

Evaluation of the Dutch food security programme in Bangladesh – including impact studies of SaFal and Blue Gold projects

Country case study for the food security policy evaluation for the Dutch Ministry of Foreign Affairs

Consortium of Aidenvironment, APE, BRAC University / Development Research Initiative (DRI) and UNESCO-IHE

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Foreword

This evaluation was commissioned by the Policy and Operations Evaluation Department (IOB) of the Ministry of Foreign Affairs.

The views and opinions are those of the authors, not necessarily those of the Ministry of Foreign Affairs or IOB.

The evaluation team acknowledges the efforts by staff from selected projects for this policy evaluation, especially those from SaFal project and Blue Gold project, for making available the time and resources for helping organize and participating in field visits. This has been indispensable for a proper understanding of the realities on the ground. Lastly the evaluation team acknowledges the efforts by the RNE Dhaka food security and water management team to make available relevant documentation, organize joint sessions and provide feed-back on preliminary findings.

List of abbreviations

| | |
|-------------------|--|
| B group | Beneficiary group |
| BARD | Bangladesh Academy for Rural Development |
| BGD | Bangladesh |
| BDT | Bangladesh Taka (currency) |
| BGP | Blue Gold Project |
| BLR | Baseline report |
| BWDB | Bangladesh Water Development Board |
| C group | Control group |
| CDSP | Char Development and Settlement Project |
| CEP | Coastal Embankment Project |
| CGIAR | Consultative Group on International Agricultural Research |
| CWM | Community Water Management |
| DAE | Department of Agricultural Extension |
| DOC | Department of Cooperatives |
| DoF | Department of Fisheries |
| ELR | Endline survey report |
| EKN | Embassy of the Kingdom of the Netherlands |
| ECRRP | Emergency Cyclone Recovery and Restoration Project |
| FAO | Food and Agriculture Organisation |
| FFS | Farmer Field Schools |
| FG | Farmers' Group |
| FGD | Focus Group Discussion |
| FNS | Food and nutrition security |
| FS | Food security |
| GoB | Government of Bangladesh |
| GoN | Government of the Netherlands |
| GPWM | Guidelines for Participatory Water Management |
| Ha | Hectare |
| HDDS | Household Diet Diversity Score |
| HHS | Household Survey |
| HYV | High Yielding Variety |
| IA | Impact Analysis |
| IMED | Implementation Monitoring and Evaluation Department (Ministry of Planning) |
| LG | Local Government |
| LGED | Local Government Engineering Department |
| IOB | Policy and Operations Evaluation Department (Ministry of Foreign Affairs, The Netherlands) |
| IPSWAM | Integrated Programme for Sustainable Water Management |
| KII | Key Informant Interview |
| KJDRP | Khulna-Jessore Drainage Rehabilitation Project |
| LCG | Local Consultative Group |
| M4P | Markets for the Poor |
| MFS | Marketing Field School |
| MoWR | Ministry of Water Resources |
| NFP | National Food Policy |
| NWPo | National Water Policy |
| O&M | Operation and Maintenance |
| P30, P43/2D, etc. | Polder 30, 43/2D, etc. |
| pd | person-day |

| | |
|----------|---|
| PG | Producer Group |
| PROOFS | Profitable Opportunities for Food Security |
| PWM | Participatory Water Management |
| PWMR | Participatory Water Management Rules |
| RNE | Royal Netherlands Embassy |
| SRGR | Sexual and reproductive health and rights |
| SSWRSDP | Small Scale Water Resources Sector Development Project |
| SWAIWRMP | Southwest Area Integrated Water Resources Development Project |
| ToR | Terms of Reference |
| UP | <i>Union Parishad</i> , Union Representative Council |
| WASH | Water, access to Sanitation and Health |
| WFP | World Food Program |
| WMA(-EC) | Water Management Association (-Executive Committee) |
| WMCA | Water Management Cooperative organisation |
| WMG(-EC) | Water Management Group (-Executive Committee) |
| WMIP | Water Management Improvement Project |
| WMS | Water Management System |

Definitions

Related to water management organisations as used in this report

| | |
|------|---|
| BWDB | Bangladesh Water Development Board. Under the MoWR. Responsible for the design, construction and management of the major water infrastructure of Bangladesh: sea-facing and river-facing embankments and structures, structures and flows in rivers and main drainage and supply canals, amongst others. In the context of this study: main counterpart for development projects in the large polders and custodian of the related WMA and WMG. Responsibility limited to primary water management infrastructure. |
| DAE | Department of Agricultural Extension. Represented with agricultural officers in all of the 460 sub-districts (<i>upazila</i>) and extension workers in all of the 4,550 unions of Bangladesh. DAE is a partner in most of the PWM development projects for the agricultural component. DAE capacity in water management at field-level is still limited. DAE maintains a web-based agricultural database with production figures on union-level. |
| DoC | Department of Cooperatives. Guides the institutionalisation of cooperatives. In the past, any WMO ¹ which wished to be registered did so under one of the two cooperative societies acts, implemented by the DoC. |
| LGED | Local Government Engineering Department. Responsible for design and construction of infrastructure under the ownership of LG. Advisor to LG. Represented at local level. Since NWPo (1999) also responsible for small scale water infrastructure in schemes up to 1,000 hectares and as such custodian of the WMCAs. Main implementing agencies for development projects that address these schemes (SSWRSDP). |
| PWM | Participatory Water Management. The NWPo writes “the participation of all project affected persons, individually and collectively, will be ensured in the planning, design, implementation, and operation and maintenance (O&M) of publicly funded surface water resources development plans and projects”. The GPWM presents a code of good practice and the PWMR provides the legal basis for the formation of Water Management Organisations. Relevant development projects follow this approach and specifically assist GoB to establish WMOs and create capacity to operationalise the NWPo. |
| WMA | Water Management Association, in the larger (>1,000 ha) polders; institutionalised and registered with BWDB. Represent several WMG, covering a hydrological unit within the polder with sluice at the river, often the WMA supervises several sluices. For example, P30 of 6400 ha gross has 1 WMA and 21 main sluices and corresponding <i>khals</i> . The WMA are the entry point for the BWDB and represent the WMG in formulating the annual O&M Plan. The “vision” is that the WMA eventually will take over role of BWDB in management of polders up to 5,000 ha. |
| WMCA | Water Management Cooperative Association, in the smaller (<1,000 ha) schemes; institutionalised and registered by the DoC. Under the custodianship of the LG and LGED. In these smaller schemes, there is only one WMCA. The WMCA resemble the WMG in the larger polder. |
| WMF | Water Management Federation. May exist as an apex body to represent several WMA at the polder level. In practice not yet existing. |
| WMG | Water Management Group, in the larger (>1,000 ha) polders; institutionalised and registered with BWDB (since 2014, earlier with DoC). Generally organized at the level of a hydrological sub-unit, sometimes at village level. For example, P30 of 6,400 ha gross has 41 WMG, P43/2D with 6500 ha has 30 WMGs. |
| WMO | Water Management Organisation. Aggregate term to address all specific water management organisations (WMG, WMA, WMCA) in a more general sense |

¹ There are more community based organisations related to water than discussed in this study.

Related to water management infrastructure as used in this report

| | |
|----------------|--|
| Embankments | The primary embankment is the outer, circular embankment of a polder, protecting it from the sea or a river. Canal embankments align the main internal canals (<i>khals</i>). |
| High, Low Land | One of Bangladesh' land classification systems is linked to the depth of flooding: F0=0-30 cm, F1=30-60 cm, F2=60-90 cm and F3=90-180 cm. It is especially used in floodplain management projects, i.e. polders. F0 is considered the best, F3 the worst class. In polders all four classes may be present. Improving drainage may improve the class of land. Different land classes have different cropping patterns and require different water management, which often means a different operation of the main sluice. The issue of low-land versus high-land is often mentioned in FGDs. |
| <i>Khal</i> | Usually used for the main canal in a polder at primary level, although there are also smaller secondary and tertiary <i>khals</i> . Polders have usually several main <i>khals</i> . The main <i>khal</i> connects to the river through a main sluice gate. Primary function is drainage, in forthcoming cases <i>khals</i> may supply water for irrigation and be used for water conservation and maintaining water levels. Sedimentation of the <i>khal</i> is a recurrent issue of concern. Conflicts arise around people encroaching upon the <i>khal</i> , with cross dams (for fish cultivation, water conservation, drainage) and cultivation on different levees within the <i>khals</i> , exploiting residual moisture. |
| Polder | Enclosed hydrological unit, separate from the surrounding hydrology, in which water conditions can be managed independently from the surroundings, provided the infrastructural means are provided; one constraint in Bangladesh is that drainage is depending upon gravity, there are no pumped drainage systems. |
| Sluice Gates | The main sluice gate connects the main <i>khal</i> with the surrounding river. As there are hardly any internal sluices in the polders, the operation of the main sluice determines water levels in the polder, the rate of drainage or supply and salt intrusion, depending of course upon the boundary conditions. As there are different wishes on the water management conditions in the polder, the operation of the main sluice gate is seen as crucial. Conflicts arise on who controls the main sluice. In larger polders the control is formally the mandate of the WMA. In the small polders it is the mandate of the WMCA. |

Summary

Objectives and focus

The evaluation of the Dutch food security (FS) country programme in Bangladesh is one of four IOB-commissioned impact evaluations. It consists of:

- an impact evaluation of the Dutch food security country programme
- an impact evaluation of selected food security projects, including projects with a clear relation between water management and food security.

The overarching research question for the impact evaluation study of the food security programme in Bangladesh is: *what has been the contribution of the Dutch food security programme to the food security situation in Bangladesh?* Following are the more specific evaluation questions:

1. What is the composition and motivation for the Dutch food security country programme 2012-2015?
2. What instruments are used and what is the synergy in tackling food insecurity?
3. What are the effects of a) the Dutch country programme, and b) the selected project, on food security?
4. How does the expenditure relate to the number of directly and indirectly targeted beneficiaries and to the expected food security effect per beneficiary?
5. What can be said about the efficiency or cost-effectiveness of the food security interventions?

This impact evaluation obtained a slight extension of the assignment to address additional questions on the relation between agricultural production and water management (extension approved in April 2014) and thereby also contributes to the IOB policy evaluation on sustainable eater management (expected in 2017).

For the selection of projects, the evaluation team distinguished three levels of intensity in evaluating the Dutch food security and relevant water related projects in order to realize the set objectives (see table below):

- Level A: Detailed household surveys and focus group discussions, of two pre-selected projects: Safal and Blue Gold, as well as detailed analysis of project progress and monitoring reports and interviews with project staff.
- Level B: Detailed analysis including review of progress and monitoring reports and interviews with project staff, of four projects: Profitable Opportunities for Food Security (PROOFS), Char development and resettlement project (CDSP IV), Improving Food Safety in Bangladesh (by FAO), and Scaling up rice fortification (by WFP).
- Level C: Screening of the main findings of three other relevant projects, all funded by the water budget and with relevant food security objectives, being: Crop water management (by FAO), Market Infrastructure Devt. Charland Regions (MIDPCR), South-West area integrated water resource (SWAIWRPMP).

Methodology

Use was made of a mixed methods approach, including quantitative data collection using household surveys and qualitative data collection using Focus Group Discussions (FGD) and Key informant interviews (KII).

For the household surveys extensive survey questionnaires were made. Use was made of digital data collection tools. These were tested and enumerators were trained to use the digital tools in the correct way. The baseline survey was carried out in April and May 2014, the endline survey was carried out in March and April 2016, by staff of BRAC University (later shifted to DRI). The household survey was conducted according to an agreed sampling design, with a similar number of households in treatment and control areas (unions) for Safal, and treatment and control polders and villages for Blue Gold. Control areas were selected in such a way that they corresponded as much as possible with the beneficiary areas. The selection criteria of households in control areas were defined in such a way to reproduce the criteria used by the projects to select beneficiaries. The questionnaire used for the baseline and endline survey was essentially the same, but the endline survey included additional questions on the perception of changes during the last 2 years.

The households in treatment and control areas each covered 400 households, thus ending up with 1,600 households for the two projects together. For the Safal areas a distinction was made between landowners (270 households) and landless (130 households). The landless are defined as those with less than 0.2 ha of land, but they can use land or aquaculture ponds through renting or leasehold arrangements.

For the endline survey the same 1,600 households were approached to be able to observe differences between base and endline at the micro-level. In total 41 (2.6%) could not be retrieved or interviewed, and had to be replaced by similar households. In multivariate panel type analyses these 41 households will be disregarded.

For qualitative data collection, during the baseline survey, FGDs on water management were held in 42 villages of the Blue Gold polders (men and women separately), supported by a short questionnaire among the FGD participants, covering 266 persons. In addition, KII were held with members of 17 Water Management Group Executive Committees and 4 Water Management Association Executive Committees, focusing on functionality of these structures. FGDs on food security value chains (horticulture, aquaculture and livestock) were held in 21 Safal villages (men and women separately). During the endline survey, in total 28 FGDs and 24 KIIs were held, selected in such a way to cover different value chains, value chain actors and other relevant stakeholders, for both Safal and Blue Gold project areas. Both during the baseline study and during the endline study coordination took place by local supervisors and team members from the Netherlands undertook field visits to Bangladesh, conducting the following:

- Workshop with RNE staff and project partners of selected six projects;
- In-depth interviews and discussions with staff from the selected six projects and staff from RNE Dhaka;
- Participation in surveys and focus group discussions;
- Separate study and field visit on water management experiences.

Bangladesh food security context

Despite rapid population growth, Bangladesh has achieved impressive progress in food production and poverty reduction over the past two decades, as well as declines in the extent of wasting and stunting. However, food insecurity and undernourishment remain at unacceptably high levels for a large part of the population. The Monitoring Report 2013 of the National Food Policy Plan of Action and the Country Investment Plan show that a large part of the population still suffers from a lack of food security. In 2011/12 16.8% of the population was found to be undernourished; 36.4% of all children under five were underweight and 41% were stunted, which not only greatly impairs their physical and intellectual development, but will also act as a severe impediment to the economic and social development of the country. The World Bank estimates that micronutrient deficiencies can cost countries up to 5% of gross national product (GNP) due to their negative impact on productivity.

The challenges in improving food security in Bangladesh are the increase in production of nutritious and safe food, increase in employment and income, and awareness of proper nutrition. To address these challenges, national food policies focus on technology development, value chain development, organisation of farmers, and investments in processing, logistics and infrastructure.

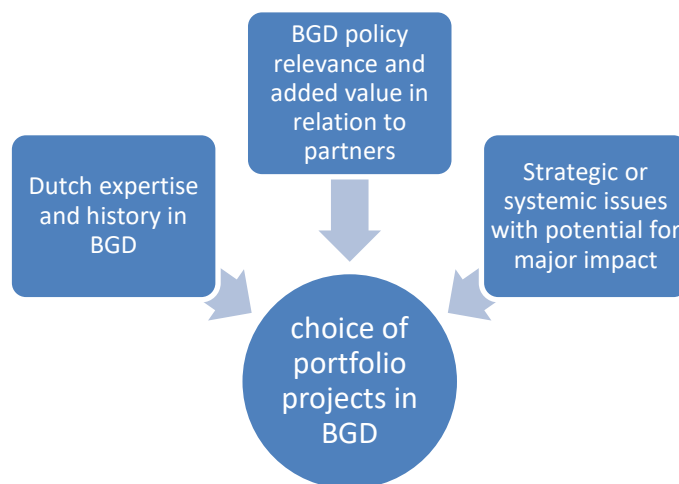
The Dutch project focus is at southwest Bangladesh. Here we find the following key challenges:

1. Lack of adequate water infrastructure and poor governance in water and land management.
2. Risks of cyclones and tidal surges damaging farms, livestock and people, and problems of water salinity
3. Poor organisation of smallholder into professional groups for collective benefits and reducing costs, and hardly any connection with organized high value markets
4. Poor nutrition, health and hygiene practice due to inadequate knowledge mainly
5. Limited coordination of several government and non-governmental initiatives in the region.

However, in this region the existing natural resource base is highly productive, allowing more crops per year if well managed. There has been increasing presence and investments of the local and national private sector in the region. There is increased donor and GoB interest in polder management and infrastructure development, research institutes developing new and sustainable agricultural systems and technology, oriented at transforming local agricultural practices through effective mobilization and engagement of the enterprising communities. During the project implementation period there have been positive trends leading to an overall increase in agricultural production, an increase in GDP per capita, a stabilization of the production of rice but an increase in other agricultural products, including aquaculture, horticultural and dairy. In the study area there has also been a significant improvement of the roads network, leading to better access to markets, which is particularly important for aquaculture products.

1. What is the composition and motivation for the Dutch food security country programme 2012-2015?

The Dutch food security programme is aligned with Bangladesh's Plan of Action under the National Food Policy as well as the Perspective Plan 2010-2021 and the sixth Five Year Plan 2011-2015. In line with Bangladesh's Country Investment Plan, which serves as a road map towards investment in agriculture, food security and nutrition, a number of interventions have been started in the form of projects. The reconstruction of the choices made by the RNE in Bangladesh (2014), and the changes and developments made in 2016, shows a choice for strategic issues and innovations in the following areas mainly: local water management institutions, smallholder farmer integration in value chain development, household decision-making on nutrition and women empowerment. The RNE food security programme shows a diversity of themes that were motivated from three different angles:



The Dutch expertise and history in Bangladesh is most significant for two subjects, being: (i) connecting food security interventions to the water sector, and (ii) food security in relation to private sector development and trade (import and export). This evaluation therefore also included an overview and analysis of 10-15 years of involvement in water management projects, and has used the emerging insights to draw relevant conclusions on the added value of the BGP. The BGP has a more explicit attention on food security and nutrition. For Safal value chain development and linkages with Dutch export markets and companies has been a strong underlying motivation.

While the projects in the portfolio cover a range of different impact pathways of the Dutch food security policy, three impact pathways stand out:

- Relation between food security and water management – this includes the largest budget due to high costs of major water infrastructural works
- Value chain development for cash crop production and revenue generation – this focuses at value chains that are relevant for nutrition and potential markets
- Diet diversity and improved nutrition – this is mainly work oriented at awareness raising and change of behavior at household and consumer level.

There are also significant projects on food safety, rice fortification (and its relation with garment industry), polder development (new polders being created from so-called 'chars') and advice on a Delta plan.

Following are the main conclusions on this evaluation question.

- There has been a clear and justifiable rationale for the development of the Dutch food security programme in Bangladesh and its relation with water management;
- Many themes are innovative and address frontline issues, with pilots being conducted that have potential for wider impacts if being more widely adopted (e.g. on market-driven supply chains, food safety, rice fortification, integration of SRHR aspects into food security projects);

- Three themes and impact pathways stand out: the relation between water management and food security, value chain development with traders and export markets in the Netherlands (markets for the poor -M4P), integration of food safety and awareness raising on nutrition;
- There are initiatives to better understand the dynamics at household level that appear to be critical to food security outcomes.

2. What instruments are used and what is the coherence and synergy in tackling food insecurity?

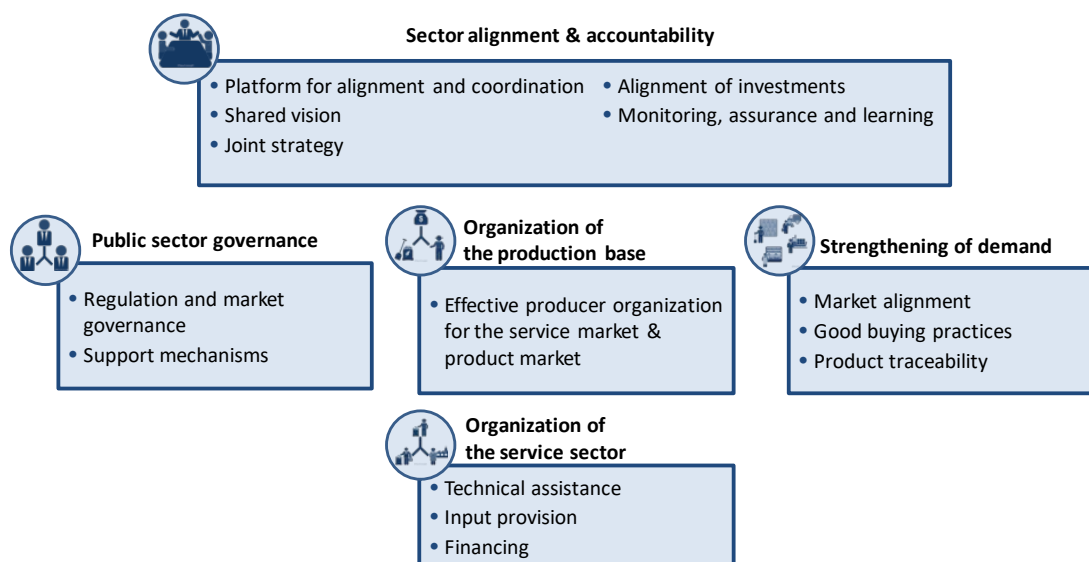
From the inventory of the existing Dutch funded projects and programmes it appears that a major part of the programme embassy managed projects. Some projects that are centrally managed from The Hague are for example: (i) the ICCO programme that is MFS II funded, (ii) the GAIN programme component in Bangladesh that is a public-private partnership, (iii) one PSI project and (iv) some research and knowledge oriented projects (WUR, NUFFIC). These projects are already being evaluated, explaining the focus of this evaluation on the funding channel delegated to the embassy. In terms of synergy of instruments, the evaluation team therefore focused on synergy and coherence of the project portfolio from different angles (see for details section 4.5):

1. *Coherence in relation to local context.* The RNE food security programme addresses main challenges in south-west Bangladesh. Both programmes have shown to be adaptive by building onto new insights and adjusting to new conditions. One remaining gap appears to be the insufficient human and financial resources of central and decentralized government agencies, to create an enabling environment for smallholder production. This is especially valid for water management, characterized by a weak Bangladesh Water Development Board.
2. *Coherence in relation to Bangladesh policies.* The Dutch Food security programme is aligned with the Bangladesh food policy (National Food Policy – NFP) and more specifically its strategic areas, and several projects appear to be given a high priority (Table 7). The projects funded through the RNE, and the changes made during the last few years, show the intention to address new frontiers and strategic issues that emerged in recent years but do not feature in the Bangladesh food security policy.
3. *Coherence in relation to other development partners.* The FS programme has been positioned in order to have an added value in relation to the work by other development partners. The evaluation team noted that both in 2014 and 2016 the RNE chaired the LCG on Food Security and took a very active role in coordinating the interventions of development partners. More recently, the emphasis has been on the relation between food security and SRHR (sexual and reproductive health and rights).
4. *Coherence and synergy internal to Dutch FS Programme.* There is good collaboration and exchange between projects, stimulated by the RNE Dhaka through regular joint sessions and inspiring conceptual thinking. There are examples of joint learning and exchange leading to new forms of collaboration. Yet, there is also scope for more integration.
5. *Coherence with private sector development.* There is participation by the Dutch private sector, for instance in fisheries and in horticulture (linked to the Safal project) and linked to the rice fortification project. However, the projects do not yet show significant progress of Dutch private sector willing to participate and invest in Bangladesh. This can probably be explained by a number of factors:
 - Bangladesh has a relatively poor business climate and (more recently) a poor security situation
 - Bangladesh has a poor track record on food safety with poor enforcement mechanisms
 - In Bangladesh the concept of ‘markets for the poor’ has not yet been widely adopted and thus it takes time to build up relations of trust between producers and market players (estimated at at least 3 years).

Following are the main conclusions on this evaluation question.

- There is exchange between projects stimulated by the RNE Dhaka through regular joint sessions and inspiring conceptual thinking, with examples of improved collaboration and synergy, and new insights being taken up by the projects;
- On the impact pathway of water management, agricultural production and food security, maintenance of large scale water infrastructure by respective regional or national institutions should have been a priority, as this is one condition for local level water management to be effective. It is uncertain whether sufficient RNE diplomacy has focused at this level.
- On the impact pathway of food security and nutrition, there is new thinking in synergy between SRHR and food security, by the central focus theme of ‘the young women in the household’. This appears to be a new theme to be developed.

- On the impact pathway of export oriented cash crop production, there is evidence of significant progress in stimulating export value chains through involvement of Dutch companies, however, progress is slow and more time and resources will be required to consolidate and expand the expected impacts. Also, a conceptual model for enhancing the synergy between projects operating in this area has been missing. We refer to the following model that has been developed to define the main building blocks for sector transformation towards more sustainable and inclusive agricultural value chains.



The sustainable sector transformation model and its building blocks (source: Aidenvironment, New Foresight, IIED and IFC)

In the following table we assess to what extent the selected projects have dealt with these different components. It is clear that sector alignment has so far been the weakest component.

| | Building blocks for sector transformation | | | | |
|-------------|---|--------------------------|---------------------------------|----------------------|--------------------------------|
| | Sector accountability | Public sector governance | Organisation of production base | Strengthening demand | Organisation of service sector |
| Safal | 0 | + | + | + | ++ |
| Blue Gold | - | 0 | + | - | 0 |
| PROOFS | - | 0 | + | 0 | + |
| CDSP | - | - | ++ | - | 0 |
| Food Safety | + | ++ | - | 0 | 0 |

This overview shows the potential complementarity between different projects. It shows that the Safal project is unique because of its activities to enhance market access, organize the service sector and work with value chain actors. The Food Safety project is unique because of its influence on national and sector-based policies and guidelines, as well as local pilots such as those with green vendors (see section on food safety impact chain). Together, these two projects have the potential to realise sector transformation, by addressing all different components of the sector transformation model.

3. What are the effects of a) the Dutch country programme, and b) the selected project, on food security?

When looking at the impact pathways leading to improved food security, there are effects with proven attribution to the projects for about 110,000 beneficiary households, distributed as follows:

- 47,000 HHs (of which 4,000 landless) for the impact pathway of cash crop production (Safal),
- 35,000 HHs (all landless) for the impact pathway of improved nutrition (Safal)
- 28,000 HHs for the impact pathway of improved water management and food production (CDSP)

In addition, there is a plausible contribution by the projects to positive changes with 170,000 to 350,000 households, having benefitted from the selected projects. For these households there are either or both

improvements in agricultural production, household incomes, improved water management, food security and diet diversity, as well as nutritional adequacy. While for this category of beneficiaries there is qualitative evidence of project effects, there are no proven project effects because in the control areas we find similar trends.

Beneficiaries include both landowners and landless (those with less than 0.2 ha of land). For Safal it was possible to clearly make this distinction during the evaluation. For landowners, farm incomes have increased by USD 1520, of which USD 840 can be attributed to the project. For landless, Safal created employment for 1307 landless (80% men) as value chain actors (selling inputs, transport) in 17 types of enterprises in three subsectors, with additional incomes due to the project estimated at USD 1,000 per year. In addition, at least 4000 landless have benefitted from increased crop and fish production, with farm incomes increased by USD 1298, of which USD 594 can be attributed to the project. For both the landowners and the landless, fish production and sales has highest contribution to this project effect.

In terms of gender aspects, there is no evidence that the projects have influenced existing decision-making structures or ownership patterns. In aquaculture men still strongly dominate the sales and the revenues. In rice and other crops men also dominate, while in milk women do play an important role. There is no evidence that the project has influenced this.

Another way of classifying the project results is according to the 4 different levels of food security outcomes, as indicated in below table. The table provides the expected results by each project as determined during the baseline study, based on project theories of change, as well as the conclusions on results based on the evaluation study during the last 2 years. It can be observed that plausible positive results are achieved in terms of reaching targeted beneficiaries, including the landless and most vulnerable, through increased food production and availability. Improving food accessibility through improved incomes from marketing agricultural products is not always realised. Improved food consumption has been realised in many cases, with improved food security indicators as a result. Improved food access stability is the weakest component, as sustainability of the realised results is uncertain in most cases.

Classification of selected projects by their main food security outcomes

| Projects | Food security outcomes | | | | |
|---|--|--|---|---|--|
| <i>Objectives</i> | <i>Number direct beneficiaries, and targeting food insecure</i> | <i>Increased food availability</i> | <i>Increased food accessibility</i> | <i>Improved food access stability</i> | <i>Improved food consumption / utilization</i> |
| Level A projects | | | | | |
| 1. Safal | 250,000 landowners / beneficiaries; 1,300 unemployed landless to benefit through marketing FULLY REALISED | Yes, for targeted sectors (dairy, horticulture, aquaculture) the emphasis is at generating income. FULLY REALISED | Yes, for targeted sector increased incomes through higher productivity and marketing is main driver. PARTLY REALISED | Yes, production systems will become more resilient and productive; attention to sustainability issues. UNCERTAIN | Yes, project also includes awareness on behavioural change on nutrition and health for households PARTLY REALISED |
| 2. Blue Gold | 150,000 households that are generally food insecure. Women are particularly targeted. PARTLY REALISED | Yes, directly through the agriculture component and indirectly through improved water management PARTLY REALISED | Doubtful, the assumption is that improved production will also be marketed, but this needs to be developed INDEED NOT REALISED | Yes, improved water management leads to more production stability, e.g. more crops / year, diversity UNCERTAIN | Yes, project also includes awareness on behavioural change on nutrition and health for households REALISED |
| Level B projects | | | | | |
| 3. Char Development and Settlement Phase-IV | 155,000 people living on 5 new chars, landless and vulnerable receive land titles REALISED | Yes, through the agriculture activities, by land security + water management REALISED | No, unlikely that people will gain an income from selling (high transportation costs) PARTLY REALISED | Yes, water management and sustainability enhance production stability + diversity PARTLY REALISED | no |
| 4. Improving Food Safety in Bangladesh | No targets set, the poor are not particularly targeted UNCERTAIN | no | Partly, by improved access to good quality food PILOTS REALISED | no | Yes, focus at improving food safety and nutrition quality REALISED |
| 5. PROOFs | 80,000 rural households, focused at poor HHs, as producers or entrepreneurs REALISED | Not specifically, focus is at market-based linkages and market opportunities REALISED | Yes, aim is to increase income by linking small producers to markets UNCERTAIN | Yes, production systems will become more productive, sustainability not clear. PARTLY REALISED | Yes, nutrition messages and nutrition packages are provided PARTLY REALISED |
| 6. Scaling up of Rice Fortification in Bangladesh | The ultra-poor are targeted, particularly women; no targets set REALISED | No, the target groups purchase or receive rice INDEED NO PRODUCTION | Yes, access to food of good (enriched) quality, women empowerment REALISED | No | Yes, the project directly improved the nutrition status of rice REALISED |

The evaluation team identified three success factors related to effectiveness of the projects, being:

- *Context factors.* in agricultural development, there is a positive context of increasing consumption, consumer demand and export demand. Positive developments have been most significant in aquaculture, which is simply a booming business. Safal, BGP and PROOFS have benefited from this 'wave'.
- *Design factors.* Safal has been strong in terms of its design of the value chain and market-oriented approach, based on its global experiences. This approach has worked well for Safal, contrary to the experiences within BGP where the market oriented approach was not well designed. The FAO food safety has been well designed, with activities at multiple levels and pilots that can be scaled. The BGP did not sufficiently benefit from lessons of earlier water management projects, which would have shown that assuring maintenance of large-scale water management infrastructure is one condition for success. Also, the principle of water management groups would have benefitted from a restructuring, rather than revitalising the existing structures.
- *Implementation factors.* The rice fortification project benefitted from a redesign halfway, resulting in an effective gender focus. Without which it would not have been effective. The BGP project has been delayed in terms of late approval of major water infrastructural works, reducing the potential benefits for beneficiaries.

Apart from that, it should be noted that the evaluation was carried out two years after the start of the projects, which has been frequently stated as being very soon. Especially the BGP did not yet have sufficient time to fully realise its effects due to the delay of water infrastructural works.

With respect to the effects that have been achieved, there are also some concerns, being scale, inclusiveness and sustainability.

- a. *Scale.* While many beneficiaries have been reached, the numbers are not significant in relation to the population in Bangladesh or even the south-western region. Thus, the expected aim would be to scale the successful pilots. The evaluation team looked at effects of copying and crowding in effects². We found evidence of copying effects for introduced practices that lead to improved productivity (for Safal and BGP). However, there is no copying of practices by producers or value chain actors leading to improved sales. Also, there are few crowding in effects, of value chain actors wanting to join the project, raising concerns about possible limitations. Limitations could be related to the poor business climate, security effects or remaining uncertainties with respect to the expected benefits.
- b. *Inclusiveness.* There are remaining concerns on inclusiveness, whether women benefit, as decision making on sales tend to remain dominated by men. We have indications that where women dominate production and sales there are better food security effects. There are also concerns about beneficiaries in more remote areas, those with little or no land or not having received sufficient education.
- c. *Sustainability.* With respect to value chain approaches, the question is whether the changes realized so far are sustainable. Best practices are emerging from projects like SaFaL, but will need follow-up for at least several more years in order to consolidate. The market changes do not yet move towards 'markets for the poor' (i.e. markets becoming more accessible and responsive to supply by smallholders), especially not the intermediate value chain actors (factories, traders, middlemen, ...). More insights are required on what would make value chain actors change.
There are also concerns on environmental and social sustainability issues: there are concerns on the increasing use of chemical agricultural inputs, and on increasing workload of women and conditions for workers, with questions about equal wages for men and women.

4. How does the expenditure relate to the number of directly and indirectly targeted beneficiaries and to the expected food security effect per beneficiary?

Project costs are lowest for Safal and Proofs projects (EUR 70-200 per household), and highest for the two water management oriented projects (up to EUR 600-700 per household) (Table 10). The latter can be explained by the fact that major water infrastructural works are most costly. However, it should be noted that for the BGP polders that were surveyed the expensive activities on water infrastructural works have not yet been carried out, so the realized costs should be much lower. For most projects the potential for upscaling is

² Copying and crowding in effects are derived from the DCED approach to sector transformation, crowding in refers to other organisations joining the project or adopting the project strategy.

high, especially through the work on value chains (by Safal, as well as to some extent Proofs), and in combination with the Food Safety results at national, local and agricultural sector policy levels. This potential would need to be realized in coming years.

5. What can be said about the efficiency or cost-effectiveness of the food security interventions?

For Safal the costs can be compared with the realized benefits for beneficiaries (see below table), which were determined at USD 594 (EUR 530) for a landless household and at USD 840 (EUR 760) for a landowner household. This is a highly positive comparison. The comparison is even more positive if one realizes that the costs were made over several years while the benefits are every year. Also, there is good potential for upscaling of these benefits with reduced costs. For the CDSP-IV project, the increase in revenues over four years (2011-2015) has been a 126% increase (EUR 1000, thus EUR 250 per year), which can be largely attributed to the project. For PROOFS at the time of the evaluation there was no evidence of an increase in incomes for beneficiaries. This comparison is not relevant for the BGP polders that were surveyed because here the expensive activities on water infrastructural works have not yet been carried out (so the realized costs are much lower) while the expected benefits could have been higher if these investments had been made. For the Food safety project it is not yet possible to make this estimate because different types of activities and beneficiaries are involved. For the scaling up rice fortification project the results were not yet clear at the time of the evaluation.

| Project | Costs project period | Benefits per year per household | | |
|-----------|-----------------------------------|---------------------------------|---|---|
| | Costs per HH (see previous table) | Revenues | Revenue specifications | Other benefits |
| SaFaL | 71-110 | 530-760 | Mainly from aquaculture | Improved nutrition |
| Blue Gold | 338-675 | None proven | Expected in coming year | Improved nutrition proven |
| PROOFS | 100-200 | None proven | Expected n coming year | Improved access to water and sanitation |
| CDSP IV | 630 | 250 | From wages, trading, gardening, aquaculture, poultry, | Improved water management |

6. Conclusions with respect to the validity of the food security hypotheses of the Dutch FS policy?

Three hypotheses or impact pathways have been particularly studied and validated by this evaluation study. It has led to the following insights.

| Impact pathway | Conclusions |
|---|---|
| 1. Value chain development | <ul style="list-style-type: none"> Value chain development oriented at export and revenue generation can be effective provided a good design, experience to engage private sector companies and match smallholders. Where household income and food security is poor, households have a priority of using improved production for consumption and food security purposes It takes time to build up new value chain relations of trust and market relations between smallholders producers and buyers Aspects of service delivery, remoteness and transport play a role. |
| 2. Agricultural production – water management | <ul style="list-style-type: none"> At local level water management groups can have different functions, apart from managing water infrastructure Sustained management of larger water management infrastructure is a condition for local level WMGs to operate successfully It is yet unclear what conditions should be met for WMG members to be willing to pay for improved local water management, even if there is evidence of improved agricultural production |
| 3. Nutrition and food | <ul style="list-style-type: none"> Some effects on improved nutrition can be realized, but the patterns are |

| | |
|--------|--|
| safety | <p>not easy to understand and household dynamics are complex.</p> <ul style="list-style-type: none"> Realising effects for the all household members requires in-depth understanding of household dynamics, gender and cultural issues. |
|--------|--|

Recommendations

1. In general, less attention is needed at local level for the introduction of improved practices of agricultural production and water management. Many other NGOs are also doing this and copying of good practices readily takes place. However, more training is required on raising awareness on marketing of products, joint selling and negotiating with traders. Also, more attention is required to assure that service delivery systems have a good business case for providing adequate services to all categories of producers, including those in remote areas, disadvantaged groups and women groups.
2. More fine-grained analyses are needed to better understand the dynamics at household level and who really benefits. For example, there are indications that the landless have particularly benefitted in the Safal project, especially those newly starting agriculture and fisheries, but the underlying ownership or leasehold situation is unclear. And monitoring should not look at average yields and overall production, but also the variability and whether there are skewed patterns. Another example is that WMGs seem to benefit the larger landowners, but then many labourers may benefit indirectly. Also, it appears that women's role in agriculture has hardly changed, and there are indications that this constitutes a barrier in terms of increased production leading to concrete food security improvements.
3. There are remaining concerns on environmental and social sustainability that need to be addressed. For instance, there are concerns on the increasing use of chemical fertilizers and the use of pesticides that has not significantly declined. More specific normative standards seem to be required. There are also concerns about increasing labour for more productive agricultural systems and wages for men, women and hired workers by large land or pond owners.
4. The RNE has particularly focused on developing pilots on innovative approaches and strategies. However, a strategy on how to scale the successful pilots is missing. More attention is needed for strategies to support upscaling and sector transformation towards achieving greater impacts. Systemic changes can enhance upscaling and assure that results will sustain within a more conducive policy and market context. Strategic choices can be made based on a conceptual model with building blocks of sector transformation. More attention could be given to value chain interventions involving private sector engagement in changing practices of private sector operators especially in the middle levels of supply chains. These processes take time as relations of trust need to be built up between producers, value chain actors and wholesalers. It seems important to draw lessons regarding how to sustain and scale up the results and how can this be done.³ While some projects clearly address more strategic issues (e.g. food safety policies, rice fortification, Delta plan), these issues could be (better) integrated in the projects that focus at producer level results. Specific mechanisms for creating more synergy are the following:
 - Facilitate and support sector industry or producer organisations or multi-stakeholder platforms
 - Enhance national or industry production standards (on environmental and social sustainability)
 - Strengthen relevant national legislation (e.g. on environmental, social, labour, food safety issues)
 - Assure local service providers work on the basis of a business model
 - Strengthening food security diplomacy at national and sector level, by the RNE Dhaka, especially to stimulate national and sector wide policy changes and adoption of improved standards and guidelines.
5. There is also scope for more synergy between projects, for instance projects addressing sector policy issues (e.g. Food Safety) and value chain interventions (e.g. Safal, Proofs). A model has been proposed to better plan potential synergy between projects.
6. Building capacities on water management at local level has not been very effective due to the absence of effective maintenance of large-scale water infrastructure, mainly by the BWDB (Bangladesh Water Development Board). This could have been clear from earlier project experiences in the water sector.

³ This has also been a firm conclusion of the midterm review of the PROOFs project.

Diplomacy through FAO or other international institutions is recommended. This should be positioned in a broader multi-stakeholders and landscape / waterscape approach, as local level water management cannot be successful without adequate maintenance and operations of larger water infrastructure. Also, the interaction between water management and agricultural production requires strategic land-use planning with crops and products that take into account both climate changes and linkages to markets. Some such initiatives are underway, but the interactions with high level authorities remain weak.

7. There appears to be more need for food diplomacy on processes of change with national policy stakeholders, agricultural sectors and frontrunner private sector companies, for adopting changes that are in line with a model towards systemic changes. There is reference to the fact that the RNE has already played a constructive role in several cases, this could be continued and enhanced.
8. Monitoring and evaluation is currently focused at knowing direct results in terms of local beneficiaries, but could be more oriented at indirect results, changes in perceptions at policy level and changes in behavior of value chain actors, constituting important enabling conditions for upscaling and sustainability of results.

1. Introduction

Objectives

The evaluation of the Dutch food security (FS) country programme in Bangladesh is one of four IOB-commissioned impact evaluations. It consists of:

- an impact evaluation of the Dutch food security country programme; and
- an impact evaluation of selected food security projects
- with household level effects, one being the Safal project which is focused at value chain development, the other being the Blue Gold project which looks at the interaction between water management and agricultural value chain development.

The overarching research question for the impact evaluation study of the food security programme in Bangladesh is: *what has been the contribution of the Dutch food security programme to the food security situation in Bangladesh?* Following are the more specific evaluation questions:

1. What is the composition and motivation for the Dutch food security country programme 2012-2015?
2. What instruments are used and what is the synergy in tackling food insecurity?
3. What are the effects of a) the Dutch country programme, and b) the selected project, on food security?
4. How does the expenditure relate to the number of directly and indirectly targeted beneficiaries and to the expected food security effect per beneficiary?
5. What can be said about the efficiency or cost-effectiveness of the food security interventions?

Note that this impact evaluation obtained a slight extension of the assignment to address additional questions on the relation between agricultural production and water management (extension approved in April 2014) and thereby also contributes to the IOB policy evaluation on sustainable eater management (expected in 2017).

