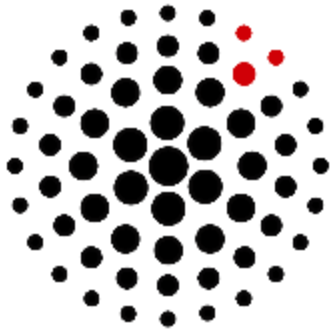


A black and white photograph of a person wearing a dark jacket and a head covering, leaning over to examine a bundle of wheat plants in a field. The background shows more wheat plants and a blurred structure.

Impact Assessment on CIMMYT Early Sown Wheat Innovation in India

30 November, 2023 |



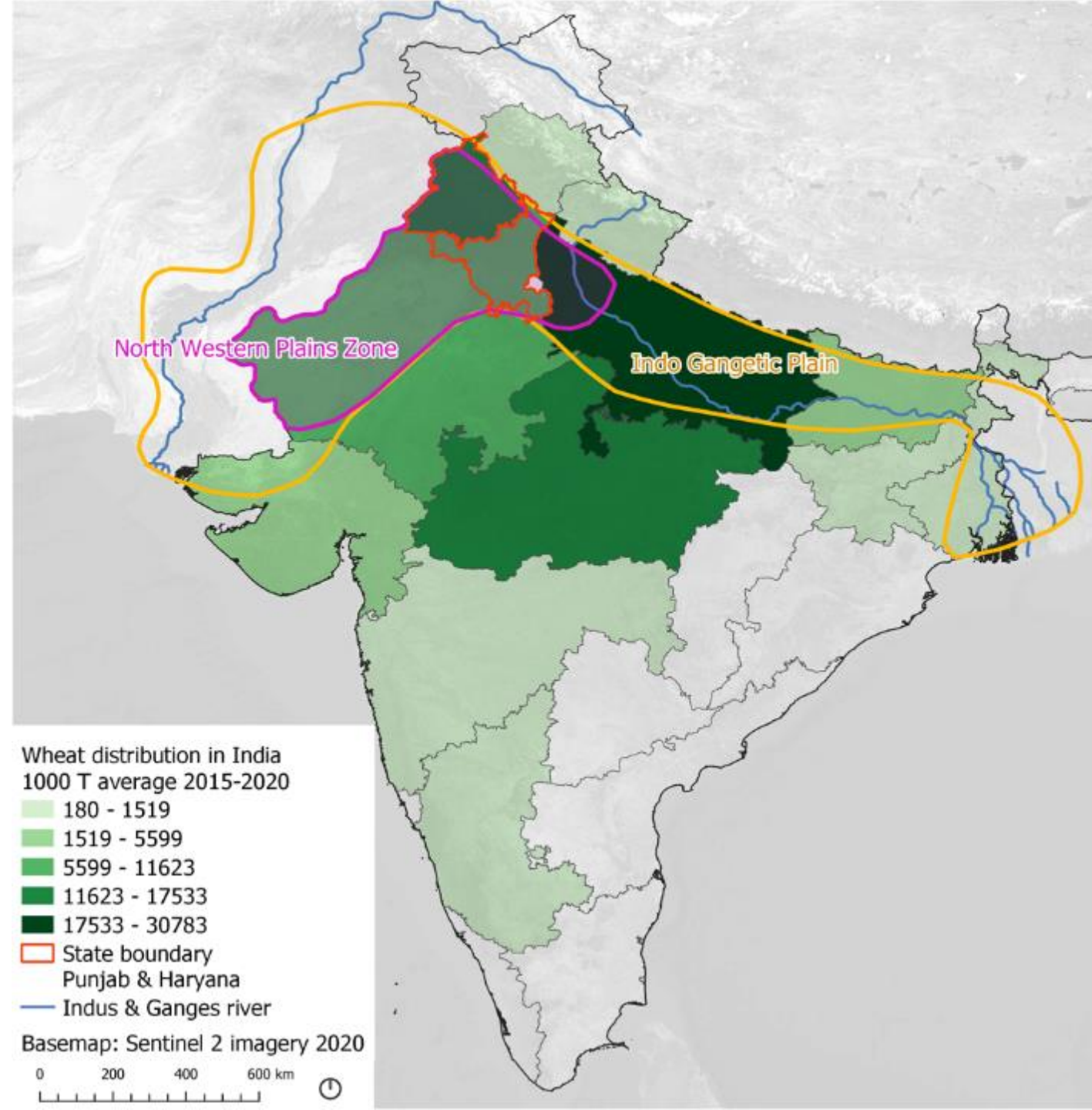
DATA POWERED POSITIVE DEVIANCE

- Leverages **non-traditional data** (e.g. earth observation data) to identify positive deviants
- This **reduces the initial time and cost** needed for their identification
- It also enabling their discovery at **geographic and temporal scales** that weren't previously possible



