Gender Responsive Technology Assessment Index: Scaling Inclusive Climate Smart Interventions in Data-Limited Settings

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Leveraging the Agrifood System for Jobs

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Outline

- Introduction.
- Context and Research Gap.
- Objectives of the study.
- Conceptual Framework.
- Spatial Prioritisation and Scaling Methodology.
- Application to Climate Smart Interventions.
- Concluding Remarks.

Introduction

- Responsible scaling of agricultural interventions requires a nuanced understanding of technical, socioeconomic, and ecological contexts.

- A lower adoption rate of interventions is attributed to various factors, including preferences (Das et al., 2022; Khatri-Chhetri et al., 2019), budget constraints (Anderson et al., 2021), and limited access to resources (Rola-Rubzen et al., 2020).

- In particular, women farmers often face structural barriers, including unequal access to and control over productive resources, limited decision-making power, and restrictive gender norms, which further constrain their ability to adopt, benefit from, and scale agricultural interventions (Agarwal, 2018).

- Evaluating technologies based on gender responsive indicators helps inform ex-ante prioritisation when selecting among competing interventions.

Introduction- Knowledge gap

- Gender responsiveness in technology should be a paramount focus in both design and scaling.
- It is challenging to evaluate **pre-existing agricultural technologies** which were not designed with gender inclusion in mind; however, they provide a productivity or income boost..
- Although Gender Equality and Social Inclusion (GESI) frameworks are incorporated in project appraisals, only a few ex-ante prioritisation methods exist.
- The **intersectional dimension of division of labour**, age, class and caste is not included.
- **Spatial aspects of responsible scaling** and prioritisation are often ignored.
- Data limitations.

Objectives

1. To provide a **composite index-based framework** to assess the relative gender responsiveness of technologies and practices compared to conventional practice.

2. To derive two composite indices for **'cultivators' and 'agricultural labourers'** by accounting for the intersectionality of the division of labour in agriculture.

3. To illustrate a methodology for **spatial prioritisation of technologies based on the results of the gender-responsive assessment** to inform scaling of climate-smart interventions.

Technology Adoption in Agriculture

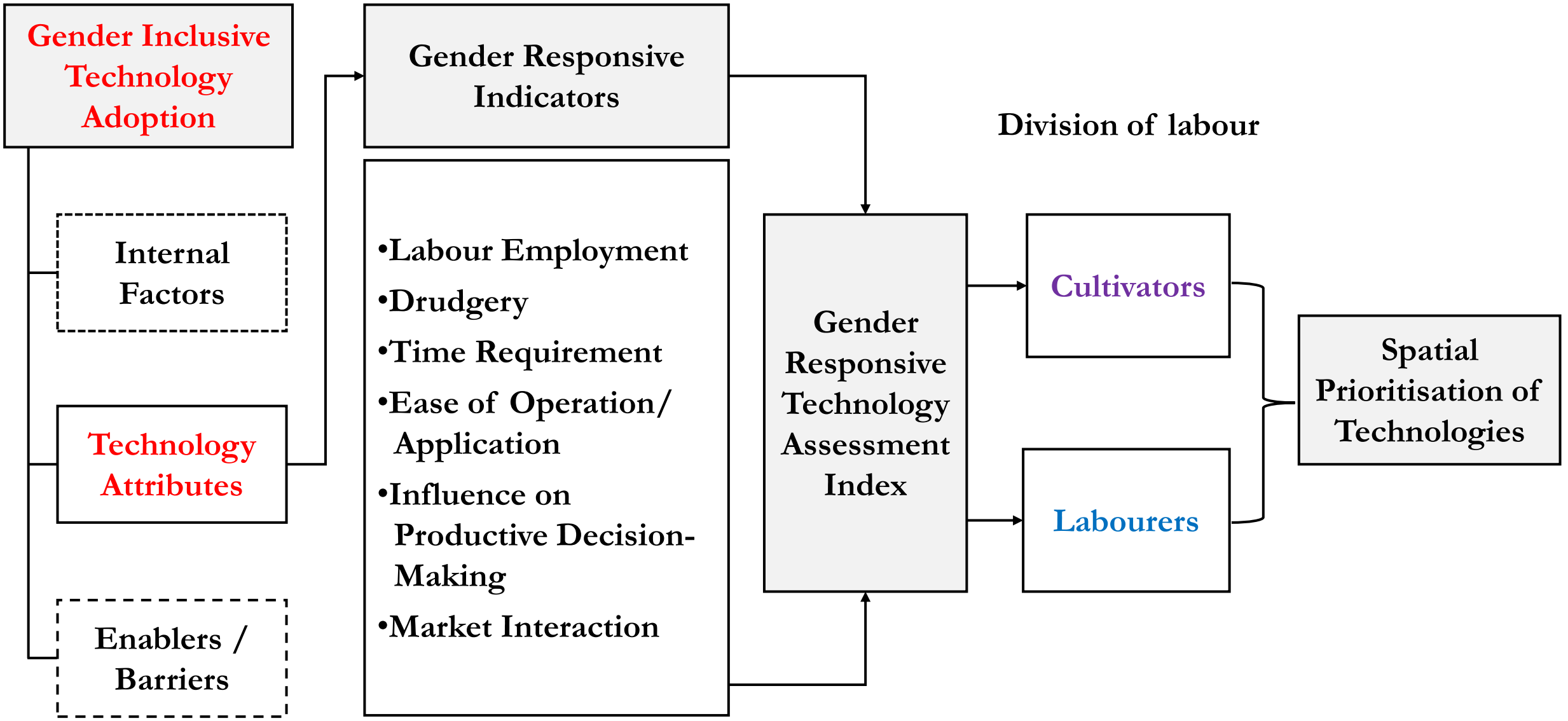
a) **Internal factor:** It includes intrinsic factors of the production context, such as cultural production practices and gender norms;

b) **Technology attributes:** It includes technical, structural, and operational characteristics of a technology, including suitability to specific crops; and

c) **External factors:** These factors include access to productive resources, information, and institutional support.