Phases and deliverables

This impact evaluation knows three distinct phases with related deliverables, as follows:

- Inception phase and inception report, with the main purpose to acquire inputs to be able to plan the subsequent phases of the impact evaluation.
- Baseline phase with resulting baseline report, consisting of two parts: (i) country programme baseline and (ii) project survey baseline (survey in April 2014).
- Endline phase with resulting final report taking into account the baseline and impact phase surveys and findings, again consisting of above two parts (survey in April 2016).

Selected projects

The impact evaluation distinguished three levels of intensity (or approaches) in evaluating the Dutch food security and relevant water related projects in order to realize the set objectives (see table below):

- Level A: Detailed household surveys and focus group discussions for two pre-selected projects: Safal and Blue Gold, as well as detailed analysis of project progress and monitoring reports and interviews with project staff.
- Level B: Detailed analysis of four projects including review of progress and monitoring reports and interviews with project staff, being Profitable Opportunities for Food Security (PROOFS), Char development and resettlement project (CDSP IV), Improving Food Safety in Bangladesh (by FAO), and Scaling up rice fortification (by WFP).
- Level C: Screening of the main findings of three other relevant projects, all funded by the water budget and with relevant food security objectives, being: Crop water management (by FAO), Market Infrastructure Devt. Charland Regions (MIDPCR), South-West area integrated water resource (SWAIWRPMP).

In the following table (Table 1) an overview is given of the main characteristics of the projects that were studied for this evaluation. The project budgets originate from the Food security and the Water

programme budgets, as well as in one case from the Gender programme. For the Blue Gold programme (BGP), while the full project budget originates from the Sustainable water management programme, it has been included in this evaluation because the project has main objectives focused at food security. The other projects with funding from the Water budget were also included because of the clear linkages to food security.

Table 1: Main characteristics of projects involved in the evaluation

| Project | Implementing Organisation | Year begin to end | Location | Project Budget and budget origin |
|---|-------------------------------------|--------------------------------|---|--|
| Level A projects | | | | |
| SaFaL | Solidaridad | 01/09/2012-31/08/2016 | South-west | EUR 12 million - Food security |
| Blue Gold | Mott MacDonald – Gov. of Bangladesh | 01/01/2012 30/06/2020 | South-west | EUR 50.6 million - Water |
| Level B projects | | | | |
| Profitable Opportunities for Food Security - PROOFS | ICCO, BOP inc., iDE, and GAIN | 01/07/2013 31/06/2017 | South-west (3 Districts) and north-west (4) | EUR 8 million - Food Security |
| Char development and resettlement project – CDSP IV | IFAD and Gov. of Bangladesh | 01/01/2013 31/12/2017 | Southern coastal zone - charlands | EUR 17.6 million - Water |
| Improving Food Safety in Bangladesh | FAO | 01/07/2012 30/08/2015 | Country wide, system level | USD 12.5 million - Food security |
| Scaling up rice fortification | WFP and DSM | 01/09/2013 31/12/2016 | National level and 4 districts | EUR 3.8 million - Gender - Food security |
| Level C projects | | | | |
| Crop water management | FAO | 01/07/2012 30/06/2014 | South-west, overlap with BG mainly | EUR 2.2 million - Water |
| Market Infrastructure Devt. Charland Regions - MIDPCR | IFAD | <i>Finalized</i> 30/06/2013 | Southern coastal zone - charlands | EUR 4.75 million - Water |
| South-West area integrated water resources-SWAIWRPMP | Asian Development Bank | 01/11/2015 -30/06/2023 | South-west | EUR 6.3 million - Water |

As for geographical locations, there is a clear focus on South-West Bangladesh and partial overlaps between projects: (1) Blue Gold and SaFaL both operate in South West Khulna, Satkhira, Narail districts; (2) Blue Gold and PROOFS in Patuakhali; (3) CDSP IV, MIDPCR and PROOFS in Noakhali, Bhola (see also map Appendix 1).

2. Methodology

2.1 Working with impact pathways

During the baseline phase, the impact evaluation team defined impact pathways that are part of the overall food security theory of change, and indicated how the selected projects are expected to contribute to these impact pathways. In the first place, an overview was made showing that the ten selected food security projects contribute to most food security impact pathways (see Appendix 2). This illustrates the diversity and wide scope of the food security programme in Bangladesh. From the original set of impact pathways, in collaboration with IOB and the RNE Dhaka the team selected three impact pathways to focus upon during this impact evaluation. Table 2 shows the three pathways and how these are applicable to the six selected projects.

Table 2: Defined food security impact pathways for selected projects

| Projects | Impact pathways | | |
|-----------------------|----------------------------|---|------------------------------|
| | 1. Value chain development | 2. Agric. production – water management | 3. Nutrition and food safety |
| SaFaL | ++ | + | + |
| Blue Gold | + | ++ | + |
| PROOFS | ++ | | + |
| CDSP-IV | + | ++ | + |
| Improving Food Safety | + | | ++ |
| Rice Fortification | + | | ++ |

++ = main effects expected by the project; + = additional effects expected

We elaborate on the selected impact pathways and discuss progress on the basis of a scheme that shows the main elements of the pathway (result chain) and assumptions involved, see chapter 5.2.

2.2 Methodology

Table 3 shows the research methodologies applied for the different categories of projects.

Table 3: Different evaluation approaches applied

| Level of intensity / approach | Expected results |
|--|---|
| Level A <ul style="list-style-type: none"> Detailed quantitative surveys at HH level with control areas, focus group discussions, key informant interviews and interviews with project staff | Conclusions on <i>proven</i> impact and <i>attribution</i> based on econometric analysis and analytic description of cause-effect relations |
| Level B <ul style="list-style-type: none"> Analysis of progress, evaluation and monitoring reports, analysis of aggregated results, expert meetings, focus at selected impact pathways | Conclusions on <i>plausible</i> impact and <i>contribution</i> based on quantitative data and narratives |
| Level C <ul style="list-style-type: none"> Screening of relevant monitoring and evaluation reports on progress and results, focus at relations between water management and agricultural production | Conclusions on relevant insights with respect to results, impacts and cause-effect relations |

Survey approach

The baseline survey was carried out in April and May 2014, the endline survey was carried out in March and April 2016, by staff of BRAC University (later shifted to DRI). The main household survey (HHS) was conducted according to the agreed sampling design, with a similar number of households in treatment and control areas (unions) for Safal, and treatment and control polders and villages for Blue Gold. Control areas were selected in such a way that they corresponded as much as possible with the beneficiary areas. The selection criteria of households in control areas were defined in such a way to reproduce the criteria used by the projects to select beneficiaries. The questionnaire used for the baseline and endline survey was essentially the same, but the endline survey included additional questions on the perception of changes during the last 2 years.

The households in treatment and control areas each covered 400 households, thus ending up with 1,600 households. For the Safal areas a distinction was made between landowners (270 households) and landless (130 households).

Table 4 shows the distribution of selected households in relation to land size. It reflects that Safal has selected a relatively large group of beneficiaries from the group of medium (12%) and large scale farmers (2%). This was done in consultation with the RNE to ensure quantity and quality of commodities supply to the market, especially also on aquaculture products. This was not known when the survey was designed. The control sample may be assumed to represent the composition of the total population. This biased selection of beneficiaries was corrected during the impact evaluation by using the method of propensity score matching.

Table 4: Safal landowner and landless beneficiary households and control survey samples by land size 1)

| | 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% | 58.52% | 90.77% | 81.85% | 99.23% |
| Marginal Farmer (50-149) | 45% | 28.15% | 8.46% | 14.81% | 0.00% |
| Small holder (150-249) | 21% | 9.63% | 0.77% | 2.59% | 0.77% |
| Medium farmers (250-749) | 12% | 3.70% | 0.00% | 0.74% | 0.00% |
| Large farmers (> 750) | 2% | 0.00% | 0.00% | 0.00% | 0.00% |
| Total | 100% | 100% | 100% | 100% | 100% |

1) 100 decimal is equal to 0.4 ha

Table 5 shows that the Blue Gold beneficiary and control samples are well matched in terms of land size.

Table 5: Blue Gold beneficiary and control sample by land size

| | Blue Gold beneficiaries (n= 400) | Blue Gold controls (n=400) |
|--|-------------------------------------|-------------------------------|
| Landless (0-49 decimal lands) | 68.50 | 76.00 |
| Marginal Farmer (50-149 decimal lands) | 19.75 | 13.00 |
| Small holder (150-249 decimal lands) | 7.75 | 5.50 |
| Medium farmers (250-749 decimal lands) | 4.00 | 5.25 |
| Large farmers (750 decimal and above) | 0.00 | 0.25 |
| Total | 100% | 100% |

For the endline survey the same 1,600 households were approached to be able to observe differences between base and endline at the micro-level. In total 41 (2.6%) could not be retrieved or interviewed, and had to be replaced by similar households. In multivariate panel type analyses these 41 households will be disregarded.

Focus group discussions and key informant interviews

During the baseline survey, Focus Group Discussions (FGD) on water management were held in 42 villages of the Blue Gold polders (men and women separately), supported by a short questionnaire among the FGD participants, covering 266 persons. The FGD format and survey was adjusted based on the approved extension of the evaluation on water management issues. In addition, structured interviews were held using a questionnaire with 1-2 members of 17 Water Management Group Executive Committees (WMG-EC), and with 1-2 members of 4 Water Management Association Executive Committees (WMA-EC), focusing on functioning of these structures. The structured interviews were done on the basis of a format that was developed for the approved extension on water management issues. Focus Group Discussions on food security value chains (horticulture, aquaculture and livestock) were held in 21 Safal villages (men and women separately), supported by a short questionnaire among the FGD participants.

During the endline survey, in total 28 FGDs were held and 24 key informant interviews (KIIs), following below scheme (Table 6). All FGDs and KII (of different types) were held using a predefined format, were transcribed in English and then analysed to acquire summaries.

Table 6: Focus group discussions and key informant interviews held

| Level | Type | Blue Gold | | | Safal | | |
|--------------------------|--------|----------------------|--------------------------|-----|-------|---------|---------|
| | | Sesame (Polder 3) | Moon dahl (polder 43) | FFS | Dairy | Shrimps | Hortic. |
| Producer | FGD-1 | 2 | 2 | 4 | 2 | 4 | 4 |
| Water management | FGD-2 | 10 (5 men, 5 women) | | | | | |
| Input supply | KII-1 | | | | | 1 | 2 |
| Collection centres | KII-2 | | | | 1 | 3 | 2 |
| Other value chain actors | KII-3 | 2 | 2 | | 1 | 2 | 2 |
| Other stakeholders | KII -4 | 6 | | | | | |

Workshops and interviews

Both during the baseline study and during the endline study project team members undertook field visits in Bangladesh, conducting the following:

- Workshop with RNE staff and project partners of selected six projects;
- In-depth interviews and discussions with staff from the selected six projects and staff from RNE Dhaka;
- Participation in surveys and focus group discussions;
- Separate study and field visit on water management experiences.

3. Food security context

The economy of Bangladesh is largely agro-based. But agriculture, which is the largest economic sector accounting for 48% of the actively employed labour force and 21 % of GDP has not been able to realize its full potential in playing a role in overall economic development of Bangladesh. The rural population of Bangladesh has the highest number of underweight children (44.6 %) while the national average is 41%. Twenty-five percent of the rural population lives below the minimum level of dietary energy consumption (1805 Kcal/person/day).

Southwest Bangladesh, the geographic focus of the RNE food security programme and this impact evaluation study, is an ecologically rich delta with water and natural resources with many poor people, including small and marginal farmers who are ecosystem dependent. They now find it difficult to ensure their food and livelihood security. The region is facing catastrophic consequences of extreme weather events, environment and natural resource degradation, decreased soil fertility due to saline intrusion, improper water management and poor access to fresh water and drinking water. As a result, agricultural productivity is suffering, impacting on income and employment opportunities for the poor and marginalized. This has resulted in household instability and large-scale migration. There are clear indications of large-scale internal migration from Bangladesh's southern coastal zone, which is known to be highly susceptible to climate induced hazards. The majority of the migrants are men, with women left behind to maintain livelihoods with fragile economic resources, and limited social safety net arrangements. The evaluation team during the inception phase also clearly observed large areas prone to water logging, with resulting low food production. This kind of situation has made South West Bangladesh as one of the remaining food deficit areas.

The key issues facing southwest Bangladesh are the following⁴:

1. Lack of adequate water infrastructure and poor governance in water and land management.
2. The whole region is prone to cyclones and tidal surges damaging farms, livestock and people.
3. Salinity in water is challenging the traditional agricultural practices.
4. The supportive infrastructure (enabling environment) for the productive sector, such as research and extension services, input supply, credit, processing technology is not well developed and not supportive for the producers.
5. The majority of the farmers are smallholders and are rarely organized into professional groups for reaping collective benefits and for reducing costs.
6. No avenues for organized marketing of agricultural products with hardly any connection with organized high value market.
7. Very limited avenues for alternative entrepreneurship development and employment opportunities for landless women in the region.
8. Poor nutrition, health and hygiene practice due to inadequate knowledge and understanding on safe behavior.
9. Insufficient human and financial resources of central and decentralized government agencies, to create an enabling environment for smallholder production
10. Limited coordination of several government and non-governmental initiatives in the region.

However, there are also many opportunities in the Southwest, given the existing base of natural resources that would allow more crops per year if well managed, increasing presence and investments of the local and national private sector in the region. There is increased donor and GoB interest in polder management and infrastructure development, a surge of national and international research institutes developing new and sustainable agricultural systems and technology, and the potentials of transforming local agricultural practices through effective mobilization and engagement of the enterprising communities.

⁴ Source: Safal project proposal

During the last few years there have been a few important changes in the context where the FS programmes operate, and specifically in the regions where the projects are located. From the surveys and related interviews with project partners we note the following changes:

- Increase in GDP per capita
- Increase in agricultural production
- Stabilization of production of rice, no further increases in yield
- Increase in aquaculture production, yields and exports
- Increase in horticultural production, yields and exports
- Increase in dairy production, yields and exports

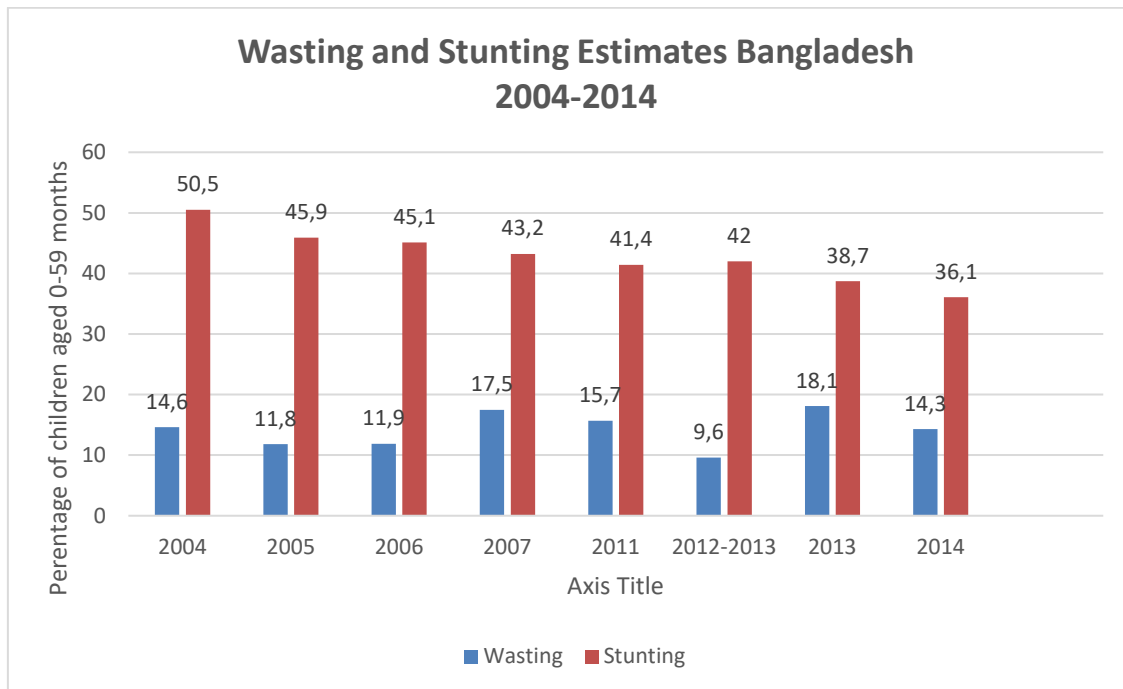
Another important change in the study area has been the improved roads network, reportedly leading to better access to markets, which is, for instance, very important for aquaculture products.

Despite rapid population growth, Bangladesh has achieved impressive progress in food production and poverty reduction over the past two decades. However, food insecurity and undernourishment remain at unacceptably high levels for a large part of the population. The Monitoring Report 2013 of the National Food Policy Plan of Action and the Country Investment Plan shows that a large part of the population suffers from a lack of food security. In 2011/12 16.8% of the population was found to be undernourished; 36.4% of all children under five were underweight and 41% were stunted, which not only greatly impairs their physical and intellectual development, but will also act as a severe impediment to the economic and social development of the country.

There have been during the last few years continuous declines in the extent of wasting and stunting, although the levels are still critical (see below Figure 1 and trends). The national prevalence of chronic undernutrition in children under the age of five continues to pose a major challenge, with about 6 million children (36%) stunted and a global acute undernutrition rate of 14%. Micronutrient deficiencies remain to be a risk factor for many diseases, for stunted growth and development, which in turn leads to reduced physical and cognitive performance, and increases the risk of morbidity and mortality. The prevalence of iron deficiency (anaemia) is 64% in children 6-23 months and 46% in pregnant women and 30% in non-pregnant and non-lactating women. Zinc deficiency is 57% among non-pregnant and non-lactating women in Bangladesh. The World Bank estimates that micronutrient deficiencies can cost countries up to 5% of gross national product due to their negative impact on productivity⁵.

⁵ McGuire J, Galloway R, World Bank 1994, *Enriching lives: overcoming vitamin and mineral malnutrition in developing countries*, Development in Practice Series, Washington DC, World Bank.

Figure 1: Trends on wasting and stunting in Bangladesh 2004-2014



In the coming years, the challenges in improving food security in Bangladesh continue to be the increase in production of nutritious and safe food, increase in employment and income, and awareness of proper nutrition. To address these challenges, national food policies need to be implemented effectively, technologies developed and applied, value chains enhanced, farmers organized, and investments in processing, logistics and infrastructure made. In this, the government, the private sector and civil society need to play their respective roles.

4. Bangladesh and Dutch food security policies and plans

4.1 Food security policies and plans

4.1.1 Dutch food security policy

Food security is a thematic focus for the Dutch development cooperation policy. This coincides with a global trend to focus on the increase of food availability as well as quality. The budget available for improving food security has been increased by the Netherlands from € 160 million in 2011 up to around € 300 million in 2015. The food security policy works through four pillars:

- Increased sustainable food production;
- Improved access to better nutrition;
- More efficient markets;
- A better business climate

The Dutch food security policy is delivered through four channels:

1. Multilateral channel contributions from the Dutch government to global agencies, for example UN agencies like FAO, IFAD, UNICEF and WFP. Mostly these contributions are not earmarked and can therefore be spent freely on subject and country deemed most relevant;
2. Central contributions through the bilateral channel, for example to IDH, Agriterro, GAIN, Geo Data for Water and Agriculture (G4WA), the applied research fund and FDOV. These programmes support many initiatives in a lot of different countries;
3. Funds delegated to the embassies for projects in their respective countries. For 2014 these include € 162 million in total on the Dutch budget for food security worldwide;
4. Indirect contributions through budgets for other policy objectives, for example MFS funding targeted at strengthening civil society.

The focus of this evaluation is entirely on the third channel.

4.1.2 Result areas of RNE Bangladesh food security policy

The RNE Bangladesh has developed a result framework for the food security sector that is divided in three 'result areas', reflecting the four sub-themes in the Dutch FS policy (number 3 and 4 have been merged). For each of these three result areas indicators are defined to monitor the changes at national level and then indicators that would allow to know the contribution to these changes by the FS programme (i.e. from the projects in their respective target areas). The following result areas and main indicator categories were defined:

- A. Increase in sustainable food production, with sub-questions and indicators on:
 - a. The increase in food production (with indicators on production volumes, as well as the share of rice value added in total value added - which is expected to become less)
 - b. The use of land, water, energy and labour (with indicators on cropping intensity and yields, as well as uptake of improved agricultural practices by men and women)
- B. Better access to sufficiently nutritious food, with sub-questions and indicators on:
 - a. The increase in availability of sufficiently nutritious food (with indicators on health and malnutrition, as well as food safety)
- C. More efficient markets *and* improved business climate, with sub-questions and indicators on:
 - a. The increase in business activity and trade and whether it was inclusive (with indicators on number of jobs, business contracts and market places)
 - b. The increase in international investments and trade, especially involvement of Dutch companies (with indicators on businesses started by Dutch companies, investments made and jobs created).

With respect to private sector development, the RNE Dhaka business-related activities focused on four priority areas:

1. Creating more business-to-business links between Bangladeshi and Dutch companies (through sector studies, facilitation of business contacts and deals, and Holland branding).
2. Private sector development; this also involves improving the business environment and addressing obstacles to a sound investment climate (through economic diplomacy and programme support to Katalyst and other programmes focusing on improving value chains).
3. Supporting a big infrastructure project such as a new airport (by engaging Dutch expertise and technology, lobbying with the GoB, and through programme support).
4. Enhancing CSR awareness and CSR behaviour (through advocacy and programme support).

The RNE Dhaka's other cross-cutting activities are in line with its economic objectives. For instance, the Embassy's governance agenda has a strong focus on improving the tax system, the priority activities (SRHR, water, food security) will involve more Dutch businesses, and the education programme will be geared towards vocational training and skills development which underpin private sector development (PSD) efforts.

4.1.3 Bangladesh national level policies

At national level a National Food Policy Plan of Action and Country Investment Plan have been elaborated for the period of 2008 to 2015, by the Food Planning and Monitoring Unit (FPMU) of the Ministry of Food and Disaster Management of the People's Republic of Bangladesh. The National Food Policy (NFP) endorsed by the Food Planning and Monitoring Committee and thereafter approved by the Cabinet in August 2006, provides strategic guidance on the way to address the key challenges facing Bangladesh in achieving food security in all its dimensions, including food supply and availability, physical, social and economic access to food, as well as nutrition/utilization of food, as embedded in its three core objectives:

NFP Objective 1: Adequate and stable supply of safe and nutritious food

NFP Objective 2: Increased purchasing power and access to food of the people

NFP Objective 3: Adequate nutrition for all individuals, especially women and children

The Plan of Action translates the provisions of the NFP towards achieving its three core objectives into 26 strategic areas of intervention, priority actions to be undertaken in the short term, medium term and long term over the period 2008-2015, identifies responsible actors (government and non-government) and suggests a set of policy targets and indicators for monitoring progress.

A monitoring report is being produced annually since 2011, reviewed by the inter-ministerial Food Policy Working Group, a stakeholder workshop composed of the Government, development partners, private sector and civil society; and it was discussed and endorsed by the National Committee. The *Monitoring Report 2013* shows that the high recognition accorded to food and nutrition security at the highest levels of the Government and amongst development partners continues to pay substantial dividends for the well-being of Bangladeshi people. At the same time, the report is realistic to the situation in Bangladesh and urges for concerted efforts to do better. Rice production has intensified making the country self-sufficient, purchasing power has increased, people are consuming a broader range of foods and exclusive breastfeeding has dramatically increased. The report also refers to the fact that food availability needs to be more diversified, resilient and sustainable, food access needs to be broadened and stabilized, and progress on utilization needs to be accelerated because of the remaining high level of stunting.

The Dutch programme in food security broadly aligns with the main policy objectives of the national food policy. The NFP mainly mentions the Dutch involvement with respect to the promotion of effective utilization of national food safety testing facilities and establishment of a laboratory.

4.2 Donor programmes and opinions

There are a number of other development partners active in the area of food security including donors, UN agencies, and international and national NGOs. The following are the most important:

1. The WFP aims to support the government of Bangladesh in achieving the Millennium Development Goals by improving food security of ultra-poor households, their nutritional wellbeing and their livelihoods. They support social safety net programs and play a role in monitoring food security. The majority of its programs provide staple foods such as rice, pulses, vegetables, and oil. Other programs provide non-staple foods like energy and micro-nutrient rich biscuits for school children.
2. IFAD implements different food security related projects and has experience in Bangladesh in livestock and fisheries development and the access and user rights to water bodies for small-scale aquaculture.
3. FAO chairs the Local Consultative Group (LCG) on Agriculture, Rural Development and Food Security (since 2007). The LCG is closely involved in developments like the Country Investment Plan. Furthermore, the FAO works closely with the government on different food security related projects focused on strengthening the capacity of the public sector at both the policy and implementation levels, for example the National Food Policy Capacity Strengthening Program, the Food Safety Project, and the Emergency Cyclone Recovery and Rehabilitation Program.
4. The EU is funding different food security focused programs. One of the main programs is the Food Security for Ultra Poor Program which is being implemented by four international development agencies: Islamic Relief Worldwide, CARE, the WFP and ICCO in association with 15 national NGOs (2009-2013).
5. USAID funds the National Food Policy Capacity Strengthening Programme II (NFPCSPII) implemented by the FAO. In general, USAID focuses its investments mainly on the crop sector.
6. DFID funds two large food security focused programs, the Shiree/EEP program, which aims at taking large numbers of people out of extreme poverty and the Chars Livelihood Program, which focuses on the 55,000 poorest households living on chars.
7. DANIDA, the Danish international development assistance, gives long-standing support to the agricultural sector through the respective ministries. DANIDA has an Agriculture Sector Support Program including extension development for improved food security and nutrition and supports the use of farmer field schools.

In addition, numerous national and international non-governmental organisations are implementing food security assistance programs. BRAC, Bangladesh's largest NGO, has a large economic development programme with a component which explicitly targets the ultra-poor. This programme emphasises economic development through asset transfer but also includes a monthly subsistence allowance designed to cover a portion of a household's basic needs, such as food and other essentials. A large number of local NGOs are involved in food security programmes. The food security mission by the FAO in 2008 estimated that 6.3 million people received assistance through non-governmental channels and that as many as 8.1 million people could be receiving regular food assistance designed to access food support from governmental and non-governmental channels. These 8.1 million people represent 12.4% of the total estimated food insecure population.

As regards the water sector, development partners contribute about 20% of the water resources development fund annually. The major donors in water sector are World Bank (WB), Asian Development Bank (ADB), the Netherlands Embassy, Japan International Cooperation Agency (JICA) and the International Fund for Agriculture Development (IFAD).

Opinions on Market for the Poor

The evaluation team conducted some interviews with development partners and public agencies in the food security and business development sector. From this the following comments emerged. In Bangladesh Katalist is the pioneer in market development projects started working from 2003, introducing the Markets for the Poor (M4P) concept. In the beginning of the Katalist project activity, donors directly provided input subsidies for the project success. Subsequently, donors incorporated

private sector engagement in market development. As a result there is a change in the agriculture sector (In production, supply and technology use) through private sector engagement. These types of projects made private sector stakeholders realize that if they want to do business in rural market, then they have to innovate. By using new technologies, rural farmers can assess the market situation.

However, overall development of rural farmers and market systems has been slow. There are several specific reasons. The main reason is the process of matching suppliers and demand and assuring high volume and quality of products. Other underlying reasons are mainly:

1. Short term interventions are not useful, there is need to have long during projects
2. Need to get better insights in the role of middlemen and how they can become part of the solution
3. The need for another approach than that of lead farmers of whom we can't see many in the market.
4. The need for scaling up development projects in private sector development
5. There is more need for economics and business oriented people in the development sector.

The conclusion is that the concept of markets for the poor works has not shown significant results in Bangladesh, as progress has been slow and impacts are not convincing.

4.3 Dutch Food security programme in Bangladesh

4.3.1 During baseline (2014)

The Dutch food security programme is aligned with Bangladesh's Plan of Action under the National Food Policy as well as the Perspective Plan 2010-2021 and the sixth Five Year Plan 2011-2015. The Embassy has used two entry points for positioning the food security programme. These are: (i) connecting food security interventions to the water sector, an area in which the Embassy has a strong reputation and deep experience in Bangladesh and (ii) food security in relation to private sector development and trade (import and export). In line with Bangladesh's Country Investment Plan, which serves as a road map towards investment in agriculture, food security and nutrition, a number of interventions have been started in the form of projects.

The history of the Dutch programme in Bangladesh reflects the priorities set and the underlying theory of change with its various assumptions. Before 2011, when food security became a priority thematic area, the focus of the Dutch programme in Bangladesh was on the water sector. The Netherlands has a high reputation in water related activities, e.g. in relation to polder management. Any projects relevant for food security were until then done within water-related projects. Four main strategic considerations have been at the basis of the current food security project portfolio of the RNE:

- One is the fact Bangladesh has so far focused mainly on increasing its rice production and has been quite successful in doing that, but paid much less attention to the subject of increasing the proportion of nutritious food. Opportunities for improving nutrition, employment and private sector development were especially identified in the sub-sectors of aquaculture, horticulture and dairy.
- The value chain approach was introduced and was considered as useful to develop the selected sub-sectors by a market oriented approach that also involves the private sector.
- Food nutrition and safety was identified as a relevant theme, for instance due to a range of food additions with major health risks, which so far received little attention. There is great need for food quality standards.
- The geographical focus at the south-west region was chosen because of historical focus of the Dutch water programme and because of the strong focus on rice production only and thus scope for diversification.

For building up the food security portfolio the first opportunity was the ending of an EU project on food security in 2012, which was followed up by *the FAO project on food safety*. The overall goal of the project is an efficient and well-functioning food safety control system in Bangladesh that leads to improved public health and enhanced trade in food commodities. The project will strengthen food security through improved food safety and reduced incidence of food borne illness within the

population and strengthened stakeholder involvement and coordination leading to enhanced trade in selected food commodities (e.g. fish and fish products and fruits and vegetables). The outcome of the Project is stronger food safety and quality control in Bangladesh across selected food chains resulting in increased confidence in food supply.

A second opportunity was *the Safal project* which operates in the SW region on the above selected value chains by using a value chain approach. Safal would focus on areas with water management groups that could be strengthened in order to become production groups oriented at the selected value chains (this is one of their selection criteria). Where these groups do not exist, the programme team facilitates village wise formation of such groups with the help of local government bodies. Global sustainability standards are used to enhance food safety in the first place, even though mainly domestic markets are served. Local supermarkets will be created and it is expected that the spin-off of improved value chains will also improve the livelihoods of the landless. Food safety will also be promoted through surveys and awareness raising campaigns.

A third project within the food security programme is *the Blue Gold project*, which is largely a follow-up on the Dutch IPSWAM (Integrated Planning for Sustainable Water Management) project. The Blue Gold project works in previous IPSWAM polders and has four distinct components of which one is food security and agricultural production through revitalised water management groups. The value chains being promoted are mainly homestead vegetable and fruit production, as well as fisheries and livestock (poultry mainly). We have the impression that this component has not yet fully materialized.

Both in Safal and the Blue Gold projects the relation between water management and food production is important, in two ways: in terms of water management and access to water (as well as keeping out saline water), as well as in terms of the functioning of water management groups (i.e. roles in terms of conflict management, coherence within the community etc.).

A fourth project is the *PROOFS (Profitable Opportunities for Food Security)* project which is a follow-up on the FSUP (Food security for the ultra poor). This project is stated to be less 'technology driven' and oriented at creating new markets (as done by the Safal project) rather than starting out from the constraints and opportunities of existing value chains and markets aimed at enhancing benefits at local level (bottom of the pyramid). Examples are increasing the bargaining power of smallholder producers. This project will also partly operate in the South-West region. Another difference between Safal and PROOFS would be that while Safal starts out from relatively motivated and resourced farmers and orients at long value chains, PROOFS would work with all farmers and focus on short value chains. The project also provides training of health workers and distribution of micro-nutrient supplements. Training of WASH equipment micro-entrepreneurs.

A fifth project that has just been signed is the project on *Scaling up rice fortification implemented by the WFP (World Food Programme)*. It has a completely different focus, aimed at complementing rice with vitamins and minerals through a technological process. The fortified kernels now originate from China, but it is hoped that this project can trigger such an initiative in Bangladesh. The focus is on measuring effectiveness to raise awareness and willingness to adopt this approach.

A sixth project that has started recently is the *Char development and resettlement project (CDSP IV)*. It is a follow-up in earlier projects on Char development and can be best seen as an integrated rural development project that includes all elements to develop the newly acquired char lands. Especially important are land titles and providing basic infrastructure and services. The potentials of the CDSP IV project should also be seen in the context of the MIDPCR (market infrastructure development in charland regions) project, oriented at linking farmers to markets and was finalized in 2013.

Apart from these 6 projects and some of the precursors of these projects, there are three more large projects:

- South-West area integrated water resources project – SWAIWRPMP, which has just started

- Crop water management – FAO, which is ongoing and will be finalized soon
- Formulation of the Bangladesh Delta plan, which is basically an institutional strengthening project and has just been signed, we will discuss to what extent institutional issues can be adequately monitored.

4.3.2 Main changes during last years

During the workshop at the start of the endline survey, the RNE Dhaka emphasized the following changes and priorities during the last two years:

- The emerging insight that stunting is not only influenced by access to food and knowledge on nutrition, but is also strongly determined by gender norms and reproductive health culture. In Bangladesh the occurrence of stunting, infant mortality and child mortality is five times higher among mothers being younger than 18 years compared to older mothers (UNICEF). If a child is born within 24 months after the previous child, the chance of stunting is over 50%. If, however, the child is born after 48 months the chance is 38%. More specifically, nutrition of the mother plays a crucial role and the hypothesis is that underlying factors are early and unwanted pregnancies.⁶ This also means that the household level as such does not say much because more gender-related specifications are needed. The level of stunting depends on several other factors than access to food and knowledge on nutrition. This has led to a focus on the relation between food and nutrition security (FNS) and sexual and reproductive health and rights (SRHR), also leading to the decision to focus on young adolescent girls as the main target group where improvements can be achieved.
- Another insight is that land productivity not only matters but especially labour productivity and the differentiation in tasks between men and women, as improved practices may imply an additional burden for producers, especially women.
- There are three new projects that have been approved during the last two years and that were considered relevant in the RNE Food security portfolio, being the one on 'making markets work for women' (on the relation with SRHR), the extension project of FAO food safety, and a new project on a micro-franchise model for sustainable input supply.

4.4 Food security diplomacy

From interviews and meetings with the RNE Dhaka food security coordinators it appears that much has been done on food security diplomacy activities in terms of donor coordination and dialogue with Bangladesh public agencies and individuals. From 2010 onwards the RNE Dhaka has been involved in donor coordination through participation in the LCG Water, LCG Gender, LCG Health, Nutrition and Population and the LCG Governance, and has initiated contact with the FAO with regard to food security and agriculture. The MASP 2012-2015 stated that there are several other active LCGs where the RNE could harmonise with other development agencies such as the LCG Agriculture, Rural Development and Food Security and LCG Private Sector Development and Trade. The LCG Health and Nutrition is also looking after the issue of food safety. Other exchange platforms offer the opportunity to coordinate with development agencies such as the Market Development Forum and the Horizontal Learning Group Local Governance.

The evaluation team noted both in 2014 and 2016 that the RNE chaired the LCG on Food Security and took a very active role in coordinating the interventions of development partners. More recently, the emphasis has been on the relation between food security and SRHR (sexual and reproductive health and rights). The WFP emphasised that the RNE Dhaka has played an important role in bringing together development partners around the issue of Food safety, and emphasised that their role has been very constructive as compared to other donors.

⁶ Quotes from FNS and SRHR draft document by RNE, 2016.

4.5 Coherence and synergy

Coherence in relation to local context

The RNE food security programme has addressed several main challenges in south-west Bangladesh in a comprehensive way. There have also been major contributions through the water programme, focusing at the relations between water management and agricultural production. Both programmes have shown to be adaptive by building onto new insights and adjusting to new conditions. Most clearly noted are the following:

- The integration between water management and food security, especially in polder areas
- Establishment of supportive infrastructure (enabling environment) for the productive sector, such as input supply, access to credit, processing technology
- The organisation of smallholders farmers into professional groups, including organized marketing
- The integration of nutrition (training and products) into existing programs, with a focus at disadvantaged and vulnerable gender groups
- Work on value chain actors to enhance up take of products from smallholders.

One remaining gap appears to be the insufficient human and financial resources of central and decentralized government agencies, to create an enabling environment for smallholder production. This is especially valid for water management, characterized by a weak Bangladesh Water Development Board.

Coherence in relation to Bangladesh policies

The Dutch Food security programme is aligned with the Bangladesh food policy (National Food Policy – NFP) and more specifically its strategic areas, and several projects appear to be given a high priority (Table 7).

Table 7: Coherence of selected priority projects with Bangladesh food security policy

| Project | Alignment with Bangladesh Food Security policy according to BEMO | Comments |
|--|--|---|
| Blue Gold | The programme is consistent with the Government priorities as defined in the Master Plan for the Agricultural Development in the Southern Delta. In this Plan the need for more coordination between ministries is emphasised. | The programme focuses on NFP programme 2, water management. The programme is also in line with the policy strategic areas |
| SaFaL (Sustainable agriculture, Food security and market Linkages) | The project will contribute to sub-programmes 4 (fisheries and aquaculture development), 5 (livestock development) and 6 (Improved access to markets, value addition in agriculture, and to non-farm incomes) in the Country Investment Plan for Agriculture, Food Security and Nutrition. | Project focuses on fisheries and livestock, which are also the focus of strategic areas 4 and 5, but also on horticulture, which is not a priority. The value chain approach seems to fit well into strategic area 6. |
| PROOFs (Profitable Opportunities for Food Security) | The project will contribute to sub-programmes 1: sustainable and diversified agriculture through integrated research and extension; 3: improved quality of input & soil fertility; 6: improved access to markets, value-addition in agriculture and non-farm incomes; and 10: community based nutrition programmes and services. | Alignment with both NFP is made explicit in BeMo. No comments. |

| | | |
|---|--|---|
| Char Development and Settlement Phase -IV (CDSP-IV) | The proposed activity is fully compatible with the policy frameworks. The project is entirely consistent with the Government's priorities, and is mentioned in Bangladesh's poverty reduction strategy paper 2009. Furthermore, it has been designed to support the Government's Coastal Zone Policy 2005 and Coastal Development Strategy 2006. | The FS monitoring report 2013 mentions this project as an example of sub-programme 9.2, marked as high priority. RNE only/ mainly checked the project proposal against PRSP and water policies, not against the NFP |
| Improving Food Safety | The Project will contribute to the Government of Bangladesh's Poverty Reduction Strategy Paper (2005), Sixth Five Year Plan (2011 to 2015), Country Investment Plan for agricultural development and food security and National Food Policy and its Plan of Action. | This project focuses on strategic area 12, being marked as medium to high priority. |
| Scaling up of Rice Fortification | The Government of Bangladesh has indicated that it intends to use fortified rice in its safety net programmes. | The project fits into strategic area 10, which is marked with priority. |

The projects funded through the RNE, and the changes made during the last few years, show the intention to address new frontiers and strategic issues that emerged in recent years but do not feature in the Bangladesh food security policy. Some good examples are:

- Matching smallholder producers and exporters (in the context of markets for the poor)
- Improved nutrition through rice fortification
- Service provision for smallholder farmers
- Focus on young adolescent girls for improved nutrition
- Nutrition integrated in water management projects

Coherence in relation to other development partners

The FS programme has been carefully positioned in order to have an added value in relation to the work by other development partners. The evaluation team noted that both in 2014 and 2016 the RNE chaired the LCG on Food Security and took a very active role in coordinating the interventions of development partners. More recently, the emphasis has been on the relation between food security and SRHR (sexual and reproductive health and rights). The WFP emphasised that the RNE Dhaka has played an important role in bringing together development partners around the issue of food safety, and emphasised that their role has been constructive as compared to other donors.

Coherence and synergy Dutch FS Programme

The inventory of the existing Dutch funded projects and programmes shows that bilateral aid projects dominate. Some important other projects are (i) the ICCO programme that is MFS II funded, (ii) the GAIN programme component in Bangladesh that is a public-private partnership, (iii) one PSI project and (iv) some research and knowledge oriented projects (WUR, NUFFIC). These projects have all already been evaluated. For the RNE programme on food security in Bangladesh the focus of this evaluation study is on the funding channel delegated to the embassy.

There is good collaboration and exchange between projects, stimulated by the RNE Dhaka through regular joint sessions and inspiring conceptual thinking. There are examples of joint learning and exchange leading to new forms of collaboration, such as those between:

- Food safety and Safal project (integration of food safety into value chain interventions)
- Safal and PROOFS (comparison of value chain approaches)
- BGP and CDSP (comparison of working with water management groups).

There are a few examples of participation by the Dutch private sector, for instance in fisheries and in horticulture (linked to the Safal project) and linked to the rice fortification project. However, the projects that were evaluated do not show significant results of Dutch private sector willing to participate and invest in Bangladesh. This can probably be explained by a number of factors:

- Bangladesh has a relatively poor business climate and (more recently) a poor security situation
- Bangladesh has a poor track record on food safety with poor enforcement mechanisms
- In Bangladesh the concept of 'markets for the poor' has not yet been widely adopted and remains being looked at in a critical way.

5. Results

In this chapter we present a **summary of findings for the priority projects Blue Gold (5.1) and Safal (5.2)**. Each of these chapters includes the information from different sources of the research: surveys, Focus Group Discussions and Key Informant Interviews, project monitoring reports and interviews held with project staff. The detailed survey data are available in separate Appendices and can be made available upon request: baseline survey report, endline survey report and impact analysis report (**Appendices 3A, 3B and 3C**). The baseline report includes a preliminary analysis of the findings and insights emerging from regression analyses, as well as conclusions with respect to whether the beneficiary and control samples can be matched. The endline report only presents the findings in a tabular format. The impact study analysis makes a comparison between baseline and endline data using propensity score matching and a diff-in-diff approach. There are also elaborate reports available on the results of the focus groups discussions, with transcripts and summaries.

