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IMPACT OF ASSET TRANSFER PROGRAMME ON LANDHOLDINGS AND FOOD SECURITY OF THE ULTRA POOR: EVIDENCE FROM BRAC'S CFPR-TUP PROGRAMME

Abstract

This paper attempts to examine the impact of the 'Challenging the Frontiers of Poverty Reduction-Targeting the Ultra Poor' (CFPR-TUP) programme on landholdings and food security of the ultra poor using a large balanced panel dataset (2002, 2005 and 2008). The main objective of this paper is to explore short- and long-term impact of the programme on landholdings and food security of the ultra poor using conditional and unconditional difference-in-differences (DID) methods. In addition, fixed effects estimation is also applied to check the robustness of the estimates on this certain outcomes of landholdings like total landholdings, access to land, land-man ratio and chronic food deficit after capturing the unobserved heterogeneity. In particular, this paper examines the distinction between treatment and control groups in the base year. This study (based on proportion as a unit of measurement) finds the robustness of impact estimates in the long-term for homestead, cultivable and total landholdings using both DID approaches, which also find short- and long-term robust impact for cultivation of others' land, access to land and leasing. After using decimal as a unit of measurement, this study finds the long-term robust impact on homestead, total land owned, access to land and land-man ratio. Here this study does not find robust impact on cultivable land and cultivation of others' land both in short- and long-term. Fixed effects method is applied on total land owned, access to land and land-man ratio. The findings suggest that the CFPR has robust impact on total land owned, access to land and land-man ratio only in the long-term irrespective of the approaches. To check the channel between landholdings and food security, fixed effects method is applied only for chronic food shortage and DID methods are applied to all self-perceived food safety issues like chronic and occasional food deficit, break-even and food surpluses. All three approaches provide very much consistent results for short- and long-term impact. All three approaches validate robustness of impact on chronic food deficit suggesting households belong to the programme face significantly less chronic food shortages compared to the control.

1. Introduction

Bangladesh has very well-known programmes targeted at the ultra poor like Vulnerable Group Development (VGD) and Rural Development (RD) of the World Food Programme (WFP) and BRAC's 'Challenging the Frontiers of Poverty Reduction-Targeting the Ultra Poor' (CFPR-TUP)¹. Among these programs, BRAC's CFPR-TUP is distinct in a

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sense that it has combined its methodology for its beneficiary selection from prior field experiences and empirical research and provided not only Income Generating Assets (IGAs), but also other complements like stipend, training, health care and support from local elites. A growing number of past studies have examined impact on poverty of the CFPR-TUP but not much is known about the specific and detailed impact of the programme on landholdings and food security issues of the ultra poor.² Existing studies have so far also neglected the long-term impact of this programme in detail, especially on landholdings and food security. This paper addresses these gaps using a large panel dataset collected by BRAC-RED³ in three rounds (2002, 2005 and 2008). CFPR provided IGAs, cash in terms of opportunity cost and health care to the ultra poor households to increase their capital stock and thus the return. It then encourages investing more in functional landholdings, which in turn, help the ultra poor to exit poverty in a sustainable way through ensuring the food security.

Land is the key component of natural assets to the rural ultra poor as it plays decisive role not only to their livelihood outcomes, but also to have a permanent residence and security. Landlessness explains the reason of high concentration of ultra-poverty in rural Bangladesh. Though absolute landlessness over the last decade is decreasing, functional landlessness, in terms of not owning cultivable land, is increasing.⁴ Agricultural land in poor countries plays crucial role in the daily livelihoods of the vast majority of the people, especially the poor.⁵ Nevertheless, land transaction in the poor countries in terms of buying and selling is very low due to weighty stock to the wealthiest person, but it is more active in lease and sharecropping market. However, ultra poor in Bangladesh is more likely to be excluded from lease and sharecropping market because of their negligible asset base. It is evident that ownership and/or access to land can help the ultra poor to grow more food, increase in income and to have permanent residence and security. Thus outcomes derived from land endowment are crucial helping poor to exit poverty in a sustainable way.

The remainder of this paper comprises the followings: firstly, it defines ultra-poverty⁶ and poverty dynamics in Bangladesh. Section 3 draws on empirical data, institutional setting and descriptive statistics. Section 4 explores the model specification for impact assessment, regression results are analysed in section 5 and finally, the summary and conclusion.

¹ CFPR-TUP is a donor consortium made up of the CIDA, DFID, Oxfam Netherlands and the WFP, AusAid, and BRAC. This project is conducted by Bangladesh Rural Advancement Committee (BRAC). This study uses CFPR-TUP or CFPR interchangeably.

² W. Raza, N. C. Das and F. A. Misha, "Can Ultra-Poverty be Sustainably Improved? Evidence from BRAC in Bangladesh", BRAC-RED Report, 2011. See, N. C. Das, and F. A. Misha, "Addressing Extreme Poverty in a Sustainable Manner", CFPR Working Paper No. 10, BRAC-AKFC, 2010; also M. Rabbani, V. A. Prakash and M. Sulaiman, "Impact Assessment of CFPR/TUP: A Descriptive Analysis Based on 2002-2005 Panel Data", CFPR Working Paper No. 12, BRAC-AKFC, 2006.

³ BRAC-RED implies Research and Evaluation Division of BRAC.

⁴ M. Rabbani, V. A. Prakash and M. Sulaiman, 2006, *op. cit.*

⁵ P. Bardhan and C. Udry, "Development Microeconomics" Ch-6 and 10, pp. 60-75 & 123-231, Oxford University Press: Oxford, 1999.

⁶ This study uses the terms 'ultra poor' and 'extreme poor' synonymously.

