# Extended Abstract
## Please do not add your name or affiliation

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| **Paper/Poster Title** | Gendered impact of agricultural shocks on the farm and non-farm sectors of the rural economy of Nigeria |

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| **Abstract** | *200 words max* |
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Distressing climate events such as droughts and floods are causing several untold hardships to many rural households in the developing world. Many research works have focused on the impact of weather shocks on the farm sector, but not on the non-farm sector of the rural economy. Employing climate data merged with georeferenced Nigeria General Household survey panel data, the effects of excessive rainfall shocks on off-farm labour supply and regional differences in gender norms' influence on labour supply decisions were determined. The findings show that households increase their labour supply to off-farm labour employment in response to excessive rainfall shocks, however, while it was positive and significant for female-headed households, it was not significant for male-headed households. No significant response for the deficit rainfall shocks for both male and female-headed households. Furthermore, we find suggestive evidence that in response to the excessive rainfall shocks, households decrease their labour supply to off-farm labour employment for patriarchal states (in favour of men). While this was the case for female-headed households, it was positive and insignificant for male-headed households. Policies targeted at climatic shocks may need to consider the non-farm sector considering gender and regional differences.

| **Keywords** | Climate Change, Excessive rainfall shocks, Deficit rainfall shocks, Agriculture, Labour supply and Gender |
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| JEL Code | **Q540** Climate; Natural Disasters and Their Management; Global Warming<br>see: www.aeaweb.org/jel/guide/jel.php?class=Q) |
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| **Introduction** | *100 – 250 words* |

In Nigeria, rural households depend largely on rainfed agriculture as their primary source of livelihood, leaving them vulnerable to weather and climate shocks (Hirvonen, 2016; Hertel & Rosch, 2010). These shocks, which directly impact farms, could also indirectly impact the non-farm sector, through the linkages that exist in both sectors as established in studies by Grabrucker & Grimm (2020) and Haggblade, Hazell & Brown (1989), but are often ignored. In Nigeria, no work has extended the impact of these shocks to the non-farm sector and incorporated gender dimensions and norms. The work of Haggblade, et al. (1989) found a strong impact of the farm sector on the non-farm sectors through several linkages such as capital flows, labour flows, production, consumption, and investment. In Nigeria, the rural non-farm sector makes up a key part of the rural economy most especially as a means of increasing household income and as a coping strategy when faced with several shocks (Nnadi et al., 2021). The gender dimension is important because women are dominant in the agricultural sector in rural areas. Most of the foods (60-80%) are produced by women mostly at the subsistence level (Otitoju and Enete 2016; Osuafor and Nnorom, 2014). Hence, this study investigates the effect of rainfall shocks on the non-farm labour supply, separately for women and men, and also investigates whether regional differences in gender norms influence labour supply decisions of rural men and women in response to rainfall shocks.

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| **Methodology** | *100 – 250 words* |
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**Data**

Climate data merged with georeferenced Nigerian General Household Survey panel data. Three waves (2010/2011, 2012/2013, 2015/16) was employed in this study.

The LSMS-ISA data consists of 5,000 randomly selected households across the six zones in the country.

**Measurement of Variables**

Rainfall shock $(RS)_{it} = \left(\frac{\bar{R}_i - R_{it}}{R_i^{SD}}\right)$

Negative/deficit rainfall shock $(NRS)_{it} = 1$ if $\left(\frac{\bar{R}_i - R_{it}}{R_i^{SD}}\right) < -1$

Positive rainfall shock $(PRS)_{it} = 1$ if $\left(\frac{\bar{R}_i - R_{it}}{R_i^{SD}}\right) > +1$

$R_{it}$ means current year rainfall at the location of household $i$ for year t. $\bar{R}_i$ is the historical average rainfall (for 50years) at the location of household $i$. $R_i^{SD}$ is the standard deviation of rainfall at the location of household $i$ (calculated over the 50-year period).