Wheat in India

- Wheat is a crucial crop in India
- 2nd in wheat production and consumption globally
 - Production: 117 million metric tons
 - Consumption: 104 million metric tons
- Provides ~50% of required calories and protein for the population
- Concentrated in IGP region (yellow marking)
- Punjab, Haryana, and Uttar Pradesh produce 70% of India's total wheat output



Early Sowing

- Climate Threats to Wheat Production: Altered temperature and precipitation patterns
- Need to enhance wheat yields to meet increasing food demand
- Terminal heat stress:
 - reduces wheat yields
 - Limits growing period
- Early sowing:
 - Avoids terminal heat
 - Prolongs growing period
 - Needs increased tolerance to early heat
 - Needs adjusted practices
- Definition of Early Sowing: October - Mid November



CIMMYT & FIA

- BMZ (via FIA @ GIZ) funded the development of ESW Varieties
- We look at 3 varieties developed by CIMMYT and released in Punjab & Haryana: DBW 303, DBW 187, WH 1270

FIA & DSC

- Data Service Center is an GIZ internal service provider for data management & analysis
- With support by the GIZ DataLab we decided that it would be interesting to apply DDPP (exceptional responders framework) to an impact evaluation



Research Questions

- **Impact:** Is there a noticeable increase in crop yields among farmers who adopt CIMMYT varieties compared to those who do not during the early sowing period?
- **Adoption:** What perceptual, management, biophysical, and socio-economic factors influence the adoption of CIMMYT varieties?
- **Effective use:** What factors contribute to higher yields within the group of farmers who have adopted CIMMYT varieties?

Why use the DDPP method for this?

Gaining an understanding of the factors that influence the adoption of ESW technologies and identifying barriers to their proper use can provide valuable insights for guiding interventions and policies aimed at promoting this agricultural practice.

What, where and who are Positive Deviants?

Our definition: Positive Deviants (PDs) are **households** who adopted one of the three **CIMMYT ESW varieties** (DBW 303, DBW 187, and WH1270) on at least one plot during the **Rabi season 2021/22**

0. Homogenous Grouping

Study population divided into homogeneous groups, identification relative to context. Study area can be considered single homogenous agroecological zone, similar climatic conditions

1. Mapping Sowing Dates

Wheat sowing dates with a spatial resolution of 250 m for the years 2017-2021 in Punjab and Haryana were generated using satellite imagery (MODIS) & time series analysis.

