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भारतीय प्रौद्योगिकी संस्थान तिरुपति
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Optimal sowing dates for major crops in India under climate change

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Introduction

- Agriculture - critical for **Indian farmers**

- Future changes in rainfall patterns influence:
  - Irrigation water requirements (IWR)
  - Water consumption
  - Agricultural output
  - Food security
- Finding optimal sowing date with lowest IWR is **important**

Objectives

- To determine the impact of **altering sowing dates** of major crops on their **irrigation water requirements**

- To optimize the sowing dates for each crop based on the **predicted climate change impacts**

Methodology

- Period of interest → 2020-2099
- Spatial resolution → 0.25^{o}
- Temporal resolution → Daily
- Model → EC-Earth 3
- Scenarios → SSP126, SSP245, SSP370, and SSP585
- Crops → Groundnut, Maize, Paddy, Red gram, Soybean, Sugarcane and Wheat
- Sowing dates → 1st and 16th of every month
- Software to calculate IWR → FAO's CROPWAT

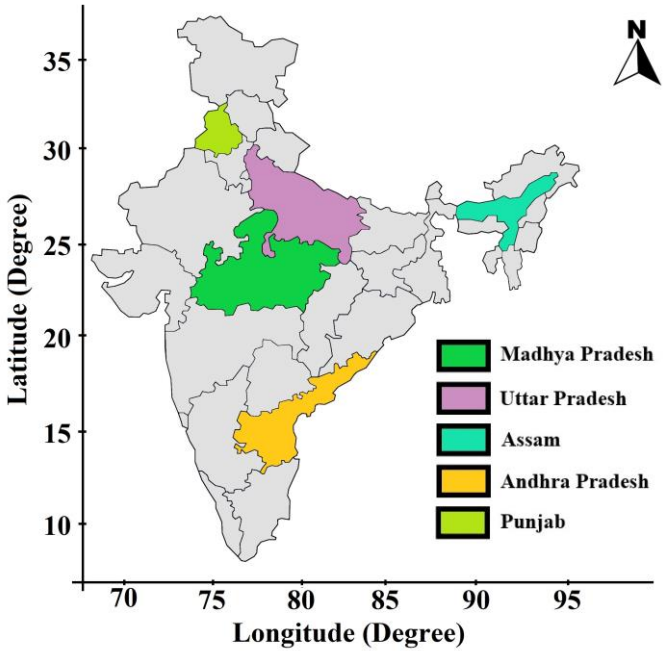

Fig 1: Study area

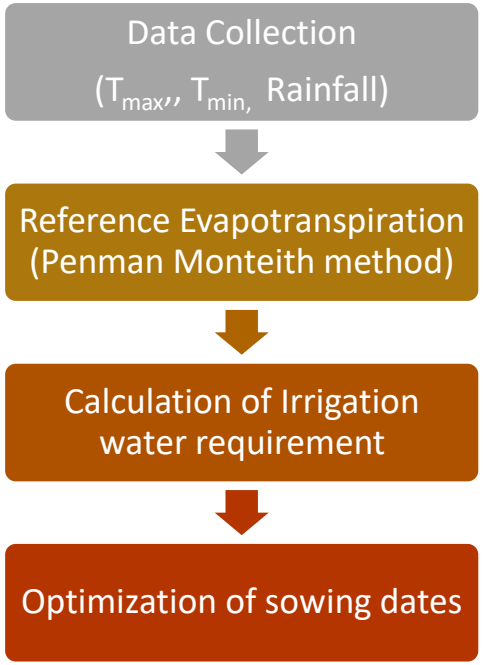

Fig 2: Flowchart of methodology

Results & discussion

- Assam - **lesser water demands** for all crops.

