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Integrating Gender and Nutrition within Agricultural Extension Services

The Egiye Jai and Nijera Gori Projects in Bangladesh
Interim Evaluation Report

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Interim Evaluation Report

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CRS CATHOLIC RELIEF SERVICES faith. action. results.

CARITAS BANGLADESH

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Abbreviations

ATO	Agriculture Technical Officer
CB	Caritas Bangladesh
CRS	Catholic Relief Services
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field School
ICT	Information and Communication and Technolgy
INGENAES	Integrating Gender and Nutrition within Agricultural Extension Services
KM	Kernel Matching
LR	Likelihood Ratio
NN	Nearest Neighbor
PSM	Propensity Score Matching
T&V	Training and Visit
UNICEF	United Nations Children's Emergency Fund
VDT	Village Development Team
VPMT	Village Production and Marketing Team

Executive Summary

In most developing countries, agriculture is an important component of a strategy facilitating economic activities, reducing poverty, and contributing to improving human capital and other measures of family well-being of the families. Agricultural extension services provide mechanisms to enhance dissemination and adoption of improved agricultural technologies, better farming practices, marketing, and resource management, to improve agricultural productivity and develop the rural community.

As of January 2013, Caritas Bangladesh (CB) and Catholic Relief Services (CRS) have partnered in implementing the the Egiye Jai ("Move Forward") and Nijera Gori ("We Build it Ourselves") projects. The agricultural extension projects aim to improve household food security and nutrition through increasing the yield of year-round quality homestead production, promoting more effective participation in the local value chain, and increasing savings and assets to purchase food during the lean season of vulnerable farming households in 16 villages in Barisal and Dinajpur districts. This report evaluates the impacts that agricultural extension projects have on households' income and farm livelihoods of livestock, vegetable, and fisheries when they increase women farmers' access to improved technologies and advisory services.

This report utilizes cross-sectional data of 1,682 households, collected in 2016, from 29 rural villages in two vulnerable districts of Bangladesh. Using a propensity score matching method, we find that agricultural extension projects increased participants' monthly income (expenditure) and the likelihood of having poultry and planting vegetable garden and varieties. However, we cannot find a consistent statistical extension effect on the possession and quantity of larger animals and fisheries within the household, with both activities are often considered to be men's responsibility, across different propensity score matching and specifications. Our main findings imply reaching women farmers with advanced technologies and advisory services would improve participants' food security and dietary diversity; however, field experiments may be necessary to understand gender-specific farm livelihoods and the role of agricultural extension.

In summation, the projects had the following impacts within households:

- Egiye Jai (Barisal)
    - Increases the likelihood they would have poultry by 25-30 percentage points
    - Increases the likelihood they would plant a vegetable garden by 37-45 percentage points, and increases plating by about four types of vegetables in the garden
    - Increases their average monthly income by 2,710-3,418 taka (35-44 U.S. dollars)
- Nijera Gori (Dinajpur)
    - Increases poultry in the household by about three
    - Increases the likelihood they would plant a vegetable garden by about 20-21 percentage points, and increases planting by about two types of vegetables in the garden
    - Increases their average monthly income by 1,772-1,952 taka (23-25 U.S. dollars)

- Egiye Jai and Nijera Gori:
    - A higher proportion of households in the treatment villages sold their poultry and vegetables during the last year
    - Women are more likely involed in making decisions on marketing poultry and vegetables

Introduction

In most developing countries, the growth and development of agriculture is an important strategy to reduce poverty. Agricultural extension provides mechanisms to enhance dissemination and utilization of new agricultural technologies and practical information to improve agricultural productivity and farm decision making and develop sustainable agro-industrial economy (Binswanger & Von Braun, 1991; Feder & Slade, 1986; Garforth 1982; Just & Zilberman, 1988). Extension systems use various forms of delivery, including specialists or field agents visiting and training selected communities, known as the training-and-visit (T&V) approach (Evenson & Mwabu, 2001; Feder, Slade, & Lau, 1987; Gautam, 2000; Hussain, Byerlee, & Heisey, 1994; Owens, Hoddinott, & Kinsey, 2003); the use of information and communication technology (ICT) (Aker, 2010; Aker & Mbiti, 2010; Goyal, 2010); and learning through the share of knowledge and experiences between farmers or through farmer field schools (FFS) (Alene & Manyong, 2006; Feder, Murgai, & Quizon, 2004; Tripp, Wijeratne, & Piyadasa, 2005; Weir & Knight, 2004).

Despite the variety of delivery mechanisms and advisory approaches, previous evaluation studies and reviews of agricultural extension services provide consistent evidence of gender bias and gender-specific constraints in access to extension services of poor rural women. For example, Swanson, Farner, and Bahal (1990) show that women receive only between 2% and 10% of all extension contacts and a mere 5% of extension resources worldwide. Moreover, the recent studies of Gilbert et al. (2002), Katungi et al. (2008), and Madhvani and Pehu (2010) do not show any substantial improvements in gender equality in extension service delivery despite decades of efforts to integrate gender issues into economic development and poverty reduction strategies.

On the other hand, a number of empirical studies exploring the relative position of women in society on the level of economic development suggest that an increase in women's access to education and financial opportunities improve families' nutrition, child education, and other society-wide economic developments (Duflo, 2012; Goetz & Gupta, 1996; Hashemi, Schuler, & Riley, 1996; Panjaitan-Drioadisuryo & Cloud, 1999; Pitt & Khandker, 1998; Sharma & Zeller, 1997). Also, recent findings from the Food and Agriculture of the United Nations (FAO) (2011) show that women can increase yields on their farms by 20-30% if they have the same level of access to extension services and resources as men, which could, in turn, reduce hunger for 12-17% of people worldwide. However, the impact of agricultural extension differs depending on the types of technologies, delivery mechanism of the services, typography of the country, and cultural and social factors (Anderson & Feder, 2004; De Janvry & Sadoulet, 2002; Norton, Alwang, & William, 2014; Todaro, 2000).

This report evaluates the impact of agricultural extension projects that increase women farmers' access to improved technologies and advisory services in poor rural villages in two districts of Bangladesh on households' income and farm livelihoods of livestock, vegetable, and fisheries. As of January 2013, Caritas Bangladesh (CB) and Catholic Relief Services (CRS) have partnered in implementing the the Egiye Jai ("Move Forward") and Nijera Gori ("We Build It Ourselves")

projects, aiming to increase the yield of year-round quality homestead production and household food security and nutrition.[1] In order to increase women farmers' access to extension services, the project adopt a cluster-level training approach – extension workers provide one-on-one and group training of farmers on a variety of agricultural subjects at each village cluster – to avoid spatial constraint from the cultural norm that limits women's mobility beyond her homestead or community. Given the differential effects of extension services and the small number of research due to gender bias and structural and cultural constraints of women in access to extension services, this study aims to contribute to agricultural extension and gender literature by providing empirical evidence of extension projects targeting rural women farmers in increasing their access to improved technologies and advisory services.

Background

Bangladesh, a South Asian country of approximately 160 million people, is characterized by a high population density, low per-capita income, and high poverty in which around 47 million people are below the poverty line. Agriculture accounts for 16% of the country's gross domestic product and employs nearly half of the country's workforce. Also, nearly two-thirds of Bangladesh's population live in rural areas, and over 87% rural people depend on agriculture as an income source. The World Bank (2016) reports that agriculture has played a key role in reducing Bangladesh's poverty from 48.9% in 2000 to 31.5% by 2010; however, people living in the flash flood and drought-prone districts in the northwest – where the Nijera Gori project has been implemented – and the saline-affected tidal surge areas in the south - the location of the Egiye Jai project – still suffer from more severe food insecurity and higher poverty than the national average.

The Egiye Jai project has been implemented in eight villages in Rajihar Union of Barisal district, and the Nijera Gori project has been implemented in eight villages in Dinajpur Sadar and Birgonj Upazilas of Dinajpur districts. Both projects deliver the similar extensive agricultural training that provides a strong basis for sustainable and quality homestead production of vegetable, poultry, livestock, and fisheries as well as post-harvest management and financial skills.[2] In order to deliver the training, each project appoints one agriculture technical officer who collects information from government agencies (the upazila level government agriculture officer, livestock officer, and

[1] Caritas Bangladesh (CB) is a national non-profit non-governmental organization (NGO) that aims to enhance human welfare and contribute to the national development operating in over 200 upazilas in Bangladesh. Catholic Relief Services (CRS) is the official international humanitarian agency of the US Catholic community, providing humanitarian relief and development assistance in over 90 countries on five continents. Research data were collected by Caritas Bangladesh (CB) and Catholic Relief Services (CRS) in conjunction with Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES). INGENAES is a project of the University of Illinois at Urbana-Champaign (UIUC). Funded by USAID, INGENAES supports the development of improved extension and advisory systems (EAS) to reduce gender gaps in agricultural extension services, and improve gender and nutrition integration within extension services. Currently INGENAES is operational in six countries: Bangladesh, Zambia, Nepal, Honduras, Tajikistan, and Uganda.

[2] Types of improved agricultural technologies are listed in Appendix A.

fishery officer) and community leaders to prepare a draft training schedule and technical materials for project animators and service recipients. The animators receive five days of agricultural training for improved production practices, followed by 2-3 hours of regular training bi-weekly.

