Annex 3C. Impact analysis

- Impact evaluation food security programme Bangladesh

1. Impact assessment

To determine whether the Blue Gold (BG) and Safal projects have had an impact on the linkages in the Food Security Result Chain we follow upon the analyses reported in the final Sections of the Baseline report. In these Sections we presented a preliminary recursive model and logit regressions to determine propensity scores by which both the beneficiary and the control group observations are weighted to make these groups comparable.

Propensity Score Matching

The logits on whether a household is in the beneficiary area were done using a number of variables that supposedly do not affect the program outcomes, such as household size and composition, religion, education, and ownership and location of dwelling. The results are used for weighting.

Diff-in Diff model

For each household and for each variable that indicates a link in the result chain baseline and endline observations are merged. 41 households that could not be visited at endline had to be removed from this merged dataset.

For each equation in the recursive model the following model is estimated by OLS:

$$Y_{it} = \beta_0 + \beta_1 Treat_i + \beta_2 Post_t + \beta_3 (Treat * Post)_{it} + \Gamma' Z_{it} + \epsilon_{it}$$

Y is an indicator of a link in the result chain. They can be inputs, outputs, outcomes or impacts.

Treat equals 1 if the observation is in the treatment area; β_1 shows the effect of the difference in *Y* between households in program areas and those in control areas.

Post is equals 1 if the observation is post treatment (endline); β_2 shows the effect of the difference in *Y* between end- and baseline.

*Treat * Post* equals 1 if the observation is both in a treatment area and measured at endline; β_3 represents the program effect.

$\Gamma' Z$ stands for the other explanatory variables in a specific equation. Given the recursive structure of the full model Z may be a combination of link indicators (*Y*) and other variables, not used for matching.

ϵ_{it} are the usual independent and identically distributed disturbance terms.

Diff-in-Diff results

First the estimation results for BG are shown; then those for Safal farmers and at last for Safal landless. We discuss the results by type of link in the result chain: input, output, outcome and impact.

Inputs

We analysed treatment effects on five inputs: total size of plots used, total size of ponds used, use of chemical fertilizer and use of fingerlings, and whether the water management was considered good for agriculture.

Outputs

Next we report on treatment effects on the following four outputs: crop production, fish production, milk production (only for Safal), total annual amount of crops and fish consumed or stored for consumption, total annual amount of crops and fish sold or stored for sale.

Impacts

The final assessment of treatment effects is on outcomes: farm (including livestock for Safal) and non-farm income, value of the food consumption, wealth, months of adequate household food, food (in)security as indicated by HFIAS, household dietary diversity score (HDDS) and nutritional adequacy. The inputs and outputs are explanatory variables.

1.1 Blue Gold

Matching the beneficiary and control group

Originally the total Blue Gold group contained 800 households. 29 of them were replaced at endline because they couldn't be found. In the following analysis these replaced households will be left out. This leaves us with 771 households (387 from the beneficiary group and 384 from the control group). According to our calculations 128 households consumed for less than 1 dollar a day at the baseline or the endline.[i] Considering a poverty line of 1.25 dollar per day per household member and the fact that poor households probably spend most of their income on consumption, we consider these observations as unreliable. Therefore we leave these households out. The remaining households (301 beneficiaries and 342 controls) are matched by propensity score matching. The "propensity score" is an estimate of the conditional probability of finding the household in the treatment group given a set of household characteristics.

The propensity scores are estimated with a logit regression where the dependent variables equals one if the household is located in the Blue Gold beneficiary area and 0 if it is located in the control area. The cofounder 'being a member of a water management group' is left out of the logit regression. The beneficiary households are significantly more often member of a water management group (23%) than the households in the control group (3%). It seems like this was a selection criteria for the program. If we would include this characteristic in the propensity score estimation, the households in the control group that are member of a water management group would be assigned too large a weight.

The results are shown in table 1 below. In the Blue Gold beneficiary area the households are bigger and more often Hindu than in the control area. The households in the Blue Gold beneficiary area used smaller plots for agriculture. In the control area fewer household members 15 years or older have some form of education. Although more households in the Blue Gold beneficiary area own their house, they have lower wealth. Participation in a farmer field school was considered at selection. Hence, household members in the beneficiary area participated significantly more often in such schools. All in all, household size, education, being Hindu, owning one's dwelling, plot size used, participation in a farmer field school and wealth index are significant matching variables.

[i] These calculations are based on the value of the consumption from Module L.

Table 1 Estimation results logit regression propensity scores, Blue Gold area, n=643, pseudo R^2=0.11

Variable	coefficient	p-value
household size	0.162	0.004
percentage of men	0.664	0.188
age distribution in the household		
percentage 0-11 years	-1.198	0.082
percentage 11-19 years	-0.434	0.535
percentage 20-29 years	-0.458	0.515
percentage 30-39 years	-0.345	0.648
percentage 40-49 years	0.769	0.285
percentage 50 years or older	*Reference*	
% of HH members age >=15 with no education	-1.145	0.002
Religion		
Hindu	1.049	0.000
other religion (Muslim or Buddhist)	*Reference*	
distance to the main road (in km)	0.022	0.659
no own dwelling	-2.130	0.007
plot size used	-0.672	0.000
pond size used	-0.752	0.479
participated in a farmer field school	0.655	0.011
received extension services	-0.276	0.257
participated in a project related to food security, agriculture or nutrition	0.101	0.714
participated in a project from which unconditional (free) cash or asset transfer was received	-0.083	0.797
wealth index	-0.170	0.003
Constant	-0.923	0.081

Kernel density

To examine whether there are enough households in the control area that have the distinguishing matching characteristics we look at the common support. A kernel density plot visualizes the common support. The kernel densities for the propensity scores are displayed in Figure 1. The propensity score is on the horizontal axis. The density is displayed on the vertical axis: a higher density means a higher occurrence of the propensity score. The overlap of both densities is the common support.

Figure 1 Kernel density estimates Blue Gold beneficiary (pink) and Blue Gold control (grey)

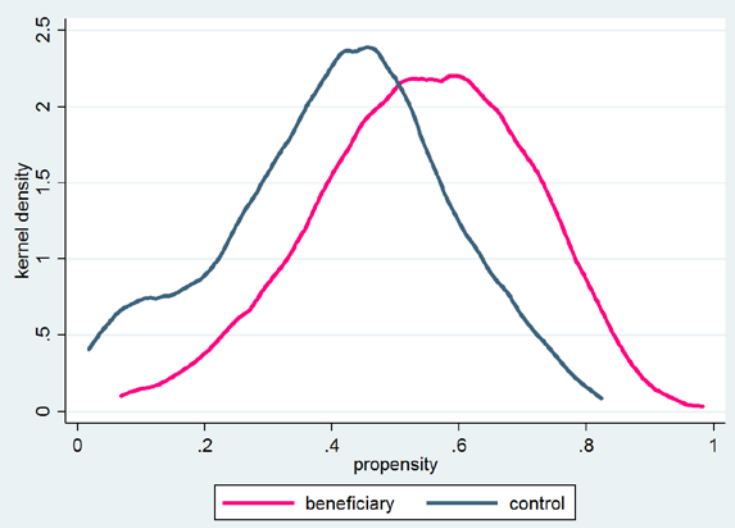


Figure 1 shows that there is enough overlap, so the common support condition holds. 2 beneficiary households are not on the support, because their propensity score was too high. The weighted beneficiary group and the weighted control group are balanced for all matching variables.[2]

Households in the treatment group receive weight 1/"propensity score"; households in the beneficiary group receive weight 1/(1-"propensity score").[3] Table 2 shows the weighted means of the households in the beneficiary and households in the control area.

Table 2 Weighted means baseline, Blue Gold area, n=641

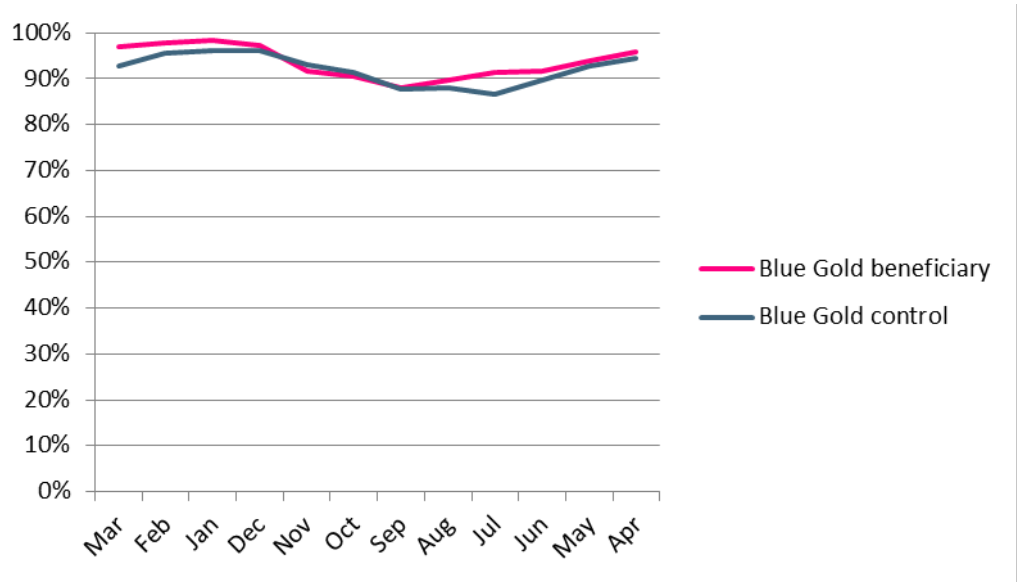
Variable	Weighted mean beneficiary area	Weighted mean control area
household size	4.94	4.98
percentage of men	0.57	0.57
age distribution in the household		
percentage 0-11 years	0.18	0.18
percentage 11-19 years	0.16	0.17
percentage 20-29 years	0.17	0.18
percentage 30-39 years	0.14	0.14
percentage 40-49 years	0.13	0.13
% of HH members age >=15 with no education	0.21	0.19
Religion		
Hindu	0.39	0.37
distance to the main road (in km)	0.09	0.11
no own dwelling	0.03	0.03
plot used	0.53	0.54

[2] This is tested by using the pstest command in Stata. The criterion was a p-value of less than 0.05.

[3] The weights are corrected, such that the sum of the weights is equal to the number of households in the sample. If we would not do this, the number of observations would be artificially inflated such that the standard errors would be artificially low.

pond used	0.02	0.02
participated in a farmer field school	0.18	0.18
received extension services	0.25	0.23
participated in a project related to food security, agriculture or nutrition	0.12	0.12
participated in a project from which unconditional (free) cash or asset transfer was received	0.11	0.09
wealth index	-0.33	-0.38

Figure 2 Percentage of the households with enough food per month Blue Gold, baseline n=400



The food groups which are used to construct the household dietary diversity score contain the following food items:

- **Cereals:** Rice Muri/khoi Rice Flour Semai/noodles Chira (flattened rice)
- **Roots and tubers:** Potato
- **Vegetables:** Dhania Shak, Lau shak, Lal Shak (red amaranth), Palang Shak, Radish leaves, Pui (indian spinach), Mixed leafy vegetables, Kachu Shak, Bathuua, Onion/garlic shak, Onion, Garlic, Green Chilli, Eggplant, Ash Gourd, Tomato, Carrot, Water Gourd, Cabbage, Cauliflower, Bitter Gourd, Shalgom, Kachu (arum), Sweet Gourd, Radish, Cucumber
- **Fruits:** Apple, Orange, Jujube, Banana, Coconut, Olive, Grapes, Papaya, Mango
- Poultry products: Chicken, Eggs
- **Fish and seafood:** Tilapia, Silver Carp, Pangash, Rui, Taki, Mrigel, Koi, Poona fish, Jatka, Chital, Puti , Panch mishali, Gura mach, Small prawn, Tengra
- **Vegetables, Nuts and Seeds**: Lentil, Anchor daal, Khesari, Black Gram
- **Milk and milk products:** Powdered milk, Milk
- **Oils and Fats:** Soy Bean (oil), Mustard (oil)
- **Sweets:** Sugar, Gur
- **Spices:** Tea

Figure 3 Percentage of the households were any member of the household consumed an item of this product group the day before the day of the baseline questionnaire, Blue Gold

	Blue Gold beneficiary	Blue Gold control
Cereals	98%	100%
Roots	84%	87%
Vegetables	89%	93%
Fruits	30%	49%
Poultry	30%	39%
Fish	57%	71%
Seeds	40%	57%
Milk	26%	32%
Oil	82%	92%
Sweet	13%	23%
Spices	74%	90%

Table 3 Means (unweighted) baseline/ endline, Blue Gold beneficiary area, n=301

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.40	0.52	0.00	3.54	0.51	0.55	0.00	3.54
pond used (ha)	0.02	0.09	0.00	0.81	0.03	0.14	0.00	2.17
used chemical fertilizer (1=yes)	0.61	0.49	0.00	1.00	0.65	0.48	0.00	1.00
used fingerlings (1=yes)	0.33	0.47	0.00	1.00	0.59	0.49	0.00	1.00
good WM[4] (1=yes)	0.65	0.48	0.00	1.00	0.62	0.49	0.00	1.00
crop production (kg)	1,245.47	1,642.32	0.00	10,070.00	1,431.11	1,681.35	0.00	11,533.00
fish production (kg)	47.95	122.31	0.00	1,000.00	80.95	151.87	0.00	1,140.00
consumed or stored for consumption (kg)	685.93	824.70	0.00	5,000.00	802.37	748.04	0.00	4,000.00
sold or stored for sale (kg)	539.90	1,084.06	0.00	7,200.00	446.29	902.79	0.00	9,080.00
farm income from cultivation (USD)	691.37	1,331.66	0.00	12,928.33	2,169.55	2,419.10	0.00	16,130.32
off farm income (USD)	1,224.07	2,178.39	0.00	16,663.49	5,879.48	10,504.55	0.00	83,510.30
wealth index	-0.51	1.94	-4.15	7.83	0.50	1.64	-2.87	5.64
value of food consumption (USD)[5]	1,585.43	1,122.38	375.00	8,723.52	992.08	641.55	365.22	4,978.29
months of adequate household food access	11.27	1.55	0.00	12.00	11.13	1.46	2.00	12.00
HFIAS	1.94	3.59	0.00	18.00	1.83	3.01	0.00	20.00
HDDS	6.62	1.67	3.00	11.00	7.82	1.56	4.00	11.00
Nutritional adequacy index	0.56	0.26	0.03	1.00	0.58	0.13	0.23	1.00
Ca adequacy	0.34	0.36	0.00	1.00	0.25	0.18	0.05	1.00
Fe adequacy (ad.)	0.37	0.22	0.00	1.00	0.42	0.17	0.10	1.00
Energy ad.	0.91	0.20	0.11	1.00	0.77	0.18	0.22	1.00
Carbohydrates ad.	0.68	0.35	0.00	1.00	0.92	0.17	0.10	1.00
Protein ad.	0.72	0.32	0.00	1.00	0.84	0.18	0.19	1.00
Magnesium ad.	0.76	0.31	0.00	1.00	0.94	0.13	0.28	1.00
Zinc ad.	0.75	0.32	0.00	1.00	0.88	0.16	0.26	1.00
Vitamin A ad.	0.41	0.37	0.00	1.00	0.33	0.25	0.01	1.00
B1Thiamin ad.	0.45	0.32	0.00	1.00	0.39	0.15	0.12	1.00

[4] Is the performance of the water management system good for your agricultural production and fishing/aquaculture production? 1=yes, 0=other.

[5] The value of the food consumption is based on Module L. For each product the consumption in the past 7 days was multiplied by the price of the product for which the household could by the product. This is multiplied by 52 to calculate the approximate value of the food consumption in a year. Prices are corrected for outliers.

