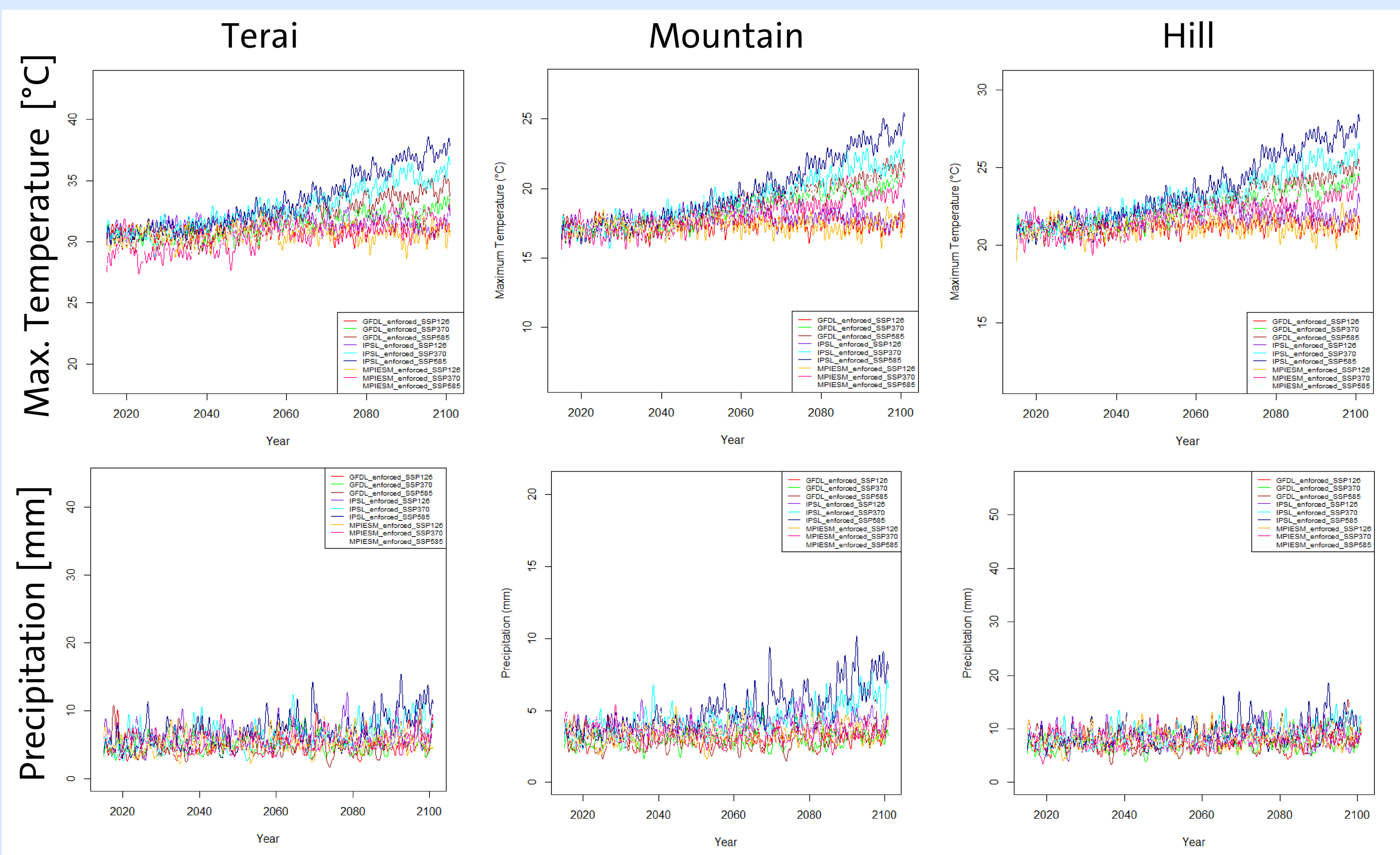
- What are the current yield gaps? How much fertilizer and irrigation water would be required to close the yield gaps, and where?
- How will climate change induced precipitation, solar radiation and temperature affects the rice crop productivity in Nepal?