The projects use a cluster-level training approach to promote women farmers' participation in agricultural training programs. Specifically, in each village, the projects define geographical boundaries for each cluster of households, ensuring that households within close proximity to each other are in the same cluster. Indeed, restrictions on women's physical mobility beyond her homestead or community are often discussed in literature as a major barrier to women farmers' access to and adoption of new technologies and educational and financial opportunities in Bangladesh (Adato & Meinzen-Dick, 2007; Schuler & Hashemi, 1994). In order to overcome this barrier while avoiding cultural conflict within the household and community, the projects bring extension services to a gathering space close to participants' homes in each village cluster. Additionally, in each village cluster, the projects select one or two community representatives (voluntary) who have roles in clarifying and informing local agriculture-related issues and challenges to project animators.

After carrying out agricultural training for developing the capacity of project animators and village leaders, the animators inform details about projects and the training schedule to all households in the village clusters prior to actual implementation. Project participation is voluntary for farmers in a designated area, but the delivered technologies are shown to farmers in the cluster through organized demonstration plots and field days. This approach facilitates replication for improved agricultural practices through sharing knowledge and experiences among farmers in a neighborhood, thereby strengthening the impacts that extension services have on the targeted clusters and villages.

According to CRS's 2015 report, the Egiye Jai project (Barisal) serves 118 village clusters in eight project villages, reaching 3,018 households. The project assigns ten animators whom each serves about 12 village clusters and 300 households. Similarly, the Nijera Gori project (Dinajpur) serves 119 village clusters in eight villages and reaches 3,633 households, with ten animators each serving about 12 villages and 360 households. The report also shows that 2,090 households (69.3%) had attended Egiye Jai cluster-level training between June 2013 to June 2014. 92% were women. Similarly, 1,916 households (52.7%) attended Nijera Gori cluster-level training between Feburary 2014 and July 2014. 88% were women (Table 1).[3] These results indicate the fact that the cluster-level training approach appears to be an effective way to reach women farmers with improved agricultural practices by alleviating their mobility constraints as well as saving travel time and costs in case training holds in distance from their homesteads. Additionally, all project beneficiaries receive a Bengali version of a booklet entitled "Homestead Cultivation: Food Security and Income

[3] The number of Nijera Gori training attendees (and percent reaching project population) would be recorded relatively less, compared to Egiye Jai training attendees, due to the short data collection period. Also, since extension training was provided from mid-2013 to December 2016, the cumulated number of training attendees through the life of the projects would be more than the recorded estimates.

Sources" that contain all delivered agricultural practices, food security and nutrition, and financial skills with a narrative and pictures. The process of disseminating agricultural technology is presented in Appendix B.

Table 1: Summary of Egiye Jai and Nijera Gori Cluster-Level Training Attendance

Topic	**Egiye Jai (Jun, 2013 – Jun, 2014)**			**Nijera Gori (Feb – Jul, 2014)**		
	Men	Women	Total	Men	Women	Total
Vegetable						
First round	229	1976	2205	421	1744	2165
Second round	186	2029	2215	-	-	-
Poultry						
First round	158	1631	1789	181	2022	2203
Second round	-	-	-	122	1958	2080
Livestock	153	1652	1805	291	1755	2046
Aquaculture						
First round	165	2106	2271	172	1455	1627
Second round	149	1926	2075	149	1196	1345
Post-harvest management	137	2132	2269	-	-	-

Sources: CRS (2015) interim evaluation reports.

Conceptual Model

In a project evaluation context, if extension services are randomly distributed, one can estimate the extension effect by comparing outcomes of treated households to control households that have not received extension services. Assuming that an outcome of interest is a linear function of a binary treatment indicator variable, along with other control covariates (X), leads to the following equation:

$$(1) \qquad Y_h = \gamma X_h + \delta T_h + \varepsilon_h,$$

where Y represent outcome variables, T is a treatment indicator, γ and δ are vectors of parametrs to be estimated, and ε is an error term. The treatment impact on the outcome variable is measured by the estimates of the parameter δ. Since not all of the treated households make the same decisions on farming activities based on their level of understanding, farming experiences, and financial constraints, the treatment effect estimates, δ, represent the average effect for the

entire households in the treatment villages regardless of whether the treatment is actually received. However, the Egiye Jai and Nijera Gori projects are not an ideal random assignment, indicating that the treatment site selection and voluntary nature of participation are likely to be influenced by unobservable characteristics that may be correlated to the outcomes of interest, and in this case, the coefficients estimated from the Equation (1) can be biased.

In order to reduce potential source of selection bias, we use the PSM approach to create a statistically sample of control group households that share approximately similar likelihoods of being assigned to the treatment condition based on a rich set of observables (Dehejia & Wahba, 2002; Heckman, Ichimura, Smith, & Todd, 1998). A major criticism of PSM is to assume that selection is based on observables, and the presence of unobserved variables in the propensity score estimation can create mismatching and biased estimators (Heckman & Navarro-Lozano, 2004). However, Jalan and Ravallion (2003) assert that, in cross-sectional data analysis, the PSM assumption for selection on observable variables is no more restrictive than problems of weak instruments of the two-step Heckman or IV approach. Another concern of PSM is that the treatment observations with no comparison observations nearby in the propensity score distribution are dropped to achieve the common support condition. However, PSM can increase the likelihood of reasonable comparisons across treated and matched control observations with a sufficient number of control samples from which to draw matches, thereby potentially lowering bias in effect estimates.

Several matching methods have been developed to match the treatment and control group households of similar propensity scores, but asymptotically, all matching methods should yield the same results. However, in practices there are trade-offs in terms of bias and efficiency with each method (Caliendo & Kopeinig, 2008). In this report, we utilize the nearest neighbors matching (NNM) and kernel-based matching (KM) approaches. Specifically, we report four matching estimates based on the five-NNM with replacement and common support and the Epanechnikov KM estimates with a bandwidth of 0.06 and common support by logit and probit regressions. Additionally, we present results from covariate balancing tests to ascertain whether the statistical differences in control covariates between the treatment and control group have been eliminated after the match. We report a comparison of the pseudo R2 and p-values of the likelihood ratio (LR) test of joint significance of all regressors before and after the match (Sianesi, 2004). The pseudo R2 should be low, and p-values of the LR test should be insignificant accepting the hypothesis of joint significance after the match. Moreover, we report the mean absolute standardized bias between the treatment and control group.

Data

This report utilizes cross-sectional data collected from a survey between February and April 2016 by Caritas Bangladesh (CB) and Catholic Relief Services (CRS) in conjunction with Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES). The data were collected from 29 villages in two districts where extension projects have been offered in eight

villages in Rajihar Union of Barisal district with ten nearby villages serving as a control area, and eight treatment villages in Dinajpur Sadar and Birgonj Upazilas in Dinajpur district with three nearby control villages. Since villages in the two districts have different individuals and agro-ecological characteristics, we conduct separate analyses for Barisal and Dinajpur districts.

Survey respondents were randomly selected at the cluster level in the treatment villages. Specifically, the projects assigned a project identification number to training attendees, and, based on the size of training attendees in the cluster, the projects randomly chose one to twenty respondents from each cluster. Table 2 shows that the Egiye Jai project selected an average of four respondents from each of the 120 clusters in eight treatment villages, and about five respondents from each of the 92 clusters in Nijera Gori project villages. If a selected respondent was not available, then next available respondent in the randomized list of project attendees was selected. In the meantime, we also interviewed rural farmers in the control villages located close to the project sites. However, unlike the treatment village's sampling scheme, control village respondents were randomly selected from a list of farm households in each village obtained from CRS and CB. Specifically, we randomly chose 50 respondents from each of the ten villages as a comparison group for evaluating the impact of the Egiye Jai project. For the Nijera Gori project, two of the three control villages were relatively larger, so we randomly selected 200 respondents from each of these villages, and another 100 from the other village. Altogether, in each project, we collected 1,000 surveys including 500 surveys from the treatment villages and 500 surveys from the control villages.

Table 2: Number of Sampled Households Surveyed by Village and Districts

	# of Village Clusters	# of Sampled Households	Average # of Sampled Households in Each Cluster	Min # of Sampled Households	Max # of Sampled Households
	(1)	(2)	(3)	(4)	(5)
Egiye Jai					
Boro Bashail	40	166	4.15	1	11
Choto Bashail	9	35	3.89	1	6
Choto Dumuria	7	30	4.29	2	7
Paschim Goail	10	47	4.70	1	11
Paschim Razihar	8	29	3.63	1	8
Razihar	27	114	4.22	1	7
Sutar Bari	3	8	2.67	1	4
Valuksi	17	71	4.18	1	7
Total	121	500	4.13	1	11
Nijera Gori					
Dabra Jineshwari	25	114	4.56	1	9
Fajilpur	1	14	-	1	14
Khorikadam	10	42	4.20	2	11
Mohadebpur	15	68	4.53	2	11
Nagri Sagri	12	100	8.33	3	20
Salbari Dabra	12	50	4.17	1	8
Sundori Hatgachh	6	26	4.33	1	9
West Paragon	11	86	7.82	1	9
Total	92	500	5.43	2	11

For the purpose of this report, we limited our analysis samples to married households (dropped 3.7% of the entire sample). Also, we excluded surveys completed by son, daughter, parents, or other relationships to the head of household (13.25%) since they would increase the likelihood of measurement errors in data. We had a total of 803 households including 419 households from

eight treatment villages, and 384 households from ten control villages in the Egiye Jai project, and we had a total of 879 households with 438 households from eight treatment villages and 441 households from three control villages in the Nijera Gori project. The number of sampled households and their treatment status by villages and districts are detailed in Table 3. The survey questionnaire consists of extensive information on household characteristics, farm livelihoods, expenditure, land holding, labor activities, and dwelling characteristics. Description of variables used in this study is detailed in Appendix C.