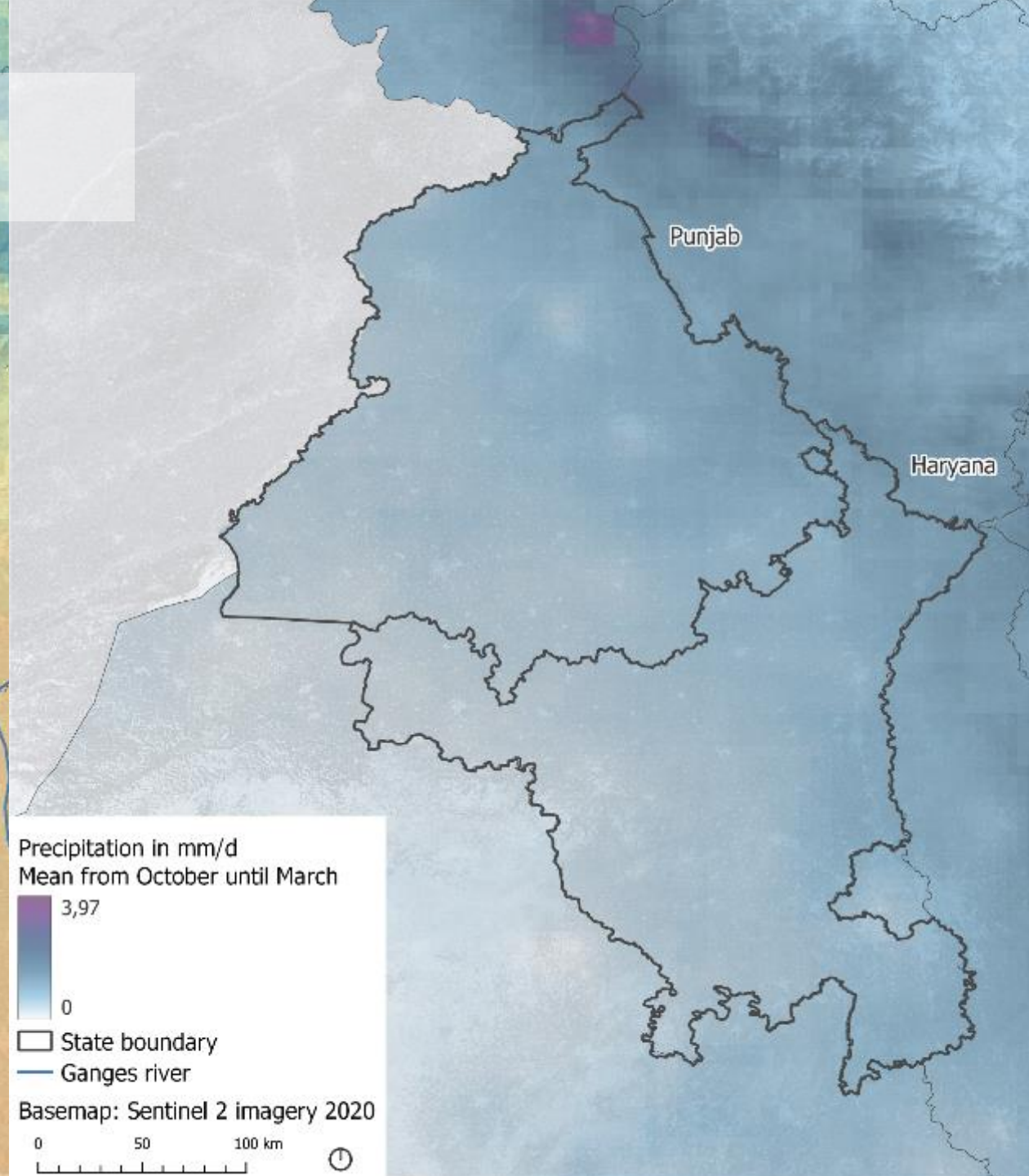