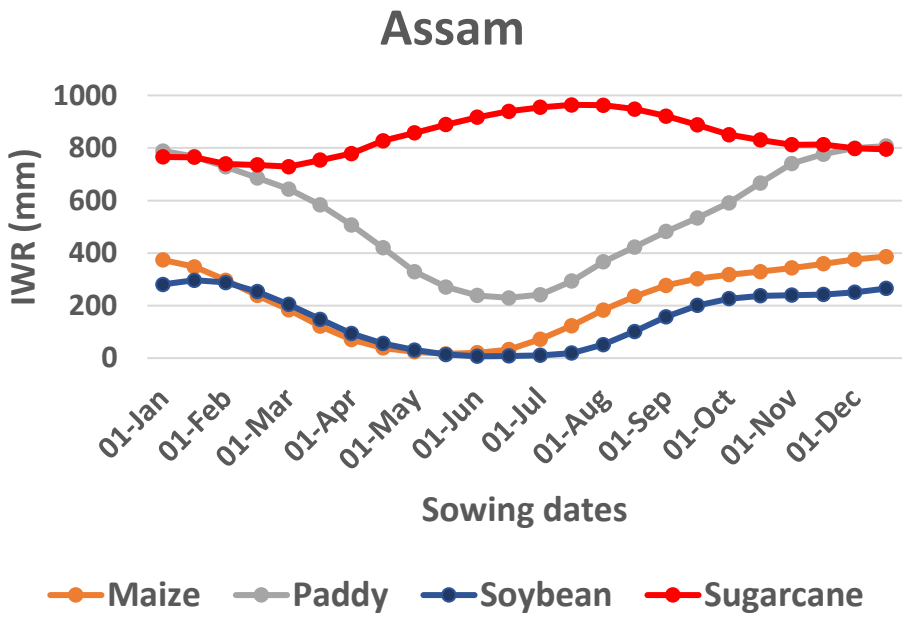

Fig 3: Variation of IWR for different crops in Assam

- Andhra Pradesh - suitable for growing **red gram and groundnut**

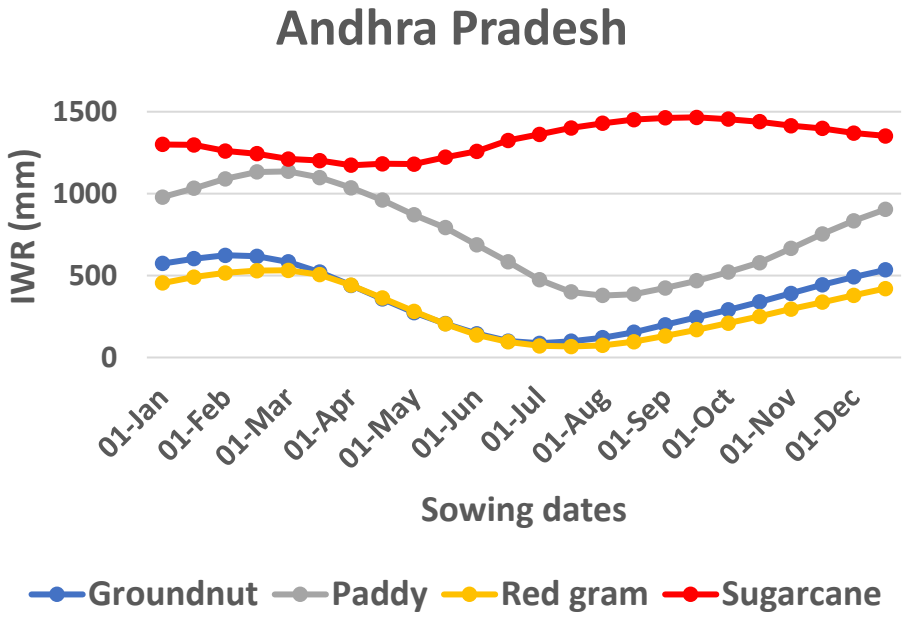

Fig 4: Variation of IWR for different crops in Andhra Pradesh

Results & discussion

- Assam - **Ideal state** for growing sugarcane

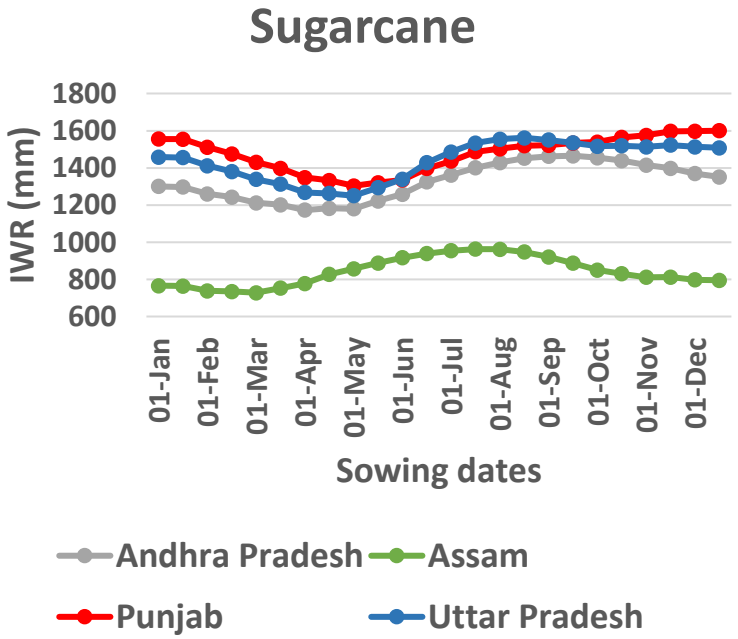

Fig 5: Variation of IWR for sugarcane in different states

- Punjab - **broad sowing window**

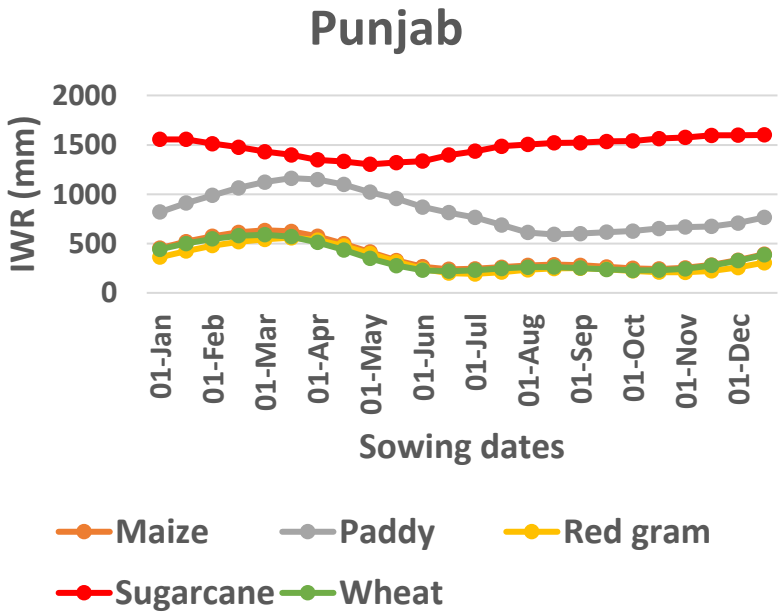

Fig 6: Variation of IWR for different crops in Punjab

- **No significant changes** in minimum IWR