B2Riboflav ad.	0.50	0.38	0.00	1.00	0.44	0.24	0.12	1.00
B3Niacin ad.	0.67	0.32	0.00	1.00	0.77	0.2	0.12	1.00
B6 ad.	0.39	0.29	0.00	1.00	0.33	0.15	0.08	1.00
B9Folate ad.	0.28	0.24	0.00	1.00	0.21	0.11	0.07	1.00
B12 ad.	0.51	0.44	0.00	1.00	0.36	0.25	0.00	1.00
Vitamin C ad.	0.62	0.33	0.00	1.00	0.82	0.21	0.22	1.00

Table 4 Means (unweighted) baseline/ endline, Blue Gold control area, n=342[ˁ]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.65	0.83	0.00	5.38	0.63	0.75	0.00	5.83
pond used (ha)	0.02	0.09	0.00	0.65	0.03	0.11	0.00	1.68
used chemical fertilizer (1=yes)	0.68	0.47	0.00	1.00	0.76	0.43	0.00	1.00
used fingerlings (1=yes)	0.52	0.50	0.00	1.00	0.71	0.46	0.00	1.00
good WM (1=yes)	0.46	0.50	0.00	1.00	0.18	0.39	0.00	1.00
crop production (kg)	2,418.37	3,045.14	0.00	24,120.00	2,844.48	3,782.18	0.00	29,840.00
fish production (kg)	105.78	413.55	0.00	6,000.00	127.00	180.28	0.00	1,493.00
consumed or stored for consumption (kg)	960.27	984.16	0.00	5,200.00	958.61	893.33	0.00	5,756.00
sold or stored for sale (kg)	1,449.94	2,600.63	0.00	24,128.00	1,734.25	3,166.68	0.00	28,805.00
farm income form cultivation (USD)	943.20	1,589.23	0.00	15,399.33	3,043.80	4,491.52	0.00	48,448.19
off farm income (USD)	1,682.64	2,960.95	0.00	17,589.24	5,712.42	10,253.53	0.00	63,972.36
wealth index	-0.32	2.11	-4.06	7.16	0.81	1.86	-3.29	6.03
value of food consumption (USD)	1,644.26	1,040.97	368.77	9,458.50	910.34	465.53	367.06	3,827.80
months of adequate household food access	11.10	1.53	0.00	12.00	11.23	1.27	5.00	12.00
HFIAS	2.37	4.35	0.00	27.00	1.79	2.79	0.00	19.00
HDDS	7.25	1.72	3.00	11.00	7.72	1.59	3.00	11.00
Nutritional adequacy index	0.63	0.22	0.10	1.00	0.58	0.13	0.20	0.96
Ca adequacy	0.42	0.37	0.01	1.00	0.29	0.20	0.04	1.00
Fe adequacy (ad.)	0.42	0.19	0.03	1.00	0.43	0.18	0.09	1.00
Energy ad.	0.95	0.12	0.15	1.00	0.78	0.17	0.13	1.00
Carbohydrates ad.	0.80	0.29	0.02	1.00	0.92	0.18	0.09	1.00
Protein ad.	0.83	0.24	0.04	1.00	0.86	0.17	0.20	1.00
Magnesium ad.	0.87	0.23	0.05	1.00	0.95	0.13	0.23	1.00
Zinc ad.	0.84	0.23	0.04	1.00	0.88	0.16	0.24	1.00
Vitamin A ad.	0.48	0.38	0.00	1.00	0.33	0.26	0.01	1.00
B1Thiamin ad.	0.51	0.30	0.02	1.00	0.39	0.16	0.10	1.00
B2Riboflav ad.	0.56	0.37	0.02	1.00	0.43	0.22	0.10	1.00
B3Niacin ad.	0.76	0.27	0.03	1.00	0.78	0.19	0.12	1.00
B6 ad.	0.43	0.29	0.01	1.00	0.34	0.17	0.07	1.00
B9Folate ad.	0.32	0.24	0.01	1.00	0.21	0.12	0.06	1.00

[ˁ] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

B12 ad.	0.6	0.41	0.00	1.00	0.38	0.25	0.00	1.00
Vitamin C ad.	0.7	0.32	0.00	1.00	0.77	0.24	0.20	1.00

Table 5 Means (weighted) baseline/ endline, Blue Gold beneficiary area, n=299[7]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.53	0.71	0.00	3.54	0.55	0.59	0.00	3.54
pond used (ha)	0.02	0.09	0.00	0.81	0.03	0.11	0.00	2.17
used chemical fertilizer (1=yes)	0.59	0.49	0.00	1.00	0.64	0.48	0.00	1.00
used fingerlings (1=yes)	0.33	0.47	0.00	1.00	0.58	0.50	0.00	1.00
good WM (1=yes)	0.68	0.47	0.00	1.00	0.60	0.49	0.00	1.00
crop production (kg)	1,462.59	1,916.05	0.00	10,070.00	1,515.83	1,788.99	0.00	11,533.00
fish production (kg)	49.44	122.18	0.00	1,000.00	85.69	151.12	0.00	1,140.00
consumed or stored for consumption (kg)	757.85	919.96	0.00	5,000.00	827.20	786.43	0.00	4,000.00
sold or stored for sale (kg)	644.46	1,216.37	0.00	7,200.00	498.24	927.67	0.00	9,080.00
farm income form cultivation (USD)	753.53	1,332.82	0.00	12,928.33	2,311.83	2,600.12	0.00	16,130.32
off farm income (USD)	1,134.73	2,001.64	0.00	16,663.49	5,390.41	10,112.72	0.00	83,510.30
wealth index	-0.33	2.16	-4.15	7.83	0.56	1.72	-2.87	5.64
value of food consumption (USD)	1,616.31	1,149.47	375.00	8,723.52	984.51	629.66	365.22	4,978.29
months of adequate household food access	11.35	1.40	0.00	12.00	11.09	1.49	2.00	12.00
HFIAS	1.83	3.45	0.00	18.00	1.86	3.00	0.00	20.00
HDDS	6.71	1.66	3.00	11.00	7.83	1.55	4.00	11.00
Nutritional adequacy index	0.57	0.26	0.03	1.00	0.58	0.12	0.23	1.00
Ca adequacy	0.35	0.37	0.00	1.00	0.24	0.18	0.05	1.00
Fe adequacy (ad.)	0.38	0.22	0.00	1.00	0.42	0.17	0.10	1.00
Energy ad.	0.92	0.19	0.11	1.00	0.79	0.17	0.22	1.00
Carbohydrates ad.	0.69	0.36	0.00	1.00	0.93	0.16	0.1	1.00
Protein ad.	0.74	0.32	0.00	1.00	0.86	0.17	0.19	1.00
Magnesium ad.	0.77	0.31	0.00	1.00	0.94	0.13	0.28	1.00
Zinc ad.	0.76	0.31	0.00	1.00	0.89	0.16	0.26	1.00
Vitamin A ad.	0.43	0.37	0.00	1.00	0.32	0.24	0.01	1.00
B1Thiamin ad.	0.48	0.33	0.00	1.00	0.40	0.15	0.12	1.00
B2Riboflav ad.	0.53	0.38	0.00	1.00	0.45	0.23	0.12	1.00
B3Niacin ad.	0.69	0.32	0.00	1.00	0.78	0.20	0.12	1.00
B6 ad.	0.41	0.30	0.00	1.00	0.34	0.15	0.08	1.00
B9Folate ad.	0.29	0.25	0.00	1.00	0.21	0.11	0.07	1.00
B12 ad.	0.53	0.44	0.00	1.00	0.35	0.24	0.00	1.00
Vitamin C ad.	0.64	0.33	0.00	1.00	0.83	0.21	0.22	1.00

[7] 2 households are not 'on the support'.

Table 6 Means (weighted) baseline/ endline, Blue Gold control area, n=342[$]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.54	0.71	0.00	5.38	0.56	0.68	0.00	5.83
pond used (ha)	0.02	0.08	0.00	0.65	0.04	0.12	0.00	1.68
used chemical fertilizer (1=yes)	0.64	0.48	0.00	1.00	0.73	0.44	0.00	1.00
used fingerlings (1=yes)	0.53	0.50	0.00	1.00	0.71	0.45	0.00	1.00
good WM (1=yes)	0.45	0.50	0.00	1.00	0.18	0.38	0.00	1.00
crop production (kg)	2,133.63	2,887.78	0.00	24,120.00	2,583.63	3,465.59	0.00	29,840.00
fish production (kg)	96.90	399.68	0.00	6,000.00	120.54	168.55	0.00	1,493.00
consumed or stored for consumption (kg)	920.57	988.63	0.00	5,200.00	901.45	864.30	0.00	5,756.00
sold or stored for sale (kg)	1,217.52	2,465.53	0.00	24,128.00	1,553.01	2,859.29	0.00	28,805.00
farm income form cultivation (USD)	856.94	1,590.65	0.00	15,399.33	2,748.70	3,821.69	0.00	48,448.19
off farm income (USD)	1,666.85	2,975.52	0.00	17,589.24	5,729.04	10,207.81	0.00	63,972.36
wealth index	-0.38	2.03	-4.06	7.16	0.80	1.81	-3.29	6.03
value of food consumption (USD)	1,640.50	1,046.53	368.77	9,458.50	906.27	488.17	367.06	3,827.80
months of adequate household food access	11.11	1.53	0.00	12.00	11.17	1.34	5.00	12.00
HFIAS	2.38	4.27	0.00	27.00	1.92	2.89	0.00	19.00
HDDS	7.22	1.73	3.00	11.00	7.68	1.61	3.00	11.00
Nutritional adequacy index	0.63	0.22	0.10	1.00	0.58	0.13	0.20	0.96
Ca adequacy	0.43	0.37	0.01	1.00	0.29	0.20	0.04	1.00
Fe adequacy (ad.)	0.41	0.19	0.03	1.00	0.43	0.18	0.09	1.00
Energy ad.	0.95	0.13	0.15	1.00	0.77	0.17	0.13	1.00
Carbohydrates ad.	0.80	0.29	0.02	1.00	0.92	0.18	0.09	1.00
Protein ad.	0.82	0.25	0.04	1.00	0.86	0.17	0.20	1.00
Magnesium ad.	0.86	0.23	0.05	1.00	0.94	0.13	0.23	1.00
Zinc ad.	0.83	0.24	0.04	1.00	0.89	0.16	0.24	1.00
Vitamin A ad.	0.48	0.39	0.00	1.00	0.34	0.27	0.01	1.00
B1Thiamin ad.	0.51	0.30	0.02	1.00	0.39	0.16	0.10	1.00
B2Riboflav ad.	0.56	0.37	0.02	1.00	0.43	0.22	0.10	1.00
B3Niacin ad.	0.75	0.27	0.03	1.00	0.78	0.19	0.12	1.00
B6 ad.	0.43	0.29	0.01	1.00	0.34	0.17	0.07	1.00
B9Folate ad.	0.32	0.24	0.01	1.00	0.21	0.13	0.06	1.00

[$] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

B12 ad.	0.60	0.41	0.00	1.00	0.38	0.25	0.00	1.00
Vitamin C ad.	0.69	0.32	0.00	1.00	0.78	0.24	0.20	1.00

Water management (only Blue Gold Endline)

The following analysis is based on the endline questionnaire. This is because most of the questions concerning water management are not asked at the baseline survey. Water management related problems are however measured both at the baseline as in the endline. These are therefore included in the difference-in-difference regressions following later in this document (see Table 50-Table 54).

Membership water management group

Table 44 shows the percentage of the households that participated in one of the water management groups supported by the BG program in the past 2 years (Module B) in the beneficiary area and the control area. For the participants and non-participants we further examined if they were a member of any Water Management Group at the time of the survey (Module I).

Table 7 Membership Water Management Group (weighted percentages)

Last 2 years member Blue Gold WM	Beneficiary (n=299)		Control (n=342)	
	total	of which currently member of a WM[9]	total	of which currently member of a WMG
Yes	92.99%	80.06% Yes	0.34%	10.00% Yes
No	6.10%	7.04% Yes	11.81%	0.82% Yes
Don't know about Blue Gold	0.91%	100.00% Yes	87.85%	2.16% Yes
Total	100.00%		100.00%	

Almost in every household in the Beneficiary area there is a household member that participated in a WMG of the BG program in the last 2 years (93%). From this group of households 80 percent still joined a WMG at the time of the survey. 6% of the households in the beneficiary area did not have any household member that participated in a WMG of the BG program in the last 2 years. From this group 7% did participate in some WMG at the time of the survey.
As is to be expected, this is completely different in the control area. Here 12% of the households report that they did not join a WMG of the BG program in the last 2 years and 88% did not even know about Blue Gold. There were just a few households in the control area that participated in any WMG at the time of the survey.

Table 8 Membership any Water Management Group at the time of the endline-survey (weighted percentages)

	Beneficiary (n=324)		Control (n=317)	
	Baseline	Endline	baseline	endline
Yes	23.80%	76.62%	4.10%	2.50%
No	76.20%	23.38%	95.90%	97.50%
Total	100.00%	100.00%	100.00%	100.00%

At the time of the endline-survey 77% of the households in the beneficiary area and 2.5% of the households in the control area have a household member that is a member of a Water Management Group (see Table 9). For both groups this indicates only a marginal change relative to the baseline.

[9] Any WMG including Blue Gold at the time of the endline-survey.

Support and (paid) services from the water management group

Table 9 Support on agricultural activities through the water management group (weighted percentages)

Received?	Beneficiary (n=301)	Control (n=342)
Yes	37.96%	0.48%
No	62.04%	99.52%
Total	100.00%	100.00%

In the beneficiary area 62% did not receive support on agricultural activities through the water management group (Table 9). In het control area almost no household received support on agricultural activities through the water management group.

Table 10 Most important services delivered by the water management group during the last 2 years on agricultural activities (weighted percentages) (multiple response)

	Beneficiary (n=301)	Control (n=342)
Savings and loans	13.53%	0.23%
Cooperative services for inputs (e.g. fertilizer, seeds, …)	8.08%	0.00%
Training	21.87%	0.00%
Transport to markets	1.69%	0.00%
Negotiation with traders for better prices	1.13%	0.00%
Information about markets	2.45%	0.00%
Link to agricultural extension services	10.50%	0.25%
New information and techniques	5.13%	0.00%

The most important services delivered by the WMG in the beneficiary area during the last 2 years on agricultural activities are training (22%), savings and loans (14%) and a link to agricultural services (11%) (see Table 10).

Table 11 Payment for services provided by the water management groups (weighted percentages)

Paid?	Beneficiary (n=114)	Control (n=2)
Yes	2.45%	52.80%
No	97.55%	47.20%
Total	100.00%	100.00%

Most of the households in the beneficiary area (98%) did not pay for the services provided by the WMG (Table 11). (In the control area there are only two observations from which we cannot draw conclusion.)

Table 12 Use of services provided by the WMG in the past 2 years (weighted percentages) (multiple response)

	Beneficiary (n=301)	Control (n=342)
Training in on-farm water management	8.97%	0.00%
Training on agricultural practices	26.03%	0.57%
Coordination on cropping pattern	5.39%	0.68%
Cooperative buying of agricultural inputs	0.77%	0.00%
Cooperative selling of production	0.61%	0.00%
Information on water deliveries	19.49%	0.83%
Other	8.28%	9.33%
None provided	48.14%	90.32%
Non used	1.67%	0.22%

48% of the households in the beneficiary indicate that there were no services provided by the WMG in the past 2 year. The most used services are training on agricultural practices (26%) and information on water deliveries (19%).

Table 13 Did households believe that the WMG can help solve problems with access to water? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Yes	53.02%	6.85%
No	46.98%	93.15%
Total	100.00%	100.00%

In the beneficiary area 53% of the households believe that the WMG can help solve problems with access to water. In the control area this is only 7% (see Table 13).

Table 14 Did households provide funds to the WMG so that the WMG can better carry out its functions of water management? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Yes	6.00%	1.40%
No	94.0%	98.60%
Total	100.00%	100.00%

Almost no household provide funds to the WMG so that the WMG could better carry out its function of water management (see Table 14).

Table 15 Did households contribute money, material or time (labour) to building, maintaining or reconstructing water infrastructure in the community in the past 12 months? (weighted percentages)

	Beneficiary (n=301)		Control (n=342)	
	baseline	endline	baseline	endline
Yes	13.14%	2.22%	8.02%	1.41%
Yes, money		*0.21%*		*1.06%*
Yes, material		*0.25%*		*0.00%*
Yes, labour or time		*1.76%*		*0.35%*
No	86.86%	97.78%	91.98%	98.59%
Total	100.00%	100.00%	100.00%	100.00%

In both the beneficiary area as the control area fewer households contributed money at the endline compared to the baseline (see Table 15). In the beneficiary area only one household paid at the endline. This was an amount of 4 US dollar. In the control area only 4 households paid at the endline. The highest amount was 3 US dollar.

Quality of the infrastructure

For these analyses no weighting is done because we want to show the amount of household in the different Unions.

Table 16 Average rate of the water infrastructure part (n=1600, standard deviation between brackets)

Water infrastructure part	Blue Gold beneficiary	Blue Gold control
Main embankments	2.3 (0.7)	2.6 (0.9)
Main sluices	2.3 (0.6)	2.8 (0.9)
Main drains	2.7 (0.8)	3.0 (0.9)
Local embankments	2.4 (0.7)	2.8 (0.9)
Local sluices	2.4 (0.7)	2.9 (0.9)
Local drains	2.8 (0.8)	3.1 (0.9)

Index: 1=excellent, 2=good, 3=reasonable, 4=poor, 5=very bad

The drains (main as well as local) are the least good water infrastructure parts in both the beneficiary as the control area.

Table 17 Importance of the water infrastructure part for crops/ponds (n=1600, standard deviation between brackets)

Water infrastructure part	Blue Gold beneficiary	Blue Gold control
Main embankments	2.0 (0.5)	1.9 (0.6)
Main sluices	2.0 (0.4)	1.8 (0.6)
Main drains	2.0 (0.5)	1.8 (0.5)
Local embankments	2.0 (0.5)	1.8 (0.5)
Local sluices	2.0 (0.5)	1.8 (0.5)
Local drains	2.0 (0.5)	1.8 (0.5)

Index: 1=not important, 2=important, 3=very important

The water infrastructure parts are equally important within the Blue Gold beneficiary area and the Blue Gold control area separately. The households in the beneficiary area rate the water infrastructure parts on average as more important than the households in the control area.

