Annex 3A. Household survey baseline report - Impact evaluation food security programme Bangladesh

Commissioned by:
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Authors:
Philip de Jong
Maartje Gielen
Jan Joost Kessler

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Contents

1. Introduction

1.1 Samples: six subgroups

To assess the impact of two Food Security projects, Safal and Blue Gold (BG) that are sponsored by the Dutch government, a baseline survey was designed and fielded among samples of households that participate in one of both projects. Both samples of beneficiary households and control groups were surveyed. In the Safal areas a distinction is made between 'farmers' and 'landless'. Whilst the first group are the main beneficiaries, landless are expected to benefit in an indirect way from the spin-off effects of Safal on beneficiary farmers. Both the Safal samples and the concomitant control sample are stratified such that 270 households are 'farmers' and 130 are 'landless'.

The baseline survey therefore consists of six subgroups:

- 400 BG beneficiaries
- 400 BG controls in areas that match with the polders in which BG is active
- 270 Safal beneficiaries ('farmers')
- 130 indirect beneficiaries ('landless') in Safal areas
- 270 control farmers in areas in which Safal is not active
- 130 control landless in areas in which Safal is not active

These groups were selected by choosing four different areas (districts and upazillas), and within those areas unions and villages were chosen at random. The choice of two beneficiary and two control areas, the sampling protocol and the questionnaire are described in the Inception Report. The survey consists of background characteristics and indicators that measure several aspects of food security programs.

1.2 Composition and representativeness of the samples

One way to check whether the samples used are representative is by looking at the distribution of the households by the size of the cultivable land they own.

For Safal Table 1 shows this distribution. It reflects that Safal has deliberately selected as beneficiaries medium (12%) and large scale farmers (2%). This was been done in consultation with the EKN to ensure quantity and quality of commodities supply to the market, especially also on aquaculture products. In total 57,342 beneficiaries were selected against the target of 50,000 to ensure that the project reached to the landless, marginal and smallholders as per the agreed proposal. From Table 1 we learn that:

- the landsizes of the sampled beneficiary households are considerably smaller (and the representation of landless is higher) than that of the full beneficiary population;

- the landsizes of the sampled farmer households in the control areas are considerably smaller (and the representation of landless is higher) than the sampled beneficiary households.

Unfortunately, we did not know the land size distribution beforehand, and therefore could not stratify the samples by land size. Also, we did not know that Safal selected medium and large-scale farmers from the total population. The control sample may be assumed to represent the composition of the total population.

Land sizes may indicate wealth but can also indicate the degree to which an area is urbanized. Hence, the differences between the Safal population and beneficiary sample and between beneficiaries may be caused by mismatches in wealth, or in urbanization, or both.

Table 1 Safal population and samples by land size

	All Safal farmers (n= 57,342)	Safal samples		Safal control sample	
		Beneficiaries (n= 270)	Landless (n= 130)	Farmers (n= 270)	Landless (n= 130)
Landless (0-49 decimal lands)	20%	48%	97%	71%	98%
Marginal Farmer (50-149 decimal lands)	45%	34%	2%	24%	2%
Small holder (150-249 decimal lands)	21%	11%	1%	3%	0%
Medium farmers (250-749 decimal lands)	12%	6%	0%	2%	0%
Large farmers (750 decimal and above)	2%	1%	0%	0%	0%
Total	100%	100%	100%	100%	100%

Table 2 shows that the Blue Gold beneficiary and control samples are well matched in terms of landsize.

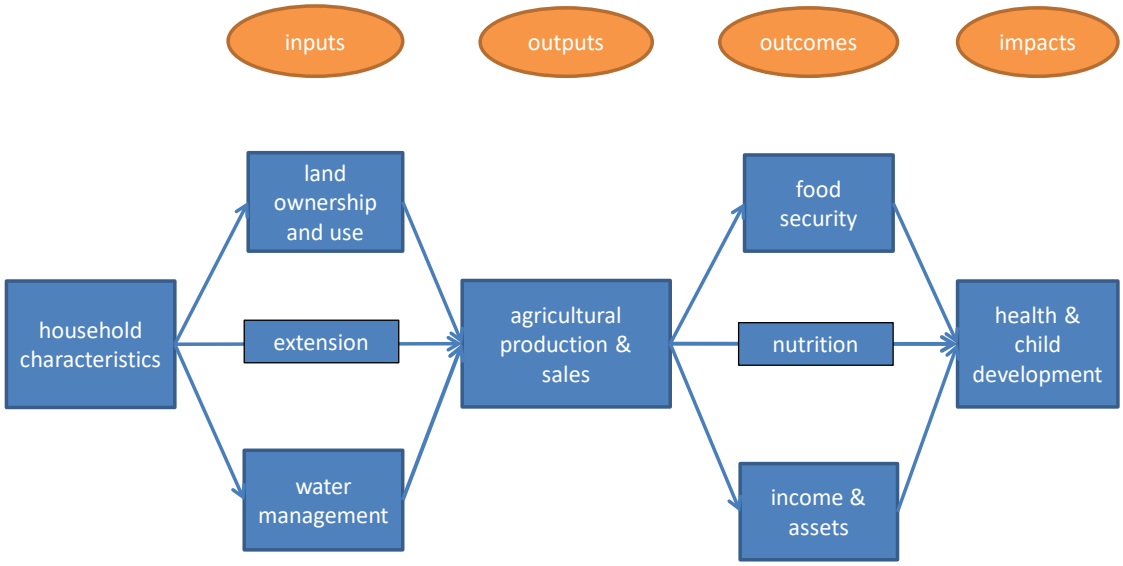
Table 2 Blue Gold beneficiary and control sample by land size

	Blue Gold beneficiaries	Blue Gold controls
Landless (0-49 decimal lands)	60%	60%
Marginal Farmer (50-149 decimal lands)	26%	25%
Small holder (150-249 decimal lands)	10%	7%
Medium farmers (250-749 decimal lands)	4%	7%
Large farmers (750 decimal and above)	0%	1%
Total	100%	100%

1.3 Analytic framework

To put an analytical order in the presentation of the survey results we distinguish between inputs, outputs, outcomes and impacts, given a set of household characteristics. This distinction mimics the result chain that we investigate using the endline survey. It also fits the theory of change for both Food Security projects. See Figure 1.1.

Figure 1.1 Result chain of a food security project



This report is structured according to the above logic:

- General: household size and composition, housing, sanitation and vulnerability (chapter 2);
- Water management (chapter 3)
- Program participation and extension (chapter 4)
- Land ownership and use (chapter 5)
- Agricultural production and sales (chapter 6) and livestock and poultry (chapter 7)
- Farm costs and income, non-farm income, wealth and entrepreneurship (chapter 8)
- Food insecurity prevalence (HFIP), dietary diversity (HDDS) and the hunger scale (HHS) (chapter 9)
- Nutrition (chapter 10)
- Health: general health, stunting and weight status among children under five (chapter 11).

We present frequencies for each of the six subgroups, so that beneficiary and control groups can be directly compared.

From the frequencies we derive indicators for each link in the result chain, which can be further analysed. In chapter 12, we investigate the relationships between the links conditional

on household characteristics using a recursive set of regression equations. We do this separately for each of both Food Security project areas (and for Safal distinguishing farmers and landless).

In chapter 13 we conclude by running Propensity Score Matching (PSM) regressions to see if there is scope to improve the composition of the two control groups by checking what is called the common support between the beneficiary and control groups.

2. General household characteristics

2.1 Household size and composition

There are no differences in family size or age distribution.
More than 3 out of 4 households in the Safal beneficiary area is Hindu, while in the Safal control area more than 3 out of 4 households is Muslim. In the Safal beneficiary area the household head is on average better educated. These characteristics are correlated: in the total sample of 1,600 households 89% of the Hindu household heads passed at least 6 years of schooling, while from the Muslim household heads this is only 74%. As expected, the landless have considerably lower education: 48% has with age above 15 years has no education at all, as compared to 23-28% for the landowners. Altogether, education level in the Safal control area is considerably lower than in the beneficiary area.

Table 3 General characteristics of household members

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Sample HH members n=7,640	n=1,999	n=1,945	n=1,350	n=546	n=1,241	N=559
Average family size	5.0	4.9	5.0	4.2	4.6	4.3
Age distribution of HH members						
<=5	6.5	7.9	7.3	6.8	6.4	6.1
5-15	18.4	20.6	14.6	18.9	18.6	23.6
15-30	27.5	25.8	27.2	23.1	26.1	23.6
30-60	35.9	34.5	36.5	37.5	36.3	36.9
=>60	11.8	11.3	14.4	13.7	12.7	9.8
Age distribution of HH head	n=400	n=400	n=270	n=130	n=270	n=130
15-30	3.5	6.3	7.8	10.0	5.9	5.4
30-60	66.0	67.8	66.3	66.2	67.8	73.8
=>60	30.5	26.0	25.9	23.8	26.3	20.8
Gender of HH members	n=400	n=400	n=270	n=130	n=270	n=130
Male /Female ratio	1.44	1.44	1.34	1.30	1.30	1.34
Education of HH head	n=400	n=400	n=270	n=130	n=270	n=130
No education	24.5	28.3	21.9	56.2	30.7	56.9
1-5 years schooling (passed)	34.5	35.3	22.2	22.3	31.5	28.5
6+ years schooling (passed)	40.8	35.3	54.8	21.5	37.4	14.6
Others [a]	0.3	1.3	1.1	0.0	0.4	0.0
% of HH members age =>15 with no education	n=1,502	n=1,391	n=1,054	n=406	n=931	n=393
	17.51	21.71	22.87	48.28	27.50	48.60
Religion of HHs (N=1600)	n=400	n=400	n=270	n=130	n=270	n=130
Muslim	52.5	68.8	23.0	24.6	76.7	80.8
Hindu	47.5	31.3 [b]	77.0	75.4	23.3	19.2

a = religious education, don't know

b = this includes three Buddhist households

2.2 Housing and sanitation

In terms of housing there are no significant differences between BG beneficiary and control areas. Safal beneficiary areas appear to be somewhat better off, when looking at the use of cement as construction material and access to electricity.

Table 4 Housing and sanitation

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Sample of HHs (N=1600)	n=400	n=400	n=270	n=130	n=270	n=130
Ownership of dwelling						
Own	98.3	94.5	98.1	83.8	98.1	87.7
Construction materials of wall						
Cement/brick/rod/tiles	11.3	17.0	51.5	16.9	48.9	15.4
Tin/wood	53.5	47.0	3.7	7.7	8.9	16.9
Other (mud/straw)	35.3	36.0	44.8	75.4	42.2	67.7
Construction materials of roof						
Cement/brick/rod/tiles	3.8	3.8	15.2	3.2	7.4	1.5
Tin/wood	81.8	86.0	72.2	66.1	78.9	76.9
Other	14.5	10.3	12.6	30.8	13.7	21.5
Energy source use for lighting						
Electricity	40.5	44.8	75.2	48.5	70.0	52.3
Battery	7.5	6.0	4.4	2.3	1.5	0.8
Kerosene lamps	40.8	21.0	16.3	49.2	28.2	46.2
Other (solar)	11.3	28.3	4.1	0.0	0.4	0.8
Sanitation						
Source of drinking water						
Tube well	97.8	99.8	88.9	87.7	94.4	99.2
Toilet facility						
Pit latrine with slab	70.0	77.0	64.8	70.0	70.0	66.2
Modern/pit with flush	11.5	7.8	4.4	16.2	4.8	14.6
Ventilated improved pit latrine (vip)	3.8	3.5	8.5	0.8	5.2	0.8
Else (open/hanging etc)	4.8	2.5	3.3	6.2	3.3	10.0
Dispose of stool of children under 5, n=697						
Use toilet	12.0	17.8	10.7	11.5	12.2	7.7
Put/rinsed into toilet	18.0	17.0	16.3	15.4	15.9	14.6
Else (thrown in garbage/rinsed into drain/open etc)	70.0	65.2	63.0	73.1	71.8	77.7

2.3 Vulnerability

Table 5 lists a number of adverse events that took place in the 12 months before the survey. The first 7 types of events are of a natural origin, followed by three agricultural problems.

Table 5 Percentage of households that suffered adverse events, by event

		Blue Gold		Safal beneficiary areas		Safal control areas	
		beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
		n=400	n=400	n=270	n=130	n=270	n=130
	Climate						
1	Flood	19.8	16.8	8.5	7.7	4.8	3.1
2	Drought	14.0	24.8	28.9	25.4	30.0	18.5
3	Cyclone	5.0	11.5	0.7	2.3	1.5	3.1
4	River Erosion	0.0	0.3	0.0	2.3	0.4	0.0
5	Land Slide	0.0	0.0	0.0	0.0	0.0	0.0
6	Excessive Rain	17.3	8.8	13.0	4.6	10.7	13.1
7	Wind damage	11.0	6.5	3.3	2.3	3.3	6.9
	Faced one or more of the 7 natural disaster	*58.5*	*62.8*	*52.2*	*43.8*	*49.6*	*43.8*
	Production						
	Crop Lost	6.8	2.0	0.4	0.0	1.9	0.8
	Agricultural Crop Failure	0.8	0.8	0.4	0.0	1.1	0.8
	Faced crop lost or crop failure or both	*7.5*	*2.8*	*0.7*	*0.0*	*3.0*	*1.5*

As indicators of vulnerability we propose to use (1) exposure to one or more of the 7 natural disaster events and (2) crop loss or failure. Looking at these indicators, there are no significant differences between the BG beneficiary and control areas, although beneficiary areas experience more floods and excessive rain, while control areas experience more drought.
For the Safal areas, there are no differences.
It is clear that the BG areas experience more natural calamities than the Safal areas.

3. Water management

For BG areas, we observe that beneficiary farmers have more problems with flooding and water logging, mainly because of excessive rainfall, while control areas experience more problems of lack of water and salinity, mainly because of drought. Both areas experience a range of serious consequences, especially reduction and destruction of production. In both areas the majority of farmers experience an absence of sufficient water infrastructure, but more so in the control areas (65%) than in the beneficiary area (56%). For Safal areas, there do not appear to be significant differences, possibly slightly more water related problems and underlying causes in the beneficiary area.

Table 6 Water management related problems in last 12 months (percentages)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Type of water problem						
Lack of water	26.0	32.5	28.1	26.9	31.5	28.5
Flooding	16.0	12.3	5.9	5.4	3.3	2.3
Water Logging	27.3	19.3	22.6	10.0	18.1	10.0
Salinity	6.0	24.3	10.4	5.4	10.7	6.2
Other	0.0	0.0	0.0	0.8	1.5	0.8
Households with at least one water problem	64.5	70.0	60.0	46.2	58.9	46.9
*Causes of water problem **						
Absence of sufficient water infrastructure	55.8	65.4	53.1	46.7	47.8	36.1
Deterioration of water infrastructure	9.3	4.3	10.5	8.3	4.4	0.0
Subotage of water infrastructure	3.5	2.9	0.0	0.0	0.6	0.0
Decision by water management group	10.1	7.9	1.9	6.7	5.0	1.6
Drought	24.0	34.6	40.7	56.7	40.3	52.5
Excessive rainfall	42.6	32.1	33.3	26.7	27.0	18.0
No specific cause	4.3	6.4	1.9	1.7	9.4	9.8
*Consequences of water problems**						
Reduction of crops	69.0	72.1	70.4	55.0	67.3	50.8
Destruction of crops	43.8	33.9	15.4	6.7	10.7	0.0
Planting of crops postponed	17.4	21.1	12.3	11.7	15.7	13.1
Land could not be used for crop production	8.5	11.1	8.6	6.7	4.4	1.6
Fishery/aquaculture production was affected	10.5	24.3	32.7	11.7	22.0	6.6
Livestock production was affected	2.3	5.7	3.7	1.7	1.3	1.6

Source of drinking water was affected	6.6	15.4	9.9	30.0	13.8	36.1
No serious consequences	5.0	5.0	3.1	13.3	10.1	19.7

* multiple responses

Table 7 shows the performance of the water management system.