There are two additional results reported as part of this evaluation that will be used in the conclusions section (Chapter 6):

- **Summary of findings on the additional food security projects** in the FS portfolio of the RNE Dhaka that were studied, using progress and monitoring reports as well as some interviews with project staff. The summary report can be found in **Appendix 4**.
- **Report on additional water management aspects** which includes the findings from the surveys, FGDs and project monitoring, as well as additional work that was carried out to bring together and analyse findings on water management from projects and programs that were carried out in the last 10-20 years, including the projects categorized as C projects for this evaluation. It can be found in **Appendix 5**.

5.1 Findings Blue Gold project

5.1.1 Introduction

Objectives

The overall objective of the Blue Gold Programme (BGP) is to improve livelihoods for 150,000 households living in 160,000 ha area of selected coastal polders by creating a healthy living environment and a sustainable socio-economic development. Improved livelihoods includes improved incomes and improved food security. Specific objectives are to:

1. Protect the communities and their land located in polders against floods from river and sea (climate change adaptation) and to optimize the use of water resources for their productive sectors;
2. Organize the communities in cooperatives which will have to become the driving force for the natural resources based development (agriculture, fisheries and livestock), whereby environment, gender and good governance are effectively addressed;
3. Increase the household income derived from the productive sectors;
4. Strengthen the institutional framework in support of the product or value chain development.

The project builds on the results obtained and lessons learned from previous programs and projects, especially the IPSWAM project, as well as the CDSP projects. The project operates in a series of polders, many of which are previous IPSWAM polders with WMGs installed (9 polders, 42,000 ha). In polders not covered by IPSWAM (17 polders, 115,000 ha) in most cases there are no WMGs.

Components

The project has 4 main components and related targets.

Component 1: Community Mobilization and Institutional Strengthening.

The aim is to establish and empower community organisations to sustainably manage their water resources and based on the priorities set by these community organisations deliver the services for which they have expressed a demand. The IPSWAM polders have 250 WMGs registered under the Cooperative Societies Act and these WMGs are mainly focused on *routine* operation and maintenance (O&M) of the water management infrastructures. The BGP made an assessment of the current functionality of the existing WMGs and subsequently provided institutional support to revitalize the WMGs. It is also noteworthy that WMGs are now registered under the Bangladesh Water Development Board (BWDB). In addition to the 250 WMG cooperatives, the BGP is tasked to form 600 new WMGs and strengthen these to manage the water management infrastructures, engage in economic activities and enter into market transactions to enhance production and income levels.

Component 2: Water resources management

In the polders activities will be carried out that include minor repairs and major rehabilitation works. Once rehabilitation activities are concluded, the responsibilities for O&M are, in line with an O&M agreement, transferred from the BWDB to the WMOs. The activities on O&M of water infrastructure at community level are integrated in the higher level polder development plan. Activities may consist of:

1. *Operation*: i.e. the manipulation of water management infrastructures to manage and maintain the appropriate water levels in the project area. The objectives of operation are:
 - To control the water levels and flow of water in the canal system of the scheme.
 - To ensure that water availability matches with requirements of stakeholders.
2. *Maintenance*: i.e. the actions undertaken to prevent the deterioration of the water management infrastructure and keep the physical components in such a condition so that they can serve the purpose. The objectives of maintenance are:
 - To retain the hydraulic infrastructures in line with the technical objectives of the scheme.
 - To preserve the infrastructure and prevent high rehabilitation costs.

Component 3: Food security and agricultural production

The approach taken by BG to create revenues from agricultural production and involvement in value chains is one of creating supply (component 3) and creating market demand (component 4). With improved water management the potential for agricultural production will improve. Farmers in all agricultural sectors (crops, livestock, aquaculture) will receive support to adapt their farm management. The support to WMG farmers involves education and some free inputs through Farmer Field Schools (FFS) on a range of topics. At the request of the embassy nutrition activities were also included half way the project. In September 2014, Blue Gold started FFS cycle 3, with modules homestead vegetables & fruits, poultry and nutrition. FFS Cycle 4 took place from March to September 2015. It seems that by 2016 all selected WMGs have been reached by FFS including nutrition training.

Component 4: Business development and private sector development

Within this component Market Oriented Farmer Field School (MFS) as undertaken, which is a new approach. In early 2015, polder 30 Blue Gold has been conducting 20 MFSs on sesame; in polder 43 Blue Gold has been conducting 20 MFSs on Mung bean. The number of HHs reached is not well documented. The basic premise of the BGP is the rehabilitation of infrastructure to facilitate appropriate O&M of water management infrastructure and subsequent increase of agricultural productivity. The MFS activities (supported by the FFS activities) aim to motivate the farmers to water resource management (WRM) and WMO development, alongside cultivation practices and market orientation. This WRM aim carried weight in the selection criteria for the value chains, alongside the more traditional end-market and impact considerations.

Status of activities by early 2016 in surveyed polders

The following table 8 provides an overview of the status of activities carried out by the BGP in the polders where the survey was carried out (polders 30 and 43), in early 2016 when the endline survey took place.

Table 8: overview of the status of activities carried out by the BGP in the polders

| Component | Polder 30 | Polder 43 |
|------------------------------|--|---|
| 1. Support to WMGs and WMO | Registration and capacity development activities are on track. | |
| 2. Rehabilitation activities | In both polders rehabilitation activities have not yet started by early 2016, the majority of major repairs have still not been carried out. | |
| | Two large sluices urgently need to be repaired, which has so far been delayed, apart from a series of minor repairs. | The 17 main sluices require rehabilitation, there is need for re-excavation of 48 km of major canals and repair of embankments, drainage outlets and irrigation inlets. |
| 3. FFS conducted | FFS has by now covered almost all HHs in both polders. FFS was done on homestead vegetables and fruits, poultry and nutrition, and some also on fisheries / aquaculture. | |
| 4. MFS conducted | MFS activities started early 2015 with 20 MFSs on sesame value chain, with activities in the value chain | As in polder 30, on mung bean value chain, with activities in the value chain |

Theory of change and hypotheses

The theory of change of the Blue Gold project was discussed with the Blue Gold team during a workshop in 2014. Following is a narrative of the main elements summarized by the evaluation team.

The main added value of the BG project as compared to previous (IPSWAM) and similar projects is the component 3 on agricultural production through FFS and component 4 on the link to the value chain approach through MFS, aimed at generating revenues.

The key hypotheses for the 'proof of concept' of the BGP theory of change are the following.

1. Sustained functioning of WMGs leads to more effective O&M of water management infrastructure.
WMGs have an important role in effective and sustained Operations and Maintenance (O&M) of polder water management infrastructure, including small repairs. However, large repairs will be required by other institutions mainly the BDWB.

The improved functioning of WMGs could be assessed on the basis of resources becoming available to WMGs. From two previous, similar projects we can learn the following. The South West Project requires the members of the WMGs to make provision for up-front financial resources whereas in IPSWAM the resources are mobilized when these are required. In most cases WMG members contribute to required O&M funds in kind by providing free labour and in some cases materials. In BGP, WMGs are responsible for resource mobilisation for routine O&M. It was found, in earlier projects, that WMGs are able to mobilise labour and materials for routine O&M through voluntary contributions of the beneficiaries and the use of WMG savings. Sustained functioning of the WMGs mainly depends upon:

- The sense of ownership by WMGs of the water management infrastructure;
- The ability of WMGs to use the water infrastructure and cooperative services for income generation activities
- Care is taken of the larger infrastructural works by BDWD.

2. Improved O&M of water management infrastructure leads to improved crop production.

There is evidence from the previous IPSWAM and other projects that improved O&M of water management infrastructure can lead to improved crop production. The BGP aims to support improved crop production through its FFS and MFS activities. Improved crop production can be realized through:

- More area available for crop production
- Less damage to crops

- More crops per year and / or higher yields
- Change in cropping patterns / crop diversification

3. Improved production of value chain crops leads to improved revenues from sales and crop profitability

Higher revenues can also be realized by better marketing. The BGP has initiated a Market Oriented Farmer Field School (MFS) approach in order to generate more income for farmers and thus motivate farmers to support and undertake appropriate O&M of water management infrastructure, alongside cultivation practices and market orientation. Improved sales will depend upon the potentials in the value chain and whether current constraints in equitable marketing can be overcome (such as the role of middlemen).

4. WMGs are more effective in water management as being encouraged by improved agricultural production and related incomes

This is what one would expect given the importance of food production and incomes for local livelihoods. However, from earlier projects we learn that many WMGs created by IPSWAM were found to be rather poorly functioning after a few years even if there was improved cropping production. In the SWAIWRPMP polders and in the CDSP area many WMGs also undertook various livelihood activities. In the CDSP-IV project WMGs also adopt functions in the productive sector but mainly when there are funds or support to do so. WMGs may also liaise with other community groups involved in productive sectors.

5. Improved access to agricultural products and knowledge in nutrition leads to improved food nutrition, diversity and food security

This hypothesis is also associated with the nutrition and food safety programme component. FFS have included extension on food nutrition and food safety, focused at women. Together with improved crop production this is expected to enhance household food diversity and food security.

In the next chapters, first the main conclusions will be presented (section 5.1.2), overall and then for each of the 5 hypotheses, with supportive evidence. Subsequently the more detailed findings are presented, providing more detailed evidence for the main conclusions (section 5.1.3).

5.1.2 Conclusions

Context factors

The identification of BGP effects during the last 2 years should be seen against the following context, as emerging from the survey and focus group discussion results:

- The baseline survey showed that for the majority of output and outcome indicators the beneficiary area is backward as compared to the control area. Most noteworthy are: crop production (-50% in beneficiary area as compared to control area), fish production (-60%), production consumed or stored for consumption (-30%), production sold or stored for selling (-200%), farm income (-50%).
- In both beneficiary and control groups we observe significant increases in almost all indicator values during the last 2 years. The effects of the BGP should be seen against this background of overall increases, possibly as a result of the overall economic development in Bangladesh, improved technologies, infrastructure and market development. For instance, over the last 2 years access to electricity has almost doubled in both beneficiary and control polders.
- There is a shift from growing rice to crop diversification. More specifically, more farmers nowadays grow Boro (dry season) crops like sesame and mung beans. Farmers also grow sunflower, maize and more horticultural crops. This crop diversification potentially enhances diet diversity.
- In both beneficiary polders, during the evaluation period, there have been serious crop failures and damages as a result of climate events (high unexpected rainfall in the dry season), less so in the control polders. This might also be the main reason of lower crop productivity in the beneficiary

polders, where new crops have been introduced in the dry season while there were no crops as yet in the control polders: a more intensive cropping is also more vulnerable to climate variability risks.

Main conclusions

Overall meagre results have been achieved by the BGP, due to both design problems and slow implementation. Basically, WMGs do not have the mandate nor resources to drastically improve their situation even if being provided major support. Yet, some relevant project effects were observed.

For WMGs to function effectively in terms of managing water resources within their mandate, it is essential that major water infrastructure is timely rehabilitated and subsequently maintained by other agencies (BWBD or others). This apparently was not a priority in the design of the BGP. The focus has been at revitalizing and building capacities of WMGs. There is evidence of positive effects of the BGP on local water management (both in terms of the perception by WMG members and in terms of concrete practices). However, at the same time many people believe further improvements are required. This perception was strongly enhanced due to crop failures during the 'dry period' due to unexpected excessive rainfall and problems of water logging, which could not be avoided by local water management actions. These limitations and perceptions should be placed in the context of the fact that the BGP has not yet been able to carry out major water infrastructure rehabilitation works. There are several indications that WMGs still play a minor role in operation and maintenance of water management infrastructure. Also, there are no indications that WMGs have shown structural changes in terms of their role in operations and maintenance of water management infrastructure, other than minor ones. There has not been an increase in making available financial or in-kind resources for the functioning of WMGs, although consecutive projects in the past have estimated that the resources required to do so are limited.

The BGP has significantly contributed to the adoption of improved agricultural practices and introduction of new crops, leading to improvements in agriculture and aquaculture production (especially fish production). Beneficiaries include farmers with small plot or pond sizes and benefits for women. Without exception, beneficiaries greatly appreciate the BGP support activities and believe it has helped them to improve their incomes. However, it is uncertain to what extent these improvements can be attributed to the BGP, as similar improvements are found in the control polders. Due to limitations of the evaluation method, it is not clear to what extent this might be the result of spin-off (replication) from the BGP polders.

BGP has not been effective in enhancing sales of increased production, as it intended to do in order to increase household incomes. The interventions on supply chains aspects have not been well designed; the challenges to change the behavior of supply chain actors and producers to sell their products have been underestimated. It appears that in the beneficiary polders the increased production is mainly used for consumption. The increased consumption has been effective to partly overcome a backlog in consumption levels as compared to the control polders. This has also lead to improved incomes as well as improved diet diversity and nutritional adequacy. However, there is no evidence of improved sales in the beneficiary polders. This suggests that the impact pathway of improved farm production and diversity leading to increased homestead consumption, has been more effective than the impact pathway of increased cash crop production and sales leading to improved nutrition.

There is a plausible positive effect of the BGP activities on women decision-making in agriculture. Women have acquired more rights and influence in decision-making, on management of outputs from agriculture, fisheries and homestead products management as well as the management of savings and management of loans. The addition of a nutrition components and the focus on women is an essential element for the home consumption impact pathway to be effective.

In spite of positive opinions by respondents on the relation between water management and agricultural production, we conclude that the main project effect is due to the support given to WMGs

in terms of their internal organisation and the FFS and MFS training on improved agricultural practices. Also, WMGs are much appreciated by their members in terms of a focal point for training, as a savings and loans facility and also for generating labour work contracts. There is no evidence of concrete improvements in terms of local water management.

Sub-conclusions

Sub-conclusions supporting the main conclusion will now be drawn in line with the 5 hypotheses underlying the theory of change of the BGP (see chapter 1).

1. Effects on the functioning of WMGs and on O&M of the water management infrastructure

Sub-conclusions: In spite of positive opinions about the functioning of WMGs among beneficiaries, WMGs still play a minor role in operation and maintenance of water management infrastructure:

- WMGs will only be able to play an effective role in terms of operational and maintenance works if major water infrastructure rehabilitation and maintenance works are being carried out by other agencies, most notably the BWDB, however such rehabilitation has not yet been carried out in the targeted polders, which is a design and implementation weakness of the project.
- Some WMGs do not fully represent a (micro-) water catchment or water command area including all the main water users., which is also a design factor of the project.
- Individual WMGs are not allowed to repair or to contract a constructor to carry out repairs, even if they would be willing to do so.
- Even if minor operation and maintenance works do not require major financial resources, it appears that WMGs have very limited financial resources and did not receive more funds during the last 2 years even if incomes have significantly increased.

However, WMGs are much appreciated by their members in terms of a focal point for training, as a savings and loans facility and also for generating labour work contracts.

Underlying evidence

In the BGP polders there is a significantly more positive opinion about the functioning of the WMGs. However, in absolute terms the survey showed that the opinions on water management deteriorated for both B and C groups during the last 2 years. This is probably due to poor climate conditions causing crop damage in the evaluation period.

There is an improved awareness among WMGs on the roles in water management by different actors. In addition, beneficiary households also stated that conflicts have reduced, although WMGs still find it difficult to cope with conflicting interest with “influential people” especially on the use of the main canals for fisheries and on water management related to high- and low lying areas.

The opinions about the quality of the water management infrastructure are more positive for the beneficiary groups than the control groups. They believe there have been improvements in water management infrastructure over the last 2 years, and the quality of managing the water infrastructure (in relation to its importance for crops or ponds) is higher in the beneficiary polders. Positive effects of WMGs are mainly on the operation of minor water management infrastructures (such as sluices). There is evidence of perceived improvements during the last 2 years in the reliability, timing and communication of irrigation water deliveries, rated higher than in the control areas. However, at the same time there have been crop failures due to waterlogging during the last year, and many people believe further improvements are required.

From the BGP project results as well as from the review of similar projects during the last 10-15 years operating on water management, there are several indications that WMGs still play a minor role in operation and maintenance of water management infrastructure:

- Some WMGs were not established in a (micro-) water catchment or water command area, but rather at village level, so cannot be expected to perform useful water management functions. In other cases, the WMG does not fully represent all water users so part of the catchment area might not be served.

It was found that major land-users are often not part of the WMG, although they benefit most from proper water management.

- Even if preventive maintenance by WMGs is conducted, periodic major maintenance (responsibility BWDB) will remain necessary. If preventive maintenance is overdue it becomes less effective, leading to the typical cycle of build-neglect-rebuild. In most cases this will gradually lead to the WMGs losing interest or feeling incapable to address the situation and consequently also losing interest in operation
- WMGs do not have the mandate to carry out other than minor operations or repairs, they only deal with minor operational matters, especially the opening and closing of sluices. Individual WMGs are not allowed to repair or to contract a constructor to carry out repairs, but the WMA (water management association, an association of WMGs) are allowed to do so in collaboration with BWDB.
- It appears that WMGs in the targeted polders have very limited resources. Contributions are mainly in-kind and the financial contributions are very small. In the beneficiary polders the proportion of WMG members who have contributed in kind or in-cash has even declined during the last 2 years. WMGs do not have a formal mechanism for water users to pay for water management, for example proportional to the benefits of the area of land being served. On the other hand, WMGs do not require much funds for carrying out maintenance activities.

However, WMGs are much appreciated by their members in terms of passing on training messages, as a savings and loans facility and also for generating labour work contracts. Members of the WMGs also benefit from labour work contracts with BWDB and BGP (especially women and landless). WMGs may keep a list of the ones who should benefit first from labour contracts. Small voluntary works were also regularly conducted. In one WMG, every year a temporary dam is built to prevent salt intrusion.

2. Effects on agricultural production, and the relation with water management infrastructure

Sub-conclusions: There are significant improvements in terms of agricultural production, especially on fishery (aquaculture) production and including small farmers that have started producing fish during the last 2 years. We find similar but less pronounced trends in the control polders. In spite of positive opinions by respondents on the relation between water management and agricultural production, the main project effect is due to the support given to WMGs in terms of their internal organisation and the FFS and MFS training on improved agricultural practices. There is no evidence of concrete improvements in terms of local water management. On the contrary, there is evidence of crop failure due to waterlogging in recent year.

Underlying evidence

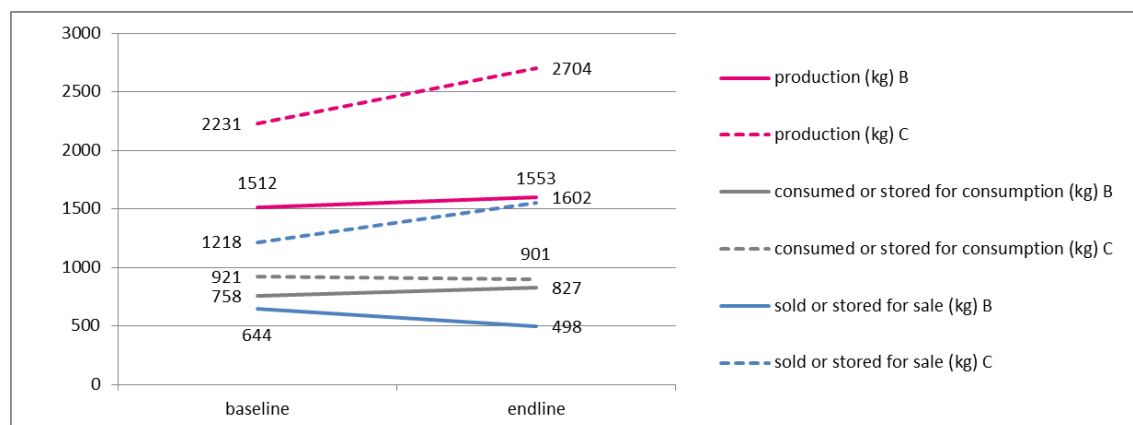
As services provided to the WMG members by the project beneficiary respondents mainly refer agricultural training, savings and loans and agricultural extension. These services are clearly related to the BGP activities of FFS and MFS. Reference was made to training on agricultural practices (26%), on water deliveries (19%) and on-farm water management (9%). There is strong evidence that households in the beneficiary polders have adopted a range of improved agricultural practices, including the introduction of sesame and mung beans as cash crops.

In the beneficiary area 42% of the households have the opinion that access to water for agricultural production has improved over the past 2 years. In the control area this hardly occurred. According to survey respondents, the positive effects are most pronounced in the Amon season (main rice cropping season). Almost all respondents indicated that better access to water has contributed to better yields and higher food production, more so than in the control polders.

The perceptions on improved agricultural production in the beneficiary polders are supported by the survey data, which show significant improvements in fishery yields and agricultural production per household (see Figure below). The changes in aquaculture have been remarkable, with large numbers of households picking up on fisheries who had not done so 2 years ago. However, similar trends occur in the control area. There are also indications that improved agricultural practices being promoted by FFS

and MFS have found their way to control polders, or have been promoted in control polders by other organisations. In spite of these improvements in the beneficiary polders, for crops as well as fish production the level of production per household remains higher in the control areas.

Development average production, consumption and sales in kilos per household (weighted)



This raises the question whether and to what extent improved agricultural production is the result of improved water management, improved functioning of water management groups, or the adoption of improved agricultural practices as a result of the agricultural extension works. Further analysis of the available data showed a positive relation between the production of oilseeds, pulses and fisheries and indicators for improved water infrastructure and water management systems. For oilseeds and pulses this correlation is strongest when taking only farmers with large land size. This could suggest that large land owners have benefitted most from the introduction of oilseeds (including sesame) and pulses (including mung beans), and were able to manage water according to their needs. The positive relation between fisheries and water management is stronger for small fish producers.

On the other hand, in both beneficiary polders the improved functioning of the WMGs has not been able to avoid significant damage on cash crops due to extreme climate events and resulting waterlogging. It is more likely that improved crop production is the direct result of FFS and MFS training by the BGP, but apparently many of these practices also find their way to control polders (e.g. through other supporting organisations). Another possible explanation of these trends is related to contextual changes, especially those that favoured fish production through improved access to inputs and markets.

3. Effects on improved revenues from sales of agricultural production

Sub-conclusions: The increased agricultural production in the beneficiary area has led to increased consumption but reduced sales, contrary to the trends in the control area. This happened in spite of support to collective marketing by the BGP. It appears that increased production in the beneficiary areas has been mainly used for own consumption, in order to make up for a significant backlog of the beneficiary area compared to the control area (from 21% to 9% behind).

Underlying evidence

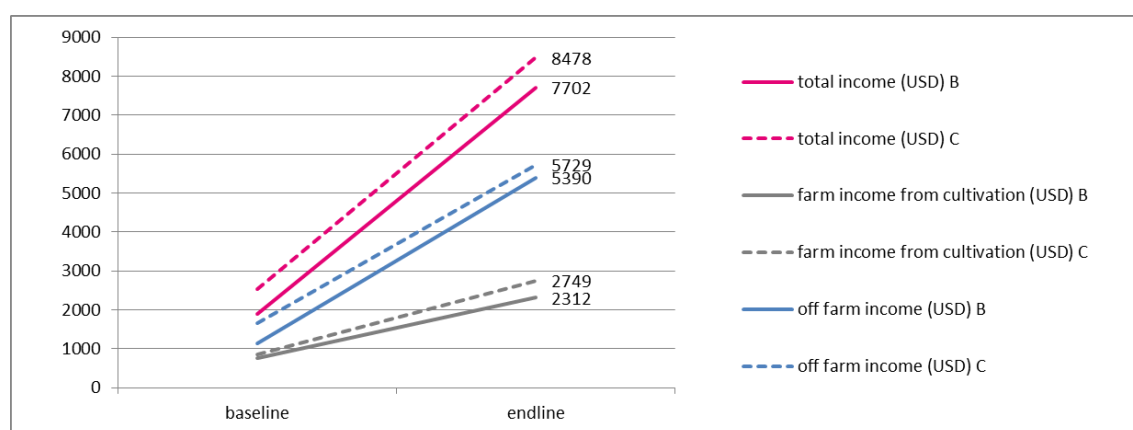
In the beneficiary areas 94% of households have the opinion that better access to water lead to improved incomes (61% in the control areas). This can only be explained if there would be better sales of agricultural products. This would be in line with the MFS approach advocated by the BGP, promoting cash crops and facilitating better sales through preferred buyers and traders in order to overcome current constraints in equitable marketing (such as the role of middlemen).

These opinions and expectations are not supported by the survey results – see Figure above with previous hypothesis. During the last 2 years the volume of agricultural products consumed and stored

for consumption increased by 10% for the beneficiary group, contrary to the control group (stable). However, the volume of sold and stored for sales declined by 20% for the beneficiary group, contrary to the control group (increase by 30%). This is a significant difference between the beneficiary and control group. The proportion sold and stored for selling has now become 3 times lower for the beneficiary group as compared to the control group. This dynamic may be explained by the fact that 2 years ago the beneficiary group had a 21% lower level of the volume of consumption and stored for consumption as compared to the control group. It seems that the additional production during the last 2 years has been used to make up for this backlog, now being reduced to 9% less than the control group. With respect to reduced sales by the beneficiary group, it should also be kept in mind that the cash crop sesame failed due to climate events and there were problems in selling cash crops to the preferred traders for an attractive price.

The above findings are supported by the FGDs. These demonstrated that joint buying of inputs by WMGs who have received MFS training is taken up, but joint sales is not yet happening. The buying of inputs for fishery production have increased by 30%. It is recognized that collective marketing is a new and problematic feature and will require more time to mature.

Development average total, farm and non-farm income in USD per household (weighted)



The impact analysis showed that there is no significant difference between the increase in farm and non-farm incomes in the beneficiary and control areas (see Figure above). In other words, there are no additional project effects of the BGP on household farm income of beneficiaries as compared to the control group. This could be explained by the low proportion of production being sold for an attractive price.

4. Effects of improved production and incomes on the commitment by WMGs

Sub-conclusions: There is no evidence that improved crop production and higher incomes have led to improved functioning of the WMGs.

Underlying evidence

There are no indications that WMGs have shown structural changes in terms of their role in operations and maintenance of water management infrastructure, other than minor ones. Also, there has not been an increase in making available financial or in-kind resources for the functioning of WMGs.

Earlier experiences with WMGs in other projects showed that many WMGs created by projects are functioning poorly after a few years even if there was improved cropping production. Other projects show that in most cases WMG members contribute to required O&M by providing services in kind (labour and in some cases materials) or use of WMG savings. However, there is no evidence of sustainable improvements by a structural link to improvements in crop production.

There are significant positive relations between the perception of good water management and input variables of plot size or pond size, as well as with crop production per household, farm income, production consumed and stored for consumption, and farm diet diversity score. This suggests that plot and/or pond size of respondents plays an important role in judging the quality of water management. The question is whether positive opinions about the functioning of WMGs are associated with improved crop production due to improved water management, or simply because those with larger plot or pond size benefit most from improved water management.

5. Effects on nutrition, food diversity and food security

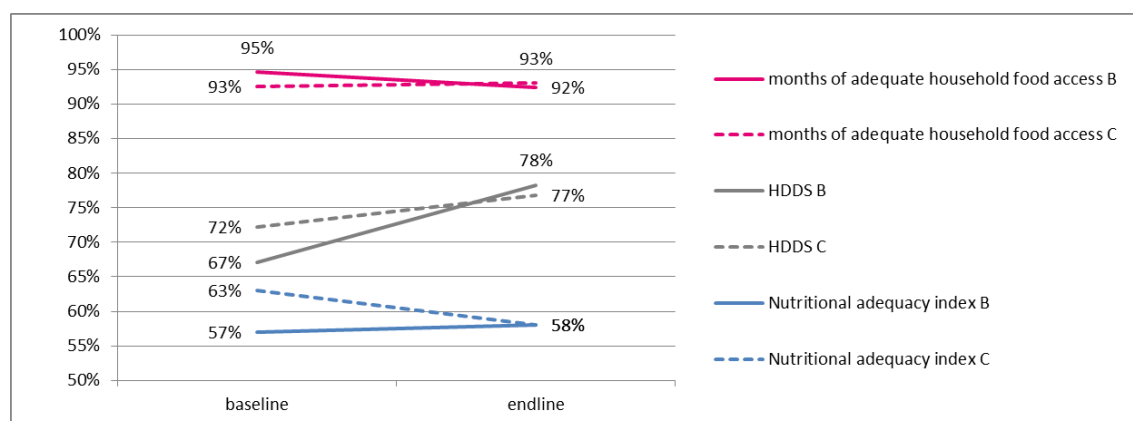
Sub-conclusions: There is evidence of a contribution by the BGP to improvements in food diversity and nutrition, supported by improvements in the role of women in decision-making in agriculture. The results suggest that the impact pathway of improved farm production and diversity leading to increased homestead consumption has been more effective than the impact pathway of increased cash crop production and sales leading to improved nutrition.

Underlying evidence

Since early 2014 extension and awareness raising activities on nutrition were also included as part of the FFS activities in the communities, focused at women. All respondents in the FGDs indicated that they are more aware about nutrition aspects, especially the need to diversify food intake, and also refer to new homestead gardening crops that were introduced or supported and used for home consumption (including poultry and egg production).

These perceptions are partly supported by the quantitative data. There is a negative BGP effect on months of adequate HH food access, by about 10 days per year. However, there is a significant positive BGP effect on the dietary diversity score (HDDS), from 67% to 78%, as well as on the nutritional adequacy index, from 57% to 58%, contrary to the control group which shows a decline (see Figure below).

Food access and diversity and nutritional adequacy in percentage of the highest scores weighted)



The relation between agricultural production and the HDDS or the nutritional adequacy index was further explored and showed that rice production as well as the (increased) production of fish has been responsible mainly for positive effects on the HDDS and the nutritional adequacy index, and mainly so for small farmers. This could be explained by the fact that especially small farmers have massively started to produce some fish, even in small quantities, and that they have used the increased production mainly for home consumption. From this analysis we can conclude that nutrient adequacy remains low (less than 50% adequacy) for the following nutrients: iron, Vitamin A, Vitamin B1 Thiamin, Vitamin B2 Riboflavin, Vitamin B6, Vitamin B9 Folate and Vitamin B12.

On health, we observe a strong decline in stunting, in wasting as well as in overweight, for both B and C groups; there are no significant effects of the BGP. The proportion of stunting is now 29% (B) to 22% (C), wasting is 10% (B) to 2% (C). The strong effects cannot be associated with improved nutrient adequacy, as there are still major deficiencies, but could also be explained by improved access to water and sanitation.

There are also relevant relations with the gender focus of the FFS work. The FFS work on agricultural practices and nutrition has mainly targeted women. FGD results showed greater women's satisfaction with the results. The survey provides evidence that women have acquired more rights and influence in decision-making, on management of outputs from agriculture, fisheries and homestead products management as well as the management of savings and management of loans.

The above raises doubts about the impact pathway of improved incomes from cash crops, leading to increased revenues and then to improved and more diverse food diversity. This can be explained by the fact that due to climate events the production of cash crops was meager and marketing was not yet very successful. It could be that the impact pathway of improved subsistence farming (in terms of productivity and diversity), leading to increased production of subsistence crops and used for homestead consumption, has been more effective. The analysis shows that both rice production and (increased) fish production significantly contribute to the improved HDDS and nutritional adequacy. This could be associated with the FFS training on improved and more diversified homestead gardening (not affected by the climate events) and the training on nutrition.

5.1.3 Detailed findings

This section presents detailed findings supporting the conclusions presented in the previous section. The findings are based on the analysis of data and information from different sources: Blue Gold monitoring data, quantitative survey analysis and focus group discussions, as well as a detailed study on previous experiences in working with water management groups (see also Appendix 5). In section 5.1.3.1 relevant contextual changes are presented. In subsequent sections the findings are presented in relation to the 5 main hypotheses that will be studied (see section 5.1.1). In several cases, the main conclusion of a paragraph is presented first, in italics, followed by the underlying evidence.

5.1.3.1 Relevant changes in project context during the last few years

Agro-climatic conditions

The BG working area is characterised by difficult agro-climatic conditions. The climate is risky. The weather during the last 2 years has shown some dramatic changes. “We get rain when we do not want it and we do not get rain when we need it.” Farmers are sure about one rice crop (*Aman* wet season paddy), but unsure about a second crop cycle because they do not have shallow tubewell pumps so depend upon gravity irrigation from the canal. At present only about 5% of farmers grow *Aus* paddy because it is not profitable. The second season is with other crops that require less water. Very few also grow IRRI rice, only when they have access to irrigation water. In the area they have problems of saline water, water logging and lack of irrigation water.

Table 9: Main cropping seasons in the BGP area

| Season | Main crops | Rainfall and climate effects |
|-------------------------|--|--|
| Aus (March to August) | Rainfed rice, but increasingly other crops | Intermediate season, increasingly problematic and affected by climate events |
| Aman (June to November) | Rainfed rice | Wet season, has always been most affected by floods |
| Boro (December to May) | Mainly dryland or irrigated crops | Dry season, increasingly affected by early rains |

There is a shift from growing rice to crop diversification. More specifically, more farmers nowadays grow Boro (dry season) crops like sesame and mung beans that do not require much water but are sensitive to waterlogging. Sesame is mainly grown on the higher lands. Farmers also grow sunflower. Maize was also grown but requires much water. These crops provide additional income. In polder 30, sesame is the main cash crop. In polder 43 the growing of mung beans gained momentum 2 years ago. Some farmers replaced the Aus paddy by mung beans as it is more profitable and less input and labour intensive.

In terms of natural events, the survey results shows an increase during the last two years in the incidence of natural events and an increase in crop lost and/or crop failure as a result of these events, from 7.5% to 27% for BGP beneficiaries and from 2.8% to 20.3% for the control group. This can be explained by the strong increase in the incidence of water logging from 27% to 40% for the B group and from 19% to 33% for the C group. On the other hand, there has been a decline in the incidence of drought (from around 25% to 4%). When looking at water related problems, we observe the lack of water as the main problem in 2014, while this has been replaced by water logging caused by excessive rainfall in 2016, especially experienced by the landowners.

Table 10: Natural events, baseline and endline in beneficiary and control group areas

| | Beneficiary group area | | Control group area | |
|---|------------------------|---------|--------------------|---------|
| | baseline | endline | baseline | endline |
| Faced crop lost or crop failure or both | 7.5% | 27.0% | 2.8% | 20.3% |
| Water logging | 27.3% | 39.8% | 19.3% | 32.8% |
| Lack of water | 26.0% | 8.8% | 32.5% | 7.0% |

Socio-economic conditions

In polder 30, 65-75% of the farmers are land-poor (<1 acre of land), 20-30% are medium land-poor (1-5 acre), 2-5% are rich (>5 acre). In polder 43, 45% of the farmers are land-poor (<1 acre of land), 50% are medium land-poor (1-5 acre), 5% are rich (>5 acre). Village people show respect to the rich. The poor are considered 'landless' because they only have some homestead land. But they work on land of others as tenant farmers. Tenant farmers have to pay half of the crop to the landlord and bear all expenses, or pay two third of the crop and not bear the expenses.

Infrastructure development

- There has been a significant increase in the proportion of HHs with access to electricity, from 46% (B and C groups) to 78% and 90% in 2016 for the B and C groups respectively. Likewise, the use of batteries has strongly increased and the use of kerosene has declined.
- The surveys also show a strong improvement in access to water.
- There have been significant improvements in the road network around Khulna. This is especially important for aquaculture as fish need to be transported quickly to the main markets and centers where they can be frozen. It is stated that this has been a major factor stimulating aquaculture.

5.1.3.2 Effectiveness on the functioning of Water Management Groups

Changes in enabling conditions for water management

In both polders, at macro scale the three main water-management features are: (1) salinity in the main river in the dry season, (2) condition of main rivers restricts base for drainage which leads to water logging, (3) fair opportunity to fill canals with fresh water in the rainy seasons. At the meso- and micro scale the two main water management features are the different demands posed by (1) the occurrence of higher- and lower lying lands within the polder, and (2) the demand for freshwater for the cultivation of crops versus the demand for salt water for shrimp aquaculture. Prevention of salt intrusion is the main reason for operating the gate. Next there is drainage of low-lying areas, but the conditions of canals and river is often a constraint.

As indicated in section 5.1.1, the BGP is behind schedule in implementing large infrastructural activities. In both polders rehabilitation activities have not yet started by early 2016 and the majority of major repairs have still not been carried out. This means that many water related problems cannot yet be solved by better operations at local level.

The new Participatory Water Management Rules of Bangladesh (2014) are not very clear on the role of and contributions by WMGs in operations and maintenance of water infrastructure. It is suggested that most contributions are voluntary and based on social responsibility. A major constraints is the fact that WMGs are formally not authorized to have a bank account and carry out commercial activities, only cooperatives are allowed to do so. A relevant legal change has been the re-registration in 2015 of WMG from the Department of Cooperatives to the Bangladesh Water Development Board. This has potential for positive changes for WMGs in three ways. First, registration has become more simple and fees are lower. Secondly, registration with the BWDB requires meeting the standards set out in the Participatory Water Management Rules (2014) with respect to number of members (55%), composition of committees, etc. Thirdly, and most importantly, there are now more direct contacts with BWDB and formal control over the main sluice gate, while in the past this was not well defined and often in the

hands of influential persons. As a result, although the operation of the main sluice cannot cope fully with different demands (e.g. of high- and low lying areas and for cropping and fisheries), the issue is better discussed and local practices (timing of cropping, choice of crops) may mitigate certain negative effects.

Membership of WMGs is said to be well distributed, including women and landless. When contracts for work would be given to WMGs, then preference would be given to women. Apparently there is little concern about the fact that not all inhabitants are member of the WMG, because it appears that both WMG members and non-members contribute and benefit to some extent from better water management. All WMGs report positively about the membership and role of women (around 40%).

Changes in operations and maintenance

WMGs are functional in terms of passing on training messages, as a savings and loans facility and also for generating labour work contracts. At the time of the endline-survey, 77% of the households in the B group and 2.5% of the households in the C group have a household member that is a member of a Water Management Group (WMG). In the B group 38% received support on agricultural activities whereas in the C group this was almost zero. The most important services delivered by the WMG in the B group during the last 2 years has been training (22%), savings and loans (14%) and a link to agricultural extension services (11%). Of the B group, the most used training services are those on agricultural practices (26%) and information on water deliveries (19%) followed by training on on-farm water management (9%). However, 48% of the households in the B group indicate that no services were provided by the WMG in the past 2 year. In polder 43, where many WMGs seem to be dormant with respect to activities in water management, WMG meetings are still being held and WMGs operate a savings account and occasionally provide for loans. Some WMGs have the ambition to have a micro-credit facility. It is also important to note that some WMGs were not established around a (micro-)catchment area, or a command area of a sluice, but were established on a village level, which is not appropriate for water management purposes. In total 48% of the households in the beneficiary indicate that there were no services provided by the WMG in the past 2 year.

Members of the WMGs also benefit from labour work contracts with BWDB and BGP (especially women and landless). WMGs may keep a list of the ones who should benefit first from labour contracts. Small voluntary works were also regularly conducted. In one WMG, every year a temporary dam is built to prevent salt intrusion.

The WMG members in the beneficiary area have a better awareness on their roles in water management than in the control area. According to the survey results, the responsibility for the quality and maintenance of the different water infrastructure parts in the beneficiary area is spread. For the main embankments BWDB are mostly considered to be responsible, for the main and the local sluices the sluice/block committee is mostly responsible and for the main drains, the local embankments and the local drains it is mostly unknown who is responsible. In the control area most respondents do not know who is responsible for water management infrastructure.

A number of improvements are noted over the past two years in terms of aspects of the water management system. In the beneficiary area 51% of the households indicate that the performance of the water management system has improved over the past 2 years, while in the control area only 13% indicates that the system has improved.

Table 11: Is the water management system performing better than in the past? (weighted percentages) Baseline

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

Table 12: Has the performance of the water management system improved over the past 2 years? (weighted percentages) Endline

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

Looking at the different aspects of the water management system, both in the beneficiary and the control areas all aspects have improved during the last 2 years: flood protection, drainage, irrigation and prevention of salt intrusion. However, while drainage and irrigation now score highest in the beneficiary area, flood protection and prevention of salt intrusion score highest in the control polders. Of the households that indicated that the water management system performed less well over the last 2 years, especially drainage is mentioned.

Table 13: What aspect of the water management system is performing better than in the past? (weighted percentages, multiple response) Baseline

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

Table 14: What aspect of the water management system improved over the last 2 years? (weighted percentages, multiple response) Endline

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

The current water management infrastructure situation has a slightly higher rating in the beneficiary areas. The quality of the infrastructure was determined by the Water Quality index, by weighting two results from the endline survey: the rated quality of parts of the infrastructure and the importance for the crops or ponds⁷. The water infrastructure parts are: main embankments, main sluices, main drains, local embankments, local sluices and local drains. The average quality of the infrastructure is calculated

⁷ Very important = weight 3, important = weight 2, not important = weight 1.

per union. On average the quality of the water management related infrastructure is better in the beneficiary area compared to the control area. The average index in the beneficiary area is 2.5 (between reasonable and good) while that in the control area is 2.9 (reasonable). The assessments per type of water infrastructure show that the drains receive the lowest ratings.

Table 15: Water Quality index Beneficiary area (unweighted)

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

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

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

Table 16: Water Quality index Control area (unweighted)

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

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

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

However, WMGs still play a modest role in maintenance of water management infrastructure. Their inputs are mainly in-kind, are voluntary and are mobilized in case of a specific problem, such as a threat to an internal embankment, silt removal around a sluice, etc. Also action against illegal blocking of canals by “outsiders” is mentioned often, strengthened by the notion of being united in the WMG. It is recognised that the “WMG can only do small things”.

Generally, it was stated that conflicts have reduced. The FGDs show that WMGs still find it difficult to cope with conflicting interest with “influential people” especially on the use of the main canals for fisheries which requires a different water management regime from agriculture. The fishers involved often have lease of water body rights from the BWDB and are not necessarily member of the WMG. In forthcoming cases the WMG tried to involve the Union Parishad, with limited success. WMG have proposed to change the system of leases and bring it closer to WMG. The conflict on water management on high- and low areas (often also a conflict between larger and smaller=poorer) farmers cannot always be resolved easily (“the larger get preference”). However, on this matter there are no real conflicts. There is also recognition of the fact that it may be good for large land owners to get preference because this improves employment opportunities for the poor.