The quality of the infrastructure is constructed by weighting the quality of parts of the infrastructure by the importance for the crops/ponds (Module I)[16]. The water infrastructure parts are: main embankments, main sluices, main drains, local embankments, local sluices and local drains. The average quality of the infrastructure is calculated per union and per area as shown below.

Table 18 Water Quality index Beneficiary area (unweighted)

Union	Amount of households	Quality of the infrastructure (index)
Batiaghata	99	2.4
Gangarampur	100	2.4
Marichbunia	60	2.4
Madarbunia	80	2.5
Auliapur	60	2.6
13 No. Gutudia	1	3.0
Marichbunia	400	2.5

Index: 1=excellent, 2=good, 3=reasonable, 4=poor, 5=very bad

A Pearson's chi-squared test shows that it is unlikely that any observed differences between the unions arose by chance (p-value = 0.000).

Table 19 Water Quality index Control area (unweighted)

Union	Amount of households	Quality of the infrastructure (index)
Kharnia	4	2.6
Dumuria Sadar	51	2.6
Gutudia	24	2.7
Jalma	23	2.8
13 No. Gutudia	78	2.9
Mithaganj	80	2.9
Thornia	19	3.0
Baliatoli	120	3.1
	399	2.9

Index: 1=excellent, 2=good, 3=reasonable, 4=poor, 5=very bad

A Pearson's chi-squared test shows that it is unlikely that any observed differences between the unions arose by chance (p-value = 0.000).

On average the quality of the water management related infrastructure is better in the beneficiary area compared to the control area. The average index in the beneficiary area is 2.5. This means that the infrastructure is rated exactly between reasonable and good. The index in the control area tends more towards reasonable.

[16] Very important = weight 3, important = weight 2, not important = weight 1.

Table 20 Responsibility quality and maintenance Blue Gold beneficiary (n=400)

	Main embankments*	Main sluices*	Main drains*	Local embankments*	Local sluices*	Local drains*
BWDB	37.75%	19.00%	16.75%	31.00%	17.75%	14.50%
WMG	16.50%	22.75%	19.50%	15.25%	23.50%	22.75%
Sluice/block committee	17.25%	34.00%	19.00%	21.00%	34.00%	18.00%
WMA	0.75%	1.00%	1.25%	0.50%	1.50%	0.25%
Don't know	27.75%	23.25%	43.50%	32.25%	23.25%	44.50%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

*A Pearson's chi-squared test shows that it is unlikely that any observed differences between the Blue Gold beneficiary area and the Blue Gold control area arose by chance. (P-value = 0.000)

The responsibility for the quality and maintenance of the different water infrastructure parts in the beneficiary area is spread. For the main embankments BWDB are mostly responsible, for the main and the local sluices the sluice/block committee is mostly responsible and for the main drains, the local embankments and the local drains it is mostly unknown who is responsible (see Table 20).

Table 21 Responsibility quality and maintenance Blue Gold control (n=400)

	Main embankments*	Main sluices*	Main drains*	Local embankments*	Local sluices*	Local drains*
BWDB	26.25%	13.00%	11.25%	20.25%	11.75%	11.25%
WMG	0.50%	0.75%	0.75%	0.50%	0.25%	0.50%
Sluice/block committee	13.75%	29.75%	17.00%	16.75%	31.00%	18.75%
WMA	0.50%	0.75%	0.75%	0.50%	0.75%	0.50%
Don't know	59.00%	55.75%	70.25%	62.00%	56.25%	69.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

*A Pearson's chi-squared test shows that it is unlikely that any observed differences between the Blue Gold beneficiary area and the Blue Gold control area arose by chance. (P-value = 0.000)

In the control area most households do not know who is responsible for the quality and maintenance of each of the water infrastructure parts (see Table 21).

Table 22 How did quality and use of the part of the infrastructure affect the crop/pond over the past 12 months? Blue Gold beneficiary (n=400)

	Main embankments*	Main sluices*	Main drains*	Local embankments*	Local sluices*	Local drains*
Very positively	7.25%	6.25%	5.75%	7.25%	6.00%	5.25%
Positively	60.50%	62.75%	52.75%	56.25%	62.00%	50.75%
Not affected	18.50%	16.50%	20.50%	18.25%	15.75%	21.50%
Negatively	4.50%	4.25%	10.50%	8.00%	5.50%	11.50%
Very negatively	0.25%	0.75%	0.25%	0.25%	0.50%	0.50%
Not Applicable	9.00%	9.50%	10.25%	10.00%	10.25%	10.50%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

*A Pearson's chi-squared test shows that it is unlikely that any observed differences between the Blue Gold beneficiary area and the Blue Gold control area arose by chance. (P-value = 0.000)

The majority of the households in the beneficiary area indicate that the quality and use of each of the parts of the infrastructure positively affected the crops/ponds over the past 12 months (see Table 22).

Table 23 How did quality and use of the part of the infrastructure affect the crop/pond over the past 12 months? Blue Gold control (n=400)

	Main embankments*	Main sluices*	Main drains*	Local embankments*	Local sluices*	Local drains*
Very positively	6.50%	3.00%	2.00%	4.00%	1.75%	2.50%
Positively	43.50%	39.25%	36.25%	43.00%	41.00%	35.25%
Not affected	24.00%	29.25%	29.75%	25.00%	27.75%	30.75%
Negatively	9.75%	11.00%	14.50%	10.00%	12.50%	14.75%
Very negatively	0.75%	1.75%	1.50%	1.50%	1.25%	1.25%
Not Applicable	15.50%	15.75%	16.00%	16.50%	15.75%	15.50%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

*A Pearson's chi-squared test shows that it is unlikely that any observed differences between the Blue Gold beneficiary area and the Blue Gold control area arose by chance. (P-value = 0.000)

In the control area the households in the beneficiary area mostly indicated to be positive about the way the quality and use of each of the parts of the infrastructure affected the crops/ponds over the past 12 months (see Table 22). The next largest group indicates that it did not affect the crops/ponds.

Table 24 In which season was this effect most pronounced? Blue Gold beneficiary (n=400)

	Main embankments*	Main sluices*	Main drains*	Local embankments*	Local sluices*	Local drains*
Aush	0.92%	0.60%	1.26%	0.92%	1.19%	1.59%
Amon	81.60%	82.34%	74.21%	78.29%	78.93%	71.34%
Boro	1.53%	2.40%	7.23%	5.20%	4.45%	9.24%
Robi	2.76%	1.80%	3.77%	2.75%	2.37%	3.50%
Not Applicable	13.19%	12.87%	13.52%	12.84%	13.06%	14.33%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

*A Pearson's chi-squared test shows that it is unlikely that any observed differences between the Blue Gold beneficiary area and the Blue Gold control area arose by chance. (P-value = 0.000)

Table 25 In which season was this effect most pronounced? Blue Gold control (n=400)

	Main embankments*	Main sluices*	Main drains*	Local embankments*	Local sluices*	Local drains*
Aush	2.96%	2.83%	4.63%	4.67%	3.81%	5.78%
Amon	62.83%	58.30%	49.82%	54.67%	55.36%	49.10%
Boro	7.89%	10.25%	16.01%	14.33%	12.11%	15.52%
Robi	4.93%	4.95%	5.69%	3.00%	6.23%	5.42%
Not Applicable	21.38%	23.67%	23.84%	23.33%	22.49%	24.19%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

*A Pearson's chi-squared test shows that it is unlikely that any observed differences between the Blue Gold beneficiary area and the Blue Gold control area arose by chance. (P-value = 0.000)

Both in the beneficiary group as in the control group the effect was the biggest in the Amon season (see Table 24 and Table 25).

Improvement of the infrastructure

For the analyses of the improvement of the infrastructure we use the PSM-weighted groups of households again.

Table 26 Is the water management system performing better than in the past? (weighted percentages) Baseline

	Beneficiary (n=301)	Control (n=342)
Yes	34.83%	21.36%
No	21.96%	31.13%
Don't know/ no opinion	43.21%	47.51%
Total	100.00%	100.00%

Table 27 Has the performance of the water management system improved over the past 2 years? (weighted percentages) Endline

	Beneficiary (n=301)	Control (n=342)
Yes	50.84%	12.60%
No	36.66%	60.30%
Not applicable	12.50%	27.10%
Total	100.00%	100.00%

In the beneficiary area 51% of the households indicate that the performance of the water management system has improved over the past 2 years, while in the control area only 13% indicates that the system has improved.

Table 28 What aspect of the water management system is performing better than in the past? (weighted percentages, multiple response) Baseline

	Beneficiary (n=113)	Control (n=68)
Flood protection	1.97%	17.11%
Drainage	43.17%	34.10%
Irrigation	47.06%	34.46%
Prevention of salt intrusion	7.80%	14.32%

Table 29 What aspect of the water management system improved over the last 2 years? (weighted percentages, multiple response) Endline

	Beneficiary (n=154)	Control (n=43)
Flood protection	19.22%	46.47%
Drainage	63.43%	56.24%
Irrigation	71.75%	32.47%
Prevention of salt intrusion	19.10%	41.18%
Other	1.98%	3.48%

In the beneficiary area drainage and irrigation are often indicated as aspects that improved over the last 2 years. In the control area drainage is often indicated as an improved aspect (see Table 29).

Table 30 What aspect of the water management system is performing less well than in the past? (weighted percentages, multiple response) Baseline

	Beneficiary (n=71)	Control (n=99)
Flood protection	7.29%	7.61%
Drainage	57.55%	33.55%
Irrigation	27.35%	24.17%
Prevention of salt intrusion	7.80%	34.67%

Table 31 What aspect of the water management system performed less well over the last 2 years? (weighted percentages, multiple response) Endline

	Beneficiary (n=107)	Control (n=208)
Flood protection	24.10%	22.22%
Drainage	45.22%	38.17%
Irrigation	33.90%	23.32%
Prevention of salt intrusion	13.82%	28.21%
Other	22.12%	37.77%

While many households in the beneficiary area indicated that the drainage improved, there are also many households that indicated that the drainage performed less well over the last 2 years (see Table 31).

Access to water

Table 32 Has the access to water for agricultural production improved over the past 2 years? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Yes	42.28%	5.32%
No	57.72%	94.68%
Total	100.00%	100.00%

In the beneficiary area 42% of the households felt that the access to water for agricultural production improved over the past 2 years. In the control area this hardly occurred (see Table 32).

Table 33 Did better access to water lead to better yields and higher food production? (weighted percentages)

	Beneficiary (n=132)	Control (n=18)
Yes	97.36%	71.47%
No	2.64%	28.53%
Total	100.00%	100.00%

Table 34 Did better access to water lead to higher incomes from food production? (weighted percentages)

	Beneficiary (n=132)	Control (n=18)
Yes	93.69%	60.89%
No	6.31%	39.11%
Total	100.00%	100.00%

Almost all households in the beneficiary area indicated that better access to water has led to better yields, higher food production (97%) and higher incomes from food production (94%). In the control area 71% of the households indicated that better access to water has led to better yields and higher food production and for 61% this also led to higher incomes (see Table 33 and Table 34).

Reliability and timing

Table 35 How do you rate the reliability of irrigation water deliveries? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Excellent	0.94%	0.57%
Good	36.66%	15.58%
Reasonable	52.48%	46.16%
Poor	9.35%	21.89%
Very bad	0.57%	15.79%
Total	100.00%	100.00%

Table 36 How do you rate the reliability of irrigation water deliveries now in comparison to 2 years ago? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Much better now	2.77%	1.75%
Slightly better now	29.09%	8.62%
The same	65.28%	71.13%
Slightly worse now	1.75%	5.69%
Much worse now	1.11%	12.82%
Total	100.00%	100.00%

Most households rate the reliability of irrigation water deliveries as reasonable and most households rate the reliability the same as 2 years ago (see Table 35 and Table 36). However, in the beneficiary

area 29% indicated that the reliability of irrigation water deliveries is slightly better now compared to 2 years ago. In the control group this was only 9%.

Table 37 How do you rate the timing of irrigation water deliveries? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Excellent	0.42%	0.39%
Good	39.69%	16.60%
Reasonable	48.62%	49.21%
Poor	10.40%	19.90%
Very bad	0.88%	13.90%
Total	100.00%	100.00%

Table 38 How do you rate the timing of irrigation water deliveries now in comparison to 2 years ago? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Much better now	2.35%	0.66%
Slightly better now	28.54%	9.84%
The same	65.42%	71.57%
Slightly worse now	2.58%	3.93%
Much worse now	1.11%	14.00%
Total	100.00%	100.00%

Table 39 How do you rate the communication on irrigation water deliveries? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Excellent	0.68%	0.00%
Good	40.71%	16.84%
Reasonable	49.71%	49.49%
Poor	8.01%	19.75%
Very bad	0.89%	13.92%
Total	100.00%	100.00%

Table 40 How do you rate the Communication on irrigation water deliveries now in comparison to 2 years ago? (weighted percentages)

	Beneficiary (n=301)	Control (n=342)
Much better now	2.66%	0.85%
Slightly better now	28.42%	8.80%
The same	64.93%	71.19%
Slightly worse now	2.88%	4.99%
Much worse now	1.11%	14.17%
Total	100.00%	100.00%

The rating of the timing and communication shows somewhat the same pattern as the rating of the reliability: most households indicate the timing as reasonable (in the beneficiary area as well as in the control area). For 28-29% of the households in the beneficiary area the timing and communication is slightly better now compared to 2 years ago; for the control area this is only 9-10% (see Table 37 t/m Table 40).

Validation intervention logic

(note: the standard errors are not correct, because it was not possible to do a weighted regression and simultaneously estimate cluster robust standard errors)

Table 41 Estimation results: good WM and production, Blue Gold areas

Dependent variable	**Production crops (in kg)**
Explanatory variables	**coefficient**
Good WM (1=yes)	385.83***
Constant	1734.28***
number of observations	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 42 Estimation results: production, (farm-) income (only from cultivation) and value of food consumption, Blue Gold areas

Dependent variable	**Farm income (in USD per year)**	**Value of food consumption (in USD)**	**Value of food consumption (in USD)**
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Production crops (in kg)	0.61***		0.07***
Production fish (in kg)	1.92***		0.17
Farm income (in USD per year)		-0.02*	-0.05***
Non-farm income (in USD per year)		0.00	0.00
Constant	334.68***	1317.42***	1242.20***
number of observations	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 43 Estimation results: production (farm-) income (only form cultivation) and household dietary diversity (HDDS), Blue Gold areas

Dependent variable	**HDDS**	**HDDS**	**HDDS**
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Production crops (in 1.000 kg)	0.06***		0.02
Production fish (in 1.000 kg)	0.19		-0.01
Farm income (in 1.000 USD per year)		0.08***	0.07***
Non-farm income (in 1.000 USD per year)		0.03***	0.03***
Constant	7.22***	7.11***	7.10***
number of observations	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Estimation results

(note: the standard errors are not correct, because it was not possible to do a weighted regression and simultaneously estimate cluster robust standard errors)

Table 44 Estimation results multivariate regression Inputs, Blue Gold areas

Dependent variable	Plot size used (in ha)	Pond size used (in ha)	Used chemical fertilizer	Used fingerlings	Good WM (1=yes)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.00	-0.00	-0.05	-0.20***	0.23***
post treatment (1=yes)	0.03	0.01	0.09**	0.18***	-0.27***
beneficiary post treatment (1=yes)	***-0.01***	***-0.00***	***-0.04***	***0.07***	***0.20******
Constant	0.54***	0.02***	0.64***	0.53***	0.45***
number of observations	1282	1282	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 45 Estimation results multivariate regression Outputs, Blue Gold areas

Dependent variable	Production crops (in kg)	Production fish (in kg)	Consumed (in kg)	Sold (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-671.04***	-47.46**	-162.72**	-573.06***
post treatment (1=yes)	450.00**	23.64	-19.12	335.49**
beneficiary post treatment (1=yes)	***-396.76***	***12.61***	***88.46***	***-481.70****
Constant	2133.63***	96.90***	920.57***	1217.52***
number of observations	1282	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 46 Estimation results multivariate regression Outcome Part 1 income, Blue Gold areas

Dependent variable	Farm income (in USD per year)	Non-farm income (in USD per year)	Value of food consumption (in USD)	Wealth Index
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-103.41	-532.12	-24.18	0.06
post treatment (1=yes)	1891.76***	4062.19***	-734.23***	1.18***
beneficiary post treatment (1=yes)	***-333.46***	***193.49***	***102.42***	***-0.30***
Constant	856.94***	1666.85***	1640.50***	-0.38***
number of observations	1282	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 47 Estimation results multivariate regression Outcome Part 2 Food security and diversity, Blue Gold areas

Dependent variable	Months of adequate household food access	HFIAS	HDDS
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.24**	-0.55**	-0.51***
post treatment (1=yes)	0.06	-0.46*	0.46***
beneficiary post treatment (1=yes)	***-0.32****	***0.49***	***0.67*****
constant	11.11***	2.38***	7.22***
number of observations	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 48 Estimation results multivariate regression Outcome Part 3 nutritional adequacy, Blue Gold areas

Dependent variable	Nutritional adequacy index	Calcium adequacy	Iron adequacy
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.05***	-0.07***	-0.03*
post treatment (1=yes)	-0.05***	-0.14***	0.02
beneficiary post treatment (1=yes)	***0.05****	***0.02***	***0.02***
constant	0.63***	0.43***	0.41***
number of observations	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Plot and Pond size

Table 49 Estimation results multivariate regression Inputs and outputs, Blue Gold ` areas

Dependent variable	Used chemical fertilizer	Used fingerlings	Production crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.00	-0.20***	0.00	0.00
post treatment (1=yes)	0.05	0.19***	0.00	0.00
beneficiary post treatment (1=yes)	***-0.09***	***0.06***	***0.00***	***0.00***
total plot size used (in hectare)	0.26***		2600.01***	
beneficiary x plot used	-0.10**		-518.93***	
post treatment x plot used	0.06		1256.38***	
beneficiary post treatment x plot used	***0.10***		***-678.54****	
total pond size used (in hectare)		1.09***		619.89***
beneficiary x pond used		-0.08		-404.41*
post treatment x pond used		-0.57		-461.95**
beneficiary post treatment x pond used		***0.31***		***629.01****
constant	0.50***	0.50***	736.47***	82.70***
number of observations	1282	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Participation in other programs, natural disasters, water related problems and electricity or solar power

Table 50 Means (unweighted) baseline/ endline, Blue Gold beneficiary area, n=301

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.23	0.42	0.00	1.00	0.68	0.47	0.00	1.00
received extension services	0.23	0.42	0.00	1.00	0.18	0.38	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.14	0.35	0.00	1.00	0.15	0.36	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.08	0.27	0.00	1.00	0.36	0.48	0.00	1.00
electricity or solar power	0.43	0.50	0.00	1.00	0.77	0.42	0.00	1.00
lack of water	0.26	0.44	0.00	1.00	0.10	0.30	0.00	1.00
flooding	0.16	0.37	0.00	1.00	0.02	0.13	0.00	1.00
logging	0.30	0.46	0.00	1.00	0.42	0.49	0.00	1.00
salinity	0.05	0.21	0.00	1.00	0.07	0.26	0.00	1.00
vulnerability index 1[11]	0.61	0.49	0.00	1.00	0.61	0.49	0.00	1.00
vulnerability index 2[12]	0.07	0.26	0.00	1.00	0.77	0.42	0.00	1.00

[11] Faced one or more of the 7 natural disasters.