Table 7 Performance of the water management system (percentages)

	Blue Gold		**Safal beneficiary areas**		**Safal control areas**	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Good for the crop/livelihood/agri and fishing/aquaculture?						
Yes	64.75	46.75	46.30	20.77	22.59	23.85
No	12.75	21.75	12.59	12.31	13.33	14.62
Don't know/ no opnion	22.50	31.50	41.11	66.92	64.07	61.54

4. Project participation and extension

For BG areas, beneficiaries have participated much more in FFS activities, received some more agricultural extension and are more often member of a cooperative or farmer group.

For Safal areas, the differences between beneficiary and control areas are very significant. On all indicators Safal beneficiaries have received much more support from FFS or agricultural extension, are much better organised (38% as compared to 5%!). This suggests a bias in the selection of the beneficiary areas, as during the baseline survey Safal had hardly started its activities (and certainly did not yet organise farmers into groups).

As expected, the landless receive hardly any support and are hardly organised.

Table 8 Project participation and extension (in percentages)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
participated in a farmer field school (FFS)	21.8	13.8	20.4	3.1	10.0	2.3
received other agricultural extension services	24.5	22.3	48.5	7.7	9.3	2.3
member of a cooperative of farmers, or farmer group	13.8	8.8	37.8	3.1	4.8	1.5
participated in a project related to food security, agriculture or nutrition	12.5	12.5	11.1	2.3	4.4	3.1

5. Land ownership and use

5.1 Land ownership

Table 9 shows that almost all households own homestead land, both farmers and landless (for Safal). Average plot sizes are based on households who own plots or ponds (excluding zeros). For BG areas, control areas appear to have larger plot cultivable plot size. For Safal areas, beneficiary farmers have larger cultivable land size and much larger pond size. This is a result of the deliberate selection of farmers by Safal (see chapter 1). It is noteworthy that the landless in Safal areas also have cultivable land (so they are not completely landless). In the control areas the difference between landowners and landless is not even very large. This could be explained by the fact that the landless include as their land the land that is being leased or sharecropped (see next table 9). Note that according to FGDs the poor or landless are defined as having less than 50 decimal of land.

Table 9 Ownership rate and average size of land and ponds in hectares*

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
	n=400	n=400	n=270	n=130	n=270	n=130
Homestead Land:						
ownership rate	95.3	94.5	98.1	81.5	95.9	86.2
average size	0.09	0.08	0.07	0.03	0.07	0.03
Cultivable Land:						
ownership rate	76.0	69.3	85.9	21.5	72.6	12.3
average size	0.65	0.80	0.74	0.21	0.47	0.29
Ponds (deep, non-cultivable):						
ownership rate	26.3	23.3	20.4	3.1	11.1	3.8
average size	0.05	0.05	0.13	0.06	0.08	0.03
Other Non-Cultivable Land:						
ownership rate	2.5	5.8	7.8	1.5	4.8	1.5
average size	0.15	0.07	0.09	0.02	0.11	0.08

* 1 hectare = 247.16 decimal

In our further analyses we take average plot or pond size separately as input indicators.

5.2 Land and pond use

In terms of the use of land and ponds (Table 10), in BG areas we observe that beneficiaries have more owned land (and less leased) and grow more 'other crops' (than rice). This could be the result of their initial participation in agricultural support activities.

For Safal areas, beneficiaries also own more land (and less leased) and have vastly more aquaculture. The number of product groups is also much higher. We do not see such differences among the landless.

In BG areas the landless do sharecropping (6%) and lease land (24%). In Safal areas these percentages are much higher (6% sharecropping and 34-43% leased land).

Table 10 Use of plots / ponds by area (excluding homestead)

	Blue Gold		**Safal beneficiary areas**		**Safal control areas**	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Number of households using plots and ponds	315	339	254	46	212	28
% of households using plots or ponds	79%	85%	94%	35%	79%	22%
Number of plots (2.912)	922	800	667	65	408	50
Average # of plots per household (max. 6 plots)	2.9	2.4	2.6	1.4	1.9	1.8
Type of ownership (%) (n=2.768)						
Owned	73.64	60.31	74.11	44.07	67.20	37.50
Share crop	5.80	5.87	6.20	6.78	4.50	7.50
Leased	15.68	24.41	12.09	47.46	23.81	42.50
Other	4.89	9.40	7.60	1.69	4.50	12.50
Product groups (%):						
Rice	69	73	84	31	69	15
Other crops	58	31	21	3	27	5
Aquaculture	40	56	73	6	30	6
Dairy	67	65	72	44	58	45
Number of product groups						
0	11.50	9.00	4.44	41.54	14.44	50.00
1	16.25	18.25	10.74	37.69	23.70	35.38
2	21.00	27.25	26.67	16.15	31.48	10.00
3	30.25	30.00	46.30	4.62	23.70	1.54
4	21.00	15.50	11.85	0.00	6.67	3.08

In terms of the gender aspects of managing agricultural outputs, Table 11 shows that by far the majority is managed by the men. For homestead products women are more involved, but still the percentage is low. We do observe that in the Safal beneficiary areas women have more management responsibilities than in the beneficiary areas, especially among the landless. Possibly this is related to their different religious backgrounds.

Table 11 Management of the output from the parcel

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**Farmers**	**landless**	**farmers**	**landless**
Agriculture	296	292	226	45	193	20
Male	92.91	95.55	97.79	100.00	96.37	100.00
Female	3.38	1.03	0.00	0.00	0.00	0.00
Both	3.72	3.42	2.21	0.00	3.63	0.00
Fisheries	62	70	62	2	30	4
Male	90.32	90.00	91.94	100.00	96.67	100.00
Female	1.61	4.29	0.00	0.00	0.00	0.00
Both	8.06	5.71	8.06	0.00	3.33	0.00
Homestead	39	33	21	6	30	10
Male	61.54	72.73	71.43	50.00	83.33	90.00
Female	15.38	0.00	9.52	16.67	6.67	0.00
Both	23.08	27.27	19.05	33.33	10.00	10.00

6. Production & sales

6.1 Specialization

The number of households producing crops and / or fish is displayed in Table 12. Note that livestock is treated in the next chapter.

For BG areas the households in control areas seem to produce more crops and fishery products together. For Safal areas the difference is very significant: many more beneficiary farmers produce both crops and fishery products. This is related to the selection bias of large land and aquaculture pond owners. Farmers who don't grow crops or fish can still have cattle and dairy products as output, or have mainly non-farm activities as source of income.

Table 12 Percentage distribution of households by type of product

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**Controls**	**farmers**	**Landless**	**farmers**	**landless**
Product types						
Only crops	37.3	27.3	20.7	27.7	45.9	11.5
Only fisheries	3.8	7.8	5.9	0.0	2.2	0.8
Both	36.0	48.5	66.7	6.2	28.1	5.4
No crops nor fisheries	23.0	16.5	6.7	66.2	23.7	82.3

6.2 Production and yield in last 12 months

Table 13 gives the average annual production in kilograms, excluding households with zero production. Note, however, that very few landless use plots and are involved in any agricultural production (see Table 12). So the average on the landless are based on a few households only.

BG beneficiaries have a much lower (50%) average rice production than the control farmers, and also have more aquaculture production. On the other hand, the BG beneficiary farmers grow more other crops.

For the Safal areas, beneficiary farmers are more productive in terms of rice and aquaculture, while the control beneficiaries are slightly more productive on 'other crops'. Some landless in the control areas may also produce a large volume of other crops.

Table 13 Average production per household in kgs per year

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
# hh's producing:						
Rice	275	292	228	40	187	20
Other crops	230	123	57	4	73	7
Aquaculture	159	225	196	8	82	8
Production volume						
Rice	1,405.3	2,827.9	2,510.9	1,187.9	1,940.3	1,550.4
Other crops	327.0	714.7	1,294.8	899.5	942.4	983.1
Aquaculture	131.6	201.2	459.5	178.4	210.5	146.3
Total production volume						
Rice	386,457	825,751	572,475	47,517	362,830	31,007
Other crops	75,202	87,904	73,802	3,598	68,797	6,882
Aquaculture	20,923	45,268	90,058	1,427	17,257	1,170

To determine yield - production per hectare – we first calculated per crop the total size of the plots (in hectare) on which the crop is cultivated. Next the production of that crop from these plots is taken and divided by total size. Table 14 shows the results, with the number of plots on which crops are grown. For example the 50 plots on which Safal landless grow rice give a high yield. Obviously, the average across all households would be much lower because the majority of landless households have no agricultural production (see Table 12).

Table 14 Number of plots for a crop and average yield per hectare and crop type

Crop type	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
# plots/ ponds for:						
Rice	698	621	525	50	299	35
Other crops	484	181	77	4	97	8
Aquaculture	62	70	62	2	30	4
Yield per hectare						
Rice	2,850.3	3,331.3	3,972.1	6,393.1	5,460.8	6,220.5
Other crops	751.0	1,201.8	3,131.1	7,732.8	3,033.9	6,691.5
Aquaculture [a]	660.0	929.9	1666.1	2907.7	536.9	832.0

[a] The number of plots/ponds used for agriculture is smaller than the number of households producing fish because there are households that they harvested fish in the last 12 months (Module G2) but they did not mention any plots/ponds used for fisheries (Module F2 where only information is asked about the 6 biggest plots/ ponds). For these households it was not possible to calculate the yield of fish.

Rice yields in BG areas are around 3 tons per hectare, and in Safal areas are 4 to 5.5 tons per hectare. These data are based on a large number of farmers producing rice. The yields of other crops are 0.8 to 1.2 ton per hectare in BG areas, and much higher (around 3 ton) for Safal areas. This clearly shows the very high productivity of Safal areas for both rice and especially also other crops. For aquaculture the yields are variable: higher for BG controls than beneficiaries than controls, and higher for Safal control farmers than beneficiaries.

The yield data for landless are less reliable because they are based on less households that produce these crops and on very small plot sizes. In the Safal beneficiary area, 40 (out of 130) landless, with only 50 plots used for rice production, produce on average 6,393 kg of rice per hectare. Four of them have a yield of more than 10,000 kg of rice per hectare. The highest yield of 31,385 kg/ha (dataid 1235) is from 0.25 ha of leased land. The other landless with a high yield used their own land (0.04 ha and 0.17 ha) or shared cropping (0.34 ha) to produce rice. In the Safal control area 20 (out of 130), with 35 plots used for rice production, generate a high average yield of 6,220 kg per hectare. The highest yield of 11,597 kg/ha (dataid 1575) is based on two leased plots with a total size of 0.21 ha.

Similar explanations can be given for the high yield data for other crops produced by the landless.

6.3 Harvest per season

Table 15 Harvest of rice per season (kgs per season)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Season 1						
Average	1402	2623	2349	1375	1547	1603
Minimum	20	120	200	280	40	360
Maximum	9400	11040	12000	8000	8640	3400
Number of households	226	211	140	18	143	12
Season 2						
Average	1036	1976	2155	936	1288	1022
Minimum	100	70	160	80	90	120
Maximum	6400	9300	25720	3400	6300	2100
Number of households	17	64	112	24	103	11
Season 3						
Average	613	1220	333	0	655	0
Minimum	145	80	160	0	180	0
Maximum	2370	3600	560	0	1200	0
Number of households	6	4	3	0	4	0
Season 4						
Average	986	2237	433	145	903	260
Minimum	40	120	220	50	200	120
Maximum	8000	16000	800	240	2800	400
Number of households	47	61	3	2	7	2

Table 16 Harvest of other crops per season (kgs per season)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Season 1						
Average	212	1474	1354	853	758	640
Minimum	5	10	12	10	2	120
Maximum	2500	24120	10920	2000	8800	1000
Number of households	33	40	32	3	39	3
Season 2						
Average	313	282	604	519	710	1322
Minimum	3	5	10	38	16	30
Maximum	8000	3240	4780	1000	5000	6000
Number of households	209	94	28	2	33	6
Season 3						
Average	169	137	1495	0	947	32
Minimum	4	10	60	0	35	32
Maximum	720	400	6350	0	4200	32
Number of households	13	10	13	0	19	1
Season 4						
Average	167	1042	740	0	132	0
Minimum	25	90	480	0	35	0
Maximum	360	4000	1000	0	280	0
Number of households	4	5	2	0	3	0

Table 17 Number of harvests

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Rice						
0	31.25	27.00	15.56	69.23	30.74	84.62
1	63.75	61.25	73.70	27.69	43.70	11.54
2	4.75	11.50	10.37	3.08	25.19	3.85
3	0.25	0.25	0.37	0.00	0.37	0.00
Average	*0.7*	*0.9*	*1.0*	*0.3*	*1.0*	*0.2*
Other crops						
0	42.50	69.00	78.89	96.92	72.59	94.62
1	50.50	26.00	16.30	2.31	21.11	3.08
2	6.75	4.00	2.96	0.77	5.19	2.31
3	0.25	0.75	1.85	0.00	1.11	0.00
4	0.00	0.25	0.00	0.00	0.00	0.00
Average	*0.6*	*0.4*	*0.3*	*0.0*	*0.3*	*0.1*
Rice or other crops						
0	26.75	24.25	12.59	66.15	25.93	83.08
1	21.00	39.75	63.70	30.00	35.56	9.23
2	49.00	32.75	20.37	3.85	31.48	6.92
3	3.25	3.00	2.96	0.00	7.04	0.77
4	0.00	0.25	0.37	0.00	0.00	0.00
Average	*1.3*	*1.2*	*1.1*	*0.4*	*1.2*	*0.3*

6.4 Consumption and sales in last 12 months

Table 18 shows the sales of production volumes and Table 19 shows the different sales channels.

In BG areas beneficiaries sell much less of their products (38%) than the control farmers (57%), and then obviously the proportion used for home consumption is just the other way round. Sales are mainly in village (control farmers) or District markets (beneficiary). Very few sales are through contracts or cooperatives (both around 3%).

In Safal areas the proportion of sales is comparable: around 48% is sold and a similar proportion is used for home consumption. For aquaculture, as expected, we find a significant difference between Safal beneficiaries (85% sold) and control farmers (72% sold). Again, sales are mainly through District and village markets, with a slightly higher proportion of sales through contracts (6%) and none through cooperatives.

For aquaculture, the sales by the (medium and large) aquaculture producers (Safal beneficiaries) is commonly through a contract (42%), which shows a stark difference with the control group (2% only through a contract).

