The Farmers Household Food Security in the Experience of Climate Change Perceptions, Agricultural Technology uses, and Weather Parameter Fluctuations: insights from coastal Bangladesh

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INTRODUCTION

- ❑ According to the WHO (2017) and Lowder et al. (2021), smallholder farmers are rural agricultural producers who farm less than two hectares.
- ❑ Adapting agriculture to climate variations is essential for ensuring food security and sustainable environment (Lipper et al., 2014).
- ❑ There is a mentionable interconnection between climate anomalies (such as rainfall, temperature, drought, flood etc.) with the national growth indicators such as GDP, crop production (Conway et al., 2015).
- ❑ Climate anomalies cause food shortages, migration, and biodiversity loss (Cross & Congreve, 2021).
- ❑ Climate change has greatly diminished the well-being (Oparinde, 2021), food security (Rahman et al., 2022), and health (Talukder et al., 2021) of small-scale farmers.

This study aims to investigate the climate change risk perceptions and household access to resources, agriculture adaptations have any impacts on farmers household food insecurity in rural areas of Bangladesh's coastal regions, focusing on the threats posed by climate change towards agriculture system.

METHODS AND MATERIALS

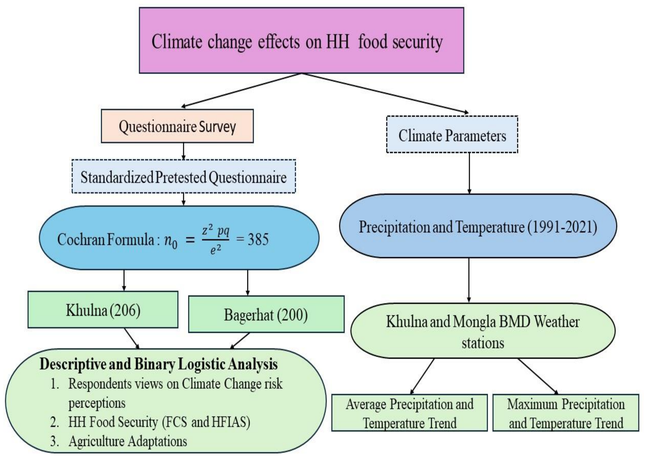

Figure 1 : The Study Methodology Flowchart

Figure 2: The Discussion of the Individual and Group of the Primary Respondent of the farmers' HH.

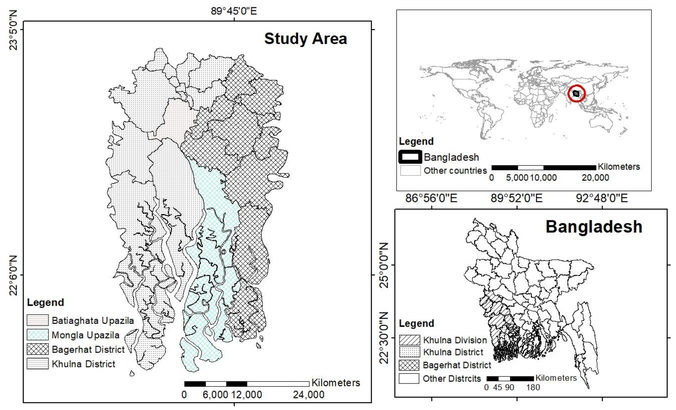

Figure 3 : The coastal study area Khulna and Bagerhat districts in Bangladesh

RESULTS

Table 1: Descriptive statistics of the continuous variables.

Variables	Mean	±St. Dev.	Min	Max
Farmers HH characteristics				
Distance from Market(km)	1.44	1.03	0.1	6
Distance from Sea/River(km)	2.37	2.45	.01	9
Education (Total Years)	8.88	3.77	0	18
Family Size (Number)	5.38	2.12	.00	16
Total Farmland (Acre)	.57	.8	.00	7.52
Total Number of Livestock	13.29	10.27	0	111
FCS	43.41	11.90	21	86
HFIAS	8.54	3.70	0	20

Table 2: Descriptive statistics of the categorical variables.