[12] Faced crop lost or crop failure or both.

Table 51 Means (unweighted) baseline/ endline, Blue Gold control area, n=342[12]

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.15	0.35	0.00	1.00	0.09	0.29	0.00	1.00
received extension services	0.23	0.42	0.00	1.00	0.17	0.38	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.13	0.33	0.00	1.00	0.14	0.35	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.09	0.29	0.00	1.00	0.30	0.46	0.00	1.00
electricity or solar power	0.47	0.50	0.00	1.00	0.91	0.29	0.00	1.00
lack of water	0.35	0.48	0.00	1.00	0.07	0.26	0.00	1.00
flooding	0.11	0.32	0.00	1.00	0.13	0.34	0.00	1.00
logging	0.19	0.39	0.00	1.00	0.32	0.47	0.00	1.00
salinity	0.23	0.42	0.00	1.00	0.18	0.38	0.00	1.00
vulnerability index 1[14]	0.63	0.48	0.00	1.00	0.56	0.50	0.00	1.00
vulnerability index 2	0.03	0.18	0.00	1.00	0.67	0.47	0.00	1.00

[13] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

[14] Vulnerability index 1 means: faced one or more of the 7 natural disasters: flood, drought, cyclone, river erosion, land slide, excessive rain, and wind damage. Vulnerability index 2 means: faced crop lost or crop failure or both.

Table 52 Means (weighted) baseline/ endline, Blue Gold beneficiary area, n=299[15]

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.18	0.38	0.00	1.00	0.66	0.47	0.00	1.00
received extension services	0.25	0.43	0.00	1.00	0.17	0.37	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.12	0.32	0.00	1.00	0.15	0.36	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.11	0.31	0.00	1.00	0.38	0.49	0.00	1.00
electricity or solar power	0.46	0.50	0.00	1.00	0.78	0.41	0.00	1.00
lack of water	0.27	0.44	0.00	1.00	0.11	0.31	0.00	1.00
flooding	0.17	0.37	0.00	1.00	0.01	0.12	0.00	1.00
logging	0.30	0.46	0.00	1.00	0.41	0.49	0.00	1.00
salinity	0.04	0.21	0.00	1.00	0.07	0.25	0.00	1.00
vulnerability index 1[16]	0.63	0.48	0.00	1.00	0.59	0.49	0.00	1.00
vulnerability index 2[17]	0.06	0.23	0.00	1.00	0.78	0.42	0.00	1.00

[15] 2 households are not 'on the support'.

[16] Faced one or more of the 7 natural disasters.

[17] Faced crop lost or crop failure or both.

Table 53 Means (weighted) baseline/ endline, Blue Gold control area, n=342[18]

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.18	0.38	0.00	1.00	0.08	0.28	0.00	1.00
received extension services	0.23	0.42	0.00	1.00	0.18	0.38	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.12	0.33	0.00	1.00	0.15	0.36	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.09	0.28	0.00	1.00	0.30	0.46	0.00	1.00
electricity or solar power	0.46	0.50	0.00	1.00	0.90	0.29	0.00	1.00
lack of water	0.34	0.47	0.00	1.00	0.07	0.26	0.00	1.00
flooding	0.10	0.30	0.00	1.00	0.13	0.34	0.00	1.00
logging	0.19	0.39	0.00	1.00	0.30	0.46	0.00	1.00
salinity	0.23	0.42	0.00	1.00	0.16	0.37	0.00	1.00
vulnerability index 1[19]	0.62	0.49	0.00	1.00	0.56	0.50	0.00	1.00
vulnerability index 2	0.04	0.20	0.00	1.00	0.65	0.48	0.00	1.00

[18] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

[19] Vulnerability index 1 means: faced one or more of the 7 natural disasters: flood, drought, cyclone, river erosion, land slide, excessive rain, and wind damage. Vulnerability index 2 means: faced crop lost or crop failure or both.

Table 54 Estimation results multivariate regression Inputs and outputs, Blue Gold areas

Dependent variable	Used chemical fertilizer	Used fingerlings	Production crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.05	-0.20***	0.00	0.00
post treatment (1=yes)	0.10***	0.20***	0.00	0.00
beneficiary post treatment (1=yes)	***-0.04***	***0.07***	***0.00***	***0.00***
project fsan	0.15***	0.18***	817.64***	39.83**
project cash	-0.08**	-0.11***	-65.03	-35.04**
electricity or solar power			421.85**	42.62***
lack of water			219.28	11.31
flooding			268.20	0.40
logging			1079.10***	27.50*
salinity			424.22*	-25.56
vulnerability index 1			57.95	-25.98*
vulnerability index 2			-161.96	-33.70*
constant	0.63***	0.52***	1413.98***	89.96***
number of observations	1282	1282	1282	1282

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Farmer field school and extensive services have been left out of the regression because they are part of the program and are therefore highly correlated with project participation.

1.2 Safal landowners

Matching the Safal landowners and control group

Originally the total Safal landowners group contained 540 households (beneficiary and control groups taken together). 18 were replaced at endline because they couldn't be found. In the following analysis these replaced households will be left out. This leaves us with 532 households (266 from the beneficiary group and 266 from the control group). According to our calculations 36 households consumed for less than 1 dollar a day at the baseline or the endline.[20] Considering the poverty rate of 1.25 dollar a day per household member and the fact that especially poor households probably spend most of their income on consumption, we consider these observations as unreliable. Therefore we leave these households out. The remaining households (249 beneficiaries and 247 controls) are matched by propensity score matching. The "propensity score" is an estimate of the conditional probability of finding the household in the treatment group given the household characteristics. The propensity scores are estimated with a logit regression where the dependent variables equals one if the household is located in the Safal beneficiary area and 0 if it is located in the control area. The cofounder 'being a member of a cooperative' is left out of the logit regression because beneficiary households are significantly more often member of a cooperative (39%) than the households in the control group (5%). It seems like this was a selection criteria for the program. If we would include this characteristic in the propensity score estimation the households in the control group who are member of a cooperative would be assigned too much weight.

The results of the logit analysis, with dependent variable equal to one if the household is in the beneficiary area and zero otherwise, are shown below.

Table 55 Estimation results logit regression propensity scores, Safal landowners area, n=496, pseudo R^2=0.33

Variable	coefficient	p-value
household size	0.023	0.766
percentage of men	0.759	0.301
age distribution in the household		
percentage 0-11 years	0.619	0.543
percentage 11-19 years	1.753	0.071
percentage 20-29 years	2.423	0.015
percentage 30-39 years	0.708	0.479
percentage 40-49 years	-0.752	0.474
percentage 50 years or older	*Reference*	
% of HH members age >=15 with no education	-0.264	0.610
Religion		
Hindu	2.236	0.000
other religion (Muslim or Buddhist)	*Reference*	
distance to the main road (in km)	-0.711	0.350
no own dwelling	1.290	0.128
plot size used	0.493	0.106

[20] These calculations are based on the value of the consumption from Module L.

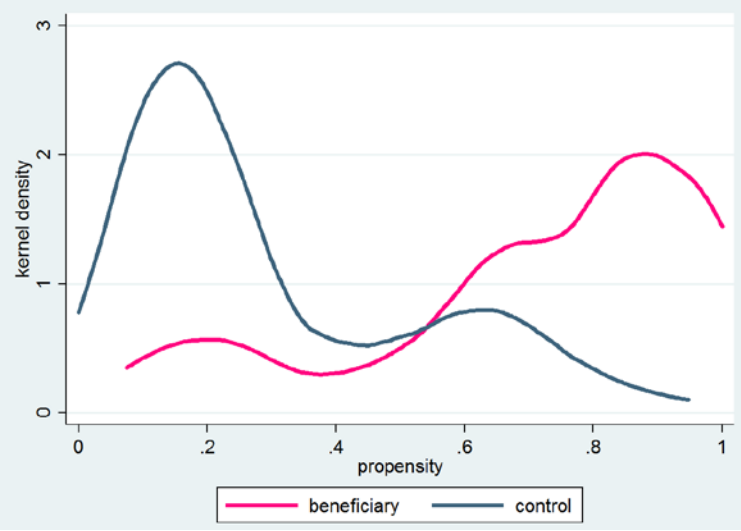
pond size used	-0.419	0.533
participated in a farmer field school	0.257	0.454
received extension services	1.956	0.000
participated in a project related to food security, agriculture or nutrition	-0.027	0.955
participated in a project from which unconditional (free) cash or asset transfer was received	-1.095	0.096
wealth index	0.022	0.759
Constant	-3.041	0.000

Safal landowners in the beneficiary group received extension services more often. Another important distinguishing feature is being Hindu. Bengalis with this religion live more often in the Safal beneficiary area than in the Safal control area. The multivariate analysis (see Chapter 12 baseline report) shows that Hindus in the Safal area produce more agricultural products and have more wealth than Bengalis with other religions. Thus being a Hindu is an important matching variable: it is significant in the propensity score matching analyses and it is an important explanatory variable in terms of output and impact.

Kernel density

A kernel density plot visualizes the common support. The kernel densities for the propensity scores are displayed in Figure 4. The propensity score is on the horizontal axis. The density is displayed at the vertical axes: a higher density means a high occurrence of the propensity score. The overlap of both densities is the common support. In practice, the matching for Safal means that the Hindu households in the beneficiary area are matched with Hindu households in the control area. In the same way, the non-Hindu households in the beneficiary area are matched with the non-Hindu households in the control area.

Figure 4 Kernel density estimates Safal landowners beneficiary (pink) and Safal landowners control (grey)



The kernel densities in Figure 4 show that the beneficiary and control group are different. There are two peaks in the kernel density of the estimated propensity scores for the beneficiary group as well as for the control group. In both the left figure (control) and the right figure (beneficiary) the right peak includes the Hindu households. These households have a high propensity to live in the Safal beneficiary area. This peak is higher for the beneficiary households because there are more Hindus in this group. However, the control group also contains Hindus. That is why there is still a common support, though it is smaller than at the Blue Gold area.

1 household from the control group is not on the support, because the propensity score was too low. The weighted beneficiary and treatment group are balanced for all matching variables, except for four of them.[21] The percentage of men is higher in the beneficiary group. The households in the beneficiary group more often have their own dwelling, while the control group joined a farmer field school more often and the control households participated in a project related to food security, agriculture or nutrition more often.

Households in the treatment group receive weight 1/"propensity score"; households in the beneficiary group receive weight 1/(1-"propensity score").[22] Table 2 shows the weighted means of the households in the beneficiary and households in the control area.

[21] This is tested by using the pstest command in Stata. The criterion was a p-value of less than 0.05.

[22] The weights are corrected, such that the sum of the weights is equal to the number of households in the sample. If we would not do this, the number of observations would be artificially inflated such that the standard errors would be artificially low.

Table 56 Weighted means baseline, Safal landowners, n=495

Variable	Weighted mean beneficiary area	Weighted mean control area
household size	5.03	4.86
percentage of men	0.53	0.52
age distribution in the household	0.16	0.15
percentage 0-11 years	0.15	0.15
percentage 11-19 years	0.20	0.19
percentage 20-29 years	0.12	0.14
percentage 30-39 years	0.13	0.13
percentage 40-49 years	0.26	0.25
% of HH members age >=15 with no education	0.48	0.46
Religion	0.09	0.09
Hindu	0.02	0.03
distance to the main road (in km)	0.43	0.35
no own dwelling	0.07	0.06
plot used	0.16	0.19
pond used	0.29	0.24
participated in a farmer field school	0.09	0.12
received extension services	0.04	0.03
participated in a project related to food security, agriculture or nutrition	0.31	0.22
participated in a project from which unconditional (free) cash or asset transfer was received	5.03	4.86
wealth index	0.53	0.52

Figure 5 Percentage of the households with enough food per month Safal landowners, baseline n=270

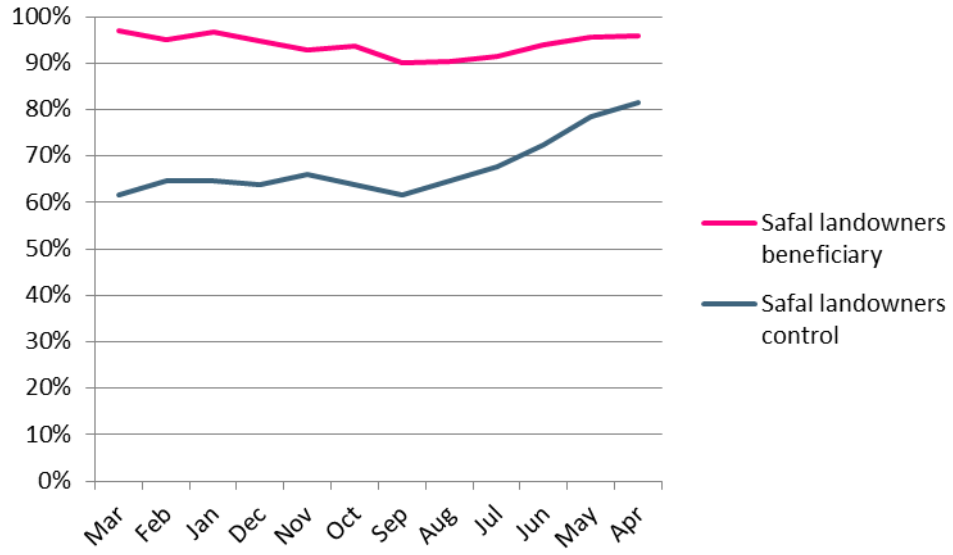


Figure 6 Percentage of the households were any member of the household consumed an item of this product group the day before the day of the baseline questionnaire, Safal landowners

	Safal landowners beneficiary	Safal landowners control
Cereals	100%	99%
Roots	92%	91%
Vegetables	98%	94%
Fruits	71%	39%
Poultry	51%	35%
Fish	76%	49%
Seeds	53%	47%
Milk	32%	14%
Oil	93%	91%
Sweet	31%	15%
Spices	95%	90%