Table 18 Production per HH in kgs (last 12 months) and sales (in percentages)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Number of HHs producing crops	293	303	236	44	200	22
Production of crops (kgs)	*1575.6*	*3015.4*	*2738.5*	*1161.7*	*2158.1*	*1722.2*
Sold and stored for sale	55.4%	38.5%	48.1%	54.5%	48.2%	42.5%
Consumed and stored for consumption	37.9%	56.5%	49.2%	30.8%	46.9%	44.2%
Other (a.o. given away)	6.7%	5.0%	2.8%	14.8%	4.9%	13.2%
Number of HHs practicing fishery	159	225	196	8	82	8
Production of fisheries (kgs)	*131.6*	*201.2*	*459.5*	*178.4*	*210.5*	*146.3*
Sold and stored for sale	34.3%	29.7%	14.0%	34.5%	28.0%	32.9%
Consumed and stored for consumption	64.1%	67.1%	85.2%	65.5%	71.6%	66.2%
Other (a.o. given away)	1.6%	3.6%	0.7%	0.0%	1.3%	0.9%

Table 19 Distribution of sale volumes by channel (in percentages)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Sale volume of crops (kgs)						
Farmgate	1.0	2.0	3.0	4.0	5.0	6.0
Village market	28.7	77.4	49.8	69.3	42.8	80.5
District market	64.2	17.5	38.6	30.7	50.6	19.5
Contract	3.0	2.1	5.8	0.0	6.7	0.0
Cooperative	4.1	3.0	0.8	0.0	0.0	0.0
Sale volume of fisheries (kgs)						
Farmgate	0.0	0.0	4.9	0.0	0.0	0.0
Village market	38.6	49.1	20.4	9.8	19.4	6.3
District market	56.2	37.6	36.7	90.2	78.3	55.6
Contract	5.2	13.2	42.4	0.0	2.3	38.1
Cooperative	0.0	0.1	0.3	0.0	0.0	0.0

Table 20 Average prices (in USD) per kg

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Average sales price						
Rice	0.27	0.23	0.24	0.23	0.25	0.24
Other crops	1.63	0.26	0.20	NA	0.26	0.18
Aquaculture	6.94	3.71	4.67	8.97	3.37	3.86

7. Livestock and poultry

7.1 Size, purchase and sale

More than half the households in the survey own one or more milk cows. The same applies for chicken and ducks. Other types of livestock like bullocks and goats are less frequently part of the stock. The differences between the six survey groups are small (Table 21, 17 and 18). From the households with milk cows less than half the households own one milk cow; the others have two or more.

For all groups the purchases and sales of livestock are few. Purchases are taken as a percentage of the number of animals reported, minus purchases plus sales.

The average sale price of a milk cow differs from USD 103 in the Safal landless control area to USD 234 in the Safal landowners beneficiary area. The place of sale differs between the four areas: in the BG area a considerable part of livestock and poultry is sold at a market place, especially in the BG beneficiary area. In the Safal beneficiary area the vast majority of sales took place at the farm gate. Interestingly, the average price in the Safal farmers (landowners) area is higher than elsewhere.

We also observe that the smaller the animals, the less the man in the household is involved in the decision to sell and to control the money earned from the sale.

Table 21 Percentage distribution of production and marketing of livestock and poultry (for BG areas)

	Study areas											
	Blue gold beneficiary, n=400						Blue gold control, n=400					
Number of HHs with at least one:	Bullock, n=82	Milk cow, n=213	Goat n=34	Hen n=261	Duck n=205	Others n=17	Bullock n=92	Milk cow, n=211	Goat n=55	Hen n=276	Duck n=214	Others n=15
Ownership	98.88	96.06	95.88	99.42	100	69.47	100.00	99.59	98.30	99.89	99.65	100.00
Present number												
1	41.46	44.13	32.35	23.75	9.27	17.65	53.26	44.08	27.27	25.00	8.41	0.00
2	28.05	23.94	17.65	10.73	11.22	17.65	25.00	26.07	29.09	15.94	9.81	13.33
3+	30.49	31.92	50.00	65.52	79.51	64.71	21.74	29.86	43.64	59.06	81.78	86.67
# bought last 12 months												
0	84.15	84.51	88.24	83.52	79.02	52.94	76.09	88.15	78.18	84.78	71.50	93.33
1	10.98	10.80	2.94	2.30	0.00	23.53	17.39	6.64	12.73	1.45	1.40	6.67
2	2.44	4.23	8.82	3.45	7.80	11.76	5.43	3.32	5.45	3.99	6.07	0.00
3+	2.44	0.47	0.00	10.73	13.17	11.76	1.09	1.90	3.64	9.78	21.03	0.00
Purchase value												
Mean (USD) [a]	137.25	202.62	25.07	2.69	2.16	121.72	190.99	198.38	22.63	3.03	2.70	514.31
# sold last 12 months												
0	84.15	89.76	79.41	85.82	89.27	88.24	73.91	85.78	87.27	84.42	86.92	86.67
1	9.76	6.10	2.94	1.53	0.98	5.88	16.30	9.00	0.00	1.45	0.00	6.67
2	2.44	2.82	2.94	1.53	1.95	5.88	6.52	3.32	3.64	1.81	1.87	0.00
3+	3.66	1.41	14.71	11.11	7.80	0.00	3.26	1.90	9.09	12.32	11.21	6.67
Sales value												
Mean (USD)	133.36	137.06	27.95	4.44	3.36	266.80	189.24	195.90	34.13	2.82	3.08	35.36
Place where sold												
Farm gate	38.46	59.09	42.86	75.68	59.09	0.00	70.83	76.67	57.14	76.74	64.29	0.00
Village	61.54	40.91	57.14	24.32	36.36[f]	100.0	29.17	23.33	42.86	23.26	35.71	100.0
Decision to sell												
Male	92.31	100.00	71.43	32.43	22.73	100.00	100.00	93.33	71.43	37.21	25.00	100.00
Female	7.69	0.00	28.57	67.57	77.27	0.00	0.00	6.67	28.57	62.79	75.00	0.00
Controls sales money												
Male	100.00	90.91	71.43	40.54	31.82	100.00	100.00	93.33	71.43	44.19	42.86	100.00
Female	0.00	0.09	28.57	59.46	68.18	0.00	0.00	6.67	28.57	55.81	57.14	0.00

[f] One out of 22 ducks is sold somewhere else.

Table 22 Percentage distribution of production and marketing of livestock and poultry (for Safal project, landowners)

	Study areas											
	Safal beneficiary, n=400						Safal control, n=400					
Number of hhs with at least one:	Bullok, n=77	Milk cow n=177	Goat n=39	Hen n=158	Duck n=149	Others n=9	Bullok n=57	Milk cow, n=152	Goat n=62	Hen n=169	Duck n=108	Others, n=4
Ownership	98.28	97.36	98.06	99.74	99.12	100.00	97.56	97.60	92.70	100.00	98.20	100.00
Present number												
1	44.16	42.37	30.77	33.54	6.71	11.11	68.42	55.92	37.10	31.36	18.52	0.00
2	31.17	32.20	7.69	11.39	12.75	33.33	21.05	27.63	20.97	13.02	15.47	0.00
3+	24.68	25.42	61.54	55.06	80.54	55.56	10.53	16.45	41.94	55.62	65.74	100.00
# bought last 12 months												
0	79.22	89.83	82.05	89.87	71.14	77.78	87.72	92.76	93.55	89.94	83.33	75.00
1	12.99	7.34	15.38	1.27	1.34	22.22	12.28	6.58	6.45	1.18	0.93	0.00
2	6.49	2.82	2.56	3.16	8,72	0	0.00	0.66	0.00	2.96	4.63	0.00
3+	1.30	0.00	0.00	5.70	18.79	0	0.00	0.00	0.00	5.92	11.11	25.00
Purchase value												
Mean (USD.) [a]	223.17	234.31	27.74	1.80	2.50	142.40	240.81	194.03	25.07	2.20	2.01	2.57
# sold last 12 months												
0	77.92	82.49	79.49	94.30	91.95	88.89	84.21	89.47	88.71	91.72	91.67	75.00
1	15.58	11.86	10.26	0.63	0.67	0.00	15.79	7.24	3.23	0.00	0.93	0.00
2	3.90	3.39	7.69	1.27	2.01	11.11	0.00	3.29	3.23	1.18	1.85	0.00
3+	2.60	2.26	2.56	3.80	5.37	0.00	0.00	0.00	4.84	7.10	5.56	25.00
Sales value												
Mean	343.56	285.16	39.27	2.97	3.18	16.07	337.16	234.25	53.57	4.24	2.77	1.29
Place where sold												
Farm gate	94.12	83.87	100.00	88.89	100.00	0.00	88.89	68.75	42.86	92.86	100.00	100.00
Village	5.88	16.13	0.00	11.11	0.00	100.00	11.11	31.25	57.14	7.14	0.00	0.00
Decision to sell												
Male	94.12	96.77	75.00	22.22	25.00	0.00	100.00	93.75	71.43	21.43	33.33	100.00
Female	5.88	3.23	25.00	77.78	75.00	100.00	0.00	6.25	28.57	78.57	66.67	0.00
Controls sales money												
Male	88.24	87.10	75.00	11.11	41.67	0.00	100.00	93.75	71.43	35.71	33.33	100.00
Female	11.76	12.90	25.00	88.89	58.33	100.00	0.00	6.25	28.57	64.29	66.67	0.00

Table 23 Percentage distribution of production and marketing of livestock and poultry (for Safal project, landless)

	Study areas											
	Safal beneficiary, n=400						Safal control, n=400					
Number of hhs with at least one:	Bullok, n=25	Milk cow n=55	Goat n=15	Hen n=65	Duck n=57	Others n=0	Bullok n=17	Milk cow, n=54	Goat n=24	Hen n=65	Duck n=40	Others, n=0
Ownership	100.00	92.59	89.29	100.00	100.00	-	96.55	87.50	88.37	100.00	100.00	-
Present number												
1	52.00	65.45	53.33	27.69	8.77	-	70.59	68.52	58.33	40.00	25.00	-
2	32.00	23.64	20.00	26.15	24.56	-	5.88	20.37	20.83	13.85	7.50	-
3+	16.00	10.91	26.67	46.15	66.67	-	23.53	11.11	20.83	46.15	67.50	-
# bought last 12 months												
0	88.00	89.09	93.33	96.92	80.70	-	76.47	85.19	83.33	93.85	80.00	-
1	12.00	10.91	6.67	0.00	0.00	-	0.00	12.96	8.33	0.00	0.00	-
2	0.00	0.00	0.00	1.54	10.53	-	17.65	1.85	8.33	1.54	2.50	-
3+	0.00	0.00	0.00	1.54	8.77	-	5.88	0.00	0.00	4.62	17.50	-
Purchase value												
Mean (USD.) [a]	150.01	121.08	12.86	2.46	2.36	-	98.04	103.32	26.52	2.65	2.02	-
# sold last 12 months												
0	88.00	90.91	93.33	92.31	96.49	-	88.24	83.33	79.17	93.85	95.00	-
1	8.00	9.09	0.00	0.00	0.00	-	11.76	14.81	8.33	1.54	0.00	-
2	4.00	0.00	6.67	3.08	1.75	-	0.00	1.85	8.33	0.00	0.00	-
3+	0.00	0.00	0.00	4.62	1.75	-	0.00	0.00	4.17	4.62	5.00	-
Sales value												
Mean	201.44	223.72	25.72	2.59	5.46	-	186.44	213.58	40.29	2.55	3.54	-
Place where sold												
Farm gate	100.00	100.00	100.00	100.00	100.00	-	50.00	55.56	100.00	75.00	100.00	-
Village	0.00	0.00	0.00	0.00	0.00	-	50.00	44.44	0.00	25.00	0.00	-
Decision to sell												
Male	100.00	100.00	100.00	0.00	100.00	-	100.00	88.89	80.00	0.00	0.00	-
Female	0.00	0.00	0.00	100.00	0.00	-	0.00	11.11	20.00	100.00	100.00	-
Controls sales money												
Male	100.00	100.00	100.00	20.00	100.00	-	100.00	88.89	80.00	25.00	0.00	-
Female	0.00	0.00	0.00	80.00	0.00	-	0.00	11.11	20.00	75.00	100.00	-

7.2 Production and use of dairy products

Milk and eggs are the main dairy products and are important products being sold in both BG and Safal areas. These are also important products for the landless in the Safal areas. Of the produced milk 32-68% is sold, highest for the landless in the Safal control area (68%). Of the produced eggs, a lower proportion (29-39%) is sold, the majority is for home consumption.

Both milk and eggs are predominantly sold at the farmgate. The women are involved in the decision to sell, more so for eggs (70-87%) than for milk (33-100%) and also control the money obtained from eggs (60-79%) and milk (24-100%).

Table 24 Production and use of dairy products (per year)

	Blue Gold				Safal beneficiary areas				Safal control areas			
	beneficiaries		Controls		Farmers		landless		farmers		landless	
# hhs with at least one	**98**	**234**	**125**	**212**	**84**	**165**	**12**	**52**	**60**	**123**	**18**	**52**
	milk (L)	egg (n)	milk (L)	egg (n)	milk (L)	egg (n)	milk (L)	egg (n)	milk (l)	egg (n)	milk (l)	egg (n)
Produced (average)	396	508	569	488	802	639	297	349	568	547	581	508
Consumed	67.3	68.1	46.0	67.6	35.5	60.8	60.3	67.7	44.2	69.4	30.4	61.4
Sold	30.6	28.9	51.6	29.4	64.4	38.1	39.7	32.0	53.7	29.0	68.3	38.6
given away	2.1	2.9	2.3	3.0	0.1	1.0	0.0	0.3	2.1	1.5	1.3	0.0
If sold where (%)												
Farm gate	71.4	78.3	85.2	79.4	90.2	93.2	100	93.8	84.3	89.5	92.3	81.0
Village	23.8	21.7	14.8	19.1	7.8	6.8	0.0	6.3	15.6	10.8	7.7	19.1
Other	4.8	0.0	0.0	1.59	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Who decides to sell (%)												
Male	66.7	20.0	64.8	30.2	51.0	18.6	0.0	18.7	53.1	13.2	46.2	28.5
Female	33.3	80.0	35.2	69.8	49.0	81.3	100	81.2	46.9	86.8	53.9	71.4
Who controls the money (%)												
Male	76.2	40.0	61.1	38.1	54.9	28.8	0.0	25.0	59.4	21.1	53.9	33.3
Female	23.8	60.0	38.9	61.9	45.1	71.2	100	75.0	40.6	79.0	46.2	66.7

8. Income, investments, costs and profits

8.1 Income by source

While income from crops, fish sales and proceeds from sale of livestock were obtained for the past 12 months, proceeds from sales of dairy were obtained for the past month. For the non-farm income, while income from remittance, land rent, rent of other property, other cash receipts were obtained for the past 12 months, wage labour of the household head and three other members were obtained for the past month. Incomes are presented as *yearly* averages. Those income sources that are measured over the past month are multiplied by twelve. This may constitute a significant error because the sales that were obtained per month may vary greatly per month over one year period.

Farm incomes are obtained by taking the production volume per product and multiplication by its realized price. To obtain an average realized price per product we took the price per channel used to sell that product and weigh these prices by the share of the channel in the volume sold. We use these weighted realized prices as shadow prices for the production that is stored or consumed.[z]

Table 21 shows the annual farm and non-farm incomes (in USD). For the BG areas, both farm and non-farm incomes are higher for the control than the beneficiary farmers, resulting in a significant difference (almost 50%) of total income per year between these two groups. Lower farm incomes could be related to more natural calamities and the effects on production and yields.

For the Safal areas, as expected the farm incomes are by far highest for the Safal beneficiaries. Non-farm incomes are slightly higher for the Safal control farmers. Overall incomes are clarly highest for the Safal beneficiary farmers. For the landless, farm incomes are as expected very low. Non-farm incomes for the landless are average for those in the Safal target area, and very high in the Safal control area. The latter may be expected given the fact that the control area is a more urbanised area, with more job opportunities in the vicinity.