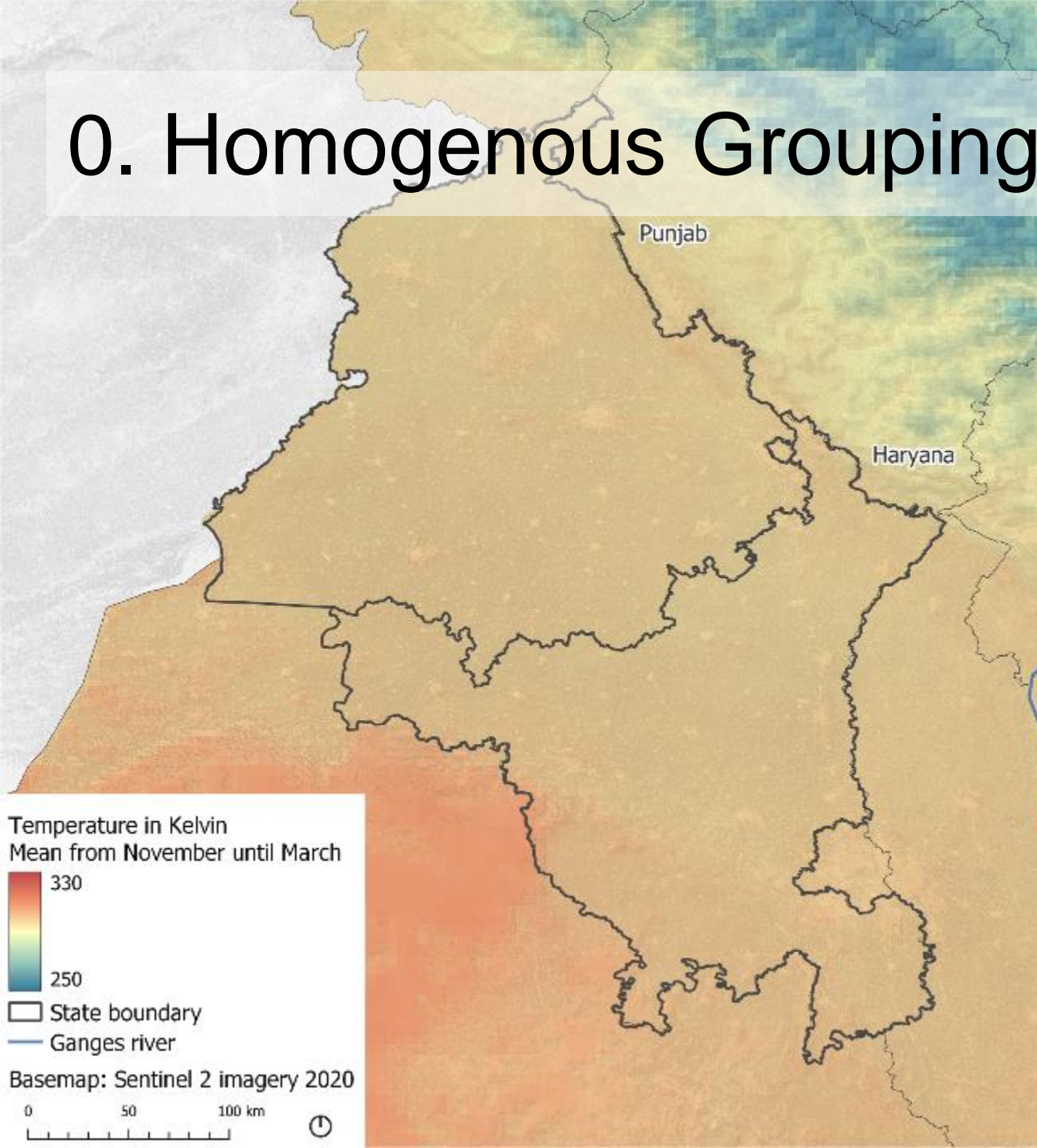
2. Identifying Early Sowing Districts

