Mid-term Evaluation of Climate Smart Agriculture Project

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Background

- This quasi-experimental study was carried out in the backdrop of TRDP Project called "Strengthening food security resilience of small-holder farmers by adapting climate change through multi-level approaches of District Umerkot of Sindh Province in Pakistan"
- Are the project and its associated activities are achieving their intended objectives
- learning what worked well and what could have been done better
- This study touched base through detailed literature review including the earlier project reports and data to determine if and how project could bring positive change in Months of Adequate Household Food Provisioning (MAHFP) and Household Dietary Diversity Score (HDDS) of the project beneficiaries.

Interventions

- Farmers Field School
- Seed bank
- Crop production gardens
- Provision of trainings such as CSA trainings
- Presence of Community Livestock Extension Workers (CLEWs)
- Provision of organic food
- Provision of livestock management
- Others

Study Area and Data

- Sample size for midline survey: 256 households (out of the 385 households from baseline survey)
- Sampling area: two union councils namely, Faqeer Abdullah and Kaplore, of the district Umerkot
- Sampling method: random sampling
- Selection criteria: households with at least one of the interventions of CSA practices



Key Variables

1. Months of Adequate Household Food Provisioning (MAHFP

- The MAHFP is designed to describe variation in food security in the previous year.
- It measures the number of months in the previous year with adequate/sufficient for the household.
- Taking the average of MAHFP across the sample household gives the mean MAHFP in the study or project area.

2. Household Dietary Diversity Score (HDDS):

- HDDS is an indicator of food diversity.
- The HDDS for each household is calculated by adding the number of food groups from which at least one food item is consumed over the past 24 hours.
- The mean HDDS is calculated by taking the average of the HDDS across all sampled households.

Method

- We used *Propensity Score Matching* (PSM) method.
- It compares the outcome of a treated group (intervention) with control group (no intervention)
- the baseline survey is used as control group whereas midline survey is used as treated group
- We estimate the the impact of CSA as follows:

•
$$MAHFP_{ij} = \beta_0 + \beta_1 Treatment_i + \beta_2 X + \varepsilon_i$$
 (1)

•
$$HDDS_{ij} = \gamma_0 + \gamma_1 Treatment_i + \gamma_2 X + \varepsilon_i$$
 (2)

• We used all matching methods for a robustness checks.

Profile of the Respondents

Figure 1: Gender and Age Profile of the Respondents



Profile of the Respondents



Knowledge of Climate Change and CSA

Figure 4: Knowledge and Practice of Climate Change and CSA

Know the term "Climate Change Adaptation" Know the term "Climate Smart Agriculture" Shallow ploughing soil and water conservation Rainwater harvesting for cropping/livestock Efficient irrigation technologies (e.g., drip) Organic fertilizers to maintain soil fertility Mulching as a way to maintain soil moisture Using crop rotation and inter-cropping Using drought tolerant seeds Preparing land with less machinery (zero tillage) Less chemical pesticides and fertilizers Less fuel consumption on agriculture



Months of Adequate Household Food Provision



Months of Adequate Household Food Provision

VARIABLES	Model 1	Model 2
CSA Interventions	1.199***	1.180***
	(0.0932)	(0.0991)
Age		-0.00284
		(0.00379)
Gender		-0.00833
		(0.0982)
Household Size		-0.0273
		(0.0167)
Constant	7.590***	7.908***
	(0.0589)	(0.196)
Observations	641	641
R-squared	0.206	0.211
Note: Standard errors are reported in parenthe Source: Authors' Calculations from Baseline and	ses. ***, ** and * show significance at 1%, 5% an d Midline Surveys.	d 10%, respectively.

Table 1: Relationship between CSA and MAHFP

Months of Adequate Household Food Provision

Matching Techniques	Model 1	Model 2	Model 3	Model 4
Nearest neighbor matching	1.232***			
	(0.146)			
Radius matching		1.241***		
		(0.123)		
Kernel matching			1.298***	
			(0.168)	
Stratification matching				1.294***
				(0.121)
Note: Standard errors are reported in parentheses. ***, ** and * show significance at 1%, 5% and 10%, respectively.				

Table 2: CSA's Causal Impact on MAHFP

Source: Authors' Calculations from Baseline and Midline Surveys.