(Polar et al. (2017)

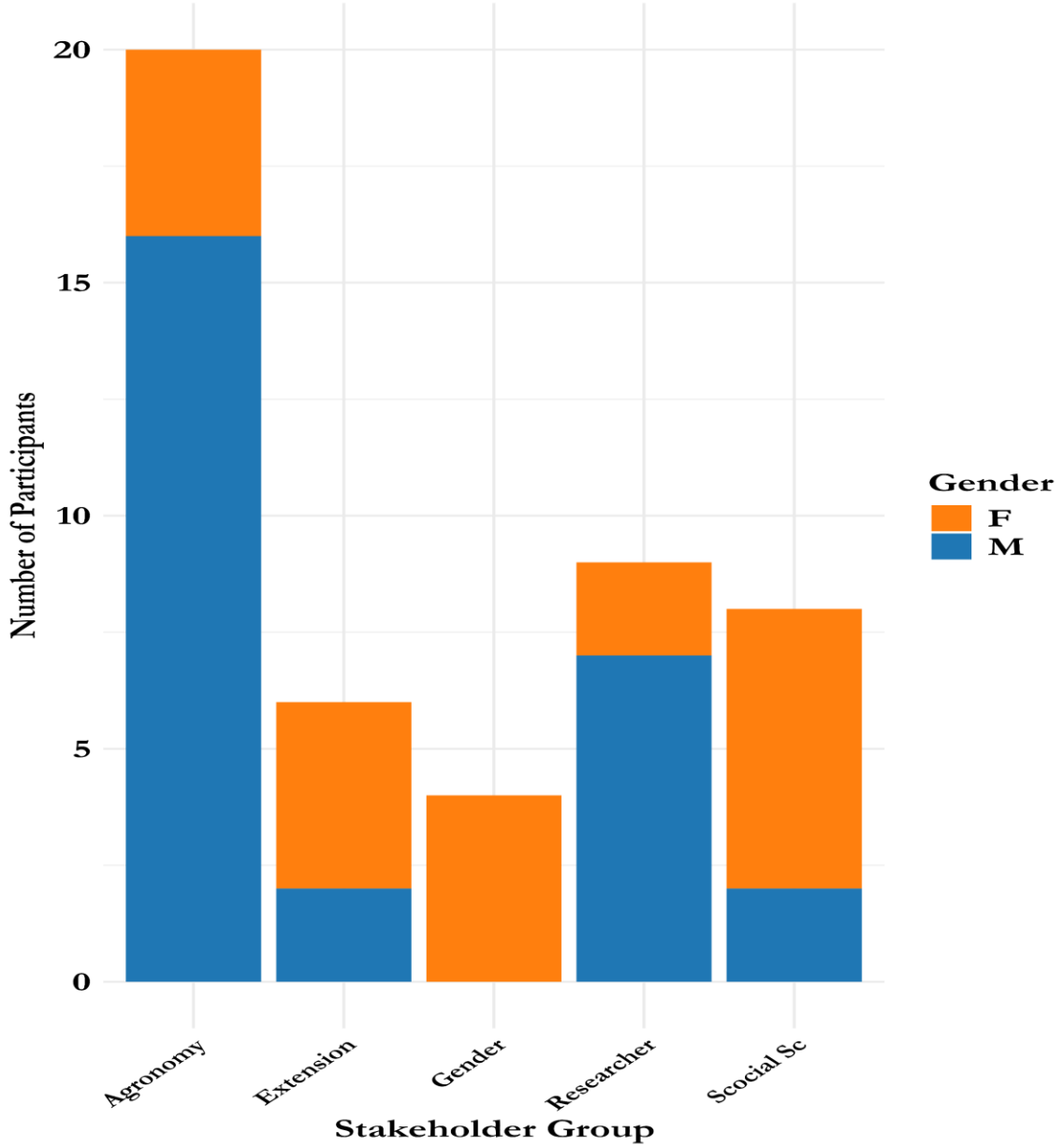
Conceptual Framework



Composite Index- Indicators and Weights

Indicators	Women-inclusive indicator	Cultivator		Labourer	
		Expected sign	Weight (%)	Expected sign	Weight (%)
1. Labour requirement	Increase/reduction in labour employment	-	24	+	40
2. Drudgery	Drudgery reduction	-	15	-	26
3. Labour time	Time saving	-	20	-	17
4. Ease of application	Easy to operate/apply	+	17	+	17
5. Decision-making	Enhanced opportunity of participation in productive decision-making	+	11	NA	
6. Market interaction	Decrease market dependency	-	13	NA	