In spite of the affirmed positive role of the WMGs, there are hardly any financial or in-kind contributions to the WMGs, and this has not improved at all. The baseline survey showed that only 14% of the HHs in the B group had contributed money or labour over the last 12 months to the water infrastructure development or maintenance (8% in the C group). According to the end-line survey, the proportion of HHs who had contributed to the functioning of the WMGs in the past 2 years was only 2%, and this was mainly payment in kind (by providing labour). In the B group only one household had paid over the last year (an amount of 4 USD). In the C group 4 HHs had paid over the last year (the highest amount was 3 USD), only one paid in kind.

Table 17: Payment for services provided by the water management groups (weighted percentages)

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

Table 18: Did households provide funds to the WMG so that the WMG can better carry out its functions of water management? (weighted percentages)

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

Table 19: Did households contribute money, material or time (labour) to building, maintaining or reconstructing water infrastructure in the community in the past 12 months? (weighted percentages)

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

The FGDs during the endline survey confirm that little has changed on the financial capacities of the WMGs over the past 2 years. The main source of income for the WMGs is the contribution/fee from the members, with credits and loans and sales of inputs as another source of income. However, the proportion of members paying fees is very low (highest in polder 30: 12%). The contribution by the members is mainly in kind / labour (50-60%). The WMGs have very modest membership fees, often with 50 BDT at time of registration and some 10-20 BDT yearly. WMGs do not collect funds for major improvements. Some WMGs have substantial income (up to 20,000 BDT) from renting out equipment provided by projects (FAO low lift pumps, tiller, thresher). It is as yet unclear how this money is spent. The active WMGs operate a savings- and loan facility (5% interest). For WMGs savings and loans have always been an important function for its members.

Experiences from earlier projects

A meta-analysis carried out of experiences on water management and agricultural production in programmes executed in the last 10-20 years, generated the following relevant insights:

- The use of the concept of participatory water management has highly improved the decision-making on and implementation of polder rehabilitation projects in all past and ongoing projects.

- However, the water management infrastructure sooner or later shows deterioration after closure of the project, both for “older” as well as recently concluded projects. Even if preventive maintenance (responsibility WMG) is conducted, periodic major maintenance (responsibility BWDB) will remain necessary. If preventive maintenance is overdue it becomes less effective, leading to the typical cycle of build-neglect-rebuild. In most cases this will gradually lead to the WMGs losing interest or feeling incapable to address the situation and consequently also losing interest in operation.
- The active WMGs can generate some capital, but this capital is mainly used for their savings and loans functions. This is generally considered as the most important function of the WMG by the members. However, the capital is not used for O&M. By far most activities carried out by the WMG on O&M are paid for by in-kind contributions. The activities of WMGs in service provision in agriculture (e.g. purchase of inputs and sale of produce) remains limited, and WMGs also do not formally have the mandate to do so.
- All reviewed projects suggest that the contribution demanded from WMGs for O&M of water management infrastructure is only a small percentage of the increased value of production as a result of the project interventions (around 1-2% of additional incomes). However, all reviewed projects show that WMG contributions are well below these expectations and that maintenance is not a priority of the WMG activities. In a similar way, the annual O&M budgets of the BWDB are far below the needs based assessment, while BWDB finds it difficult to plan maintenance effectively and efficiently.
- Most projects have indicated that WMGs can only continue to function well if they are well connected with other organisations, especially local government and BWDB. The role of local government in water management is not well defined. BWDB has established a Water Management Office to facilitate the establishment and continuing guidance of WMO, the staffing and funding of which has so far remained very limited.

5.1.3.3 Effects on agricultural production, and the relation with water management infrastructure

Inputs - The beneficiaries of farmer field schools (FFS) and market field schools (MFS)

FFS training basically reached to all beneficiaries in the selected polders, even if WMG members were prioritised. Training focused on practices such as seed selection, weeding, identifying insects, line seeding, use of fertilizer, the use of compost. The farmers refer to the introduction of various ‘scientific methods’. Also, farmers were taught about marketing aspects and understanding fair prices, but others would say that they did not receive useful training on marketing.

Mainly women were selected for FFS training; women have benefitted more than men because they do the vegetable gardening and the poultry. There is reference to 75% of FFS participants being women. But the men do the fisheries. One group stated that men benefit more because they grow the cash crops, like mung bean.

In the FGDs it was stated that those who received training have all benefitted, but most so those who have much land, because they can produce more. Others stated that of all farmers in the area 40-60% benefited from FFS/BG, most of them are tenant (poor) and medium scale farmers.

From the survey it appears that of the beneficiaries, 37% participated in another project than BG related to water management (compared to 3% in the C group), and 15% participated in another project than BG related to food security (similar 15% for the C group). Obviously almost all HHs in the B group stated to be member of a cooperative or farmer group, while only 5% of the C group stated to be organized.

Inputs - land resources and ownership

There have been relevant changes in terms of plot and ponds used, basically leading to more households using ponds and conducting aquaculture, a reduction of average plot or pond size, and an increase in the proportion of leasehold use; there are no significant differences between the B group and the C group. In terms of ownership of plots and ponds used, the category of ‘owned’ has declined, while the category of ‘leased’ has increased. Aquaculture as the product group for the used plots or ponds has most

significantly increased, with many more households conducting aquaculture. The other uses remained the same (Table 20).

Table 20: Ownership rate and average size of land and ponds per household in hectares*

| | Beneficiary (n=400) | | Control (n=400) | |
|--------------------------------------|---------------------|---------|-----------------|---------|
| | baseline | endline | baseline | endline |
| Homestead Land: | | | | |
| ownership rate (%) | 95.3 | 87.8 | 94.5 | 85.8 |
| average size (ha) | 0.09 | 0.07 | 0.08 | 0.07 |
| Cultivable Land: | | | | |
| ownership rate (%) | 76.0 | 70.3 | 69.3 | 63.3 |
| average size (ha) | 0.65 | 0.58 | 0.80 | 0.59 |
| Ponds (deep, non-cultivable): | | | | |
| ownership rate (%) | 26.3 | 63.3 | 23.3 | 59.3 |
| average size (ha) | 0.05 | 0.05 | 0.05 | 0.06 |
| Other Non-Cultivable Land: | | | | |
| ownership rate (%) | 2.5 | 14.3 | 5.8 | 10.8 |
| average size (ha) | 0.15 | 0.06 | 0.07 | 0.09 |

* 1 hectare = 247.16 decimal

Table 21: Use of plots / ponds by area (excluding homestead)

| | Beneficiary (n=400) | | Control (n=400) | |
|--|---------------------|---------|-----------------|---------|
| | baseline | Endline | baseline | endline |
| Number of households using plots and ponds | 315 | 400 | 339 | 399 |
| % of households using plots or ponds | 79 | 100 | 85 | 100 |
| Number of plots or ponds | 922 | 1,297 | 800 | 1,092 |
| Average # of plots or ponds per household | 2.9 | 3.2 | 2.4 | 2.7 |
| Type of ownership (%): | | | | |
| Owned | 74 | 62 | 60 | 60 |
| Share crop | 6 | 0 | 6 | 1 |
| Leased | 16 | 27 | 24 | 32 |
| Product groups (%): | | | | |
| Rice | 69 | 67 | 73 | 69 |
| Other crops | 58 | 64 | 31 | 42 |
| Aquaculture | 40 | 76 | 56 | 82 |
| Number of product groups produced | | | | |
| 0 | 12 | 8 | 9 | 8 |
| 1 | 16 | 19 | 18 | 22 |
| 2 | 21 | 32 | 27 | 39 |
| 3 | 30 | 42 | 30 | 31 |

Input supply – agrochemicals used

Epecially the use of fishery inputs (fingerlings+ fishfeed) have significantly increased, for both the B and C group. The number of HHs making costs on chemical fertilizer has significantly increased, and even

more so the number of HHs making costs on fingerlings + fishfeed. However, there are no significant beneficiary treatment effects. Expenditures on inputs per HH have increased by about 30% for fishery inputs (fingerlings and fish feed), but not so for other input categories. Expenditures on fishery inputs are about 2.5 times higher for the C group in absolute terms. There have been no changes in spending on other inputs, which will most likely imply a reduction of quantities used because of price increases.

Input supply – finances

In terms of access to finance, there has been a slight increase in the proportion of HHs with savings (from 31-38% to 70-73%) or with loans (from 63-69% to 84-86%), with no difference between B and C groups. This reflects the increased potentials for investments in agricultural production (as reflected by the increased use of inputs). In Bangladesh products for micro finance are available, but the issue is the payment term and interest. The existing MFI's payment mechanism starts from the next week of the loan disbursed and the interest is calculated on a yearly basis. This financial package is not conducive for the smallholders since their return from the farm business starts after harvest. Many of the smallholders take a loan from the traders with a condition of selling their products to them. While it may be good that market actors are investing, there are often exploitative conditions.

Outputs - Adoption of good practices and inputs supply

There is evidence of good adoption of new practices introduced by Blue Gold.

FFS training has generally lead to adoption of new practices, resulting in more diversity of vegetables grown and higher yields according to FGDs and monitoring reports. Farmers are also conscious about using pesticides and make their own organic fertilizer. An exception is line sowing which has been promoted but was hardly adopted, because of higher labour requirements and scarcity of labour.

Specific MFS training was given on cash crops: in polder 30 on growing black sesame, in polder 43 on growing mung bean or 'fat mung bean' (Bari 6). The outcome assessment by the BGP confirms that both sesame and mung bean growers are mainly men (73% for sesame, 88% for mung bean). In terms of land ownership, both sesame and mung bean producers own at average 200 decimal of land. Of the producers, only 4% (mung bean) to 10% (sesame) own a power tiller or irrigation pump. The MFS outcome assessment shows that on mung bean production (polder 43) there has been adoption of the new Mung bean variety Bari 6 (from 20% in the 1st year to 80% of farmers in the 2nd year), also by buying from 1st year adopters. On sesame production (polder 30), adoption of the new black sesame seed variety has been 100% in the 1st year.

Those who received the sesame training got 1.5 kg of seeds free of charge and also 600 feet of net. Farmers also received packages of vegetable seeds, like spinach, as well as free fertilizers. Those who received training on fisheries or poultry received various free inputs as well. In polder 30, for black sesame, with improved techniques farmers could yield 33 maunds (as compared to 20 maunds of red sesame). However, due to heavy rainfall the crops failed in June 2015 as well as seedlings were destroyed in February 2016, so productivity was much lower. For black sesame, it was stated that production inputs are higher but production as well as selling price is also higher, so everyone is convinced that the profit can be much higher (more than double). One calculates the profit from 50 decimal of land at 12,000 BDT. There is little labour required for growing black sesame. In polder 43 the production of mung bean has increased in yield (40-75% yield increase) and also in area used for mung bean. By now everyone grows mung bean. For mung bean, it was stated that production inputs are higher but production as well as selling price is also higher, so the profit is higher. The profits on mung bean during the last year have been very good.

According to Blue Gold monitoring reports, in poultry by now hatching time and egg production have both improved significantly. With cattle, milk production has increased from 2.5 to 3.2 l per day. On fisheries data were given showing that fish production increased by about 75%.

The MFS activities have also promoted collective input supply. Collective actions have so far been limited to the joint purchase of pesticides, followed by seeds and tillage. In sesame there has been some

joint action on inputs (e.g. fertilizer) and selling, but less so in mung bean. These collective actions have generally led to a reduction of input prices for the producers, by an estimated 10-20%. Another collective action is the use of digital weighing machines, which farmers have much appreciated.

Outputs – crop and fish production

Both production of crops (including rice) and production of fish (aquaculture) per HH have significantly increased, but there is no significant difference between the B and C groups, and production per HH remains highest for the C group. Most HHs of both the B and C group now produce both crops and fisheries (67%), increasing from 36% in the B group and 49% in the C group in the baseline. The production volume per HH of other crops than rice has slightly increased for the B group (about 10%) and more for the C group (40%). The aquaculture production per HH has increased for both the B and C groups (by more than 50%), but is still 50% higher for the C group. Taking together the strong increase in number of HHs producing and the changes in production volume per HH, total production for crops and for aquaculture have both increased, in both the B and C groups.

All farmers in FGDs agree that as a result of FFS training production has increased in multiple ways: greater area of land is cultivated with vegetables and yields are higher.

Table 22: Total production in kg of different product groups, baseline and endline in beneficiary and control group areas

| Product(group) | Beneficiary group area | | | Control group area | | |
|------------------|------------------------|---------|-------|--------------------|---------|-------|
| | baseline | endline | | baseline | endline | |
| Rice | 315,476 | 375,039 | 19% | 736,536 | 802,715 | 9% |
| Leafy vegetables | 0 | 949 | NA | 2,590 | 6,709 | 2490% |
| Pulses | 14,884 | 21,817 | 47% | 12,908 | 8,788 | -32% |
| Oilseeds | 22,555 | 8,147 | -64% | 440 | 612 | 39% |
| Mung beans | 835 | 20,665 | 2375% | 9 | 1,380 | 1433% |
| Prawn | 1,712 | 4,380 | 156% | 6,521 | 9,277 | 42% |
| Other fish | 2,213 | 19,987 | 803% | 10,308 | 34,158 | 231% |

Table 23: Number of households producing different product groups, baseline and endline in beneficiary and control group areas

| Product(group) | Beneficiary area | | | Control area | | |
|------------------|------------------|---------|-------|--------------|---------|-------|
| | baseline | endline | | baseline | endline | |
| Rice | 215 | 204 | -5% | 253 | 241 | -5% |
| Leafy vegetables | 0 | 20 | NA | 3 | 20 | 567% |
| Pulses | 99 | 124 | 25% | 47 | 44 | -6% |
| Oilseeds | 72 | 58 | -19% | 6 | 12 | 100% |
| Mung beans | 9 | 117 | 1200% | 1 | 21 | 2000% |
| Prawn | 30 | 51 | 70% | 73 | 119 | 63% |
| Other fish | 23 | 205 | 791% | 59 | 266 | 351% |

There is evidence that the project has contributed to higher production of mung beans, but not to higher production of sesame, most likely due to waterlogging problems. On fishery production the beneficiary area has also shown a significant increase. From the two tables (Table 22 and Table 23) it appears that most product groups have increased, in production but there are some interesting differences:

- Rice has increased in volume, but declined in number of households, so we observe a concentration
- Leafy vegetables have increased in both areas, were absent in the B area
- Pulses and mung beans have obviously increased much more strongly in the B area, both in volume and households, mung beans were introduced by the BGP.
- Oil seeds was clearly a preferred cash crop in the B area but have declined in the B area, which seems strange because it basically includes sesame which was introduced by the BGP. However, from the 72

farmers who produced oilseeds at the baseline 27 suffered from water logging at the endline which has strongly affected the crop, while they did not suffer from water logging at the baseline.

- Prawns and fish were produced much less in the B group but they have caught up by a stronger increase during the project period. The increase in the production of 'other fish' is spectacular.

Outputs – yields

Yields have doubled for aquaculture, for both B and C groups, while yields for all product categories are higher for the C group. We observe that both for rice and for other crops, yields have declined for the B group but have increased for the C group. In the B group, for instance, the production of rice (in kg) increased, but the amount of land used (in hectare) for rice production increased even more (not in the table), leading to a lower average yield. While we have information on the size of the plots used, it is not known which share of the plot is used for rice production. Specific intercropping patterns and seasonal variation in crops grown may differ between baseline and endline. The same holds for other crops. The decreased yields might also be explained by the fact that of the farmers with rice yields, in the baseline situation 26% had indicated to be affected by waterlogging and 6% indicated to have crop failure or lost, while in the endline situation these percentages were much higher: 54% and 75%. The average for the beneficiary polders was higher (77%) than for the control polders (67%). Yields for aquaculture have doubled for both B and C groups. Yields for all product groups already were higher for the C group during the baseline survey, but are now considerably higher in the C group area as compared to the B area.

Table 24: Average production per household, total production and yields per year

| | Beneficiary (n=400) | | Control (n=400) | |
|-------------------------------------|---------------------|----------|-----------------|----------|
| | baseline | endline | baseline | endline |
| # hh's producing: | | | | |
| Rice | 275 | 268 | 292 | 275 |
| Other crops | 230 | 254 | 123 | 168 |
| Aquaculture | 159 | 302 | 225 | 326 |
| Production volume (kg/HH) | | | | |
| Rice | 1,405.3 | 1,742.2 | 2,827.9 | 3,197.7 |
| Other crops | 327.0 | 345.2 | 714.7 | 1,053.6 |
| Aquaculture | 131.6 | 113.8 | 201.2 | 168.4 |
| Total production volume (kg) | | | | |
| Rice | 386,457 | 466,910 | 825,751 | 879,368 |
| Other crops | 75,202 | 87,681 | 87,904 | 177,005 |
| Aquaculture | 20,923 | 34,368 | 45,268 | 54,898 |
| # plots/ ponds for: | | | | |
| Rice | 698 | 908 | 621 | 724 |
| Other crops | 484 | 672 | 181 | 257 |
| Aquaculture | 62 | 187 | 70 | 211 |
| Yield per hectare | | | | |
| Rice | 2,850.3 | 2,620.58 | 3,331.3 | 4,452.18 |
| Other crops | 751.0 | 595.44 | 1,201.8 | 1,313.90 |
| Aquaculture | 660.0 | 1,325.37 | 929.9 | 1,872.37 |

From the FFS monitoring by BGP (benchmark 2013, cycle 4 in 2015) we obtain the following selected data on input use and effects – it should be noted that there were no controls and also the survey took place at different seasons.

Table 25: Selected data on Farmer Field Schools from Blue Gold monitoring reports

| Variable | Benchmark | End 2015 |
|--|-----------|-----------|
| # of vegetables grown within same homestead | 3.2 | 8.1 |
| Proportion of farmers selling more than 50% of their products | 3% | 49% |
| Proportion of farmers using any chemical fertilizers: urea / TSP | 85% / 51% | 99% / 97% |
| Proportion of farmers using any organic fertilizers: cow dung, compost | 24% / 1% | 91% / 16% |
| Used funds for pest management | 48% | 70% |
| Eggs per hen for chicken producers | 47 | 94 |
| Eggs consumed per week for chicken producers | 3.8 | 11.0 |

The number of farmers using fertilizer increased strongly (see Table 25) but the quantities used are very skewed. Few farmers use much and many farmers use very little. In terms of quantities per hectare for most farmers the use of fertilizers remains well below the recommended rate. Similarly, very few farmers use pesticides. There is also very little use of pump irrigation.

According to BGP monitoring, for growing sesame the use of own labour has slightly increased, but for mung bean cultivation it has strongly increased. It is not indicated whether this labour is provided by men or women.

Copying and crowding in effects

All farmers following FFS had to promise to instruct another 5 persons. Whether this has really taken place is not so clear. One underlying reason might be that other farmers also want the free gifts that those who participated in FFS had received. Another reason is the failed sesame crops. Yet, it seems that many farmers are adopting techniques which were trained during the FFS, especially the introduced new crops. From the MFS intermediate outcome assessment by BGP there is a clear indication that the new Mung bean variety as well as the new black sesame seeds have spread rapidly within the entire community, beyond the ones that were trained. It is not clear whether this has also spread to other polders, as suggested by the data in Table 25.

Analyses on the relation between water management and agricultural production

Oilseeds, pulses and fisheries benefit most from improved water infrastructure and water management systems. However, the relation with both oilseeds (including sesame) and pulses (including mung beans) is also directly related to the interventions by the BGP, as both sesame and mung beans were introduced in the polders following some improvements of water infrastructure and water management systems.

The water quality index was calculated based on the rating of water infrastructure and the rating of the importance of water infrastructure for crop production. Multivariate analyses generated the following insights:

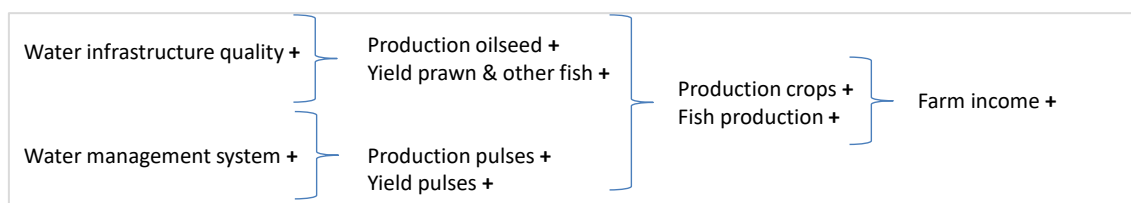
- for the relation with production per product group, only for the product group of oil seeds (including sesame) there is a significant correlation between the water quality index and the production of oilseeds. This means that farmers with a high quality of water infrastructure have higher production of oilseeds. If farmers are split into two groups (farmers that used less or more than 0.3 ha of land) the significant correlation only holds for big farmers.
- for the relation with yield of the different product groups, only for the product group of prawn and other fish there is a correlation with the water quality index. This means that farmers with a high quality of water infrastructure have higher yields of prawn and fish. If the farmers are split up in two groups (farmers that used less or more than 0.08 ha of ponds) the significant relation only holds for small fishers (whether already fishing at the baseline or only at the endline).
- there is no significant correlation between the water infrastructure quality index and the plot size or the pond size used.

Relations with perceived improvement in water management

A perception of improved water management was obtained at the endline (IA Table 27). Multivariate analyses generated the following insights:

- for the relation with production per product group, there is only a significant correlation between water management improvement and production of pulses (including mung beans).
- for the relation with yield per product group, again there is only a significant correlation between water management improvement and yield of pulses. (See Figure 1).
- there is no significant correlation between WM improvement and the plot size or the pond size used.

Figure 2: Water management and perceived effects on yields and incomes



5.1.3.4 Effects on improved revenues from sales of agricultural production

Outputs - home consumption and marketing

There are several indications that behaviour in terms of marketing has not changed much; moreover the BGP beneficiaries have sold significantly less, contrary to the control group. The survey shows that among the services being provided by the WMGs, the provision of services related to marketing score low (transport to markets, negotiations with traders and information about markets), both in the B and C group. (ELR: Table 9). Also, within the B group, sales to village and District markets have declined, while there has been an increase in the C group.

The diff-in-diff analysis shows that the B group has sold significantly less of its production than the C group (5% significance), even though agricultural production has increased. This might be explained by the fact that 2 years ago the B group had a 18% lower level for consumption + stored for consumption score as compared to the C group, and has used the additional production to make up for this backlog (however, they are still 8% behind). The proportion sold + stored for selling has declined for the B group and is now 4 times lower than for the C group. This difference could also be explained by the failure of their cash crop sesame.

Figure 3: Development average production, consumption and sales in kilos per household (weighted)

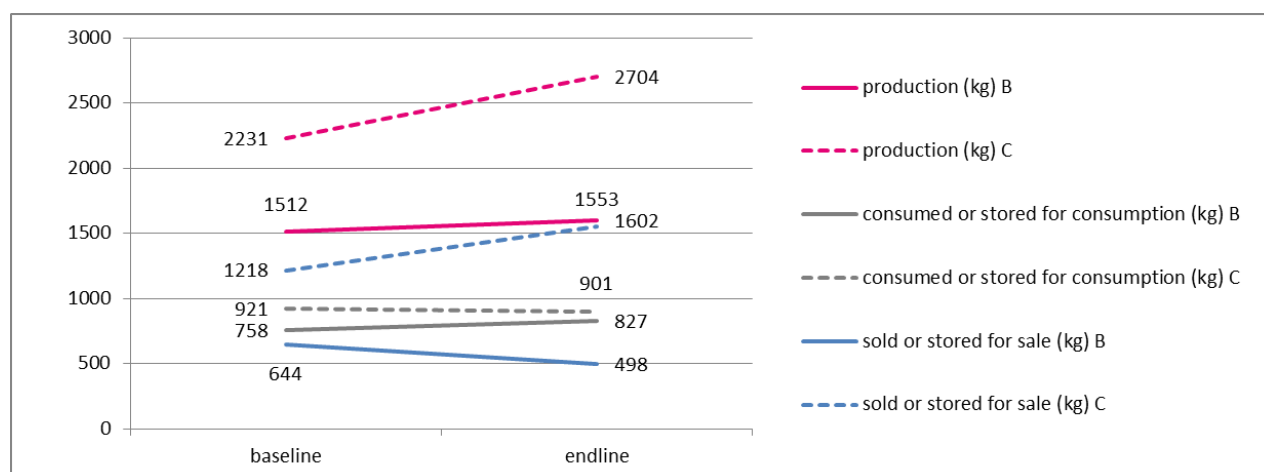


Table 26: Estimation results multivariate regression: production, consumption and sales (including storage) (weighted)

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

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

From the FGDs it appears that vegetables are mainly for home consumption, and only if there is a surplus production this is brought to the market. From the FGDs it seems that although vegetable production has increased, there has not been an increase in vegetables being marketed. However, the monitoring results of BGP show that marketing by households has strongly increased (see above table). This might be explained by the fact that several products were also introduced that are primarily aimed at being marketed, including cash crops such as sesame and mung beans, as well as poultry (eggs mainly) and fish. MFS activities focused on growing sesame and mung-bean for marketing purposes. Another element of explanation might be that the focus on a few crops has led to over-supply and decline of market prices, e.g. for certain vegetables at peak season moments.

The FGDs provide the following details with respect to marketing of the introduced cash crops.

- For polder 30 sesame producers, BG established contacts with a trader who provided black sesame seeds. He provided good seeds and promised to buy the black sesame for a good price. He distributed seeds among 300 farmers. He received support from BG to construct a warehouse. But it was not used due to bad weather. The black sesame market price was said to be much higher (2400 BDT as compared to 1200 BDT), because black sesame is exported. However, due to mixing the black sesame with mustard and fatty acid (a general way of cheating) the trader could not pay even half of the expected price and they only received 1300 BDT. This has spoilt the export market for some time.
- For polder 43 mung bean producers, BG appointed a collector of mung beans in the collection centre established by the BGP. He buys the mung bean at a fixed price and then sells to the BSCIC warehouse, which then sells to a Japanese company. Farmers used to get cheated and received a low price. The main problem is the distance to the market.

While joint input buying seems to have been successful, this is not the case for joint selling. Before BG intervened producers could not negotiate with buyers or traders. BG advised them to sell in bulk quantities, and not individually, and also to create one selling point. BG taught them to purchase inputs and market collectively. The FGDs give the following insights.

An inputs seller was also involved by the BG project. He told that the farmers used to buy very few inputs, and only individually in very small quantities, thus they had to pay a high price and also pay for transport. The input seller was asked to participate in the FFS classes. The farmers now buy inputs collectively and they get a discount of 20%. His sales of inputs have increased by 80%. They also receive free of charge counseling. At present 80% of farmers buy fertilizer and pesticides which used to be 20%. Also, many more farmers buy better and a greater variety of seeds.

Before BG intervened men were selling the mung beans to middlemen who came to their village. They were bound to sell because otherwise they had to go for at least 6 km to the nearest market. This practice still has not changed much as means of transport have not improved. BG advised to transport and sell collectively and bargain the price but they have not yet done so.

The MFS outcome assessment states that the mung bean price dropped from 80 to 60 BDT/kg as a result of oversupply. The sesame seed price dropped from 2500 to 1600 BDT/kg, which is still higher than brown sesame. There is one international buyer of mung bean (a Japanese), and is also one main buyer of the sesame. There has been networking with power tiller- and tractor operators as well as input suppliers and the main buyer. This was initiated by BGP. The lead firm buying the sesame now also carries out its own training activities of farmers.

All farmers now use the weighing machine for all their crops, this has much reduced cheating.

In general, both men and women farmers would like to receive more training on marketing aspects.

Outputs – incomes and wealth

There are significant improvements of farm and non-farm incomes and wealth, with the B group 'catching up' but still lagging behind as compared to the C group (see Figure 4).

Farm incomes have significantly increased for both the B and C groups during the last 2 years, slightly less for the B group as compared to the C group (306% and 321% respectively). Non-farm incomes have also significantly increased, more so for the B group than the C group (475% and 336% respectively). Thus, total incomes have increased by 408% (B group) and by 336% (C group). In the baseline survey, the total HH incomes were highest for the C group. The difference between the two groups has now become less but the C group still has an advantage on both farm and non-farm incomes.

Increases in incomes are supported by the results of FGDs, although there are also claims of remaining shortages in financial resources.

Figure 4: Development average total, farm and non-farm income in USD per household (weighted)

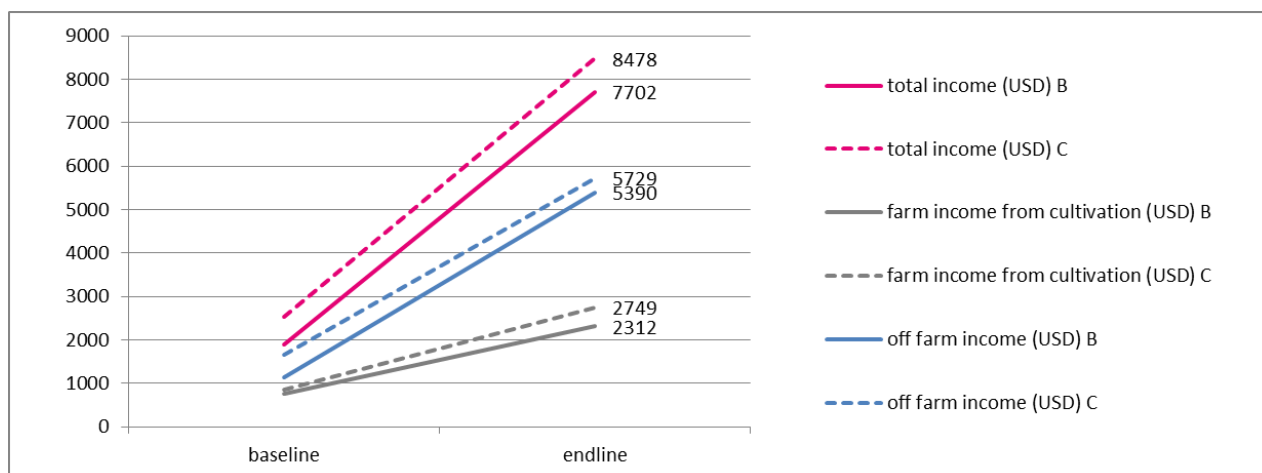


Table 27: Estimation results multivariate regression: farm and non-farm income, wealth index (weighted)

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

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

The wealth index shows a significant increase but no significant beneficiary treatment effect by the project (See Table 27)

There are also significant positive relations between crop production per household and (i) farm income, (ii) production consumed and stored for consumption, (iii) farm diet diversity score. The production of fish most significantly contributes to the increase of farm incomes. (See Table 28Table 28).

Table 28: Estimation results: production and (i) (farm-) income (only from cultivation), (ii) value of food consumption, (iii) household dietary diversity score (HDDS)

| Dependent variable | Farm income (in USD per year) | Value of food consumption (in USD) | HDDS |
|--------------------------|-------------------------------|------------------------------------|-------------|
| Explanatory variables | coefficient | coefficient | coefficient |
| Production crops (in kg) | 0.61*** | 0.03*** | 0.06*** |
| Production fish (in kg) | 1.92*** | 0.07 | 0.19 |
| constant | 334.68*** | 1220.00*** | 7.22*** |
| number of observations | 1282 | 1282 | 1282 |

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

5.1.3.5 Changes in the relation between agricultural production and water management

There are positive effects of the changes in the water management infrastructure on access to water for cropping and aquaculture. The majority (57%) of the households in the beneficiary area indicate that the quality and use of each of the parts of the infrastructure positively affected the crops and ponds over the past year. The scores are consistently higher (more positive) for the beneficiary group as compared to the control groups: positive and very positive scores total 43% in the C group. The positive effects are clearly most pronounced in the Amon season (50-80% of respondents). In the beneficiary area 42% of the households indicated that the access to water for agricultural production had improved over the past 2 years. In the control area this hardly occurred.

There are positive effects of the changes in the water management infrastructure on crop and fisheries production, but this could be partly associated with plot and pond ownership. Almost all households in the beneficiary area indicated that better access to water has led to better yields, higher food production (97%) and higher incomes from food production (94%). In the control area 71% of the households indicated that better access to water has led to better yields and higher food production and for 61% this also led to higher incomes. Most households rate the reliability of irrigation water deliveries as reasonable and most households rate the reliability the same as 2 years ago. However, in the beneficiary area 29% indicated that the reliability of irrigation water deliveries is slightly better now compared to 2 years ago. In the control group this was only 9%. The rating of the timing and communication shows somewhat the same pattern as the rating of the reliability: most households indicate the timing as reasonable (in the beneficiary area as well as in the control area). For 28-29% of the households in the beneficiary area the timing and communication is slightly better now compared to 2 years ago; for the control area this is only 9-10%

The impact analysis shows a significant positive relation between the perception of good water management and input variables of plot size or pond size. This suggests that plot and/or pond size of respondents plays an important role in judging the quality of water management. We note that this corresponds with one outcome of the FGDs: water management tends to focus on the positive effects for large landowners, which is also good for the community because if large landowners produce well this creates employment and a food surplus in the community. In addition, in the BGP beneficiary areas, there is a significant positive correlation between the perception of good water management and crop production per household (1% significance).

During the FGDs, the WMGs generally mentioned the important role of the FFS, in terms of:

- Decisions on cropping systems, especially dry season crops and kitchen gardens
- Awareness on the relevance of small-scale water management systems

- Collective purchase of inputs and selling of produce.

However, according to the FGDs, the water situation is still far from ideal to assure a good crop. In one WMG where the main sluice was improved, the canals still are said to require improvement. Even a little rain may lead to water logging in lower lying areas. The drainage is also hampered by the fact that the river has become shallow, ideally that should be addressed as well. Control of the main sluice is in the hands of the WMG, which is seen as positive, but the means are not there.

Experiences from earlier projects

A meta-analysis carried out of experiences on water management and agricultural production in programmes executed in the last 10-20 years supports the above insights:

- Most projects refer to a positive relation between water management and agricultural production. However, the underlying data are not robust and also there are no data on whether improved agricultural production is sustained after project closure. Data collected by the SSWRSDP project do not show a positive relation between (i) the capital collected by the WMG and their expenditure on maintenance, or (ii) the increase in agricultural production and expenditure on maintenance
- Most projects subscribe to the fact that access to markets is an important factor influencing agricultural production and incomes but do not address the question how WMGs can acquire better access to markets.

5.1.3.6 Effects on nutrition, food diversity and food security, as well as women empowerment

Outcomes - women empowerment

There are consistent indications that overall women have acquired more rights and influence in decision-making, both for B and C groups. The FFS work on agricultural practices and nutrition has mainly targeted women. FGD results showed greater women's satisfaction with the results. The survey provides evidence that women have acquired more rights and influence in decision-making, on management of outputs from agriculture, fisheries and homestead products as well as the management of savings and management of loans. However, these trends are similar for B and C groups and there are no significant differences, thus it should be concluded that this is a general trend.

Some details are the following. First, on management of outputs from agriculture, fisheries and homestead products the role of women only remains very low, but management by men only has declined in favour of management by both men and women. The absolute levels of management by women (alone or with men) and the increases are largest for management of homestead products; the absolute levels are much lower for agricultural and aquaculture products. (BLR: Table 11; ELR: Table 13). On the management of savings and management of loans, the category of both men and women has strongly increased (from 9-17% to 40-44%), while the category of women only has generally declined for both B and C groups. (BLR Table 27; ELR: Table 28).

Impact - food diversity, food security and nutritional adequacy

There are significantly positive effects on dietary diversity and on the nutritional adequacy index. The impact analyses show there is a significant negative BGP effect on months of adequate HH food access, which has slightly deteriorated during the past 2 years (contrary to the control polder). (See Figure 5 and Table 22). This negative effect can be explained by the crop failures in the beneficiary polders (especially polder 30). However, there is a highly significant positive BGP effect on the dietary diversity score (HDDS) as well as on the nutritional adequacy index (5% significance). There are also positive changes on the food security index (HFIAS), although less so in the BGP beneficiary polders than in the control polders, so there is no significant positive effect of the programme.

Figure 5: Food access and diversity and nutritional adequacy in percentage of the highest scores (weighted)

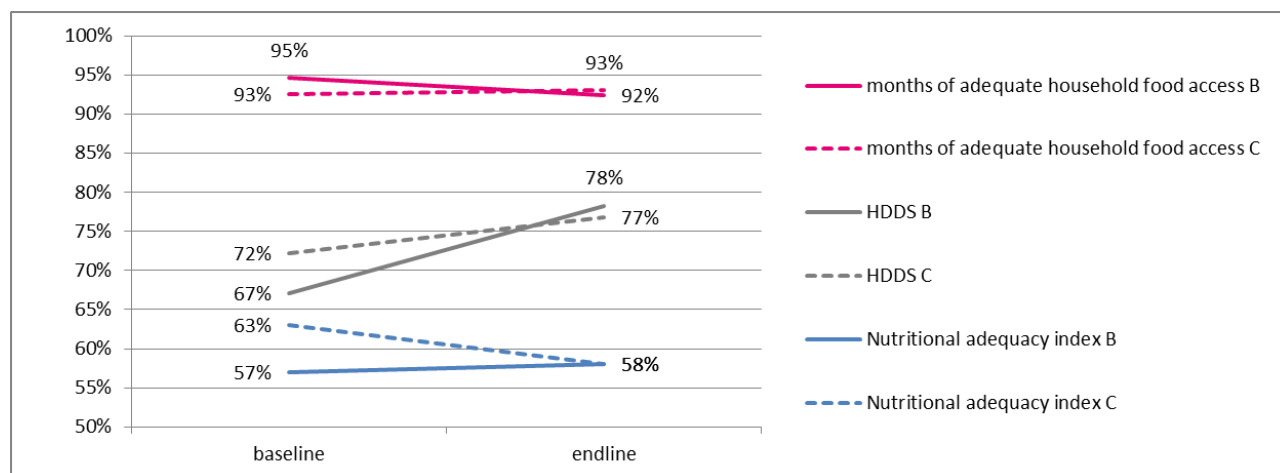


Table 29: Estimation results multivariate regression: food access and diversity and nutritional adequacy (weighted)

| Dependent variable | Months of adequate household food access | HDDS | Nutritional adequacy index |
|---|--|----------------|----------------------------|
| Explanatory variables | coefficient | coefficient | coefficient |
| beneficiary (1=yes) | 0.24** | -0.51*** | -0.05*** |
| post treatment (1=yes) | 0.06 | 0.46*** | -0.05*** |
| beneficiary post treatment (1=yes) | -0.32** | 0.67*** | 0.05** |
| constant | 11.11*** | 7.22*** | 0.63*** |
| number of observations | 1282 | 1282 | 1282 |

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

In all FGDs, the participants stated that awareness on nutrition has improved as a result of the FFS training on nutrition. All state that nowadays people grow more vegetables and also eat more vegetables. For instance, now they eat spinach which they were not used to do. They also give more vegetables and fruits to their children. They now eat vegetables every day. Also, they cook the vegetables less long. It is also noted that changing food habits will take time. They notice that illnesses are declining.

More detailed survey findings supporting the above insights are the following.

On average, food security shows an improvement, apparently mainly for the C group, and the extremes of severely food insecure or severe hunger have become much less. The HFIAS index shows improvements for both the B group (decline of 0.17 points) and C group (decline of 0.41 points), so the improvement is stronger for the C group. The HFIP index shows that for both the B and the C groups, the proportion of HHs that were food secure has slightly declined (by about 4 points), but the proportion of HHs that were severely food insecure have more strongly declined (by about 8 points). The group of mildly food insecure has increased most strongly, followed by the group of moderately food insecure. These trends are the same for B and C groups. (See Figure 6) The household hunger scale shows consistent improvements. Both for the B and the C groups now 99% of the HHs have little or no hunger (baseline was 94% and 95%). (See Figure 7)

Figure 6: Household food insecurity prevalence (HFIP)

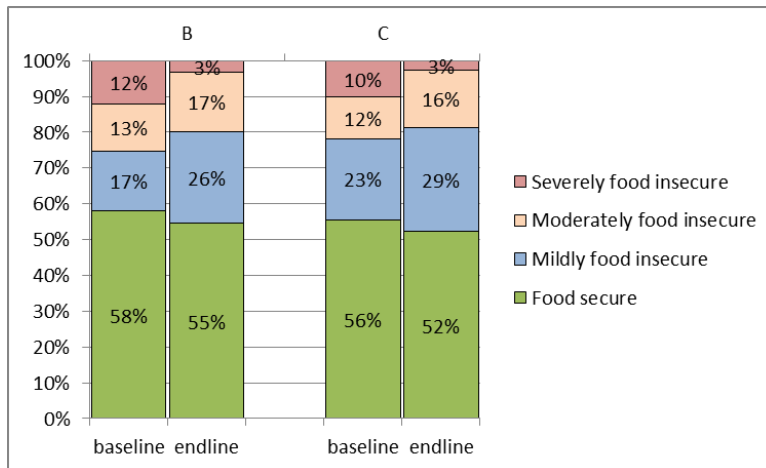
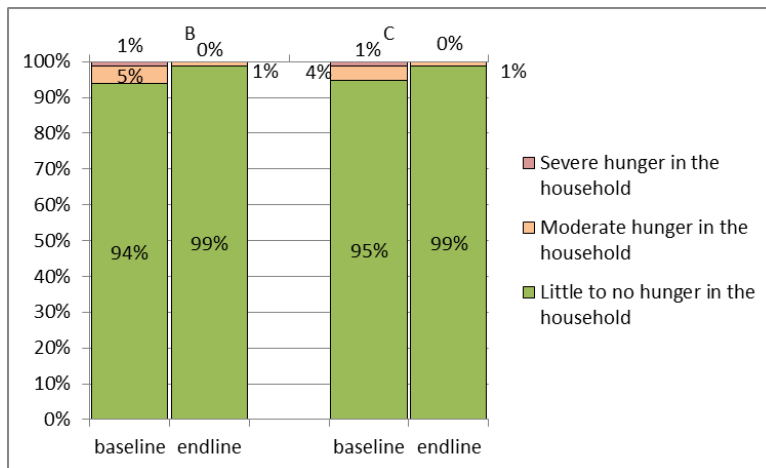


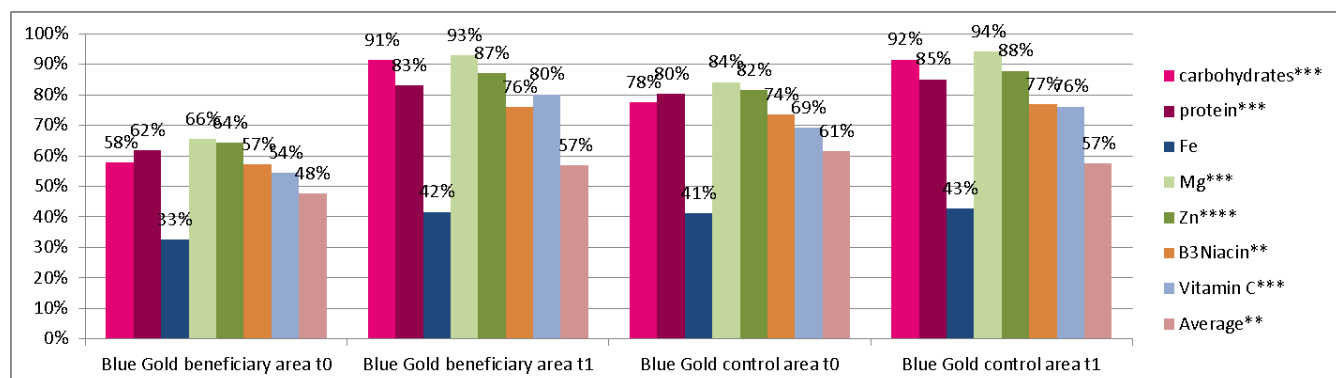
Figure 7: Household hunger scale (HHS)



On nutritional adequacy, we observe a significant positive project effect. This is a result of the fact that for seven nutrients the increase in adequacy was larger for the B group compared to the C group and the fact that the decline of the adequacy of the other eight nutrients was smaller for the B group compared to the C group.