Table 57 Means (unweighted) baseline/ endline, Safal landowners, beneficiary n=249[43][44]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.60	1.57	0.00	23.57	0.46	0.41	0.00	2.78
pond used (ha)	0.08	0.23	0.00	1.87	0.16	0.44	0.00	3.75
used chemical fertilizer (1=yes)	0.84	0.37	0.00	1.00	0.88	0.32	0.00	1.00
used fingerlings (1=yes)	0.70	0.46	0.00	1.00	0.88	0.33	0.00	1.00
good WM (1=yes)	0.48	0.50	0.00	1.00	0.52	0.50	0.00	1.00
rice production (kg)	2,165.84	2,330.91	0.00	25,720.00	2,261.02	2,308.67	0.00	21,200.00
other crops production (kg)	285.35	1,089.38	0.00	10,920.00	516.81	1,512.28	0.00	13,320.00
fish production (kg)	324.90	711.03	0.00	7,600.00	609.67	1,599.78	0.00	15,730.00
milk production (litre)	261.27	740.78	0.00	8,640.00	225.88	658.07	0.00	7,920.00
rice consumption (kg)	1,153.24	1,361.49	0.00	18,400.00	1,131.56	890.10	0.00	6,000.00
other crops consumption (kg)	12.74	49.82	0.00	620.00	48.05	95.84	0.00	600.00
fish consumption (kg)	48.70	68.93	0.00	440.00	75.73	64.71	0.00	380.00
milk consumption (litre)	93.82	183.47	0.00	1,440.00	71.14	132.12	0.00	720.00
rice sold (kg)	962.56	1,424.40	0.00	9,500.00	1,010.28	1,779.80	0.00	16,360.00
other crops sold (kg)	241.97	956.77	0.00	10,770.00	429.57	1,413.15	0.00	12,970.00
fish sold (kg)	291.47	679.32	0.00	7,600.00	477.31	1,272.17	0.00	15,600.00

[43] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

[44] For three households the farm income and the non-farm income data is missing.

milk sold (litre)	166.82	670.58	0.00	8,280.00	146.73	585.99	0.00	7,560.00
farm income from cultivation and livestock products (USD)	1,637.97	2,625.43	0.00	26,302.16	4,672.32	6,053.87	0.00	74,275.16
off farm income (USD)	1,792.38	3,113.98	0.00	17,820.67	4,578.77	10,735.33	0.00	139026.97
wealth index	0.99	2.26	-4.84	9.37	1.95	2.04	-2.70	7.04
value of food consumption (USD)	1,651.44	978.19	366.39	9,422.53	1,008.05	541.84	383.52	4,123.07
months of adequate household food access	11.33	1.57	0.00	12.00	11.74	0.75	8.00	12.00
HFIAS	1.09	2.17	0.00	13.00	0.72	1.69	0.00	11.00
HDDS	7.75	1.66	2.00	11.00	8.04	1.47	5.00	11.00
Nutritional adequacy index	0.69	0.22	0.10	1.00	0.62	0.12	0.19	0.99
Ca adequacy	0.44	0.37	0.02	1.00	0.31	0.21	0.05	1.00
Fe adequacy (ad.)	0.47	0.22	0.04	1.00	0.49	0.17	0.13	1.00
Energy ad.	0.93	0.16	0.13	1.00	0.84	0.16	0.16	1.00
Carbohydrates ad.	0.80	0.31	0.02	1.00	0.95	0.14	0.08	1.00
Protein ad.	0.87	0.24	0.03	1.00	0.90	0.14	0.14	1.00
Magnesium ad.	0.89	0.23	0.07	1.00	0.98	0.09	0.25	1.00
Zinc ad.	0.89	0.23	0.07	1.00	0.94	0.12	0.18	1.00
Vitamin A ad.	0.60	0.38	0.00	1.00	0.41	0.28	0.01	1.00
B1Thiamin ad.	0.58	0.31	0.03	1.00	0.42	0.16	0.11	1.00
B2Riboflav ad.	0.66	0.36	0.03	1.00	0.43	0.21	0.14	1.00
B3Niacin ad.	0.83	0.26	0.03	1.00	0.85	0.17	0.08	1.00
B6 ad.	0.50	0.30	0.03	1.00	0.36	0.18	0.12	1.00
B9Folate ad.	0.41	0.27	0.03	1.00	0.23	0.12	0.07	1.00
B12 ad.	0.69	0.39	0.00	1.00	0.41	0.27	0.00	1.00
Vitamin C ad.	0.83	0.27	0.00	1.00	0.78	0.23	0.24	1.00

Table 58 Means (unweighted) baseline/ endline, Safal landowners, control n=247

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.28	0.34	0.00	2.02	0.25	0.26	0.00	1.62
pond used (ha)	0.04	0.17	0.00	1.34	0.07	0.49	0.00	7.48
used chemical fertilizer (1=yes)	0.68	0.47	0.00	1.00	0.76	0.43	0.00	1.00
used fingerlings (1=yes)	0.28	0.45	0.00	1.00	0.47	0.50	0.00	1.00
good WM (1=yes)	0.23	0.42	0.00	1.00	0.36	0.48	0.00	1.00
rice production (kg)	1,337.45	1,624.83	0.00	9,600.00	1,362.23	1,775.71	0.00	12,000.00
other crops production (kg)	251.38	1,133.96	0.00	15,000.00	500.23	1,394.04	0.00	12,000.00
fish production (kg)	64.34	171.10	0.00	1,800.00	106.92	350.78	0.00	4,820.00
milk production (litre)	131.22	391.17	0.00	3,600.00	144.67	627.28	0.00	7,200.00
rice consumption (kg)	762.74	780.28	0.00	3,760.00	725.36	746.06	0.00	4,260.00
other crops consumption (kg)	29.19	174.35	0.00	2,160.00	75.94	213.82	0.00	2,130.00
fish consumption (kg)	17.83	40.50	0.00	250.00	34.00	46.99	0.00	215.00
milk consumption (litre)	55.09	210.26	0.00	3,000.00	64.17	380.77	0.00	5,400.00
rice sold (kg)	529.18	1,181.13	0.00	7,680.00	420.74	1,025.35	0.00	10,000.00
other crops sold (kg)	205.43	945.40	0.00	12,040.00	394.07	1,213.45	0.00	11,900.00
fish sold (kg)	46.99	152.08	0.00	1,720.00	77.47	332.70	0.00	4,680.00
milk sold (litre)	72.58	290.90	0.00	3,420.00	79.49	375.79	0.00	4,800.00
farm income form cultivation and livestock products (USD)	632.95	931.35	0.00	7,386.67	2,301.08	2,719.47	0.00	20,235.80
off farm income (USD)	2,265.56	3,788.36	0.00	22,217.98	4,698.81	7,526.18	0.00	56,316.41
wealth index	-0.23	1.86	-4.65	6.17	0.59	1.67	-3.75	5.74
value of food consumption (USD)	1,595.03	1,020.22	398.15	7,392.97	1,013.38	1,495.50	367.97	17,319.66
months of adequate household food access	11.01	1.88	0.00	12.00	11.15	1.49	3.00	12.00
HFIAS	2.47	4.89	0.00	27.00	1.74	3.12	0.00	18.00
HDDS	7.86	1.69	4.00	11.00	7.68	1.65	4.00	11.00
Nutritional adequacy index	0.70	0.20	0.16	1.00	0.61	0.12	0.26	0.97
Ca adequacy	0.41	0.36	0.02	1.00	0.26	0.20	0.04	1.00
Fe adequacy (ad.)	0.48	0.20	0.10	1.00	0.48	0.18	0.15	1.00
Energy ad.	0.97	0.10	0.21	1.00	0.82	0.17	0.12	1.00
Carbohydrates ad.	0.88	0.23	0.04	1.00	0.94	0.17	0.06	1.00

Protein ad.	0.88	0.20	0.14	1.00	0.90	0.15	0.30	1.00
Magnesium ad.	0.93	0.17	0.20	1.00	0.97	0.10	0.24	1.00
Zinc ad.	0.91	0.18	0.18	1.00	0.92	0.14	0.21	1.00
Vitamin A ad.	0.61	0.36	0.00	1.00	0.38	0.29	0.00	1.00
B1Thiamin ad.	0.58	0.29	0.08	1.00	0.41	0.16	0.13	1.00
B2Riboflav ad.	0.65	0.34	0.04	1.00	0.41	0.20	0.12	1.00
B3Niacin ad.	0.85	0.22	0.10	1.00	0.85	0.16	0.21	1.00
B6 ad.	0.49	0.28	0.02	1.00	0.38	0.19	0.09	1.00
B9Folate ad.	0.40	0.25	0.03	1.00	0.24	0.15	0.08	1.00
B12 ad.	0.66	0.39	0.00	1.00	0.35	0.25	0.00	1.00
Vitamin C ad.	0.86	0.25	0.06	1.00	0.80	0.21	0.26	1.00

Table 59 Means (weighted) baseline/ endline, Safal landowners, beneficiary n=249[45]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.43	1.13	0.00	23.57	0.37	0.38	0.00	2.78
pond used (ha)	0.07	0.23	0.00	1.87	0.16	0.46	0.00	3.75
used chemical fertilizer (1=yes)	0.78	0.41	0.00	1.00	0.83	0.38	0.00	1.00
used fingerlings (1=yes)	0.59	0.49	0.00	1.00	0.83	0.38	0.00	1.00
good WM (1=yes)	0.47	0.50	0.00	1.00	0.46	0.50	0.00	1.00
rice production (kg)	1,721.79	1,975.29	0.00	25,720.00	1,852.38	2,090.94	0.00	21,200.00
other crops production (kg)	248.68	879.07	0.00	10,920.00	545.24	1,412.94	0.00	13,320.00
fish production (kg)	242.55	561.34	0.00	7,600.00	527.39	1,482.47	0.00	15,730.00
milk production (litre)	193.92	658.97	0.00	8,640.00	188.28	645.92	0.00	7,920.00
rice consumption (kg)	968.11	1,111.00	0.00	18,400.00	964.81	831.41	0.00	6,000.00
other crops consumption (kg)	11.47	42.90	0.00	620.00	43.79	88.98	0.00	600.00
fish consumption (kg)	39.56	64.62	0.00	440.00	67.45	65.80	0.00	380.00
milk consumption (litre)	66.77	152.48	0.00	1,440.00	53.31	116.18	0.00	720.00
rice sold (kg)	707.97	1,235.39	0.00	9,500.00	793.68	1,577.34	0.00	16,360.00
other crops sold (kg)	221.26	791.10	0.00	10,770.00	453.32	1,292.88	0.00	12,970.00
fish sold (kg)	212.82	530.24	0.00	7,600.00	424.57	1,230.93	0.00	15,600.00
milk sold (litre)	126.65	599.74	0.00	8,280.00	126.13	578.69	0.00	7,560.00
farm income from cultivation and livestock products (USD)	1,505.02	3,139.37	0.00	26,302.16	3,865.86	5,051.24	0.00	74,275.16
off farm income (USD)	1,596.92	2,916.21	0.00	17,820.67	4,172.97	9,087.77	0.00	139026.97
wealth index	0.31	2.27	-4.84	9.37	1.24	2.12	-2.70	7.04
value of food consumption (USD)	1,486.09	841.12	366.39	9,422.53	969.42	496.71	383.52	4,123.07
months of adequate household food access	11.17	1.54	0.00	12.00	11.68	0.83	8.00	12.00
HFIAS	1.18	2.29	0.00	13.00	1.25	2.40	0.00	11.00
HDDS	7.96	1.57	2.00	11.00	7.92	1.50	5.00	11.00
Nutritional adequacy index	0.67	0.22	0.10	1.00	0.62	0.13	0.19	0.99
Ca adequacy	0.40	0.34	0.02	1.00	0.31	0.24	0.05	1.00

[45] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

Fe adequacy (ad.)	0.45	0.21	0.04	1.00	0.49	0.18	0.13	1.00
Energy ad.	0.92	0.16	0.13	1.00	0.84	0.16	0.16	1.00
Carbohydrates ad.	0.77	0.33	0.02	1.00	0.96	0.13	0.08	1.00
Protein ad.	0.85	0.26	0.03	1.00	0.90	0.14	0.14	1.00
Magnesium ad.	0.86	0.25	0.07	1.00	0.97	0.09	0.25	1.00
Zinc ad.	0.87	0.25	0.07	1.00	0.94	0.11	0.18	1.00
Vitamin A ad.	0.60	0.37	0.00	1.00	0.39	0.28	0.01	1.00
B1Thiamin ad.	0.55	0.29	0.03	1.00	0.43	0.18	0.11	1.00
B2Riboflav ad.	0.65	0.35	0.03	1.00	0.43	0.22	0.14	1.00
B3Niacin ad.	0.81	0.27	0.03	1.00	0.86	0.16	0.08	1.00
B6 ad.	0.46	0.27	0.03	1.00	0.38	0.20	0.12	1.00
B9Folate ad.	0.38	0.25	0.03	1.00	0.24	0.15	0.07	1.00
B12 ad.	0.67	0.40	0.00	1.00	0.40	0.28	0.00	1.00
Vitamin C ad.	0.80	0.27	0.00	1.00	0.77	0.23	0.24	1.00

Table 60 Means (weighted) baseline/ endline, Safal landowners, control n=246[26]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.35	0.36	0.00	2.02	0.27	0.27	0.00	1.62
pond used (ha)	0.06	0.20	0.00	1.34	0.06	0.40	0.00	7.48
used chemical fertilizer (1=yes)	0.73	0.44	0.00	1.00	0.79	0.41	0.00	1.00
used fingerlings (1=yes)	0.35	0.48	0.00	1.00	0.51	0.50	0.00	1.00
good WM (1=yes)	0.23	0.42	0.00	1.00	0.37	0.48	0.00	1.00
rice production (kg)	1,942.95	2,349.46	0.00	9,600.00	1,487.05	1,831.34	0.00	12,000.00
other crops production (kg)	454.31	1,551.47	0.00	15,000.00	491.33	1,398.42	0.00	12,000.00
fish production (kg)	77.03	163.03	0.00	1,800.00	118.65	311.92	0.00	4,820.00
milk production (litre)	152.87	379.12	0.00	3,600.00	138.25	534.06	0.00	7,200.00
rice consumption (kg)	954.26	885.57	0.00	3,760.00	795.81	752.59	0.00	4,260.00
other crops consumption (kg)	35.38	216.09	0.00	2,160.00	72.13	183.33	0.00	2,130.00
fish consumption (kg)	22.34	42.44	0.00	250.00	40.82	51.30	0.00	215.00
milk consumption (litre)	58.79	173.52	0.00	3,000.00	59.84	313.49	0.00	5,400.00
rice sold (kg)	944.78	1,754.69	0.00	7,680.00	515.17	1,209.38	0.00	10,000.00
other crops sold (kg)	351.86	1,289.70	0.00	12,040.00	394.17	1,267.83	0.00	11,900.00
fish sold (kg)	56.15	146.61	0.00	1,720.00	83.24	294.09	0.00	4,680.00
milk sold (litre)	91.62	294.71	0.00	3,420.00	77.79	330.64	0.00	4,800.00
farm income from cultivation and livestock products (USD)	843.18	1,096.99	0.00	7,386.67	2,363.67	2,516.18	0.00	20,235.80
off farm income (USD)	2,237.69	3,710.81	0.00	22,217.98	5,302.47	7,809.07	0.00	56,316.41
wealth index	0.22	1.87	-4.65	6.17	0.89	1.58	-3.75	5.74
value of food consumption (USD)	1,659.48	1,028.92	398.15	7,392.97	960.51	1,238.26	367.97	17,319.66
months of adequate household food access	11.31	1.58	0.00	12.00	11.22	1.44	3.00	12.00
HFIAS	2.00	4.26	0.00	27.00	1.63	2.83	0.00	18.00
HDDS	8.00	1.69	4.00	11.00	7.83	1.65	4.00	11.00
Nutritional adequacy index	0.71	0.20	0.16	1.00	0.58	0.13	0.26	0.97
Ca adequacy	0.44	0.38	0.02	1.00	0.24	0.19	0.04	1.00
Fe adequacy (ad.)	0.47	0.19	0.10	1.00	0.46	0.17	0.15	1.00

[26] One household in the control area is not 'on the support'.