Composite Index- Stakeholder Workshop



M= Male

F= Female

Composite Index- Indicators

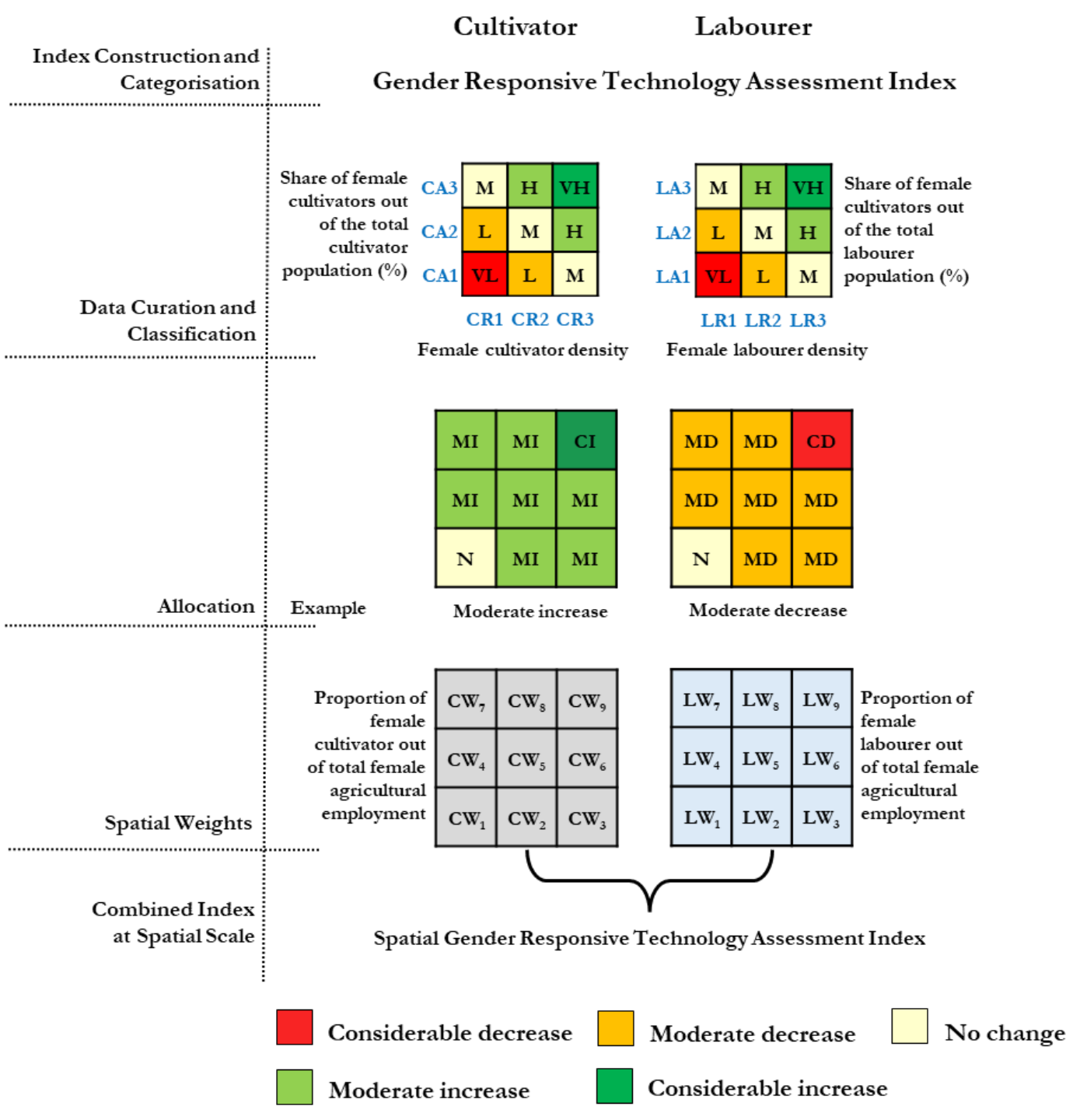
CSA Options	Labour requirement		Drudgery		Time requirement		Ease of operation		Influence on decision-making		Market Interaction	
	M	W	M	W	M	W	M	W	M	W	M	W
Machine interventions												
Zero tillage with residues	-3	-2	-3	-2	-3	-2	3	2	2	0.5	2	3
Direct-seeded rice	-1	-2.5	-1	-3	-1	-3	1	1.5	0.5	1	2	3
Precision land level	1	0	-1	0	-1	-1	-2	0	2	0	3	4
Non-machine interventions												
Alternate wetting and drying in Rice	1.5	2	2	0.5	2	2	1.5	1	2	1	1	1
System of rice intensification	2	1	2	1	1	1	-3	-1	2	1	0.5	0.5
Stress-tolerant varieties	0	0	0	0	1	0.5	0	0	2	1	1	2
Fertiliser management	0.5	0.5	0	0	0.5	0.5	0	0	1	1	1.5	2

M= Men, W= Women, Compare each intervention with conventional practice by score 1 to 5 (in either direction) and 0= No change