Figure 8 shows the average nutrient adequacy, only for the nutrients whose adequacy has increased at the endline for the households in the beneficiary area and the households in the control area.

Figure 8: Overall nutrient adequacy and nutrient adequacy for nutrients whose adequacy has increased (in both the B and the C group).



The nutrient adequacy for the nutrients shown in the figure increased in both the beneficiary area as in the control area, but the increase was bigger in the beneficiary area. The project effect was significant for all of these nutrients except for iron (Fe). (See Table 30).

Table 30: Estimation results multivariate regression: nutrient adequacy positive project effects (weighted)

| Dependent variable | Carboh | Protein | Fe | Mg | Zn | B3Niacin | C |
|---|----------------|----------------|-------------|----------------|----------------|---------------|----------------|
| Explanatory variables | coefficient | coefficient | coefficient | coefficient | coefficient | coefficient | coefficient |
| beneficiary (1=yes) | -0.11*** | -0.08*** | -0.03* | -0.09*** | -0.07*** | -0.06*** | -0.05** |
| post treatment (1=yes) | 0.12*** | 0.04** | 0.02 | 0.08*** | 0.05*** | 0.03 | 0.09*** |
| beneficiary post treatment (1=yes) | 0.12*** | 0.08*** | 0.02 | 0.09*** | 0.07*** | 0.07** | 0.10*** |
| constant | 0.80*** | 0.82*** | 0.41*** | 0.86*** | 0.83*** | 0.75*** | 0.69*** |
| number of observations | 1282 | 1282 | 1282 | 1282 | 1282 | 1282 | 1282 |

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

For the other eight nutrients (energy, Ca, vitamin A, B1Thiamin, B2Riboflavin, B6, B9Folate, B12) there was a significant decline in nutrient adequacy in both the beneficiary as the control area. (See post treatment effect *Table 31*) The declines were however larger in the control area, so the project effects are still positive and even significant for Energy.

From this analysis we can conclude that nutrient adequacy remains low (less than 50% adequacy) for the following nutrients: iron, Vitamin A, Vitamin B1 Thiamin, Vitamin B2 Riboflavin, Vitamin B6, Vitamin B9 Folate and Vitamin B12.

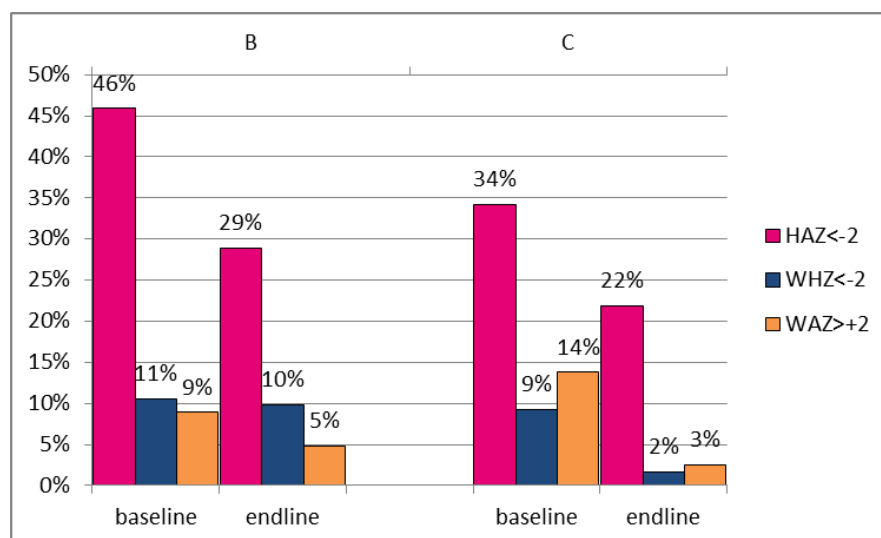
Table 31 Estimation results multivariate regression: nutrient adequacy decline post treatment (weighted)

| Dependent variable | Energy | Ca | A | B1 | B2 | B6 | B9 | B12 |
|---|---------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Explanatory variables | coefficient | coefficient | coefficient | coefficient | coefficient | coefficient | coefficient | coefficient |
| beneficiary (1=yes) | -0.03*** | -0.07*** | -0.05** | -0.03 | -0.03 | -0.02 | -0.03** | -0.06** |
| post treatment (1=yes) | -0.18*** | -0.14*** | -0.14*** | -0.11*** | -0.13*** | -0.09*** | -0.11*** | -0.22*** |
| beneficiary post treatment (1=yes) | 0.05** | 0.02 | 0.04 | 0.03 | 0.05 | 0.01 | 0.03 | 0.04 |
| constant | 0.95*** | 0.43*** | 0.48*** | 0.51*** | 0.56*** | 0.43*** | 0.32*** | 0.60*** |
| number of observations | 1282 | 1282 | 1282 | 1282 | 1282 | 1282 | 1282 | 1282 |

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

On health, we observe a strong decline in stunting, in wasting as well as in overweight, for both B and C groups; there are no significant effects of the BGP. The proportion of stunting is now 29% (B) to 22% (C), wasting is 10% (B) to 2% (C). (See Figure 9). The strong effects cannot be associated with improved nutrient adequacy, as there are still major deficiencies, but could also be explained by improved access to water and sanitation.

Figure 9: Percentage of under five children with stunting (low height for age), wasting (low weight for height), overweight (high weight for age)



Further in-depth analyses on HDDS and nutritional adequacy

The underlying causes of the improved HDDS and nutritional adequacy index (NAI) were further explored by specific regression analyses. The hypothesis is that these improvements are associated with more home consumption (of crops that are grown in greater volumes or have been newly introduced). To do so, the following relations were explored:

- the relations between product groups and the HDDS. It was found that only for fish (prawns + other fish) a significant correlation was found. This relation is stronger for farmers with small land size (less than 0.3 ha of land). See Table 32.
- the relations between product groups and the nutritional adequacy index. It was found that a significant correlation was found both for rice and for fish, which is stronger for small farmers. See Table 33.

It can be concluded that both the production of rice and the (increased production of fish have been responsible for positive effects on the HDDS and the nutritional adequacy index, and mainly for small farmers. Small farmers have massively started to produce some fish, even in very small quantities.

Table 32: Estimation results: HDDS and production, for different groups of farmers

| Dependent variable | HDDS | HDDS | HDDS |
|-----------------------------------|-------------|-------------|-------------|
| Explanatory variables | coefficient | coefficient | coefficient |
| Produced rice (1=yes) | 0.16 | 0.07 | -0.29 |
| Produced leafy vegetables (1=yes) | -0.01 | -0.19 | 0.16 |
| Produced pulses (1=yes) | 0.14 | 0.09 | 0.16 |
| Produced oil seeds (1=yes) | 0.16 | 0.41 | 0.04 |
| Produced fish and seafood (1=yes) | 0.68*** | 0.83*** | 0.48*** |
| constant | 6.88*** | 6.76*** | 7.52*** |
| Farmers | All | Small | Big |
| number of observations | 1286 | 612 | 674 |

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

Table 33: Estimation results: Nutritional adequacy and production

| Dependent variable | Nutritional adequacy |
|---|----------------------|
| Explanatory variables | coefficient |
| Production of rice (1000 kg) | 0.01*** |
| Production of leafy vegetables (1000 kg) | 0.01 |
| Production of pulses excluding mung beans (1000 kg) | -0.03 |
| Production of oilseeds (1000 kg) | -0.14 |
| Production of mung beans (1000 kg) | 0.05 |
| Production of prawn (1000 kg) | 0.12* |
| Production of other fish (1000 kg) | 0.07 |
| constant | 0.57 |
| number of observations | 1286 |

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

5.2 Findings Safal project

5.2.1 Introduction

The overall objective of the Safal programme is to enhance food and nutrition security of small farmers and landless workers in Southwest Bangladesh with a focus on developing resilient livelihoods through promoting sustainable agricultural production and market chain development. This will be achieved by enhancing the productivity of poor and smallholder farmers (in particular women) through integrated sustainable farming systems suitable and adaptive to the ecology of SW Bangladesh. The aim is to support adoption of sustainable value chain-based farming practices in 3 sectors, with market and nutrition opportunities, being livestock, aquaculture and horticulture, in such a way that these bring positive outcomes in quality of nutritious food intake as well as economic and environmental benefits. Producers will be linked to private sector actors in the sustainable supply chains at international, national and local level. The project will thus improve competitiveness of the food supply chain in Bangladesh.

The project targets five districts in SouthWest Bangladesh: Khulna, Jessore, Bagherhat, Narail and Satkhira. The main beneficiaries are smallholders and marginal farmers apart from agricultural labourers. The project will organize farmers into producers groups in three sub-sector i.e. aquaculture, dairy and horticulture. The total number of beneficiaries impacted would be around 250,000 people. The project will also target market intermediaries-local, national and international, public and private service providers, local government bodies and other associated stakeholders. The project addresses young landless unemployed (1,300) – men and women. They are trained and provided employment within the value chain. The project will also generate awareness through mechanisms to bring about behavioural changes in food habits, health and hygiene. In doing so, it connects with various initiatives already existing in the region.

Capacities and knowledge building of farmers groups are planned for adoption of profitable and sustainable farming and enter into new business venture in the market supply chain. Promotion of technologies, market linkages and financial services are planned so that smallholder farmers can have accessibility and affordability of new technologies and that ensures profitable earning. Prioritizations are given to optimizing yield, nutritional quality and postharvest life.

Components

To achieve the above changes, the project activities are organized in 4 groups.

1. *Activities aimed to increase farm household income through better farm management*, high-quality input use, better farming practices (including adaptations to climate change and salinity) and market access. While some activities directly address farm management, farming practices and market requirements, other activities address producer group capacity to manage trainings, business relations, finance and Internal Control Systems.
2. *Activities aimed to increase the investment of private-sector players*, both in Bangladesh and in the international market, in safe, sustainable and efficient supply chains This involves policy influencing, facilitation of business deals, implementation of standards, pushing for enforcement of legislation, improving supply-chain management and improving the reputation of Bangladesh food sectors.
3. *Activities aimed to integrate landless men and women as labourers or entrepreneurs in agricultural supply chains*.
4. *Activities aimed to diversify the diets of farm households*, aided by an increase in production, income and awareness of the importance of a nutritious and diverse diet.

Status of activities by early 2016 in surveyed polders

The following table provides an overview of the status of the main outputs of the activities carried out by Safal, by early 2016 when the endline survey took place, in the different areas where Safal operates.

Table 34: Overview of activities and beneficiaries reached by Safal project

| Component | Activities |
|--|--|
| 1. Activities to increase farm income | <ul style="list-style-type: none"> Reached 58,000 smallholder farmers into 1,000 producer groups in aquaculture, dairy and horticulture subsectors with 48% representation of women. Improved farm management has led to increased production and income from farming. A total of 18,000 hectares of land is covered with more eco-efficient farming practices. |
| 2. Activities aimed to increase the investment of private-sector players | <ul style="list-style-type: none"> 51,000 farmers were linked with public and private sectors and are getting services for improved farming practices 15,000 farmers received loans from MFIs towards minimizing investment crisis 16 private sector companies are engaged with SaFaL supported supply chain |
| 3. Activities aimed to integrate landless men and women | <ul style="list-style-type: none"> In total 1,300 poor/landless men and women have been trained to enter into the market chain as skilled labourers and entrepreneurs. |
| 4. Activities aimed to diversify the diets of farm households | <ul style="list-style-type: none"> Reached 287,000 people to improve their food and nutrition behaviour 1,800 school-going children and 52,000 adults have been communicated and made aware of nutrition and health issues |

Theory of change and hypotheses

The theory of change of the Safal project was discussed with the Safal team during a workshop in 2014. Following is a narrative with the main elements.

The project basically addresses two main pillars of the intervention strategy which together do not only lead to immediate results through increased production, but also to resilient production systems that can meet future challenges. To do so, two main change processes are envisaged:

1. Changes with respect to the way producer groups conduct their farming business – becoming more sustainable and market-oriented -, based on solid business models; this includes employment opportunities for local women and landless as labourers or entrepreneurs. The aim is to leverage transition towards smarter, less input-dependent and more resilient forms of farming that build on agro-ecological principles. The assumption is that farmers will be incentivized to adopt more sustainable practices if they can increase their income through higher productivity. Improving farm management is a critical component of the approach to increase productivity.
2. Changes with respect to the main local, national and international market players in the selected value chains, being more oriented at safe, sustainable and efficient supply chains and buying from smallholder producers in the project area, based on market opportunities. In order to resolve market failures, commitment from both local stakeholders and international buyers are needed. To this effect, the project will facilitate deals between producer groups, exporting processors and/or international buyers, based on viable business models. With respect to domestic supply chains, the project will work with existing market players, such as ambitious retailers.

The first change is expected to lead to more resilient production systems; the second change is part of a market transformation process leading to upscaling and sustainability of the results. A critical element of the theory of change seems to be the interaction between these two pillars as they should reinforce each other. *Sustainable sector development* is characterized as follows:

- More public and private investment (demand and supply) in the 3 sub-sectors for safe and efficient supply chain development
- Improved availability, accessibility and affordability of nutritious food
- Enterprise agriculture provides economic incentives and viable employment for the target groups
- Sector players are aware of appropriate food safety measures.

The critical hypotheses for the 'proof of concept' of the Safal theory of change are the following.

1. Safal producers adopt better practices, leading to improved productivity and resilience in farming systems. The improved production systems will also meet criteria of sustainable production systems (based on agro-ecological environmental and social criteria). A separate component of this hypothesis is also the need for improved water management, as a condition and improved practice for achieving higher productivity
2. There is a viable business model for increasing agricultural production leading to improved incomes from enhanced sales. The improved incomes from sales are expected to form an incentive for producers to further invest in improved production systems.
3. The project will also reach out to the landless, by their specific involvement in supply chain activities (through activities that are not land-bound) and / or through upscaling effects in selected value chain development. The interventions will also specifically focus on benefits for women.
4. The improved access to agricultural products and knowledge in nutrition leads to improved food nutrition, diversity and food security at household level. This hypothesis is associated with the nutrition and food safety programme component. Much training and awareness raising was oriented at extension on food nutrition and food safety, focused at women. Together with improved crop production this is expected to enhance household food diversity and food security.
5. There is a business case for entrepreneurs to organize themselves for input supply and improved marketing and for companies in the supply chain to build up sourcing / trade relations with smallholder producers. This will include the provision of adequate business support services to producers and to some extent the success of the project will depend upon their (continuous) functioning to serve demands from producer groups. This may gradually contribute to sector transformations in markets towards more inclusive and sustainable markets. The drivers to do so are assumed to be stronger than vested interests who will lose power or profits from current imperfect / unsustainable markets.

5.2.2 Conclusions

Context factors

The identification of Safal effects during the last 2 years should be seen against the following context, as emerging from the survey and focus group discussion results:

- In both beneficiary and control groups we observe significant increases in almost all indicator values. The effects of the Safal project should be seen against this background of overall increases, possibly as a result of the overall economic development in Bangladesh, improved technologies, infrastructure and market development. For instance, in terms of infrastructure over the last 2 years access to electricity has considerably improved in both beneficiary and control polders.
- In terms of agricultural production, there has been an important increase especially in production of aquaculture production, which was confirmed in interviews with private sector actors. This might be associated with improvements in the road network around Khulna. This is especially important for aquaculture as fish need to be transported quickly to the main markets and centers where they can be frozen. It was stated that this has been a major factor stimulating aquaculture.
- In terms of agro-climatic conditions, there has been a strong increase in the incidence of crop lost and/or crop failure, from almost 0 to more than 50% of households, which can be explained by the strong increase in the incidence of floods and water logging, for both beneficiary and control groups.

Main conclusions

The main project effects are increased incomes, both for landowners and landless, which is due to improved agricultural production and improved sales for products targeted by the Safal project. For both the landowners and the landless, fish production and sales has the highest contribution to this project effect. Secondly there is more production and sales of rice, horticulture products (both mainly for large landowners) and milk (landless only).

In terms of beneficiaries of aquaculture activities, Safal has made a selection of fishery producers with relatively large land and pond ownership, which could be justified in terms of demonstrating 'proof of concept'. However, Safal did not monitor whether project beneficiaries are large or small land owners, which can be considered an implementation weakness.

Improved incomes result from the adoption of improved agricultural practices as being promoted by the Safal project, leading to higher yields and higher production per household. We observe that farmers grow less rice and more other crops and aquaculture is rapidly expanding. The landless also use more land and ponds. While this is a general trend, project effects are that land users have been able to acquire higher yields than farmers in the control group. This effect was clearly demonstrated for small landowners cultivating fish.

With respect to agricultural practices leading to improved yields and production, there is evidence of the promotion by the project of agro-ecological methods and products, but the survey shows that farmers have invested more on chemical fertilizers than on organic fertilizers. Safal does not undertake soil testing or monitor whether the amount of chemical fertilizers is based on requirements for responsible soil management, which is a project implementation weakness. There are also concerns about low wages for workers and differences between female and male workers.

There is evidence of higher sales of fish products, rice and horticulture products by Safal beneficiaries, for different categories of farmers. Improved sales can be associated with improved access to markets resulting from the various interventions of the Safal project in the different supply chains.

Safal has successfully intervened at different points in the supply chain. First, it established input and service centers, reaching out to 51% of the beneficiary producers and reduced input costs (by 10-20%). Second, the project supported the establishment of collection centers and linkages to supply chain buyers. Third, Safal has established linkages with national or international market chains. Fourth, Safal establishes linkages with local public sector agencies, such as the fisheries department. There are indications that these agencies pick up Safal initiatives or collaborate effectively. As a result of these interventions, according to Safal reporting, almost 40% of Safal beneficiaries sold their produce through Safal supported supply chains. During the survey we found success stories but also challenges of oversupply and low prices, or producers choosing for alternative marketing channels. There are also concerns about the viability of input centers located at remote areas. The results in the fishery sector appear to be most promising, which is associated with good export markets for shrimps and a good relationship with one trader. The positive cases in working within the supply chain are still limited in numbers, but Safal is receiving requests from other companies to join the project.

For 1300 landless (of which 80% are men) Safal has created employment as actors in the supply chain, in 17 types of enterprises in three subsectors. Landless were supported through entrepreneurship and skill development trainings such as use of technologies, enterprise management, facilitation of skill and business plan development. Their incomes are estimated at around USD 1,000 per year. In addition, around 4,000 landless have benefitted from the project by increased production from farming, using small plots or ponds (that have been leased or acquired). The average increased farm income for the landless is USD 1298 per year, with a project effect of USD 594. This shows that the project has significantly contributed to more landless acquiring better incomes through agricultural production. The Safal landless also benefitted by increased sales of milk, which is associated with specific activities by the Safal project in the milk supply chain.

The Safal project has generated positive effects on food security and on household diet diversity for the landless. This could also be explained by the fact that for the landless there was much scope for improvement. For the landowners, there are only minor changes and no project effects on food security indicators. For both categories of beneficiaries, there are limited or no improvements in nutritional adequacy. Moreover, the overall trends on nutritional adequacy is negative for both the B and C groups, for both landowners and landless. This remains difficult to understand and could be associated with the evaluation design.

On health, we observe a strong decline in stunting, in wasting as well as in overweight, but no project effects. It should be kept in mind that improved access to water and sanitation has also improved in the project and control areas, with important positive effects on health.

Sub-conclusions

Sub-conclusions supporting the main conclusion are based on the 5 hypotheses underlying the theory of change of the Safal project (see chapter 1).

1. (a) Safal producers have adopted better practices, leading to improved productivity in farming systems. (b) The improved production systems meet criteria of sustainable production systems. (c) Improved water management is a condition for achieving higher productivity.

Sub-conclusions:

(a) There are project effects of Safal beneficiaries having adopted improved practices leading to improved rice production and production of other crops (including horticulture), most significantly so for large landowners. There are also project effects for aquaculture producers, with evidence of positive project effects for small landowners. The landless have benefitted by increased crop and milk production. (b) There are some concerns about the ecological and social aspects of the agricultural production systems (use of agro-chemicals, fair wages). (c) No specific attention has been given to water management issues, in spite of increasing crop damage by excessive rain.

Underlying evidence

(a) Over the last 2 years in the Safal area there is general improvement in terms of agricultural production, especially in horticulture and in fish production, both among beneficiaries and the control groups, and also including the 'landless' (owning less than 0.2 ha of land, but including leaseholders). In both the beneficiary and control areas there is a trend of less rice production, more production of other crops and more aquaculture, thus increasing agricultural production diversity. This can be understood by the fact that in Bangladesh the market demand for rice is satisfied, while market demand for horticulture and fish is expanding, including export markets. There is a project effect on the increased use of ponds used for aquaculture by landowners, and for the landless on the increased use of land. This has been triggered by Safal offering improved agricultural practices and marketing perspectives.

After correcting for the selection bias in favour of beneficiaries with relatively large land and pond size, and against the background of the overall trend of increasing agricultural production, there are some important project effects. Overall, there are positive project effects for all three product groups (rice, other crops and fish) with strongest effects for fish producers and production. Overall, the project effects on production per household are more positive as land or pond size increases. However, further analysis shows some relevant differences in relation to land or pond size. In terms of production per HH there is a project effect for rice production (less decline as compared to the control group) and for other crops (increase), with significant effects for large landowners mainly. The positive effects on fish production are strongest for small landowners. It appears that many small farmers have newly embarked on fish production, using small ponds for producing fish, which is a trend also found in the control area but to a lesser extent. There is a project effect on fishery yields for these small farmers in the beneficiary group, resulting in higher fish production and incomes per household. Yield increases especially in fisheries were confirmed during focus group discussions and interviews. Safal beneficiary large fish farmers did not show a yield or production increase, which can be explained by the fact that their yields were already high.

For the category of landless there is a project effect on land size used and rice production, as well as milk production. The production of milk per HH among the landless in the B group has increased by 70%. Fish production has also increased, but there is no project effect.

Improved production for Safal beneficiaries can be explained by the adoption of better practices and improved marketing, as supported by information from focus group discussions and Safal monitoring. Beneficiaries mention improved practices and there is also evidence of copying effects, although it should be mentioned that improved agricultural practices are also promoted by other NGOs and state actors. Improved access to finance was not often mentioned, which is in line with the survey which shows improvements but no project effects on savings and loans.

(b) With respect to agricultural practices leading to improved yields and production, there is evidence of the promotion by the project of agro-ecological methods and products and input supply centers selling responsible products. However, the survey shows that farmers have invested more on chemical fertilizers than on organic fertilizers, which is supported by the results of FGDs with producers. Average expenditures on chemical fertilizer is around USD 160 per hectare, similar for beneficiaries and the control group. This leads to a higher dependency on chemical fertilizers. The midterm review of Safal (2015) noted that producers are not aware of soil quality testing and using fertilizers accordingly. This is a theme that should receive more attention by Safal, especially in the context of the government that strongly promotes chemical fertilizers (with subsidies).

The survey has shown that a higher incidence and stronger increase in the use of labour by producers in the beneficiary group (up to 50% increase as compared to a 30% increase in the control group). The FGDs have shown that wages for workers are low, and there are consistent differences in wages between female and male workers (women earning up to 40% less).

(c) With respect to water management, there is a significant relationship between the perception of water management and agricultural production, both for landowners and landless, which implies that the farmers understand the importance of water management. However, the improvements in water management has not been able to prevent crop failure and damage due to excessive rain leading to waterlogging and causing negative perceptions. Safal did not give attention to water management in its activities.

2. There is a viable business model for increased productivity and improved incomes from enhanced sales

Sub-conclusions: There are project effects on Safal beneficiaries having benefitted by increased incomes, both landowners and landless, which is associated with improved production and improved sales, mainly of fish (both landowners and landless), rice and milk (landless only). Improved sales can be associated with improved access to markets resulting from activities by the Safal project.

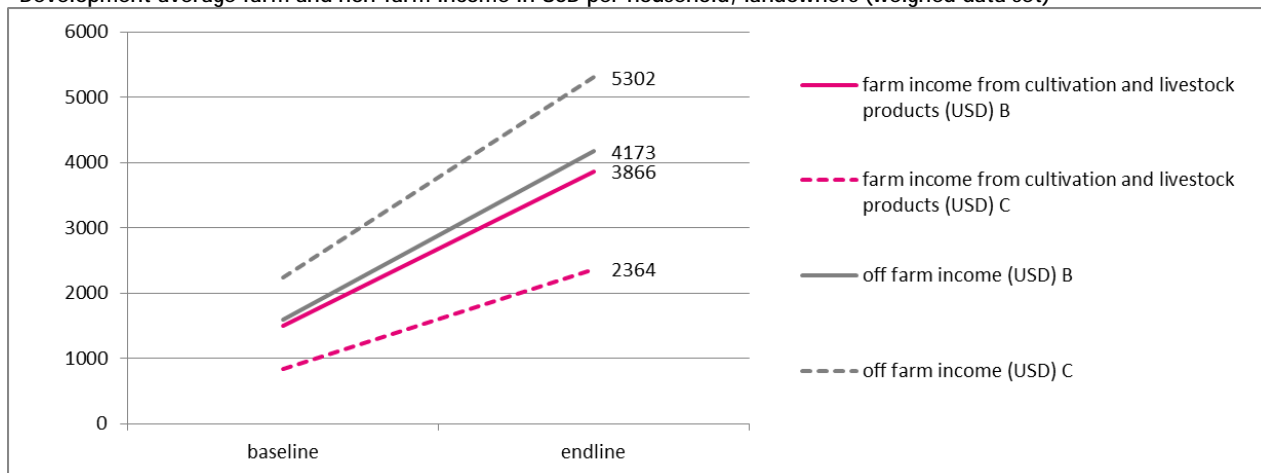
Underlying evidence

For both landowners and landless, in line with increased production of crops and fish, there is an increase in both the amount of production consumed and sold. However, there are no project effects on the level of product consumption. There are project effects on increased sales of rice and fish production by the landowners, and for the landless only on milk production sold.

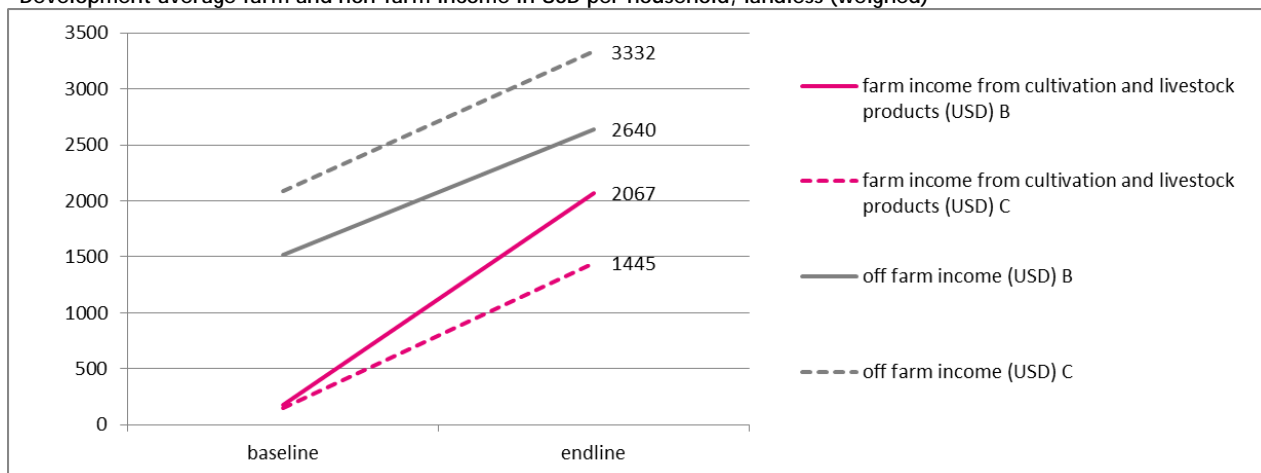
In terms of incomes, within both the beneficiary and control groups, for the landowners as well as the landless, there is a strong increase in incomes over the last 2 years, both in terms of farm- and off-farm incomes (increase by a factor 2 to 4, most so for the landless). There is also a positive project effect on farm incomes for both landowners and landless. For landowners, farm incomes have increased by USD 1520, with a project effect to increased farm incomes of USD 840. For the landless farm incomes have increased by USD 1298, with a project effect by USD 594. For both the landowners and the landless, fish production and sales has highest contribution to this project effect. More specifically, for landowners, the project effect on incomes is greatest for small landowners who have started to produce fish (large land owners were already selling fish). In addition, beneficiary large landowners have been able to continue selling much rice (contrary to the control group). For the landless, the strong increase in farm income has led to a reduced dependency on off-farm incomes. While milk also shows significantly higher

sales, it has not significantly contributed to higher farm incomes per household. This could be explained by the fact that incomes from milk are relatively small in relation to other income categories. There are no project effects for sales of 'other crops than rice', including horticulture. Also, for non-farm incomes there are no project effects.

Development average farm and non-farm income in USD per household, landowners (weighed data set)



Development average farm and non-farm income in USD per household, landless (weighed)



Both for the landowners and the landless, more use is made of selling from the farmgate. This reduces their time to take their product to the market, and also reduces the uncertainty of getting a buyer. In addition, direct sourcing from the farm gate reduces the risk of post-harvest loss. However, selling by contracts or cooperatives has been low and has further declined, which is contrary to expectations. Farmers expect further improvements with respect to access to markets, especially in horticulture where prices are strongly fluctuating and markets easily get saturated. They expect to receive more support.

There is evidence of a positive business case for producers in each of the three targeted sectors. The business case generally shows (i) improved quality of inputs as well as increased costs, (ii) increased productivity (yields), (iii) higher revenues from improved sales, leading to (iv) higher profitability due to a positive balance between increased input costs and sales.

3. Effectiveness on the involvement of the landless and gender aspects

Sub-conclusions: Safal created employment for 1307 landless (80% men) as supply chain actors, in 17 types of enterprises in three subsectors. In addition, at least 4000 landless have benefitted from increased crop and fish production with a project effect of USD 594. On the role of women in decision-making, we see no improvements in the management of agricultural outputs, this remains largely a men's business.

Underlying evidence

For 1307 landless Safal has created employment as actors in the supply chain, in 17 types of enterprises in three subsectors (source Safal reporting). Of these beneficiaries about 80% are men. Landless were supported through entrepreneurship and skill development trainings such as use of technologies, enterprise management, facilitation of skill and business plan development. These examples show that for the landless there are income opportunities that do not depend on land ownership or lease of land. Their incomes are estimated at around USD 1,000 per year. We estimate based on the survey findings that around 4,000 landless have benefitted from the project by increased production from farming, using small plots or ponds (that have been leased or acquired). The average increased farm income for the landless is USD 1298 per year, with a project effect of USD 594. This shows that the project has significantly contributed to more landless acquiring increased agricultural production.

With respect to gender aspects, the aquaculture sub-sector is dominated by men, which is supported by survey data showing that decision-making in aquaculture is dominated by men and also that the proportion of decision-making by men has further increased from 92% to 98% during the last 2 years. The dominance of men is less on homestead products (around 70%) while management by both men and women is highest for homestead products (up to 40%) and has slightly increased. There has been a consistent increase in the proportion of HHs with savings or with loans, but no project effects. On credit and savings there is a stronger role for women, and a positive trend, but apparently no project effects.

4. Effects on nutrition, food diversity and food security

Sub-conclusions: The Safal project has generated positive effects on food security and on household diet diversity for the landless. This could also be explained by the fact that for the landless there was much scope for improvement. There are few if any improvements in nutritional adequacy, which is difficult to understand. It should be kept in mind that improved access to water and sanitation has also improved in the project and control areas, with important positive effects on health.

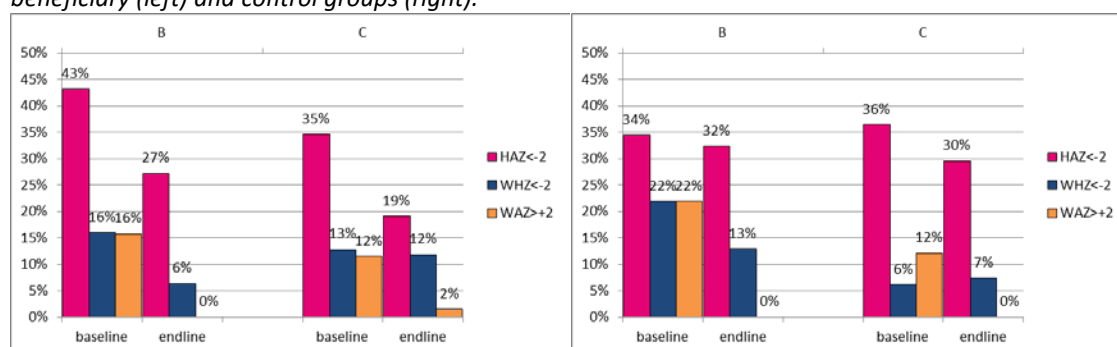
Underlying evidence

For the landowners, there are project effects on the months of adequate food access, by 0.59 months, thus reaching up to almost the full 12 months (11.68 months). However, there are only minor changes and no project effects on the HFIAS or HDDS indices. For the landless, the number of months with adequate household food access shows a positive project effect, of 1.47 months, of which 1.28 months is the project effect, thus reaching up to 10.93 months. The HFIAS index shows a strong improvement for both the B group and the C group, and also with a positive project effect of 2.26 points. Lastly, on the HDDS there has been an improvement and significant effect of the project by 0.64 points.

There is an overall negative change on nutritional adequacy for both the B and C groups, for both landowners and landless. For landowners, the project had a less negative effect on the overall nutritional adequacy of landowner families as well as some nutrients, as compared to the control group, and for some nutrients there was a positive effect. This positive project effect is probably related to the better production of rice (no decline) and fish (more increase) for the B group as compared to the C group. For the landless, there was not any project effect on nutritional adequacy. This seems to be in contradiction with the improvements in food security indicators and the fact that landless households have benefitted from the project by producing more milk. One explanation of the latter could be that milk has been used mainly for sales and less so for consumption.

On health, we observe a strong decline in stunting, in wasting as well as in overweight, for both B and C groups, but no project effects. The proportion of stunting among the landowners at the endline situation is higher in the B group (27%) than in the C group (19%). On wasting we find an inverse pattern: 6% in the B group and 12% in the C group. Among the landless we find a mixed view in terms of the comparison between B and C groups, while all trends show considerable improvements.

Percentage of under five children with stunting (low height for age), wasting (low weight for height), overweight (high weight for age). Landowners (left) and landless (right), and within each group beneficiary (left) and control groups (right).



5. There is a business case for entrepreneurs to organize themselves for input supply and improved marketing and for companies in the supply chain to build up trade relations with smallholder producers. This may gradually contribute to more inclusive and sustainable markets.

Sub-conclusions: The Safal project has successfully intervened at different points in the supply chain, including linking producers to national and international supply chain actors and support for the establishment of service and collection centers, reaching around 40% of Safal beneficiary producers. It seems that initiatives in the fish sector are most promising, which is probably associated with good export markets for shrimps and a good relationship with one trader.

Underlying evidence

Safal has successfully intervened at different points in the supply chain. First, it organized farmers and has supported the establishment of input and service centers, reaching out to 51% of the beneficiary producers. During interviews and FGDs producers confirmed improved accessibility to inputs and reduced costs (by 10-20%). Second, the project supported the establishment of collection centers and linkages to supply chain buyers. Third, Safal has established linkages with national or international market chains (which benefit around 40% of Safal beneficiaries), in some cases including agreements or contracts between buyers and the collection center, with price agreements. There is evidence of better relations with supply chain actors. Export markets are important as domestic markets may have over supply. The number of these initiatives is gradually increasing and the results are promising yet several challenges remain. Fourth, Safal consistently establishes linkages with local public sector agencies, such as the fisheries department. There are indications that these agencies pick up Safal initiatives or collaborate effectively.

As a result of these interventions, according to Safal reporting, almost 40% of Safal beneficiaries sold their produce through Safal supported supply chains. During the survey we found mixed results on improved sales: there are success stories but also challenges of oversupply and low prices, or producers choosing for alternative marketing channels. Also producers have difficulties in meeting high demand for supply volumes and secure high and constant quality.

Service centers and collection centers operate on the basis of a sound business case, with costs for the services that are being provided. This approach enhances satisfaction and sustainability of the approach taken. However, while service or collection centers at remote places can be particularly useful for small

farmers (who have no means of transport), the profitability of the center may be at risk as transport costs of supplies are higher.

5.2.3 Detailed findings

This section presents detailed findings supporting the conclusions presented in the previous section. The findings are based on the analysis of data and information from different sources: Blue Gold monitoring data, quantitative survey analysis and focus group discussions, as well as a detailed study on previous experiences in working with water management groups (see also Appendix 5). In section 5.1.3.1 relevant contextual changes are presented. In subsequent sections the findings are presented in relation to the 5 main hypotheses that will be studied (see section 5.1.1). In several cases, the main conclusion of a paragraph is presented first, in italics, followed by the underlying evidence.

Note that in the analyses of the household surveys, a distinction has been made between landowners and landless (defined as having less than 50 decimal of land, thus not strictly having no land; also the landless commonly use land for agriculture through leasehold arrangements). Thus, in the following text there are separate conclusions for the landowners and the landless.

5.2.3.1 Relevant changes in project context

Agro-climatic conditions in Safal area

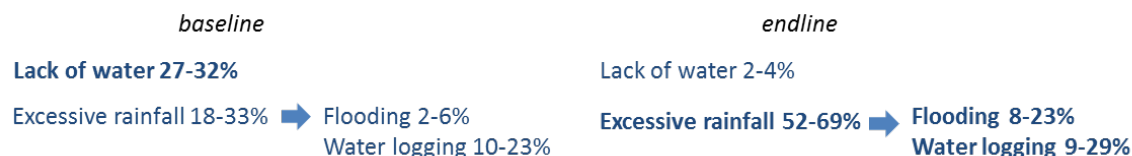
The Safal working area is characterized by relatively good agricultural conditions (better than conditions in the Blue Gold programme area), as producers can have 3 cropping cycles a year. Farmers are sure about one rice crop (*Aman* wet season paddy), while the second rice crop cycle depends upon gravity irrigation from canals or tubewells (*Aus* paddy). During the second season other crops that require less water are also grown. Very few also grow IRRI rice, only when they have access to irrigation water. In the area they have problems of saline water, water logging and lack of irrigation water.

Table 35: Main cropping season in the Safal area

| Season | Main crops | Rainfall and climate effects |
|-------------------------|--------------------------------------|--|
| Aus (March to August) | Rainfed rice, as well as other crops | Intermediate season, increasingly affected by climate events |
| Aman (June to November) | Rainfed rice | Wet season, may be affected by floods |
| Boro (December to May) | Mainly dryland or irrigated crops | Dry season |

There are remaining and increasing problems of extreme weather events of cyclones, water logging (also of fish ponds) and saline water intrusion. In terms of natural events, the survey results shows an increase during the last two years in the incidence of natural events and a very strong increase in crop lost and/or crop failure as a result of these events, from almost 0 to more than 50% of households. This can be explained by the strong increase in the incidence of floods (from around 6% to 20%), as well as a slight increase in the incidence of water logging (from 18% to 26%), for both B and C groups. On the other hand, there has been a decline in the incidence of drought (from around 25% to 4%). When looking at water related problems, we observe the lack of water as the main problem in 2014, while this has been replaced by water logging and flooding caused by excessive rainfall in 2016, especially experienced by the landowners.

Figure 10: Shift in type of water related problems (range of average percentages of households facing water related problems for landowners and landless in the B and C group)



Changes in agricultural sector

There has been a long period of the Government promoting rice. The country is now self-sufficient in rice. Producers stated that input costs for rice have increased and revenues for rice have declined, while demand and prices for vegetables, fruits and fish have generally increased. Domestic demand for fruits has increased by 3-4% annually. Export markets for shrimps have also increased, with relatively attractive prices. This has contributed to a massive shift towards growing fruits and vegetables, and also fish farming has doubled in two years to respond to export demand. Producers refer to the fact that this shift started several years ago. The region is not well favoured with dairy production facilities.