2. Who are the Ultra Poor? Poverty Dynamics in Bangladesh

As there is no universally accepted definition for the ultra poor, different studies use their own concepts and approaches. The term 'ultra poor' was first used by Lipton in 1983 meaning those people who spend 80 percent of their total expenditure on food and cannot attain 80 percent of standard calories required.⁷ The ultra poor are those who have no own land or house, no other income sources except manual labour, no savings, no capacity to have three meals a day, no affordability to have minimum clothing and to invest in human capital.⁸ The World Bank sub-divides the extreme poor as the destitute and the ultra poor based on kilo calorie (kcal) consumption per person per day.⁹ While the first category, the destitute, consume less than 1600 kcal and are unable to fit for any development intervention, the second category, the ultra poor, consume less 1805 kcal but more than 1600 kcal and physically fit for work. This study uses HIES¹⁰ data and finds that out of 36 percent extreme poor, ultra poor and destitute comprise 31 percent and 5 percent respectively. Multidimensionality is incorporated for addressing the ultra poor such as income, occupation, housing, physical assets, geography, sex of the household head and dependency ratio.¹¹ Khandker and Chowdhury used the Food and Agricultural Organization (FAO) standard of 2,112 (kcal) per person per day and identify the extreme poor based on consumption which is Tk. 5,270 per person per year.¹² Therefore, there are distinctive characteristics and causes of being ultra poor.¹³ Thus, the ultra poor lack ownership in homestead or agricultural land and IGAs. They usually own a very little or even not any amount of land and suffer from food insecurity. It is therefore important to emphasis on the impact of the CFPR-TUP on the landholdings and food security issues of the ultra poor. Key characteristics of the ultra poor in Bangladesh are summarised in table 2.a.

⁷ M. Lipton, "Poverty, Under-nutrition and Hunger", World Bank Staff Working Paper No. 597, World Bank: Washington, D.C., 1983.

⁸ S. R. Halder, and P. Mosley, "Working with the Ultra-Poor: Learning from BRAC Experiences", *Journal of International Development*, Vol. 16, No. 3, pp. 387-406.

⁹ World Bank, "Bangladesh: From Counting the Poor to Making the Poor Count, Poverty Reduction and Economic Management Network, South Asia Region", World Bank: Washington, D.C., 1998.

¹⁰ HIES stands for Household Income and Expenditure Survey, Bangladesh.

¹¹ A. Rahman and A. Razzaque, "On Reaching the Hard Core Poor: Some Evidence on Social Exclusion in NGO Programmes", *The Bangladesh Development Studies*, Vol. 26, No.1, pp. 1-36.

¹² S. R. Khandker and O. H. Chowdhury, "Targeted Credit Programs and Rural Poverty in Bangladesh", *World Bank Discussion Paper*, No. 336, Washington, D.C., 1996.

¹³ H. Marsden, "Targeting the Extreme Poor: Learning from Shiree", *Working Paper*, No. 2, Shiree, Dhaka, Bangladesh, 2010.

Table 2.a - Key Characteristics of the Ultra Poor¹⁴

Characteristics	Statistics
No land (% of HH)	9.8
10 decimal land (% of HH)	50.3
Average agricultural day labour per HH	0.5
Average non-agricultural day labour per HH	0.4
Female headed household (%)	10.8
% with primary education per household (14+ years)	21.7
% with literate per household (6+ years)	29.7

Though poverty reduction rate is somewhat impressive in Bangladesh over the last few decades, ultra-poverty situation remains at 25 percent around in 2005. The upper and lower poverty lines use the Cost of Basic Needs (CBN)¹⁵ that makes clear-cut distinction between the moderate and extreme poor. While the proportion of population below the upper poverty line declined by 18 percentage points between 2000 and 2005, the rate of decline in extreme poverty for the same time period was 27 percentage points.¹⁶ Nevertheless, the ultra poor issue remains a key challenge in Bangladesh. The incidence of ultra-poverty is almost twice in rural than the urban and thus this study considers rural ultra-poverty. Table 2.b shows poverty dynamics in Bangladesh.

Table 2.b - Dynamics of Head Count Rate of the Incidence of Poverty in Bangladesh

Reference Year	Upper Poverty Line ¹⁷			Lower/Ultra Poverty Line ¹⁸		
	National	Urban	Rural	National	Urban	Rural
1991/92	56.6	42.7	58.7	41.0	23.6	43.7
1995/92	50.1	27.8	54.5	35.1	13.7	39.4
2000	48.9	35.2	52.3	34.3	20.0	37.9
2005	40.0	28.4	43.8	25.1	14.6	28.6

3. Data, Setting and Descriptive Analysis

3.1 Data

This study uses quantitative data to analyse impact of the CFPR-TUP on landholdings and food security of the ultra poor households. The longitudinal data comprises three wave surveys (2002, 2005 and 2008) to evaluate short- and long-term impact of the CFPR on landholdings and food security of the ultra poor.

¹⁴ I. Matin, M. Sulaiman and M. Rabbani, "Crafting a Graduation Pathway for the Ultra Poor: Lessons and Evidence from a BRAC Programme", *CPRC Working Paper*, No. 109, Manchester, U.K., 2008.

¹⁵ CBN defines values of consumption needed to satisfy minimum subsistence needs. Estimates developed by the Bangladesh Bureau of Statistics (BBS) jointly with the World Bank (WB).

¹⁶ HIES, 2000 and 2005.

¹⁷ Upper poverty line applies to those who are moderately poor.

¹⁸ Lower poverty line applies to those who are extremely poor.

The latest innovative approach (inclusive microfinance), undertaken by BRAC in 2002 with the assistance from donor consortium, is likely to impact the livelihoods of ultra poor. This raises issue to adopt proper methodology for measuring impact of the CFPR on landholdings and food security. BRAC-CFPR aims explicitly at improving socioeconomic and political asset base through promotional and protective approaches.¹⁹ The CFPR was introduced in all the sub-districts of the three northern districts of Bangladesh (namely, Rangpur, Nilphamari and Kurigram)²⁰. BRAC has combined various targeting methodologies and knowledge streams for fair and effective targeting.