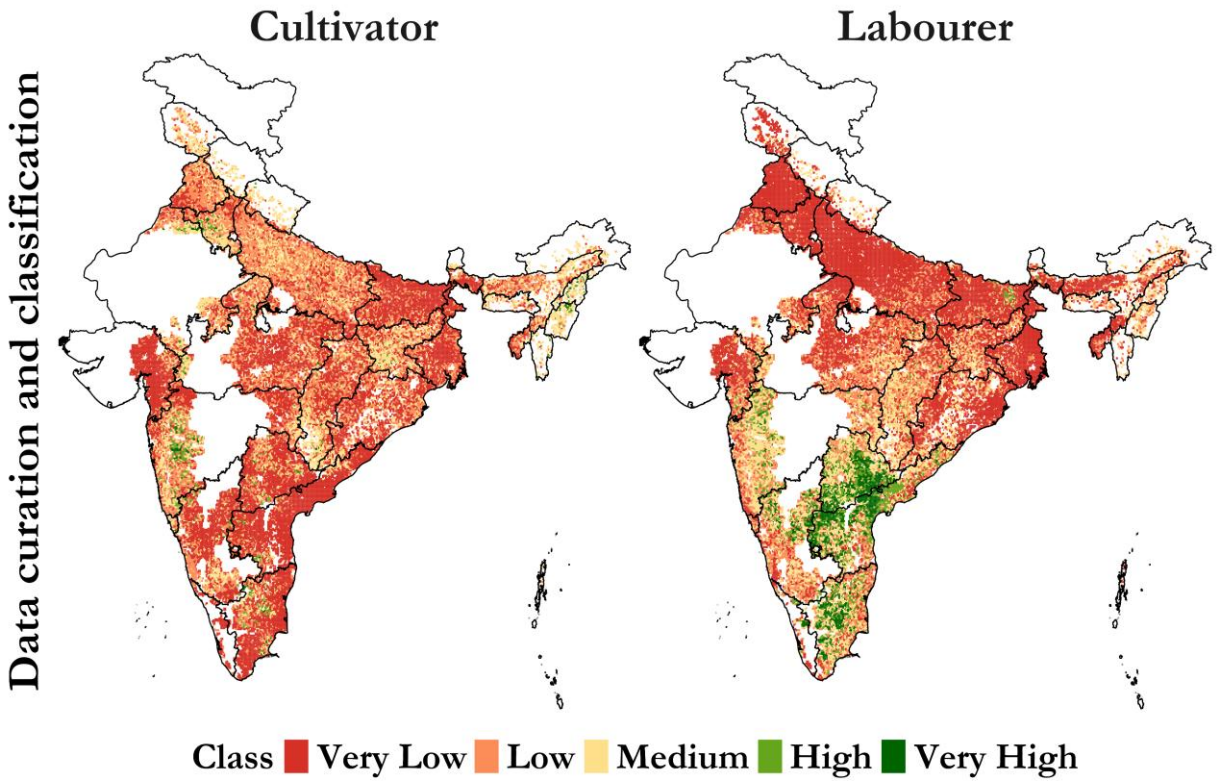
Composite Index- Women (Non Spatial)

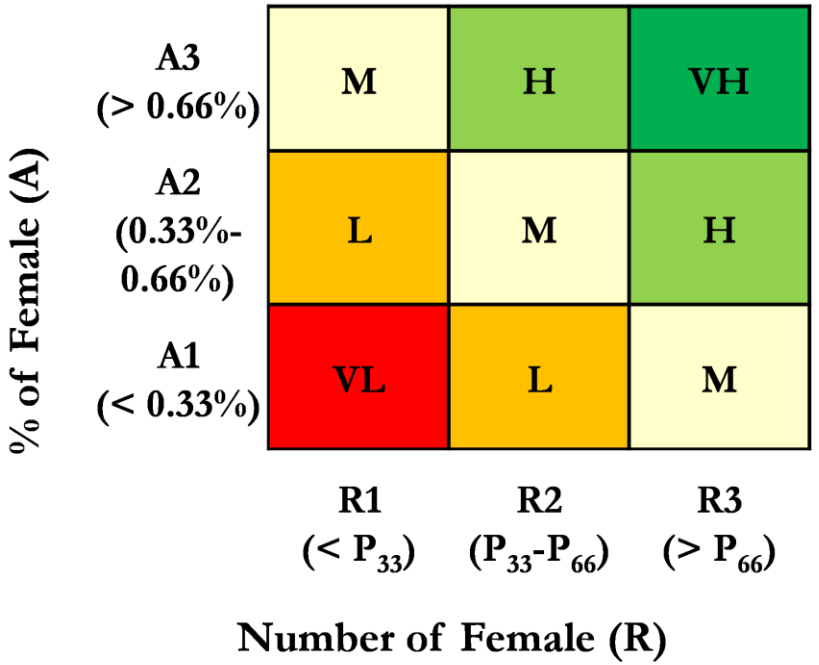
CSA Options	Women Cultivator		Women Labourer	
	Score	Class	Score	Class
Machine interventions				
Zero tillage with residues	1.18	Moderate increase	0.40	No change
Direct-seeded rice	1.62	Moderate increase	0.46	No change
Precision land level	-0.32	No change	0.17	No change
Non-machine interventions				
Alternate wetting and drying in rice	-0.8	Moderate decrease	0.5	Moderate increase
System of rice intensification	-0.75	Moderate decrease	-0.2	No change
Stress-tolerant varieties	-0.25	No change	-0.08	No change
Fertiliser management	-0.37	No change	0.11	No change