There is also increasing awareness of food safety issues. There is improved legislation on food safety issues. The demand for pesticide-free products is increasing.

Many NGOs work with producers to improve farmer production skills (in cropping and aquaculture), but most of these work for a short period only and do not work on markets. There is during the last 10 years increasing attention for the concept of Markets for the Poor (M4P), but very few organisations actually work on markets. They rather establish contacts between producers and wholesalers and then leave marketing etc. to private companies. There was a government loan programme for fisher entrepreneurs but it was discontinued.

Socio-economic conditions and infrastructure development

In the Safal project area, the landless constitute 10-15% of the population. The landless commonly lease land or operate as sharecroppers.

There has been a significant increase in the proportion of HHs with access to electricity, for all groups: B landowners (76% to 91%), C landowners (71% to 85%), B landless (54% to 77%) and C landless (58% to 70%). Likewise the use of batteries has strongly increased especially among the landless (BLR Table 4; ELR: Table 5).

There have been significant improvements in the road network around Khulna. This is especially important for aquaculture as fish need to be transported quickly to the main markets and centers where they can be frozen. It was stated that this has been a major factor stimulating aquaculture.

5.2.3.2 Effectiveness of producers to adopt improved practices for improved productivity within selected supply chains, including water management aspects

In the following we treat landowners and landless separately, but when dealing with agricultural activities we treat both of them with the same hypothesis because landless may also lease land.

Inputs – Beneficiary groups and gender aspects

The first activity of Safal has been to organize and support producer groups. During the FGDs some expressed their views that one of the main benefits of the project was the fact that producer groups had been organized supported. With respect to the functioning of Producer groups, according to Safal reporting 85% were found to function well while 15% need improvement (by the end of 2015).

During the FGDs the perception was expressed that on horticulture and aquaculture mainly middle income farmers benefit. It was stated that the poor are not in a position to decide on improved practices (as they have no land apart from their homestead). It was also stated that the rich benefit more from the established input supply centers as they require large volumes of inputs, and also because they do not need to buy on credit. The poor and the marginal farmers often buy inputs on credit, which the input supply centers cannot continue to do in large volumes because they don't have enough provisions. This is something that Safal is looking into. In dairy it was stated that middle income farmers have benefitted most from improved market access, which can be explained by their volumes of milk. The affordability for the adoption of technologies is also an issue for the poor and marginal farmers. In horticulture both men and women benefit, we did not notice significant differences in the FGDs. However, in aquaculture mainly men participate and benefit. In dairy it is clear that women participate and benefit most.

Safal reporting does not specify gender of those that improved performance. However, it does report on the proportion of women in Producer Groups, being 87% in dairy, 56% in horticulture and 17% in aquaculture. The proportion of women among the lead farmers trained is 47% in dairy, 22% in horticulture and 3% in aquaculture. Safal also developed capacity of 86 women as Community Nutrition Volunteers (CNVs) for facilitating health and nutrition-focused activities in order to upgrade the health and nutrition status of the farm household members

Inputs – access to land and land used

In terms of land size the beneficiaries of Safal (see Table 1) can be classified according to landholding size, with distinct differences between the three types of producer groups (aquaculture, horticulture and dairy) – see below Table 36. Overall, the distribution is as follows: 2% large land size, 12% medium size, 21% smallholder, 45% marginal and 20% landless farmers (see table below). Note that for Safal the criteria for being considered as landless (and thus being eligible for a landless 'job') includes that of owning less than 50 or less than 100 decimal of land. Thus, the definition does not fully match with the criteria in below table.

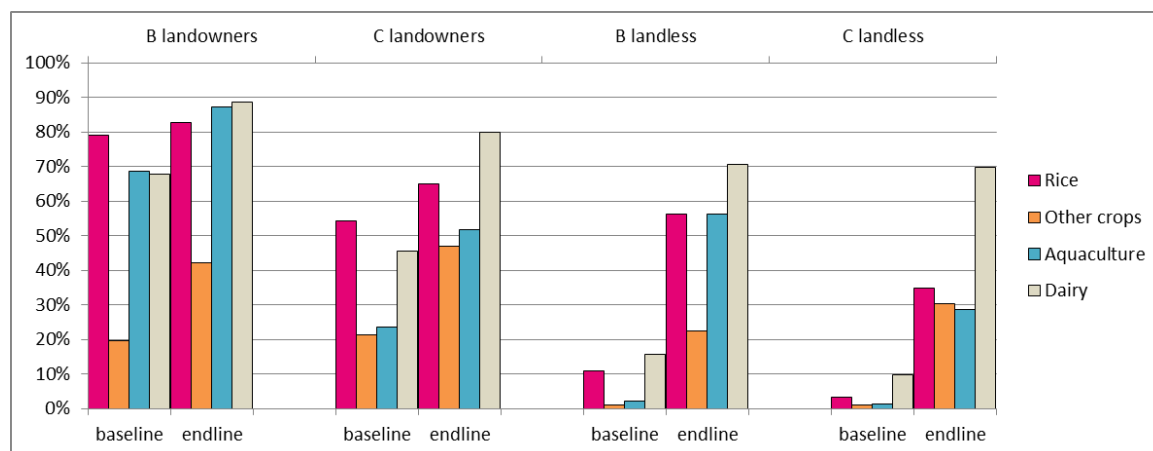
Table 36: Households by Landholding size and type of producer group

| Sub-sector | Landless | | Marginal Farmer | | Small holder | | Medium farmers | | Large farmers | |
|--------------------|----------------|-----------|------------------|-----------|-------------------|-----------|-------------------|-----------|-----------------|----------|
| | (0-49 decimal) | | (50-149 decimal) | | (150-249 decimal) | | (250-749 decimal) | | (> 750 decimal) | |
| | HH. No. | % | HH. No. | % | HH. No. | % | HH. No. | % | HH. No. | % |
| Aquaculture | 3,156 | 11 | 13,401 | 47 | 6,111 | 22 | 4,878 | 17 | 1,147 | 4 |
| Dairy | 5,024 | 29 | 7,277 | 42 | 3,812 | 22 | 1,212 | 7 | | 0 |
| Horticulture | 3,397 | 30 | 5,209 | 46 | 2,152 | 19 | 566 | 5 | - | 0 |
| Grand Total | 11,577 | 20 | 25,887 | 45 | 12,075 | 21 | 6,656 | 12 | 1,147 | 2 |

For landowners, there is a project effect on the increased average size of ponds used per household for fisheries, while the average size of lands used per household has declined but no project effect.

Using the weighed data set, there is a significant (5%) beneficiary post-treatment project effect on average pond size. More detailed insights show that the increase in average pond size per HH is due to the fact that the number of farmers who undertake fisheries has strongly increased during the last 2 years. Both within the B and the C group, about 50% of the households who did not use any ponds (for fisheries) at the baseline have started using ponds for fisheries at the endline, but the average pond size is significantly higher for Safal beneficiaries starting to produce fish. (see Figure 11 and Figure 12)

Figure 11 Percentage of households (270 landowners, 130 landless) using plots to produce rice or other crops, ponds for aquaculture and dairy (products)



On land size, the surveys show a decline for both B and C groups in the average land size per household, by about 25%, and no project effect (Figure 13 and Table 37). The pond size used has increased for the B groups and was stable for the C groups. The impact analysis shows a positive project effect.

Figure 12: Average plot and pond size used per household, landowners (weighed)

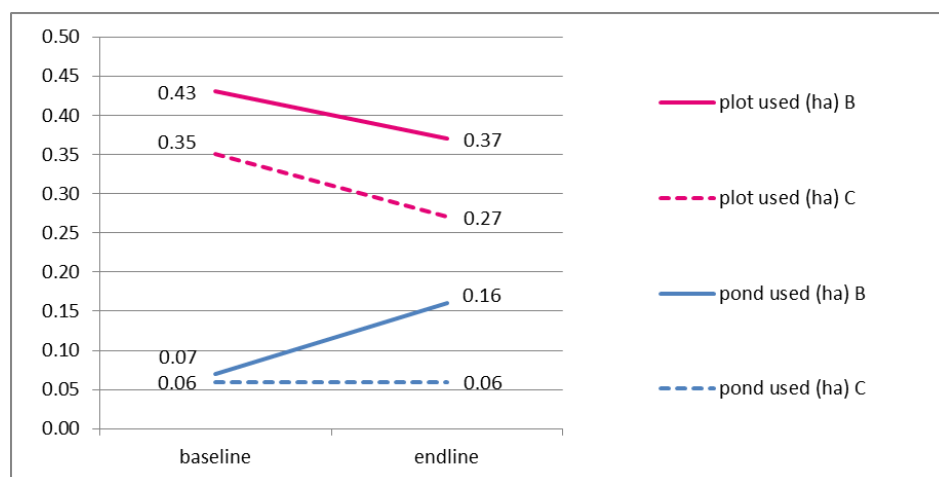


Table 37: Estimation results multivariate regression: plot and pond size used, landowners

| Dependent variable | Plot size used (in ha) | Pond size used (in ha) |
|---|------------------------|------------------------|
| Explanatory variables | coefficient | coefficient |
| beneficiary (1=yes) | 0.08 | 0.01 |
| post treatment (1=yes) | -0.08 | -0.00 |
| beneficiary post treatment (1=yes) | 0.03 | 0.09** |
| constant | 0.35*** | 0.06*** |
| number of observations | 989 | 989 |

For the landless, there is a project effect on the increased average size of land per household, while average pond size has not changed much. The surveys show a significant increase for both B and C groups in the average land size used per household, by more than 100%, and significantly higher for the

B group (+500% when using the weighed data) (Figure 13; Table 38). It should be kept in mind that for the landless land used mainly implies land being leased from landowners. The baseline survey shows that average pond size for the landless is very low (0.0-0.02 ha) and has become higher (up to 0.03 ha) but is still very low. Again, this increase can be mainly attributed to the fact that more landless have gone into fisheries, although with very small ponds. This means that the landless B group has benefitted significantly from the Safal project by more households undertaking crop production, resulting in an increase of the average size of lands used.

Figure 13: Average plot and pond size used per household, landless (weighed)

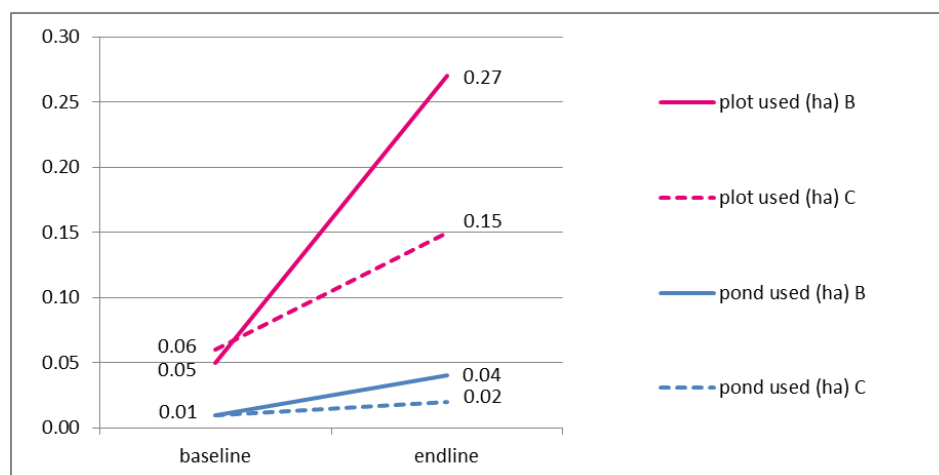


Table 38: Estimation results multivariate regression: plot and pond size used, landless

| Dependent variable | Plot size used (in ha) | Pond size used (in ha) |
|---|------------------------|------------------------|
| Explanatory variables | coefficient | coefficient |
| beneficiary (1=yes) | -0.01 | -0.00 |
| post treatment (1=yes) | 0.09*** | 0.01 |
| beneficiary post treatment (1=yes) | 0.13*** | 0.02 |
| constant | 0.06*** | 0.01 |
| number of observations | 392 | 392 |

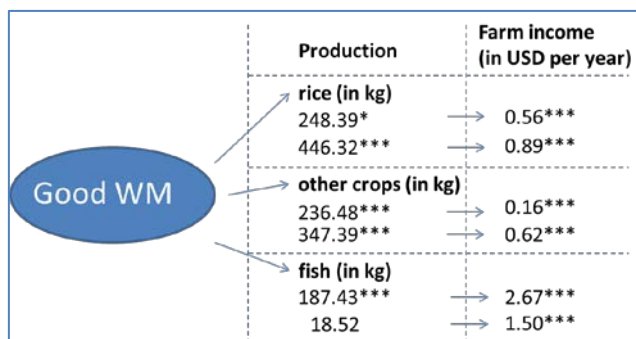
Inputs - access to water and water use

The appreciation of the water management performance has not improved, but this has not been a focus of the project. For the landowners, the proportion of HHs stating that the water management system is good for their agricultural production (both cropping and aquaculture) is higher for the B group than the C group but has not improved (weighed data). The improvement has been more for the C group so there is a significant negative beneficiary post treatment effect. For the landless we observe improvements for the B group (21% to 38%) contrary to the C group (remained 24%), but the effects are not significant. When asked whether the water management system has improved over the last 2 years, we observe more positive responses in the B group, both among the landowners and the landless. However, the improvements in water management has not been able to prevent crop failure and damage due to waterlogging, causing negative perceptions.

There is a significant relationship between the perception of water management and agricultural production, both for landowners and landless, which implies that the farmers understand the importance of water management. There is a significant relationship between the perception of good water management and the production of rice, other crops and fish. For landowners the relations are

significant for water management with rice, other crops and fish. For the landless the relation with fish is not significant, which is probably because the landless do not produce much fish. (Figure 14).

Figure 14: Water management and perceived effects on production and incomes for landowners (row 2) and landless (row 3) (based on IAR Table 61, 62, 87 and 88)



| | Production | Farm income (in USD per year) |
|----------------------------|------------|----------------------------------|
| rice (in kg) | 248.39* | 0.56*** |
| | 446.32*** | 0.89*** |
| other crops (in kg) | 236.48*** | 0.16*** |
| | 347.39*** | 0.62*** |
| fish (in kg) | 187.43*** | 2.67*** |
| | 18.52 | 1.50*** |

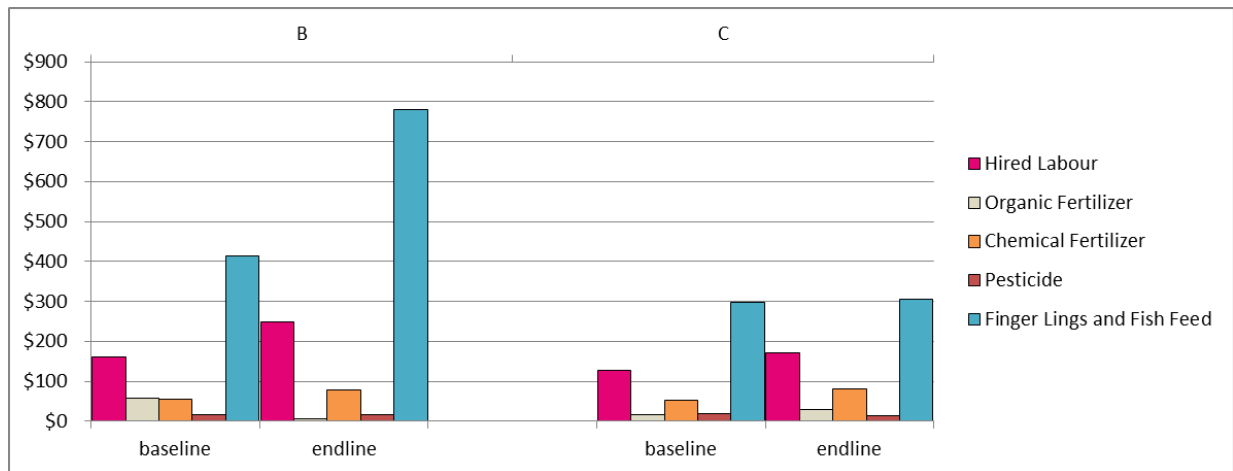
In FGDs it was expressed that producer groups have become more active in water management in order to secure their increased production. If ponds get flooded, producers also rent a pump to evacuate the water (as evidence for the importance attached to it). However, improved water management has not managed to prevent crop failure and crops lost, thus the perceptions have not improved. In the focus group discussion we did not observe different responses between groups of men or women. Overall, it would appear to be relevant for Safal to pay attention to water management in relation to agricultural production.

Input supply – agrochemicals used

For landowners, the use of fingerlings+ fishfeed has significantly increased, while for fertilizer use there is no increase, but for both there are project effects. For the landowners, the number of HHs making costs on the various input categories has increased, for all different input categories: hired labour, seeds, organic and chemical fertilizer, pesticides, irrigation, fingerlings + fishfeed, veterinary products. Treatment effects were analysed for chemical fertilizer and for fingerlings+fishfeed. Only for fingerlings + fishfeed the number of HHs using it has significantly increased, but there is no significant beneficiary post treatment effect because the B group was already using significantly more in the baseline situation (IA: Table 64). The number of HHs using fingerlings + fishfeed as well as the expenditures per HH are still about double as high for the B group (USD 780 per HH with aquaculture production) as compared to the C group.

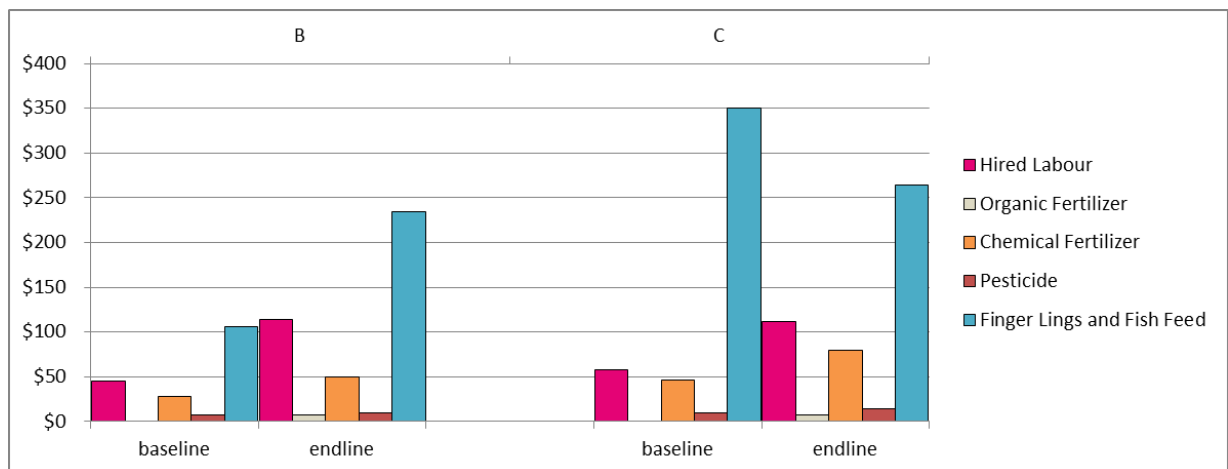
For chemical fertilizer, the differences between the B and the C group are small and there has been a slight increase. Average expenditures of chemical fertilizer is USD 80 per HH, thus around USD 160 per hectare (given the average size of land used). Looking at the expenditures only, the increase between baseline and endline is most pronounced and highly significant for fingerlings + fishfeed and for hired labour. There was a decline in expenditure on organic fertilizer (from USD 59 to USD 6 per HH). On irrigation and pesticides there were no changes (Figure 15; BLR Table 30 and ELR Table 31).

Figure 15: Total annual input costs (in USD) - only households with production, landowners (weighed data)



For the landless, the use of both chemical fertilizer and fingerlings+ fishfeed has significantly increased, with significant effects by the project (IA: Table 90). For the landless, the number of HHs making costs on the various input categories also increased for all different input categories (see above). Beneficiary treatment effects can be observed for the use of chemical fertilizer and for fingerlings+fishfeed. The number of HHs using fingerlings + fishfeed as well as the expenditures per HH are very variable. (Figure 16; BLR: Table 30 and ELR: Table 31).

Figure 16: Total annual input costs (in USD) - only households with production, landless (weighed)



The use of chemical fertilizer has increased. We particularly looked at the use of fertilizers and pesticides because Safal has promoted a more sustainable use. For fertilizers, we observe that the expenditures on chemical fertilizers have increased for all categories of farmers, most so for the beneficiaries. But expenditures have declined on organic fertilizers. However, most farmers will not buy organic fertilizer but rather produce it by themselves. We can see that among the landowner beneficiaries 45 are using organic fertilizers (17% of surveyed HHs), of which only 8 buy it and the others produce it by themselves. Almost all are using chemical fertilizers (87%) and pesticides (73%), always purchased. For the control group of landowners these percentages are 18% (organic fertilizers), 75% (chemical fertilizers) and 61% (pesticides). Thus, we see that the beneficiaries more frequently use chemical fertilizers and pesticides but do not make more frequent use of organic fertilizers.

SaFaL developed 50 vermin compost entrepreneurs and they are running their business successfully, as of April 2016 they are producing 15.4 MT of organic fertilizer. However, this is still very little as compared to the market demand.

On food safety, Safal reported that 30,853 (77%) HHs (aquaculture 21,031 and horticulture 9,822) avoided the use of any harmful pesticides in farming practices.

Safal aims to promote an agro-ecological type of farming. This would imply that a balanced use is made of chemical and organic fertilizer types. This will vary by crop and type of land. Safal has based its practices on recommended rates but has not yet studied this in detail. However, it seems from the surveys that the current trend is leading to a higher dependency on chemical fertilizers. There is probably too limited organic fertilizer available on the market.

The midterm review (2015) noted that producers are not aware of soil quality testing and using fertilizers accordingly; soil testing is now being introduced. The midterm review concludes that over the past years, the use of chemical fertilizers have gone up due to training on the use of chemical fertilizers for (higher) production. Therefore, the respondents who bought one type of chemical fertilizer, now tends to buy multiple types of chemical fertilizer to boost their production. This is also echoed in the qualitative survey with input sellers where they have pointed out that the sales of chemical fertilizers have increased.

Input supply – finances used

In terms of access to finance, there has been a consistent increase in the proportion of HHs with savings (from 21-46% to 70-77%) or with loans (from 62-69% to 83-91%), with no difference between B and C groups. This reflects the increased potentials for investments in agricultural production (as reflected by the increased use of inputs). In Bangladesh there are available products for micro finance, but the issue is the payment term and interest. The existing MFI's payment mechanism starts from the next week of the loan disbursed and the interest is calculated on a yearly basis. This financial package is not conducive for the smallholders since their return from the farm business starts after harvest. Many of the smallholders take a loan from the traders with a condition of selling their products to them. While it may be good that market actors are investing, there are often exploitative conditions. Between landowners and landless there was only a difference in terms of the proportion having savings in the baseline situation (landowners 46%, landless 21%), but at the endline the difference has become much less (77% compared to 70%).

Outputs – adoption of new practices

The FGDs provide evidence that in horticulture and aquaculture, Safal has improved production practices, notably by improving input supply, reducing the use of agro-chemicals (in horticulture), improving the quality of seed supply (seeds, fingerlings), improving production practices (e.g. of feeding fish with improved feeds instead of cow dung to avoid semolina infection), and introducing new production practices (e.g. pheromone trap). Beneficiary producers commonly refer to the use of 'more scientific' methods.

Outputs – agricultural production

Safal reporting provides the following data on the outputs of farmers that have been reached:

- In horticulture, 11,361 farmers have been supported with an annual production volume of 55,459 metric tons of fruits and vegetables. A total of 1205 hectares of land is covered for more eco-efficient farming practices. In the horticulture sub-sector, 84% HHs adopted food safety technologies followed by post harvest management (82%) and farm management technologies (78%). Yield increases are 14-19% depending upon crop. Incomes have increased by 17% at average.
- In dairy, 17,406 farmers have been supported with an annual production volume of 14,482,314 liters of milk. A total of 211 hectares land is covered for more eco-efficient farming practices. Under the dairy subsector, 83% HHs adopted farm management followed by food safety (76%) and post harvest

management (62%). Productivity (per cow) increased by 30%. Incomes have increased by 24% at average.

- In aquaculture, 28,699 farmers have been supported with an annual production volume of 9,501 metric tons of fish. A total of 18,009 hectares land is covered for more eco-efficient farming practices. Under the aquaculture sub-sector, 83% HHs adopted farm management technology, which is followed by food safety (72%) and post harvest management (67%). Yield increases vary from 13% to 40% depending upon fish type. Incomes have increased by 13% at average.

Following are insights and findings from the baseline and endline surveys. In terms of crops, a distinction is made between rice, other crops and fish. We also look at the production of milk.

For landowners, there is a significant positive effect by the project on production of rice and other crops, most significantly so for large landowners, and on fish production per HH, mainly for small landowners. Most HHs now produce both crops and fish, with increases for both B and C groups. In the B area the landowners now have the highest proportion of HHs producing both product groups (80%), much more than in the C area (47%). (ELR: Table 14). In terms of product groups, the increase has been highest for 'other crops than rice', followed by aquaculture, both for B and C groups (Table 39). In terms of production per HH there is a project effect for rice (less decline as compared to the C group) and for other crops (increase), with significant effects for large landowners mainly, and on fish production (increase), with main effects for small landowners. The B group now has highest rice production (2625 kg per HH, as compared to 1969 kg per HH for the C group), and by far highest average aquaculture production (658 kg per HH, as compared to 207 kg for the C group), while for other crops the production levels are more comparable (970 to 1200 kg per HH). (Table 39).

Table 39: Households producing, production per HH, overall total production, for landowners (n=270) (weighed data)

| | Safal beneficiary areas | | Safal control areas | |
|--------------------------------|-------------------------|---------|---------------------|---------|
| | baseline | endline | baseline | endline |
| # hh's producing: | | | | |
| Rice | 228 | 226 | 187 | 179 |
| Other crops | 57 | 112 | 73 | 129 |
| Aquaculture | 196 | 238 | 82 | 142 |
| Milk | 84 | 79 | 60 | 55 |
| Production volume/HH | | | | |
| Rice (kg) | 2,510.9 | 2,625.4 | 1,940.3 | 1,969.2 |
| Other crops (kg) | 1,294.8 | 1,207.6 | 942.4 | 970.1 |
| Aquaculture (kg) | 459.5 | 658.2 | 210.5 | 207.4 |
| Milk (L) | 802 | 738 | 568 | 699 |
| Total production volume | | | | |
| Rice (kg) | 572,475 | 593,340 | 362,830 | 352,487 |
| Other crops (kg) | 73,802 | 135,251 | 68,797 | 125,143 |
| Aquaculture (kg) | 90,058 | 156,652 | 17,257 | 29,451 |
| Milk (L) | 67,368 | 58,302 | 34,080 | 38,445 |

For the landless, there is a significant positive effect by the project on rice and milk production per HH. The production of milk per HH among the landless in the B group has increased by 70%. Landless HHs show increases in production of crops and fisheries for both B and C groups. In the B area the landless

now have the highest proportion of HHs producing both product groups (43%), much more than in the C area (19%). The increase has been high for all product groups (Table 40). However, when compared to the control group, there is a significant beneficiary post treatment effect for rice production only, not for other crops or fish production.

Table 40: Households producing, production per HH, total production, landless (n=130) (weighed data)

| | Safal beneficiary areas | | Safal control areas | |
|--------------------------------|-------------------------|---------|---------------------|---------|
| | baseline | endline | baseline | endline |
| <i># hh's producing:</i> | | | | |
| Rice | 40 | 75 | 20 | 46 |
| Other crops | 4 | 30 | 7 | 40 |
| Aquaculture | 8 | 75 | 8 | 38 |
| Milk | 12 | 24 | 18 | 27 |
| <i>Production volume / HH</i> | | | | |
| Rice (kg) | 1,187.9 | 1,480.8 | 1,550.4 | 1,788.3 |
| Other crops (kg) | 899.5 | 768.3 | 983.1 | 442.1 |
| Aquaculture (kg) | 178.4 | 191.6 | 146.3 | 127.7 |
| Milk (L) | 297 | 503 | 581 | 445 |
| <i>Total production volume</i> | | | | |
| Rice (kg) | 47,517 | 111,060 | 31,007 | 82,262 |
| Other crops (kg) | 3,598 | 23,049 | 6,882 | 17,684 |
| Aquaculture (kg) | 1,427 | 14,370 | 1,170 | 4,853 |
| Milk (L) | 3,564 | 12,072 | 10,458 | 12,015 |

The production of milk per HH among the landless in the B group has increased by 70%, while for the C group there is a decline. As a result, there is a significant beneficiary post treatment effect by the project on milk production per HH for the landless (Table 40). The milk production among the landless in the B group was lower than the C group during the baseline survey, but the situation has by now reversed.

There are differences in project effects for small and large landowners: large land owners seem to benefit most from crop production while small landowners benefit more from fish production. For all product categories taken together, the larger the land or plot size used, the larger the treatment effect. When further analyzing the dynamics of increased production for different producer groups, we find that for rice there are no effects for small farmers (who used at most 0.5 ha of land at the baseline), while for big farmers (who used more than 0.5 hectare of land) there is a significant positive project effect (of increased rice production while the general trend is a decline). For the category of other crops, we find a similar pattern: for small farmers there is an increase in production, but only for the large farmers there is a project effect (of increased production of other crops while the general trend is a decline). For the category of fish, we find a significant increase in fish production for small farmers but not so for large farmers. The significant effect for small farmers is due to many small farmers string to produce fish. While this is also the case for the C group, the significant effect is caused by the fact that beneficiary small farmers have a much higher area of pond used and fish production than control farmers (0.13 ha of pond used with 514 kg produced per HH for the B group, as compared to 0.06 ha used and 82 kg per HH for the C group). (Table 41).

Table 41: Average pond size used, production per HH and yield of small landowners (who used at most 0.5 ha of land at the baseline) starting fisheries last 2 years

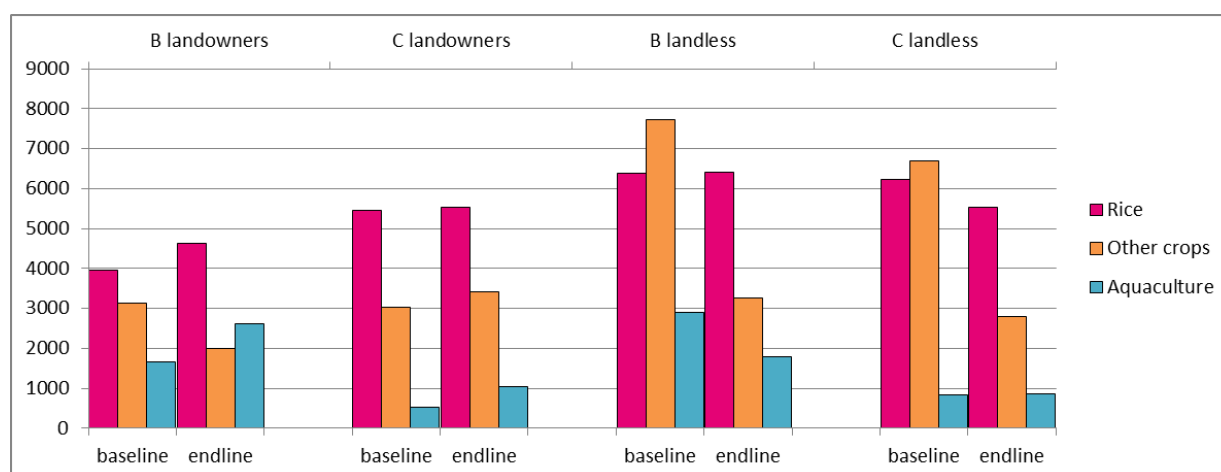
| | Pond size used (ha) | Production per HH (kg) | Yield (kg/ha) |
|--|---------------------|------------------------|---------------|
| Small landowners starting fisheries last 2 years - Safal beneficiary | 0.13 | 514 | 3,954 |
| Small landowners starting fisheries last 2 years control group | 0.06 | 82 | 1,367 |

A combined analysis of beneficiary and post treatment effect with plot size for landowners, shows that when all production categories are taken together, there is a significantly more positive beneficiary treatment effect for higher plot size used or pond size used. This means that the larger the land or plot size used, the larger the treatment effect. (IA: Table 75).

Outputs – yields

There are several changes in yields (kg per hectare) per household over the last two years, but a significant project effect was found only for the sub-category of aquaculture small landowners. The main changes in average yields per household are illustrated in Figure 17. We observe that yields for rice have remained the same in most HH groups, except for an increase of the landowners in the B group. Yields of ‘other crops’ have declined for this group mainly because many more households have started growing other crops. Aquaculture yields were already highest for the B group, and have further increased. This is mainly caused by higher yields for small landowners (who used more than 0.5 hectare of land) in the B group that have started to produce fish, showing three times higher production levels than those in the C group. (see Table 42). This is a significant project effect. Aquaculture yields among the large landowners have not significantly increased, but were already much higher in the B group as compared to the C group. See Figure 17.

Figure 17: Average yield (kg/ha) per household for rice, other crops and aquaculture



In terms of yields, the FGDs commonly refer to improved yields for the different product groups, but the proportion of increase was difficult to grasp. In aquaculture, there is reference to a 20-30% increase of yields, as a result of better inputs of feed and fingerlings mainly. There is also reference to one person who has doubled production. With respect to milk production, there is reference to higher volumes of milk and better milk quality (fat content), leading to a higher sales price.

5.2.3.3 Increased productivity will lead to improved incomes from enhanced sales.

Outcomes – agricultural production sold

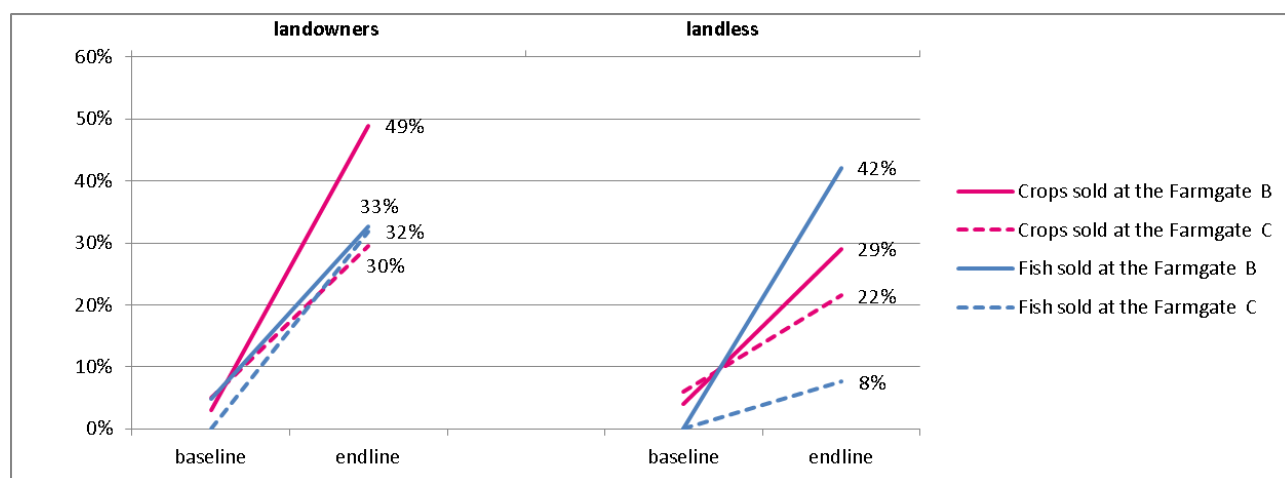
For both landowners and landless, in line with increased production of crops and fish, there is an increase in both the amount of production consumed and sold, with a significant project effect on rice and fish production sold for the landowners, and milk production sold for the landless. Almost all categories of agricultural products show an increase of consumption (except for rice among landowners), but for none of these changes there is a project effect. For all categories of agricultural products the volumes sold have also increased (again except for rice among landowners), with significant beneficiary post treatment effects for the landowners on rice and fish (strong increase). For fish there is a 100% increase in sales of fish by landowners beneficiaries over the last 2 years, compared to a 25% increase for the C group. (IA: Table 67). This effect is most likely associated with the small landowners who have started fishing and gained high yield levels as a result of the project. There are no significant effects on the category of 'other crops'. Among the landless there is a significant project effect on the sales of milk.

In terms of market channels, the survey shows an increase in selling at the farmgate and a decrease in selling at District markets, especially for aquaculture products. Among landowners, we observe that selling at farm gate used to be very low and has substantially increased, both for crops and fish. On the contrary, selling at the District market has become much less. Selling of crops or fish at the village market remains high and is now at an equal level as selling at the farm gate. In the dairy sector, selling by all HH groups has shifted more towards selling at the farmgate, and is now predominantly at the farmgate (95% or more).

The above trend means that the farmers have a good alternative of selling their farm produces at farmgate, which reduces their time to take their product at the market, and also reduces the uncertainty of getting a buyer. In addition, direct sourcing from the farm gate reduces the risk of post-harvest loss. Selling by contracts or cooperatives has been low and has further declined, which is contrary to expectations. (BLR: Table 19, ELR: Table 21).

There are improved perceptions on access to markets among the beneficiaries. The survey shows that among the perceived benefits of Safal beneficiaries we find more positive responses as compared to the control group on all questions related to access to markets, prices, information, negotiation power, access to finance, etc. (ELR, Table 10). It is possible that these improvements have contributed to the shift of a higher proportion of products being sold at the farmgate, which is a positive development. (Figure 18; ELR: Table 21).

Figure 18: Percentage of sale volumes sold at the farmgate (in percentages)



The FGDs with different producer groups (fish, horticulture, milk), both men and women's groups, referred to both improved consumption and sales of increased production, but with differences

according to the product group. Aquaculture products are largely for selling (dominance by men), vegetables and fruits are for home consumption and for selling but market access is variable (both men and women involved). In horticulture, several producers would like to see the marketing of their products further improved, but there is also common reference to difficulties of over-supply and poor local prices (this was expressed mainly by men). Producers expect more training on marketing and had expected more secured prices from Safal. For the landless home consumption of milk has somewhat increased but most milk is for selling (dominated by opinions by women).

Outputs – milk sold

In the dairy sector, there is a project effect on milk production as well as the proportion being sold by the landless in the B group. The production of milk among landless in the B group has increased by 70%, while for the C group there are limited changes. As a result, there is a significant beneficiary post treatment effect by the project on milk production for the landless (IA: Table 91). Since the production among the landless in the B group was lower than the C group during the baseline survey, the situation has by now become almost similar or somewhat better. Especially the proportion of milk being sold by the landless in the B group has significantly increased (from 40% to 60%).

Outcomes – profitability

The FGDs provide some evidence of a positive business case for producers in each of the three targeted sectors. The business case generally shows (i) improved quality of inputs as well as increased costs, (ii) increased productivity (yields), (iii) higher revenues from improved sales, leading to (iv) higher profitability due to a positive balance between increased input costs and sales. The improved sales are strongly associated with improved product quality and improved market access due to the Safal project (see below).

- In fisheries there is a clear positive business case, associated with higher fish prices and improved markets due to interventions by Safal in improving sales; the profit margin appears to have increased from 1.7 to 2.5.
- In horticulture the picture is less clear, due to oversupply and variable market prices, depending on the product. Note also that on 'other crops than rice' there is no significant project effect.
- In dairy for small landowners (the landless) there is a clear business case of increased input costs (especially on high quality feeds and medicines) but revenues have increased much more (due to higher quality of milk), so that profits have almost doubled.

Outcomes – farm and off-farm incomes

For both landowners and landless, there is a positive project effect on farm incomes, of USD 840 for landowners and USD 594 for the landless, which is associated with crop and fishery increases in production and sales. The increase in milk production is mainly for consumption purposes. For non-farm incomes there are no project effects. For landowners farm incomes during the last 2 years have more than doubled, both for B and C groups (weighed data). Farm incomes were about twice higher for the B than for the C group in the baseline situation, which has remained so as both have equally increased. For non-farm incomes we find an opposite situation: non-farm incomes were higher for the C group than the B group, which has remained so.

Farm incomes have increased by USD 1520, with a significant post-treatment effect by the project to increased farm incomes of USD 840. (Figure 19; Table 43). There is a significant contribution to these farm incomes by all product groups (rice, other crops and fish), but the rate of increase is by far highest for fish and lowest for other crops (IA: Table 62). There is no relation between farm income and milk production. All product groups also show a positive relation with the value of food consumption. There is a negative relation between farm income and the value of food consumption. (IA: Table 62).