METHODOLOGY:

- The **EPIC crop model** was used for biophysical crop modelling (Williams et al. ,1989). 3430 simulation units were delineated for Nepal:



- **Model calibration** was done by iteratively adapting crop parameters until simulated and reported yields (district level, 1999-2014) matched
- For **climate data**, we used projections based on SSP1-2.6 (low emissions), SSP3-7.0 (high emissions), and SSP5-8.5 (extreme emissions) scenarios, run with three general circulation models (GFDL-ESM4, IPSL-CM6A-LR and MPI-ESM1-2-HR). The data were bias corrected as part of the **CMIP6** and downloaded from **ISIMIP3b**.

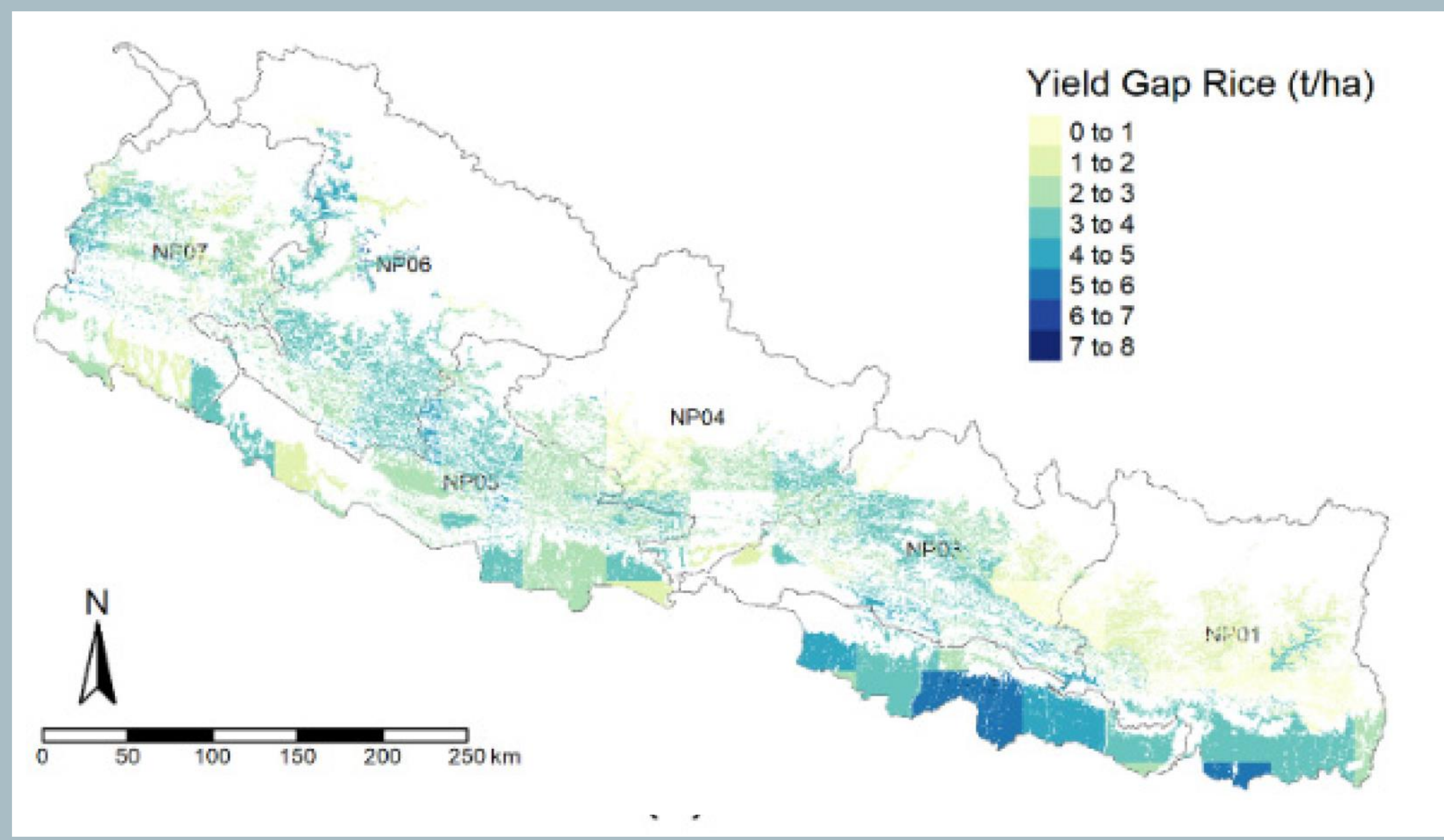


WHAT IS THE CURRENT YIELD GAP FOR RICE IN NEPAL?

We simulated **1)** current yields and **2)** attainable yields (yields produced with additional irrigation water and fertilizer). The yield gap was calculated as the difference between the two scenarios

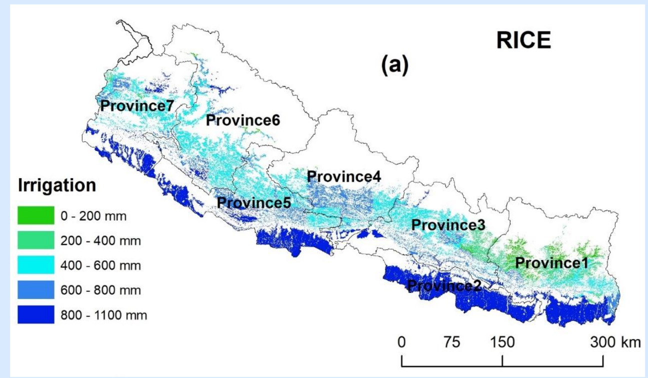
The **average yield gap for rice is 2.7 t/ha**

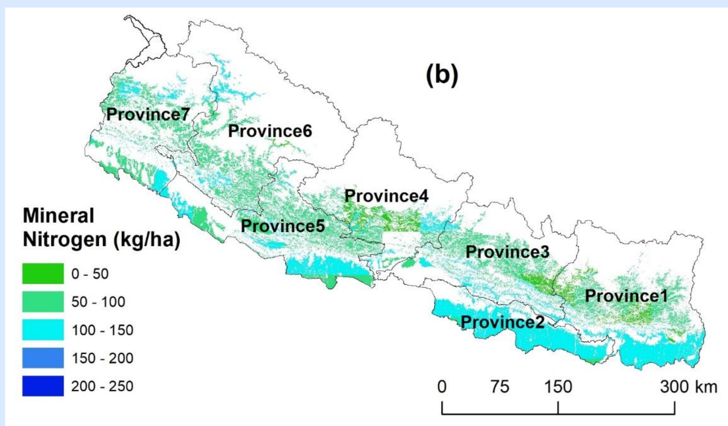
At simulation unit level, yields gaps vary. **They can rise to over 5 t/ha** in the warm Southern regions; and are lower in the colder mountainous regions.



WHAT DOES IT TAKE TO CLOSE THE YIELD GAP?