Energy ad.	0.95	0.13	0.21	1.00	0.79	0.18	0.12	1.00
Carbohydrates ad.	0.86	0.27	0.04	1.00	0.93	0.17	0.06	1.00
Protein ad.	0.88	0.20	0.14	1.00	0.87	0.16	0.30	1.00
Magnesium ad.	0.92	0.18	0.20	1.00	0.96	0.11	0.24	1.00
Zinc ad.	0.92	0.17	0.18	1.00	0.90	0.15	0.21	1.00
Vitamin A ad.	0.65	0.35	0.00	1.00	0.36	0.27	0.00	1.00
B1Thiamin ad.	0.60	0.29	0.08	1.00	0.39	0.15	0.13	1.00
B2Riboflav ad.	0.67	0.33	0.04	1.00	0.38	0.19	0.12	1.00
B3Niacin ad.	0.84	0.21	0.10	1.00	0.82	0.18	0.21	1.00
B6 ad.	0.51	0.29	0.02	1.00	0.35	0.18	0.09	1.00
B9Folate ad.	0.42	0.24	0.03	1.00	0.22	0.14	0.08	1.00
B12 ad.	0.68	0.40	0.00	1.00	0.33	0.25	0.00	1.00
Vitamin C ad.	0.88	0.23	0.06	1.00	0.77	0.22	0.26	1.00

Validation intervention logic

(note: the standard errors are not correct, because it was not possible to do a weighted regression and simultaneously estimate cluster robust standard errors)

Table 61 Estimation results: good WM and production, Safal landowners

Dependent variable	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Good WM (1=yes)	248.39*	236.48***	187.43***
constant	1656.75***	341.44***	176.16***
number of observations	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 62 Estimation results: production, (farm-) income (cultivation and livestock) and value of food consumption, Safal landowners

Dependent variable	Farm income (in USD per year)	Value of food consumption (in USD)	Value of food consumption (in USD)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Production rice (in kg)	0.56***		0.14***
Production other crops (in kg)	0.16***		0.05**
Production fish (in kg)	2.67***		0.27***
Production milk (in l)	-0.04		0.19***
Farm income (in USD per year)		0.00	-0.07***
Non-farm income (in USD per year)		-0.00	-0.00
constant	457.53***	1260.28***	1071.79***
number of observations	987	987	987

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 63 Estimation results: production (farm-) income (only form cultivation) and household dietary diversity (HDDS), Safal landowners

Dependent variable	HDDS	HDDS	HDDS
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Production rice (in kg)	0.09***		0.12***
Production other crops (in kg)	0.04		0.04
Production fish (in kg)	0.10*		0.14*
Production milk (in l)	0.28***		0.26***
Farm income (in 1.000 USD per year)		0.02*	-0.03
Non-farm income (in 1.000 USD per year)		0.03***	0.03***
Constant	7.68***	7.79***	7.61***
number of observations	989	987	987

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Estimation results

(note: the standard errors are not correct, because it was not possible to do a weighted regression and simultaneously estimate cluster robust standard errors)

Table 64 Estimation results multivariate regression Inputs, Safal landowners

Dependent variable	Plot size used (in ha)	Pond size used (in ha)	Used chemical fertilizer	Used fingerlings	Good WM (1=yes)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.08	0.01	0.05	0.24***	0.23***
post treatment (1=yes)	-0.08	-0.00	0.06	0.16***	0.14***
beneficiary post treatment (1=yes)	***0.03***	***0.09****	***-0.02***	***0.08***	***-0.14****
constant	0.35***	0.06***	0.73***	0.35***	0.23***
number of observations	989	989	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 65 Estimation results multivariate regression Outputs: production, Safal landowners

Dependent variable	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)	Production of milk (in litres)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-221.16	-205.63*	165.52**	41.05
post treatment (1=yes)	-455.90**	37.01	41.62	-14.62
beneficiary post treatment (1=yes)	***586.49****	***259.54***	***243.22****	***8.97***
constant	1942.95***	454.31***	77.03	152.87***
number of observations	989	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Small farmers are farmers who used at most 0.5 ha of land at the baseline. Big farmers are farmers who used more than 0.5 hectare of land.

Table 66 Estimation results multivariate regression Outputs: production of rice for small and big farmers, Safal landowners

Dependent variable	Production rice (in kg)	Production rice (in kg)
Explanatory variables	**coefficient**	**coefficient**
beneficiary (1=yes)	51.72	-898.40*
post treatment (1=yes)	147.19	-2207.11***
beneficiary post treatment (1=yes)	***131.56***	***1881.60****
constant	1010.73***	4649.88***
Farmers	Small	Big
number of observations	742	247

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 67 Estimation results multivariate regression Outputs: production of other crops for small and big farmers, Safal landowners

Dependent variable	Production other crops (in kg)	Production other crops (in kg)
Explanatory variables	**coefficient**	**coefficient**
beneficiary (1=yes)	56.77	-952.76***
post treatment (1=yes)	385.31***	-974.35***
beneficiary post treatment (1=yes)	***-92.31***	***1281.86******
constant	107.07	1462.62***
Farmers	Small	Big
number of observations	742	247

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Small farmers are farmers who used at most 0.3 ha of land at the baseline. Big farmers are farmers who used more than 0.3 hectare of land.

Table 68 Estimation results multivariate regression Outputs: production of fish for small and big farmers, Safal landowners

Dependent variable	Production fish (kg)	Production fish (kg)	Production fish (kg)	Production fish (kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	128.54	121.38	133.46	627.51***
post treatment (1=yes)	38.99	32.60	136.73	69.23
beneficiary post treatment (1=yes)	273.39**	259.17**	356.65	-108.83
constant	56.54	47.64	192.69	291.99**
Farmers	No ponds used at the baseline	Small and no ponds used at baseline	Small	Big
number of observations	908	833	75	81

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Note: Half of the farmers who used no ponds at the baseline used ponds for fishing at the endline. This occurs in the control area as well as in the beneficiary area. But the farmers who used no ponds at the baseline and did use ponds at the endline in the beneficiary area produced more fish than the same type of farmers in the control area as shown in Table 69.

Table 69 Unweighted average fish production and pond used at the endline of farmers who used no ponds at the baseline, Safal landowners

	Beneficiary (199)				**Control (221)**			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
fish production (kg)	513.49	1431.00	0	15730	81.66	339.38	0	4820
Pond used (ha)	0.13	0.44	0	3.75	0.06	0.51	0	7.48

Table 70 Estimation results multivariate regression Outputs: consumption, Safal landowners

Dependent variable	Consumption[47] rice (in kg)	Consumption other crops (in kg)	Consumption fish (in kg)	Consumption of milk (in litres)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	13.85	-23.91*	17.22***	7.99
post treatment (1=yes)	-158.45*	36.76***	18.48***	1.05
beneficiary post treatment (1=yes)	***155.15***	***-4.44***	***9.41***	***-14.51***
constant	954.26***	35.38***	22.34***	58.79***
number of observations	989	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 71 Estimation results multivariate regression Outputs: Amount sold, Safal landowners

Dependent variable	Rice sold[48] (in kg)	Other crops sold (in kg)	Fish sold (in kg)	Milk sold (in litres)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-236.82*	-130.60	156.67**	35.03
post treatment (1=yes)	-429.61***	42.31	27.09	-13.83
beneficiary post treatment (1=yes)	***515.32******	***189.75***	***184.66****	***13.31***
constant	944.78***	351.86***	56.15	91.62***
number of observations	989	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 72 Estimation results multivariate regression Outcome Part 1 income, Safal landowners

Dependent variable	Farm income (in USD per year)	Non-farm income (in USD per year)	Value of food consumption (in USD)	Wealth Index
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	661.84**	-640.77	-173.39**	0.10
post treatment (1=yes)	1520.49***	3064.78***	-698.97***	0.67***
beneficiary post treatment (1=yes)	***840.35****	***-488.73***	***182.30***	***0.25***
constant	843.18***	2237.69***	1659.48***	0.22*
number of observations	987	987	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

[47] Consumed or stored for consumption.

[48] Sold or stored for consumption.

Table 73 Estimation results multivariate regression Outcome Part 2 Food security and diversity, Safal landowners

Dependent variable	Months of adequate household food access	HFIAS	HDDS
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.14	-0.82***	-0.04
post treatment (1=yes)	-0.09	-0.37	-0.17
beneficiary post treatment (1=yes)	***0.59******	***0.44***	***0.13***
constant	11.31***	2.00***	8.00***
number of observations	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 74 Estimation results multivariate regression Outcome Part 3 nutritional adequacy, Safal landowners

Dependent variable	Nutritional adequacy index	Calcium adequacy	Iron adequacy
Explanatory variables	**coefficient**	**coefficient**	**Coefficient**
beneficiary (1=yes)	-0.04***	-0.04	-0.02
post treatment (1=yes)	-0.13***	-0.20***	-0.02
beneficiary post treatment (1=yes)	***0.08******	***0.11******	***0.05****
constant	0.71***	0.44***	0.47***
number of observations	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Plot and Pond size

Table 75 Estimation results multivariate regression Inputs and outputs, Safal landowners

Dependent variable	Used chemical fertilizer	Used fingerlings	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.23***	0.28***	0.00	0.00	115.84**
post treatment (1=yes)	0.06	0.21***	0.00	0.00	27.58
beneficiary post treatment (1=yes)	***-0.14****	***0.04***	***0.00***	***0.00***	***-35.81***
total plot size used (in hectare)	0.57***		4476.03***	1613.88***	
beneficiary x plot used	-0.51***		-3955.09***	-1584.79***	
post treatment x plot used	0.17		1215.49***	-204.25	
beneficiary post treatment x plot used	***0.18***		***3098.69*****	***966.23****	
total pond size used (in hectare)		1.01***			395.76**
beneficiary x pond used		-0.64***			696.96***
post treatment x pond used		-0.84***			252.19
beneficiary post treatment x pond used		***0.59*****			***1021.50*****
constant	0.53***	0.29***	389.06***	-105.96	52.53
number of observations	989	989	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Participation in other programs, natural disasters, water related problems and electricity or solar power

Table 76 Means (unweighted) baseline/ endline, Safal landowners, beneficiary, n=249

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.22	0.41	0.00	1.00	0.96	0.19	0.00	1.00
received extension services	0.51	0.50	0.00	1.00	0.14	0.35	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.12	0.32	0.00	1.00	0.08	0.27	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.04	0.19	0.00	1.00	0.16	0.36	0.00	1.00
electricity or solar power	0.76	0.43	0.00	1.00	0.91	0.29	0.00	1.00
lack of water	0.28	0.45	0.00	1.00	0.05	0.21	0.00	1.00
flooding	0.06	0.24	0.00	1.00	0.23	0.42	0.00	1.00
logging	0.24	0.43	0.00	1.00	0.29	0.45	0.00	1.00
salinity	0.10	0.31	0.00	1.00	0.12	0.33	0.00	1.00
vulnerability index 1	0.54	0.50	0.00	1.00	0.57	0.50	0.00	1.00
vulnerability index 2	0.01	0.09	0.00	1.00	0.45	0.50	0.00	1.00

Table 77 Means (unweighted) baseline/ endline, Safal landowners, control, n=247[39]

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.10	0.30	0.00	1.00	0.07	0.25	0.00	1.00
received extension services	0.10	0.30	0.00	1.00	0.11	0.32	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.05	0.22	0.00	1.00	0.10	0.30	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.03	0.18	0.00	1.00	0.16	0.37	0.00	1.00
electricity or solar power	0.71	0.45	0.00	1.00	0.85	0.35	0.00	1.00
lack of water	0.32	0.47	0.00	1.00	0.04	0.20	0.00	1.00
flooding	0.04	0.19	0.00	1.00	0.16	0.37	0.00	1.00
logging	0.18	0.39	0.00	1.00	0.19	0.39	0.00	1.00
salinity	0.11	0.31	0.00	1.00	0.08	0.27	0.00	1.00
vulnerability index 1	0.49	0.50	0.00	1.00	0.54	0.50	0.00	1.00
vulnerability index 2	0.03	0.17	0.00	1.00	0.52	0.50	0.00	1.00

[39] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

Table 78 Means (weighted) baseline/ endline, Safal landowners beneficiary, n=249

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.16	0.36	0.00	1.00	0.96	0.19	0.00	1.00
received extension services	0.29	0.45	0.00	1.00	0.12	0.33	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.09	0.28	0.00	1.00	0.06	0.24	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.04	0.21	0.00	1.00	0.14	0.35	0.00	1.00
electricity or solar power	0.78	0.42	0.00	1.00	0.90	0.31	0.00	1.00
lack of water	0.25	0.43	0.00	1.00	0.03	0.18	0.00	1.00
flooding	0.05	0.21	0.00	1.00	0.26	0.44	0.00	1.00
logging	0.29	0.46	0.00	1.00	0.25	0.43	0.00	1.00
salinity	0.11	0.31	0.00	1.00	0.13	0.34	0.00	1.00
vulnerability index 1	0.55	0.50	0.00	1.00	0.51	0.50	0.00	1.00
vulnerability index 2	0.00	0.07	0.00	1.00	0.47	0.50	0.00	1.00

Table 79 Means (weighted) baseline/ endline, Safal landowners control, n=246[30][31]

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.19	0.39	0.00	1.00	0.06	0.25	0.00	1.00
received extension services	0.24	0.43	0.00	1.00	0.15	0.35	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.12	0.33	0.00	1.00	0.12	0.33	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.03	0.18	0.00	1.00	0.17	0.37	0.00	1.00
electricity or solar power	0.78	0.41	0.00	1.00	0.88	0.32	0.00	1.00
lack of water	0.34	0.48	0.00	1.00	0.05	0.21	0.00	1.00
flooding	0.03	0.18	0.00	1.00	0.20	0.40	0.00	1.00
logging	0.19	0.39	0.00	1.00	0.20	0.40	0.00	1.00
salinity	0.10	0.30	0.00	1.00	0.09	0.29	0.00	1.00
vulnerability index 1	0.49	0.50	0.00	1.00	0.51	0.50	0.00	1.00
vulnerability index 2	0.02	0.15	0.00	1.00	0.51	0.50	0.00	1.00

[30] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

[31] One household in the control area is not 'on the support'.

Table 80 Estimation results multivariate regression Inputs and outputs, Safal landowners

Dependent variable	Used chemical fertilizer	Used fingerlings	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.06	0.25***	0.00	0.00	0.00
post treatment (1=yes)	0.05	0.19***	0.00	0.00	0.00
beneficiary post treatment (1=yes)	***-0.01***	***0.08***	***0.00***	***0.00***	***0.00***
project fsan	0.14***	0.31***	1169.76***	536.68***	21.72
project cash	0.08*	-0.22***	-246.53	-256.21*	-98.52
electricity or solar power			779.66***	176.79	140.68*
lack of water			257.31	326.89***	-5.89
Flooding			483.35**	143.38	12.11
Logging			334.27**	155.00	44.70
Salinity			-178.83	-16.27	14.27
vulnerability index 1			11.71	-37.36	-38.93
vulnerability index 2			82.42	99.79	-112.89
constant	0.71***	0.32***	1039.07***	129.62	-18.80
number of observations	989	989	989	989	989

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

1.3 Safal landless

Matching the Safal landless beneficiary and control group

Originally the total Safal landless group contained 260 households. 4 of them were replaced at the endline because they couldn't be found. In the following analysis these replaced households will be left out. This leaves us with 256 households (128 from the beneficiary group and 128 from the control group). According to our calculations 36 households consumed for less than 1 dollar a day at the baseline or the endline.[32] Considering the poverty rate of 1.25 dollar a day per household member and the fact that especially poor households probably spend most of their income on consumption, we consider these observations as unreliable. Therefore we leave these households out. The remaining households (96 beneficiaries and 101 controls) are matched witch propensity score matching. The "propensity score" is an estimate for the conditional probability of finding the household in the treatment group given the household characteristics. The propensity scores are estimated with a logit regression where the dependent variables equals one if the household is located in the Safal beneficiary area and 0 if they are located in the control area. The 'landless' households in the Safal area (both control and beneficiary) almost barely joined a cooperative, project or farmer field school or received extension services. Therefore these cofounders are left out of the logit regression.

The results of the logit analysis, with dependent variable equal to one if the household is in the beneficiary area and zero otherwise, are shown below.

Table 81 Estimation results logit regression propensity scores, Safal landless, n=197, pseudo R^2=0.35

Variable	Coefficient	p-value
household size	0.114	0.414
percentage of men	0.824	0.414
age distribution in the household		
percentage 0-11 years	-2.663	0.088
percentage 11-19 years	-1.462	0.310
percentage 20-29 years	-0.306	0.841
percentage 30-39 years	1.223	0.368
percentage 40-49 years	-0.963	0.518
percentage 50 years or older		
% of HH members age >=15 with no education	-0.939	0.167
Religion		
Hindu	3.125	0.000
other religion (Muslim or Buddhist)		
distance to the main road (in km)	-3.039	0.006
no own dwelling	0.719	0.242
plot size used	2.028	0.329
pond size used	-1.568	0.024
wealth index	-0.317	0.044
Constant	-1.822	0.147

[32] These calculations are based on the value of the consumption from Module L.

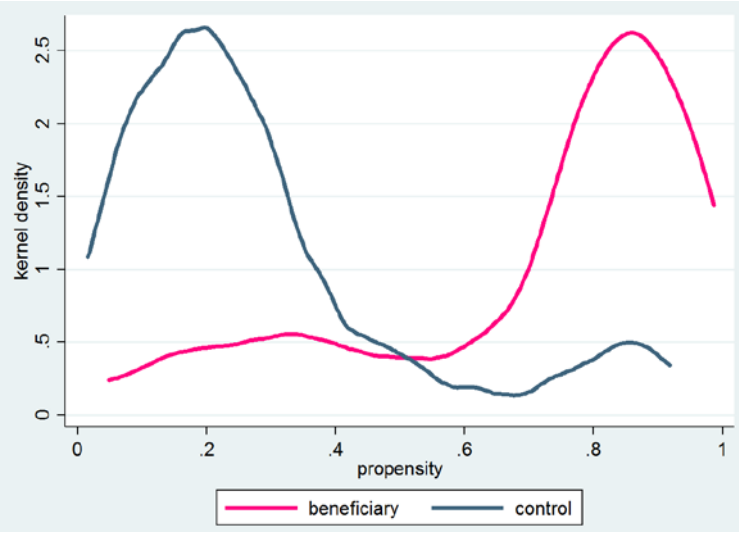
Safal landless in the beneficiary group use smaller ponds and have on average less wealth than the control group. Another important distinguishing feature is being Hindu. Bengalis with this religion live more often in the Safal beneficiary area than in the Safal control area. The multivariate analysis (see Chapter 12 of the baseline report) shows that Hindus in the Safal area produce more agricultural products and have a higher wealth than Bengalis with other religions. Thus being a Hindu is an important matching variable: it is significant in the propensity score matching analyses and it is an important explanatory variable in terms of output and impact.