Table 3: Number of Study Samples and Treatment Status by Villages and Districts

Egiye Jai (Barisal)				**Nijera Gori (Dinajpur)**			
Treatment	N	Control	N	Treatment	N	Control	N
Boro Bashail	148	Basumda	37	Dabra Jineshwari	99	Bochapukur	98
Choto Bashail	25	Batra	41	Fajilpur	12	Mahatabpur	171
Choto Dumuria	25	Changutia	37	Khorikadam	37	Moricha	172
Paschim Goail	35	Lokharmatia	36	Mohadebpur	60		
Paschim Razihar	25	Magura Bahadurpur	36	Nagri Sagri	85		
Razihar	102	Nowpara	40	Salbari Dabra	47		
Sutar Bari	7	Purbo Goail	38	Sundori Hatgachh	22		
Valuksi	52	Ramander akh	40	West Paragon	76		
		Rangta	43				
		Vazna	36				
Total	419	Total	384	Total	438	Total	441

We present, in Appendix D, summary statistics and a balance test which compared the difference in control covariates – statistical significance tests on equality of means for continuous variables and equality of proportion for binary variables – between the treatment and control groups. If the control group is well established, we would expect that none of the coefficient would statistically differ from zero. The results show that Egiye Jai treatment villages tended to have fewer households with Hindu religion and more households with less than 49 decimals or no land

while, in Nijera Gori, the treatment villages tended to have less households with Muslim religion, smaller household size, more households with less than 49 decimals or no land, and more households using firewood for cooking than those in the control villages.[4]

Table 4 compares outcomes of interest including households' monthly expenditure and farm livelihoods of livestock, vegetable, and fisheries between the treatment and control group households by districts. Specifically, we use expenditure as a proxy for income for two reasons – expenditures are considered to reflect household's permanent income more closely, as well as expenditure data are generally more reliable and stable than income data (Ahmed at al., 2013; Friedman, 1957). Therefore, we use the terms "expenditures" and "income" interchangeably in this report. Additionally, farm livelihoods of livestock, vegetable, and fisheries are core components of projects' agricultural training, and the difference in outcomes of service recipients to non-recipient farm households would reveal how extension projects have influenced on households' livelihood production and strategies.

Table 4: Descriptive Statistics for Outcomes of Interest

	Egiye Jai		**Nijera Gori**	
	Treatment	**Control**	**Treatment**	**Control**
	(1)	**(2)**	**(3)**	**(4)**
Monthly Expenditure [a]	8,295.673	9,095.031	6,299.658	5,693.878
	(3,930.919)	(6,607.961)	(2,959.648)	(2,407.221)
Livestock				
Own Cows	0.418	0.374	0.776	0.714
	(0.494)	(0.485)	(0.417)	(0.423)
Own Goats	0.088	0.050	0.634	0.494
	(0.284)	(0.218)	(0.482)	(0.501)
Number of Livestock	1.155	0.747	3.779	2.739
	(1.694)	(1.166)	(2.923)	(2.396)
Own Poultry	0.845	0.708	0.877	0.902
	(0.362)	(0.455)	(0.329)	(0.297)
Number of Poultry	10.136	5.703	8.936	5.893
	(12.610)	(7.202)	(8.753)	(6.025)

[4] Majority of the sampled households (94% or higher) had their own lands in both districts, but the project site respondents tended to have less land holdings compared to control villages.

	Egiye Jai		Nijera Gori	
	Treatment	**Control**	**Treatment**	**Control**
	(1)	**(2)**	**(3)**	**(4)**
Vegetable				
Plant a Vegetable Garden	0.926	0.563	0.961	0.711
	(0.262)	(0.497)	(0.194)	(0.454)
Types of Vegetables	5.988	2.617	4.916	2.596
	(3.182)	(2.609)	(2.657)	(2.517)
Own Aquaculture	0.370	0.497	0.386	0.256
	(0.483)	(0.501)	(0.487)	(0.437)
Obs.	419	384	438	441

Notes: Standard deviations are in parenthesis. a is expressed in Bangladesh Taka.

The results show that Egiye Jai project villages relatively had more households with poultry and vegetable gardens, but had less households with aquaculture production than those in the control villages. Also, on average, the project villages had a greater number of poultry and types of vegetables. We also observed that the treatment villages in the Nijera Gori project tended to have more households with goats, a vegetable garden, and aquaculture production. Similarly, the project villages had a greater number of poultry and types of vegetables than those in the control villages. Further, on average, households in the Egiye Jai project had lower monthly expenditures, but Nijera Gori project households had higher expenditures than those in the control villages.

Overall we observed that the project villages had more households with small or no land holdings, and had more households engaged in livestock rearing and vegetable production. One can expect the differential project impact on household's farm livelihood production and strategies based on the level of land holdings, but more than three-fourths of the sampled households in our data had small land less than 49 decimals which reduce statistical power to detect the statistical differences in outcome variables for larger landholding households.

Results

The logit and probit estimates of the treatment propensity are presented in Appendix E. Both regression models report a pseudo R^2 value of 0.21 for the Egiye Jai, and about 0.37 for the Nijera Gori project. Several variables are statistically significantly associated with treatment status. Particularly the husband's education level, cultivated landholding, the household's labor activities, and some dwelling characteristics are significant predictors to determining the treatment sites across districts. Additionally, own landholding and religion are statistically associated with the treatment status in the Nijera Gori project.

Table 5 reports some test-statistics to compare the level of bias before and after propensity score matching. The standardized mean difference for overall covariates used in the propensity score (around 15% for the Egiye Jai project and 21% for the Nijera Gori project) is reduced to 0.5%-1.0% and 1.2%-1.5%, respectively, based on different PSM specifications after matching.[5] This substantially reduces total bias, in the range of 73.8%-81.4% for the Egiye Jai, and 88.1%-92.1% for the Nijera Gori project through matching. Also, the LR test results lead us to accept the hypothesis of joint significance of matching variable after matching. Moreover, the mean and median standardized bias decrease significantly after matching. Therefore, the results of low pseudo-R^2 and mean standardized bias, high total bias reduction, and the insignificant *p*-values of the LR test after matching suggest that the proposed specification of the propensity score is fairly successful in terms of balancing the distribution of covariates between the two groups. We also show the density distribution of the calculated propensity scores for the treatment and control groups after matching (Appendix F). We depict the propensity distribution using the KM (probit) with a bandwidth of 0.06 since it produces the lowest pseudo R^2 and mean standardized bias after matching in both districts. The more the two distributions are similar (overlapped), the larger common supports are that ensure that the treatment observations have comparison observations nearby in the propensity score distribution (Heckman, LaLonde, & Smith, 1999).

Based on propensity score matching estimation, we calculate the average treatment effect estimates for the Egiye Jai and Nijera Gori projects reported in Table 6 and 7, respectively. As a sensitivity analysis, we compute the estimates based on four different PSM specifications discussed in the previous section. All the analyses were based on implementation of common support, so that the distributions of treatment and control group households were located in the same domain.[6] Table 6 shows that the Egiye Jai project, depending on the specific matching algorithm used, increases the likelihood of having poultry by 25-30 percentage points; and enhances the likelihood of planting a vegetable garden by 37-45 percentage points. Also, Egiye Jai increases the average monthly income (expenditures) by 2,710-3,418 taka (or 35-44 dollars). Similarly, in Table 7, the Nijera Gori project enhances the likelihood of planting a vegetable garden by 20-21 percentage points; increases about two types of vegetables in the garden; and increases poultry by three. Moreover, Nijera Gori increases the average monthly income (expenditure) by 1,772–1,952 taka (or 23-25 dollars). However, we cannot find a consistent statistical project effect on the possession and quantity of larger animals and fisheries within the household, with both activities are often considered to be men's responsibility, across different propensity score matching and specifications.

[5] Rosenbaum and Rubin (1985) suggest that a standardized difference of greater than 20% should be considered too large and an indicator that the matching process has failed.

[6] Sample size differs because we exclude observations that propensity score is higher than the maximum or less the minimum of the control group (common support) depending on different PSM specifications. Ravallion (2007) asserts that a nonrandom subset of the treatment sample may need to be dropped if similar comparison units do not exist.