Methodological framework for Spatial Prioritization



Step 1: Two-way **classification** of population density and the female share of cultivators to the total cultivator population





Step 2: Allocation of Gender Responsive Technology Index

Direct Seeding of Rice

Cultivator

1.62

Labourer

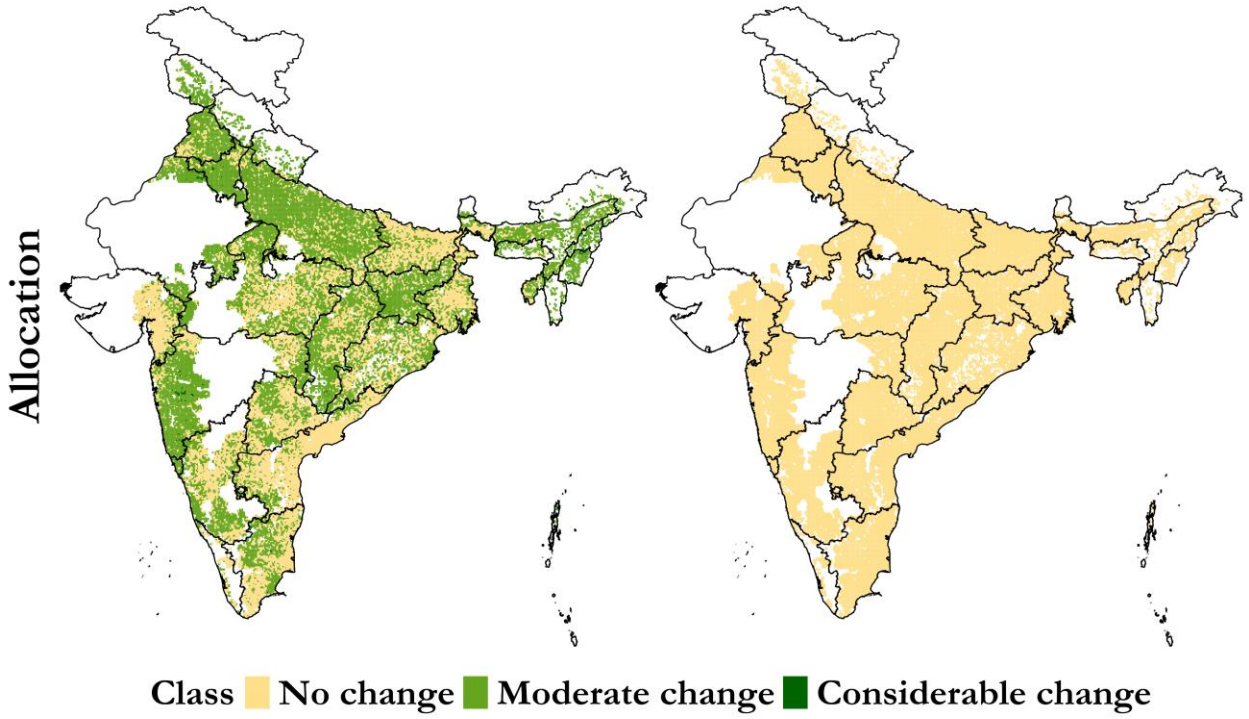