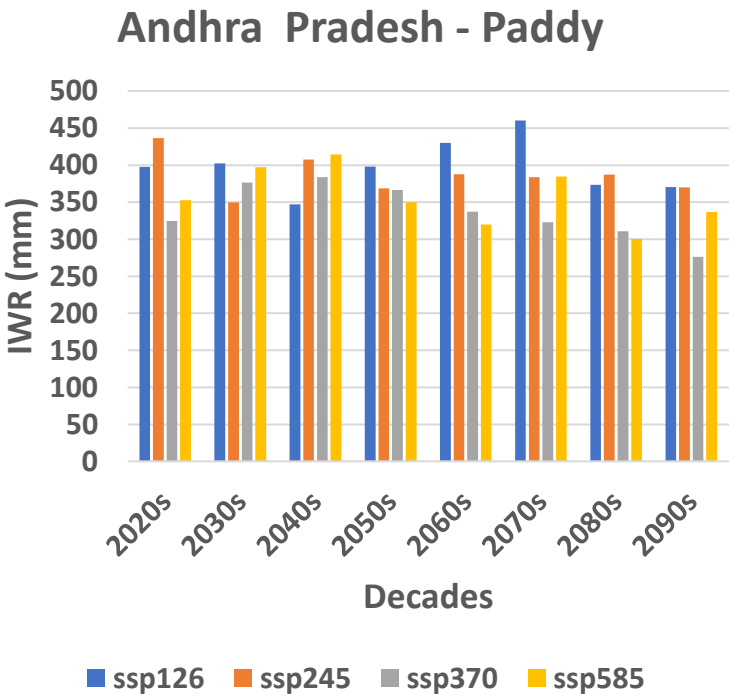

Fig 7: Variation of minimum IWR for different SSP scenarios in different decades

Conclusions & Future work

- Punjab - **broad sowing window**
- Assam - **least vulnerable state** for agriculture
- **Lesser variation** of IWR and optimal sowing window for sugarcane
- Optimal sowing window for **less water consuming crops** → similar
- Optimal sowing window for **paddy** in all the states → similar except Assam
- Assam requires → **half of water** (other states) for same crop production
- Study can be performed for **other regions** and on **finer scales.**

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