There are households in the Safal control area with a high yield per hectare, but not a high income. As an example, household #902 produced 3400 kg of rice, 400 kg of fish and 3000 kg of other vegetables. However, the farm income of this household is only USD 2,434. The biggest amount of their income is from agriculture (rice and “other vegetables”). They did not sell the rice. Therefore a shadow price of 0.33 USD is used to calculate the shadow income

[z] This amount is calculated by subtracting the sales of production. There are two households (372 and 891) that sold more in the past 12 months than they produced. This is possible, because there is a delay in sales. For these households the production not sold is set to zero.

from rice. This is only 1,106 USD. They did not sell the other vegetables either. The shadow price is 0.27 USD. So there is shadow income from other vegetables of 805 USD.[3]

Table 25 Yearly Farm and Non-Farm Income (in USD)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Yearly farm income (BG excluding livestock)						
Average	825.05	1066.160	1657.31	243.18	732.56	192.91
Minimum	5.46	6.31	0.75	0.56	0.47	0.47
Maximum	12928.33	15399.33	26302.16	2125.51	7386.67	2160.89
N	307	334	258	76	230	65
Yearly non-farm income						
Average	1,469.46	2,064.96	2,311.03	1,522.46	2,425.98	2,454.75
Minimum	0.62	18.00	12.96	51.43	36.00	70.72
Maximum	16,663.49	17,589.24	17,820.67	1,6663.49	22,217.98	26,229.56
N	303	316	212	122	240	125
Total Yearly Income (BG excluding livestock)						
Average	1805.003	2573.03	3410.87	1595.48	2811.70	2475.83
Minimum	39.16	15.20	0.84	66.16	2.62	23.74
Maximum	18383.74	18372.37	27235.63	16,666.29	22741.40	26,235.17
N	387	392	269	128	267	129

[3] On top of that, household 902 produced 3000 kg of tomatoes over the last 12 months (Module G1). However tomatoes do not appear in Module G4 and G5, used to calculate the income from cultivation. 21 households produced between20 and 6000 kg of tomatoes.

Table 26 Sources non-farm income (in percentages)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Wage labour earnings	40.0	26.1	17.2	44.8	17.5	22.9
Shop or (off-farm) enterprise profit	42.7	57.4	66.1	50.1	67.6	71.4
Remittances	5.4	5.0	3.5	0.0	2.7	0.8
Land rent	5.3	3.5	4.7	0.2	2.8	0.2
Rent of other profits	1.9	0.1	0.5	0.2	1.0	0.2
Cash receipts	0.1	0.0	0.0	0.0	0.0	0.0
Other sources	4.6	7.9	8.0	4.7	8.4	4.6

Table 27 gives the savings and loans by surveyed households. Many farmers (land owners) have savings (36-46%), more of these farmers have loans (63-69%). Of the landless, the proportion of those with savings is lower (21-24%) but the proportion of those having loans is the same. Savings are done by both men and women (30-55%), somewhat more by men. Loans were taken very commonly by men (50-70%), much less so by women (10-25%).

Table 27 Financial situation: savings and loans

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Households with savings *Proportion of HHs*	150 38%	123 31%	123 46%	27 21%	97 36%	31 24%
Who saved the money?						
Male	47.33	56.10	43.90	48.15	37.11	38.71
Female	37.33	28.46	25.20	40.74	40.21	35.48
Both	15.33	15.45	30.89	11.11	22.68	25.81
Households with loans *Proportion of HHs*	253 63%	277 69%	168 62%	80 62%	187 69%	90 69%
Who lent the money?						
Male	72.33	71.84	66.67	57.50	66.31	52.22
Female	18.58	10.83	13.69	17.50	16.04	26.67
Both	9.09	17.33	19.64	25.00	17.65	21.11

8.2 Entrepreneurship

Table 28 shows the willingness of farmers to invest a certain amount of money in order to increase their annual income by 10%. It shows that the beneficiary farmers in the Safal areas are more willing to invest than the farmers in the control areas.. As expected, among the landless the willingness (and the means) to invest is much lower . The average amount farmers arewilling to invest ranges from 1,100 among the landless in the Safal beneficiary areas to 4,500 in 4,500 in the safal beneficiary areas. In the Blue gold areas there is hardly any difference between beneficiaries and controls. The average here is about 4,300 taka.

Table 28 Willingness to invest to increase annual income by 10% (percentage)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Investment (taka)	%	%	%	%	%	%
10,000	18.50	21.50	25.19	1.54	15.19	2.31
8,000	5.75	4.25	2.59	0.00	3.33	0.77
6,000	13.75	9.50	9.63	2.31	8.15	1.54
4,000	15.00	17.75	13.33	3.85	13.70	2.31
2,000	18.00	19.00	25.93	6.92	14.44	13.08
1,000	12.25	10.75	11.85	19.23	13.33	19.23
Less than 1,000	16.75	17.25	11.48	66.15	31.85	60.77
Average investment (taka) [a]	4301.25	4343.75	4531.48	1107.69	3403.70	1234.62

a Averages are calculated by taking 500 taka for “less than 1,000”.

Table 29 shows the average time required to earn back the investment, if the maximum initial investment farmers to increase their annual income by 10% is linked to 10% of the their total annual household income. For example, if a household has a total (farm and non-farm) income of 150,000 BDT, an investment of 10,000 BDT would be earned back in 8 months. The shorter recuperation time is expected to be associated with higher income. Therefore, higher income farmers are more willing to invest higher amounts of money. The recuperation time is an indicator of riskiness or enterpreneurial spirit: the longer the time needed to earn back an investment the more one is exposed to risk.

The BG farmers, especially in the beneficiary areas, have longest recuperation time, so take the greatest risk. In the Safal areas farmers are less vulnerable to risk, irrespective of their household income.

Table 29 Proportion of farmers with a defined time until the investment is recouped

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Number of HHs willing to invest and household income present	327	328	238	44	184	50
Recoupment time	%	%	%	%	%	%
1 month	8.26	14.33	25.21	11.36	21.20	24.00
1 to 3 months	29.05	29.88	26.89	50.00	32.07	44.00
3 to 6 months	18.35	24.70	23.95	22.73	22.28	18.00
6 to 12 months	22.02	18.60	18.91	6.82	19.02	8.00
1 to 3 years	16.82	10.98	3.78	6.82	3.80	4.00
3 to 10 years	3.98	0.61	1.26	2.27	1.09	0.00
10 years or more	1.53	0.91	0.00	0.00	0.54	2.00
Average recoupment time in months	65.23	29.43	4.44	5.19	7.75	5.31

8.3 Input costs and profits

Input costs (Table 30) vary greatly. Note that these only concern farmers who undertake cultivation or fisheries, so farmers who make input costs. Profits made (Table 31) also show much variation. The comparison shows that Safal beneficiary farmers make highest input costs but also have highest average profits, followed by the BG control farmers. It seems that some landless in Safal control areas also make high input costs, but their profits are not accordingly high. The highest investment costs are clearly on aquaculture, and most likely here also the highest profits can be made. The next highest input costs are labour.

Table 30 Total annual input costs (in USD) - only households with production

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Hired Labour	108.52	160.83	161.20	45.43	128.72	58.30
Seed/Plants	20.64	25.05	22.23	12.24	20.12	16.48
Organic Fertilizer	15.47	12.21	58.50	0	15.56	0
Chemical Fertilizer	23.82	49.58	55.89	27.70	51.56	46.00
Pesticide	13.83	23.35	15.50	7.07	18.66	9.26
Irrigation cost	22.79	45.45	61.02	39.52	54.29	35.11
Finger Lings and Fish Feed	88.54	200.95	413.80	105.59	297.77	350.05
Veterinary product	27.77	29.42	21.63	9.43	18.45	23.14
Other Cultivation Cost	31.37	176.88	75.35	0	27.70	480.88
Total	352.75	724.02	883.12	246.98	632.83	538.34

Table 31 Profits (in USD) - only households with production

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Profits from production						
Average	776.32	1,003.64	1,253.58	392.55	639.46	310.68
Minimum	-422.47	-862.14	-3081.53	-147.86	-393.93	-857.21
Maximum	12,242.47	30,928.47	25,636.98	2,471.61	8,379.28	1,966.58
Households with no profit	6.1%	5.9%	6.7%	4.4%	6.7%	8.7%
N	311	338	252	45	207	23

8.4 Construction of a wealth index

From household assets, found in several parts of the survey, we constructed a wealth index. The indices are constructed for Blue Gold en Safal separately. The index for the Blue Gold area is based on 45 items. For the Safal area we also included livestock, so the index for Safal is based on 56 items. Each of these variables is standardized such that its average is zero and its standard deviation is one (a z-score) over the baseline and endline together, because we want to compare over time. To determine the importance of separate items for the welfare of households we weight the items by using a principal component analysis (PCA) before summing them up. PCA is a valuable approach to weight according to Moser and Felton (2007) because it has a fairly intuitive interpretation (see Box 8-1).

Box 8-1 Why use PCA from Moser and Felton (2007)

"The coefficient on any one variable is related to how much information it provides about the other variables. If ownership of one type of asset is highly indicative of ownership of other assets, then it receives a positive coefficient. If ownership of an asset contains almost no information about what other assets the household owns (its correlation coefficient is near zero), then it receives a coefficient near zero. And if ownership of an asset indicates that a household is likely to own few other assets, then it receives a negative coefficient. Higher and lower coefficients mean that ownership of that asset conveys more or less information about the other assets. This makes PCA excellent for modelling a presumed underlying continuous variable, such as wealth. If ownership of a certain asset is highly correlated with owning the other assets that were asked about in the survey, then it is likely also correlated with owning other types of assets that were not in the survey. For example, wealthy households are more likely to own a television than poor ones, but mobile phone ownership is spread evenly across the area. Therefore, knowing that one household owns a television provides us with more information about that household's wealth than a mobile phone does, and it receives a higher weighting."

Because the data covers multiple time periods, the "values" of these assets may have changed between observations. We address this issue by aggregating the data across time. Summing the weighted Z-scores of the items yields our proposed wealth index.

The scores on the wealth index can be ordered by size and divided into 25% groups. This gives quartiles: in the first quartile are the 25% households with the lowest wealth scores; the fourth quartile contains those with the highest scores. If the wealth score of each household would be the same the wealth distribution would be uniform: 25% in each quartile.

Whilst the Safal control group has highest non-farm income it is lowest in wealth. This may be due to a "farming bias" in the choice of items to construct the wealth index. The difference in wealth between BG beneficiaries and controls is smaller than what one would expect from the difference in agricultural production and non-farm income.

Table 32 Wealth distribution in quartiles (in percentages)

	Study areas					
	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
	n=400	n=400	n=270	n=130	n=270	n=130
First quartile (low)	25.50	24.50	6.67	57.69	14.44	52.31
Second quartile	25.25	24.75	19.26	27.69	27.78	28.46
Third quartile	27.25	22.75	27.04	11.54	33.70	16.15
Fourth quartile (high)	22.00	28.00	47.04	3.08	24.07	3.08

To check the validity of this constructed index we cross it against the HFIP food security scale. Our hypothesis is that wealth and food security are correlated. Table 33 shows that, in a statistical sense, food security and wealth go together.

Table 33 Wealth distribution versus food insecurity Blue Gold (in percentages)

	food secure	Extent of food insecurity (HFIP)		
		mildly	moderately	severely
	n=454	n=158	n=98	n=90
First quartile (low)	13.44	23.42	44.90	64.44
Second quartile	19.60	39.87	26.53	24.44
Third quartile	29.74	22.78	20.41	10.00
Fourth quartile (high)	37.22	13.92	8.16	1.11

Table 34 Wealth distribution versus food insecurity Safal (in percentages)

	food secure	Extent of food insecurity (HFIP)		
		mildly	moderately	severely
	n=356	n=183	n=137	n=124
First quartile (low)	8.43	18.03	45.99	59.68
Second quartile	19.38	24.59	34.31	31.45
Third quartile	33.43	27.32	15.33	8.06
Fourth quartile (high)	38.76	30.05	4.38	0.81

Each household is assigned a z-score on each of the items in the wealth index. A variable is standardized by subtracting its mean and dividing the difference by its standard deviation. The relative wealth index for an individual household is the sum of all standard scores of the items considered.

Some of these variables are dummy variables, such as household owned assets (see tables below). For example on average 89% of the households owns a mobile phone. By using z-scores not having a mobile phone yields a relatively large negative contribution to the wealth

index and having one means only a small positive contribution to the index. So, z-scores take account of the relative uniqueness of having or not having a specific item. Other dummy variables considered in the wealth index are (see Table 37):

- relatively luxurious materials used to build the walls and/or the roof of the house: 1= build with tin, cement, brick, rod or wood, 0=otherwise).
- whether they are connected to the electricity network or use solar energy (1=yes, 0=no), and kind of energy source for cooking (1=electricity, gas, kerosene stove or earthen stove, 0=fire wood or cow dung).

Continuous and ordinal variables used in the wealth index are:

- type and number of cattle the household owns;
- savings and loans. Loans are multiplied by minus one because it is a negative attribute;
- kind of toilet: 0=pit latrine with slab, 1=modern latrine/pit with flash, -1=else;[ɬ]
- area of homestead;
- area of cultivable land;
- area of owned fish ponds.

Table 35 Ownership of HH assets, transport, productive and agricultural tools [a]

	Blue Gold		Safal	
Variables	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
HH assets				
Radio/cassette player	0.11	0.32	0.05	0.21
Electric fan	0.33	0.47	0.59	0.49
Computer	0.01	0.10	0.02	0.13
Mobile phone	0.92	0.27	0.86	0.35
Television	0.24	0.43	0.35	0.48
Dish antenna / decoder	0.05	0.22	0.12	0.33
VCD/DVD	0.02	0.14	0.02	0.15
Air Conditioning / Fans / Heaters	0.00	0.00	0.00	0.04
Washing Machine	0.00	0.00	0.00	0.00
Stove / oven/ micro-oven	0.00	0.00	0.01	0.10
Clock	0.42	0.49	0.22	0.41
Jewellery	0.68	0.47	0.59	0.49
Transport				
Pickup/vehicle	0.02	0.13	0.02	0.14
Motor bike	0.04	0.21	0.06	0.24
Bicycle	0.28	0.45	0.56	0.50

[ɬ] 'Kind of toilet' is a categorical variable. A disadvantage of using normal PCA with categorical variables is that the 'distance' between having a modern latrine/pit with flash and a pit latrine with slab is the same as the 'distance' between having a pit latrine with slab and something worse. Polychoric PCA is considered to be better method for categorical variables. However, we used just one categorical variable so we decided to do the more simple analysis.

	Blue Gold		Safal	
Variables	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Productive				
Local boat	0.08	0.27	0.11	0.32
Engine driven boat	0.01	0.09	0.00	0.05
Fishing net	0.60	0.49	0.46	0.50
Rickshaw/van	0.11	0.31	0.10	0.29
Bus/tram	0.00	0.00	0.00	0.00
CNG/auto rickshaw	0.01	0.10	0.01	0.10
Buffalo cart	0.00	0.00	0.01	0.08
Tractor	0.01	0.09	0.00	0.06
Power tiller	0.05	0.22	0.01	0.10
Spraying machines	0.21	0.41	0.18	0.39
Tube well	0.31	0.46	0.51	0.50
Barrow	0.00	0.05	0.00	0.04
Trolley	0.00	0.00	0.01	0.07
Agricultural tools				
Plough	0.19	0.39	0.04	0.19
Irrigation pump	0.10	0.30	0.11	0.31
Axe	0.57	0.49	0.61	0.49
Kodal (Spade)/ Shabol (Shovel)	0.89	0.31	0.86	0.35
Paddle thresher	0.02	0.14	0.07	0.25
Chopper	0.94	0.24	0.95	0.23
Treadle pump	0.00	0.06	0.00	0.04
Hoe	0.31	0.46	0.25	0.43
Threshing machine	0.03	0.17	0.04	0.20
Shallow tube well	0.10	0.29	0.17	0.38
Power pump	0.02	0.13	0.02	0.13

Source: Section D of the baseline household questionnaire.

