



Women's empowerment as an effective way to increase resilience to climate change

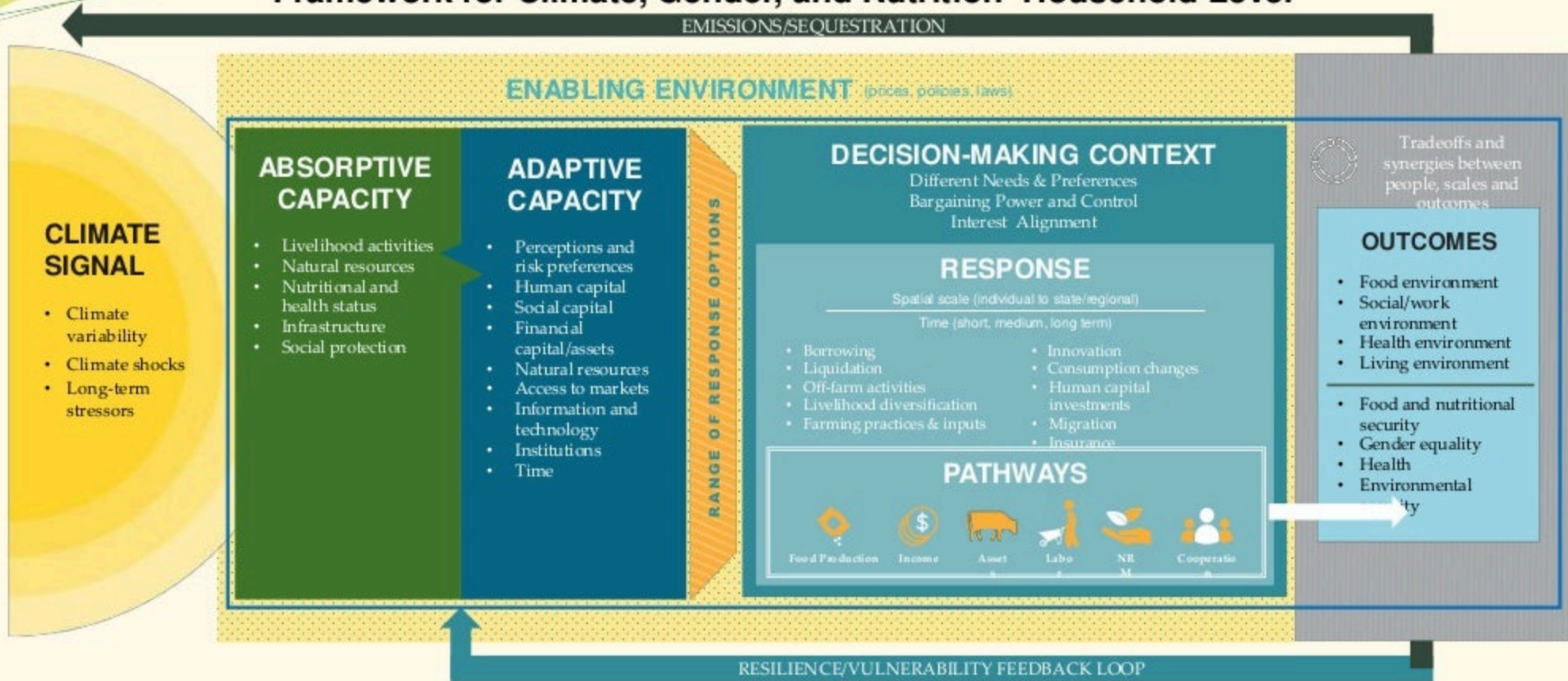
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Background

- USAID sponsored project : GENDER-RESPONSIVE AND CLIMATE-RESILIENT AGRICULTURE FOR NUTRITION (GCAN)
- Working at the intersection of climate change gender and nutrition to understand synergies, barriers, and unintended consequences
- The GCAN team developed an integrative framework that describes the linkages between nutrition, climate change and gender.

