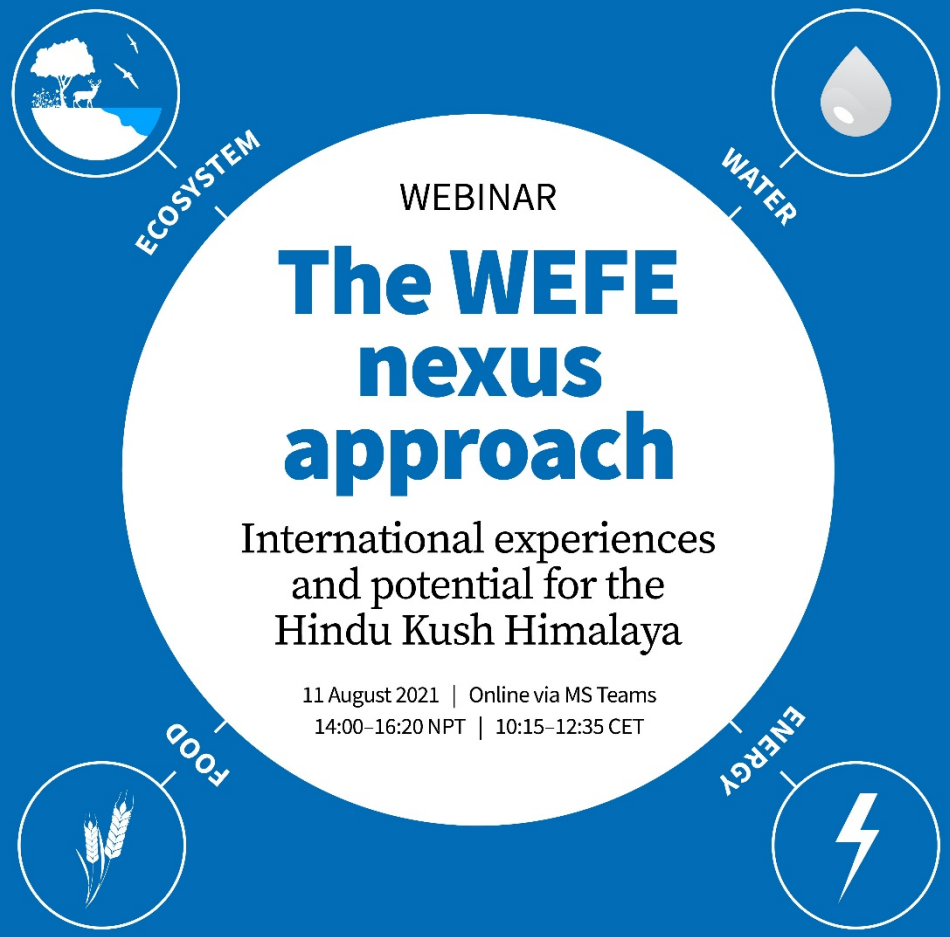


# Quantifying the WEFE nexus

Presenter: Christian Siderius

Date: 11 Augustus 2021

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# How to quantify the nexus?

Many reviews, little quantification

Optimisation techniques have been used for several decades to analyse river basins