Adm 5 units with sowing in October and a prevalence of mid- November. Purposive selection of seven districts with concentration of early sowing communities

3. Identifying Adopters of CIMMYT ESW Varieties

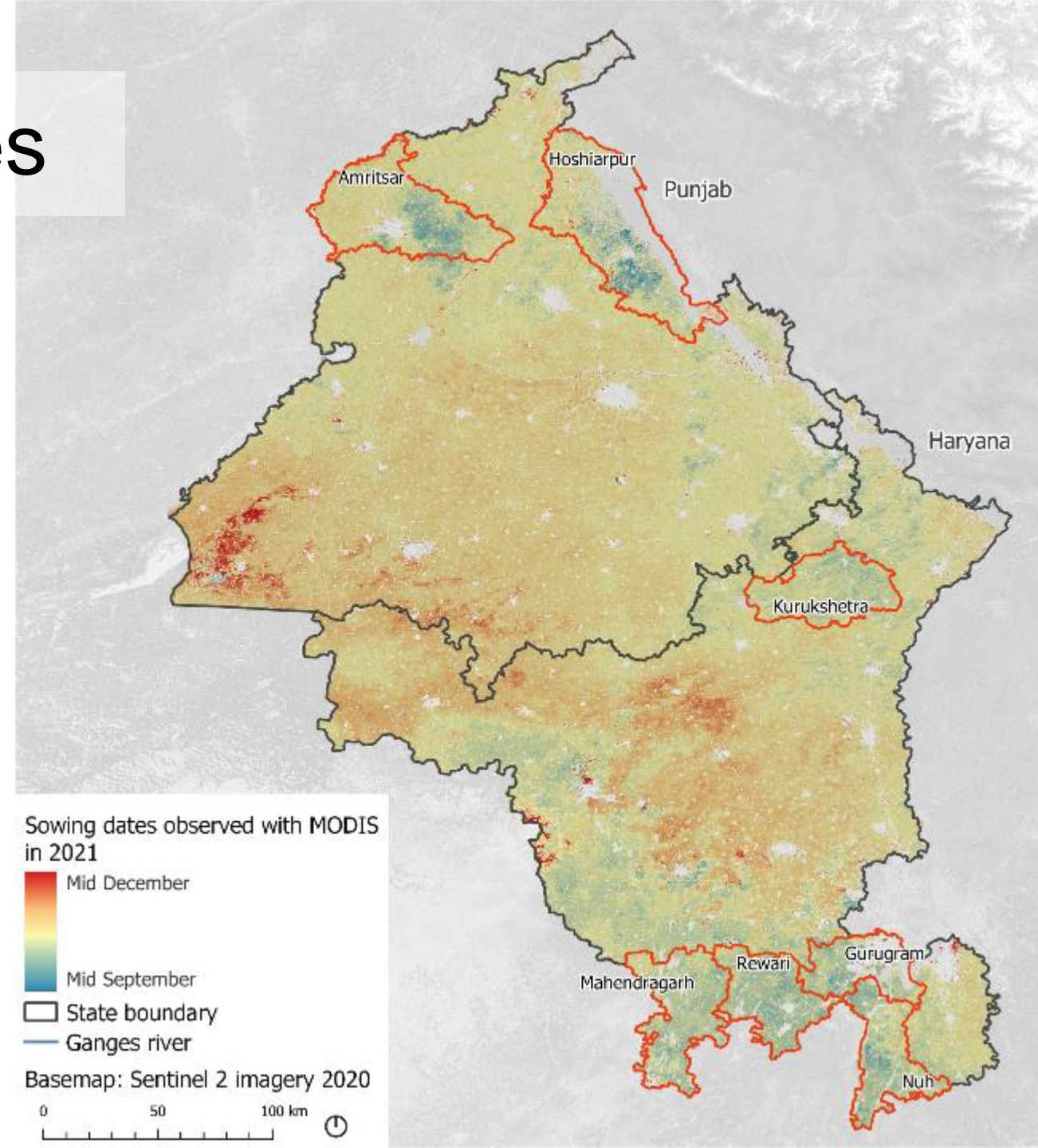
Household survey: 1206 wheat farming households, 70 communities in early sowing districts. 80 households that applied CIMMYT varieties identified, on a total of 96 plots.