BRAC-RED carried out a baseline survey for the CFPR from June to August 2002 as a part of its evaluation plan. The survey includes both the programme and control households from 27 villages located in 3 out of Bangladesh's 64 districts. The CFPR has selected the ultra poor through Participatory Wealth Ranking (PWR), where households living in the poorest category are considered as ultra poor though sometimes the poorest two categories are considered. Among these ultra poor, those are finally selected for the CFPR known as Selected Ultra Poor (SUP or Treatment) and those are excluded are the Non-Selected Ultra Poor (NSUP or the Control). The NSUP households are also surveyed to represent the control group for the CFPR. Though both categories are recognised as ultra poor by the PWR, NSUPs are excluded from having benefits from the programme as they are relatively better off.²¹

In baseline survey, the sample size was 5,626 households of which 2,633 were treatment and 2,993 were control. In 2005, RED re-surveyed a total of 5,228 households of the 5,626 households surveyed in 2002 to construct the 2002- 2005 panel. The 2005 follow-up survey included 2,474 treatment and 2,754 control households. Whether impacts are sustainable or not, RED re-surveyed a total of 4549 households of which 2,251 were treatment and 2,298 were control households. The overall attrition (2002-2008) is about 20 percent, which is high. However, attrition is not biased as we still find the significant differences in the outcome variables in the base year between the treatment and control group. Thus, the attrition or drop out from the sample is random. This study uses the balanced panel of 4,549 households of which 2,251 are treatment and 2,298 are control. It is necessary to compare outcomes for beneficiaries with the outcomes of non-beneficiaries for measuring impact. This requires controlling for the effects of economic and contextual factors that make programme beneficiaries systematically different from non-beneficiaries. These factors might include household characteristics (e.g., demographics, skill levels, or social networks) that affect the programme impact. Studies that imperfectly control for these characteristics suffer from 'selection biases'. As the programme selection

¹⁹ Matin and Halder, "Combining Methodologies for Better Targeting of the Extreme Poor: Lessons from BRAC's CFPR/TUP Programme", CFPR/TUP Working Paper No. 2, BRAC-AKFC, 2004.

²⁰ Sub-districts are selected based on district level income poverty and human poverty indices. All three districts fall in the highest group in terms of income poverty in its first phase.

²¹ *Ibid.*

was done based on the household characteristics, this study controls only those characteristics and then looks at to what extent the CFPR contributes to landholdings and food security of the ultra poor. For assessing the impact, this study uses DID with or without controlling the contextual factors to observe the sensitivity of the impact estimates for desired outcomes. In addition, this study uses Fixed Effect Method (FEM) as it removes the unobserved effects along with time-invariant explanatory variables. As it assumes unobserved effects are correlated with the time-variant or invariant regressor, FEM is appropriate, which is done by the Hausman test between the FEM and the Random Effects Model (REM). Here the FEM is appropriate as it is possible to control for all possible household characteristics that do not change over time.

3.2 Descriptive Statistics

3.2.1 Key Characteristics of the Sample Ultra Poor Households

Table 3.a presents the means and standard deviations of the key characteristics of sample ultra poor households over the three rounds.

Variables	2002		2005		2008	
	Mean	SD	Mean	SD	Mean	SD
Household size	3.78	1.72	4.15	1.83	4.48	1.93
Age of HHH* (years)	43	12.7	45	12.7	48	12.8
Sex of HHH (female=1)	32.4	0.47	35.0	0.48	35.7	0.48
Married HHH (Married=1)	71.7	0.45	68.7	0.46	67.4	0.47
Schooling of HHH (in years)	0.57	1.76	0.57	1.76	0.57	1.76
Literate HHH (Literate=1)	7.5	0.26	7.4	0.26	7.4	0.26
No of earning member	1.62	0.77	1.74	0.89	1.62	0.83
Cash savings	14.5	0.35	61.7	0.49	65.7	0.47
N = 4549						

The average household size is 3.78, which is smaller than the national average 4.85.²³ However, our findings reflect an upward trend for average family size. Household heads are around 43 years in baseline. Household heads also had very little schooling – average schooling attainment was 0.57 years. Female-headed households are very common in poorer households, which is evidenced in our finding and justified by inclusion and exclusion criteria of the CFPR that more than 30 percent of the ultra poor households are female-headed. The prevalence of widowed, divorced and separated household heads is worth mentioning that

²² Authors' tabulation. * HHH implies household head.

²³ HIES, 2005.

²⁴ Agricultural Census, Bangladesh 2006.

only 70 percent of the household heads are married and others fall into those categories. Years of schooling and literacy status of the household heads remain almost constant over time.

3.2.2 Prevalence of landholdings of the Ultra Poor Households

Landlessness is a very common criterion among the ultra poor households in Bangladesh. It is defined here as those who do not own any type of lands like homestead, cultivable and uncultivable. This study reports that around 45 percent of the ultra poor households are landless in 2002. Findings of agricultural census in Bangladesh report that among the rural households, 12.85 percent are landless.²⁴ Findings from this study imply higher prevalence of landlessness within the ultra poor households in Bangladesh.

