**Women’s empowerment and trait preferences in Bangladesh[[1]](#footnote-0)**

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**Abstract**

*[250 words]*

**Keywords:** WEAI, trait preferences, BIHS

1. **Introduction**
2. **Background and context**
   1. **Linking women’s empowerment and trait preferences**
   2. **Women’s participation in agriculture in Bangladesh**
3. **Data**
   1. **Bangladesh Integrated Household Survey (BIHS)**

This analysis is based on the three rounds of the Bangladesh Integrated Household Survey (BIHS), which were administered in 2011, 2015 and 2018 under the guidance of the International Food Policy Research Institute (IFPRI). Designed to monitor the progress of the US Government’s Feed the Future initiative in Bangladesh, the BIHS is performed in 64 districts, and it is nationally representative of rural areas (Seymour, 2017). The first wave of BIHS followed a two-stage stratified: in the first stage, the selection of primary sampling units (village) within each administrative division in Bangladesh was based on the probability proportional to the total number of households in each village, derived by the 2001 population census. In the second stage, 20 households were randomly selected from each village. This process resulted into approximately 6,500 households surveyed in 325 primary sampling units (Sraboni et al. 2013). Subsequent rounds of the survey in 2015 and 2018 interviewed the same respondents to form a panel dataset.

Teams comprising male and female enumerators conducted one-on-one interviews with the self-identified, primary adult male and female decision makers for each household: a male enumerator interviewed the man (usually the household head), and a female enumerator interviewed the woman (typically the wife of the head of the household). The overall survey is composed by 27 separate modules, which collect comprehensive data on, among others, plot-level agricultural production and performs, dietary consumption of all household members, economic shocks, and women’s status. This paper primarily uses two modules: agriculture and women’s empowerment in agriculture (WEAI) index. The former module was answered solely by the self-identified, primary adult decision maker (male or female) in each household, while the module on women’s empowerment was employed to interview both household head and spouse[[2]](#footnote-1).

Attrition rate among baseline and endline rounds was low: 4.41% between 2011 – 2015 and 14% between 2015 – 2018. To assemble the panel dataset for this study, we relied on the unique household identification number contained in the household roster module; for households which have split between the three rounds of survey (e.g., due to marriage of an adult), the original household identification number is reported with decimal places[[3]](#footnote-2), where \*\*.1 denote the parent household (i.e., originally interviewed at baseline). As we aim to measure trait preference changes within same household units across years, we opt for keeping only the originally interviewed parent household (Ahmed, 2016). This reduces our final sample to 5,076 observations. Furthermore, the first BIHS round does not contain information on respondents’ trait preferences for each crop harvested in the previous season: being it a key outcome in our analysis, our econometric model relies predominantly on the second and the third round, restricting our array of observations to 3,384. However, to mitigate issues of endogeneity, we present a third model specification (eq. 3) which requires variables lagged from the first BIHS round (thus employing all the 5,076 observations). Table 1 summarises relevant household characteristics for each of the three BIHS rounds.

Table 1 | Summary of household characteristics for each BIHS round

|  | Panel | Round 1 (2011) | Round 2 (2015) | Round 3 (2018) |
| --- | --- | --- | --- | --- |
| Women among Ag.PDM\* (%) |  |  |  |  |
| Age of Ag.PDM |  |  |  |  |
| Education of Ag.PDM |  |  |  |  |
| Household size |  |  |  |  |
| Number of plots per household |  |  |  |  |
| Plot size |  |  |  |  |
| Households (number) | 5.076 | 1.692 | 1.692 | 1.692 |
| *If not otherwise specified, it is reported the mean with standard deviation in parenthesis.*  *\*Ag.PDM = Agricultural primary decision maker.* | | | | |