Figure 19: Development average farm and non-farm income in USD per household, landowners (weighed data set)

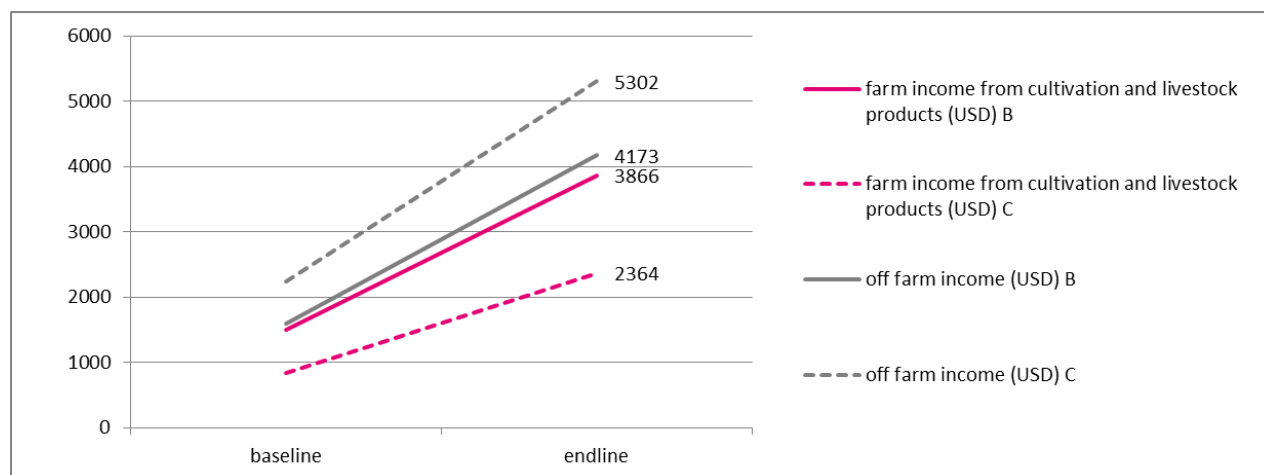


Table 43: Estimation results multivariate regression: farm and non-farm income, landowners (weighed)

| Dependent variable | Farm income (in USD per year) | Non-farm income (in USD per year) |
|---|----------------------------------|--------------------------------------|
| Explanatory variables | coefficient | coefficient |
| beneficiary (1=yes) | 661.84** | -640.77 |
| post treatment (1=yes) | 1520.49*** | 3064.78*** |
| beneficiary post treatment (1=yes) | 840.35** | -488.73 |
| constant | 843.18*** | 2237.69*** |
| number of observations | 987 | 987 |

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

For the landless, the absolute levels of farm incomes are much lower than for landowners, but the rate of increase is much higher (up to a factor 10 increase, both B and C groups). Non-farm incomes have also increased. (Figure 22). As a result, total incomes increased by 1.7 (C group) to 2.0 (B group). Farm incomes for the landless have increased by USD 1298, with a significant beneficiary post treatment project effect by USD 594. (Table 44). Again, most product groups contributed to higher incomes, with the highest rate of increase by fish. Milk shows a negative contribution to farm incomes but a significant positive contribution to the value of food consumption. There is a negative relation between farm income and the value of food consumption (IA: Table 88). This suggests that most improved incomes are obtained from selling (rice, other crops and especially fish) while milk does not contribute to improved incomes (IA: Table 88.)

Figure 20: Development average farm and non-farm income in USD per household, landless (weighed)

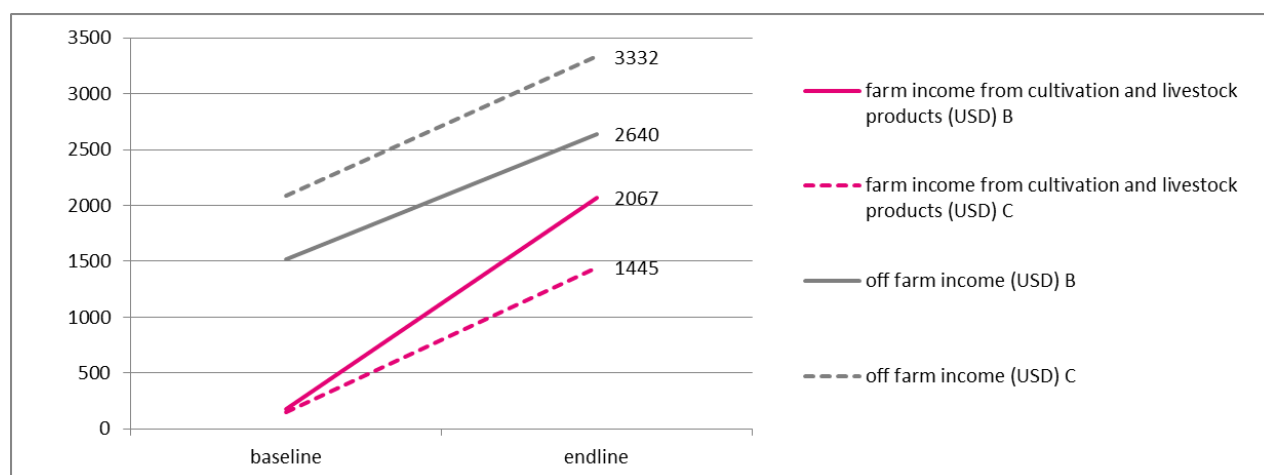


Table 44: Estimation results multivariate regression: farm and non-farm income, landless (weighed)

| Dependent variable | Farm income (in USD per year) | Non-farm income (in USD per year) |
|---|----------------------------------|--------------------------------------|
| Explanatory variables | coefficient | coefficient |
| beneficiary (1=yes) | 27.66 | -569.86 |
| post treatment (1=yes) | 1297.79*** | 1247.89** |
| beneficiary post treatment (1=yes) | 594.56** | -121.43 |
| constant | 147.17 | 2083.64*** |
| number of observations | 390 | 390 |

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

Outcomes – wealth index

For both landowners and landless, the wealth index shows a significant improvement for both the B and C groups, but no significant post-treatment effects by the project. (IA: Tables 72, 94)

5.2.3.4 Effectiveness on the involvement of the landless

Safal created employment for 1307 landless (1077 men and 230 women) as supply chain actors, in 17 types of enterprises in three subsectors. In addition, at least 4000 landless have benefitted from increased crop and fish production with a project effect of USD 594.

The landless constitute 10-15% of the population in Safal areas. The landless commonly lease land or operate as sharecroppers. The Safal project has taken some efforts to involve and improve incomes for the landless through activities that do not depend upon land ownership. Thus, Safal created employment for 1307 landless (1077 men and 230 women) as supply chain actors, in 17 types of enterprises in three subsectors. Landless were supported through entrepreneurship and skill development trainings such as use of technologies, enterprise management, facilitation of skill and business plan development. These examples show that for the landless there are income opportunities that do not depend on land ownership or lease of land.

Through FGDs and interviews information was acquired on income opportunities for the landless. One example is making vermi compost, which is a good income opportunity for the landless as no land is

required to produce it. The activity started recently and appears promising. Other landless benefit by having a rickshaw van, for selling seeds, collecting fish, or for transporting milk. One cart owner who sells seeds and markets vegetables now earns 5-7,000 BDT per month (USD 75, or USD 900 per year); he stated that just selling seeds is not a profitable business. There are 60 landless having similar jobs as this person. The one operating the milk van makes a profit of about 400 BDT per day (USD 0.50).

However, the survey also shows that the category of landless has been able to generate significant income increases as a result of land used for crop production or ponds for fish production, resulting in increased crop and fish production. This can be land or ponds owned or leased. Especially small farmers have benefitted strongly from support in the fish sector, as can be observed from much higher yields as compared to small aquaculture producers in the control group. As stated above, there is a significant project effect on incomes for the landless as a result of increased production of rice and fish mainly. Apparently, using more land or ponds is possible through leasehold arrangements.

The average increased farm income for the landless is USD 1298 per year, with a project effect of USD 594, which compares well with the incomes of a rickshaw van operator of almost USD 1,000 per year. This suggests that the landless can also benefit through regular agricultural support programmes than from non-farm supply chain services, provided that they have the capacity to use land or ponds (e.g. through leaseholds). On the other hand, average non-farm incomes have increased during the last 2 years with USD 1248 (with no project effects).

The number of landless who have benefitted in this way can be estimated at about 3700 households (58,000 farmers reached, of which 11% are landless, of which during the end-line situation 58% use fish ponds = 3700). When expanding the benefits for landless to other crops, there will be much overlap with fisheries but also some additional households, reaching at least an estimated 4,000 households.

5.2.3.5 Effects on nutrition, food diversity and food security, as well as women empowerment

Safal has also undertaken training and awareness raising on nutrition and food safety, partly together with the FAO project on food safety.

According to Safal reporting, the following are the main results in terms of food safety and nutrition.

- On food safety, the monitoring data shows that 30,853 FHHs (aquaculture 21,031 and horticulture 9,822) avoided the use of any harmful pesticide or chemical in farming practices. In the dairy sector, 14,698 FHHs practiced hygienic milking as well as feeding of clean and safe water.
- On nutrition, Safal reports that 287,330 people were reached to improve their food and nutrition behaviour. A total of 275,837 people are consuming at least 4 food groups as a result of the project interventions. More than 80% of households have a highly acceptable diversified food consumption score, while 20% of HHs consumed all (7 items) food groups within the 24 hours recall period and 90% HHs consumed at least four food items (food groups) out of 7 food groups.
- Safal reports a baseline measurement of 34% stunting, 14% wasting and 29% underweight (average status of Khulna division as per BDHS-2011). Findings from the Nutrition Study conducted in mid of 2015 are 24% stunting, 25% wasting and 28% underweight among under-5 children in Safal working areas. It is uncertain whether the baseline and 2015 data can be properly compared. Safal also provides some initial data on nutrition surveys, being as follows:
 - Consumption of postpartum, Vitamin-A capsule: 21% in programme area, 14% in control area;
 - Minimum meal frequency for children of 6-23 months: 95% in programme area, 94% in control area;
 - Consumption of Iron rich/fortified food: 79% in programme area, 74% in control area;
 - Indication of childhood illness: 36% in programme area, 44% in control area;
 - Incidence of childhood illness: 10% in programme area, 13% in control area.

Outcomes - women empowerment

There are no indications of project effects on women having acquired more rights and influence in decision-making. The Safal activities on agricultural practices and nutrition have not specifically targeted more women. FGD results do not show greater women's satisfaction with the results. On management of savings and loans there are consistent trends, but we do not find significant project effects. On the management of savings and management of loans, the category of men only has generally declined while the category of both only has increased. (Figure 21; ELR: Table 28).

For both the landowners and the landless, management of outputs from agriculture, fisheries and homestead products is mainly a men's job, especially on agriculture and fisheries (90-98% decision-making by men, in both baseline and endline), and slightly less so on homestead products (around 70%). Management by both men and women is highest for homestead products (up to 40%) and has increased. There are hardly any changes between baseline and endline surveys. (BLS ELS table 11, 13). There is one important exception, being the landowners in the B group, showing the highest and also increased predominance by men in aquaculture (94%).

Figure 21: Decision-making by men and women on savings and loans



Outcomes – diet diversity, food security and nutrition scores

The project has had a positive effect on all food security and food diversity indicators for the landless, but less so for the landowners. For the landowners, there are project effects on the months of adequate food access, by 0.59 months, thus reaching up to almost the full 12 months (11.68 months). However, there are only minor changes and no project effects on the HFIAS or HDDS indices (Table 45).

For the landless, the number of months with adequate household food access shows a positive project effect, of 1.47 months, of which 1.28 months is the project effect, thus reaching up to 10.93 months. The HFIAS index shows a strong improvement for both the B group and the C group, and also with a positive project effect of 2.26 points. Lastly, on the HDDS there has been an improvement and significant effect of the project by 0.64 points. (Table 46)

Table 45: Project effects on food security indicators, Safal landowners, beneficiary n=249 (weighed data)

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

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

Table 46: Project effects on food security indicators, Safal landless, beneficiary n=95 (weighed data)

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

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

The project had a less negative effect on the overall nutritional adequacy of landowner families as well as some nutrients, as compared to the control group, although for some nutrients there was a positive effect. For the landless, there was also a negative trend in nutrient adequacy, but not any project effect.

For the landowners, the household diet diversity score (HDDS) is strongly related to rice production, milk production and off-farm employment, and also to fish (but less so). (IA: Table 63). For the landowners, the overall nutritional adequacy declined for both the B and C group. However, for all the nutrients a positive project effect was found (Figure 22). The nutritional adequacy of energy, calcium, vitamin A, B1, B2, B6, B9, B12 and C declined for the B group, but the decline was significantly less than for the C group. For other nutrients there was even a positive trend and project effect: carbohydrates, protein, iron, magnesium, zinc and B3 Niacin (Figure 22). The positive project effect is probably related to the better production of rice (no decline) and fish (more increase) for the B group as compared to the C group. However, apparently, the improved crop and fish production in the B group did not lead to additional diversity of agricultural products and consumption of these products.

Figure 22: Overall nutrient adequacy and nutrient adequacy for nutrients whose adequacy has increased (in the B group), category of landowners (weighed data)

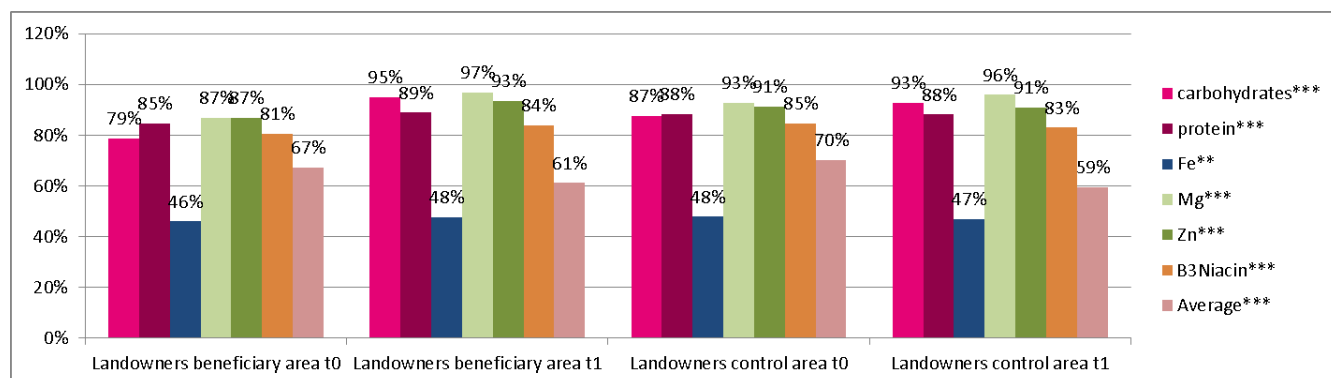


Table 47: Estimation results multivariate regression: nutrient adequacy positive project effects, landowners (weighed)

| Dependent variable | Carbohydrates | Protein | Fe | Mg | Zn | B3Niacin |
|---|----------------|----------------|---------------|----------------|----------------|----------------|
| Explanatory variables | coefficient | coefficient | coefficient | coefficient | coefficient | coefficient |
| beneficiary (1=yes) | -0.09*** | -0.03* | -0.02 | -0.06*** | -0.05*** | -0.04** |
| post treatment (1=yes) | 0.07*** | -0.02 | -0.02 | 0.05*** | -0.02 | -0.03 |
| beneficiary post treatment (1=yes) | 0.12*** | 0.07*** | 0.05** | 0.07*** | 0.09*** | 0.08*** |
| constant | 0.86*** | 0.88*** | 0.47*** | 0.92*** | 0.92*** | 0.84*** |
| number of observations | 989 | 989 | 989 | 989 | 989 | 989 |

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

Table 48: Estimation results multivariate regression: nutrient adequacy decline post treatment (weighed)

| Dependent variable | Energy | Ca | A | B1 | B2 | B6 | B9 | B12 | C |
|---|----------------|----------------|---------------|----------------|---------------|---------------|---------------|--------------|----------------|
| Explanatory variables | | | | | | | | | |
| beneficiary (1=yes) | -0.04** | -0.04 | -0.05* | -0.05** | -0.02 | -0.05** | -0.04** | 0.00 | -0.08*** |
| post treatment (1=yes) | -0.16*** | -0.20*** | -0.29*** | -0.20*** | -0.29*** | -0.16*** | -0.20*** | -0.35*** | -0.11*** |
| beneficiary post treatment (1=yes) | 0.08*** | 0.11*** | 0.09** | 0.08*** | 0.07** | 0.08** | 0.05** | 0.07* | 0.08*** |
| constant | 0.95*** | 0.44*** | 0.65*** | 0.60*** | 0.67*** | 0.51*** | 0.42*** | 0.68*** | 0.88*** |
| number of observations | 989 | 989 | 989 | 989 | 989 | 989 | 989 | 989 | 989 |

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

For the landless, there is also an overall decline of nutrient adequacy, but not any project effect. For the landless, diet diversity is strongly related to milk production only, which apparently is a new product for many landless explaining the significant increase in HDDS (Table 49).⁸ However, for the landless there is no project effect on the nutrient adequacy for any of the nutrients including calcium. This seems to be in

⁸ The amount of households consuming milk (last 7 days) increased more for the B group (17 HH baseline; 43 HH endline) than for the C group (32 HH baseline; 25 HH endline). Module L. Consumption last 7 days.

contradiction with the fact that landless households have benefitted from the project by producing more milk. However, this has been used mainly for sales of milk and less so for milk consumption (Table 49).

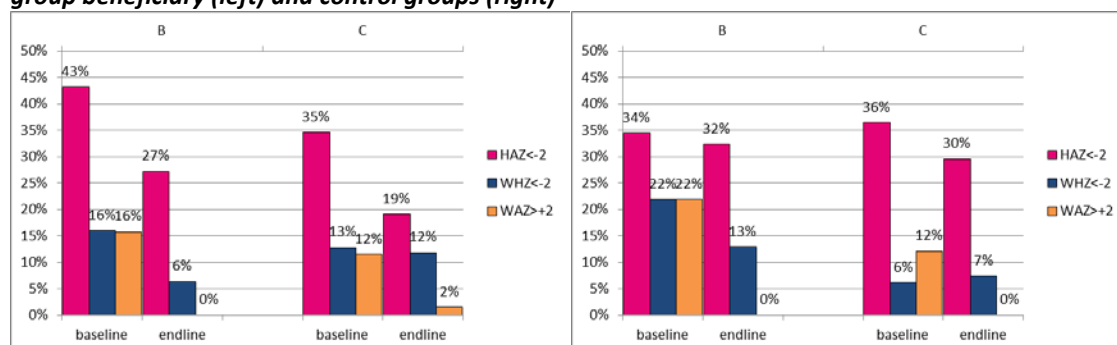
Table 49: Estimation results multivariate regression: production, consumed and sold production, HDDS and Calcium adequacy, for the landless

| Dependent variable | Production of milk (in litres) | Consumption of milk (in litres) | Milk sold (in litres) | HDDS | Calcium adequacy |
|---|--------------------------------|---------------------------------|-----------------------|--------------|------------------|
| Explanatory variables | coefficient | coefficient | coefficient | coefficient | coefficient |
| beneficiary (1=yes) | 15.40 | 33.06** | -17.25 | -0.17 | 0.05 |
| post treatment (1=yes) | 24.94 | 10.38 | 15.83 | -0.01 | -0.03 |
| beneficiary post treatment (1=yes) | 100.15* | 0.55 | 98.19** | 0.64* | -0.06 |
| constant | 59.76** | 30.36** | 27.06 | 7.35*** | 0.29*** |
| number of observations | 392 | 392 | 392 | 392 | 392 |

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

On health, we observe a strong decline in stunting, in wasting as well as in overweight, for both B and C groups, but no project effects. The proportion of stunting among the landowners at the endline situation is higher in the B group (27%) than in the C group (19%). On wasting we find an inverse pattern: 6% in the B group and 12% in the C group. Among the landless we find a mixed view in terms of the comparison between B and C groups, while all trends show considerable improvements. (ELR: Table 44; Figure 9).

Figure 23: Percentage of under five children with stunting (low height for age), wasting (low weight for height), overweight (high weight for age). Landowners (left) and landless (right), and within each group beneficiary (left) and control groups (right)



In terms of nutrition, in the FGDs there is common and convincing reference to training on nutrition and improvement of nutrition practices such as less cooking of vegetables, more food diversity and better feeding of children, improved food choice and less cases of malnutrition or illnesses. From the FGDs the picture emerges of improved nutrition due to the combination of higher food production, crop diversity and better awareness.

It can be concluded that the changes in food security indices as well as health indices are convincing for the landless. This could also be explained by the fact that for the landless there was much scope for improvement. It is difficult to understand that there are no improvements in nutritional adequacy. For the landowners, there are less improvements in food security indices but more so for nutritional adequacy and health indices. It should be kept in mind that access to water and sanitation has also improved in the project and control areas, which also has important positive effects on health.

5.2.3.6 Effects on supply chain actors and sector transformation towards more inclusive and sustainable markets

Supply chain dynamics

On supply chain and marketing effects, relevant results reported by SaFaL are the following:

- Currently 16 private sector companies are engaged with SaFaL supported supply chains and have made investments (in cash and/or in kind). It is stated that a viable business model is now in place for private sector investment in the supply chain and direct sourcing of farm produces from PGs.
- In total 22,449 farm households (39%) are linked with national and international market chains.
- In total 50,570 farm households (88%) are linked with public and private sectors for their required services for improving farm productivity. In total 15,342 farmers (27%) received micro finance supports from different MFIs.
- SaFaL has entered into formal collaboration with a number of public authorities such as DoF, DLS, DAE, Ministry of Agriculture and Ministry of Commerce to develop efficient farmers support mechanisms and responsible sourcing to link the farmers with national and international markets.
- In total 17 collection centers were established (4 in aquaculture, 8 in horticulture and 5 in dairy). Almost 40% of HHs sold their produces through SaFaL supported supply chains, with the highest proportion in horticulture (53%), followed by aquaculture (38%) and dairy (32%). Post harvest losses were reduced by about 40% over the baseline.
- In addition, a number of service centers was established. In total 51% of farmers received services (76% for aquaculture, 84% for dairy and 57% for horticulture) and purchased quality inputs with 10%-20% reduced price.
- SaFaL has also facilitated coordination meetings with Union Business Associations – a forum at the union level to assist smallholder producers, entrepreneurs, dealers and others supply chain actors for obtaining quality inputs and accessing markets. The UBAs are expected to link farmers with backward supports for reducing production cost and with forward markets for maximising profit margin.

A series of focus group discussions and interviews have been held with producers and different supply chain actors, from which the following information emerges.

Input and collection centers

Input and collection centers have been quite effective, but issues of remoteness may play an important role whether these centers will be sufficiently profitable. In all three sectors SaFaL has supported the establishment of input centers and collection centers, with financial and material means. Producers confirmed that this has improved accessibility to and reduced costs of inputs. For horticulture the presence of a collection center resulted in improved market access but did not result in an improved selling price. For aquaculture a more secured price has been established in one case as a result of an established relation with a buying company.

One horticulture input center stated that they make a profit in spite of the fact that they sell for a price that is lower than the wholesaler - the volumes are important. The aquaculture collection center also makes a profit, although they charge 2-3% for different commissions – apparently there are more benefits.

For milk producers, although the collection center is appreciated by milk producers, not all are making use of it. Aspects of remoteness and distance to the (nearest) selling point or collection center play a dominant role, as transporting milk should be done daily but takes time. The willingness of the company to invest in the supply chain and make the market more accessible for small scale producers varies by the importance given to social welfare issues (BRAC, Milk Vita, and others).

The location of the input or collection center appears to be important for different reasons. At remote places small producers benefit most as they cannot afford to pay transport costs to nearest markets.

However, at remote places the business is more difficult for the center as wholesalers are not willing to come to remote locations or transport costs are high. One input center in a remote area has difficulties. It would be a pity if it would need to close down.

Marketing and sales channels

There is evidence of more efficient marketing channels for producers. Service providers make use of an entrepreneurial approach. In all three sectors, it appears that some producers still make use of other sales channels than the established collection center and may claim that they can sell for a better price to a wholesaler. Currently some milk producers still maintain contacts with sweet shop, milk collector and collection center (spreading risks). It may take time for people to learn that the collection center may not always offer the highest price, but does offer a consistent market access minimizing product loss / waste.

The surveys showed that for marketing producers make much more use of farmgate marketing as the main marketing channel. This means that the farmers have a good alternative of selling their farm produces at farmgate, for instance to a trusted collection center or other buyer, which reduces their time to take their product at the market which also implies more uncertainty of the buyer. In addition, direct sourcing from the farm gate reduces the risk of post-harvest loss. More farmgate selling could also be associated with more collective selling, as buyers may travel through the village to buy from farm gate to farm gate. Selling by contracts or cooperatives has been low and has further declined.

The FGDs generated evidence of an entrepreneurial approach (i.e. one should pay for services being provided, and service provisions should be based on a business plan). For instance the veterinary services provided to dairy producers at a reasonable cost. People feel proud to be able to run their own business and there is evidence of the fact that they invest in further business development.

Supply chain actors

Safal has made major progress in terms of engaging supply chain actors, but more time is required to assure access markets for small-scale producers. One seafood producer was visited: MU Seafood is involved as a buyer for Safal producers and collection center. For this company, 95% of products come through middlemen, only 3-4% from the Safal collection center. For the company, the Safal shrimps are of good quality and supply is reliable. It took 3 years to build up trust and develop the model. For them, having a fixed price for 2 days is a loss, because normally they would reduce the price as soon as there is a high supply. Therefore, the first production year (2014) MU Seafood made a loss. The next year they made a slight profit. In 2015 they expect to make a good profit. They need another two years with a profit to fully trust the new model. Then they are willing to invest in further expanding the model, by investing in more collection centers by themselves and building capacity of the middlemen as new entrepreneurs. However, they only trust this new model for this region, not for other regions.

The above example shows the efforts required and time needed to work with frontrunners. Also, a fixed price for 2 days means a loss for the company so many other benefits will need to be included to compensate this. Other seafood companies interviewed do not believe in the M4P model and claim that the role of middlemen in the fisheries sector cannot be replaced.

In horticulture, there are major seasonal price variations and increasing oversupply of domestic markets. Some producers expected Safal to be able to secure a high price, which did not happen. Producers complain about local oversupply leading to low prices; for some crops prices have more than halved. There are wholesalers from distant cities who buy from the collection centers. Yet, producers have high expectations for contracts with wholesalers and new export markets. There may be need for better communication about market dynamics, prices and buyers. There may also be need for more efforts to establish contracts between wholesalers and collection centers with price agreements. However, as one wholesaler in horticulture expressed, one major condition seems to be that the supply volume and quality will be secured, which is not yet the case.

Agora is buying fruits from Safal producers since 2015. In collaboration with Safal they have introduced a high quality mango (export quality and pesticide free) that is sold next to the conventional mango for double the price. However, Agora states that the quantities are still small and the markets volatile. They say Safal is different from other NGOs because it also undertakes activities on marketing, but they would expect Safal to spend more efforts in developing markets and consumer demand for sustainable products, e.g. products that are pesticide-free. Demand is still too limited. It is certain that establishing robust relations with wholesalers will take time. There is still much reluctance among wholesalers, the development of M4P is still in its early stages. There are risks of establishing contracts if production volume and quality by producers cannot be assured.

Sector transformation?

There are indications of copying, replication and upscaling of results taking place; these could receive more attention within the framework of sector transformation. The question is to what extent the improved practices by Safal are being copied or scaled for wider adoption in the agricultural sector. Indications for other supply chain actors copying practices of the Safal project could mean a trend towards sector transformation.

Safal does not monitor whether such trends take place (although copying is part of their results chain). Orally, Safal stated that they are receiving requests from other companies to join the project. Examples given are Odyssey Sensor for market outreach with low salinity test kit, Grameen Intel with low cost soil testing tool kit, M.K Hatchery joined this year, Innovation Ltd engaged in fish seed supply recently showed interest to join.

During the FGDs we asked for copying, crowding in or upscaling effects. We found evidence of widespread copying of improved practices by producers that lead to higher productivity, in all three sectors. There is no reference to other practices such as business planning and keeping good records. Many copying effects also take place of commodity-based practices within one household, which is obvious because aquaculture and horticulture are often integrated within one farming system. It also seems that PGs on these commodity groups are closely linked (often within one community). There are also cases of the copying of the principle of input and collection centers, but not in remote areas as here the business case is too weak.

We did not come across examples of other companies wanting to join the Safal project or requesting for collaboration.

There are several examples of collaboration with local Government agencies (e.g. on fisheries) and government agencies joining Safal initiatives as they see common interest with the work of Safal. This is a positive indication of the potential for scaling to take place.

Improved access to markets and selling is more important than better prices. There is no evidence of better prices. However, there is evidence of better relations with supply chain actors. The effects are supported by the survey showing significant project effects on the level of production being sold by the B group. Export markets (e.g. for fish) are important as domestic markets may have over supply. It is noteworthy that we do not find any project effects for the category of 'other crops'.

6. Synthesis of findings

6.1 Analysis of impact pathways

In this section conclusions are drawn with respect to the three priority impact pathways that were identified, emerging from the different findings.

6.1.1 Value chain development leading to food security

Six projects contributed to the impact pathway of value chain development: Safal, Blue Gold, PROOFS, CDSP IV, Food safety, rice fortification. The following scheme (see Table 50) shows the main elements of the impact pathway, as developed from the different project theories of change and expert knowledge. This scheme is used to assess progress and contributions by the mentioned projects to this impact pathway.

Table 50: Value chain and food security pathway

| Pathway | Main outputs | Outcomes | Impacts |
|-------------|---|---|--|
| | <ul style="list-style-type: none"> • Access to knowledge on good agricultural practices • Access to inputs & finance • Access to markets • Capacity building of value chain actors | <ul style="list-style-type: none"> • Improved yields • Improved sales • More sustainable production • Improved service delivery by value chain actors | <ul style="list-style-type: none"> • Improved profitability of agric. products • Improved (farm) incomes • Improved revenues for value chain actors |
| Assumptions | <ul style="list-style-type: none"> • Access to profitable markets • Profitable business case for producers • Producers are organized, to service members, purchase inputs and do marketing • Value chain actors are engaged to purchase from smallholders • Markets and value change actors are open to 'markets for the poor' | | |

We break down this impact pathway in two segments.

1. From service provision to increased yields and production per household

There has been widespread promotion of good agricultural practices and evidence of adoption within the respective projects, especially practices to enhance yields and production per household. The surveys of BGP and Safal show that yield and production increases commonly occur throughout the respective project regions. However, the dynamics are complex because there has also been an increase in the number of farmers growing crops and aquaculture and the total land area or pond size being used. In both projects aquaculture has increased most significantly.

The BGP has significantly contributed to the adoption of improved agricultural practices and introduction of new crops, leading to improvements in agriculture and aquaculture production. Beneficiaries include farmers with small plot or pond sizes and benefits for women. Without exception, beneficiaries greatly appreciate the BGP support activities on farmer field schools (FFS) and marketing field schools (MFS), resulting in improved production and yields. However, the impact analysis does not show significant effects because there are similar trends in the control polders. The number of aquaculture producers has doubled; yields and total production also doubled. However, average production per household has slightly declined (10%) because of the larger number of new and small producers. The cash crops introduced by BGP (sesame and mung beans) show plausible evidence of rapid uptake but unfortunately the sesame crop failed during two years due to climate events. Crop damage could have been less if large infrastructure works had been timely finalized by the BGP. This is

an implementation failure of the project. This is also a limitation of the evaluation that has come too early to capture the achievements in the remaining project period.

For the Safal project analyses were carried out of project benefits for specific target groups, showing proven project effects for the following groups:

- Safal small pond owners newly starting aquaculture, on aquaculture yield (+200%) and production (+500%), benefitting from increased access to ponds, improved market demand as well as improved services and input supply by the project (large pond owners already had high yields and production)
- Safal landless rice production per household (+25%) newly starting or expanding land used for agriculture (explanation as above)
- Safal large land owners on production of rice and other crops (showing a slight 10% increase as compared to decline in the control group), possibly because of better management of flooding and water logging
- Safal landless on milk production per household (+70%), as a result of focused activities by Safal on cow productivity, health and feeding.

Also, in both regions we find qualitative evidence of copying effects of good practices between farmers, within communities and towards neighbouring communities, which can be regarded as evidence of these practices leading to benefits for farmers.

Both PROOFS and CDSP IV show plausible increases in yields and production for their targeted smallholder producers. These projects seem to have targeted producers in more remote areas than BGP and Safal. The improved yields are mainly related to improved access to inputs and improved knowledge (training). For the Safal project it was concluded that remoteness plays a role in accessibility to inputs as a result of higher prices at more remote locations. Collective buying of inputs and local service centers have been very helpful. PROOFS mentions as main underlying causes for higher yields: better quality inputs (42%); improved technical knowledge (38%); support from Farmer Business Advisors (32%). Access to financial services is also important.

There are some doubts about environmental and social sustainability. Although most projects introduce organic fertilizers (vermin compost), sex pheromone traps and provide training on food safety, there is no monitoring and no evidence whether soil and pest management has become more sustainable. There seems to be limited attention for social sustainability issues such as labour conditions, wages of workers or labour productivity.

There are indications that positive project effects of providing access to knowledge, inputs and finance to producers in order to increase yields and production per household depends upon specific factors, including: size of the household, whether producers start a new practice (being unexperienced), accessibility and remoteness. In addition, household characteristics such as gender issues might also play an important role, but the survey data did not allow to draw conclusions on this factor.

2. From improved production to increased sales and incomes

For the BGP and Safal projects the impact analysis shows the project effects on the proportion of production that was sold or consumed and on incomes. For BGP the survey shows that increased production has led to increased consumption (by 20%) but reduced sales (by 10%). This finding is supported by FGDs, illustrating the difficulty of sales. Also, it should be kept in mind that the production of cash crops was not always successful (see above). While household incomes have increased (by a factor 3-4), there has been no significant project effect on incomes when compared to control areas. Without exception, beneficiaries indicate that the BGP support activities in agriculture have helped them to improve their incomes.

For Safal project the surveys show improved sales, mainly for fish (both landowners and landless), rice and milk (landless mainly). The survey shows that the improved sales are most significant for aquaculture landowners, showing a 100% increase of sales. The effects are most significant for small

pond owners (who have started to produce fish). In terms of incomes, within both the beneficiary and control groups, for the landowners as well as the landless, there is a strong increase in incomes over the last 2 years, both in terms of farm- and off-farm incomes (increase by a factor 2 to 4, most so for the landless).

There is a positive project effect on farm incomes for both landowners and landless. For landowners, farm incomes have increased by USD 1520, of which USD 840 can be attributed to the project. For landless, Safal created employment for 1307 landless (80% men) as value chain actors (selling inputs, transport) in 17 types of enterprises in three subsectors, with additional incomes due to the project estimated at USD 1,000 per year. In addition, at least 4000 landless have benefitted from increased crop and fish production, with farm incomes increased by USD 1298, of which USD 594 can be attributed to the project. For both the landowners and the landless, fish production and sales has highest contribution to this project effect. More specifically, for landowners, the project effect on incomes is greatest for small landowners who have started to produce fish (large land owners were already selling fish). In addition, beneficiary large landowners have been able to continue selling much rice (contrary to the control group). Of these beneficiaries about 80% are men. For the landless, the strong increase in farm income has led to a reduced dependency on off-farm incomes. For them the additional incomes from the commodities is an important supplement, but non-farm incomes remains more important.

Among the project beneficiaries, there is a bias for producers who were already organized; both Safal and PROOFS have worked with pre-existing groups (at the baseline Safal beneficiaries differ from the control group by being more organized and receiving more extension services or project support). There are also indications that in the Safal project there is a bias for producers in the proximity of access roads (i.e. better access to markets). This selection bias can be justified in view of demonstrating the 'proof of concept' of a new approach, but if so it must be transparent and taken into account when scaling is aimed for.

The improved incomes can be explained by a positive business case (profitability) for producers in the three targeted sectors. The business case generally shows (i) improved quality of inputs as well as increased costs (due to higher volumes being used), (ii) increased productivity (yields), (iii) higher revenues from improved sales, leading to (iv) higher profitability due to a positive balance between increased input costs and sales. Both for the landowners and the landless, more use is made of selling from the farmgate, which according to Safal is a positive development, because it implies that producers can negotiate with buyers and influence price.

There is evidence that the improved sales can be associated with improved access to shrimp markets as a result of the Safal project, especially through established linkages with national value chain actors (traders, processors) that aim for export markets. In two cases there are linkages to Dutch buyers (shrimps and horticulture). Safal also has strategies to deal with middlemen which can be powerful and dominate markets and prices. Safal also assures that for service providers there is a good business case. Lastly, Safal involves local government agencies and labour unions into their work. These are all ingredients of a value chain approach that has been important to stimulate production and sales. This approach seems to be unique in Bangladesh.

The PROOFS project also establishes linkages between producers and markets and there are plausible data on improved sales and incomes. However, it is uncertain whether the service providers have a profitable business. The CDSP project beneficiaries mainly produce for the domestic market, with plausible improved sales and incomes. Also in this case it is not clear whether service providers have a good business.

It appears from this evaluation that much time and efforts are required for value chain actors to be convinced of the benefits of 'markets for the poor (M4P)' strategies (evidence of Safal with shrimp processing companies, evidence of Rice Fortification project with garment factories, and other). Public sector agencies are generally welcome to join, but there is no proactive strategy to engage them. On all

above issues Safal is most advanced, but there is need to consolidate the findings and develop clear strategies. The Food Safety project addresses some of these value chain actors in selected value chains, but there is no evidence of significant uptake.

Beneficiaries

It is plausible that in total an estimated 300,000 households have benefitted from the selected projects in terms of the adoption of improved practices and improved agricultural production, but no proven project effects as the increases are not higher than in control areas (see *Table 51*). Looking at the complete impact pathway, including production, sales and incomes, for an estimated 150,000 HHs there is a plausible project effect, including both landowners and landless. For about 47,000 HHs there is a proven project effect including 4,000 landless households. There are also proven effects for 1,300 landless as value chain actors (not as producers, so this is another impact pathway). In terms of gender aspects, in aquaculture men strongly dominate the sales and the revenues. In rice and other crops men also dominate, while in milk women play an important role. There is no evidence that the project has influenced this.

Table 51: Proven and plausible project effects on value chain and food security pathway

| Project | Proven project effects on the complete impact pathway | Plausible project effects on the complete impact pathway |
|--------------------|---|--|
| Safal | 1300 landless as value chain actors. 25,829 (aquaculture) and 17,406 (dairy); 4000 landless farmers | 11,361 (horticulture) |
| Blue Gold | None | 75,000 (estimated at 50% of total) |
| PROOFS | None | 40,000 (estimated 50% of total) |
| CDSP IV | None | 28,000 (all) |
| Food safety | None | No numbers |
| Rice fortification | None | 100 in garment factory |

Conclusions

1. There is evidence of adoption of good agricultural practices and improved agricultural production in different sectors and supply chains, among 300,000 beneficiary households. However, this does not cover the complete impact pathway, and does not show significant differences with control areas.
2. When combining quantitative evidence from the surveys and qualitative evidence from focus group discussions and interviews, there is robust (proven) evidence of project effects on the complete impact pathway for around 47,000 beneficiaries. These effects are strongest for aquaculture.
3. Following are the main assumptions associated with this impact pathway, with a rough scoring for the different project in the following matrix (see *Table 52*):
 - a. Existence of a profitable market (domestic or preferably export market) – this is a context factor, with variation for the product or value chain
 - b. Good local infrastructure for easy transport – this is a context factor, with geographical variation e.g. due to remoteness, especially valid for products that can perish quickly, such as shrimps
 - c. A profitable business case for smallholder producers, showing a positive balance of increased revenues and increased costs of inputs – this has been a positive effect of several projects
 - d. Organisation of smallholder producers, in terms of collective input supply, collective sales and other services provided to farmers – this has been a positive effect of several projects
 - e. Project effects targeting beneficiaries and value chain actors to assure that supply by smallholders match demand by private sector businesses – this has been a strategy by some projects (Safal, Proofs, BGP), but with limited results so far; best results were achieved with Safal, but several companies stated that more time is needed to build up relations of mutual trust.

Table 52: Assumptions associated with value chain and food security pathway

| | Assumptions for value chain development leading to food security | | | | |
|--------------------|--|----------------------|-----------------------------|---------------------------------|----------------------------|
| | Market access | Local infrastructure | Business case for producers | Smallholder producers organized | Value chain actors engaged |
| Safal | + | + / 0 | + | + | + |
| Blue Gold | + / 0 | + | 0 | 0 | 0 |
| PROOFS | + / 0 | + / 0 | + | 0 | 0 |
| CDSP IV | + / 0 | + | + | + | 0 |
| Food safety | + / 0 | + / 0 | + / 0 | - | - |
| Rice fortification | 0 | n.r. | n.r. | n.r. | + |

+ = proven positive; 0 = plausible positive; - = no evidence.

- Improving relations with value chain actors is not an easy task. BGP has failed to do so, presumably because of a combination of producers not being able to meet requirements of volume and quality, and traders not providing the expected services and access to markets. Close collaboration with value chain actors has been missing. The Safal project has successfully intervened at different points in the supply chain, including linking producers to national and international value chain actors and support for the establishment of service and collection centers, reaching around 40% of Safal beneficiary producers. It seems that initiatives in the fish sector are most promising, which is probably associated with good export markets for shrimps and a good relationship with one trader.
- There is no quantitative evidence, but plausible qualitative evidence for 150,000 households to have benefitted from the entire impact pathway. The effects are plausible for different supply chains, for which the above success factors or conditions have not or only partly been met. For instance, there are problems of: remoteness influencing access to markets, markets with over-supply, insufficient confidence by private sector buyers in smallholder production quality.
- There are also proven effects for 1300 landless operating as value chain actors, for instance selling seeds or transporting milk. However, these effects are based on another impact pathway.
- The majority of beneficiaries with proven effects through sales and improved incomes are men (around 80%), which is associated with their strong position in aquaculture and marketing activities. One group that has benefitted most are those who started doing aquaculture or agriculture with small ponds.
- In terms of support to producers, four different elements are required: improved technical knowledge, improved (and less costly) input supply, access to finance and access to markets. Remoteness (accessibility) of production areas has not received sufficient attention as a factor influencing these elements. It can strongly influence the business case for service providers.

Recommendations

- More fine-grained monitoring and analyses are needed to be able to draw firm conclusions as there can be large differences between different types of households which determines whether they can benefit from the project interventions or not. This includes the size of land and pond ownership, gender aspects and proximity to access roads.
- The number of households reached is impressive but not significant in relation to the population of producers in the project region. The projects could be expected to focus at upscaling mechanisms and opportunities for systemic changes leading to sector transformation. Both the midterm reviews of PROOFS and Safal have made similar comments. Especially the Safal project has established relevant contacts and undertaken relevant activities oriented at upscaling, but could do so in a more structured way. The RNE should be more focused at the potentials for scaling of pilots that have generated 'proof of concept', being funded with Dutch development funds.
- Working on access to markets and opportunities for smallholders to sell their products within selected supply chains should receive more attention, based on good value chain analyses and interactions with value chain actors. Programmes aimed to achieve positive change will require long project duration, for building up relations of trust with private sector companies (traders, processors).

6.1.2 Agricultural production and water management

The Blue Gold project specifically contributed to the impact pathway of agricultural production and water management, while for Safal and CDSP IV it is also very relevant. There are also several earlier projects funded by the Dutch water budget that have an important agricultural component. The experiences of these projects were taken into account by a review of their results (see separate document with Appendix 5). The following scheme (see *Table 53*) shows the main elements of the impact pathway, as developed from the project theories of change and expert knowledge. This scheme is used to assess progress and contributions by the mentioned projects to this impact pathway.