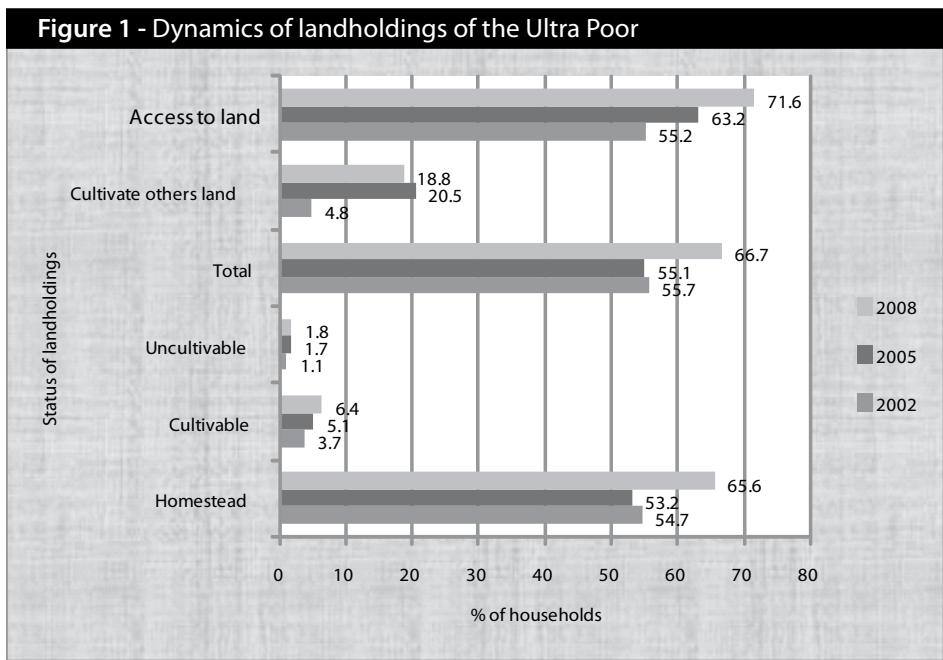


Figure 1 indicates that landlessness decreases over the years due to increased ownership of land like homestead, cultivable and uncultivable. The ownership gain in lands is due to impact of the CFPR, which is to be observed later on in this study. In 2008, landlessness within the ultra poor households is reduced to 35 percent from 45 percent in 2002 and 2005 respectively. We find dramatic increase in the access to lands. However, about 30 percent of the households have no access to this important natural resource, which is reported in table 3.b.

Though owning cultivable land is the desired outcome of most of the rural poor, buying land remains an ambitious goal. Ownership of land in decimal shows increasing trend for cultivable land, which is very essential for food safety. We find parallel trend for homestead and land-man ratio to the horizontal axis up to 2005 and then they start rising.

Table 3.b - Landholdings Pattern of the Ultra Poor²⁵

Variables	2002		2005		2008	
	Mean	SD	Mean	SD	Mean	SD
Landholdings (% of Households)						
Homestead	54.7	0.50	53.2	0.50	65.6	0.48
Cultivable	3.7	0.19	5.1	0.22	6.4	0.25
Uncultivable	1.1	0.11	1.7	0.13	1.8	0.13
Total	55.7	0.50	55.1	0.50	66.7	0.47
Cultivate others land	4.8	0.21	20.5	0.40	18.8	0.39
Access to land	55.2	0.49	63.2	0.48	71.6	0.45
Access for leasing	40.1	0.49	30.0	0.46	42.6	0.49
Amount owned (in decimal)						
Homestead	2.6	4.8	2.6	4.8	3.4	4.8
Cultivable	1.1	9.7	1.2	11.5	1.4	10.6
Uncultivable	0.2	4.9	0.2	2.7	0.2	1.7
Total	3.9	13.4	4.1	14.2	5.0	13.1
Cultivate others land	1.5	8.2	6.0	17.6	5.1	15.6
Access to land	5.4	16.4	10.1	22.9	10.1	21.1
Land -man ratio	1.1	3.1	1.1	3.6	1.2	2.7
Mortgage, buying and selling (% of households)						
Mortgage in	-	-	9.7	0.30	12.9	0.33
Mortgage out	-	-	1.6	0.12	1.1	0.10
Bought	-	-	5.7	0.23	6.0	0.24
Sold	-	-	2.4	0.15	0.9	0.10
N	4549		4549		4549	

3.2.3 Food Safety Issues of the Ultra Poor

Chronic or occasional food deficit is the key characteristics of the ultra poor in Bangladesh. In 2002, over 50 percent and 40 percent of the ultra poor households suffer from chronic and occasional food deficit respectively. Only a few households had neither food deficit nor surpluses (break-even) and less than 1 percent had the food surpluses in 2002. Table 3.c shows dramatic fall in chronic food deficit in 2005, but slightly increases in 2008. However, the extent of occasional food deficit keeps rising over the years, which is evidenced by the acute employment crisis for day labourer in the sample districts in October and November every year.²⁶ Improvement in break-even and surpluses are evidenced here.

²⁵ Authors' tabulation. Total land comprises homestead, cultivable and uncultivable. Access to land consists of total land plus cultivates other's land. – implies no availability data in 2002.

²⁶ M. Rabbani et al., *op. cit.*

Table 3.c - Dynamics of Food Safety, Income and Health Issues

Variables	2002		2005		2008	
	Mean	SD	Mean	SD	Mean	SD
Self-Perceived Food Security (% of Households)						
Chronic food deficit	51.5	0.50	22.2	0.42	26.0	0.43
Occasional food deficit	42.6	0.43	53.4	0.50	56.8	0.50
Break-even	5.2	0.22	19.3	0.40	15.1	0.36
Surplus	0.72	0.08	5.06	0.22	2.22	0.15

4. Model Specification for Impact of the CFPR Programme

4.1 Modelling Outcome of the CFPR Using Unconditional DID

A central feature of any impact evaluation is the use of longitudinal data to use DID methods, which rely on baseline (before) and the follow-up (after) data collected from households or members belong to the programme (with) and those do not belong to the programme (without). In order to separate the programme impact, thus this study requires both before and after and with and without data. CFPR fulfils all requirements for the implementation of double-difference methods in order to get true impact of the CFPR. To see how double-differences work, a modified version of Maluccio and Flores (2005) is shown in table 4.a, where estimator DID is defined as the difference in average outcome in the treatment group before and after the treatment minus the difference in average outcome in the control group before and after treatment.

Table 4.a - Difference- in-Differences (DID) Estimator²⁷

Group	Before	After	After-Before Difference
Treatment (T)	\bar{Y}_0^T	\bar{Y}_1^T	$\bar{Y}_1^T - \bar{Y}_0^T$
Control (C)	\bar{Y}_0^C	\bar{Y}_1^C	$\bar{Y}_1^C - \bar{Y}_0^C$
T-C	$\bar{Y}_0^T - \bar{Y}_0^C$	$\bar{Y}_1^T - \bar{Y}_1^C$	$\Delta_{DD} = \bar{Y}_1^T - \bar{Y}_1^C - (\bar{Y}_0^T - \bar{Y}_0^C)$

Soure: Modified from maluccioflores (2005)

4.2 Modelling Outcome of the CFPR Using Conditional DID

The CFPR outcome is modelled in (i), which adds covariates, x_i .

$$Y_i = \alpha + \beta cfpr_i + \gamma t_i + \delta (cfpr_i * t_i) + \varphi x_i + \varepsilon_i \text{ ----- (i)}$$

²⁷ J. A. Maluccio and R. Flores, "Impact Evaluation of a Conditional Cash Transfer Programme", The Nicaraguan Red de Protection, Research Report No. 41, IFPRI, Washington, D.C., 2005.