0.46

Moderate Increase

MI	MI	CI
MI	MI	MI
N	MI	MI

Neutral

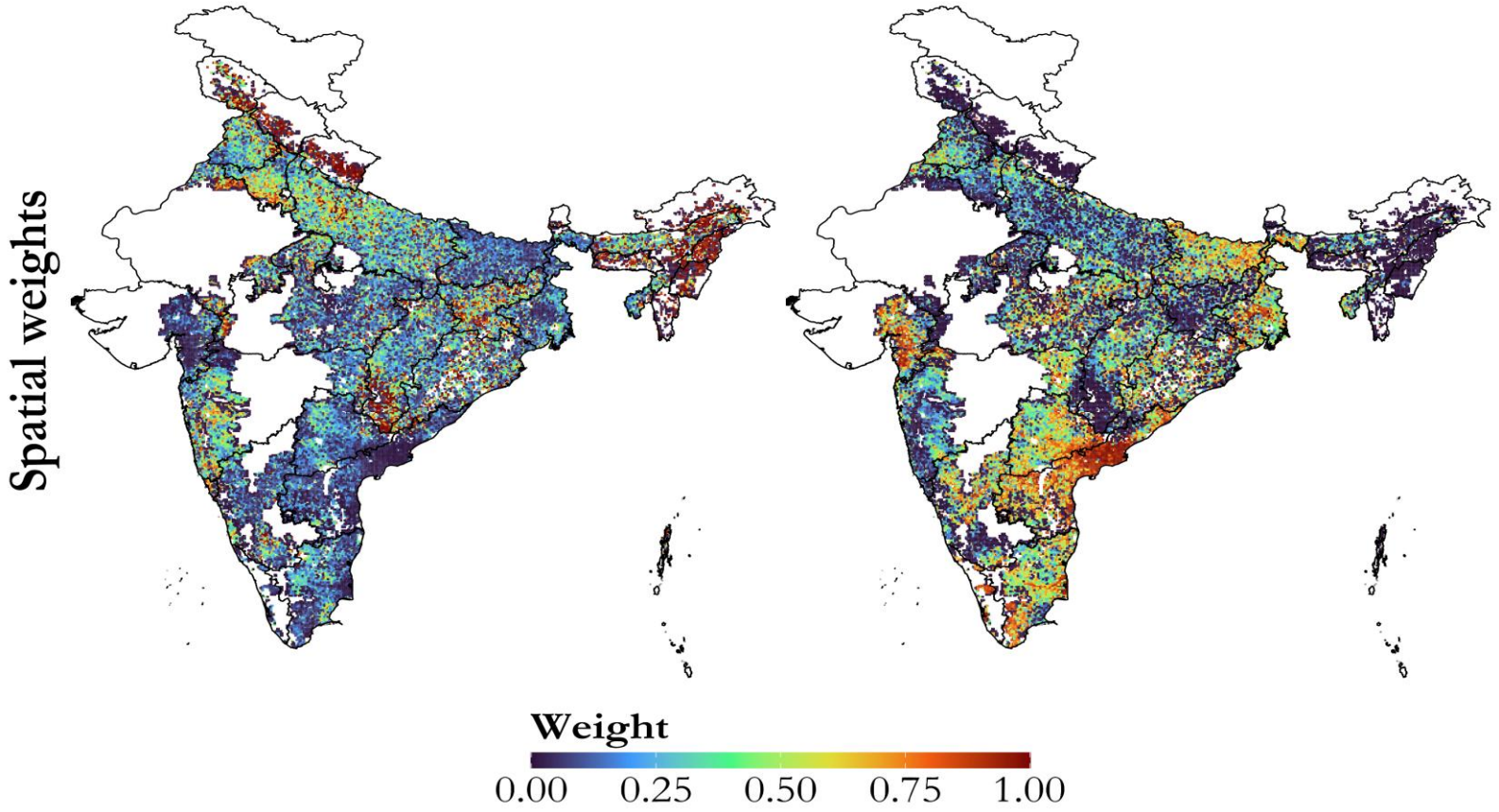
N	N	N
N	N	N
N	N	N



Cultivator **Labourer**

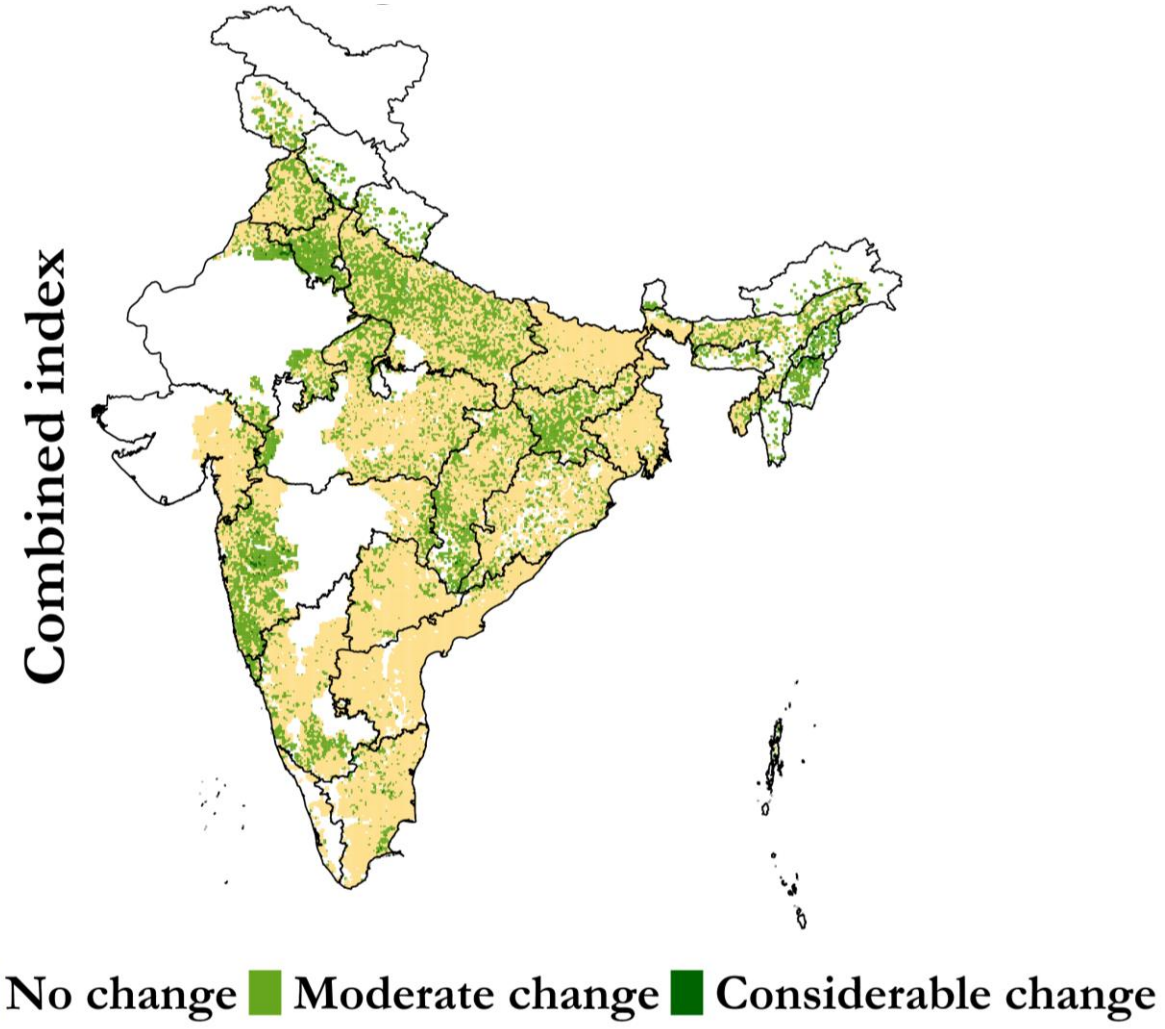
Considerable increase (CI), Moderate increase (MI), No change (N), Moderate decrease (MD), Considerable decrease (CD)