Table 36 Ownership of livestock and poultry [b]

	Safal	
Variables	**Mean**	**Standard deviation**
Number of:		
bullocks	0.41	1.18
cows	0.90	1.10
buffalos	0.00	0.00
horses	0.00	0.04
pigs	0.00	0.00
goats	0.47	1.62
sheep	0.04	0.67
hens	2.70	4.96
ducks	2.36	4.36

pigeons	0.12	1.41

Source: Section K.1 of the baseline household questionnaire

Table 37 Housing: construction materials

	Blue Gold		Safal	
Variables	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Walls are made of tin, cement, bricks, rod or wood (1=yes)	0.64	0.48	0.47	0.50
Roof is made of tin, cement, bricks, rod or wood (1=yes)	0.87	0.33	0.82	0.38
Lighting (1=electricity or solar power; 0=gas, kerosene lamps, battery charger)	0.43	0.49	0.65	0.48
Cooking (1=electricity, gas, kerosene stove, earthen stove; 0=fire wood or something else)	0.49	0.50	0.54	0.50

Source: Section H of the baseline household questionnaire

Table 38 Financial situation: savings and loans

	Blue Gold		Safal	
Variables	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Total amount in taka of all savings outstanding	11464.40	48033.34	8655.67	41799.15
Total amount in taka of all loans outstanding	47224.75	127414.72	30913.63	51658.53

Source: Section E of the baseline household questionnaire

Table 39 Kind of toilet facility

	Blue Gold		Safal	
Variables	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Quality of toilet: 1=Modern latrine/ pit with flush, 0= Pit latrine with slab, -1= Else/worse	0.16	0.49	0.19	0.54

Table 40 Currently owned land

	Blue Gold		Safal	
Variables	**Mean**	**Standard deviation**	**Mean**	**Standard deviation**
Homestead (in hectares)	0.08	0.13	0.05	0.08
Cultivable land (in hectares)	0.53	1.05	0.34	0.63
Ponds (in hectares)	0.01	0.03	0.01	0.08

Source: Section F1 of the baseline household questionnaire

Table 41 shows the contribution of the assets to the wealth index. Having an electric fan, a television, an irrigation pump, a spraying machine and electricity or solar power are examples of items that wealthy households often have.

Table 41 Component Score Coefficient Matrix

	Component 1	
Variables	**Blue Gold**	**Safal**
HH assets		
Radio/cassette player	.1003259	.0713035
Electric fan	.3078956	.2594296
Computer	.1029284	.0722632
Mobile phone	.1305234	.1622334
Television	.2929981	.2658065
Dish antenna / decoder	.1138691	.1138124
VCD/DVD	.1133030	.0698430
Air Conditioning / Fans / Heaters	NA	.0211156
Washing machine	NA	NA
Stove / oven/ micro-oven	NA	.0518815
Clock	.1956013	.1994386
Jewellery	.1904489	.2162979
Transport		
Pickup/vehicle	.0147707	-.0058485
Motor bike	.1339995	.1579883
Bicycle	.2078829	.2140373
Productive		
Local boat	.1830138	.1655135
Engine driven boat	.0094330	-.0012432
Fishing net	.1906466	.2028441
Rickshaw/van	.0371945	-.0604990
Bus/tram	NA	NA
CNG/auto rickshaw	.0209396	-.0184420
Buffalo cart	.0405534	.0059488
Tractor	.0178411	.0378484
Power tiller	.1606546	.0652867
Spraying machines	.2606372	.2292847

	Component 1	
Variables	**Blue Gold**	**Safal**
Tube well	.1182025	.1352850
Barrow	.0078571	-.0046579
Trolley	.0006848	.0179210
Agricultural tools		
Plough	-.0036062	.1126686
Irrigation pump	.2441494	.2179919
Axe	.2630045	.2064547
Kodal (Spade)/ Shabol (Shovel)	.1498863	.1443284
Paddle thresher	.0829656	.1528602
Chopper	-.0374779	-.0790485
Treadle pump	.0073826	.0218786
Hoe	.1922385	.1202770
Threshing machine	.1433123	.1508456
Shallow tube well	.1572527	.1452608
Power pump	.1050618	.1055662
Livestock		
Number of:		
bullocks	NA	.1161806
cows	NA	.1513147
buffalos	NA	NA
horses	NA	-.0243544
pigs	NA	-.0005363
goats	NA	.0170059
sheep	NA	.0002772
hens	NA	.0838767
ducks	NA	.1376501
pigeons	NA	.0197770
Housing		
Walls are made of tin, cement, bricks, rod or wood (1=yes)	-.0417057	.1738568
Roof is made of tin, cement, bricks, rod or wood (1=yes)	.0484733	.1300504
Lighting (1=electricity or solar power; 0=gas, kerosene lamps, battery charger)	.2551045	.2362165
Cooking (1=electricity, gas, kerosene stove, earthen stove; 0=fire wood or something else)	.0433999	-.0642107
Financial		
Total amount in taka of all savings outstanding	.1600852	.1455125
Total amount in taka of all loans outstanding	.0567820	.1183896

	Component 1	
Variables	**Blue Gold**	**Safal**
Toilet		
Quality of toilet: 1=Modern latrine/ pit with flush, 0= Pit latrine with slab, -1= Else/worse	.1116391	.0747957
Owned land		
Homestead (in hectares)	.1102408	.1379064
Cultivable land (in hectares)	.1964183	.2015547
Ponds (in hectares)	.1499408	.0567984

9. Food security

The household food insecurity access scale (HFIAS) score is composed of nine questions about whether the household had insufficient resources to get enough food in the past four weeks. The questions represent occurrences of increasing severity. If the answer was YES, the frequency of that occurrence is measured by choosing between: Rarely (once or twice in the past four weeks); Sometimes (three or ten times); Often (more than ten times).

Table 42 Percentage of households experiencing food insecurity

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
1. In the past four weeks did you worry that your hh would not have enough food? YES	15.25	17.50	8.52	70.00	19.26	69.23
If yes, how often?						
Rarely	36.07	42.86	56.52	35.16	46.15	42.22
Sometimes	31.15	44.29	34.78	43.96	32.69	45.56
Often	32.79	12.86	8.70	20.88	21.15	12.22
2. In past four weeks, were you or any hh member not able to eat the kinds of food you preferred due to lack of resources? YES	31.00	38.25	35.19	80.77	41.11	84.62
If yes, how often?						
Rarely	57.26	52.29	69.47	21.90	53.15	44.55
Sometimes	17.74	20.92	12.63	44.76	25.23	37.27
Often	25.00	26.80	17.89	33.33	21.62	18.18
3. In the past four weeks, did you or any hh member have to eat a limited variety of foods due to a lack of resources? YES	18.25	20.50	10.00	65.38	21.11	66.92
If yes, how often?						
Rarely	54.79	47.56	70.37	48.24	50.88	48.28
Sometimes	24.66	32.93	22.22	31.76	31.58	41.38
Often	20.55	19.51	7.41	20.00	17.54	10.34
4. In the past four weeks, did you or any hh member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food? YES	18.25	23.25	15.93	63.85	25.56	69.23

If yes, how often?						
Rarely	56.16	44.09	69.77	45.78	52.17	47.78
Sometimes	15.07	29.03	20.93	37.35	33.33	40.00
Often	28.77	26.88	9.30	16.87	14.49	12.22
5. In the past four weeks , did you or any hh member have to eat a smaller meal than you felt you needed because there was not enough food? YES	15.00	12.50	6.67	48.46	11.11	57.69
If yes, how often?						
Rarely	53.33	46.00	50.00	47.62	46.67	46.67
Sometimes	25.00	36.00	38.89	38.10	26.67	40.00
Often	21.67	18.00	11.11	14.29	26.67	13.33
6. In the past four weeks, did you or any hh member have to eat fewer meals in a day because there was not enough food? YES	13.00	8.00	3.33	39.23	8.52	37.69
If yes, how often?						
Rarely	57.69	31.25	77.78	56.86	30.43	48.98
Sometimes	21.15	31.25	11.11	25.49	43.48	40.82
Often	21.15	37.50	11.11	17.65	26.09	10.20
7. In the past four weeks, was there ever no food to eat of any kind in your hh because of a lack of resources to get food? YES	5.25	5.75	0.74	27.69	5.93	32.31
If yes, how often?						
Rarely	57.14	43.48	50.00	61.11	37.50	57.14
Sometimes	33.33	34.78	0.00	27.78	37.50	33.33
Often	9.52	21.74	50.00	11.11	25.00	9.52
8. In the past four weeks, did you or any hh member go to sleep at night hungry because there was not enough food? YES	7.75	7.00	0.00	28.46	6.30	29.23
If yes, how often?						
Rarely	38.71	42.86	-	54.05	23.53	39.47
Sometimes	9.68	28.57	-	21.62	35.29	42.11
Often	51.61	28.57	-	24.32	41.18	18.42
9. In the past four weeks did you or any hh member go a whole day and night without eating anything because there was not enough food?	1.75	2.50	0.00	9.23	3.33	11.54

YES						
If yes, how often?						
Rarely	14.29	70.00	-	58.33	22.22	26.67
Sometimes	42.86	20.00	-	41.67	44.44	60.00
Often	42.86	10.00	-	0.00	33.33	13.33

The landless households in the Safal area (both beneficiary and control areas) are considerably more food insecure than the targeted farmers in the Safal area and the households living in the BG areas. “Cannot eat preferred food due to a lack of resources” is the most frequently reported item. The frequency distributions do not show structural differences.

A HFIAS score variable is calculated for each household by summing the codes for each frequency-of-occurrence question, with rarely = 1; sometimes = 2; often = 3, provided the occurrence happened. The maximum score for a household is 27 (if the household response to all nine frequency-of-occurrence questions was “often”); the minimum score is 0 (if the household responded “no” to all occurrence questions). The higher the score, the more food insecurity is experienced by the household. The results are in Table 43.

Table 43 Percentage of households by food insecurity status (HFIAS and HFIP)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Average household food insecurity access scale (HFIAS) score [a]	2.19 (3.94)	2.39 (4.25)	1.18 (2.38)	7.69 (5.66)	2.48 (4.89)	7.67 (5.88)
Household food insecurity prevalence (HFIP)						
Food secure	58.00	55.50	62.22	13.85	56.67	13.08
Mildly food insecure	16.75	22.75	27.41	18.46	22.96	17.69
Moderately food insecure	13.00	11.50	8.89	30.00	13.33	29.23
Severely food insecure	12.25	10.25	1.48	37.69	7.04	40.00

a standard deviations in brackets.

The nine HFIAS questions can also be used to construct a prevalence scale – the HFIP. This scale has four classes: "Food secure" is obtained when the answer to the first question is NO or Rarely and NO is the answer to other questions; "Severely food insecure" means that one or more of the last five occurrences have happened.[5]

Clearly the landless in the Safal areas are most food insecure on both the HFIAS and HFIP index, and the beneficiary farmers in the Safal area are most food secure.

From the last three questions in Table 42 the Household Hunger Scale (HHS) can be constructed by recoding the responses to the frequency-of-occurrence questions into two frequency categories: "rarely or sometime" (=1) and "often" (=2). The resulting scale has values that lie between 0 and 6. We then define three categories: 0-1=1 (little to no hunger), 2-3=2 (moderate hunger), 4-6=3 (severe hunger). On the basis of our sample the correlation between the HHS and the HFIAS scales is 0.78. The resulting frequencies are in Table 44. Again, the landless in the Safal areas are worse off than the BG areas, and the Safal beneficiary farmers have the best scoring.

Table 44 Percentage of households by Household Hunger Scale (HHS)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Little to no hunger in the household	93.75	94.75	99.63	74.62	93.70	73.08
Moderate hunger in the household	5.00	4.00	0.37	22.31	4.44	23.85
Severe hunger in the household	1.25	1.25	0.00	3.08	1.85	3.08

In further analysis we take the commonly used HFIAS as indicator of food insecurity.

[5] More specifically (Qk = 0 when the answer is NO; Qka > 0 when the answer is YES with a certain frequency category (1,2,3); k=1,…9).
HFIA category = 1 if [(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]
HFIA category = 2 if [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]
HFIA category = 3 if [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0]
HFIA category = 4 if [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3]

10. Nutrition

10.1 Nutritional Knowledge

Table 45 shows the knowledge among households about the presence in food items of iodine (fortified with iodine). This nutrient is important for brain development. This knowledge is generally good, but the landless have the lowest knowledge on this aspect. On the knowledge about what to do with a child that has diarrhea, the knowledge is good and there is not much variation (table 39). In BG areas the response of using traditional medicine is more commonly given (20%) compared to Safal areas (less than 10%). Knowledge about sanitation measures is very high and does not show much variation (Table 47).

Table 45 Seasoning (food item) often fortified with iodine (percentages)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Salt	85.50	84.00	87.78	62.31	77.04	70.00
Water	0.00	0.00	0.00	0.00	0.74	0.77
Vegetable/ potato/ pump	0.50	0.75	1.11	2.31	1.11	3.08
Fruits-banana/ papaya	0.25	0.50	0.00	0.77	0.00	0.00
Fish/ sea fish	0.75	0.75	0.00	0.77	0.74	0.00
Don't know	13.00	14.00	11.11	33.85	20.37	26.15

Table 46 What households think they should do when their child has diarrhea

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
ORS	97.00	97.00	99.26	96.92	99.63	98.46
Feed less than usual	33.50	31.25	31.48	26.92	34.44	30.00
Feed as much as usual	12.50	8.75	10.74	3.08	9.63	9.23
Feed more than usual	7.50	2.25	3.70	2.31	5.19	3.85
Give less liquids than usual	3.50	1.50	0.00	0.00	0.00	1.54
Give more liquids than usual	15.25	9.75	8.15	0.77	4.44	6.15
Give more liquids than usual	9.50	8.00	8.15	9.23	3.33	6.15
Breastfeed more often	2.25	2.75	4.81	0.77	1.48	0.77
Continue breastfeeding	2.75	1.25	5.19	0.77	2.59	0.77
Give syrups	4.25	6.75	5.56	3.08	4.44	3.08
Give traditional medicine	20.00	20.50	18.89	8.46	8.89	10.77
Give treated water	1.75	3.25	0.74	1.54	0.74	0.00
Give Carrot juice or rice water	2.00	0.25	0.74	0.00	0.00	0.00

Give Zinc	1.25	2.25	5.19	2.31	0.74	2.31
Other	1.75	2.50	0.00	1.54	1.85	0.77
Don't know	1.50	1.25	0.37	1.54	0.37	0.77

Table 47 When households think they should wash their hands

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Before eating	98.50	97.50	98.15	98.46	99.63	100.00
After using toilet	88.25	86.00	92.59	81.54	86.30	86.92
Before feeding child	62.00	64.50	51.48	75.38	52.96	55.38
Before cleaning a child who has defecated	12.25	17.75	21.85	6.15	12.59	13.08
Other	2.25	3.75	0.74	0.00	1.48	0.77
Don't know	0.25	0.00	0.00	0.00	0.00	0.00

10.2 Nutritional intake

Table 43 shows nutritional intake. For the analysed vitamins and minerals, the intakes are consistently lowest for BG beneficiaries, and highest for Safal farmers. Safal landless and BG control farmers are in between these two extremes. On average, energy and carbohydrate intakes are adequate, and so are protein intakes, but there are serious deficiencies in some minerals (calcium, iron), as well as a range of vitamins.