Framework for Climate, Gender, and Nutrition- Household Level

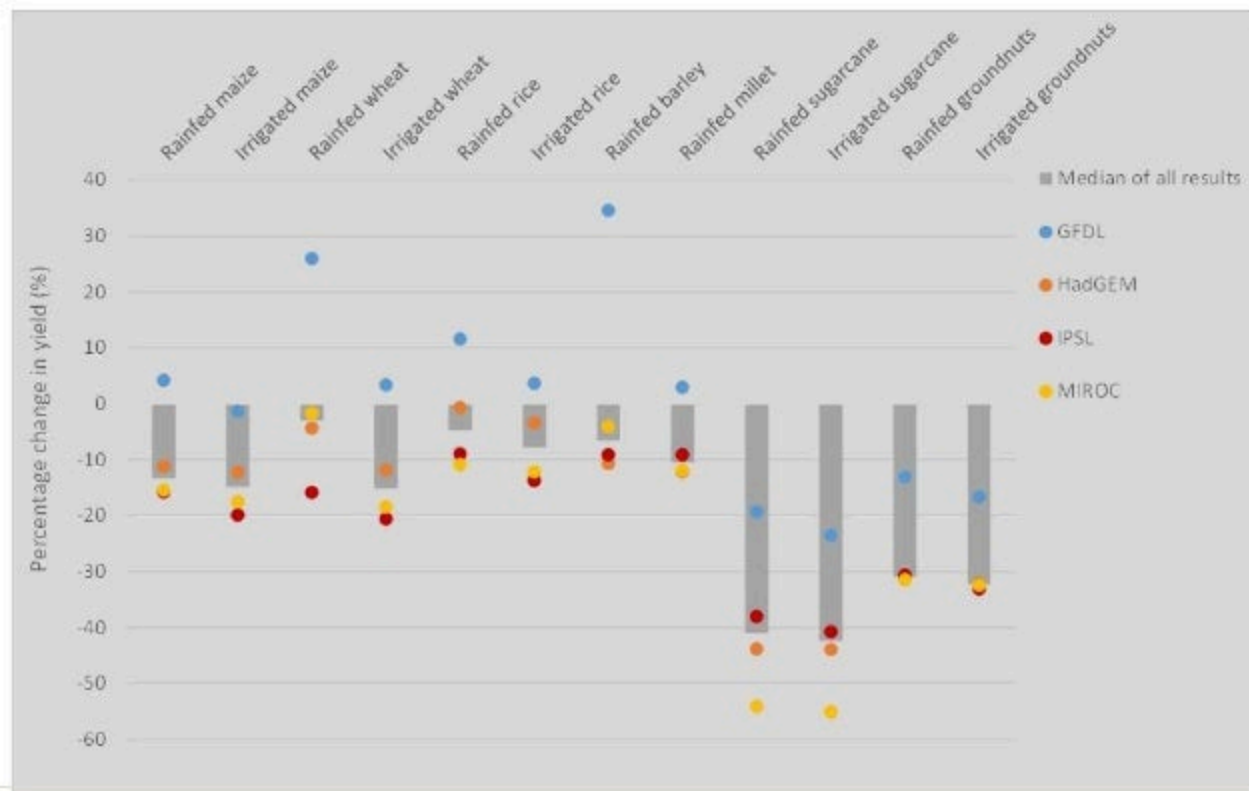


Elements inside the blue frame are influenced by gender and other social distinctions

Background

- Bangladesh is considered one of the most vulnerable countries to the impacts of climate change.
 - 40 million people remain food insecure and 11 million suffer from acute hunger (Osmani et al. 2016).
 - About 84% of the country's smallholders operate less than 1 ha of farmland and rice is the country's dominant crop (72% of cultivated land and 55% of agricultural value added)
 - Climate change will deteriorate the conditions in which smallholder farmers operate. New research finds that climate change will also affect the nutritional value of food products (FAO 2016b, Fanzo et al. 2017) and that some grains and legumes have lower concentrations of zinc and iron when grown under elevated CO₂ concentrations (Myers et al, 2014).

Multiple projections, a similar story



Percentage change in yields due to climate change based on four climate models, Years: 2000–2050. Source: Authors

Background – Crop diversification: Pros

- Production systems that drastically depart from monocropping and single cereal-based farming systems and favor ecologically diversified cropping system.
- Crop diversification and mixed farming systems can be used to optimize the use of land and productive inputs while reducing risk exposure and uncertainty in output.
- Crop diversification can be considered more robust and better suited to cope with future climate risks (Werners et al. 2007, Smit & Skinner, 2002). It has the potential to be a farm-level response to reduce exposure to climate-related risks (Bradshaw et al 2004; Huang et al. 2014; Mijatović et al 2013; Smit & Skinner, 2002).