* 1. **Women's Empowerment in Agriculture Index (WEAI)**

The WEAI is a survey-based index that uses individual-level data collected from the primary male and female decision-makers within the same households to measure respondents’ empowerment in their roles and engagement across five domains (production, resources, income, leadership, and time allocation) within the agriculture sector (Alkire et al., 2013).Launched in February 2012 by IFPRI, Oxford Poverty, Human Development Initiative, and Feed the Future by the United States Agency for International Development (USAID), WEAI is a remarkably comprehensive and standardized tool to directly measure women’s empowerment and inclusion in rural areas. The index is measured in terms of two metrics: the empowerment score and the empowerment gap. The first represent a weighted sum of primary female decision-maker’s achievement of empowerment across ten indicators belonging to the five domains previously listed (full listed present in the table A1 in the appendix). Complementarily, the empowerment gap captures the difference in the empowerment scores of the primary female decision-maker and her spouse; it takes a value of zero if a woman’s empowerment score is greater than or equal to that of her spouse. To compute the two WEAI metrics, we rely on the resources and instruments freely downloadable at the IFPRI website[[4]](#footnote-3) (for a comprehensive review of the tool and its composition, refer to Alkire et al., 2013).

This study employs both the empowerment score and the empowerment gap as variables of interest.

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Graphical user interface

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Fig. 1 | Average GPI in each district of Bangladesh (2011 and 2018)

* 1. **Trait preferences**

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Fig. 2 | First most preferred seed trait in each crop group, per gender and year

Chart

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Fig. 3 | Second most preferred seed trait in each crop group, per gender and year

BIHS contains data of trait preferences (first and second, in order of importance) at the plot level for the round 2015 and 2018, for each group of crops and for each harvesting season (i.e., *aman* (or *kharif* 2), *aus* (or *kharif* 1), *boro* and annual). In the need to reconcile this richness of data at the plot level with the WEAI measurements at the household level, we expressed our outcome of interest as follow:

For each household *i* and for each crop group *j* in year *y* (2015 and 2018), we take the trait preference *T* of order *k* (first or second for importance) which registers the highest frequency across all season *s*. We use the across season specification, as trait preferences expressed for *kharif 1* and annual crops contain numerous missing data. Nonetheless, as trait preferences might vary according to the season in which the crop is harvested, in the empirical specification we control for the the season in which the crop is harvested.

1. **Empirical specification**

In our empirical analysis, we are interested in understanding how changes in women’s empowerment relate to changes in trait priorities in Bangladesh. Our empirical specification links the women’s empowerment to the outcome of interest, as follows:

where is the variable defining trait preferences for respondent *i* at time *t*. This outcome is based on trait preferences for crop groups, using the first and second most important traits for household’s agricultural primary decision maker in the years 2015 and 2018.

Following the discussion in section 2, our variable of interest is which measures the women’s empowerment in agriculture index for respondent *i* at time *t*. is a vector of household-specific controls drawn from the BIHS data. Standard errors are clustered at the district level, as we imagine observations within each district are reasonably not independently distributed. The estimation sample consists of a balanced panel covering 3,384 observations over two rounds (2015 and 2018) of the Bangladesh Integrated Household Survey (Table 1).

Equation 1 will be correctly identified under restrictive conditions, i.e. that changes in the women’s empowerment is not influenced by existing trait preferences and that no other factors are influencing change in trait preferences beyond women’s empowerment. These assumptions can arguably be questioned under different circumstances: not only can trait priorities influence power dynamics within households, but the same could be said for some (omitted) variables that we cannot precisely account for in our analysis. In what follows, we try to address both issues while being aware that – absent an experimental setting – causal interpretation of the findings could be hard to achieve in our case.

In order to deal with endogeneity, we include individual () and year () fixed effects (eq. 2). Fixed effects at the respondents’ level clean the estimation from all time constant demographic, skill, and attitudinal differences. These respondents’ fixed effects also capture average differences in soil quality and climate across farms, which might influence changes in trait preferences. In a similar fashion, time fixed effects control for year – specific differences. Also in this case, standard errors are clustered at the district level.