	Seed Bank	1.
	Farmer Field School.	- 1.
Months of	Crop Prod. Gardens	1.
Adequate	Adaptation Strategies	
Household	Trainings	- 1.4
-ood Provision	Organic Food	-
	CLEW	1.4
	Livestock Mgt.	- 1.
		-

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Table 3: Impact of Various CSA Interventions on MAHFP

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Iviethod \	INIAtching Method				
Intervention	Nearest neighbor	Radius	Kernel	Stratification	
Seed Bank	1.389***	1.478***	1.463***	1.476***	
	-0.211	-0.253	-0.114	-0.244	
Farmer Field School.	1.619***	1.466***	1.479***	1.497***	
	-0.179	-0.207	-0.17	-0.237	
Crop Prod. Gardens	1.244***	1.384***	1.379***	1.390***	
	-0.468	-0.14	-0.0982	-0.388	
Adaptation Strategies	0.226	0.328	0.327	0.327	
	-0.505	-0.33	-0.45	-0.35	
Trainings	1.479***	1.296***	1.300***	1.315***	
	-0.248	-0.107	-0.0913	-0.133	
Organic Food	1.234	1.266***	1.279***	1.351***	
	-0.924	-0.362	-0.277	-0.506	
CLEW	1.489***	1.621***	1.622***	1.641***	
	-0.307	-0.476	-0.286	-0.283	
Livestock Mgt.	1.492***	1.371**	1.367***	1.364***	
	-0.264	-0.617	-0.18	-0.287	
Other Interventions	1.155***	1.473***	1.474***	1.473***	
	-0.293	-0.15	-0.254	-0.167	

Note: Standard errors are reported in parentheses. ***, ** and * show significance at 1%, 5% and 10%, respectively. Source: Authors' Calculations from Baseline and Midline Surveys.

Household Diet Diversity Scores

Figure 6: Improvements in HDDS



Source: Authors' Calculations form Baseline and Midline Surveys

Household Diet Diversity Scores

VARIABLES	Model 1	Model 2		
CSA Interventions	1.130***	1.116***		
	(0.0658)	(0.0701)		
Age		-0.000960		
		(0.00268)		
Gender		-0.0265		
		(0.0695)		
Household Size		-0.0102		
		(0.0118)		
Constant	5.499***	5.629***		
	(0.0416)	(0.139)		
Observations	641	641		
R-squared	0.316	0.317		
Note: Standard errors are reported in parentheses. ***, ** and * show significance at 1%, 5% and 10%, respectively. Source: Authors' Calculations from Baseline and Midline Surveys.				

Table 4: Relationship between CSA and HDDS

Household Diet Diversity Scores

Table 5: CSA's Causal Impact on HDDS

Matching Techniques	Model 1	Model 2	Model 3	Model 4
Nearest neighbor matching	1.131***			
	(0.0380)			
Radius matching		1.147***		
		(0.0507)		
Kernel matching			1.179***	
			(0.0383)	
Stratification matching				1.182***
				(0.0693)
Note: Standard errors are reported in parentheses. ***, ** and * show significance at 1%, 5% and 10%, respectively.				

Source: Authors' Calculations from Baseline and Midline Surveys.

	Method \	Matching			
	Intervention	Nearest neighbor	Radius	Kernel	Stratification
	Seed Bank	1.122***	1.090***	1.079***	1.089***
		-0.35	-0.196	-0.238	-0.0533
	Farmer Field School.	1.621***	1.503***	1.499***	1.511***
		-0.223	-0.204	-0.0382	-0.269
	Crop Prod. Gardens	1.461***	1.352***	1.350***	1.348***
		-0.141	-0.185	-0.143	-0.0718
Household	Adaptation Strategies	1.616***	1.452***	1.451***	1.451***
Diat		-0.0865	-0.0851	-0.0895	-0.0387
	Trainings	1.133***	1.143***	1.144***	1.146***
Diversity		-0.282	-0.336	-0.111	-0.416
Scorps	Organic Food	1.276***	1.064***	1.075***	1.109***
500165		-0.26	-0.274	-0.296	-0.109
	CLEW	1.071***	1.134***	1.124***	1.108***
		-0.131	-0.195	-0.326	-0.311
	Livestock Mgt.	0.983***	1.039***	1.034***	1.031***
		-0.255	-0.151	-0.333	-0.296
	Other Interventions	0.580***	0.691**	0.690**	0.691***
		-0.12	-0.313	-0.303	-0.156

Table 6: Impact of Various CSA Interventions on HDDS

Note: Standard errors are reported in parentheses. ***, ** and * show significance at 1%, 5% and 10%, respectively.

Source: Authors' Calculations from Baseline and Midline Surveys.

Concluding Remarks

- Compared to baseline, the MAHFP score has increased by 1.2 months suggesting that project interventions improves food security by 16.1%.
- The results revealed that compared to baseline (5.49), the mean HDDS has increased to 6.63 or an improvement of nearly 21%.
- This suggests that project interventions could help households add at least one extra food group to their food consumption basket.
- Almost all types of intervention were found to be effective but farmers' field schools, adaptation strategies, crop production gardens, seed banks, livestock management, and the presence of Community Livestock Extension Workers were the most effective.
- Moreover, Project had been successful in creating awareness of climate change and climate smart agriculture as almost all the respondents reported being aware of these terms.
- Based on these findings, we conclude that the project achievements are on track and impressive