Background – Crop diversification: Pros

- Diversified systems can contribute to avoid poor diet diversity, micronutrient deficiencies and the resulting malnutrition (Frison et al., 2006; Negin et al., 2009; Fanzo et al., 2013). Islam et al. (2018) have found that producing one additional crop or vegetable or fruit species leads to a 1.9% increase the dietary diversity score of a household.
- Other authors (Jones et al 2014, Sibhatu et al 2014, Kumar et al 2015, Heady and Hoddinott 2015) also find that more diverse production systems may contribute to dietary diversity and better nutrition outcomes.
- Diversification also generates employment opportunities and contribute to the increase in incomes of smallholder farmers (FAO 2012, Islam et al. 2018, Osmani et al. 2016).

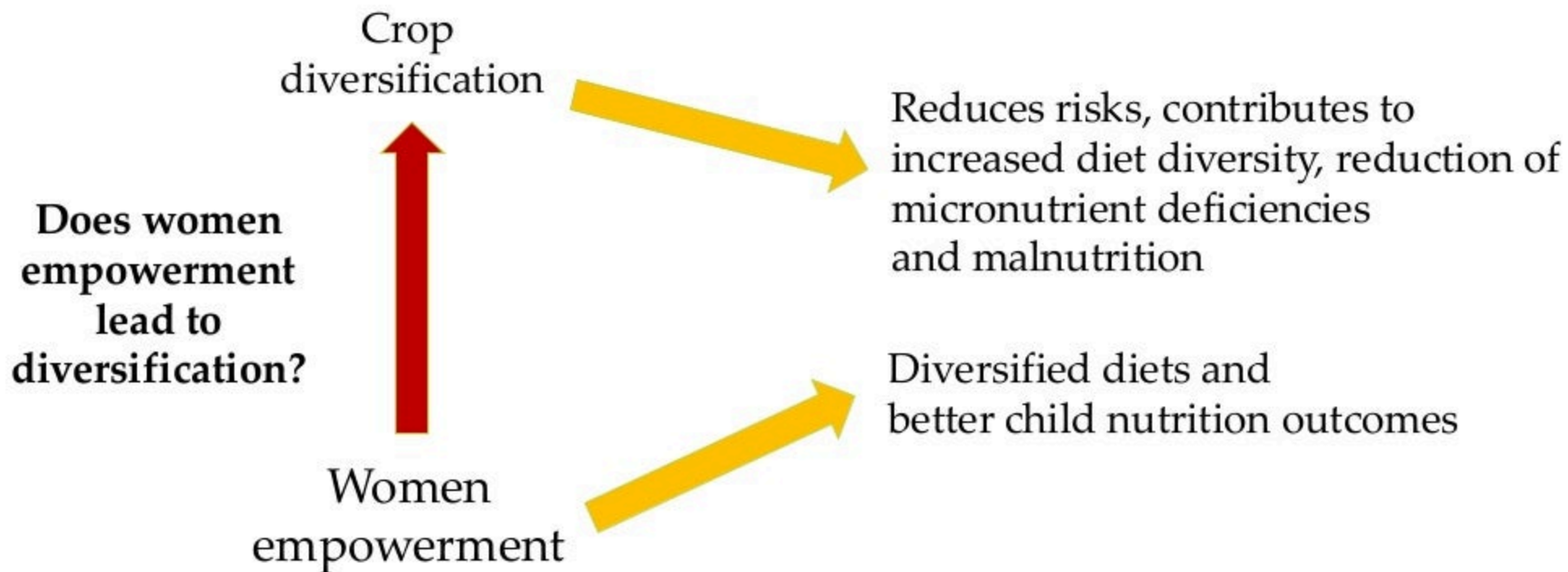
Background – Crop diversification: Cons

- People nutritional status does not depend solely on their own production; efficient production of staple food items or cash crops might improve households' incomes with the ultimate effect of diversifying and stabilizing consumption (Ruel, 2003; FAO, 2012; Darrouzet-Nardi and Masters 2015; Passarelli et al. 2018).
- Subhatu et al. (2015) found that the relationship between production diversity and diet diversity depends on the already existing level of production diversity—in some contexts excessive diversification leads to losses in dietary diversity due to lack of income from specialization of production.
- It can be labor intensive and knowledge intensive

Background – Women Empowerment and Nutrition Outcomes

- A growing body of evidence demonstrates positive linkages between women's empowerment and improved diets and nutrition outcomes (Cunningham et al. 2015; Ruel, Quisumbing, and Balagamwala 2018; Malapit and Quisumbing 2015, Sraboni et al. 2014, Sraboni and Quisumbing 2018). The mechanisms through which these impacts are achieved are not always clear.
- There are contexts in which nutrition outcomes appear to be dependent on women's roles in agriculture, decision-making authority, control over income, and preferences (Meinzen-Dick et al. 2012; Ruel and Alderman 2013; and Ruel, Quisumbing and Balagamwala 2018).