For the landless, there are similar relations as the landowners, with respect to a higher proportion of being Hindu. We also see that the distance to the main road is an important distinguishing feature: landless households in the beneficiary area are located closer to the main road than the landless in control areas.

Kernel density

A kernel density plot visualizes the common support. The kernel densities for the propensity scores are displayed in Figure 7. The propensity score is on the horizontal axis. The density is displayed at the vertical axis: a higher density means a high occurrence of the propensity score. The overlap of both densities is the common support. In practice, the matching for Safal landless means that the Hindu households in the beneficiary area are matched with Hindu households in the control area. In the same way, the non-Hindu households in the beneficiary area are matched with the non-Hindu households in the control area.

Figure 7 Kernel density estimates Safal landless beneficiary (pink) and Safal landless control (grey)



The kernel densities in Figure 7 show that the beneficiary and control group are different. There are two peaks in the kernel density of the estimated propensity scores for the beneficiary group as well as for the control group. In both the left figure (control) and the right figure (beneficiary) the right peak includes the Hindu households. These households have a high propensity to live in the Safal beneficiary area. This peak is higher for the beneficiary households because there are more Hindus in this group. However, the control group also contains Hindus. That is why there is still a common support, though it is smaller than in the Blue Gold area.

1 beneficiary household is not on the support, because its propensity score was too high. The weighted beneficiary group and the weighted treatment group are balanced for almost all matching variables, only the wealth index is on average lower for the households in the beneficiary group compared to the matched households in the control group.[33]

Households in the treatment group receive weight 1/"propensity score"; households in the beneficiary group receive weight 1/(1-"propensity score").[34] Table 2 shows the weighted means of the households in the beneficiary and households in the control area.

Table 82 Weighted means baseline, Safal landless, n=495

Variable	Weighted mean beneficiary area	Weighted mean control area
household size	4.67	4.51
percentage of men	0.55	0.54
age distribution in the household		
percentage 0-11 years	0.20	0.17
percentage 11-19 years	0.16	0.17
percentage 20-29 years	0.16	0.16
percentage 30-39 years	0.14	0.16
percentage 40-49 years	0.13	0.16
% of HH members age >=15 with no education	0.44	0.46
Religion		
Hindu	0.42	0.48
distance to the main road (in km)	0.10	0.11
no own dwelling	0.14	0.19
plot used	0.05	0.06
pond used	0.01	0.01
wealth index	-1.58	-1.76

[33] This is tested by using the pstest command in Stata. The criterion was a p-value of less than 0.05.

[34] The weights are corrected, such that the sum of the weights is equal to the number of households in the sample. If we would not do this, the number of observations would be artificially inflated such that the standard errors would be artificially low.

Figure 8 **Percentage of the households with enough food per month Safal landless, baseline n=130**

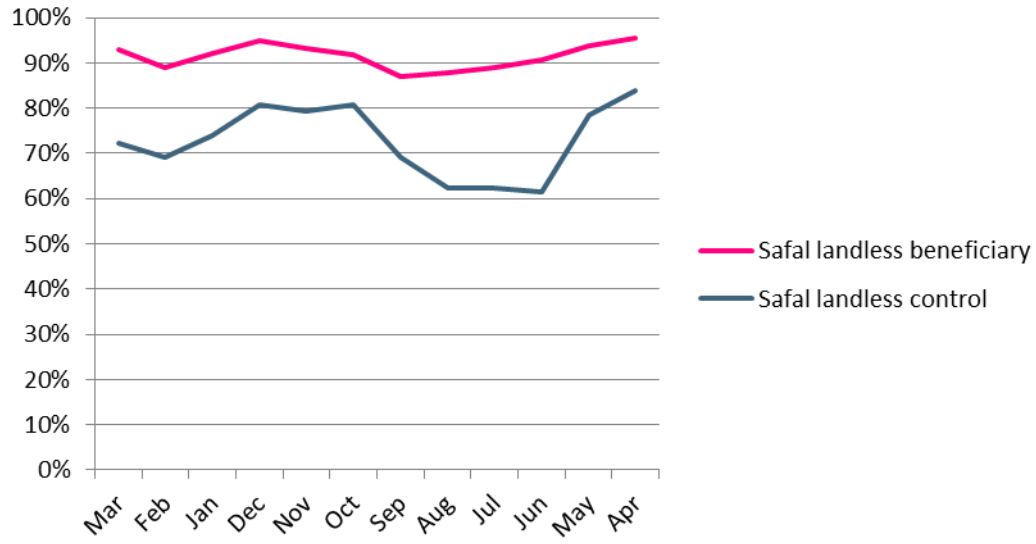


Figure 9 **Percentage of the households were any member of the household consumed an item of this product group the day before the day of the baseline questionnaire, Safal landless**

	Safal landless beneficiary	Safal landless control
cereals	100%	0%
roots	94%	24%
vegetables	99%	12%
fruits	75%	43%
poultry	56%	50%
fish	71%	46%
seeds	64%	48%
milk	35%	48%
oil	94%	23%
sweet	26%	44%
spices	93%	25%

Table 83 Means (unweighted) baseline/ endline, Safal landless, beneficiary n=96[35]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.07	0.14	0.00	0.78	0.19	0.21	0.00	1.00
pond used (ha)	0.00	0.01	0.00	0.09	0.03	0.15	0.00	1.32
used chemical fertilizer (1=yes)	0.33	0.47	0.00	1.00	0.74	0.44	0.00	1.00
used fingerlings (1=yes)	0.07	0.26	0.00	1.00	0.48	0.50	0.00	1.00
good WM (1=yes)	0.24	0.43	0.00	1.00	0.40	0.49	0.00	1.00
rice production (kg)	479.03	1,129.14	0.00	8,000.00	1,011.47	1,197.26	0.00	6,600.00
other crops production (kg)	6.23	56.23	0.00	550.00	168.20	623.41	0.00	4,220.00
fish production (kg)	14.86	54.21	0.00	350.00	105.98	398.08	0.00	3,800.00
milk production (litre)	29.57	91.42	0.00	420.00	102.06	260.70	0.00	1,440.00
rice consumption (kg)	273.72	465.28	0.00	1,790.00	530.48	570.64	0.00	2,400.00
other crops consumption (kg)	0.42	3.88	0.00	38.00	24.46	83.15	0.00	520.00
fish consumption (kg)	5.13	23.97	0.00	200.00	30.29	40.55	0.00	170.00
milk consumption (litre)	22.20	71.35	0.00	360.00	41.73	99.20	0.00	636.00
rice sold (kg)	126.77	742.67	0.00	6,940.00	280.21	766.26	0.00	6,000.00
other crops sold (kg)	5.81	56.13	0.00	550.00	135.46	534.94	0.00	3,775.00
fish sold (kg)	9.74	42.44	0.00	290.00	97.80	391.52	0.00	3,460.00
milk sold (litre)	7.13	40.18	0.00	300.00	56.58	200.05	0.00	1,260.00
farm income form cultivation and livestock products (USD)	184.55	408.70	0.00	2,125.50	1,707.97	1,693.11	0.00	7,379.35
off farm income (USD)	1,597.92	2,575.71	0.00	16,663.49	2,689.22	3,425.63	36.00	14,941.46
wealth index	-1.99	1.48	-4.99	3.33	-0.23	1.60	-3.63	3.77
value of food consumption (USD)	983.32	445.37	371.91	2,846.88	725.86	396.48	371.74	3,537.13
months of adequate household food access	8.07	3.56	0.00	12.00	10.90	1.89	1.00	12.00
HFIAS	7.19	5.27	0.00	23.00	2.41	3.31	0.00	15.00
HDDS	6.67	1.63	3.00	11.00	7.34	1.44	4.00	11.00
Nutritional adequacy index	0.60	0.20	0.18	0.99	0.59	0.13	0.23	0.89
Ca adequacy	0.26	0.30	0.03	1.00	0.27	0.20	0.04	1.00

[35] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

Fe adequacy (ad.)	0.41	0.19	0.10	1.00	0.47	0.19	0.21	1.00
Energy ad.	0.94	0.13	0.22	1.00	0.82	0.18	0.23	1.00
Carbohydrates ad.	0.83	0.27	0.04	1.00	0.94	0.17	0.13	1.00
Protein ad.	0.80	0.25	0.14	1.00	0.88	0.16	0.22	1.00
Magnesium ad.	0.88	0.21	0.23	1.00	0.96	0.11	0.49	1.00
Zinc ad.	0.85	0.22	0.15	1.00	0.91	0.15	0.29	1.00
Vitamin A ad.	0.45	0.34	0.00	1.00	0.40	0.30	0.01	1.00
B1Thiamin ad.	0.45	0.26	0.08	1.00	0.39	0.15	0.17	1.00
B2Riboflav ad.	0.49	0.34	0.04	1.00	0.39	0.22	0.12	1.00
B3Niacin ad.	0.75	0.26	0.14	1.00	0.82	0.18	0.14	1.00
B6 ad.	0.34	0.23	0.06	1.00	0.31	0.15	0.12	0.73
B9Folate ad.	0.30	0.23	0.03	1.00	0.21	0.10	0.07	0.59
B12 ad.	0.50	0.42	0.00	1.00	0.34	0.27	0.00	1.00
Vitamin C ad.	0.71	0.31	0.00	1.00	0.74	0.25	0.23	1.00

Table 84 Means (unweighted) baseline/ endline, Safal area landless, control n=101

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.05	0.13	0.00	0.71	0.14	0.19	0.00	0.81
pond used (ha)	0.01	0.06	0.00	0.40	0.01	0.06	0.00	0.40
used chemical fertilizer (1=yes)	0.19	0.39	0.00	1.00	0.48	0.50	0.00	1.00
used fingerlings (1=yes)	0.06	0.24	0.00	1.00	0.26	0.44	0.00	1.00
good WM (1=yes)	0.24	0.43	0.00	1.00	0.28	0.45	0.00	1.00
rice production (kg)	290.76	800.69	0.00	4,720.00	753.47	1,254.15	0.00	6,800.00
other crops production (kg)	96.65	627.30	0.00	6,000.00	169.10	540.99	0.00	4,200.00
fish production (kg)	9.31	47.96	0.00	400.00	38.22	151.17	0.00	1,350.00
milk production (litre)	75.05	234.22	0.00	1,800.00	101.22	247.61	0.00	1,440.00
rice consumption (kg)	147.99	396.32	0.00	1,800.00	423.83	628.06	0.00	2,400.00
other crops consumption (kg)	2.10	13.08	0.00	110.00	30.10	64.08	0.00	386.50
fish consumption (kg)	2.57	11.97	0.00	80.00	10.11	19.71	0.00	85.00
milk consumption (litre)	28.31	80.20	0.00	360.00	37.91	78.70	0.00	360.00
rice sold (kg)	93.47	389.20	0.00	2,500.00	192.87	521.90	0.00	2,980.00
other crops sold (kg)	64.46	355.55	0.00	3,000.00	128.15	503.51	0.00	3,900.00
fish sold (kg)	7.33	40.99	0.00	350.00	29.93	124.22	0.00	1,100.00
milk sold (litre)	42.82	164.58	0.00	1,320.00	61.66	195.45	0.00	1,200.00
farm income form cultivation and livestock products (USD)	117.61	326.68	0.00	2,160.89	1,177.03	1,705.12	0.00	8,896.60
off farm income (USD)	2,570.79	4,091.71	0.00	26,229.56	3,464.87	5,712.61	0.00	41,723.00
wealth index	-1.86	1.59	-5.01	3.92	-0.64	1.45	-4.10	3.44
value of food consumption (USD)	1,243.56	715.89	388.52	4,912.86	725.57	263.98	367.29	1,692.50
months of adequate household food access	9.05	2.67	0.00	12.00	10.03	2.78	0.00	12.00
HFIAS	7.50	5.93	0.00	27.00	4.47	5.33	0.00	24.00
HDDS	7.45	1.82	3.00	11.00	7.21	1.60	4.00	11.00
Nutritional adequacy index	0.65	0.20	0.16	1.00	0.58	0.11	0.32	0.84
Ca adequacy	0.33	0.34	0.02	1.00	0.23	0.14	0.06	0.67
Fe adequacy (ad.)	0.43	0.19	0.09	1.00	0.44	0.18	0.19	1.00
Energy ad.	0.97	0.08	0.61	1.00	0.79	0.16	0.26	1.00
Carbohydrates ad.	0.86	0.24	0.05	1.00	0.95	0.13	0.15	1.00

Protein ad.	0.86	0.21	0.16	1.00	0.88	0.14	0.42	1.00
Magnesium ad.	0.92	0.16	0.21	1.00	0.97	0.08	0.47	1.00
Zinc ad.	0.87	0.21	0.17	1.00	0.92	0.12	0.31	1.00
Vitamin A ad.	0.55	0.36	0.00	1.00	0.36	0.29	0.01	1.00
B1Thiamin ad.	0.50	0.28	0.07	1.00	0.38	0.13	0.19	1.00
B2Riboflav ad.	0.58	0.35	0.04	1.00	0.39	0.19	0.14	1.00
B3Niacin ad.	0.79	0.23	0.15	1.00	0.81	0.16	0.32	1.00
B6 ad.	0.41	0.27	0.00	1.00	0.34	0.15	0.12	0.90
B9Folate ad.	0.34	0.24	0.02	1.00	0.22	0.12	0.09	1.00
B12 ad.	0.56	0.43	0.00	1.00	0.27	0.20	0.00	0.87
Vitamin C ad.	0.82	0.27	0.01	1.00	0.77	0.22	0.31	1.00

Table 85 Means (weighted) baseline/ endline, Safal landless, beneficiary n=95[36][37]

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.05	0.10	0.00	0.78	0.27	0.24	0.00	1.00
pond used (ha)	0.01	0.02	0.00	0.09	0.04	0.18	0.00	1.32
used chemical fertilizer (1=yes)	0.23	0.42	0.00	1.00	0.73	0.45	0.00	1.00
used fingerlings (1=yes)	0.15	0.36	0.00	1.00	0.52	0.50	0.00	1.00
good WM (1=yes)	0.23	0.42	0.00	1.00	0.31	0.47	0.00	1.00
rice production (kg)	335.17	846.51	0.00	8,000.00	1,299.14	1,189.26	0.00	6,600.00
other crops production (kg)	4.36	47.62	0.00	550.00	385.23	866.71	0.00	4,220.00
fish production (kg)	31.72	77.25	0.00	350.00	125.12	517.89	0.00	3,800.00
milk production (litre)	75.16	143.42	0.00	420.00	200.25	396.64	0.00	1,440.00
rice consumption (kg)	219.54	392.59	0.00	1,790.00	658.63	634.02	0.00	2,400.00
other crops consumption (kg)	0.22	2.84	0.00	38.00	52.40	136.55	0.00	520.00
fish consumption (kg)	21.53	58.91	0.00	200.00	30.85	41.30	0.00	170.00
milk consumption (litre)	63.42	124.03	0.00	360.00	74.35	140.78	0.00	636.00
rice sold (kg)	75.85	538.52	0.00	6,940.00	361.11	775.78	0.00	6,000.00
other crops sold (kg)	4.14	47.55	0.00	550.00	313.25	730.42	0.00	3,775.00
fish sold (kg)	10.18	45.82	0.00	290.00	102.15	483.96	0.00	3,460.00
milk sold (litre)	9.81	35.33	0.00	300.00	123.82	331.34	0.00	1,260.00
farm income form cultivation and livestock products (USD)	174.83	403.92	0.00	2,125.50	2,067.18	1,653.42	0.00	7,379.35
off farm income (USD)	1,513.78	2,374.18	0.00	16,663.49	2,640.23	3,405.93	36.00	14,941.46
wealth index	-1.58	1.49	-4.99	3.33	-0.07	1.55	-3.63	3.77
value of food consumption (USD)	1,156.22	657.84	371.91	2,846.88	820.89	380.35	371.74	3,537.13
months of adequate household food access	8.19	3.47	0.00	12.00	10.93	1.92	1.00	12.00
HFIAS	6.74	5.37	0.00	23.00	2.14	3.04	0.00	15.00
HDDS	7.18	1.73	3.00	11.00	7.81	1.70	4.00	11.00
Nutritional adequacy index	0.64	0.21	0.18	0.99	0.60	0.14	0.23	0.89

[36] Module L does not contain the food item mung beans. These beans contain much calcium and iron. At the baseline this product was hardly grown, while in the endline many farmers started to grow it. Therefore the Ca en Fe adequacies at the endline, reported in this table, are probably lower than in reality.

[37] One household in the control area is not 'on the support'.