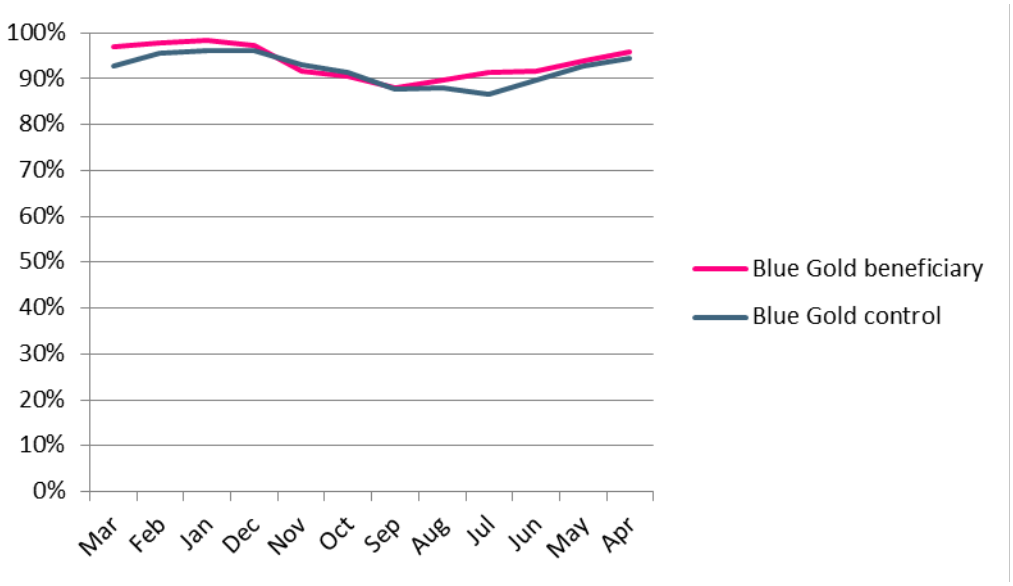
Table 48 Real intake compared to recommended intake of vitamins and minerals (percentage distribution of households)

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	controls	farmers	landless	farmers	landless
Energy						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	13.75	3.75	2.96	3.08	0.37	0.77
25-50%	7.75	2.50	3.70	3.08	0.74	0.77
50-75%	7.25	6.50	8.89	12.31	5.56	5.38
75-100%	9.75	9.25	6.67	13.85	8.52	12.31
At least 100%	61.00	78.00	77.78	67.69	84.81	80.77
Carbohydrate						
0%	0.75	0.00	0.00	0.00	0.00	0.00
Less than 25%	28.75	13.00	11.11	8.46	4.44	3.08
25-50%	13.00	7.25	12.96	16.92	7.04	10.77
50-75%	10.75	11.75	5.93	4.62	7.41	6.92
75-100%	16.50	18.50	11.48	13.85	13.70	15.38
At least 100%	30.25	49.50	58.52	56.15	67.41	63.85
Protein						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	23.50	7.00	6.30	6.15	1.85	3.08
25-50%	12.25	6.75	8.15	14.62	7.41	5.38
50-75%	17.25	19.00	8.89	19.23	11.11	12.31
75-100%	12.00	17.00	14.44	20.00	16.67	26.15
At least 100%	34.50	50.25	62.22	40.00	62.96	53.08
Calcium						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	66.75	52.75	48.52	76.15	51.11	68.46
25-50%	10.75	15.00	17.04	11.54	17.04	11.54
50-75%	5.25	7.50	8.52	3.08	5.93	6.15
75-100%	3.00	5.00	3.70	3.08	6.67	3.08
At least 100%	13.75	19.75	22.22	6.15	19.26	10.77
Iron						

0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	39.25	20.25	17.04	21.54	11.85	12.31
25-50%	38.25	50.25	46.67	50.00	49.26	54.62
50-75%	15.75	23.00	23.70	22.31	30.00	25.38
75-100%	4.00	4.25	9.26	3.85	5.93	6.15
At least 100%	2.25	2.25	3.33	2.31	2.96	1.54
Magnesium						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	22.25	7.50	4.44	5.38	1.11	0.77
25-50%	12.00	6.50	8.52	11.54	5.19	6.15
50-75%	9.75	8.50	7.78	9.23	4.81	3.85
75-100%	16.50	19.25	10.37	14.62	11.11	22.31
At least 100%	39.00	58.25	68.89	59.23	77.78	66.92
Zinc						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	24.00	7.00	5.93	4.62	1.48	3.08
25-50%	9.00	6.25	7.04	11.54	4.44	5.38
50-75%	14.25	17.00	6.67	14.62	9.63	13.08
75-100%	15.00	18.50	10.74	19.23	12.96	19.23
At least 100%	37.25	51.25	69.63	50.00	71.48	59.23
Vitamin A						
0%	2.75	0.75	0.37	1.54	0.00	0.00
Less than 25%	49.25	37.75	27.04	40.00	22.22	25.38
25-50%	18.50	16.75	15.56	17.69	17.41	21.54
50-75%	9.25	13.50	14.81	20.00	15.56	19.23
75-100%	5.50	9.50	10.00	10.00	14.07	10.77
At least 100%	14.75	21.75	32.22	10.77	30.74	23.08
Vitamin B1 Thiamin						
0%	0.75	0.00	0.00	0.00	0.00	0.00
Less than 25%	43.75	25.75	18.15	28.46	12.22	16.92
25-50%	24.75	34.00	31.48	46.92	34.44	47.69
50-75%	12.00	15.50	19.26	13.85	21.48	16.15
75-100%	6.75	7.50	10.74	6.15	13.70	7.69
At least 100%	12.00	17.25	20.37	4.62	18.15	11.54
Vitamin B2 Riboflavin						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	50.25	32.50	24.44	44.62	18.89	24.62
25-50%	12.00	20.75	15.93	18.46	20.00	26.15
50-75%	8.50	9.00	11.11	16.92	14.07	10.77

75-100%	5.00	6.25	7.41	4.62	10.37	10.00
At least 100%	23.75	31.50	41.11	15.38	36.67	28.46
Vitamin B3 Niacin						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	26.00	9.00	8.15	10.00	2.96	4.62
25-50%	15.00	9.75	8.52	14.62	6.67	7.69
50-75%	17.75	27.25	13.33	24.62	15.56	23.85
75-100%	13.75	17.50	22.59	23.08	21.11	26.15
At least 100%	27.00	36.50	47.41	27.69	53.70	37.69
Vitamin B6						
0%	1.75	0.50	0.00	1.54	0.00	0.00
Less than 25%	48.50	34.75	25.93	46.92	22.22	32.31
25-50%	28.00	31.75	35.19	36.15	35.93	41.54
50-75%	9.25	15.25	16.67	11.54	20.37	13.85
75-100%	4.50	10.00	8.89	0.77	10.74	7.69
At least 100%	8.00	7.75	13.33	3.08	10.74	4.62
Vitamin B9 Folate						
0%	0.50	0.00	0.00	0.00	0.00	0.00
Less than 25%	66.75	48.25	38.52	59.23	31.48	45.38
25-50%	18.50	31.50	31.48	31.54	38.89	36.92
50-75%	8.00	13.75	15.93	4.62	19.26	9.23
75-100%	4.25	4.25	8.89	2.31	5.93	6.15
At least 100%	2.00	2.25	5.19	2.31	4.44	2.31
Vitamin B12						
0%	29.00	13.50	9.26	25.38	7.04	18.46
Less than 25%	24.25	21.75	17.41	25.38	17.78	20.77
25-50%	7.25	8.00	9.26	7.69	9.63	10.00
50-75%	4.75	9.00	7.78	10.00	12.22	6.15
75-100%	3.75	8.50	5.19	5.38	5.93	10.77
At least 100%	31.00	39.25	51.11	26.15	47.41	33.85
Vitamin C						
0%	2.50	1.50	0.37	3.08	0.00	0.00
Less than 25%	24.25	12.25	5.93	10.00	2.96	6.15
25-50%	21.00	19.25	10.74	20.77	11.11	10.00
50-75%	16.00	12.50	14.81	14.62	12.22	16.92
75-100%	11.50	17.00	12.22	16.15	7.78	12.31
At least 100%	24.75	37.50	55.93	35.38	65.93	54.62

Figure 2Percentage 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

Table 49 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%
Sweets	13%	23%
Spices	74%	90%

11. Health

11.1 Perceived health status

Health questions were only answered by women in the household age 20-50. The number of observations is larger than the number of households surveyed because in some cases more than one woman was interviewed. From Table 50 it can be observed that the share of women who state that their health is good is somewhat larger in the BG areas than in the Safal areas. On the other hand, the percentage of women who had had some illness in the four weeks before the survey, is largest among BG households and lowest among Safal farmers.

Table 50 Self-perceived health indicators

	Blue Gold		Safal beneficiary areas		Safal control areas	
	beneficiaries	**controls**	**farmers**	**landless**	**farmers**	**landless**
Member of HHs, N=2,866	n=726	n=698	n=493	n=199	n=462	n=196
Self-assessment of health						
Good	72.6	69.3	64.1	66.3	69.3	63.3
Fair	25.8	28.7	33.9	32.2	29.7	35.2
Bad	1.7	2.0	2.0	1.5	1.1	1.5
In past 4 weeks any illness?						
Yes	26.5	23.5	18.3	21.1	19.5	24.0
If yes, types of illness [a]						
Body pain/ head pain /back pain	53.4	43.8	60.5	65.9	59.3	65.9
Prolonged fever	22.0	33.3	20.9	24.4	18.6	27.3
Diarrhea	8.9	6.2	7.0	2.4	7.0	0.0
Chronic cough	5.8	5.6	7.0	7.3	11.6	0.0
Mouth or throat infection	1.6	3.7	0.0	0.0	2.3	2.3
Skin disease	0.5	1.2	3.5	0.0	1.2	0.0
Acidity	7.9	6.2	1.2	0.0	0.0	4.6

a Multiple responses

11.2 Children's development

11.2.1 Weight and height

Table 51 contains weight and height trajectories of boys and girls with age below 5. These are obtained by weighting and measuring. The number of observations is relatively small and children below age 1 were hardly measured.

Table 51 Weight (kgs) and height (cms) of children age 0-59 months by sex, age and study area

	Blue Gold						Safal beneficiary areas						Safal control areas					
	beneficiaries			controls			farmers			landless			farmers			landless		
Age (years)	N	KG	CM	N	KG	CM	N	KG	CM	N	KG	CM	N	KG	CM	N	KG	CM
Male																		
0	0	-	-	3	9.3	79.1	0	-	-	0	-	-	0	-	-	1	14.0	94.0
1	10	7.5	71.0	11	8.4	70.6	7	8.9	70.0	3	7.7	69.5	6	8.7	72.1	2	9.0	64.2
2	16	10.2	84.6	21	10.5	82.7	11	10.1	74.5	3	10.7	73.8	6	11.0	84.9	3	11.0	79.9
3	26	12.5	86.6	16	11.9	86.5	11	11.5	88.9	3	11.7	87.1	9	11.7	89.4	4	11.5	82.7
4	15	15.1	96.8	16	13.8	97.4	8	14.9	97.4	5	12.9	94.1	6	15.3	97.3	5	14.0	95.1
5	18	14.6	99.2	14	15.4	100.7	8	15.1	101.3	2	12.5	86.5	11	13.7	95.6	2	14.5	100.3
Female																		
0	2	6.5	66.1	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
1	14	11.4	70.3	14	8.2	71.3	10	8.2	67.6	4	8.8	70.0	5	7.0	74.1	1	5	67.0
2	7	10.1	80.4	13	10.5	80.8	5	9.4	74.8	4	8.8	76.9	6	9.8	76.6	2	10.5	82.0
3	12	11.7	85.3	17	12.0	87.8	16	11.3	86.4	2	13.5	87.5	11	11.5	85.5	5	12.4	88.4
4	12	14.1	92.9	10	13.0	91.3	13	13.1	97.0	3	12.0	97.0	7	13.4	97.1	4	13.5	96.2
5	8	13.6	97.3	15	13.2	95.9	6	13.8	98.2	3	14.3	98.2	9	14.6	99.1	4	14.3	93.9

It can be observed that at age 5 the average height is between 87 and 101 cm, and the weight between 13 and 15 kilograms. This is lower than the average height for 5 year olds in Bangladesh (105 cm). As a comparison, Dutch kids at age 5 are on average more than 115 cm and weigh 19.5 kg.

11.2.2 Malnutrition: stunting, wasting and overweight

Stunting, or low height for age, is caused by long-term insufficient nutrient intake and frequent infections. Stunting generally occurs before age two, and the effects are largely irreversible. These include delayed motor development, impaired cognitive function and poor school performance. Stunting is measured by **HAZ, the Height – for - Age Z- score**. A child is moderately stunted if -3<HAZ<-2 (between two and three standard deviations below average) and severely stunted if HAZ<-3. See Table 52.

Wasting, or low weight for height, is a strong predictor of mortality among children under five. It is usually the result of acute significant food shortage and/or disease. Wasting is measured by **WHZ, the Weight – for – Height Z-score**. If -3<WHZ < -2 a child is considered moderately suffering from wasting. If WHZ<-3 children are severely wasted.

By combining HAZ and WHZ we get a **Weight-for-Age Z-score, WAZ.** WAZ measures the extent to which a child is underweight (WAZ < -2) or overweight (WAZ>2). Childhood undernutrition and overweight co-exist in many countries, leading to a double burden of malnutrition.

The age and gender dependent "healthy" median values by which the Z-scores are measured are given by internationally recognized standards, such as NCHS-1977, CDC-2000, and WHO-2006. We have used the WHO-2006 standard.

In Table 52 the prevalence of stunting, wasting and overweight are presented. Given the small number of gender specific observations the total are the more reliable results when comparing the study areas. Stunting is more frequently observed than wasting or being overweight. Stunting is more prominent among farmers (landowners) in the BG and Safal beneficiary areas, than in the corresponding control areas. For the landless there is no big difference.

Table 52 Percentage of under five children by gender, different nutritional indices and study area

	Blue Gold						Safal beneficiary areas						Safal control areas					
	beneficiaries			controls			farmers			landless			farmers			landless		
	HAZ< -2	WHZ <-2	WAZ >+2	HAZ <-2	WHZ <-2	WAZ >+2	HAZ <-2	WHZ <-2	WAZ >+2	HAZ <-2	WHZ <-2	WAZ >+2	HAZ <-2	WHZ <-2	WAZ >+2	HAZ <-2	WHZ <-2	WAZ >+2
Male	47.8	10.3	6.7	32.1	7.5	12.4	40.0	15.9	11.1	50.0	18.8	25.0	34.2	18.4	13.2	41.2	5.9	11.8
Female	42.9	10.9	12.5	36.6	11.3	15.5	46.0	16.0	20.0	18.8	25.0	18.8	35.0	7.5	10.0	31.3	6.3	12.5
Total	45.9	10.6	8.9	34.2	9.3	13.8	43.2	16.0	15.8	34.4	21.9	21.9	34.6	12.8	11.5	36.4	6.1	12.1

The share of children suffering from stunting and wasting found here compares well with the national averages for Bangladesh: 40.24% of those under five are stunted and 16.31% are wasted.[ɛ]

12. Linkages in the result chain

To test the presumed relations in the result chain we have run a set of regressions that, as a whole, represent a recursive system. For each of both program areas beneficiaries and controls are combined. It allows for acquiring insights on relations between variables and also testing the difference between beneficiaries and controls with respect of each variable in the result chain. We do this by including a variable representing the beneficiary status, taking the value 1 for beneficiaries and 0 for controls.