In Summary: Paper's Objective



Data

- The data used to estimate the land use models is obtained from the Bangladesh Integrated Household Survey (BIHS) data collected in 2015, managed by IFPRI. The total sample size for the BIHS is 6715 households. It has a WEAI component.
- For our modeling purposes, we group all the declared crops into four categories: cereals, vegetables, fruits, and all others uses.
- The survey indicates that most of farmland is allocated to cereals (66%). The other crop categories trail substantially with vegetables occupying 9% of farmland, fruits less than 1% and other uses 25%.

Methods

- Econometric model:

$$GSI = \underbrace{\beta_1 X_1, \dots, \beta_n X_n}$$

**Gini-Simpson Index
(a diversity index)**

A set of household characteristics

We use simple OLS to test the explanatory power of a household characteristics including women empowerment

Methods

- Econometric model:

$$s_j^* = \frac{\exp[s(R_j, C_j, W, A, \Omega_j)]}{\sum_{i=1}^J \exp[s(R_i, C_i, W, A, \Omega_i)]}$$

Shares: area allocated to crops

**Function of revenues, costs,
Revenue volatility, wealth, assets,
Household characteristics**

We use a fractional multinomial logit model gain insights into how household characteristics including women empowerment explain farmland allocations

Results

- No direct correlation between the GSI and the WEAI (correlation value: -0.0062) but.....
- Strong significance in the OLS regression

Parameters	Estimates
Intercept	0.7286 (.)
Number of Household Members	-0.1158 (*)
Highest level of educations	0.0287
Total farm size	0.0377 (***)
Empowerment score	2.7310 (***)
Off-farm profit	-1.4920
Value of farm assets	2.680 (*)
R ²	0.3172

Note: significance codes: (***) 0.001; (**) 0.01; (*) 0.05; (.) 0.1

Results

- More complicated results for the fractional multinomial logit model. Most estimates seems to behave as expected

	Cereals	Vegetables	Fruits
Constant	11.6916**	2.4737**	2.7594*
Gross revenue	7.6919**	2.4553*	4.3853***
Revenue variability	-4.1202**	0.3003	-6.5980**
Labor cost	0.1398***	-0.0211*	0.0339***
Urea cost	-0.7149*	-0.5398**	-0.3151**
Farm area	0.0273***	0.0002	0.0196**
Value of farm assets	-0.0042**	0.0001*	0.0025*
Off-farm revenues	-0.0209*	0.0553*	0.0118*
Number of household members	-0.7280*	0.8507***	-0.6221*
Highest education level	-0.7587**	0.1995*	-0.1616**
Max. Temperature	-2.5687*	-0.7009**	-0.9199*

Results

- More complicated results for the fractional multinomial logit model

		Cereals	Vegetables	Fruits
Model 1	Empowerment score	-18.2154**	-2.2057**	1.8339*

Results

- In Model 1 improvements in women's empowerment are associated with decreases in land allocated to cereals and vegetables and increases in land allocated to fruits and other uses. Given that most of the farmland is allocated to cereals, these results support the OLS results.
- Model 2 provides insight into two mechanisms that might affect crop allocations both of which relate to women's bargaining position within the household. Interestingly, the two mechanisms appear to operate in opposing directions. **Wealthier women tend to work in home-based economic activities and wealthier women exhibit less say in planting decisions(?)**

Conclusion

- Both econometric models support the hypothesis that increasing the women's empowerment index leads to land to shift away from cereal production. We can infer that this leads to lower risk exposure to climate change. We can speculate that this leads to a greater availability of nutrients.
- Results of Model 2 provides some lesson in how to use the WEAI in empirical research. Different WEAI components can produce opposite results and provide important nuance for contextualizing overall results.

Thank you

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RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security