Ca adequacy	0.34	0.35	0.03	1.00	0.26	0.17	0.04	1.00
Fe adequacy (ad.)	0.41	0.16	0.10	1.00	0.47	0.18	0.21	1.00
Energy ad.	0.94	0.13	0.57	1.00	0.82	0.18	0.23	1.00
Carbohydrates ad.	0.83	0.27	0.04	1.00	0.94	0.18	0.13	1.00
Protein ad.	0.83	0.24	0.14	1.00	0.89	0.15	0.22	1.00
Magnesium ad.	0.89	0.20	0.23	1.00	0.96	0.12	0.49	1.00
Zinc ad.	0.87	0.22	0.15	1.00	0.91	0.16	0.29	1.00
Vitamin A ad.	0.51	0.35	0.00	1.00	0.38	0.29	0.01	1.00
B1Thiamin ad.	0.49	0.28	0.08	1.00	0.41	0.16	0.17	1.00
B2Riboflav ad.	0.57	0.35	0.04	1.00	0.43	0.25	0.12	1.00
B3Niacin ad.	0.78	0.25	0.14	1.00	0.83	0.18	0.14	1.00
B6 ad.	0.42	0.27	0.06	1.00	0.35	0.18	0.12	0.73
B9Folate ad.	0.33	0.23	0.03	1.00	0.22	0.10	0.07	0.59
B12 ad.	0.59	0.43	0.00	1.00	0.34	0.27	0.00	1.00
Vitamin C ad.	0.78	0.29	0.00	1.00	0.73	0.24	0.23	1.00

Table 86 Means (weighted) baseline/ endline, Safal area landless, control n=101

	baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
plot used (ha)	0.06	0.13	0.00	0.71	0.15	0.18	0.00	0.81
pond used (ha)	0.01	0.04	0.00	0.40	0.02	0.08	0.00	0.40
used chemical fertilizer (1=yes)	0.23	0.43	0.00	1.00	0.53	0.50	0.00	1.00
used fingerlings (1=yes)	0.10	0.30	0.00	1.00	0.37	0.49	0.00	1.00
good WM (1=yes)	0.24	0.43	0.00	1.00	0.30	0.46	0.00	1.00
rice production (kg)	356.79	805.10	0.00	4,720.00	876.42	1,246.26	0.00	6,800.00
other crops production (kg)	66.42	519.06	0.00	6,000.00	290.76	905.73	0.00	4,200.00
fish production (kg)	10.38	44.68	0.00	400.00	59.48	156.16	0.00	1,350.00
milk production (litre)	59.76	191.07	0.00	1,800.00	84.70	214.15	0.00	1,440.00
rice consumption (kg)	182.19	447.19	0.00	1,800.00	497.91	704.06	0.00	2,400.00
other crops consumption (kg)	3.28	17.93	0.00	110.00	33.43	76.96	0.00	386.50
fish consumption (kg)	6.04	19.71	0.00	80.00	16.26	23.43	0.00	85.00
milk consumption (litre)	30.36	85.89	0.00	360.00	40.75	93.42	0.00	360.00
rice sold (kg)	122.32	403.53	0.00	2,500.00	258.28	518.04	0.00	2,980.00
other crops sold (kg)	42.45	289.75	0.00	3,000.00	249.91	843.67	0.00	3,900.00
fish sold (kg)	6.07	33.86	0.00	350.00	46.03	128.64	0.00	1,100.00
milk sold (litre)	27.06	128.04	0.00	1,320.00	42.89	159.19	0.00	1,200.00
farm income form cultivation and livestock products (USD)	147.17	341.05	0.00	2,160.89	1,444.96	1,892.54	0.00	8,896.60
off farm income (USD)	2,083.64	3,380.25	0.00	26,229.56	3,331.52	5,570.05	0.00	41,723.00
wealth index	-1.76	1.77	-5.01	3.92	-0.35	1.44	-4.10	3.44
value of food consumption (USD)	1,165.58	692.84	388.52	4,912.86	700.65	245.66	367.29	1,692.50
months of adequate household food access	8.86	3.27	0.00	12.00	10.33	2.39	0.00	12.00
HFIAS	6.51	5.48	0.00	27.00	4.16	4.73	0.00	24.00
HDDS	7.35	1.71	3.00	11.00	7.34	1.49	4.00	11.00
Nutritional adequacy index	0.63	0.20	0.16	1.00	0.60	0.12	0.32	0.84
Ca adequacy	0.29	0.33	0.02	1.00	0.26	0.16	0.06	0.67
Fe adequacy (ad.)	0.41	0.17	0.09	1.00	0.48	0.21	0.19	1.00
Energy ad.	0.97	0.08	0.61	1.00	0.80	0.16	0.26	1.00
Carbohydrates ad.	0.86	0.24	0.05	1.00	0.96	0.11	0.15	1.00

Protein ad.	0.85	0.23	0.16	1.00	0.88	0.13	0.42	1.00
Magnesium ad.	0.91	0.19	0.21	1.00	0.98	0.06	0.47	1.00
Zinc ad.	0.87	0.22	0.17	1.00	0.93	0.11	0.31	1.00
Vitamin A ad.	0.51	0.34	0.00	1.00	0.36	0.28	0.01	1.00
B1Thiamin ad.	0.48	0.27	0.07	1.00	0.41	0.19	0.19	1.00
B2Riboflav ad.	0.54	0.35	0.04	1.00	0.42	0.25	0.14	1.00
B3Niacin ad.	0.78	0.25	0.15	1.00	0.82	0.16	0.32	1.00
B6 ad.	0.38	0.26	0.00	1.00	0.36	0.19	0.12	0.90
B9Folate ad.	0.32	0.23	0.02	1.00	0.26	0.21	0.09	1.00
B12 ad.	0.51	0.42	0.00	1.00	0.28	0.22	0.00	0.87
Vitamin C ad.	0.82	0.27	0.01	1.00	0.76	0.23	0.31	1.00

Validation intervention logic

(note: the standard errors are not correct, because it was not possible to do a weighted regression and simultaneously estimate cluster robust standard errors)

Table 87 Estimation results: good WM and production, Safal landless

Dependent variable	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Good WM (1=yes)	446.32***	347.39***	18.52
Constant	601.49***	93.11**	52.84***
number of observations	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 88 Estimation results: production, (farm-) income (cultivation and livestock) and value of food consumption, Safal landless

Dependent variable	Farm income (in USD per year)	Value of food consumption (in USD)	Value of food consumption (in USD)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Production rice (in kg)	0.89***		0.12***
Production other crops (in kg)	0.62***		0.13***
Production fish (in kg)	1.50***		0.24**
Production milk (in l)	0.03		0.56***
Farm income (in USD per year)		-0.03	-0.18***
Non-farm income (in USD per year)		0.01	0.01
Constant	120.42***	970.34***	924.86***
number of observations	390	390	390

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 89 Estimation results: production (farm-) income (only form cultivation) and household dietary diversity (HDDS), Safal landless

Dependent variable	HDDS	HDDS	HDDS
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
Production rice (in kg)	0.11		0.11
Production other crops (in kg)	0.03		-0.05
Production fish (in kg)	0.27		0.32
Production milk (in l)	2.19***		2.17***
Farm income (in 1.000 USD per year)		0.10**	-0.00
Non-farm income (in 1.000 USD per year)		0.05**	0.05**
constant	7.09***	7.20***	6.99***
number of observations	390	390	390

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Estimation results

(note: the standard errors are not correct, because it was not possible to do a weighted regression and simultaneously estimate cluster robust standard errors)

Table 90 Estimation results multivariate regression Inputs, Safal landless

Dependent variable	Plot size used (in ha)	Pond size used (in ha)	Used chemical fertilizer	Used fingerlings	Good WM (1=yes)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.01	-0.00	-0.00	0.05	-0.01
post treatment (1=yes)	0.09***	0.01	0.29***	0.27***	0.06
beneficiary post treatment (1=yes)	***0.13******	***0.02***	***0.21****	***0.10***	***0.02***
constant	0.06***	0.01	0.23***	0.10**	0.24***
number of observations	392	392	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 91 Estimation results multivariate regression Outputs: production, Safal landless

Dependent variable	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)	Production of milk (in litres)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-21.62	-62.06	21.34	15.40
post treatment (1=yes)	519.63***	224.34**	49.10	24.94
beneficiary post treatment (1=yes)	***444.34****	***156.53***	***44.30***	***100.15****
constant	356.79***	66.42	10.38	59.76**
number of observations	392	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 92 Estimation results multivariate regression Outputs: consumption, Safal landless

Dependent variable	Consumption[36] rice (in kg)	Consumption other crops (in kg)	Consumption fish (in kg)	Consumption of milk (in litres)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	37.35	-3.06	15.49***	33.06**
post treatment (1=yes)	315.72***	30.15**	10.22*	10.38
beneficiary post treatment (1=yes)	***123.37***	***22.03***	***-0.90***	***0.55***
constant	182.19***	3.28	6.04	30.36**
number of observations	392	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

[36] Consumed or stored for consumption.

Table 93 Estimation results multivariate regression Outputs: Amount sold, Safal landless

Dependent variable	Rice sold[39] (in kg)	Other crops sold (in kg)	Fish sold (in kg)	Milk sold (in litres)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-46.47	-38.31	4.12	-17.25
post treatment (1=yes)	135.96	207.45**	39.96	15.83
beneficiary post treatment (1=yes)	***149.29***	***101.65***	***52.01***	***98.19****
constant	122.32**	42.45	6.07	27.06
number of observations	392	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 94 Estimation results multivariate regression Outcome Part 1 income, Safal landless

Dependent variable	Farm income (in USD per year)	Non-farm income (in USD per year)	Value of food consumption (in USD)	Wealth Index
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	27.66	-569.86	-9.36	0.17
post treatment (1=yes)	1297.79***	1247.89**	-464.92***	1.41***
beneficiary post treatment (1=yes)	***594.56****	***-121.43***	***129.60***	***0.11***
constant	147.17	2083.64***	1165.58***	-1.76***
number of observations	390	390	390	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Table 95 Estimation results multivariate regression Outcome Part 2 Food security and diversity, Safal landless

Dependent variable	Months of adequate household food access	HFIAS	HDDS
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.68*	0.23	-0.17
post treatment (1=yes)	1.47***	-2.35***	-0.01
beneficiary post treatment (1=yes)	***1.28****	***-2.26****	***0.64****
constant	8.86***	6.51***	7.35***
number of observations	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

[39] Sold or stored for consumption.

Table 96 Estimation results multivariate regression Outcome Part 3 nutritional adequacy, Safal landless

Dependent variable	Nutritional adequacy index	Calcium adequacy	Iron adequacy
Explanatory variables	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.01	0.05	-0.00
post treatment (1=yes)	-0.04	-0.03	0.07**
beneficiary post treatment (1=yes)	***-0.01***	***-0.06***	***-0.01***
constant	0.63***	0.29***	0.41***
number of observations	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Plot and Pond size

Table 97 Estimation results multivariate regression Inputs and outputs, Safal landless

Dependent variable	Used chemical fertilizer	Used fingerlings	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.03	-0.02	39.86	0.00	0.00
post treatment (1=yes)	0.17***	0.25***	103.35	0.00	0.00
beneficiary post treatment (1=yes)	***0.24******	***0.20****	***162.84***	***0.00***	***0.00***
total plot size used (in hectare)	2.69***		7382.16***	5791.45***	1590.71***
beneficiary x plot used	-0.08		-1063.17	524.24	-1587.41*
post treatment x plot used	-0.74**		-87.92	86.85	-174.77
beneficiary post treatment x plot used	***-0.99****		***-946.62***	***-1911.85******	***965.23***
total pond size used (in hectare)		2.70***			
beneficiary x pond used		14.16***			
post treatment x pond used		-0.60			
beneficiary post treatment x pond used		***-15.69*****			
constant	0.07*	0.08**	-28.02	2.80	-30.81
number of observations	392	392	392	392	392

*=significant at the 10% level; **=significant at the 5% level; ***=significant at the 1% level.

Participation in other programs, natural disasters, water related problems and electricity or solar power

Table 98 Means (unweighted) baseline/ endline, Safal landless, beneficiary n=96

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.04	0.20	0.00	1.00	0.89	0.32	0.00	1.00
received extension services	0.09	0.29	0.00	1.00	0.21	0.41	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.03	0.17	0.00	1.00	0.10	0.31	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.08	0.28	0.00	1.00	0.20	0.40	0.00	1.00
electricity or solar power	0.54	0.50	0.00	1.00	0.77	0.42	0.00	1.00
lack of water	0.28	0.45	0.00	1.00	0.03	0.17	0.00	1.00
flooding	0.04	0.20	0.00	1.00	0.09	0.29	0.00	1.00
logging	0.11	0.32	0.00	1.00	0.14	0.34	0.00	1.00
salinity	0.04	0.20	0.00	1.00	0.04	0.20	0.00	1.00
vulnerability index 1	0.38	0.49	0.00	1.00	0.57	0.50	0.00	1.00
vulnerability index 2	0.00	0.00	0.00	0.00	0.30	0.46	0.00	1.00

Table 99 Means (unweighted) baseline/ endline, Safal landless, control n=101

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.02	0.14	0.00	1.00	0.02	0.14	0.00	1.00
received extension services	0.02	0.14	0.00	1.00	0.09	0.29	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.02	0.14	0.00	1.00	0.07	0.26	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.03	0.17	0.00	1.00	0.11	0.31	0.00	1.00
electricity or solar power	0.58	0.50	0.00	1.00	0.70	0.46	0.00	1.00
lack of water	0.29	0.45	0.00	1.00	0.03	0.17	0.00	1.00
flooding	0.03	0.17	0.00	1.00	0.12	0.33	0.00	1.00
logging	0.09	0.29	0.00	1.00	0.09	0.29	0.00	1.00
salinity	0.05	0.22	0.00	1.00	0.02	0.14	0.00	1.00
vulnerability index 1	0.44	0.50	0.00	1.00	0.58	0.50	0.00	1.00
vulnerability index 2	0.00	0.00	0.00	0.00	0.47	0.50	0.00	1.00

Table 100 Means (weighted) baseline/ endline, Safal landless, beneficiary n=95[46]

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.02	0.15	0.00	1.00	0.94	0.24	0.00	1.00
received extension services	0.15	0.36	0.00	1.00	0.22	0.42	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.02	0.13	0.00	1.00	0.09	0.28	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.08	0.27	0.00	1.00	0.33	0.47	0.00	1.00
electricity or solar power	0.57	0.50	0.00	1.00	0.78	0.41	0.00	1.00
lack of water	0.18	0.39	0.00	1.00	0.02	0.15	0.00	1.00
flooding	0.03	0.16	0.00	1.00	0.05	0.22	0.00	1.00
logging	0.08	0.27	0.00	1.00	0.13	0.34	0.00	1.00
salinity	0.02	0.12	0.00	1.00	0.02	0.14	0.00	1.00
vulnerability index 1	0.27	0.44	0.00	1.00	0.64	0.48	0.00	1.00
vulnerability index 2	0.00	0.00	0.00	0.00	0.42	0.50	0.00	1.00

[46] One household in the control area is not 'on the support'.

Table 101 Means (weighted) baseline/ endline, Safal landless, control n=101

	Baseline				endline			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
participated in a farmer field school	0.01	0.11	0.00	1.00	0.02	0.15	0.00	1.00
received extension services	0.01	0.11	0.00	1.00	0.12	0.32	0.00	1.00
participated in a project related to food security, agriculture or nutrition	0.01	0.11	0.00	1.00	0.05	0.22	0.00	1.00
participated in a project from which unconditional (free) cash or asset transfer was received	0.04	0.20	0.00	1.00	0.10	0.30	0.00	1.00
electricity or solar power	0.57	0.50	0.00	1.00	0.76	0.43	0.00	1.00
lack of water	0.26	0.44	0.00	1.00	0.03	0.16	0.00	1.00
flooding	0.02	0.15	0.00	1.00	0.12	0.32	0.00	1.00
logging	0.10	0.29	0.00	1.00	0.12	0.33	0.00	1.00
salinity	0.06	0.24	0.00	1.00	0.04	0.19	0.00	1.00
vulnerability index 1	0.41	0.49	0.00	1.00	0.58	0.50	0.00	1.00
vulnerability index 2	0.00	0.00	0.00	0.00	0.49	0.50	0.00	1.00

Table 102 Estimation results multivariate regression Inputs and outputs, Safal landless

Dependent variable	Used chemical fertilizer	Used fingerlings	Production rice (in kg)	Production other crops (in kg)	Production fish (in kg)
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.01	0.05	0.00	0.00	33.50
post treatment (1=yes)	0.29***	0.28***	0.00	0.00	85.03*
beneficiary post treatment (1=yes)	***0.19****	***0.10***	***0.00***	***0.00***	***41.76***
project fsan	0.06	-0.26**	226.59	-305.80*	-91.01
project cash	0.10	0.02	264.83	-2.99	-77.91*
electricity or solar power			462.11***	50.20	40.53
lack of water			366.68**	243.88**	7.33
Flooding			597.81***	724.49***	5.73
Logging			389.13**	157.12	-32.48
Salinity			116.18	172.34	-10.90
vulnerability index 1			108.48	35.64	64.49**
vulnerability index 2			289.22*	-89.86	-91.09**
constant	0.23***	0.10**	-117.38	-79.57	-32.99
number of observations	392	392	392	392	392