The descriptives of the total set of variables used in the regressions are displayed in table 45, while the results are displayed in Table 43, 47 and 48.

12.1 Inputs

The approach follows the result chain (Figure 1.1) in that first the inputs (plot and pond size used and self-assessed quality of water management) are regressed on household characteristics (size and composition of the household, education level of the household head and religion) and the beneficiary dummy. Statistical significance of the beneficiary dummy means that the match between the control and beneficiary groups leaves room for improvement. Such improvement can be obtained by Propensity Score Matching (see Chapter 13).

Plot and pond size used

The regression results show that for BG areas the plot sizes used are bigger when households are larger. This is also the case for Safal beneficiaries, although less significant. In the BG areas beneficiaries have significantly smaller plot size used as well as pond size used. In the Safal areas we do not see such relations. In the BG area beneficiaries have smaller plots used than controls.

Both in the BG and Safal areas pond size used (not plot size) is associated with the proportion of men. For both BG and Safal areas there are positive relations between plot and/or pond size and being Hindu, and also with the proportion of household members older than 15 years having education. This suggests that being Hindu, plot and pond size used and having good education are correlated. Note that this is also significantly valid for the landless in Safal areas.

Good WMG

[ɛ] See Hasan, Ahmed, and Chowdhury, "Food Insecurity and Child Undernutrition: Evidence from BDHS 2011". *Journal of Food Insecurity*. 2013. Vol.1, No.2, pp. 52-57.

A good WMG means that the respondent said yes to the question: “Is the performance of the water management system good for your crop/livelihood/agriculture and fishing / aquaculture”. In both BG and Safal areas, the beneficiary groups judge more positively on the quality of the WMG than the corresponding controls. In the BG areas, the variables that play a role in this positive assessment are plot and pond size used (very significant), and in Safal area only plot size. This suggests that using more land or pond is related to good water management, especially in BG areas where water management is more critical.

12.2 Outputs

Crop and fishery productivity
In the BG areas crop productivity (kg per hectare) does not show significant relations with other variables, but fish productivity is associated with better education. In Safal areas, higher fish productivity is associated with being a beneficiary. In both BG and Safal areas, there are no relations between crop productivity and plot size used, but there are always relations between fish productivity and pond size used. This suggests that those with larger ponds also make the necessary investments to increase fish productivity (economies of scale). Plot size used has no significant effect on productivity, which suggests that in cropping there are no economies of scale. For the landless in Safal areas there is not only a positive relation between pond size used and fish productivity, but also between crop size used and crop productivity. This suggests that the landless invest in crop and fishery production mainly when they have relatively large plot of pond sizes.

Share of production consumed or sold
Note that production consumed or sold includes agricultural crops and fisheries (not livestock products).

In BG areas, being a beneficiary is related to consuming less and selling less products.

For land owning beneficiaries, in both BG and Safal areas, the larger the household size and the plot size used, the larger the volume of products consumed. For Safal areas there is also a positive relation with pond size used as well as crop productivity, but a negative relation with fish productivity. This suggests that fish productivity (aimed at marketing) is in competition with household food consumption. In both areas, being Hindu and the level of education (for household members older than 15 years) is good for consumption and selling of crops.

The volume sold shows similar relationships, but is more strongly related to plot size used, crop productivity as well as pond productivity (the latter BG only). This suggests that high productivity drives more marketing.

For the landless, the consumption volume is positively related to household size, but not the volume sold. The volumes being consumed and those being sold are positively related to plot and pond size used, as well as crop productivity.

12.3 Effects

Farm income
For land owners, farm income is positively related to household size, plot size used, crop productivity, fish productivity (Safal only), and crop productivity (BG only). This is not surprising since farm income is calculated as production times price. For Safal producers fish incomes are more important than for BG producers. In the Safal program areas, the landless also obtain highest farm incomes when crop land used and crop productivity are high.

It is noteworthy that in BG areas and for the landless in Safal areas, farm income shows a positive relation with both crop land used and crop productivity. So both of these variables have an important share in farm incomes. However, for beneficiaries in Safal areas, farm income shows a negative relation with crop productivity (and positive with land used). This suggests that land area is the main factor determining farm incomes, and land productivity does not significantly add to farm incomes. This might be explained by the fact that all beneficiaries in Safal areas already have relatively high productivity.

Non-farm income
In both program areas beneficiaries (land owners) have significantly less non-farm incomes than controls. In the BG area we also find that the higher the education level of the household head the larger the non-farm income of the household.

Remarkably, there are highly significant relations between households that stated the WMG operates well and higher non-farm incomes, for all beneficiary groups including the landless. This may relate with the credit and savings function of the WMG, and also the fact that being a member of a WMG gives an advantage when labourers are being selected for water works.

Wealth
In both BG and Safal areas, a larger household, having less young children, better education for those with age above 15 years and being Hindu is associated with more wealth. Independent of these household characteristics, for BG households larger plot and pond sizes, good WMG, higher fish productivity and a larger share of production sold or stored for sale increases wealth. For Safal areas consumption and selling volumes also play an important role, this is not the case in BG areas. This might be explained by the higher incomes in Safal areas, allowing wealth creation. Remarkably, for a landless there is a negative relation between wealth index and being a Safal beneficiary, which suggests that the landless do not benefit from the Safal interventions.

12.4 Outcome: Food insecurity

The HFIAS score is such that a higher value means being more food insecure. Most significant is the fact that lower education means an increase in food insecurity, also for the landless in Safal areas. Having more young children also leads to food insecurity in BG areas, but not so in Safal

areas. Neither farm or non-farm income show any relation with food insecurity, although we do observe that the Safal control area has lowest average annual incomes from cropping and highest incomes from non-farm sources, but scores lowest on food security.

However, we do see a significant relation between wealth and less food insecurity (in both Safal and BG areas). This is also supported by the relation between wealth distribution and the HFIP, showing that higher wealth classes go together with more food security (see table 28). This suggests that higher incomes are invested in more assets (wealth) rather than more food. This hypothesis is supported by significant relations between food consumed and sold (but of farm incomes), and between non-farm incomes and wealth in Safal areas. None of such relations exist for for BG areas. This difference could be caused by the fact that the higher income levels in Safal areas, with the surplus from farm sales and non-farm incomes being invested in capital assets.

12.5 Summing up

The implied result chain of both food insecurity projects is largely corroborated by the outcomes of the recursive regressions: more education leads to more productivity, more land or pond area used and /or increased productivity leads to more sales and consumption, and to more income. More income does not lead to more food security but may lead to more wealth (assets), if products are sold and generate revenues. However, non-farm incomes seem to be more important in terms of leading to wealth. In due time this may lead to more food security, as demonstrated by the significant relation between wealth and less food insecurity. Thus, positive effects on food security are not achieved directly, but indirectly through different links in the result chain.

Noteworthy are the following factors that play an important positive role on various variables for land owners: being Hindu, the proportion of household members having a high level of education, being part of a WMG that functions well. For the landless, the single most important variable is the level of education (for both wealth and food security).

Table 53 Summary statistics, n=1,600

Area	Blue Gold				Safal producers				Safal landless			
Variables	**Mean**	**Std. dev.**	**Min**	**Max**	**Mean**	**Std. dev.**	**Min**	**Max**	**Mean**	**Std. dev.**	**Min**	**Max**
beneficiary (1=yes)	0.50	0.50	0.00	1.00	0.50	0.50	0.00	1.00	0.50	0.50	0.00	1.00
participation in other programs (1=yes)	0.40	0.49	0.00	1.00	0.45	0.50	0.00	1.00	0.13	0.33	0.00	1.00
household size	4.91	1.81	1.00	19.00	4.79	1.74	2.00	15.00	4.25	1.61	1.00	11.00
percentage of men	0.57	0.18	0.00	1.00	0.53	0.17	0.13	1.00	0.55	0.21	0.00	1.00
age distribution in the household												
percentage 0-10 years	0.17	0.16	0.00	0.67	0.15	0.15	0.00	0.60	0.16	0.17	0.00	0.75
percentage 11-19 years	0.17	0.17	0.00	0.67	0.15	0.16	0.00	0.67	0.16	0.18	0.00	0.67
percentage 20-29 years	0.17	0.17	0.00	0.75	0.18	0.16	0.00	0.67	0.15	0.17	0.00	0.67
percentage 30-39 years	0.14	0.14	0.00	0.67	0.14	0.15	0.00	0.67	0.15	0.16	0.00	0.67
percentage 40-49 years	0.13	0.15	0.00	1.00	0.13	0.14	0.00	0.67	0.15	0.17	0.00	1.00
percentage 50 years or older	0.22	0.21	0.00	1.00	0.25	0.20	0.00	1.00	0.23	0.26	0.00	1.00
% of HH members age >=15 with no education	0.20	0.27	0.00	1.00	0.25	0.27	0.00	1.00	0.50	0.33	0.00	1.00
religion												
Hindu	0.39	0.49	0.00	1.00	0.50	0.50	0.00	1.00	0.47	0.50	0.00	1.00
Muslim	0.61	0.49	0.00	1.00	0.50	0.50	0.00	1.00	0.53	0.50	0.00	1.00
total plot size (in hectare)	0.50	0.69	0.00	5.38	0.43	1.11	0.00	23.57	0.05	0.12	0.00	0.78
total pond size (in hectare)	0.03	0.11	0.00	1.42	0.07	0.23	0.00	2.67	0.00	0.04	0.00	0.40
good WMG (1=yes)	0.56	0.50	0.00	1.00	0.34	0.48	0.00	1.00	0.22	0.42	0.00	1.00
natural disaster (1=yes)	0.61	0.49	0.00	1.00	0.51	0.50	0.00	1.00	0.44	0.50	0.00	1.00
production crops (in kg/hectare)	5,567.15	70,363.84	0.00	1.99e+06	4,942.81	4,363.46	0.00	31,475.53	1,706.83	3,831.11	0.00	31,385.10
production fish (in kg/hectare)	215.40	1,056.99	0.00	12,357.88	290.64	1,404.65	0.00	23,765.16	60.62	533.68	0.00	7,105.78
consumed (in kg)	785.25	948.39	0.00	7,200.00	993.47	1,147.09	0.00	18,840.00	172.47	395.48	0.00	1,840.00
consumed (in kg/hh member)	96.13	128.36	0.00	1,110.00	101.69	120.44	0.00	563.33	16.18	46.74	0.00	323.00
stored for consumption (in kg/hh member)	94.55	230.98	0.00	2,400.00	158.86	312.36	0.00	2,916.25	12.69	62.97	0.00	625.00
sold (in kg)	919.32	1,946.53	0.00	24,128.00	1,125.84	1,858.51	0.00	12,945.00	131.49	654.56	0.00	6,940.00
sold (in kg/hh member)	72.66	145.37	0.00	1,900.00	109.70	144.58	0.00	1,285.71	23.84	69.14	0.00	450.00
stored for sale (in kg/hh member)	103.63	327.80	0.00	4,020.00	87.37	234.09	0.00	1,600.00	24.16	166.43	0.00	1,720.00
farm income (in USD per year) [a]	964.67	1,883.35	0.00	31,739.61	1,249.91	2,067.48	0.00	26,511.30	143.33	377.80	0.00	2,581.17
non-farm income (in USD per year) [a]	1,394.89	2,468.14	0.00	17,589.24	1,996.60	3,445.28	0.00	22,217.98	1,916.67	3,225.01	0.00	26,229.56
total income (in USD per year) [a]	2,359.55	3,107.34	0.37	31,739.61	3,250.23	3,938.16	0.84	27,444.76	2,060.00	3,231.73	23.74	26,235.17
wealth index	1.04	13.23	-33.90	81.08	4.90	14.18	-23.17	71.65	-10.06	9.10	-31.86	34.79
HFIAS	2.29	4.10	0.00	27.00	1.83	3.90	0.00	27.00	7.68	5.76	0.00	27.00

a 13 households in the Blue Gold area, 3 households with land in the Safal area and 3 landless households in the Safal area did not give information about their income.

Table 54 Estimation results multivariate regression, Blue Gold areas

Dependent variable	Plot size used (in ha)	Pond size used (in ha)	Good WMG (1=yes)	Production crops (in kg/ha)	Production fish (in kg/ha)	Consumed (in kg)	Sold (in kg)	Farm income (in USD per year)	Non-farm income (in USD per year)	Wealth Index	HFIAS
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.33***	-0.01**	0.21***	-5823.10	-6.30	-175.19***	-210.39**	-21.18	-517.16***	-0.63	-0.12
household size	0.10***	-0.00	-0.01	868.87	-7.95	96.40***	26.64	146.48***	-3.15	2.25***	-0.08
percentage of men	0.08	0.05**	-0.12	11058.26	79.98	215.39	-248.11	-694.41**	-400.65	0.95	1.29*
age distribution in the household											
percentage 0-10 years	-0.57***	-0.04	0.19	18088.28	307.71	-1032.12***	-477.96	170.03	1537.64**	-13.43***	4.48***
percentage 11-19 years	-0.52***	-0.06**	0.22*	14106.29	192.51	-544.10**	-299.57	87.22	593.50	-8.54***	1.72
percentage 20-29 years	-0.47***	-0.03	0.09	-12862.95	-243.93	-23.79	-275.89	551.73	981.19	2.24	0.84
percentage 30-39 years	-0.11	0.01	-0.10	-4981.89	-293.37	241.91	112.52	165.08	1070.88	4.59	-1.98*
percentage 40-49 years	-0.11	-0.01	0.16	7265.69	-77.83	44.90	-363.76	-447.03	502.01	-1.56	0.06
percentage 50 years or older											
% of HH members age >=15 with no education	-0.35***	-0.02*	-0.10	-10977.45	-343.50**	-214.38**	-190.72	5.13	-785.30**	-7.40***	2.11***
religion											
Hindu (or Buddhist)	0.14***	0.03***	0.03	1992.72	-58.01	224.90***	27.47	596.30***	12.22	3.75***	-0.72**
other religion (Muslim)											
total plot size used (in hectare)			0.11***	-3466.71		638.17***	1014.28***	206.08**	232.93	5.26***	-0.22
total pond size used (in hectare)			0.52***		1658.88***	-275.31	140.86	-33.37	-1081.00	17.64***	0.67
good WMG (1=yes)				-4595.66	6.00	0.74	6.22	-51.99	477.06***	2.18***	-0.35
natural disaster (1=yes)				4574.43							
production crops (in kg/hectare)						0.00	0.01***	0.00***	-0.00	-0.00	-0.00
production fish (in kg/hectare)						-0.03	0.11***	0.02	0.00	0.00**	0.00
consumed (in gram/hh member)							-0.53	3.12***	-0.64	0.01**	-0.00
stored for consumption (in gram/hh member)							3.86***	1.92***	-0.02	0.00*	-0.00
sold (in gram/hh member)								0.15	-0.30	0.00	-0.00
stored for sale (in gram/hh member)								1.80***	0.13	0.00	0.00
farm income (in 1.000 USD/year)										0.29	-0.03
non-farm income (in 1.000 USD/year)										-0.02	-0.03
wealth index											-0.08***
constant	0.42***	0.02	0.43***	-2826.62	270.58	157.28	361.41	-476.51	1017.52*	-13.22***	1.57*
number of observations	800	800	800	800	800	800	800	787	787	787	787