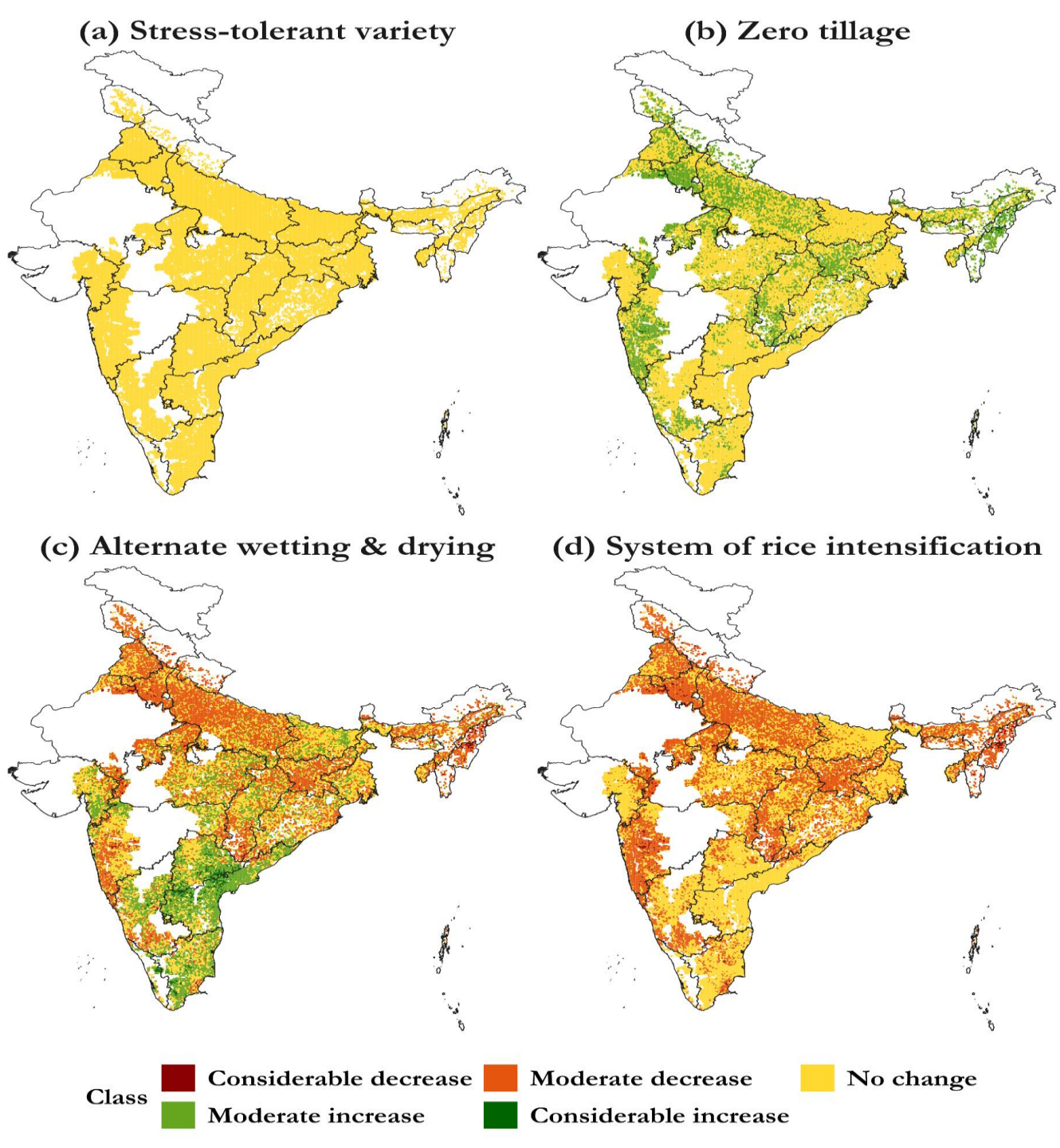
Step 3: Combining the two maps (Relative Weights)



Spatial weights are derived according to the share of cultivator/ labourer out of the total agricultural workers

Step 4: Gender Responsive Technology Assessment Index (Spatial)




(a) Stress-tolerant variety
(b) Zero tillage
(c) Alternate wetting & drying
(d) System of rice intensification
Class
Considerable decrease
Moderate decrease
No change
Moderate increase
Considerable increase

Summary

Our study advances the debate on gender and technology adoption in four key aspects:

- It introduces a **new index to conduct a gender-responsive assessment** of technologies and incorporates **intersectionality** by distinguishing livelihood groups such as cultivators and labourers.