0. Homogenous Grouping



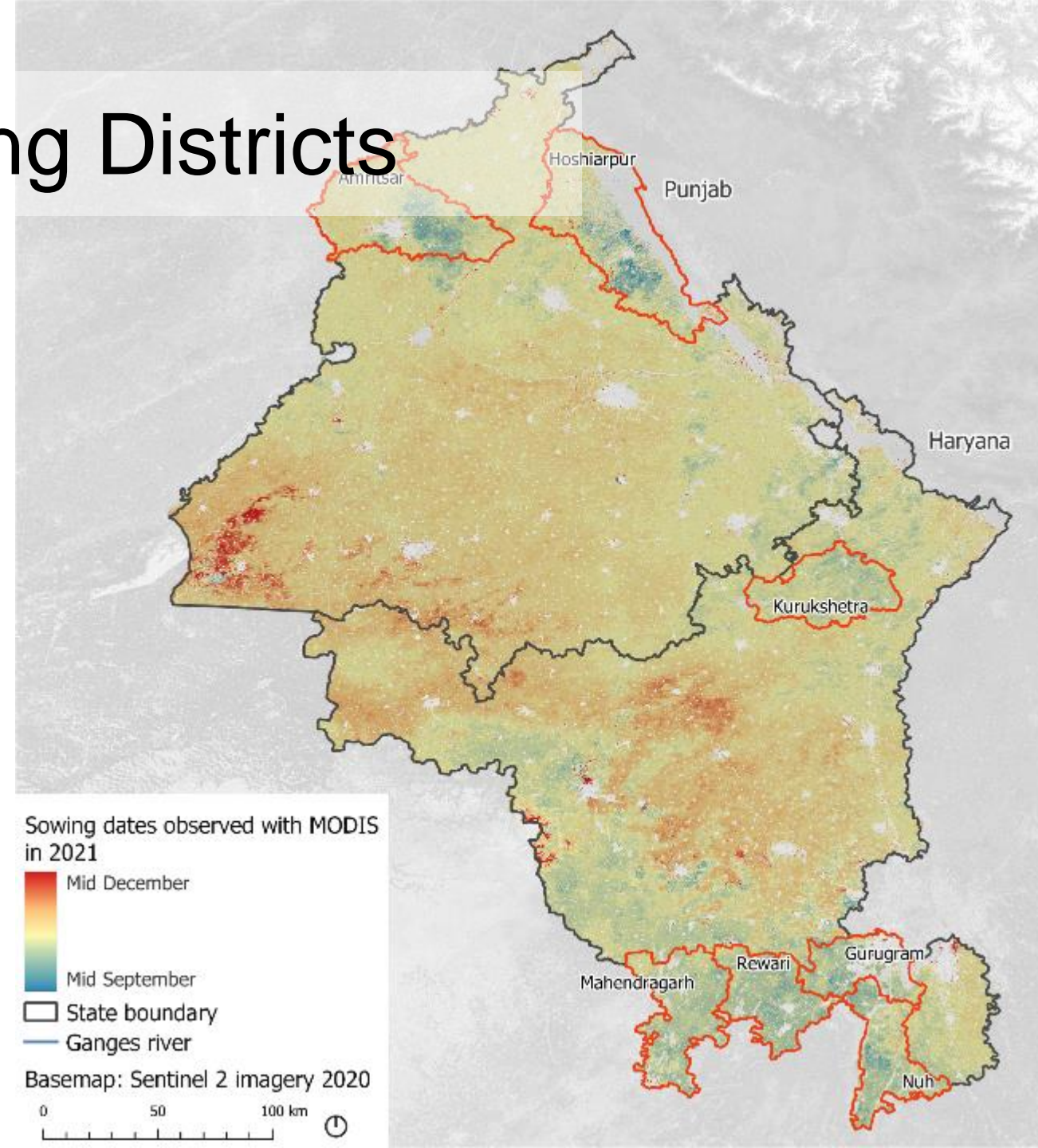
1. Mapping Sowing Dates

- Collaboration with University of Michigan
- We used MODIS Imagery
- We determined the date when NDVI started to increase by identifying the inflection point,
- To ensure accuracy, non-agricultural pixels were masked
- Sowing dates were then determined by subtracting two weeks from the corresponding green-up dates.



2. Identifying Early Sowing Districts

- Aggregated sowing dates on Admin 5 (community Level)
- Selected communities with some October sowing and a prevalence of sowing until mid-November
- Aggregated this on district level and select 7 districts
 - Punjab: Amritsar, Hoshiarpur
 - Haryana: Gurugram, Kurukshetra, Mahendragarh, Nuh, Rewari



3. Identifying Adopters

- Household survey:
 - 70 communities in early sowing districts.
 - 1206 wheat farming households
 - 80 households that applied CIMMYT varieties, on a total of 96 plots.
- The communities were selected using a stratified random sampling technique, as described in [Naeher et al. \(2023\)](#)



Conclusions & Policy Recommendations

- **Impact:** Only two of the CIMMYT varieties resulted in higher yields while one variety resulted in lower yields
- **Adoption:** Despite positive perceptions of ESW among farmers, **the adoption rates of CIMMYT varieties were low (7%) in the study region**
- 75% of the farmers did early sowing and only **6% knew about** ESW varieties
- The limited adoption is mainly due to **lack of knowledge and information**. 52% of the farmers mentioned this as a key factor for non-adoption/discontinuation.
- There is also **mis-information**, for instance, 29% of the farmers thought that ESW varieties require a certain type of soil.
- Policy makers and NGOS need to **strengthen extension services and farmer groups** to provide information about ESW varieties and seed sources

Conclusions & Policy Recommendations

- **Effective Use:** many of the farmers who adopted the varieties are not aware that it has early heat tolerance and should be **sown in October**.
- Hence, interventions that support farmers to **choose ideal sowing dates** are also needed to improve farmer outputs
- Knowledge of zero-tillage technologies was also a strong predictor for adoption and higher yields compared to Rotavator. However, limited and difficult **access to Zero-till equipments** is hindering the wide scale adoption.
- Policies and extension efforts are needed to **enhance familiarity** with zero-till technologies and provide better access to equipments
- Dominant cropping system is rice-wheat, **timing of rice cultivation** effects adoption of ESW
- Interventions that help farmers plant (and harvest) rice earlier may facilitate the adoption of ESW (e.g. early rice varieties, practices that expedite rice harvest)