Based on a description of the hydrology, they compare added value between uses

New technologies make it possible to compare more than just financial value

Complex, but they can help distinguish relevant trade-offs and synergies

Focus has been mostly on water-energy trade-offs

# Examples

© Greg Armfield / WWF

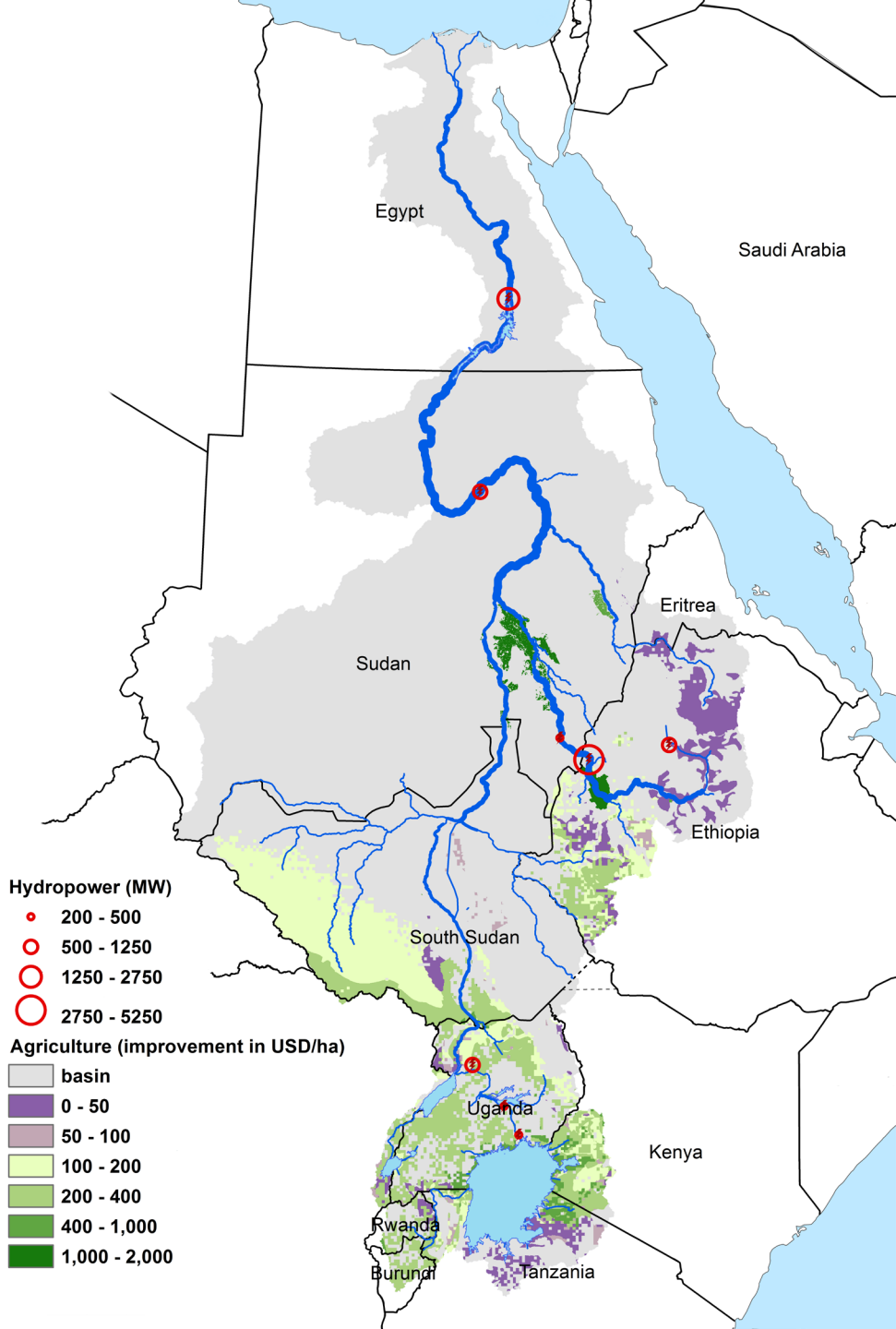
# Define the right scope

## Nile basin

New hydropower causes political tensions between riparian countries, with downstream Egypt and Sudan fearing loss of irrigation water.

A narrow focus on hydropower and irrigation will mainly highlight trade-offs.

The true potential - to increase both food production and energy - lies in underdeveloped rainfed agriculture.



# Don’t underestimate the environment

## Rufiji basin, Tanzania

In the Rufiji basin, Tanzania, a huge hydropower dam threatens downstream ecosystems by altering the frequency of flooding.

Quantifying trade-offs, we find that there is a small path to synergies, with the value of ecosystem services (i.e. tourism) of high importance.

Masdar official, Flickr

# Consider your boundaries

## Gulf region

Revenues from oil exports allow the Gulf region to compensate for low food production and scarce water availability.