When x_i are added to control, populations sampled may differ systematically over the periods. OLS estimator, δ , is no longer has the form shown in table 4.a., but its interpretation remains same. Here, one additional assumption $\text{cov}(x_i, \varepsilon_i) = 0$ is required. This study controls the household characteristics to measure true impact of the CFPR.

4.3 The Fixed Effects Model (FEM): Theoretical Aspect

Fixed effects estimates are at least as common as first differencing. For measuring impact of the CFPR on landholdings and food security, we start from:

$$Y_i = \alpha_0 + \alpha_1 t_{2005} + \alpha_2 t_{2008} + \sum_k \phi_k x_i + \delta_1 (cfpr_i * t_{2005}) + \delta_1 (cfpr_i * t_{2008}) + \varphi_i + \varepsilon_i \text{ ----- (i)}$$

Which is a regression of the amount of landholdings or food security for household i in time-period t against the household fixed effects (φ_i), a series of household socio-demographic characteristics, time dummies, interaction dummies between $cfpr$ and time dummies and a random error term (ε_i). Socio-demographic controls include age, sex, marital status, literacy and education of the household head, household size, no of earning member and savings. The programme dummy $cfpr$ takes value 1 if household belongs to the CFPR, 0 if otherwise. The household fixed effect captures all time-invariant household-specific unobserved heterogeneity such as preferences, health endowments, ability and intelligence that may affect outcome like land and food security. Time dummies capture the outcome variation in period t and remain common to all households. The interactions ($cfpr * t$) give the short- and long-term impact on landholdings or food security. The error terms represent random variations. As this study allows the unobserved fixed effects, φ_i are correlated with explanatory variables in (i), it is measured by the FEM assuming $Cov(\Delta \dot{x}, \Delta \varepsilon_i) = 0$. Here, OLS produces unbiased and efficient estimates and these would be called causal if $\text{cov}(\Delta x_i, \Delta \varepsilon_i) = 0$. As this study is concerned with household characteristics, it is better to apply FEM rather than REM.

5. Result and Discussion

5.1 Impact Estimation of the CFPR on Landholdings and Food Security Using Unconditional DID

5.1.1 Impact on Landholdings

This study uses two measurement units: proportion of households and decimal for observing the impact on landholdings. This study first applies the first-difference method between the treatment and control group for each year in order to see whether any significant differences exist. Estimates from first-difference are summarised in table A.1. This study finds the significant differences in all types of landholdings using proportion as a unit of measurement in 2002. This study gets similar results after using decimal as a unit of measurement except for uncultivable land. Negative sign in the first-difference estimates implies the proportion of households owning land is higher for the control group than that of treatment. Similarly, this study has computed the first-difference estimates for 2005 and 2008 respectively. Finally, this study has estimated impact of the CFPR on landholdings on which this study is concerned with.

Table 5.a- Impact on Landholdings Using Unconditional DID

Landholdings	CFPR Impact ⁺		
	2005 over 2002	2008 over 2002	2008 over 2005
Landholdings (% of households)			
Homestead	7.1***	12.7***	5.6***
Cultivable	2.6***	5.2***	2.7***
Uncultivable	0.3	0.5	0.3
Total	7.6***	13.5***	5.8***
Cultivate others	8.9***	14.3***	5.4***
Access to land	12.6***	17.5***	4.9**
Access for leasing	19.3***	18.8***	-0.6
Amount of land (in decimal) ²⁸			
Homestead owned	0.7***	1.0***	0.3
Cultivable owned	0.4	1.0**	0.6
Uncultivable owned	0.0	0.1	0.06
Total owned	1.1**	2.2***	1.0*
Cultivate others	1.0*	3.0***	2.0***
Access to land	2.2***	5.2***	3.0***
Land -man ratio	0.4***	0.7***	0.3**
Mortgage, buying and selling (% of households)			
Mortgage in	-	-	7.2***
Mortgage out	-	-	0.2
Bought	-	-	2.1**
Sold	-	-	1.7***

Note: + positive sign implies ownership is higher for treatment than the control. Short-term impact (2008 over 2005) is the difference between long-term minus short-term (2005 over 2002). ***p<0.01, **p<0.05 and *p<0.1. - implies unavailability of data in 2002.

²⁸ Decimal, though outdated, is still used in rural part of Bangladesh. 1 decimal is equal to 40.46 square meters.

Unconditional DID using proportion of household shows the significant true impact on landholdings in 2005 and 2008 over 2002 except for uncultivable land. Similarly, this study finds significant true impact in 2008 over 2005 except for uncultivable land and land leasing. This additional impact provides insights that short-term impact (2005 over 2002) is higher than long-term impact, but difference is no more significant on leasing in 2008 over 2005. However, all other cases, long-term impact is higher than short-term (2005 over 2002).

Unconditional DID using decimal shows the significant positive impact on homestead, total land, cultivate others land, access to land and land-man ratio in 2005 over 2002. However, this study finds the significant impact on all categories except uncultivable land in the long-run. Impact on cultivable land contradicts with the previous one as this study changes measurement unit. Thus, CFPR has significant positive impact on cultivable landholdings in the long-run. These findings are consistent with rational hypothesis that the people generally spends on a durable items after the increase in income becomes permanent. Impacts in 2008 over 2005 show that CFPR has the significant impacts on total land, cultivate others lands, access to land and land-man ratio and all these are positive.