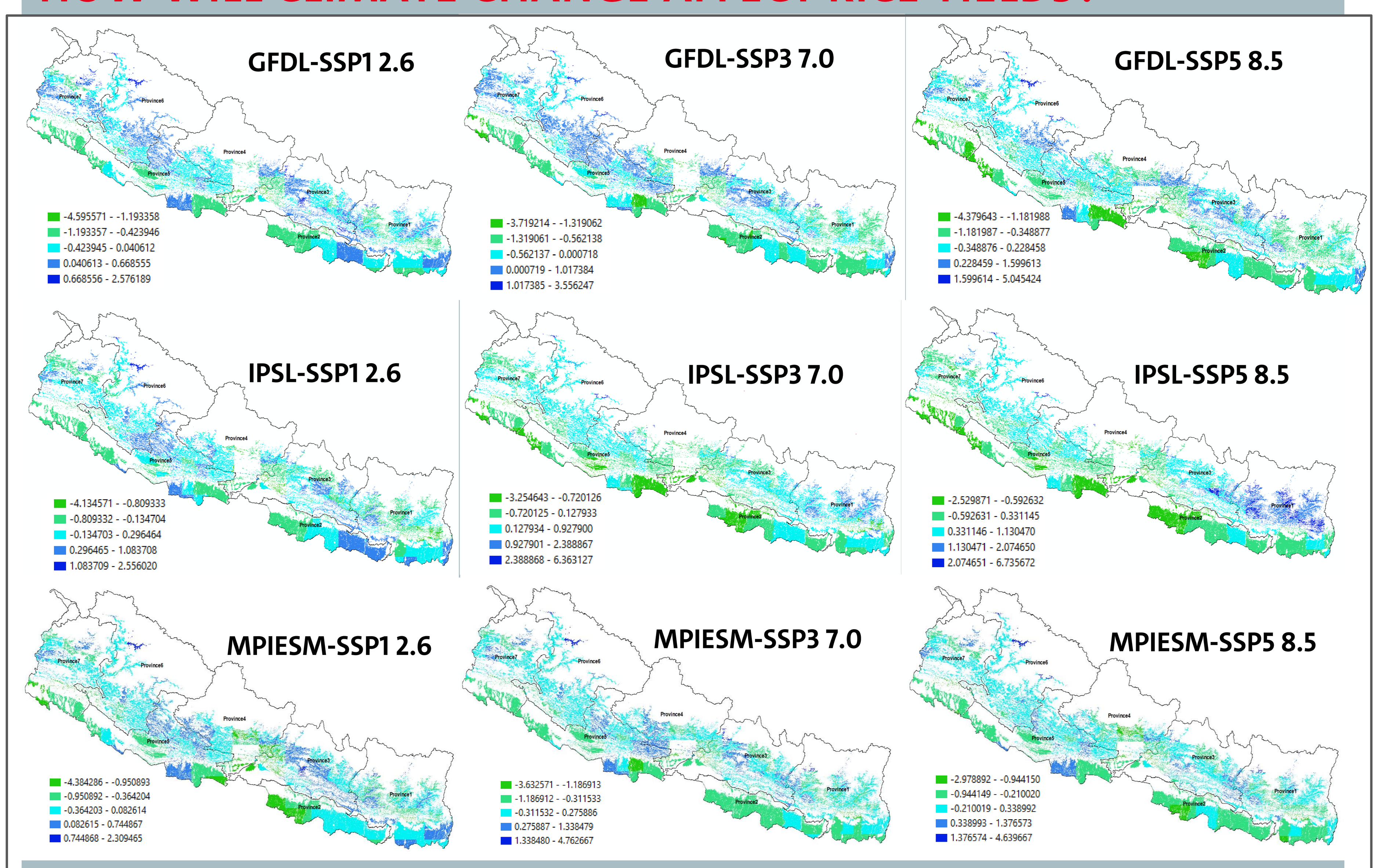
Irrigation requirements for rice range between **0-958 mm** with the highest requirements in the tropical Terai regions and decreasing with increasing altitude (a)





Mineral N requirements vary between **12-205 kg/ha** (b). **Mineral P** requirements are **2-31 kg/ha**. Spatial patterns are the same as for irrigation requirements.

HOW WILL CLIMATE CHANGE AFFECT RICE YIELDS?



Based on the results, in future, there will be decrease of rice yields in terai, however in mountain and hills there tendency of increase of rice yield.

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