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

Table 55 Estimation results multivariate regression, Safal areas producers

Dependent variable	**Plot size used (in ha)**	**Pond size used (in ha)**	**Good WMG (1=yes)**	**Production crops (in kg/ha)**	**Production fish (in kg/ha)**	**Consumed (in kg)**	**Sold (in kg)**	**Farm income (in USD per year)**	**Non-farm income (in USD per year)**	**Wealth Index**	**HFIAS**
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	0.18	0.02	0.22***	293.96	259.28*	45.07	-120.56	439.50**	-727.91**	2.00	-0.35
household size	0.05*	0.02***	-0.00	79.52	39.21	198.23***	240.76***	232.94***	144.27	2.19***	-0.02
percentage of men	-0.04	0.09*	-0.04	-2029.33*	-416.69	-94.07	79.93	-521.73	706.18	1.43	0.37
age distribution in the household											
percentage 0-10 years	-0.04	-0.13*	-0.21	33.86	-144.14	-477.87	-726.70*	-44.79	-558.66	-8.15*	1.31
percentage 11-19 years	0.79**	-0.11	-0.15	-1804.42	-153.43	-384.64	-555.43	79.58	-60.03	-5.19	1.67
percentage 20-29 years	0.11	-0.02	0.00	-2255.44	-507.43	-307.05	-262.88	-69.58	-1101.87	-3.63	-0.22
percentage 30-39 years	0.56	0.15**	-0.08	-1091.84	-119.17	-326.92	51.41	-86.48	-1579.20	3.66	-1.50
percentage 40-49 years	0.29	-0.05	-0.13	-625.70	71.80	123.09	49.48	566.79	2.27	3.77	-0.47
percentage 50 years or older											
% of HH members age >=15 with no education	-0.05	-0.06*	-0.13*	-931.26	-148.99	-245.53	-383.32**	-127.33	-891.01	-12.56***	2.19***
religion											
Hindu (or Buddhist)	0.22*	-0.00	0.00	-26.98	189.21	248.94**	323.25***	-243.69	428.24	2.56**	-0.09
other religion (Muslim)											
total plot size used (in hectare)			0.03*	-145.32		228.04***	122.73***	321.91***	-122.02	0.26	-0.15
total pond size used (in hectare)			-0.12		1338.72***	1492.18***	759.49***	2764.66***	-1043.80	5.15*	-0.34
good WMG (1=yes)				837.03**	-119.20	61.00	-177.72*	-74.47	927.59***	0.20	-0.46
natural disaster (1=yes)				-148.01							
production crops (in kg/hectare)						0.09***	0.10***	-0.05***	0.02	-0.00	-0.00
production fish (in kg/hectare)						-0.13***	0.02	-0.06	-0.03	0.00	0.00
consumed (in gram/hh member)							-0.76*	3.05***	-3.16**	0.02***	-0.00
stored for consumption (in gram/hh member)							3.78***	1.17***	-0.61	0.01***	0.00
sold (in gram/hh member)								3.21***	1.13	0.01***	-0.00
stored for sale (in gram/hh member)								1.88***	-0.47	0.01***	-0.00
farm income (in 1.000 USD/year)										0.04	-0.02
non-farm income (in 1.000 USD/year)										0.51***	-0.04
wealth index											-0.05***
constant	-0.21	-0.04	0.37***	6503.94***	244.59	-392.04	-926.25***	-724.19	1843.97*	-9.59***	2.55**
number of observations	540	540	540	540	540	540	540	536	536	536	536

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

Table 56 Estimation results multivariate regression, Safal areas landless

Dependent variable	Plot size used (in ha)	Pond size used (in ha)	Good WMG (1=yes)	Production crops (in kg/ha)	Production fish (in kg/ha)	Consumed (in kg)	Sold (in kg)	Farm income (in USD per year)	Non-farm income (in USD per year)	Wealth Index	HFIAS
Explanatory variables	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
beneficiary (1=yes)	-0.01	-0.02***	-0.06	504.64	67.40	32.07	-39.02	18.35	-763.16	-3.53***	-0.04
household size	0.01**	0.00	0.00	-37.37	-9.52	21.73***	-29.14	15.20	200.06	0.69*	-0.02
percentage of men	0.04	0.01	0.10	-1050.03	247.75	-13.31	-23.11	-53.88	-1800.64*	3.46	3.56**
age distribution in the household											
percentage 0-10 years	-0.07	-0.03*	0.00	-1400.53	457.27**	-12.41	75.60	-6.43	-828.71	-6.32*	1.95
percentage 11-19 years	-0.09*	-0.02	-0.13	-485.19	164.63	-11.92	219.59	71.36	196.19	0.65	3.14
percentage 20-29 years	-0.09	-0.00	0.02	-970.59	-104.16	53.43	24.25	147.38	327.40	5.10	0.45
percentage 30-39 years	0.04	0.01	-0.08	2455.43*	85.67	-178.35**	160.77	-31.29	2585.81*	4.30	-0.51
percentage 40-49 years	0.05	0.01	0.21	597.58	10.08	48.09	112.84	4.65	147.54	-0.37	0.67
percentage 50 years or older											
% of HH members age >=15 with no education	-0.07***	-0.01	-0.13	-797.01	-26.44	-26.78	141.35	-32.20	-138.58	-5.95***	3.49***
religion											
Hindu (or Buddhist)	0.04**	0.02***	0.06	-347.14	-98.48	11.51	19.65	-14.97	-186.64	1.75	0.07
other religion (Muslim)											
total plot size used (in hectare)			0.17	17589.46***		2169.89***	780.82**	1047.36***	-2582.20	-0.87	-5.84
total pond size used (in hectare)			0.90		3492.69***	699.62**	3374.84***	401.37	-1936.10	-16.46	3.48
good WMG (1=yes)				600.75	161.12**	35.84	-135.35**	-5.63	1949.45***	-0.03	-0.91
natural disaster (1=yes)				-202.15							
production crops (in kg/hectare)						0.03***	0.09***	0.02***	-0.10	-0.00	0.00
production fish (in kg/hectare)						0.01	0.02	0.08***	-0.39	0.00	-0.00
consumed (in gram/hh member)							-2.23***	0.89**	-1.14	0.02	-0.00
stored for consumption (in gram/hh member)							2.54***	0.55*	1.45	0.04***	0.01
sold (in gram/hh member)								0.38	5.82	0.02*	0.00
stored for sale (in gram/hh member)								0.64***	0.21	0.00	-0.00
farm income (in 1.000 USD/year)										0.94	-2.42
non-farm income (in 1.000 USD/year)										0.28*	-0.08
wealth index											-0.14***
constant	0.02	0.00	0.22	1812.58	-158.55	-69.03	-64.35	-45.66	1971.17*	-13.28***	2.49
number of observations	260	260	260	260	260	260	260	257	257	257	257

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

13. Matching

13.1 Blue Gold

Logit regression

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 they are located in the control area. The results are shown in table 1 below.

Table 57 Estimation results logit regression propensity scores, Blue Gold area, n=800, pseudo R^2=0.13

Variable	coefficient	p-value
Participation in another program	0.277	0.092
household size	0.163	0.001
percentage of men	0.778	0.082
age distribution in the household		
percentage 0-11 years	-1.011	0.096
percentage 11-19 years	-0.038	0.951
percentage 20-29 years	-0.863	0.167
percentage 30-39 years	-1.140	0.088
percentage 40-49 years	0.801	0.193
percentage 50 years or older	*Reference*	
% of HH members age >=15 with no education	-0.782	0.011
Religion		
Hindu	1.069	0.000
other religion (Muslim or Buddhist)	*reference*	
total plot size used (in ha)	-1.000	0.000
total pond size used (in ha)	-1.351	0.152
water (dummy = 1 if household was affected by flood or excessive rain)	0.702	0.000
drought (dummy = 1 if household was affected by drought)	-0.731	0.000
electricity/ solar power (1=yes)	-0.170	0.306
modern toilet[7] (1=yes)	0.225	0.253
distance to the main road (in km)	0.018	0.662
no own dwelling	-1.102	0.023
constant	-0.755	0.100

In the Blue Gold beneficiary area the households are bigger. They also participated more in other programs. Also, they are more often Hindu and they use less/smaller plots than in the control area. The households in the Blue Gold beneficiary area are more often affected by flood or excessive rain, while in the Blue gold control area there is more reference to problems of drought. The households in the Blue Gold beneficiary area more often have their own

[7] A modern toilet is defined as a toilet with flush/ pour flush or a ventilated improved pit latrine.

dwelling. So from this analysis we know that household size, plot size used, religion, problems with water or drought and having an own dwelling are important matching variables. We would like to know if there are enough households in the control area that have these characteristics to match beneficiary households. This is examined by looking at the common support.

Kernel density

A kernel density plot visualizes the common support. The kernel densities for the propensity scores are displayed in figure 13.1. 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.

Figure 13.1 Kernel density estimates Blue Gold beneficiary (upper) and Blue Gold control (lower)

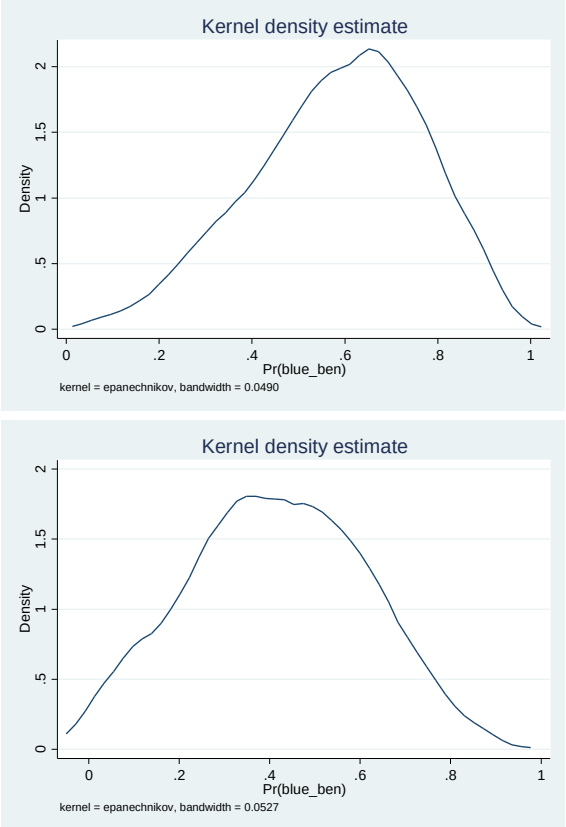


Figure 1 shows that there is enough overlap, so the common support condition holds.

13.2 Safal landowners

Logit regression

The same preliminary analysis for the Safal area gives very different results. For the Safal area variables such as an indicator if a household is affected by drought in the last 12 months is not an appropriate matching variable because it can change by the treatment. 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 58 Estimation results logit regression propensity scores, Safal landowners, n=540, pseudo R^2=0.31

Variable	coefficient	p-value
Participation in another program	1.544	0.000
household size	0.060	0.423
percentage of men	0.593	0.391
age distribution in the household		
percentage 0-11 years	0.595	0.526
percentage 11-19 years	1.399	0.135
percentage 20-29 years	1.886	0.041
percentage 30-39 years	0.174	0.853
percentage 40-49 years	-0.278	0.774
percentage 50 years or older	*reference*	
% of HH members age >=15 with no education	-0.089	0.846
Religion		
Hindu	2.171	0.000
other religion (Muslim or Buddhist)	*reference*	
total plot size used (in ha)	0.579	0.045
total pond size used (in ha)	-0.017	0.979
electricity/ solar power (1=yes)	-0.156	0.549
modern toilet (1=yes)	0.014	0.955
distance to the main road (in km)	-0.452	0.516
no own dwelling	1.160	0.132
constant	-3.070	0.000

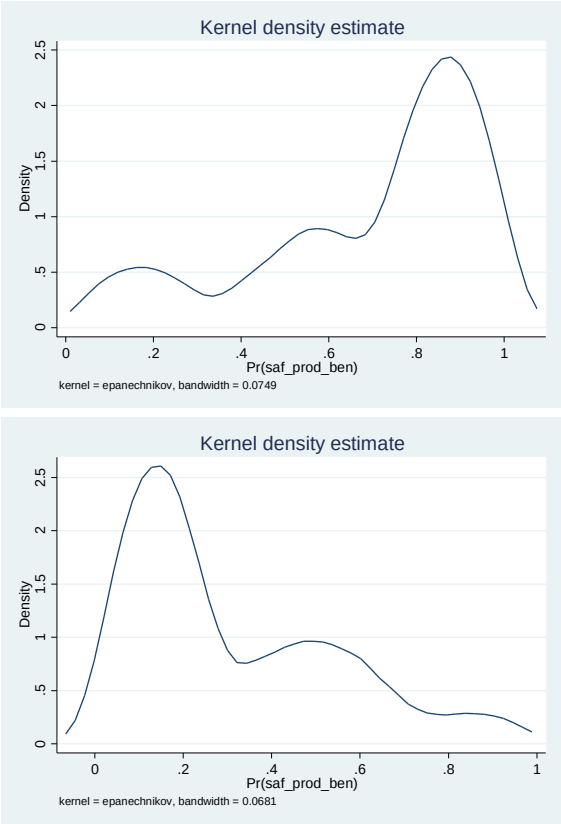
It can be observed that the Safal landowners in the beneficiary group show much more participation in earlier and other support programs than the control group. Another important distinguishing feature is being Hindu. Bengalis with this religion live more often in the Safal beneficiary area than in the Safal control area. They also have a significantly higher plot size used. The multivariate analysis (see Chapter 12) 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.

The kernel densities in figure 13.2 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 (beneficiary) and the right figure (control) 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.

Kernel density

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 13.2 Kernel density estimates Safal landowners beneficiary (upper) and control (lower)



13.3 Safal landless

Logit regression

For the landless in Safal areas, 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 59 Estimation results logit regression propensity scores, Safal landless, n=260, pseudo R^2=0.35

Variable	coefficient	p-value
Participation in another program	1.375	0.011
household size	0.036	0.759
percentage of men	1.266	0.111
age distribution in the household		
percentage 0-11 years	-1.447	0.233
percentage 11-19 years	-.490	0.670
percentage 20-29 years	-0.300	0.805
percentage 30-39 years	0.651	0.564
percentage 40-49 years	-0.933	0.391
percentage 50 years or older	*reference*	
% of HH members age >=15 with no education	-0.291	0.609
Religion		
Hindu	3.029	0.000
other religion (Muslim or Buddhist)	*reference*	
total plot size used (in ha)	0.868	0.581
total pond size used (in ha)	-20.541	0.011
electricity/ solar power (1=yes)	-0.564	0.114
modern toilet (1=yes)	0.117	0.779
distance to the main road (in km)	-3.567	0.001
no own dwelling	0.704	0.148
constant	-1.352	0.127

For the landless, there are similar relations as the landowners, with respect to more participation in extension programs and a higher proportion of being Hindu. Another distinguishing feature is that of pond size used. We also see that the distance to the main road is an important distinguishing feature: beneficiaries have a smaller distance to the main road.

The kernel densities in figure 13.3 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 (beneficiary) and the right figure (control) 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.

Kernel density

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 13.3 Kernel density estimates Safal landless beneficiary (upper) and control (lower)