This study measures only the short-term (2008 over 2005) impact as data regarding mortgage in and out, bought and sold land were not collected in 2002. Findings show the significant impact of CFPR on mortgage in, buying and selling land. Higher proportion of households of the treatment group is getting involved in mortgage in. In case of buying lands, proportion of households within the treatment group increases over the years while this declines for the control. Thus, the impact is high and significant. This implies that 2.1 percent of the households buy lands more due to the CFPR program as this study compares it to the control. As selling land or distressed sale is linked to shock, findings suggest that proportion of households selling land is higher for the control than the treatment group in 2005. The first difference is statistically significant and negative. But no significant difference is found between the groups in 2008. This is why true impact of the CFPR is positive.

5.1.2 *Impact on Food Safety*

The concept 'food security' refers to whether households face any chronic and occasional food deficit, break-even and surpluses. The estimates from first-difference are shown table A.4, which shows the higher prevalence of chronic food deficit in the treatment (61.8 percent) than the control group (41.3 percent) in 2002. However, occasional food deficit is lower for the treatment (35.8 percent) than the control (49.3 percent) in 2002. In terms of break-even and surplus, control group is better off than the treatment. Though acute food shortages are more prevalent in the treatment in 2002, they become better off in follow up year. The findings of first-differences can be found in table A.2.

Impact on food security, income and its distribution are shown in table 5.b, which shows CFPR has significant impact on reducing the chronic food deficit faced by the treatment in 2005 and 2008 over 2002. But occasional food deficit significantly increases during the same periods, which is neglected in most of the existing studies that have assessed CFPR impact. For break-even and surpluses, this study finds significant positive impact on control group both in short-run (2005 over 2002) and long-run. Negative sign in 2008 over 2005 implies long-run impact is smaller than short-run. Overall, CFPR plays a crucial role bringing food security to them though it contributes to occasional food deficit. Significant true impact of the CFPR on food security is found only for break-even in 2008 over 2005, which is negative.

Table 5.b - Impact on Food Safety, Income and Its Distribution Using Unconditional DID			
Variables	CFPR Impact		
	2005 Over 2002	2008 over 2002	2008 over 2005
Self-Perceived Food Security (% of Households)			
Chronic food deficit	-35.5***	-33.1***	2.5
Occasional food deficit	13.5***	16.6***	3.1
Break-even	16.8***	12.5***	-4.4***
Surplus	5.2***	4.0***	-1.2

***p<0.01, **p<0.05 and *p<0.1

5.2 Impact Estimation of the CFPR Using Conditional DID

5.2.1 Impact on Landholdings

The impact of the CFPR on landholdings is measured using conditional difference-in-differences estimate, which is almost same as unconditional. Conditional DID measures the impact after controlling the covariates of the household characteristics like size of the household, age, sex, marital status, education, literacy of the household head, no of earning member and savings. This study uses the following specification for measuring true impact of the programme for short-and long-term (2005 over 2002 and 2008 over 2002), shown in table 5.c.

$$\begin{aligned}
 Y_i = & \alpha_1 t_{2002} + \alpha_2 t_{2005} + \alpha_3 t_{2008} + \beta cfpr + \delta_1 cfpr * t_{2005} + \delta_2 cfpr * t_{2008} \\
 & + \varphi_1 h_size + \varphi_2 age_hhh + \varphi_3 sex_hhh + \varphi_4 married + \varphi_5 edu_hhh \\
 & + \varphi_6 lit_hhh + \varphi_7 earn_mem + \varphi_8 savings + \varepsilon_i \text{ ----- (iv)}
 \end{aligned}$$

Table 5.c - Impact on Landholdings Using Conditional DID			
Outcome variables	CFPR Impacts+		
	2005 over 2002	2008 over 2002	2008 over 2005
Landholdings (% of Households)			
Homestead	1.7	7.5***	5.9***
Cultivable	0.2	2.8***	2.6***
Uncultivable	-0.4	-0.1	0.3
Total	1.6	7.6***	6.1***
Cultivate others	3.8**	9.2***	5.4***
Access to land	5.4**	10.5***	5.2***
Access for leasing	9.1***	8.4***	-0.7
Amount owned (in decimal)			
Homestead	0.09	0.38*	0.30
Cultivable	-0.03	0.61	0.65
Uncultivable	0.03	0.09	0.06
Total	0.09	1.09*	1.01*
Cultivate others	-1.06	0.93	2.01***
Access to land	-0.97	2.02***	3.03***
Land -man ratio	0.11	0.40***	0.29**
Mortgage, buying and selling (% of households)			
Mortgage in			7.32***
Mortgage out			0.10
Bought			2.00**
Sold			1.86***

Note: +In all conditional DID estimates, this study controls for size of the household, age, sex, marital status, education, literacy of the household head, no of earning member and savings. Significance is based on robust standard errors. ***p<0.01, **p<0.05 and *p<0.1.

After controlling the household characteristics, this study finds no significant impact using proportion of households on homestead, cultivable and uncultivable land in 2005 over 2002. However, this study finds the significant impact on cultivation of others land, access to land and leasing. Thus, CFPR enhances access to land and leasing. However, long-term impact is significant for all cases except uncultivable land. The short-term impact for 2008 over 2005 is similar to long-term except for leasing. The drastic increase in leasing was held between 2002 and 2005. This study finds no significant short-term (2005 over 2002) impact using decimal as unit of measurement. However, this study finds significant short-term impact on total land, cultivate others land, access to land and land-man ratio in 2008 over 2005 and long-term impact on homestead, total land, access to land and land-man ratio. Thus, findings here are imperatives for the treatment group in a sense that long-term impact is higher for the short-term (2005 over 2002) and we, therefore, conclude it takes time for the treatment group to have true impact of CFPR on landholdings.

5.2.2 Impact on Food Safety

True impact of the CFPR on food security is estimated using conditional DID after controlling the household characteristics. It shows the significant impact on chronic food deficit in 2005 and 2008 over 2002. Negative sign implies that households belonging to CFPR face less chronic food deficit. However, this study does not find significant impact in 2008 over 2005. This study finds the opposite result for occasional food deficit. For break-even and surpluses, there is significant impact on food security.