The objectives of both projects can partly explain these results, as extension projects place more emphasis on maintaining good livestock health, for example, advising regular vaccination and animal shelter cleaning and maintenance and placing a water pot close to animal feed; however, these practices do not necessarily increase the quantity of livestock, particularly for animals with long gestation periods. Also, to cultivate fish, farmers need a nearby pond and facilities which may increase financial and labor burdens, making the option less attractive compared to the other agricultural practices that have lower levels of fixed costs. Similarly, cows and goats have higher cost investments compared to poultry and vegetables, so the initial investment costs may be a barrier.[7] Additionally, both activities are often considered to be the man's responsibility, but since the majority of project participants were women, the possibility that the wives deliver incomplete information of farm technologies for larger animals and fisheries to their husbands is higher. Further, husbands might not actively participate in the practices because they were not directly we find that agricultural extension projects increased participants' monthly income (expenditure) and the likelihood of having poultry and planting vegetable garden and varieties involved in the projects. Moreover, women may selectively choose training sessions in which they are more involved. Indeed, the CRS's interim evaluation report (2015) shows that women's training participation was overwhelmingly higher when the topics were related to vegetable and poultry production (Table 1).

[7] These reasons are supported by some qualitative results reported in CRS's interim evaluation report (CRS, 2015). For example, the key informant interviewees mentioned that they experienced an increase of poultry and vegetable production, and less incidence of livestock disease compared to prior improved practices.

Table 5: A Comparison of Matching Quality Results of Before and After Matching

Matching algorithm	Regression Type	Pseudo R^2 before matching	Pseudo R^2 after matching	LR chi-square before matching	LR chi-square after matching	Mean standardized bias before matching	Mean standardized bias after matching	Total % |*bias*| reduction
Egiye Jai (Barisal)								
NNM	Logit	0.154	0.008	170.91***	9.50	18.9	5.0	76.1
	Probit	0.154	0.010	170.91***	11.68	18.9	5.5	73.8
KM	Logit	0.154	0.005	170.91***	5.97	18.9	3.7	80.6
	Probit	0.154	0.005	170.91***	5.44	18.9	3.7	81.4
Nijera Gori (Dinajpur)								
NNM	Logit	0.211	0.015	256.76***	18.00	26.3	4.9	88.1
	Probit	0.211	0.014	256.76***	16.07	26.3	4.2	89.7
KM	Logit	0.211	0.013	256.76***	14.57	26.3	3.9	91.1
	Probit	0.211	0.012	256.76***	13.53	26.3	3.9	92.1

Notes: * denotes significance at 10 percent, ** at 5 percent, and *** at 1 percent level.

NNM = five nearest neighbor matching with replacement and common support

KM = kernel-based matching with a bandwidth 0.06 and common support

Table 6: Summary of Impact of the Egiye Jai Project on Households' Expenditure, and Livelihood of Livestock, Vegetable, and Fisheries

	NNM[8]		**KM[9]**	
	Logit	Probit	Logit	Probit
Monthly Expenditure	2,844.649***	3,417.650**	2,739.335**	2,709.883**
	(1,248.978)	(1,317.513)	(1,271.292)	(1,250.610)
Livestock				
Own Cows	-0.130	-0.115	-0.086	-0.092
	(0.138)	(0.135)	(0.133)	(0.135)
Own Goats	0.042	0.021	0.019	0.017
	(0.050)	(0.057)	(0.051)	(0.051)
Number of Livestock	-0.419	-0.368	-0.377	-0.384
	(0.439)	(0.398)	(0.385)	(0.383)
Own Poultry	0.251**	0.285**	0.302***	0.294***
	(0.111)	(0.126)	(0.109)	(0.110)
Number of Poultry	-1.154	-0.474	0.417	0.309
	(2.422)	(2.325)	(2.173)	(2.195)
Vegetable				
Plant a Vegetable Garden	0.373***	0.451***	0.442***	0.437***
	(0.126)	(0.128)	(0.120)	(0.122)
Types of Vegetables	4.029***	4.306***	4.093***	4.101***
	(0.647)	(0.620)	(0.645)	(0.645)
Own Aquaculture	0.119	0.160	0.158	0.144
	(0.155)	(0.150)	(0.144)	(0.145)
Obs.	724	731	794	793

Notes: Control variables listed in Table 4 and village-level fixed effects are included in the estimation. Robust standard errors are reported in parentheses. * denotes significance at 10 percent, ** at 5 percent, and *** at 1 percent level.

[8] NNM = five nearest neighbor matching with replacement and common support

[9] KM = kernel-based matching with a bandwidth 0.06 and common support

Table 7: Summary of Impact of the Nijera Gori Project on Households' Expenditure, and Livelihood of Livestock, Vegetable, and Fisheries

	NNM[10]		**KM**[11]	
	Logit	Probit	Logit	Probit
Monthly Expenditure	1,771.550***	1,821.234***	1,951.949***	1,918.426***
	(370.857)	(366.682)	(347.240)	(347.515)
Livestock				
Own Cows	-0.029	-0.021	-0.055	-0.045
	(0.076)	(0.081)	(0.073)	(0.075)
Own Goats	-0.139	-0.176	-0.149	-0.143
	(0.102)	(0.102)	(0.095)	(0.095)
Number of Livestock	0.083	0.097	0.024	0.044
	(0.566)	(0.557)	(0.562)	(0.566)
Own Poultry	0.024	0.015	0.036	0.033
	(0.060)	(0.057)	(0.067)	(0.065)
Number of Poultry	2.780	3.019*	3.174*	3.216*
	(1.726)	(1.656)	(1.690)	(1.667)
Vegetable				
Plant a Vegetable Garden	0.207***	0.209***	0.200***	0.201***
	(0.061)	(0.059)	(0.050)	(0.050)
Types of Vegetables	2.090***	2.176***	2.036***	2.045***
	(0.465)	(0.455)	(0.446)	(0.443)
Own Aquaculture	-0.132	-0.161*	-0.135	-0.143
	(0.091)	(0.090)	(0.089)	(0.087)
Obs.	777	779	860	860

Notes: Control variables listed in Table 4 and village-level fixed effects are included in the estimation. Robust standard errors are reported in parentheses. * denotes significance at 10 percent, ** at 5 percent, and *** at 1 percent level.

[10] NNM = five nearest neighbor matching with replacement and common support
[11] KM = kernel-based matching with a bandwidth 0.06 and common support

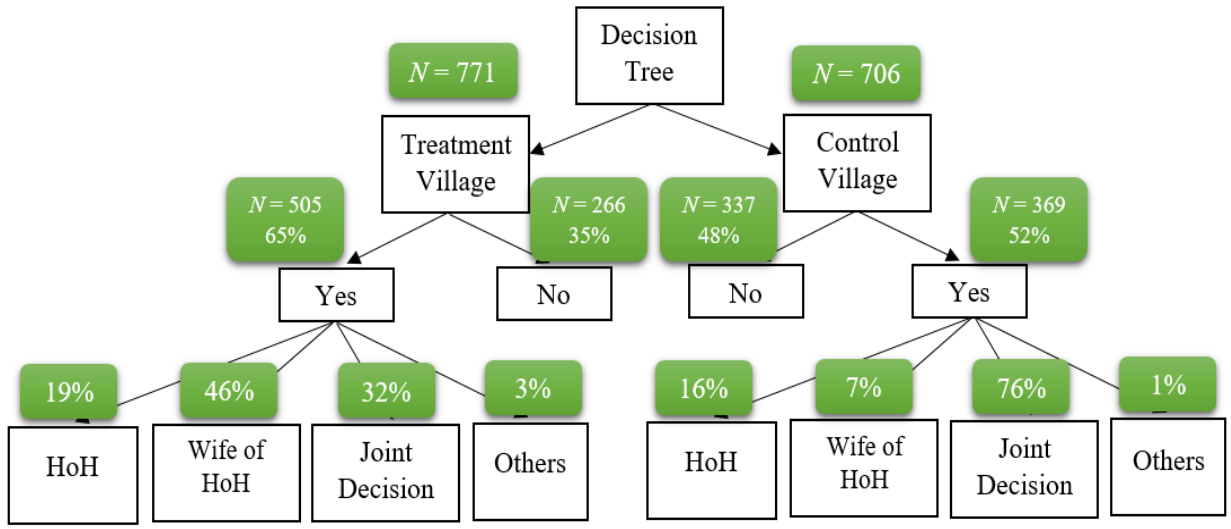
Descriptive Evidence

Intra-Household Decisions on Selling Poultry and Vegetable

Figure 1 describes intra-household decision-making on selling poultry and households that reported having a poultry at the time of the survey were asked whether they sold poultry and who decided where to sell them during the last year.[12] The results show that about 65% of households currently own and sold poultry during the last year, compared to 52% in the control villages. Also, we find that joint decision-making on selling poultry was higher (76%) in the control villages; however, wife's decision-making on marketing poultry were shown to be higher (46%) in the treatment villages compared to the control villages (7%).

