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

Alex De Pinto, Senior Research Fellow
with Greg Seymour and Elizabeth Bryan
Environment and Production Technology Division,
International Food Policy Research Institute

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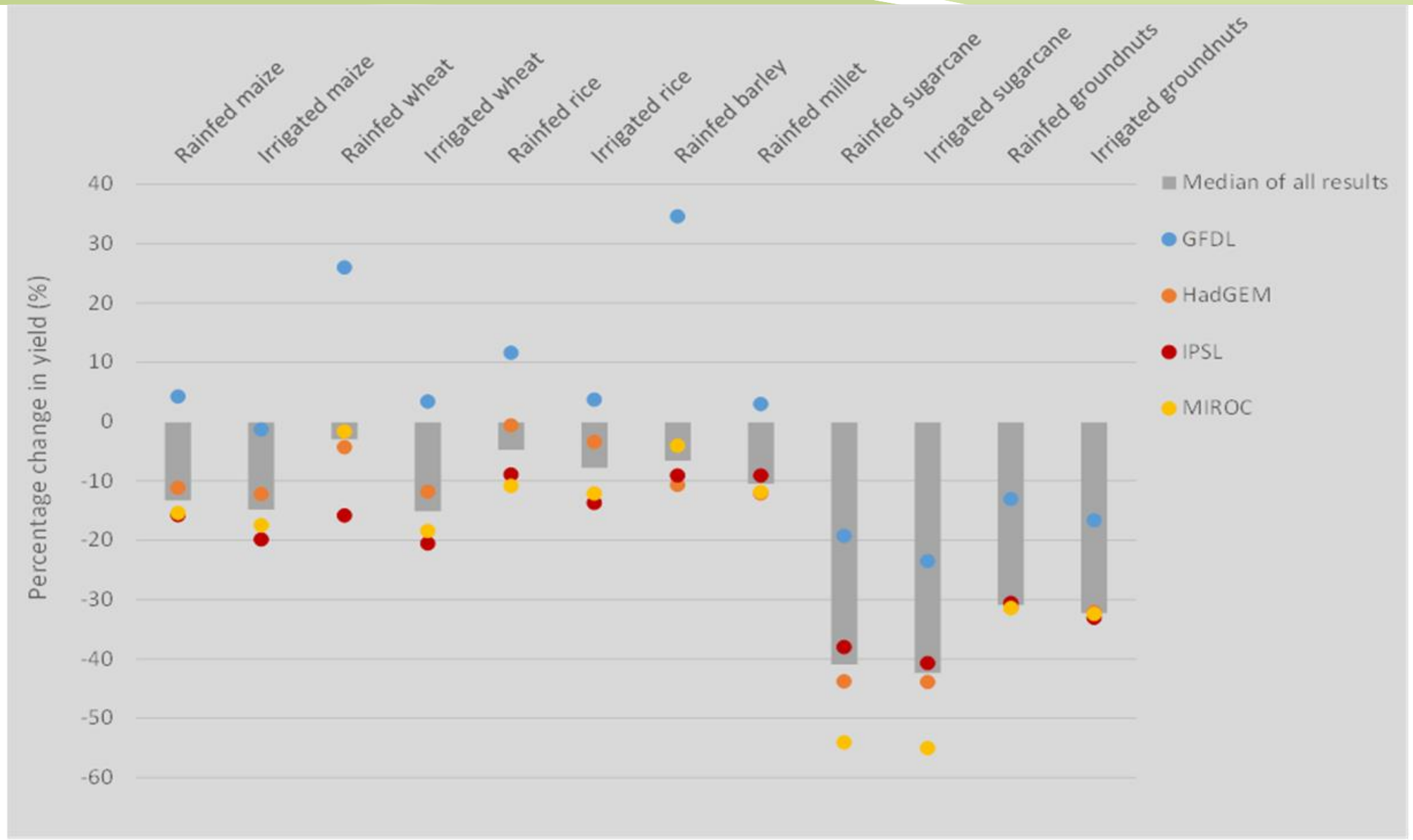


Percentage change in yields due to climate change based on four climate models, Years: 2000–2050. Source: Authors