Time-variant (omitted) variables remain uncaptured by equation 2. In the quest for mitigating time-variant sources of endogeneity, the use of the variable of interest in its lagged form remains common in economics (Blundell and Bond, 2000; Wang and Bellemare, 2019). In cases when lagged explanatory variables have no direct causal effect on the dependent variable or on the unobserved confounders, this method proves effective in mitigating the endogeneity problem (Wang and Bellemare, 2019). In our exercise, we rely on the first wave of BIHS to compute the lagged women’s empowerment in agriculture index in the year 2011 (eq. 3).

This lagged instrument is strongly correlated with the variable of interest (Table XX), but it is dubious, even though potentially plausible, whether the instrument is exogenous to trait preferences shown by respondents both in 2015 and in 2018. Therefore, we interpret cautiously results from eq. 3, as suggested by Wang and Bellemare, 2019.

1. **Results**

Table 2 | Coefficient for first trait preference, fixed effects Poisson model

|  | *Dependent variable* | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **First trait preference\*** | | | | | | | |
|  | **Cereal** | **Fiber** | **Pulses** | **Oil** | **Spices** | **Vegetables** | **Fruits** | **Other** |
|  |  |  |  |  |  |  |  |  |
| **GPI** | **2.12\*\*\***  (0.27) | **1.81\*\***  (0.79) | **2.94\*\*\***  (0.71) | -0.84  (0.92) | **3.46\*\*\***  (1.08) | **2.27\*\*\***  (0.87) | -1.26  (4.30) | **1.24\***  (0.74) |
|  |  |  |  |  |  |  |  |  |
| Sex of Ag.PDM | -0.16\*\*  (0.07) | 0.56\*\*\*  (0.16) | -0.33\*  (0.18) | -0.80\*\*  (0.42) | 0.10  (0.35) | -1.37\*\*\*  (0.46) | - | -0.71  (0.70) |
| Age of Ag.PDM | -0.004  (0.006) | -0.001  (0.002) | -0.003  (0.001) | -0.05\*  (0.002) | -0.003  (0.002) | -0.007\*\*\*  (0.002) | 0.002  (0.005) | 0.0008  (0.002) |
| Literacy of Ag.PDM  *(baseline: illiterate)*  can sign only  can read only  can read and write | 0.04\*\*  (0.02)  -1.48\*\*  (0.70)  -0.01  (0.02) | -0.04  (0.07)  -  -0.13\*  (0.07) | -0.01  (0.06)  -  -0.02  (0.06) | 0.25\*\*\*  (0.08)  -  -0.20\*\*  (0.08) | 0.15\*  (0.07)  -  0.05  (0.07) | 0.14\*\*  (0.07)  -  0.08  (0.07) | 0.43  (0.32)  -  0.60\*\*  (0.30) | 0.52\*\*\*  (0.10)  -  0.46\*\*\*  (0.10) |
| *District FE* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| *Year FE* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| *Individual FE* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| AIC |  |  |  |  |  |  |  |  |
| Observations | 6785 | 584 | 552 | 483 | 534 | 672 | 91 | 557 |
| \*FEP model for each crop group.  Significance level: p-value <0.01 (\*\*\*); < 0.05(\*\*); < 0.10 (\*). In parenthesis for all models, standard error of the mean. Year fixed effects (Year FE) control for year – specific differences. Fixed effects at the individual’s level (Individual FE) clean the estimation from all time constant demographic, skill, and attitudinal differences. Individual fixed effects also capture average differences in soil quality and climate across farms. Fixed effects at the district level (District FE) controls for district – specific differences. | | | | | | | | |