Figure 1: Intra-Household Decisions on Selling Poultry

Egiye Jai and Nijera Gori



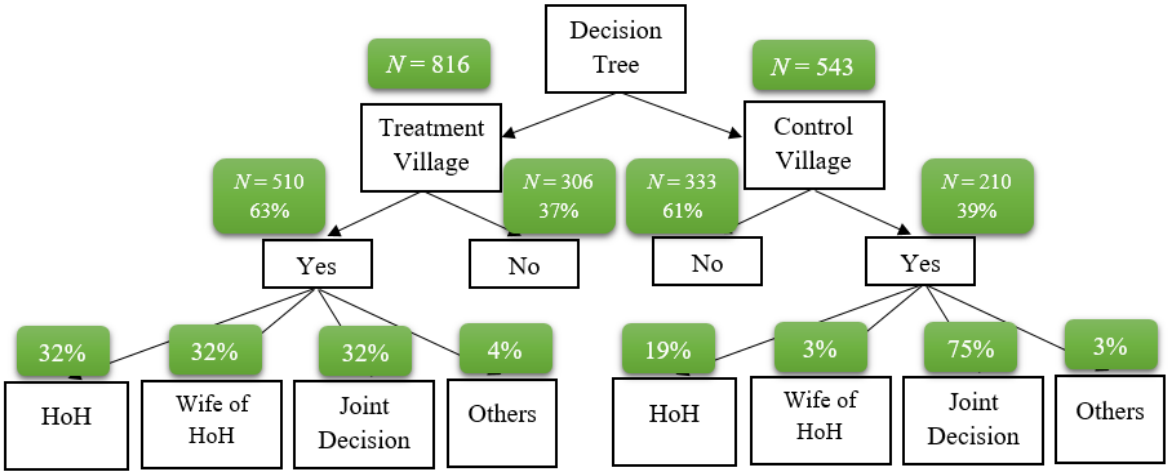
Similarly, Figure 2 describes intra-household decision-making on selling vegetables. Households that reported planting a vegetable garden during the previous growing seasons were asked whether they sold vegetables and who decided where to sell them. Figure 2 shows that approximately 63% of the households planted vegetable gardens and sold vegetables during the previous growing season compared to 39% in the control villages. Similar to decisions on marketing poultry, the majority of households in the control villages tended to make joint

[12] We utilize the same households used in preivous analyses, but we need to exclude some observations due to missing response on the question about whether a household sold poultry during the last year. The results should be interpreted with caution due to a potential selection bias on household characteristics in decision-making process.

decisions about selling vegetables (75%); however, wife's decision-making on marketing vegetables were shown to be higher (32%) in the treatment villages compared to the control villages (3%).

Figure 2: Intra-Household Decisions on Selling Vegetable

Egiye Jai and Nijera Gori

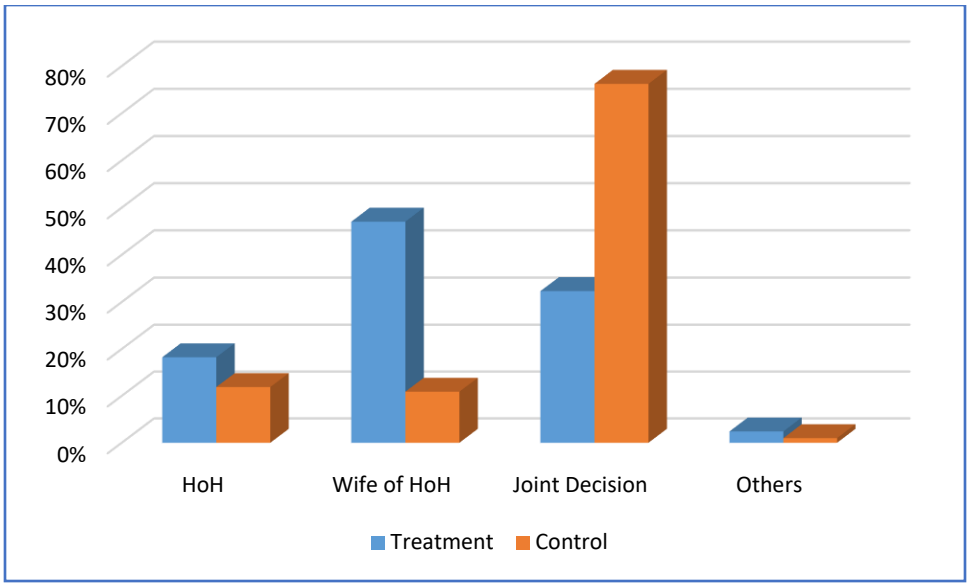


Since the response about who decided to sell poultry or vegetables may differ by survey respondent's gender, we conducted the same analyses with women respondent-only data. Figure 3 shows that the wife's decisions on marketing poultry increased by about 15 percent, while the husband's decision-making decreased by 14% in the treatment villages. The husband's decision-making on marketing poultry decreased by about 7%, while the wife's decision-making increased by about 8% in the control villages. We also find the similar pattern for decision-making concerning the vegetable. These results indicate that there existed some levels of gender bias on reporting intra-household decision-making on selling poultry and vegetables, but it did not change our main results that the wife in the treatment villages was more likely to make marketing decisions on poultry and vegetables compared to the wife in the control villages.

Figure 3: Intra-Household Decision Making on Selling Poultry

Egiye Jai and Nijera Gori – Women Respondent Only

(*Obs.* = 657)



Women-Owned Assets and Intra-Household Decision-Making

Figure 4 reports the distribution of the number of women-owned assets between the treatment and control villages in Barisal and Dinajpur districts. Assets include radio/cassette player, cell phone, bicycle, motorcycle, refrigerator, cow, goat, and fish pond. The results indicate that the wife in the treatment villages tended to possess more (own) assets than in the control villages. Table 8 also shows that the wife with an asset was more likely to decide where to sell poultry and vegetables by herself, and the proportion of joint decision-making between the head of household and his wife was lower by 10% for marketing poultry and 2% for vegetables when compared to the wife with no asset. According to Figure 4 and Table 8, we find a positive correlation between having a wife-owned asset and wife's decision-making power within the household regarding marketing poultry and vegetables.

Figure 4: Women-Owned Assets

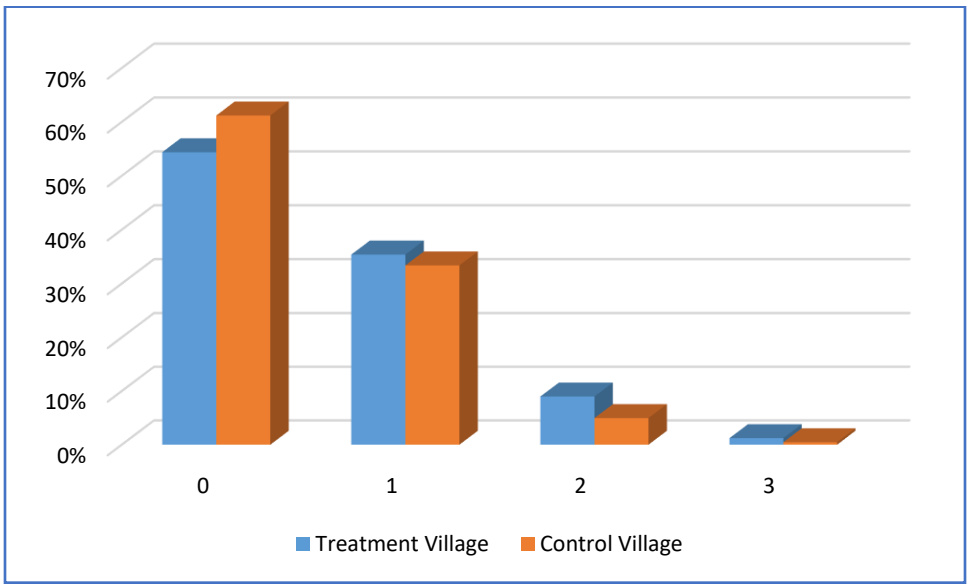


Table 8: Relationship between Women-Owned Assets and Decision Making

	Who Decided Where to Sell Chickens and Ducks?		**Who Decided Where to Sell the Vegetable**	
	With No Asset	With an Asset	With No Asset	With an Asset
Wife of Head of Household	23.80%	37.12%	19.85%	28.40%
Joint Decision between Head and Wife	54.91%	44.95%	45.41%	43.83%

Social Capital

Table 9 presents the comparison of descriptive statistics for a various measure of social capitals between the treatment and control villages.[13] This social capital index represents the community-level capacity to deal with individual and community problems. Overall, the results show that the

[13] A detailed definition of social capital variable is given in Appendix G.

treatment villages tended to have a higher level of social capitals.[14] We find that, on average, the treatment villages had a higher mean value for 'dealing with crop diseases', 'resolving the dispute', 'reciprocity', and 'neighbor,' while the mean value for 'collective action' was quite close between the treatment and control villages. Particularly, there existed a relatively larger gap in 'dealing with crop disease' and 'resolving the dispute' index between the treatment and control group villages in the Egiye Jai project, and the Nijera Gori project villages reported a lower mean for 'collective action' index than one in the control villages.