- We propose a pathway for gender-responsive technology evaluation using spatially disaggregated data and develop a **spatial prioritisation framework** that remains effective even in data-scarce environments.

- To provide a real-world illustration, we apply this **spatial prioritisation framework to identify which climate-smart interventions** are most relevant for women farmers and conducive to gender-inclusive scaling in India.

Limitations

1. Our framework can only capture **technology-related attributes**. We could not account for internal factors and barriers, such as cultural factors and resource access. We conceptualise our framework solely in terms of technological attributes.

2. Stakeholder scores are determined by comparison with conventional practices. Therefore, we do not consider **existing gender inequities**.

3. The technology suitability index is based on stakeholder input regarding various indicators and their weights. Criticism of **stakeholder bias** is valid because stakeholders have differing experiences and knowledge.

4. **Cut-offs** for spatial categorisation of demographic indicators are subjective or data-driven. Because we propose a methodological workflow, these categorisations can be further refined.

Concluding Remarks

- This framework is **generalisable beyond CSA practices**, offering a basis for scaling any agricultural intervention according to its inclusiveness of women.

- The study underscores the need for **gender-disaggregated data** on key access dimensions, including credit, extension, and input use at granular scales to sharpen prioritisation. Where such **data are lacking**, the framework still demonstrates how spatial prioritisation can generate valuable insights for responsible and equitable scaling of agricultural technologies.
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- The proposed framework for **gender-inclusive, location-specific spatial prioritisation** would be valuable to policymakers and relevant stakeholders seeking to target interventions effectively. Mainstreaming gender-inclusive spatial prioritisation can inform existing national and sub-national planning tools for adaptation and CSA policy.

- Our proposed spatial prioritisation framework may help identify regions where trade-offs are more significant, thereby enabling a **robust GESI framework** to promote competing agricultural interventions.

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[version 1]

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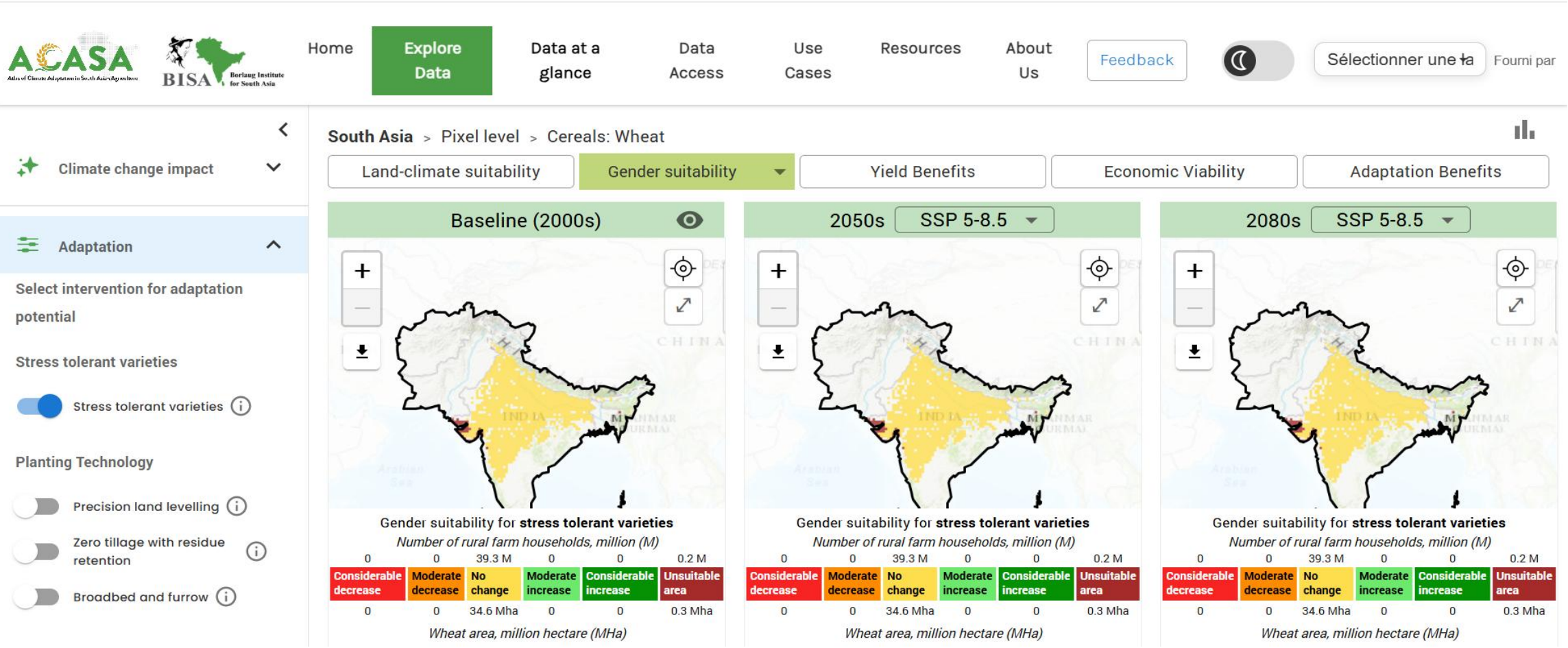
Atlas of Climate Adaptation in South Asian Agriculture (ACASA)



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