Categorical variables	N	Categorical	N
Districts		Education	
Bagerhat	201	No Education	23
Khulna	205	Primary	101
Upozilla		High	282
Mongla	201	Agriculture Adaptations	
Botiaghata	205	Adapter	341
Gender		Non-Adapter	65
Male	314	HFIAS Category	
Female	92	Food Secure	39
Climate Change Perceptions		Food Insecure	367
Rainfall Pattern	345	HH Organization Access	
Hailstorm	39	No access	111
Drought	306	Organization access	295
Flood	184	Farmers HH Technology Access	
Storm/Cyclone	217	The CC training	115
River erosion	122	Smart phone	279
		Extension	178

Table 3: The forward stepwise (likelihood ratio) binary logistic regression models

Predictors	HH Food Security (Insecure-Secure)							
	Model1 (B/SE)	Model2 (B/SE)	Model3 (B/SE)	Model4 (B/SE)	Model5 (B/SE)	Model6 (B/SE)	Model7 (B/SE)	Model8 (B/SE)
Farmland (Acre)	1.211 (.231)**	1.151 (.246)**	1.248 (.276)**	1.202 (.275)**	1.189 (.269)**	1.245 (.284)**	1.165 (.267)**	1.094 (.266)**
HH Annual Inc. Poor Income		2.378 (.414)**	2.579 (.454)**	2.548 (.465)**	2.411 (.474)**	2.039 (.494)**	2.573 (.584)**	2.234 (.602)**
Agri Inc. (50%)			-1.198 (.516)*	-1.331 (.532)**	-1.537 (.554)**	-1.851 (.592)**	-1.830 (.605)**	-1.991 (.631)**
Agri Inc. (75%)			-2.380 (.661)**	-2.280 (.682)**	-2.494 (.706)**	-2.639 (.719)**	-2.640 (.716)**	-2.672 (.702)**
Agri Inc. (100%)			-2.653 (.777)**	-2.608 (.786)**	-2.589 (.796)**	-2.720 (.841)**	-2.651 (.817)**	-2.980 (.851)**
CCSI Index				6.179 (2.189)**	6.645 (2.277)**	8.507 (2.435)**	10.983 (2.950)**	9.277 (2.989)**
Family Size					.251 (.097)**	.294 (.098)**	.289 (.099)**	.268 (.099)**
Market (Distance)						-.712 (.311)*	-.684 (.311)*	-.759 (.324)*
CCP Index							-2.934 (1.470)*	-3.880 (1.588)*
Agri.Adap. Index								5.056 (2.349)*
-Loglikelihood	211.175	180.049	159.088	150.800	144.484	138.302	134.052	129.206
Nagelkerke R^2	.227	.368	.457	.490	.516	.540	.557	.575
Omnibus Test of Model Coefficients chi-square	45.691	76.817	97.777	106.065	112.382	188.563	122.814	127.659
Omnibus Test of Model Coefficients significance	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Observations	406	406	406	406	406	406	406	406
Note: *p<0.05; **p<0.01								

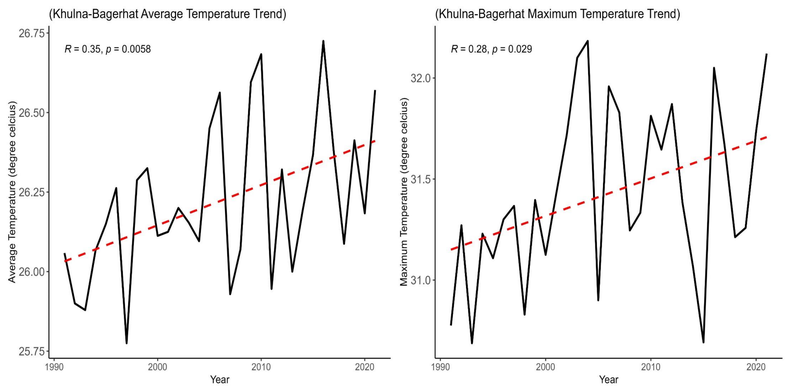

Figure 4: Khulna-Bagerhat BMD weather stations temporal (1990-2020) Average and Maximum Temperature Trend.

DISCUSSION

- ❑ Household less dependence on solely agriculture income, farmland, family size, HH Distance from market, CC perception index, CC source of information index and agriculture adaptation index were found to significantly improve food security with better food access and consumption scores.
- ❑ Climate change significantly affects household food security, with changing rainfall patterns, droughts, floods, and riverbank erosion negatively impacting food consumption (FCS) and dietary diversity, especially for smallholder farmers who rely heavily on environmental conditions.
- ❑ Access to timely and accurate climate information and climate change perceptions index plays a crucial role in improving adaptation strategies and food security, which shows a significant positive effect in our models.

CONCLUSION

- ❑ Farmland ownership, better agriculture adaptations, better climate change perceptions and climate source of information use in the study area improves food security by providing better and more diverse food access, as evidenced by higher FCS (food consumption scores) and reduced HFIAS (household food insecurity assessment scale) scores in the farmers HH.
- ❑ The CCSI (climate change source of information) index, mostly through internet access via smartphones, is the most effective information source for improving HH food security concerning CC impact.

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