Table 9: Social Capital Index

	All Villages	**Treatment Villages**	**Control Villages**	**N**
Dealing with Crop Disease	3.031	3.712	2.359	1,984
(Score: 1-5)	(1.895)	(1.658)	(1.875)	
Egiye Jai (Barisal)	2.381	3.700	1.096	985
	(1.807)	(1.691)	(0.562)	
Nijera Gori (Dinajpur)	3.672	3.723	3.62	999
	(1.757)	(1.627)	(1.879)	
Resolving the Dispute	3.157	3.717	2.610	1,977
(Score: 1-5)	(1.628)	(1.436)	(1.618)	
Egiye Jai (Barisal)	2.545	3.574	1.557	978
	(1.573)	(1.505)	(0.825)	
Nijera Gori (Dinajpur)	3.757	3.854	3.660	999
	(1.448)	(1.354)	(1.531)	
Reciprocity	3.041	3.509	2.583	1,979
(Score: 1-5)	(1.098)	(1.116)	(0.861)	
Egiye Jai (Barisal)	3.019	3.525	2.534	980
	(1.019)	(1.108)	(0.614)	
Nijera Gori (Dinajpur)	3.062	3.493	2.632	999
	(1.170)	(1.125)	(1.050)	
Collective Action	2.095	2.036	2.153	1,997
(Score: 1-4)	(1.007)	(1.040)	(0.971)	

[14] We used the entire sample (2,000 observations) excluding observations with missing information

Egiye Jai (Barisal)	2.131	2.160	2.102	1,000
	(0.966)	(0.986)	(0.945)	
Nijera Gori (Dinajpur)	2.058	1.912	2.205	997
	(1.046)	(1.078)	(0.994)	
Neighbors	5.069	5.214	4.924	1,986
(Score: 0-6)	(0.745)	(0.960)	(0.380)	
Egiye Jai (Barisal)	4.868	4.866	4.869	997
	(0.816)	(1.072)	(0.427)	
Nijera Gori (Dinajpur)	5.273	5.565	4.980	989
	(0.601)	(0.670)	(0.318)	

Note: Standard deviations are in parenthesis.

Discussion and Concluding Remarks

This report evaluates the interim impact of the Egiye Jai and Nijera Gori projects. These agricultural projects provide a strong basis for sustainable and quality homestead production, as well as aim to increase women farmers' access to improved agricultural training in two vulnerable districts of Bangladesh. We find that the Egiye Jai and Nijera Gori projects increased participants' monthly income and the likelihood of having poultry and planting vegetable garden and varieties; however, we cannot find a consistent statistical evidence on the possession and quantity of larger animals and fisheries.

Our main findings also support that, based on the developed frameworks in the literature, the projects contribute to building major pathways to strengthen household food security and nutrition status. We employ the United Nations Children's Fund (UNICEF, 1990) nutrition framework, a widely accepted conceptual framework for the analysis of malnutrition over the past two decades, which contains three level of determinants ("immediate", "underlying", and "basic" causes). Within the "underlying" causes, increasing food production and income can improve food security and nutrition through increasing food for a household's own consumption and purchasing more nutrient-rich foods and services or products that support nutrition. However, more recent studies have recognized nutrition as a broader concept, for example, "adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all time" (Quisumbing et al., 1995); and "physical, economic and social access to a balanced diet, safe drinking water, environmental hygiene, primary health care and primary education" (Swaminthan, 2008). Our estimates suggest that project participants increased the likelihood of having poultry and vegetable gardens and varieties promoting dietary diversification through the consumption of protein (poultry meat and eggs), and a better intake of micronutrients (i.e., Vitamin A) from home vegetable gardens (Bushamuka et al., 2005; Faber et al., 2002; Gibson & Hotz, 2001).

Beyond the current analyses and results, our report suggests that the M&E framework can be strengthened to allow stronger statements about program impact by adding control groups to the baseline survey and endline survey and following specific households over time. We also encourage to survey both participants and non-participants within the treated villages in baseline and enline to understand the voluntary nature of project participation and how it can influence the impacts of the extension services. These approaches also allow longitudinal econometric analyses to calculate precise project effects over time by controlling for time-invariant unobservables between the treatment and control groups, as well as increasing statistical power with a greater sample size. This study has some limitations. First, our findings may be limited to villages that share similar demographics and agricultural characteristics with the project villages. Since the impact of agricultural extension differs depending on the types of technologies, delivery mechanism of the services, typography of the country, and cultural and social factors, it is difficult to establish external validity of the findings. Second, due to the volunteer nature of participation, our project effect estimates may provide an upper limit in case where unobservables increasing project participation were correlated with a successful adoption of improved technology and utilization. Although this study has these limitations, given the differential effects of extension services and the small number of research due to gender bias and structural and cultural constraints of women in access to extension services, this study aims to contribute to agricultural extension literature by providing empirical evidence of extension services targeting rural women farmers in increasing their access to improved technologies and advisory services in Bangladesh.

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Appendix A

Delivered Agricultural Technologies by the Projects

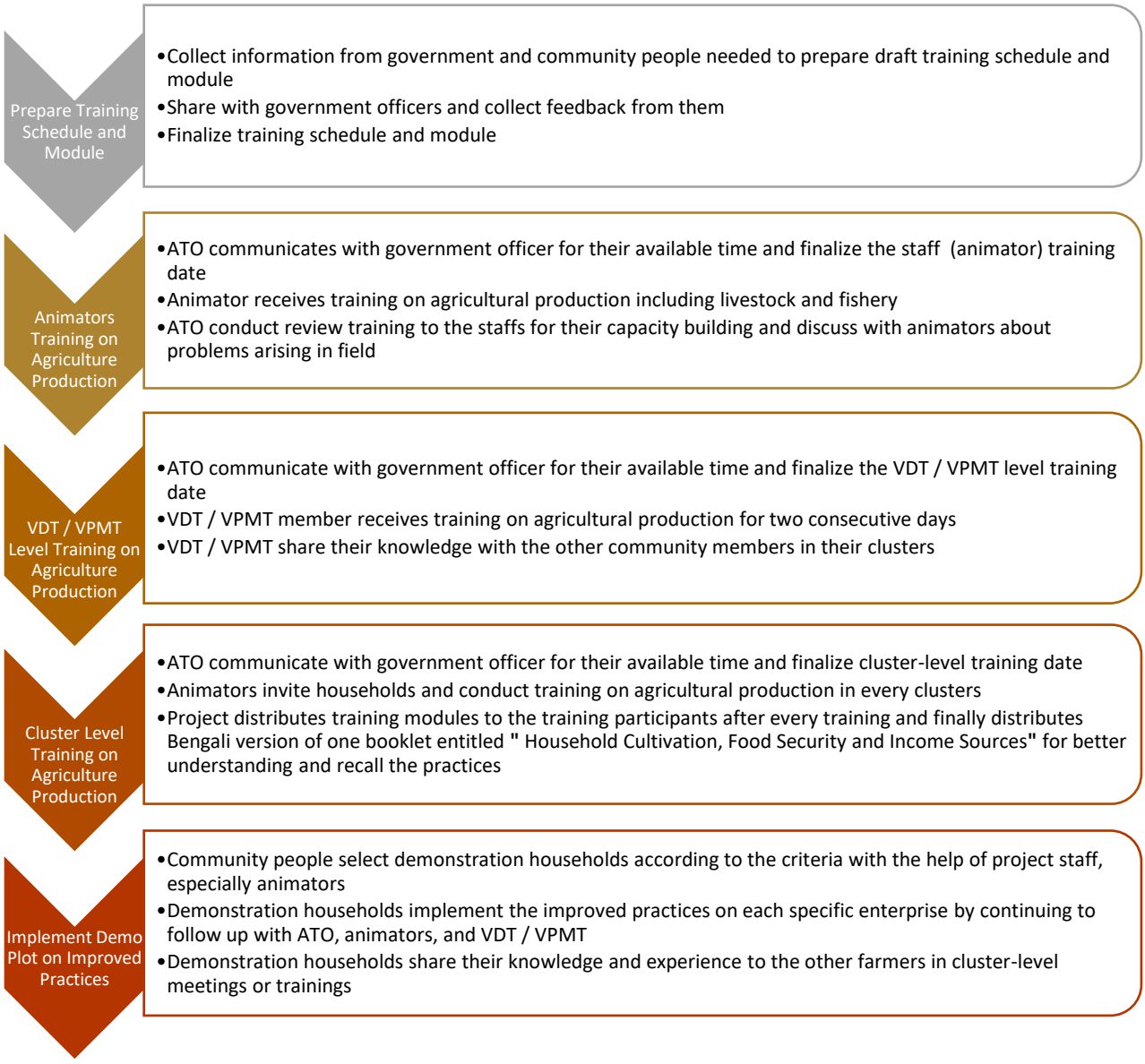
Activity	Egiye Jai	Nijera Gori
Poultry 	• Well ventilated poultry shelter • Separate shelter for hen and duck • Adding mustard cake, wheat bran/husk, egg shell, etc. in poultry feed • Clean poultry shelter at least once a week • Separate hens from chicks after 7-10 days • Quarterly de-worming for poultry • Quarterly Ranikhet vaccine for chicken • Half-yearly Duck Plague vaccine for duck	• Well ventilated poultry shelter • Clean poultry shelter minimum once a week. • Separate housing for hen and duck • Nutritious food (broken maize, broken wheat, broken rice, crushed Egg Shell or powdered shell from snails, etc.) • Separate hens from chicks after 7-10 days from hatching. • Quarterly Ranikhet vaccination for chickens • Four-monthly duck plague vaccination for ducks.
Livestock 	• Adding molasses (straw: fresh water: molasses = 10: 5: 2) in cattle feed • De-worming quarterly for livestock • Use good breeds for artificial insemination • Adding oil cake, wheat bran/husk, broken pulses, rice bran in feed up to three months after delivery • Half-yearly Badla vaccine for cows in every six month	Cow • -Vaccinate cows for Torka yearly • -De-worming quarterly. • -Sloping Floor • -Pot for food and water should remain closer. Goat • -Vaccinate goats for PPR every four months • -De-worming quarterly. • -Goat trellis
Vegetable garden	• Use pit (dig 1 hand: 1 hand: 1 hand) for plantation • Use pheromone trap one for one crop season for controlling fruit-fly	• Use Pit size (Dig 1 hand x 1 hand x 1 hand) for vegetable planting • Plant 1-2 seeds/saplings per pit