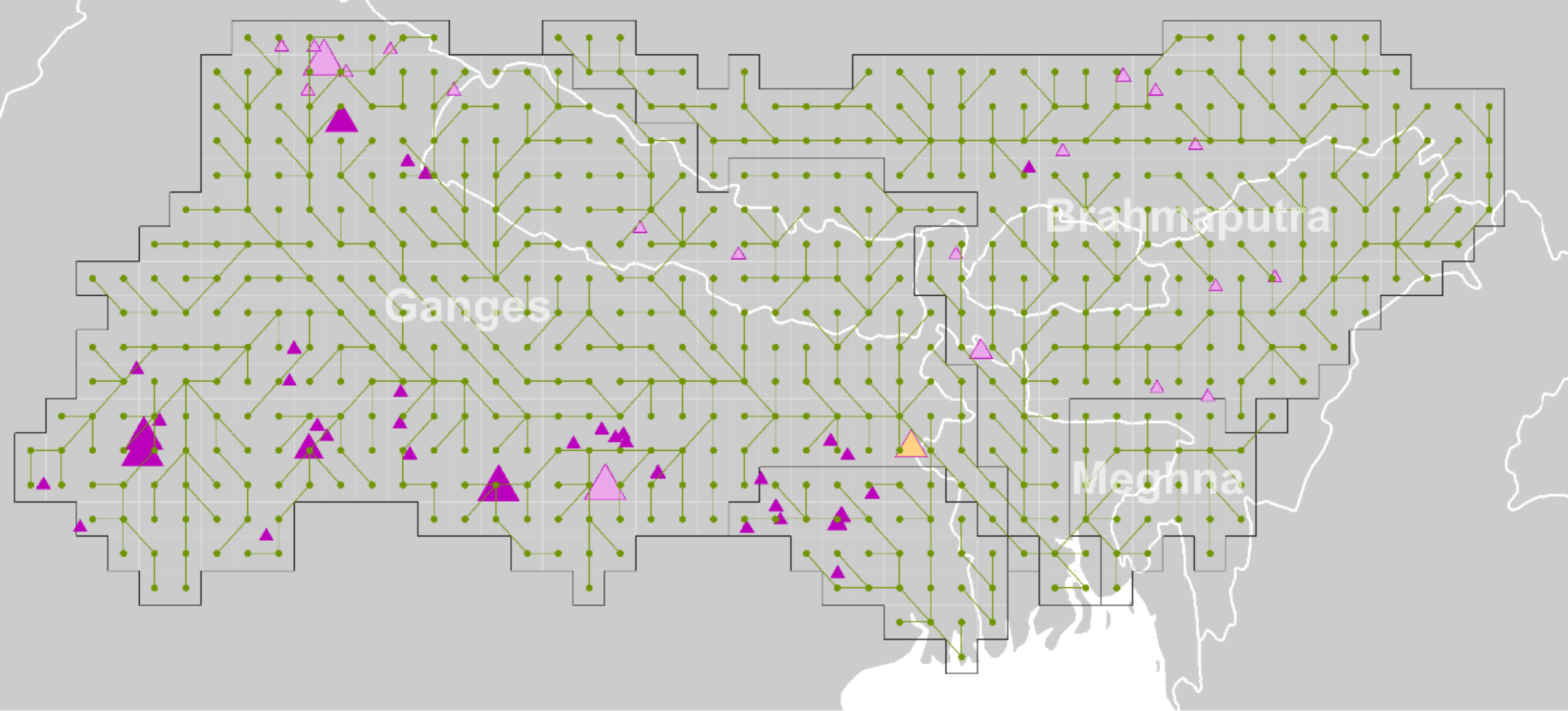
Within countries, trade-offs are actually fairly limited.

Reducing domestic trade-offs can lead to higher exposure internationally, with e.g. high volumes of rice imports originating in regions such as South Asia where groundwater is being depleted.

# WEFE nexus & SDGs in South Asia

# WEFE - SDG trade-offs in South Asia

We examined profitability of agriculture versus nutrition, energy  - both yield of hydropower, and energy use by pumping of irrigation water - and environmental flows.