Table 5.d- Impact on Food Safety, Income and Its Distribution Using Conditional DID			
Outcome variables	CFPR Impacts		
	2005 over 2002	2008 over 2002	2008 over 2005
Self-Perceived Food Security (% of Households)			
Chronic food deficit	-22.5***	-20.1***	2.5
Occasional food deficit	9.5***	12.8***	3.3
Break-even	10.2***	6.0***	-4.3***
Surplus	2.7***	1.3**	-1.4*

Note: Significance based on robust standard errors. ***p<0.01, **p<0.05 and *p<0.1

5.3 Econometric Modelling of Impact of the CFPR

Findings from FEM for landholdings and chronic food deficit of the ultra poor are reported in table 5.e. Fixed effects estimates are reported in all specifications as it is evidenced from Hausman test. The coefficients of this study's interest are reported here. The results in column (1) show the CFPR has significant long-term impact on total landholdings and access to land after controlling observed and unobserved household characteristics. Thus, long-term coefficients on CFPR interaction with time dummy 2008 are statistically significant for landholdings and land access.

Land-man ratio specification in column (3) shows the CFPR has both short- and long-term significant impact on land-man ratio at 10 percent and 1 percent level of significance respectively. As land plays a crucial role in mitigating food related crisis, higher access to land leads to less food deficit of the ultra poor. This hypothesis is tested to check whether the CFPR has any impact on reducing food insecurity. Chronic food deficit specification is presented in column (4), which shows the significant impact of the programme for both short- and long-term as the coefficients on the CFPR interactions with time dummies are statistically significantly different from zero at 1 percent level of significance. The negative sign indicates CFPR beneficiaries face less chronic food deficit compared to non-beneficiaries. Explanatory variables those are of this study's interest are summarised in table A.3.

Table 5.e- Impact on Landholdings, Land-man Ratio and Chronic Food Deficit Using FEM				
Explanatory variables	Outcome variables			
	Total land	Land Access	Land-man ratio	Chronic food deficit
CFPR-TUP*2005	0.593 (0.440)	0.459 (0.790)	0.215* (0.124)	-0.254*** (0.021)
CFPR-TUP*2008	1.581*** (0.473)	3.387*** (0.751)	0.504*** (0.114)	-0.227*** (0.021)
Constant	1.933 (1.486)	-2.037 (3.104)	1.419*** (0.417)	0.400*** (0.066)
No of observation	13,569	13,569	13,569	13,569
Hausman Chi2	93.62	65.71	94.58	194.31
Prob>chi2	0.0000	0.0000	0.0000	0.0000

Note: Complete findings are reported in table A.3. ***p<0.01, **p<0.05 and *p<0.1.

6. Summary and Conclusion

The main objective of this paper is to examine short- and long-term impact of the CFPR on landholdings and food security of the ultra poor households in rural Bangladesh using conditional and unconditional difference-in-differences (DID) methods. In addition, fixed effects estimation is also applied to check the robustness of the estimates on certain outcomes like total land owned, access to land, land-man ratio and chronic food deficit.

Based on proportion of households as a unit of measurement, both conditional and unconditional DID find the consistent, significant and positive impact of the CFPR on homestead for long-term. This study also finds similar impact on cultivable and total landholdings. Thus, both DID approaches suggest the robustness of this study's impact estimates in the long-run for homestead, cultivable and total landholdings. Both methods also find the robust estimates both for short- and long-term in cases of cultivation of others' land, access to land and leasing. Based on decimal as a measurement unit, both DID methods find the robust impact on homestead, total land owned, access to land and land-man ratio in the long-term at best 10 percent level of significance. This study finds no robust impact on cultivable land and cultivation of others' land both in short- and long-term though this study finds the robust impact for these two categories using proportion of household as a unit of measurement. Thus unit of measurement could give rise to a contradiction in the impact estimates. Additional check is done applying fixed effects estimate along with DID methods on total land owned, access to land and land-man ratio. Here this study has used decimal for impact measurement. The findings suggest that the CFPR has robust impact on total land owned, access to land and land-man ratio only in the long-term irrespective of the approaches. Here all coefficients are positive though first-difference estimates are

negative for all categories. This implies that larger impact of the CFPR programme, which is explained by the parallel trend assumption shown in figure 2. This also proves that treatment converges to the control and then succeeds.

Land market participation in terms of mortgage in and out, bought and sold shows the consistent result for short-term (2005 over 2008) and long term. Both DID approaches find the significant impacts except for mortgage-out. As there is a channel effect of landholdings on the food security, this study has applied fixed effects along with conditional and unconditional DID to observe the impact on food security. FEM is applied only for chronic food shortage on which this study is very much concerned. This study uses self-perceived food security. All three approaches provide very much consistent results for short-term and long-term. This study finds the robust impact of the CFPR on chronic food deficit after applying all three methods. Findings suggest households belong to the programme face significantly less chronic food shortages compared to the control. Based on DID approaches, it finds though CFPR contributes to chronic food security, it accelerates occasional food insecurity. However, it is imperative for the programme that the short-term impact (2008 over 2005) is no longer significant. Moreover, this study finds the consistent, positive and significant impact on break-even and surpluses. Thus the overall impact of the CFPR on food safety issues is positive.