Activity	Egiye Jai	Nijera Gori
	• Liquid fertilizer (cow dung: water= 1:3, after straining 1:10) preparation and application as supplement of urea fertilizer • Use of compost liberally during plantation time • Use of biopesticide (neem, Mehgini [@crash : water = 1 : 10]) for pest control	• Liquid Fertilizer (cow dung: water= 1:5, after straining 1:10) preparation and application as supplement of urea fertilizer) • Use compost liberally during planting time • Use pheromone trap one for one crop season for controlling fruit-fly • Use bio-pesticide (neem leaves / crushed Mehgini fruit / Bhati leaves [@crash : water = 1 : 10]) for pest control • Cow's Urine & water mixture (1:3 ratio) as pesticide • Use Kerosene and ash mixture (1 lidful of kerosene: 1 kg soft ash).
Aquaculture 	• Use lime at pond preparation time (1 kg/ decimal size pond) • Use lime before winter (1 kg in 4 equal splits for 1 decimal size pond) • Need based fertilization of pond (2 kg cow dung + if available 1 handful of urea + 1 handful of TSP decided by water color) throughout aquaculture season	• Lime used during pond preparation (1 kg/ decimal size pond) • Lime use before winter (1 Kg in 4 equal splits for 1 decimal size pond) • Removing unwanted species from pond during pond preparation • Need based fertilization of pond (2 kg cow dung + if available 1 handful of urea + 1 handful of TSP decided by water color) throughout aquaculture season
Post-harvest storage and management	• Sun-dried fruits & vegetable before storing (for winter season vegetables) • Uproot tomato plant but do not separate fruits	• Store Seeds in an airtight container with dry neem leaves and ash. • Separate broken and/or diseased seed before storing • Use a sharp knife for harvesting vegetables.

Activity	Egiye Jai	Nijera Gori
Nutrition	• Producing a range of products at the homestead (can help meet family nutritional demand) • 50% (1/2) of daily food intake should be carbohydrates (rice, wheat, etc.) • 15% (1/6) of daily food intake should be protein (fish, meat, eggs, etc.) • 35% (2/6) of daily food intake should be vitamins, minerals & fats (different vegetables, oil, etc.)	
Business and marketing	• Formation and strengthen group for marketing • Product selection considering market demand before planting • Maintain good relation with traders • Collect market price information for better negotiation with traders • Quality assessment of product for better price	• Formation and strengthen group for marketing • Product selection considering market demand before planting • Maintain good relation with traders • Collect market price information for better negotiation with traders • Quality assessment of product for better price
Savings	• Increase income sources from homestead agricultural production • Decrease expenditure by giving up bad habits i.e. smoking, betel leaf, etc. • Start savings on a daily basis	• Increase income sources from homestead agricultural production • Decrease expenditure by giving up bad habits i.e. smoking, betel leaf, etc. • Start savings on a daily basis

Appendix B

Dissminating Agricultural Techonology Process



Appendix C

Description of Variables

Variable	Description
Outcome Variable	
Monthly Expenditure	= Monthly expenditure
Livestock	
Own Cow	= 1 for having a cow; 0 for otherwise
Own Goat	= 1 for having a goat; 0 for otherwise
Number of Cows and Goats	= Number of cows and goats
Own Poultry	= 1 for having a poultry (chicken or duck); 0 for otherwise
Number of Poultry	= Number of poultry (chickens and ducks)
Vegetable	
Plant a Vegetable Garden	= 1 for planting a vegetable garden; 0 for otherwise
Type of Vegetable	= Number of vegetable types
Own Aquaculture	= 1 for rearing aquatic animals; 0 for otherwise
Control Variables	
Husband Age	= Husband's age
Wife Age	= Wife's age
Husband Education	
Primary Education	= 1 if a husband had some primary education or less (0-5 years of education)
Secondary Education	= 1 if a husband had some secondary education (6-10 years of education)
Wife Education	
Primary Education	= 1 if a wife had some primary education or less (0-5 years of education)
Secondary Education	= 1 if a wife had some secondary education (6-10 years of education)

Variable	Description
Religion	
Muslim	= 1 for having Muslim religion; 0 for otherwise
Hindu	= 1 for having Hindu religion; 0 for otherwise
Household Size	= Number of household members
Own Land	
Less than 49 decimals or no land	= 1 for having land less than 49 decimals or no land; 0 for otherwise
50-98 decimals	= 1 for having land between 50-98 decimals; 0 for otherwise
Cultivated Land	
Less than 49 decimals	= 1 for having cultivated land less than 49 decimals or less; 0 for otherwise
50-98 decimals	= 1 for having cultivated land between 50-98 decimals; 0 for otherwise
Agriculture/farming	= 1if a household member is involved in agriculture or farming activity; 0 if otherwise
Day labor	= 1 if a household member is involved in day labor activity; 0 if otherwise
Dwelling Characteristics	
Individual house (Structure)	= 1 for living in an individual house; 0 for otherwise
Earth or Sand (Floor)	= 1 if the floor is made of earth or sand; 0 for otherwise
Electricity (Lighting)	= 1 for using electricity for lighting; 0 for otherwise
Firewood (Cooking fuel)	= 1 for using firewood for cooking; 0 for otherwise

Appendix D

Descriptive Statistics for Household and Dwelling Characteristics

	Egiye Jai (Barisal)		Nijera Gori (Dinajpur)	
	Control (Std. Dev.)	Difference (Std. Err.)	Control (Std. Dev.)	Difference (Std. Err.)
	(1)	(2)	(3)	(4)
Husband Age	43.826	1.399	42.327	1.274
	(13.223)	(2.345)	(11.538)	(1.772)
Wife Age	35.323	2.766	33.619	1.415
	(11.532)	(2.057)	(9.773)	(1.482)
Husband Education				
Primary Education	0.458	0.087	0.710	0.018
	(0.499)	(0.108)	(0.454)	(0.071)
Secondary Education	0.430	0.029	0.265	-0.056
	(0.496)	(0.108)	(0.442)	(0.068)
Wife Education				
Primary Education	0.526	0.164	0.653	0.055
	(0.500)	(0.107)	(0.477)	(0.074)
Secondary Education	0.398	-0.137	0.331	-0.060
	(0.490)	(0.108)	(0.471)	(0.073)
Religion				
Muslim	0.396	0.051	0.771	-0.200***
	(0.490)	(0.090)	(0.421)	(0.062)
Hindu	0.604	-0.147*	0.209	0.078
	(0.490)	(0.081)	(0.407)	(0.061)
Household Size	5.104	-0.485	4.642	-0.395*
	(1.724)	(0.349)	(1.632)	(0.237)
Own Land				
Less than 49 decimals or no land	0.831	0.209**	0.712	0.198***
	(0.375)	(0.090)	(0.453)	(0.069)
50-98 decimals	0.117	-0.066	0.166	-0.071
	(0.322)	(0.074)	(0.372)	(0.058)
Cultivated Land				
Less than 49 decimals	0.654	0.125	0.506	0.073
	(0.476)	(0.105)	(0.501)	(0.074)
50-98 decimals	0.188	0.072	0.306	-0.041

	Egiye Jai (Barisal)		Nijera Gori (Dinajpur)	
	Control (Std. Dev.)	Difference (Std. Err.)	Control (Std. Dev.)	Difference (Std. Err.)
	(1)	(2)	(3)	(4)
	(0.391)	(0.093)	(0.461)	(0.070)
Agriculture/farming	0.497	-0.048	0.442	-0.016
	(0.501)	(0.108)	(0.497)	(0.072)
Day labor	0.180	0.061	0.261	-0.040
	(0.384)	(0.058)	(0.440)	(0.070)
Dwelling Characteristics				
Individual house (Structure)	0.739	-0.695	0.971	-0.098
	(0.440)	(0.079)	(0.169)	(0.040)
Earth or Sand (Floor)	0.930	0.062	0.939	-0.381
	(0.256)	(0.049)	(0.240)	(0.037)
Electricity (Lighting)	0.734	0.008	0.397	0.017
	(0.443)	(0.079)	(0.490)	(0.075)
Firewood (Cooking fuel)	0.977	-0.092	0.311	0.335***
	(0.151)	(0.070)	(0.463)	(0.071)
Obs.	384	803	441	879

Notes: Column (1) and Column (3) report control group means and standard deviation of covariates. Column (2) and Column (4) report the estimates obtained with the ordinary least squares (OLS) regression of each variables on treatment dummy (1 for the treatment group; 0 otherwise) with village-level fixed effects. Robust standard errors are in parenthesis. * denotes significance at 10 percent, ** at 5 percent, and *** at 1 percent level.