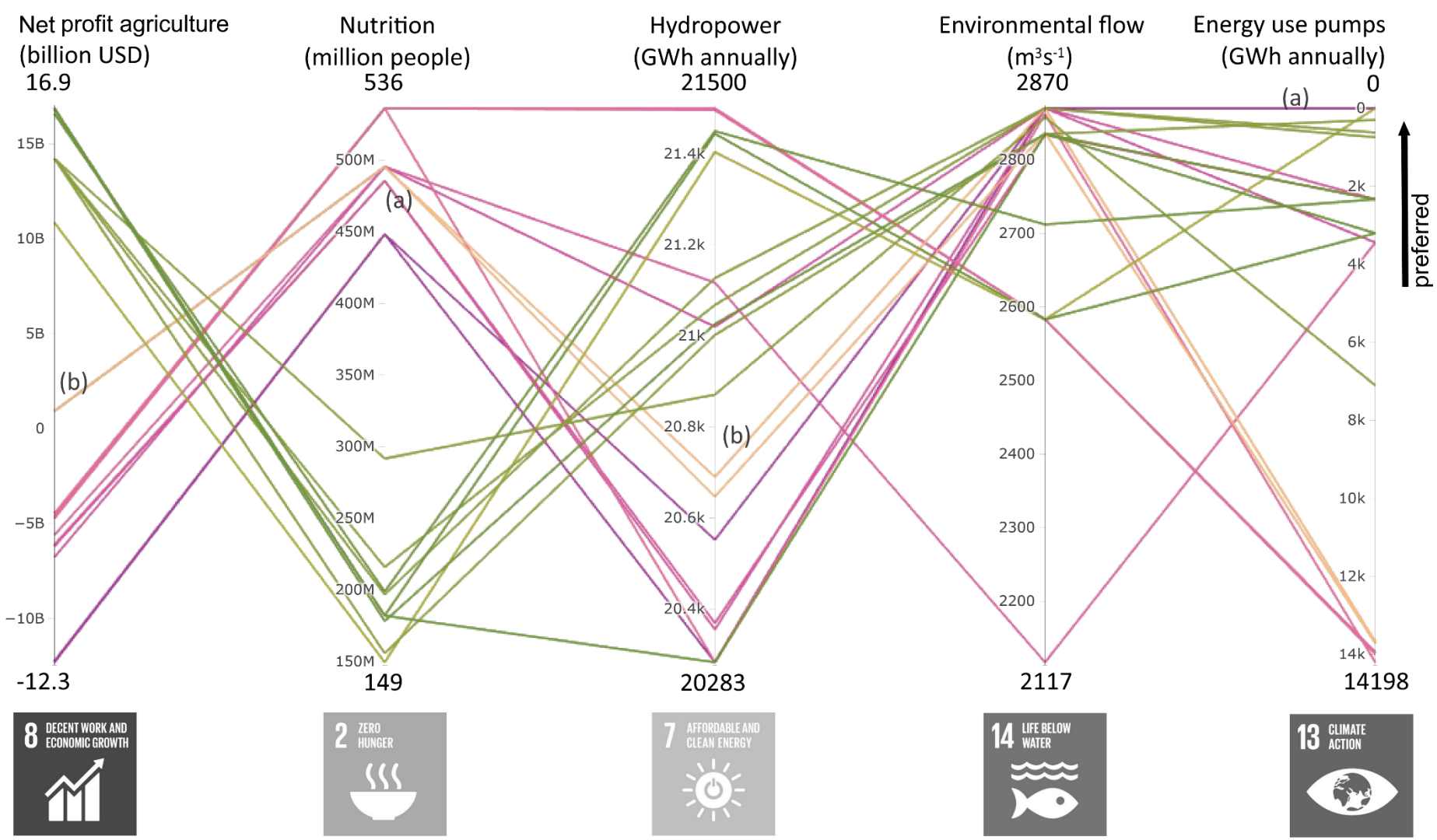

TYPE
- Irrigation
- Hydroelectricity
- Navigation

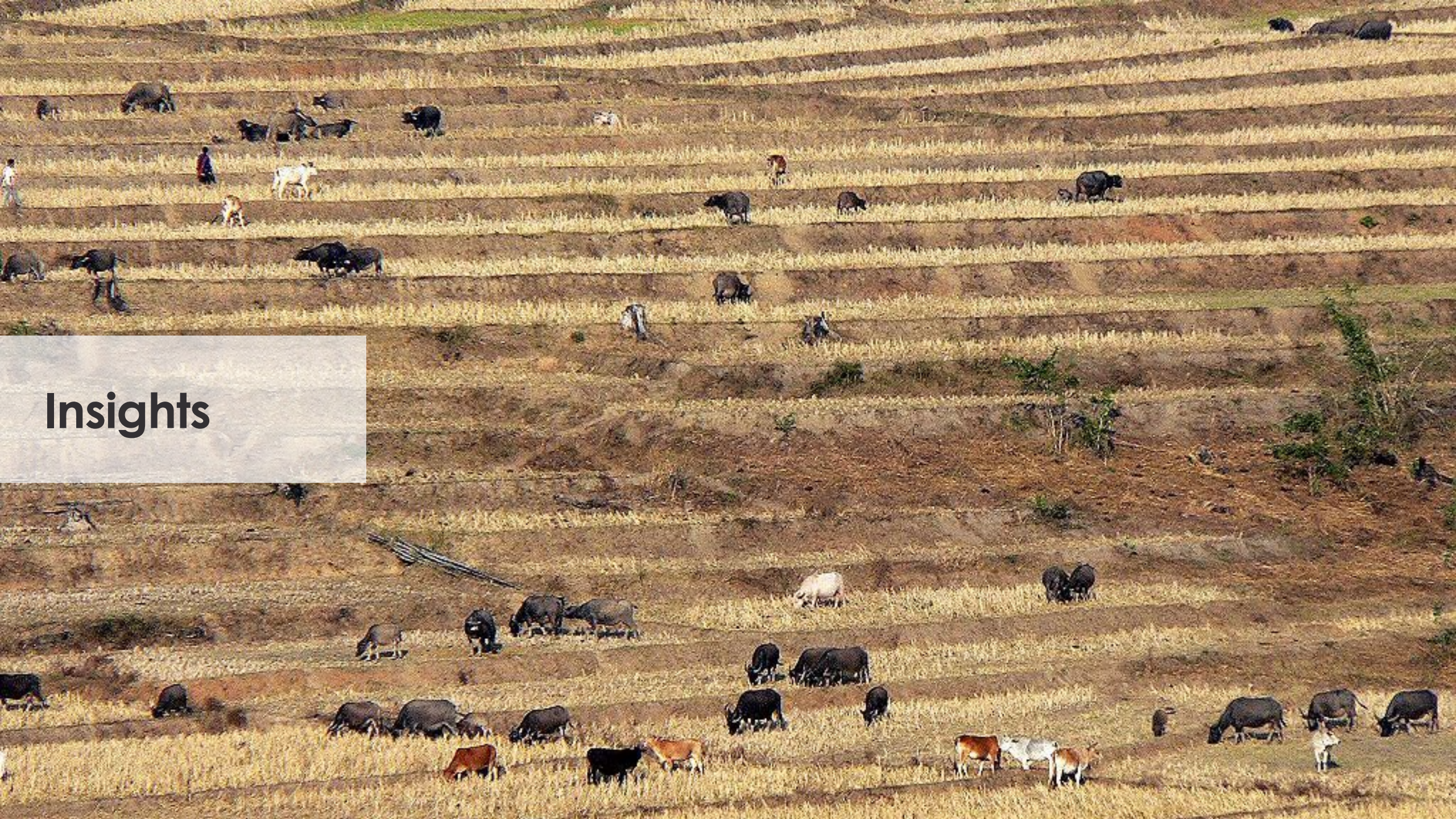
CAPACITY
- <300 MCM
- <3000 MCM
- <10000 MCM

SCHEMATIZATION
- Node
- Section
- Cell
- Basin

# Trade-offs

The trade-off between agriculture‘s net profit and total production is strong; the amount of people fed is reduced by more than two-thirds when profitablity is maximized.





# Insights

# Insights

**Scope** – all WEFE sectors are important in the HKH; but not all trade-offs are

**Variability** – under-analyzed. Some sectors are more at risk than others

**Profitability** - of high relevance to the WEFE nexus in the HKH region

**Boundaries** – dependency on downstream areas for food security. Remittances to the HKH

# Thank you

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