Table 3 | Coefficient for most preferred trait type, fixed effects Probit model

|  | *Dependent variable* | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Most preferred trait type\*** | | | | | | | |
|  | **Cereal** | **Fiber** | **Pulses** | **Oil** | **Spices** | **Vegetables** | **Fruits** | **Other** |
|  |  |  |  |  |  |  |  |  |
| **GPI** |  |  |  |  |  |  |  |  |
| *when most preferred type is* |  |  |  |  |  |  |  |  |
| **Home traits** | **4.99\*\*\***  (1.5) |  |  |  |  | 1.85  (3.99) |  |  |
| **Market traits** | **1.79\***  (0.9) |  |  |  |  | **9.09\*\*\***  (3.12) |  |  |
| **Quantity traits** | -0.45  (0.32) |  |  |  |  | -1.42  (0.93) |  |  |
| **Processing traits** | - |  |  |  |  | 1.84  (4.15) |  |  |
| **Resilience traits** | -3.43  (2.82) |  |  |  |  | -17.33  (13.59) |  |  |
|  |  |  |  |  |  |  |  |  |
| *District FE* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| *Year FE* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| *Individual FE* | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| AIC |  |  |  |  |  |  |  |  |
| Observations | 6785 | 584 | 552 | 483 | 534 | 672 | 91 | 557 |
| \*FEPr model for each crop group and for each trait type.  Significance level: p-value <0.01 (\*\*\*); < 0.05(\*\*); < 0.10 (\*). In parenthesis for all models, standard error of the mean. Year fixed effects (Year FE) control for year – specific differences. Fixed effects at the individual’s level (Individual FE) clean the estimation from all time constant demographic, skill, and attitudinal differences. Individual fixed effects also capture average differences in soil quality and climate across farms. Fixed effects at the district level (District FE) controls for district – specific differences. | | | | | | | | |

1. **Discussion**
2. **Conclusion**
3. **References**

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**Appendix**

Table A1 | Indicators belonging to the 5 domains of women’s empowerment (Seymour, 2017)

(INSERT TABLE)

Chart, box and whisker chart

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Fig. A1 | Respondents meeting the acceptable level of empowerment in (a) leisure time, (b) ability to speak in public, (c) decision on incomes and resources and (d) ability to decide on agricultural inputs, sex disaggregated, years 2011 and 2018

Table A2 | Trait preferences expressed by households, per harvesting season, per year and per crop group

|  | **2015** | | | | **2018** | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | *Aman* | *Aus* | *Boro* | *Annual* | *Aman* | *Aus* | *Boro* | *Annual* |
| Cereal | 1652 | 228 | 1691 | 1 | 1728 | 221 | 1740 | 2 |
| Fiber | 12 | 295 | 13 | 6 | 8 | 292 | 10 | 2 |
| Fruits | 4 | - | 5 | 41 | - | - | 7 | 38 |
| Oil | 34 | 55 | 216 | - | 10 | 19 | 183 | - |
| Other | 24 | 9 | 207 | 69 | 11 | 9 | 191 | 62 |
| Pulses | 20 | 26 | 262 | 6 | 22 | 10 | 256 | 1 |
| Spices | 20 | 27 | 239 | 30 | 14 | 18 | 208 | 15 |
| Vegetables | 95 | 53 | 160 | 35 | 94 | 63 | 173 | 29 |
| **Total** | 1861 | 693 | 2793 | 188 | 1887 | 632 | 2768 | 149 |

1. This manuscript is preliminary. Please do not cite nor circulate without authors’ consent. We would like to thank Agnes Quisumbing, Greg Seymour and Kalyani Raghunathan for their insights on the WEAI tools. [↑](#footnote-ref-0)
2. The term spouse is adopted from Seymour, 2017. It should be understood throughout the article to refer to either a spouse or partner, although common law marriages in Bangladesh are unusual. [↑](#footnote-ref-1)
3. A clarifying example: \*\*.1 is marked as the original household interviewed in the first round (2011), also defined as parent household. \*\*.2, \*\*.3 are new households formed after the split. [↑](#footnote-ref-2)
4. https://weai.ifpri.info/weai-resource-center/guides-and-instruments/ [↑](#footnote-ref-3)