Appendix E

Logit and Probit Estimates of the Propensity for Treatment Status

	Egiye Jai (Barisal) [a]		**Nijera Gori (Dinajpur)**	
	Logit	Probit	Logit	Probit
	(1)	(2)	(3)	(4)
Husband Age	0.060 (0.015)***	0.036 (0.009)***	-0.008 (0.016)	-0.005 (0.010)
Wife Age	-0.019 (0.018)	-0.010 (0.011)	0.011 (0.019)	0.007 (0.012)
Husband Education				
Primary Education	0.401 (0.374)	0.231 (0.226)	-1.190 (0.453)***	-0.696 (0.257)***
Secondary Education	0.683 (0.353)*	0.400 (0.213)*	-1.084 (0.448)**	-0.629 (0.253)**
Wife Education				
Primary Education	-0.005 (0.489)	0.011 (0.293)	-0.352 (0.548)	-0.178 (0.326)
Secondary Education	0.740 (0.462)	0.468 (0.277)*	-0.511 (0.531)	-0.276 (0.313)
Religion				
Muslim	0.187 (0.171)	0.112 (0.103)	-1.739 (0.423)***	-1.080 (0.252)***
Hindu	– (–)	– (–)	-0.941 (0.439)**	-0.602 (0.262)**
Household Size	-0.037 (0.050)	-0.019 (0.030)	0.025 (0.052)	0.015 (0.031)
Own Land				
Less than 49 decimals or no land	-0.444 (0.400)	-0.241 (0.234)	-1.130 (0.308)***	-0.686 (0.182)***
50-98 decimals	-0.197 (0.429)	-0.090 (0.254)	-0.908 (0.345)***	-0.553 (0.204)**

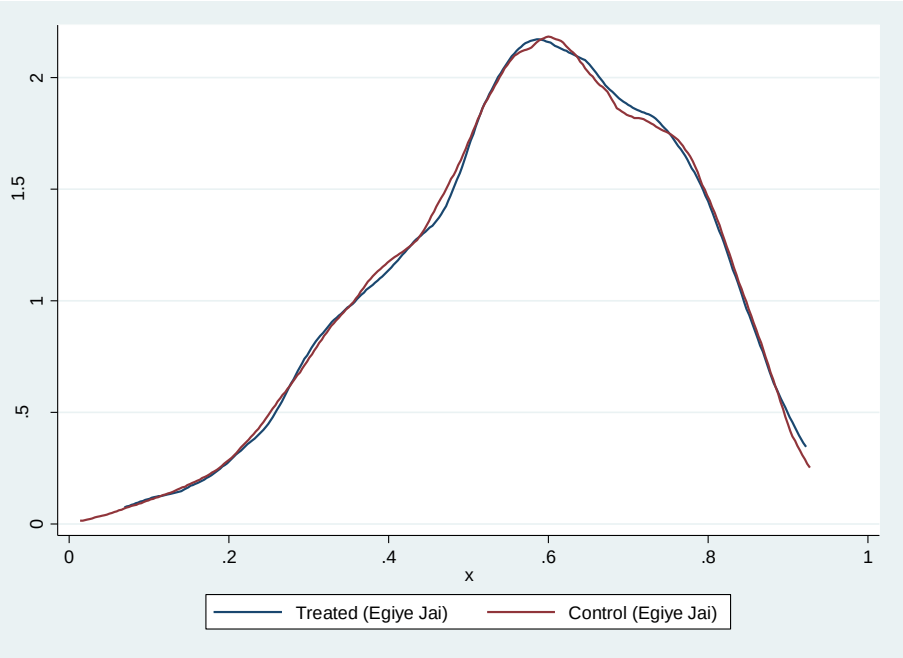
Cultivated Land				
Less than 49 decimals	0.278 (0.287)**	0.152 (0.170)	0.808 (0.313)**	0.483 (0.185)**
50-98 decimals	0.657 (0.304)**	0.387 (0.182)**	0.489 (0.300)	0.292 (0.177)
Agriculture/farming	-0.467 (0.187)**	-0.272 (0.112)**	1.298 (0.214)***	0.772 (0.126)***
Day labor	0.786 (0.223)***	0.475 (0.133)***	0.736 (0.248)**	0.435 (0.148)***
Dwelling Characteristics				
Individual house (Structure)	-1.118 (0.170)***	-0.672 (0.101)***	-1.200 (0.365)***	-0.683 (0.210)***
Earth or Sand (Floor)	1.517 (0.505)***	0.894 (0.287)***	0.370 (0.308)	0.210 (0.183)
Electricity (Lighting)	-0.008 (0.189)	-0.009 (0.113)	0.217 (0.167)	0.136 (0.099)
Firewood (Cooking fuel)	-1.001 (0.412)**	-0.612 (0.241)**	1.558 (0.170)***	0.936 (0.100)***
Constant	-2.493 (0.920)***	-1.509 (0.541)***	2.141 (0.905)**	1.258 (0.531)**
Summary statistics				
Pseudo R^2	0.208	0.207	0.365	0.365
Model chi-square	230.09***	229.23***	445.23***	444.35***
Log likelihood ratio	-467.972	-439.092	-386.655	-387.099
Obs.	803	803	879	879

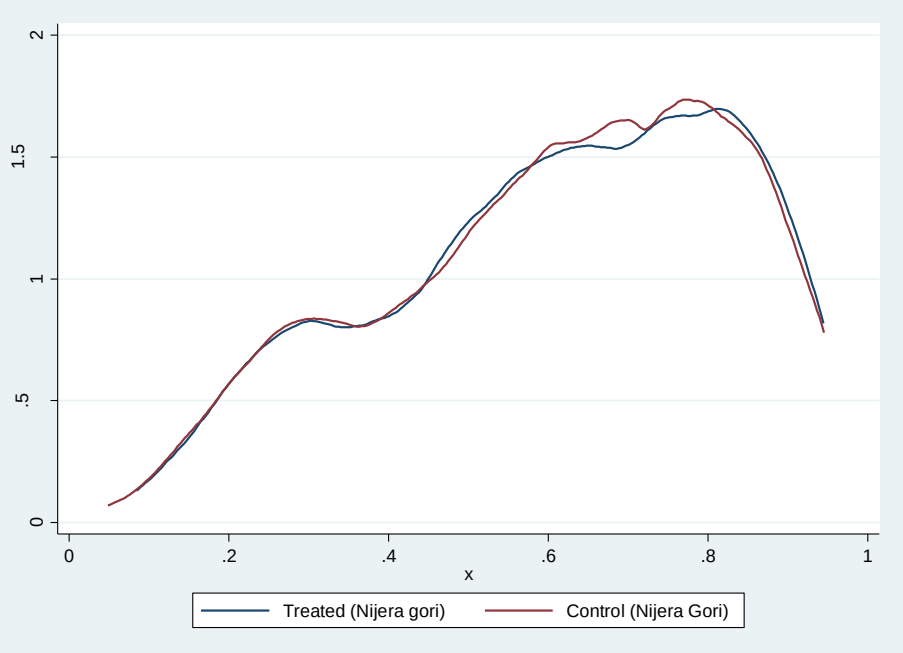
Notes: Robust standard errors are in parenthesis. a: we only include Muslim variable in region category since Muslim and Hindu variables explain more than 96% of variation in the group. * denotes significance at 10 percent, ** at 5 percent, and *** at 1 percent level.

Appendix F

Density Distribution of Propensity Score after Matching:

Kernel-Based Matching (Probit) with a Bandwidth of 0.06 and Common Support





Appendix G

Social Capital Instruments

Dealing with Crop	**If a crop disease were to affect the entire standing crop of this neighborhood, then who do you think would come forward to deal with this situation?** 1 = Everyone would deal with the problem individually 2 = Only the neighborhood leaders would act 3 = Some of the neighborhood would act, others would not 4 = The majority of the neighborhood would act together 5 = The entire neighborhood would act together
Resolving the Dispute	Suppose two people in the group had a dispute with each other. For example, one person gives his or her fruit to a neighbor to sell and the neighbor does not pay them correctly. Who do you think would resolve the dispute? 1 = People would work it out between themselves 2 = Only close relatives in the neighborhood intervenes 3 = Neighbors and relatives in the neighborhood intervene 4 = Neighborhood leaders intervene 5 = The entire neighborhood collectively intervenes
Reciprocity	Suppose some children of the neighborhood tend to stray from the correct path, for example, they are disrespectful to elders. Who in this neighborhood feels it right to correct the children? 1 = No one 2 = Only close relatives in the neighborhood 3 = Immediate neighbors and relatives in the neighborhood 4 = Neighborhood leaders 5 = Anyone in the group
Collective Action	How often in the past year have you joined together with other in the neighborhood to address a common issue, for example repairing a road? 1 = Never 2 = Once

	3 = A couple of times
	4 =Frequently
Neighbors*	Most people in this neighborhood are basically honest and can be trusted.
	1 = Yes
	0 = No
	Members of this neighbor- hood are more trustworthy than others.
	1 = Yes
	0 = No
	In this neighborhood, one has to be alert or someone is likely to take advantage of you.
	1 = Yes
	0 = No
	If I have a problem, there is always someone to help me
	1 = Yes
	0 = No
	Most people in this neighborhood are willing to help if you need it.
	1 = Yes
	0 = No
	This neighborhood has prospered in the last five years.
	1 = Yes
	0 = No

Note: * denotes neighborhood index which sums points from the listed six questions (ranged from 0 to 6).