Appendices

Table A.1 - First-Difference and Unconditional DID Estimates on Landholdings												
Landholdings	2002 (Baseline)			2005 (End of the Program)			2008 (Three years later After the end of program)			Impacts using unconditional DID		
	T	C	D	T	C	D	T	C	D	2005 over 2002	2008 over 2002	2008 over 2005
Landholdings (% of Households)												
Homestead	47.9	61.4	-13.5***	49.9	56.3	-6.4***	65.2	66.0	-0.8	7.1***	12.7***	5.6***
Cultivable	1.42	6.01	-4.59***	4.1	6.0	-1.9***	6.8	6.1	0.7	2.6***	5.2***	2.7***
Uncultivable	0.84	1.39	-0.55*	1.6	1.9	-0.3	1.8	1.9	-0.1	0.3	0.5	0.3
Total	48.6	62.6	-14.0***	51.9	58.2	-6.3***	66.5	67.0	-0.5	7.6***	13.5***	5.8***
Cultivate others	4.04	5.61	-1.57**	24.4	16.9	7.3***	25.2	12.4	12.8***	8.9***	14.3***	5.4***
Access to land	50.47	63.88	-13.42***	62.8	63.6	-0.8	73.7	69.6	4.1***	12.6***	17.5***	4.9**
Access for leasing	37.6	42.6	-5.0***	37.5	23.2	14.3***	50.0	36.3	13.7***	19.3***	18.8***	-0.6
Amount of land (in decimal)												
Homestead owned	1.9	3.3	-1.4***	2.3	3.0	-0.7***	3.2	3.6	-0.4***	0.7***	1.0***	0.3
Cultivable owned	0.2	2.0	-1.8***	0.5	1.9	-1.4***	1.0	1.8	-0.8**	0.4	1.0**	0.6
Uncultivable owned	0.1	0.3	-0.2	0.1	0.3	-0.2	0.1	0.2	-0.1	0.0	0.1	0.06
Total owned	2.2	5.6	-3.4***	2.9	5.1	-2.2***	4.3	5.6	-1.2***	1.1**	2.2***	1.0*
Cultivate others	1.0	1.9	-0.9***	6.0	5.9	0.1	6.2	4.1	2.1***	1.0*	3.0***	2.0***
Access to land	3.2	7.5	-4.3***	9.0	11.1	-2.1***	10.5	9.7	0.9	2.2***	5.2***	3.0***
Land -man ratio	0.7	1.5	-0.8***	0.9	1.2	-0.3***	1.2	1.2	0.0	0.4***	0.7***	0.3**
Mortgage, buying and selling (% of households)												
Mortgage in	-	-	-	14.5	5.0	9.5***	21.2	4.6	16.7***	-	-	7.2***
Mortgage out	-	-	-	1.1	2.0	-0.9**	0.7	1.4	-0.7**	-	-	0.2
Bought	-	-	-	8.8	2.7	6.1***	10.1	1.9	8.2***	-	-	2.1**
Sold	-	-	-	1.3	3.4	-2.1***	0.7	1.1	-0.4	-	-	1.7***

Note: Tabulated by authors from CFPR longitudinal survey data. T and C stand for treatment and control groups respectively and D stands for mean difference between treatment and control. ***p<0.01, **p<0.05 and *p<0.1. – implies unavailability of data for the base period.

Table A.2- First-Difference and Unconditional DID Estimates on Food Security

Outcome Variables	2002			2005			2008			Impacts		
	T ₁	C ₁	D ₁ (T ₁ -C ₁)	T ₂	C ₂	D ₂ (T ₂ -C ₂)	T ₃	C ₃	D ₃ (T ₃ -C ₃)	2005 Over 2002 (D ₂ -D ₁)	2008 over 2002 (D ₃ -D ₁)	2008 over 2005 (D ₃ -D ₂)
Self-Perceived Food Security(% of Households)												
Chronic food deficit	61.8	41.3	20.5***	14.7	29.7	-15.0***	19.6	32.2	-12.5***	-35.5***	-33.1***	2.5
Occasional food deficit	35.8	49.3	-13.6***	53.3	53.4	-0.1	58.3	55.3	3.0**	13.5***	16.6***	3.1
Break-even	2.4	8.0	-5.6***	25.0	13.8	11.2***	18.5	11.7	6.8***	16.8***	12.5***	-4.4***
Surplus	0.04	1.4	-1.3***	7.0	3.1	3.9***	3.6	0.9	2.6***	5.2***	4.0***	-1.2

Note: Tabulated by authors from CFPR-TUP longitudinal survey data. ***p<0.01, **p<0.05 and *p<0.1

Table A.3- Impact of the CFPR on Landholdings and Chronic Food Deficit Using FEM				
Explanatory variables	Dependent variables			
	(1)	(2)	(3)	(4)
	Total land	Land Access	Land-man ratio	Always food deficit
CFPR-TUP*2005	0.593 (0.440)	0.459 (0.790)	0.215* (0.124)	-0.254*** (0.021)
CFPR-TUP*2008	1.581*** (0.473)	3.387*** (0.751)	0.504*** (0.114)	-0.227*** (0.021)
Household size	0.286 (0.230)	1.780*** (0.549)	-0.204*** (0.044)	0.005 (0.008)
Age HHH	0.008 (0.037)	-0.028 (0.056)	0.004 (0.008)	0.002* (0.001)
Sex HHH	-0.361 (0.538)	-1.486 (0.978)	0.019 (0.195)	0.118*** (0.029)
Married(=1 if married)	0.886 (0.651)	2.757** (1.184)	0.350 (0.299)	-0.014 (0.030)
Education HHH (years)	-0.143 (0.214)	0.144 (0.378)	-0.023 (0.050)	0.009 (0.009)
Literate (=1 if literate)	0.565 (1.233)	0.595 (1.930)	-0.031 (0.278)	-0.110** (0.055)
No of earning member	-0.008 (0.142)	-0.001 (0.234)	-0.002 (0.039)	0.005 (0.006)
Savings (=1 if yes)	0.734** (0.345)	2.411*** (0.593)	0.293*** (0.089)	-0.135*** (0.014)
Year 2005	-0.598* (0.357)	2.747*** (0.597)	-0.211** (0.089)	-0.113*** (0.014)
Year 2008	-0.325 (0.379)	0.833 (0.663)	-0.146 (0.096)	-0.092*** (0.016)
Constant	1.933 (1.486)	-2.037 (3.104)	1.419*** (0.417)	0.400*** (0.066)
No of observation	13,569	13,569	13,569	13,569
Hausman Chi2	93.62	65.71	94.58	194.31
Prob>chi2	0.0000	0.0000	0.0000	0.0000

Note: Tabulated by authors from CFPR-TUP longitudinal survey data. ***p<0.01, **p<0.05 and *p<0.1. Robust standard errors are in the parentheses.

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