**Empirical Specification**

**Determine the effect of rainfall shocks on agricultural output (total value of crops per hectare)**

$$lnY_{hlt} = \beta_0 + \beta_1 R_{lt} + \beta_2 X_{ht} + \zeta_h + \theta_t + \varepsilon_{hlt}$$

$Y$ is total value of crops from the farm measured in naira per hectare, $h$ denotes household, $l$ denotes LGAs (Local Government Areas), and $t$ is year. $R_{lt}$ represent a negative rainfall shock or positive rainfall shock. $X_{ht}$ is number of hours of on-farm labour supply, $\zeta_r$ and $\theta_t$ denote household and year fixed effects respectively.

**Determine the effect of rainfall shocks on labour supply to non-farm employment.**

$$N_{hlt} = \beta_0 + \beta_1 I\_R_{lt} + \beta_2 (R * T)_{lt} + \zeta_h + \theta_t + \varepsilon_{ihlt}$$

$N$ is number of hours per week employed in non-farm employment). $I\_R_{lt}$ represents rainfall shock lagged by one year. $T_{it}$ represents gender norms, dummy variable that takes value 1 for patriarchal states (States in favour of men).

| Results | 100 – 250 words |
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**Impact of Rainfall Shocks on Agricultural Production Value Per Hectare**

| | Agricultural Production Value per hectare (naira) |
|---|---|
| | (Linear model) fixed effects |
| **Variable** Rainfall shocks | |
| Deficit rainfall shocks | -0.203** (0.094) |
| On-farm labour (hours) | 0.005*** (0.002) |
| R-squared | 0.07 |
| Household level FE | Yes |
| Year FE | Yes |
| No. of households | 7040 |

**Note: On-farm labour supply are in hours per week. Robust standard errors are clustered at the local government level in parentheses. *** significant at 1% level, ** significant at 5% level**

**Impact of rainfall shocks on Labour supply to the Non-farm Employment**

| Variable | Labour supply in hours per week (Linear model) fixed effects | | |
| --- | --- | --- | --- |
| | **All Households** | **Male Headed** | **Female-Headed** |
| **Rainfall shocks** | | | |
| Excessive rainfall shocks | 3.021*** (1.013) | 1.042 (0.643) | 1.979** (0.891) |
| Excessive rainfall shocks*gender index | -3.990** (1.665) | 0.375 (1.207) | -4.363*** (1.389) |
| Deficit rainfall shocks | -0.162 (0.657) | 0.015 (0.407) | -0.178 (0.474) |
| R-squared | 0.004 | 0.004 | 0.009 |
| Household level FE | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes |
| No. of households | 7899 | 7899 | 7899 |

**Gender index is a dummy variable with 1 representing patriarchal states (Male-favoured states) and 0 representing non-patriarchal states (States not in favour of women). Robust standard errors are clustered at the local government level in parentheses. *** significant at 1% level, ** significant at 5% level**

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| **Discussion and Conclusion** | *100 – 250 words* |

**Discussion and Conclusion**

The result on the impact of rainfall shocks on total farm output which was measured using total value (naira) from the farm shows that deficit rainfall shock decreases total value of the crops per hectare by 20.3%, this is as expected as several research works have reported the negative impact of weather shocks on farm yield. Also, the study controlled for the total number of on-farm hours employed per week on the farm and the result shows that on-farm hours increased the total value of crops from the farm, which is also in line with a-priori expectation. However, this is not the focus of the study.

On the aspect of rainfall shock on the supply of non-farm labour, excessive rainfall shocks significantly increased the supply of labour to non-farm employment and were mainly driven by the female-headed households as excessive rainfall shock had no significant effect on the non-farm labour employment by male-headed households. On interacting the excessive rainfall shock with gender index, the participation of the households in non-farm employment decreased and this was driven by female headed households in regions that had norms that were not in favour of women. It was positive for the male-headed households but not significant.

The study therefore concludes that excessive rainfall shocks affect positively labour supply to non-farm employment significantly for the female-headed households, however, in regions where gender norms favour the men as against the women the reverse is the case for the female headed households.