Background – Crop diversification: Pros

- Crop diversification and mixed farming systems can optimize the use of land and productive inputs while reducing risk exposure and uncertainty in output.
- Crop diversification is more robust and better suited to cope with future climate risks (Smit & Skinner, 2002; Bradshaw et al 2004; Werners et al. 2007; Huang et al. 2014; Mijatović et al 2013).
- Diversified systems can contribute to avoid poor diet diversity, micronutrient deficiencies and lead to better nutrition outcomes (Frison et al., 2006; Negin et al., 2009; Fanzo et al., 2013;Jones et al 2014, Sibhatu et al 2014, Kumar et al 2015, Heady and Hoddinott 2015)

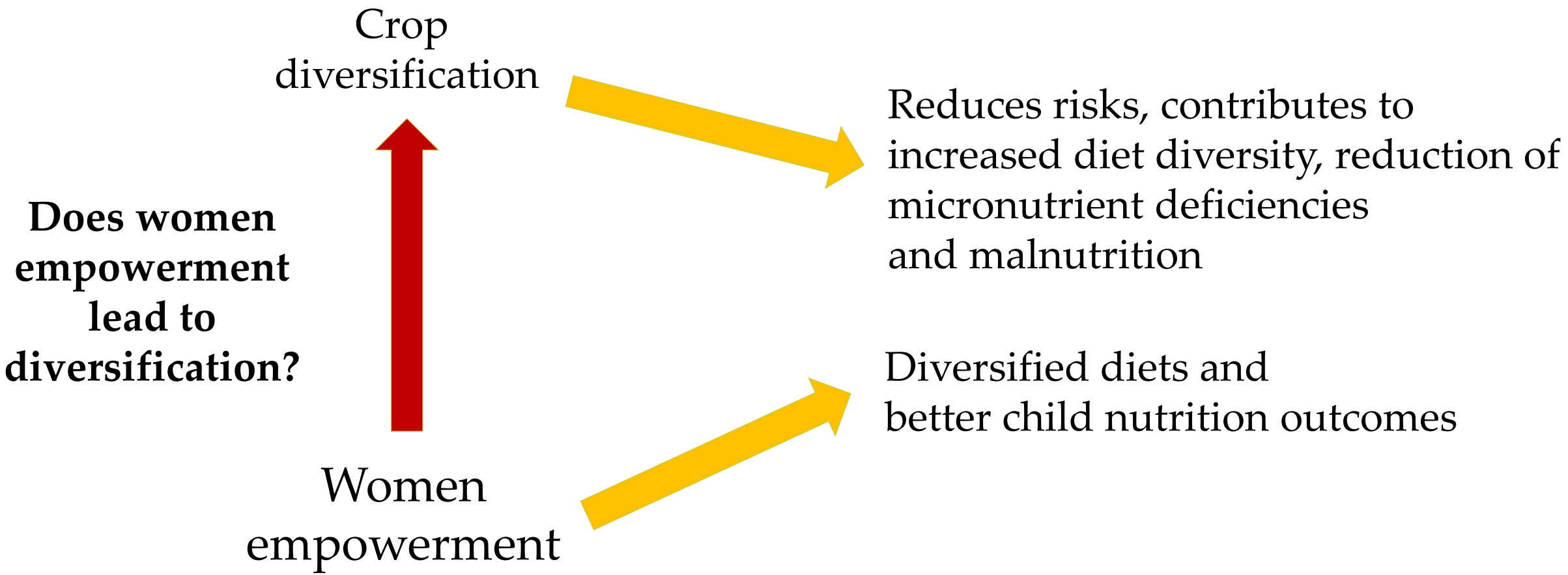
Background – Crop diversification: Cons

- 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 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).
- 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.
- 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:

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

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:

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

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. Four categories: cereals, vegetables, fruits, and all others uses.

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

- 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.
- **Favoring women empowerment helps achieving crop diversification.**

Results

- Things are more complicated as the women empowerment index is disaggregated.
- Model 2 provides insight into three mechanisms that might affect crop allocations all of which relate to women's bargaining position within the household. Interestingly, some of them appear to operate in opposing directions.
- **Promoting group membership appears provide be the strongest pathway out of cereals in favor of other uses.**

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

a.depinto@cgiar.org