Table 53: Agricultural production and water management pathway

| | Main outputs | Outcomes | Impacts |
|-------------|--|---|--|
| Pathway | <ul style="list-style-type: none"> • Access to knowledge on good agricultural practices and water management • Capacity building of water management organisations • Access to resources for water management | <ul style="list-style-type: none"> • Improved yields • Reduced crop damage by water problems • Less conflicts in water management system | <ul style="list-style-type: none"> • Improved profitability of crops • Improved (farm) incomes |
| Assumptions | <ul style="list-style-type: none"> • Water management structures have good internal governance systems • Improved water management leads to increased production • Producers are willing to invest in improved water maintenance • Major water infrastructure is well maintained • No unexpected natural calamities | | |

The evaluation of BGP and experiences of previous projects working on WMGs and agricultural production demonstrate positive opinions about the functioning of WMGs among beneficiaries. However, at the same time many people believe further improvements are required. This perception was strongly enhanced due to crop failures during the 'dry period' due to unexpected excessive rainfall and problems of water logging, which could not be avoided by local water management actions. The results show that WMGs still play a minor role in operation and maintenance of water management infrastructure:

- WMGs will only be able to play an effective role in terms of operational and maintenance works if major water infrastructure rehabilitation and maintenance works are being carried out by other agencies, most notably the BWDB. However such rehabilitation has not yet been carried out in the BGP targeted polders, which is an implementation weakness of the project, but also a limitation of the evaluation that could not capture the delayed achievements.
- Some WMGs do not fully represent a (micro-) water catchment or water command area including all the main water users, which is also a design factor of the project.
- Individual WMGs are not allowed to repair or to contract a constructor to carry out repairs, even if they would be willing to do so.
- Even if minor operation and maintenance works do not require major financial resources, it appears that WMGs have very limited financial resources and did not receive more funds during the last 2 years even if incomes have significantly increased.

However, WMGs are much appreciated by their members in terms of passing on training messages, as a savings and loans facility and also for generating labour work contracts. Members of the WMGs also benefit from labour work contracts with BWDB and BGP (especially women and landless). WMGs may keep a list of the ones who should benefit first from labour contracts. Small voluntary works were also regularly conducted. In one WMG, every year a temporary dam is built to prevent salt intrusion.

Further analysis of the relation between water management indicators and production indicators show a positive relation between oilseeds, pulses and fisheries with indicators for improved water infrastructure and water management systems, most so for farmers with large land size. On the other hand, in both beneficiary polders the improved functioning of the WMGs has not been able to avoid significant damage on crops due to extreme climate events and resulting waterlogging.

In the Safal project, with respect to water management, there is a significant relationship between the perception of water management and agricultural production, both for landowners and landless, which implies that the farmers understand the importance of water management. However, the improvements in water management have not been able to prevent crop failure and damage due to excessive rain leading to waterlogging and causing negative perceptions. Safal did not give attention to water management in its activities. However, among the producer groups selected by Safal there were also several water management groups. Water management is important in view of climate change and natural events leading to floods and waterlogging.

Both BGP and CDSP show that functional water management groups are a useful organizing structure that benefit all community members and especially women, by providing opportunities for loans and savings, facilitating and mobilizing LCS (Labour Contracting Societies, a group of adult landless labourers or share croppers who depend on manual labour as their main source of income), on activities such as earthen road construction/ rehabilitation, canal re-excavation, tree plantations. WMGs are also effective to communicate with government agencies. The Safal project made use of existing WMG groups (to become focus producer groups). CDSP also finances maintenance of major water infrastructural works which is a condition for the effectiveness of functional WMGs.

The experiences show that investments in local water management organisations can lead to increased agricultural production, but only if major water management infrastructures such as the major canals, boundary rivers and large sluices are well maintained. This is beyond the scope of local WMGs. The vulnerability of the production area to problems of floods, water logging and drought is important. Blue Gold and CDSP IV areas seem to be more vulnerable than Safal (and PROOFS) areas. In vulnerable areas farmers are more risk prone and will not invest in new technologies if the risks are not mitigated. Blue Gold also undertook agricultural support activities that depend less upon water management, such as poultry farming, piggeries and aquaculture. These appear to have been very successful (probably more successful than water dependent activities). Likewise, there may be other (less water dependent) income generating activities, such as the use of LCS. WMGs in Blue Gold areas expected more benefits from LCS.

Beneficiaries

It is uncertain whether improved water management for agricultural production will directly benefit the landless or lowest income groups as those with largest areas of land benefit most. It may be that the landless also benefit from improved productivity of large landowners, by being shareholders or workers.

WMOs appear to function best under the conditions of the CDSP IV. There are two important factors that seem to determine this. One is the availability of funding for larger scale water management O&M activities. Second is the good collaboration with other key players, especially BWDB and local governments. Within Safal the relation between water management and agricultural production has received very little attention, in spite of remaining water logging problems. A Safal study on WMGs focused on the role WMGs as an organizing social structure and not in terms of water management needs.

The above leads to the following consequences on numbers of households who benefitted (see *Table 54*).

Table 54: Proven and plausible project effects related to agricultural production and water management pathway

| Project | Proven project effects on the impact pathway | Plausible project effects on the impact pathway |
|-----------|--|---|
| Safal | | uncertain, at least 50,000 |
| Blue Gold | | 150,000 |
| CDSP IV | 28,000 | |

Conclusions

1. For several water-related projects financed or co-financed by the Netherlands, positive effects on the relation between water management and agricultural production have been observed at best for a short period. However, sustained results have not been observed. This would require increased payment for water management from agricultural revenues, which has not occurred anywhere. In the case of CDSP there is continuous support to the water management organisations, leading to proven project effects for 28,000 beneficiaries. For the other projects there are plausible short-term effects, for around 200,000 beneficiaries.
2. A set of conditions needs to be met to achieve sustainable results, which includes that larger infrastructure is maintained by BWDB or local government authorities. This was not a subject of attention for Safal, included but not a priority for BGP, and fully covered by CDSP IV by own funding.
3. A promising approach (as being tested by Blue Gold) appears to be that of a more water basin oriented approach, involving all players that have responsibilities to maintain water infrastructures at that level.
4. Following are the main assumptions associated with this impact pathway (see *Table 55*), with a rough scoring for the different project in the following matrix:
 - a. Water management structures / WMGs have good internal governance systems – this has generally been achieved through training and capacity building
 - b. Improved water management leads to increased production – this relation is plausible in most cases
 - c. Producers are willing to make available resources for improved water management – this has not been successful in any (past or present) project
 - d. Major water infrastructure is well maintained – this is being achieved with CDSP but is not sustainable.

Table 55: Assumptions related the agricultural production and water management pathway

| | Assumptions for sustainable and inclusive water management | | | |
|-----------|--|---|--------------------|---------------------------------|
| | Internal WMG functioning | Relation water management agric. production | Investment in WMGs | Major infrastructure maintained |
| Safal | + | 0 | - | - |
| Blue Gold | + | 0 | - | - |
| CDSP | + | + | - | 0 |

+ = proven positive; 0 = plausible positive; - = no evidence.

Recommendations

1. Assuring that local mandated institutions provide maintenance of large infrastructure should be a condition or priority for any project working on local water management.
2. There is need to further test a more water basin oriented approach, involving all players that have responsibilities to maintain water infrastructures at that level, and taking a farming systems approach that includes the relation between water management and agricultural production for a range of local crops.

6.1.3 Nutrition and food safety

Six projects contribute to the impact pathway of nutrition and food safety: Safal, Blue Gold, PROOFS, CDSP IV, Food safety, rice fortification. The following scheme (see *Table 56*) shows the main elements of the impact pathway, as developed from the project theories of change and expert knowledge. This scheme is used to assess progress and contributions by the mentioned projects to this impact pathway.

Table 56: Nutrition and food safety pathway

| | Main outputs | Outcomes | Impacts |
|-------------|--|---|---|
| Pathway | <ul style="list-style-type: none"> • Access to knowledge on good nutrition and on food safety • Access to means to improve nutrition and food safety • Capacity building of food safety system | <ul style="list-style-type: none"> • Improved food diversity • Improved food safety | <ul style="list-style-type: none"> • Improved health • Improved food security |
| Assumptions | <ul style="list-style-type: none"> • Increased availability of nutritious food • Change of behavior towards more nutritious food consumption • Women are empowered in agriculture and the household | | |

The following are insights emerging from the assessment of project evaluation findings to the different elements of this impact pathway.

The studied projects varied in terms of the attention given to agricultural production, training on nutrition and food safety, and support to other activities especially improved water and sanitation. It is not possible to draw conclusions on which approach has been most effective. Most projects assume that training on nutrition will stimulate households to make better use of the improved production within their farm and/or the improved incomes from selling products, to change their behavior towards improved food consumption and thus become more healthy. In the FGDs on the BGP and Safal projects almost all participating respondents stated that they have improved their nutrition habits. This is supported by survey and monitoring data for Blue Gold and Safal, which demonstrate that:

1. The Safal project has generated significant positive effects on all indicators of food security and household diet diversity, for the landless. For the landowners, there are only minor changes and no project effects on food security indicators. This could also be explained by the fact that for the landless there was much scope for improvement. For both categories of beneficiaries, there are limited or no improvements in nutritional adequacy. Moreover, the overall trends on nutritional adequacy is negative for both the B and C groups, for both landowners and landless. This remains difficult to understand and could be associated with the implementation of the evaluation. It should be kept in mind that improved access to water and sanitation has also improved in the project and control areas, with important positive effects on health.
2. On health, the Safal project shows a strong decline in stunting, in wasting as well as in overweight, for both B and C groups, but no proven project effects. The proportion of stunting among the landowners at the endline situation is higher in the B group (27%) than in the C group (19%). On wasting we find an inverse pattern: 6% in the B group and 12% in the C group. Among the landless we find a mixed view in terms of the comparison between B and C groups, while all trends show considerable improvements.
3. There is evidence of a significant positive BGP effect on the dietary diversity score (HDDS), from 67% to 78% (consumption of 11 defined food groups), as well as on the nutritional adequacy index, from 57% to 58%, contrary to the control group. These changes are supported by improvements in the role of women in decision-making in agriculture. The results suggest that the impact pathway of improved farm production and diversity leading to increased homestead consumption has been more effective than the impact pathway of increased cash crop production and sales leading to improved nutrition. The relation between agricultural production and the HDDS or the nutritional adequacy index was further explored and showed that rice production as well as the (increased) production of fish has been responsible mainly for positive effects on the HDDS and the nutritional

adequacy index, and mainly so for small farmers. This could be explained by the fact that especially small farmers have massively started to produce fish, even in small quantities, and that they have used the increased production mainly for home consumption.

4. On health, the BGP shows a strong decline in stunting, in wasting as well as in overweight, for both the beneficiary and control groups (no significant project effects). The proportion of stunting among beneficiaries has declined to 29%, wasting is 10%. The strong effects cannot be associated with improved nutrient adequacy, as there are still major deficiencies, but could also be explained by improved access to water and sanitation.
5. The CDSP IV project shows considerable improvements in terms of food security over the years but households are still food insecure during 2-3 months.
6. Two projects (PROOFS, Rice fortification) have taken measures to increase the access to products with supplements that can improved health and nutrition. These projects do not report on effect indicators.

The above facts lead to the question whether improved food security results from selling cash crops and then buying nutritive foods, or through home consumption. Most evidence supports the latter result chain:

1. For BGP beneficiaries, the analysis shows that both rice production and (increased) fish production have been mainly used to increase consumption (sales have even declined by 20%) which significantly contributed to the improved HDDS and nutritional adequacy. This could be associated with the FFS training on improved and more diversified homestead gardening (not affected by the climate events) and the training on nutrition. Note that the FFS training has been massive (reaching out to all households, especially women). Production of cash crops was meager and marketing was not very successful.
2. For Safal the landless show the greatest increase in food security indicators, whereas for them the proportion of increased production being sold is not significant.
3. The CDSP IV project shows that households are still food insecure during 2-3 months whereas they have acquired much higher incomes and have strongly increased their assets.

The role of women in management of the agricultural production is probably also significant. In the Safal project, for the landowners (who do not show a significant increase in food security) most increased production is in fisheries (which is a men's job), while for the landless (who do show a significant increase in food security) most increased production is in milk (which is a women's job). Also, in the BGP project (showing significant increase in food security) homestead gardening and activities like chicken farming have been much promoted, which are women's jobs.

The FAO Food Safety project is unique because of its influence on national and sector-based policies and guidelines, as well as on-the-ground pilots. The combination potentially has a large effect, reaching out to a large group of beneficiaries. The main project components are the following:

1. At national level, the FAO Food Safety project participated effectively in development of the Codex Alimentarius and food standards development and drafted the national Food safety policy.
2. At sector level, the project developed food safety guidelines in the poultry, farmed finfish and horticulture supply chains and trained 1500 farmers in 75 upazilas through a cascaded farmer field school approach. In the fishery sector, the project is collaborating with the Bangladesh Shrimp and Fish Foundation and the Department of Fisheries to develop food safety guidelines for the fish value chain, with training provided on Good Agriculture Practices to 30 Master Trainers, 100 Lead Trainers, 500 Lead Farmers and 200 Value Chain actors.
3. In terms of local applications, a pilot street food cart initiative in Khulna has transformed this city in South West Bangladesh into the street food capital of the country. In total 700 vendors were trained in Good Hygiene Practices, 500 provided with new carts, monitored by local agencies. In Khulna, this street food initiative was further expanded with the handing over of 200 more carts by the Programme to the Khulna City Corporation. Vendors report a doubling of incomes, consumers report lower incidence of illness, other carts are copying the design and learning the good practices.

A framework for sustainability of the street food intervention and a model for its replication have been developed.

The above leads to the following consequences on numbers of households who benefitted in terms of food security (see *Table 57*).

Table 57: Proven and plausible effects on the nutrition and food safety pathway

| Project | Proven project effects on the impact pathway | Plausible project effects on the impact pathway |
|--------------------|--|---|
| Safal | around 35,000 (landless) | around 25,000 (landowners) |
| Blue Gold | | 150,000 (all beneficiaries) |
| PROOFS | | 80,000 (estimate 50%) |
| CDSP IV | | 28,000 (all beneficiaries) |
| Food safety | | No numbers but potentially high if wide-scale adoption occurs |
| Rice fortification | 100+ in garment factories | |

Conclusions

1. There are mainly positive trends in project areas with regards to indicators of food security, household diet diversity and nutritional adequacy, and some proven positive project effects. However, the dynamics and interrelations between the observed trends are not always easy to understand. There are also mainly positive trends in project areas with regards to health indicators, of stunting, wasting as well as overweight. The survey did not allow drawing conclusions on project effects. Both above trends should be understood against a background of positive changes in Bangladesh as a whole, and also the influence of several other factors such as access to water and sanitation.
2. No significant relations were found between food security indicators and health indicators, as was expected. This is most likely a result of the fact that many other factors influence health indicators (such as cultural issues, access to water and sanitation) and thus a weakness of the evaluation approach that did not take these factors into account.
3. There are proven project effects for this impact pathway for the landless beneficiaries of Safal (35,000 persons). For the other projects and target groups we conclude there are plausible positive project effects on this impact pathway, reaching out to around 300,000 people.
4. On food nutrition and food safety, there are good examples of collaboration between RNE projects, such as between Safal and the FAO food safety project. There is plausible evidence that this collaboration has had an added value for the Safal project. There is potential to expand this type of collaboration.
5. For the BGP there are significant relations between high aquaculture production, increased consumption (not sales) and food security or health indicators. For Safal there are significant relations between high aquaculture production and sales of fish, but no effects on food security or health indicators. This suggests that the impact chain of food security through cash crops and increased cash incomes is less valid than the impact chain operating through increased subsistence crops and home consumption. It can also mean there are other stronger determinants for food security. This findings links up to recent research findings on the importance of cultural issues, such as the role of young adolescent women. Unfortunately there is no evidence that the projects have had any influence on gender aspects of decision-making – decision making in the aquaculture value chain is highly dominated by men.
6. Following are the main assumptions associated with this impact pathway (see *Table 58*), with a rough scoring for the different project in the following matrix:
 - a. Increased availability of nutritious food in the household – this is the general trend in Bangladesh and also appears to occur in all project areas, unless the emphasis at cash crops has a trade-off on food crops (there is no evidence of this trade-off in the project surveys)

- b. Improved incomes and used to buy nutritious food on the market – this is plausible for Safal only, for both BGP and CDSP it appears that improved incomes are primarily used for wealth increase and home consumption
- c. Change of behavior towards more nutritious food consumption – there is plausible evidence for all projects
- d. Women are empowered in agriculture and the household – there is no evidence for a positive change in the Safal project, but plausible evidence for most other projects.

Table 58: Assumptions related to the nutrition and food safety pathway

| | Assumptions for sustainable nutrition and food safety | | | |
|--------------------|---|--|---|--|
| | Increased availability of nutritious food | Improved incomes used to buy nutritious food on the market | Change of behavior towards more nutritious food consumption | Women are empowered in agriculture and the household |
| Safal | + | 0 | + / 0 | - |
| Blue Gold | + | - | + / 0 | 0 |
| PROOFS | + | ? | 0 | 0 |
| CDSP IV | + | - | ? | 0 |
| Food safety | + | ? | 0 | - |
| Rice fortification | + | n.r. | 0 | 0 |

+ = proven positive; 0 = plausible positive; - = no evidence; ? = unknown.

Recommendations

1. There is need for more research to compare the impact pathways of revenues from export crops or home consumption leading to food security. The evaluation suggest the latter is more valid. There could also be other determining factors.
2. To sustain and scale up the results, in principle the identified projects cover all the necessary elements of this impact pathways including increased access to products with supplements that can improve health and nutrition. However, one important weakness remains that of behavioural changes within the household. This has been identified by the RNE Dhaka, focused at the role of young women. There is need to emphasise changing gender related behavior and decision-making in value chains, such as the one aquaculture, in order to improve the nutrition related effects.

6.2 Conclusions on project efficiency

The evaluation team has data on project costs (Table 1) and on beneficiaries reached (see sections 6.1.1 to 6.1.3, indications per impact pathway), which allows to calculate costs per beneficiary household reached (Table 59).

Table 59: Data on project efficiency (costs per household beneficiary successfully reached)

| Project | Efficiency estimate (in EURO) | | | | | | |
|-----------|-------------------------------|--------------|-------------------|--------------|---------------|--------------|-------------------|
| | Proven effects | | Plausible effects | | Total effects | | Potential effects |
| | HHs** | Costs/ HH | HHs** | Costs/ HH | HHs** | Costs/ HH | |
| SaFaL | 85K | 140 | 50-85K | 140-240 | 110-170K | 71-110 | High |
| Blue Gold | | | 75-150K | 338-675* | 75-150K | 338-675* | Doubtful |
| PROOFS | | | 40-80K | 100-200 | 40-80K | 100-200 | Uncertain |
| CDSP IV | 28K | | 28K | 630 | 28K | 630 | None |

| | | |
|-------------------------------------|---|------|
| Improving Food Safety in Bangladesh | Not possible to make an estimate because different types of beneficiaries | High |
| Scaling up rice fortification | Still preliminary results and low numbers | High |

** However, high costs for water infrastructural works have not yet been made for the surveyed polders, thus are likely to be much lower than indicated.*

*** According to the household survey, family size of landowner households is at average 5.0, while family size for landless households is 4.3. This would allow one to determine the number of persons reached.*

On beneficiary households reached a distinction has been made between those for whom the entire impact pathway has been successfully realized with proven evidence, and those for which there is plausible evidence. Note that it is not possible to accumulate the numbers reached for different pathways, as the same beneficiaries can benefit from different impact pathways. We also indicate to what extent there is potential for upscaling and more impact if appropriate follow-up activities will be carried out. The costs are lowest for SaFaL and PROOFS projects (EUR 70-200 per household), and highest for the two water management oriented projects (up to EUR 600-700 per household). The latter can be explained by the fact that major water infrastructural works are more costly.

For SaFaL the costs can be compared with the realized benefits for beneficiaries (Table 60), which were determined at USD 594 (EUR 530) for a landless household and at USD 840 (EUR 760) for a landowner household. This is a highly positive comparison. The comparison is even more positive if one realizes that the costs were made over several years while the benefits are every year. Also, there is good potential for upscaling of these benefits with reduced costs. For the CDSP-IV project, the increase in revenues over four years (2011-2015) has been a 126% increase (EUR 1000, thus EUR 250 per year), which can be largely attributed to the project. For PROOFS at the time of the evaluation there was no evidence of an increase in incomes for beneficiaries. This comparison is not relevant for the BGP polders that were surveyed because here the expensive activities on water infrastructural works have not yet been carried out (so the realized costs are much lower) while the expected benefits could have been higher if these investments had been made. For the Food safety project it is not yet possible to make this estimate because different types of activities and beneficiaries are involved. For the scaling up rice fortification project the results were not yet clear at the time of the evaluation.

Table 60: Data on project costs and benefits (in EUR)

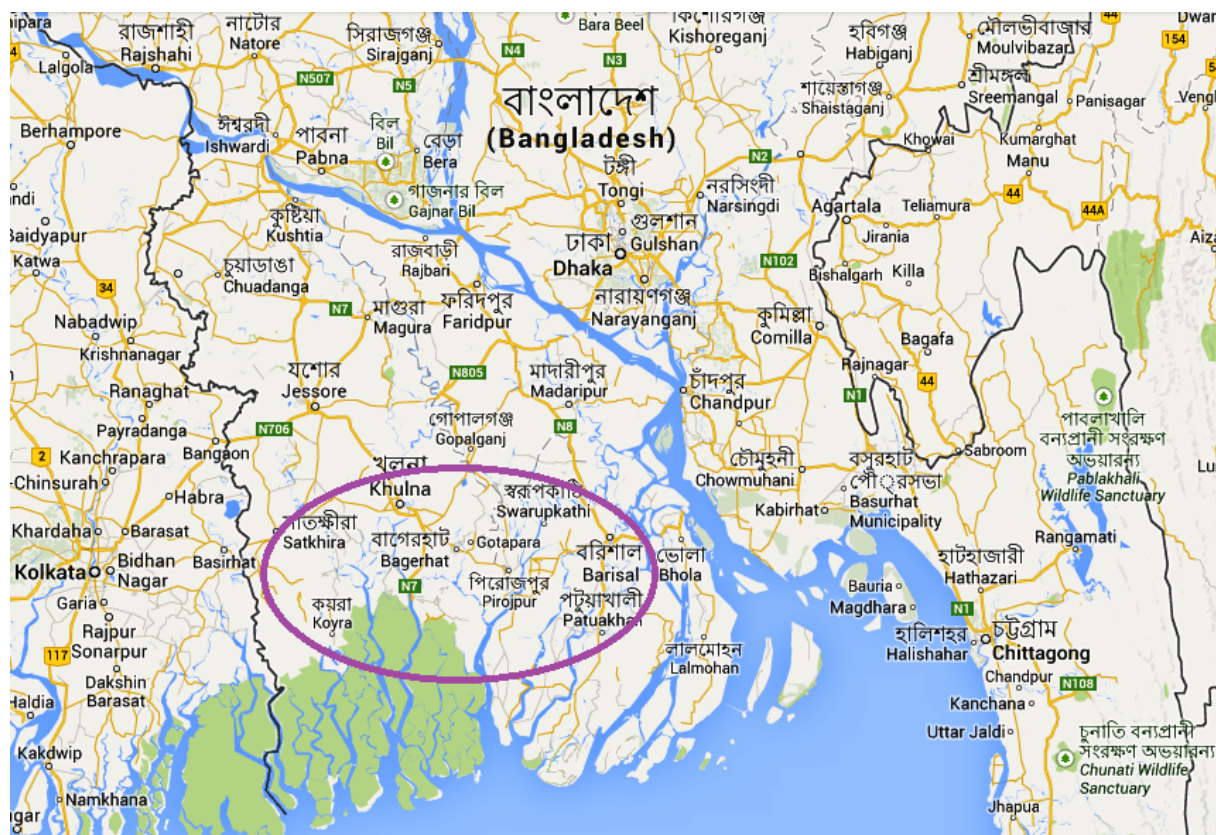
| Project | Costs project period | Benefits per year per household | | |
|-----------|-----------------------------------|---------------------------------|---|---|
| | Costs per HH (see previous table) | Revenues | Revenue specifications | Other benefits |
| SaFaL | 71-110 | 530-760 | Mainly from aquaculture | Improved nutrition |
| Blue Gold | 338-675 | None proven | Expected in coming year | Improved nutrition proven |
| PROOFS | 100-200 | None proven | Expected in coming year | Improved access to water and sanitation |
| CDSP IV | 630 | 250 | From wages, trading, gardening, aquaculture, poultry, | Improved water management |

6.3 Conclusions on research questions

The conclusions and recommendations are presented in the summary in the beginning of this report.

Appendix 1: Geographical location of Blue Gold and Safal

See purple circle with region of interventions.



Appendix 2: Impact pathways of food security projects in Bangladesh

| Projects | Impact pathways | | | | | | | | | | | | |
|---|-----------------|-----|-----|----|---|---|-----|----|----|-----|----|-----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Level 1 projects | | | | | | | | | | | | | |
| 1. Safal | x | xxx | xx | x | | | | | x | x | | | |
| 2. Blue Gold | | xx | | x | | | xx | | | | | | x |
| Level 2 projects | | | | | | | | | | | | | |
| 3. Char Development and Settlement Phase-IV | x | | | | | | xx | xx | | | xx | x | |
| 4. Improving Food Safety in Bangladesh | | x | | x | | | | | | xxx | | | |
| 5. PROOFs (Profitable Opportunities for Food Security) | x | | xxx | x | | | | | xx | xx | | | x |
| 6. Scaling up of Rice Fortification in Bangladesh | | | | | x | | | | | xxx | | | |
| Level 3 projects | | | | | | | | | | | | | |
| 7. FAO-FFS on Irrigation | | | | | | | xxx | | | | | | |
| 8. Market Infrastructure Development Charland Regions | | x | x | xx | | | | | | | | xxx | x |
| 9. South West Area Integrated Water Resources Planning and Management Project | x | x | | | | | xxx | | | | | | |

XXX= main impact pathway of the project; XX = 2nd priority, X = 3rd or lower priority

The above numbers refer to the following impact pathways that can be distinguished (based on IOB, 2011), with the exception of infrastructure and institutional development which were positioned as separate impact pathways:

1. **Non-farm sector.** Development of the non-farm sector, contributing to household income.
2. **Yield increase.** Increasing production volume, e.g. through research and extension, improved seed and inputs, organisation of producers, organisation of output markets, etc. (roads and irrigation are positioned elsewhere)
3. **Cash crop value chains.** Interventions mainly by non-governmental organisations, farmers and the private sector, increasing product prices and farmer income through value addition and linking producers to new markets
4. **Market reform.** Government interventions to make markets more efficient, to open up markets for consumers, sometimes also to protect domestic production, through domestic trade regulations and adjustments in import and export trade barriers
5. **Food distribution.** Safety nets, distributing food or cash to the most vulnerable households.
6. **Food prices.** Stabilisation of food prices and food availability at the national level by the government, e.g. by maintaining national food stocks or a marketing monopoly and subsidising food prices; or at village level by communities or farmer organisations, e.g. through cereal banks.

7. **Environmental management.** Sustainable natural resource management (*water mainly*), ensuring that the productivity potential (of land, water, vegetation) does not deteriorate (includes irrigation infrastructure)
8. **Land tenure.** Government interventions, often piloted with donors funding, encouraging farmer investment in agricultural production through policy aimed at formalising informal land use rights or land ownership, or redistributing land.
9. **Access to finance.** Improved access to finance, facilitating investments in agriculture.
10. **Improved nutrition.** Improved nutrition and food quality, necessary for good food utilisation.
11. **Access to water.** Improved access to safe drinking water and improved hygiene, necessary for good food utilization.
12. **Infrastructure development.** Opening up remote rural areas by roads, bridges, ferries etc.
13. **Institutional development.**

Appendix 4: Summary of findings of other food security projects

1. Profitable Opportunities for Food Security (PROOFS)

For PROOFS most relevant are the following 2 impact pathways towards improved food security:

- Value chain development, including access to good practices (extension), markets and finance
- Nutrition and food safety

We present the main results, based on project reporting and interviews held with project staff.

1. Value chain development

Selection of beneficiaries

- PROOFS has targeted 80,000 households (HHs).
- On the selection of beneficiary HHs, for PROOFS the starting point was to work with pre-existing groups. The MTR of PROOFS mentions that the target groups are generally well connected to markets, have access to input markets, have access to finance, have quite some land (>50 decimals), and are not so remote. PROOFS stated that in terms of remoteness of locations, the baseline found that from its sample of 2800 HHs, the average time it takes for a HH member to reach a market is 18 minutes, as per their usual mode of transport (78% of respondents meant 18 minutes walking and 21% meant 18 minutes on rickshaw/van).
- In terms of land size, some pre-existing groups did not have enough members with less than 50 decimal land, so some PG members will have larger land sizes. The table below taken from the baseline survey shows that about 65% of the beneficiaries own less than 50 decimal of land (considered as the norm for classification as landless). This is comparable to the proportion of landless within both BG and Safal beneficiary groups. Only 2% do not even have homestead land.

land, agricultural land, pond/ haor/ beel land etc. The following table shows the information about the land ownership of the respondents.

Table 14: Land ownership by size (in Decimal) (%)

| Land Size | Own homestead land | Own agricultural land(without share/lease/mortgage) | Share cropping land | Land lease-Out | Land lease-In |
|-------------------------|--------------------|---|---------------------|----------------|---------------|
| No land | 2 | 41.5 | 69 | 95 | 85.4 |
| 0.1-20 | 77.6 | 11.6 | 6.3 | 0.8 | 3.3 |
| 21-40 | 12.9 | 10.8 | 8.7 | 1 | 4.4 |
| 41-60 | 3.8 | 6.6 | 5 | 0.9 | 2.2 |
| 61-80 | 1.3 | 4.8 | 2.9 | 0.4 | 1.6 |
| 81-100 | 1 | 6.1 | 2.4 | 0.5 | 1.2 |
| 100+ | 1.4 | 18.5 | 5.8 | 1.5 | 2 |
| Average Quantity | 16.7 | 63 | 22.8 | 5.5 | 9.3 |

Access to knowledge, inputs and to markets

- The adoption of appropriate technologies is facilitated by demonstration plots through private companies, and by the development of local level agreements with companies to support promotion and training that reaches small-holders. So far 234 demonstration events have been completed along with four promotion/training events with local service providers. There is no information on the specific technologies being promoted. There is no specific attention for environmental or social sustainability aspects.

- There is no information on the type of inputs being purchased by producers and to what extent this has increased. In terms of sources, the main source of inputs for producers is the local market (50%), however Farm Business Advisors (FBAs) make an important contribution (36%). About 75% of producers buy at least some of their inputs through FBAs.
- In terms of sales, most households (33%) sell products to local traders who visit households, followed by sales to FBAs (29%) and local market (29%). Project activities do not vary for these PGs in the sense. It is the aim with PROOFS that FBAs are able to identify what makes their business different to other input market actors (the provision of embedded services and information to producers) and develop a marketing and sales plan around this for the sake of their business sustainability.
- Business planning is being supported by PGs, FBAs and Farmer business groups, and many of such plans have been made, with the aim to plan production, sales and input / output prices. It is too early to know to what extent these plans have been successful.
- Most initiatives focus on increasing crop production by PGs; this also means that market channels need to increase as PGs will have increased produce to sell.
- In total 69 deals were made between producer market committees and district level buyers and 29 deals made between collection points and district level buyers.
- Five local level agreements were signed between the project and local companies including Potato Exporter Poloygon Resource Limited; Energy Pack; Lal teer Seeds Limited; Chanchal Hatchery and Metal Seeds Limited – but mainly on input supply! The agreement with Potato Exporter *Poloygon Resource Limited* is particularly promising; the firm has agreements with 80 FBAs to source potatoes, with an expected demand of 50MT per day.
- Apart from the time it takes to reach a market (proximity to markets), there are several other factors that determine access to markets: the frequency that the market is active, how many market actors are presence, and price offered at the market. PROOFS has been working on *the quality and variety of the market channels*, by improving pre-existing market channels (example strengthening market management committees) as well as adding new channels (for example collection points).

Access to finance

- The PROOFS baseline survey showed that more than 50% of PROOFS HHs already have loans (in 2014) while the remaining HHs indicated they can access loans from micro finance institutions if required. However, PROOFS found that most HHs have limited understanding or awareness about existing bank facilities and loans. Therefore, 'access to finance' was defined as households who have been *offered appropriate financial products* and who *understand the terms and conditions associated with the financial product*. PROOFS now focuses at assuring that farmers receive financial literacy training delivered by financial institutions.

Increased crop productivity

- Product groups being promoted are vegetables, fish, maize, potato and mung bean. Survey data indicates that yields of PROOFS households increased from 150% in the first household survey to 213% in the current period and that 90% of households claimed their yields increased since becoming involved with the project. Households have indicated the reasons for increased yields include: access to better quality inputs (42%); improved technical knowledge (38%); and support from Farmer Business Advisors (FBAs) (32%).

Increased HH crop profitability and incomes

- 87% of households indicate that their profits have increased (BDT per kg produced), mainly due to increased yields (45%); because of links with an FBA (25%) and links to output buyers (20%). Again, this is supported by assessment of profit margins for each of the key crops, which shows there has been an increase in profitability. However, no comparison with control areas was made.
- Incomes have varied from 8220 BDT (May 2014) to 7635 (June 2015) to 8423 (Dec 2015) per month, so these do not show a significant change. It is not certain whether these include both farm and non-farm incomes.

Improved revenues for value chain actors

- More than 90% of FBAs have experienced an increase in income since joining the project, which (according to the progress report) provides evidence of viability of the FBA business.

2. Access to nutrition and food safety

Improved access to knowledge on good nutrition and on food safety

- So far 158,816 people have participated in the Nutrition, IYCF and Hygiene sessions
- PROOFS has also promoted WASH, with a 50% increase of improved WASH and sanitation among the targeted groups.
- Attention has also been given to food distribution within the HHs: of beneficiaries 90% (dec 2015) distribute the food equally among HH members (80% in control group).

Improved access to means to improve nutrition and food safety

- Nutrient sales agents sold an increasing amount of nutrition products, ranging from food to hygiene items and nutrition supplements.

Improved food diversity and health

- There has been an increase in HHs consuming from own production, from 45% (May 2014) to 50% (Dec 2015). The dietary diversity score increased from 4.2 (May 2014) to 6.7 (Dec 2015), as compared to the control of 5.9 (Dec 2015).
- Targeted households saw a 20% decline of expenditures on health related issues during the last 1.5 years, which could be related to improved food diversity, nutrition as well as WASH.

On sustainability and systematic changes

- The MTR of PROOFS has emphasized the need to focus on systemic changes. This is strongly associated with the question of the sustainability of the achieved results.
- The focus of PROOFS is on ensuring the sustainability of the FBAs to continue serving the PGs. Sustainability for individual FBAs would mean that the FBA is able to continue its business in an inclusive manner without project support and earn a profitable income. This individual entrepreneur level of sustainability is achievable for active FBAs within the PROOFS life span and has received attention by developing business plans for individual FBAs.
- The next level of sustainability would involve copying/crowding in of the FBA model from large input companies. The adoption of the FBA model from the private sector is a long term process and not likely to be achieved in the PROOFS project span. To develop interest at the private company level in adopting/promoting a FBA sales model, PROOFS needs to be able to demonstrate the changes the FBA model has made to company sales in working areas. This involves working closely with dealers and company representatives who are linked with a FBA on sales monitoring and evaluation.
- The above approach and interpretation of sustainability would appear to depend upon the capacity of PGs to make a profit with their sales, and thus pay for the FBA services in an adequate manner. We observe that the project has paid adequate attention to access to extension services and access to finance, but less so to access to markets and realizing deals with (large) buyer companies. So far very few deals have been made with buying companies.
- In its forward looking strategy PROOFS emphasized the need to seek crowding in of local market actors and therefore disrupting market systems less. The footprint of PROOFS will be reduced by increasing the prominence of private sector actors as key agents of change. The forward strategy for wider market strengthening will build on the successes of the first 2.5 years of PROOFS through continuing to support active collection points (CPs) and informal markets administered by market management committees (MMCs). CPs and MMCs provide producers increased access to markets by providing additional days for them to sell produce that are alternate to *haat* market days and closer to the farm gate.

- No specific attention for environmental or social sustainability issues.
- No specific attention for the relations with water management.

2. Char Development and Settlement Phase-IV

The Char Development and Settlement project (CDSP) has been ongoing since 1995, embarking on the development of subsequent chars, and gradually learning and improving its approach. CDSP IV focuses on 5 new chars with an area of 30,000 ha and an estimated population of 28,000 households. For CDSP IV most relevant are the following 2 impact pathways towards improved food security:

- Value chain development, including access to good practices (extension), markets and finance
- Agricultural production and water management

We present the main results, based on project reporting and interviews held with project staff. The results are mainly based on the last Annual Outcome Survey 2015, which also makes a comparison of progress in CDSP IV areas with those in CDSP I, II and III areas.

1. Value chain development

Access to knowledge, inputs and to markets

- CDSP IV is concerned with the overall development including support to agricultural activities for settlers on newly acquired lands.
- CDSP IV provided training, with free inputs and supporting credit schemes, on vegetables, fruits, poultry, livestock and aquaculture. For instance, on homestead gardening they received trainings on seed varieties, organic farming, sex pheromone traps and the use of vermin compost, and received inputs like seeds, hand sprayer, mustard oil cake, pheromone trap, and measuring balances.
- Producers were also supported to work together to identify problems and opportunities for collective sales and purchases. Producer Groups and Collections point Management Committees were formed.
- In the CDSP IV areas, during the last 4 years there has been a significant change in terms of the principal occupation of HHs, i.e. the occupation that provides the main part of the annual income. Agriculture as principal occupation has decreased from 37% to 24% of the HHs, and there has been a related increase in other occupations and jobs. In the other CDSP areas, a similar trend can be observed.
- In terms of access to markets the situation has much improved during the last 4 years. The road network has improved to such an extent that the time it takes to reach a market has declined from an average of 49-62 minutes to 20-25 minutes (depending upon the season).
- In terms of shocks and crises (mainly floods, cyclones and droughts), there have been much less in 2015 than during the previous years.
- The CDSP monitoring reports do not provide information on access to inputs or access to finance.

Increased crop productivity

- In CDSP IV areas the average land area being used has increased very little (from 53 to 58 decimal per HH) but cropping intensity has increased from 105% to 183% during the last 4 years, due to increased coverage of rice and cash crops during the robi season. Cropping intensity is now at a higher level than the other CDSP areas. Note that the national average benchmark is 191%.
- Productivity (yields) of rice have increased and are now at a similar level as the other CDSP areas, but rice production per HH has (slightly) decreased, demonstrating that less rice but more other crops are being cultivated.
- Yields of other crops could not be estimated, due to very large variations, but average sales of other crops have strongly increased, and so have consumption and incomes from other crops.

Increased HH crop profitability and incomes

- In terms of revenues from different agricultural activities, the following patterns emerge:
 - Consumption of rice and revenues from rice have declined, for all CDSP areas, by 10-20%.
 - The cultivation of homestead vegetables and fruits has increased significantly, and so has consumption and sales of vegetables and fruits within CDSP IV areas during the last 4 years. While this is a significant trend for the CDSP IV areas, a similar (but less strong) trend can be observed in the other CDSP areas, suggesting that this is a general trend. The increase in revenues from vegetables and fruits shows much variation depending upon the type of product, up to a three-fold increase.
 - Similar to vegetable and horticulture, the production, consumption and revenues from poultry farming have significantly increased in the last 4 years for the CDSP IV areas. However, similar revenues were observed in the other CDSP areas, although the rate of increase was somewhat lower, so that currently the levels are comparable. Revenues from eggs and from poultry meat have more than doubled during the last 4 years.
 - The production and incomes from aquaculture have shown a dramatic increase, in terms of the number of households conducting aquaculture, yields (increase by 86% to 205%), production, consumption and revenues from sales. For CDSP IV areas the increase in revenues per HH from aquaculture during the last 4 years has been 246%. Again, this is a general trend.
- In terms of overall HH incomes in CDSP IV areas during the last 4 years the increase has been from BDT 72,000 to 163,000 (EUR 1000), which is a 126% increase. This is comparable to income increases in the other CDSP areas (being 133% and 142%). It can be observed that the most important sources of income and rate of increases are the following (indicated are the absolute contribution and the rate of increase during the last 4 years):
 - Wages: 44,946 BDT (+ 33%)
 - Petty trading: 24,912 BDT (+ 262%)
 - Field crops 19,113 BDT (+ 22%)
 - Homestead gardening: 18,143 BDT (+ 482%)
 - Aquaculture: 15,633 BDT (+ 476%)
 - Poultry: 10,647 BDT (+ 464%)

Changes in food security and health

- In CDSP IV areas, HHs stated that the months that they were not able to meet their basic food needs has declined from 5 to 3 months. This situation is comparable to that in the other CDSP areas.
- The 2015 progress report notes the following changes since the start of the project:
 - Stunting; no changes
 - Underweight: 14% reduced
 - Malnutrition: 4% reduced
 - 260% increase in HH assets
 - Number of HHs with 5 months or more of food shortage, reduced from 46% to 24%
- It is concluded from the CDSP data on production, sales and food security, that sales of production are used to meet up with production costs and other cash requirements and are not the HH food surplus, since there are still gaps in food security. Also it shows that there has been a strong increase in HH assets, while stunting has not decreased and also the other health indicators have shown slight improvements. Apparently, increased revenues are firstly invested in improved assets.

2. Agricultural production and water management

Water management activities

Following is a summary of information regarding water management results (last information from 2015 progress report):

- CDSP IV continued its activities on the completion of infrastructural works including the drainage of khals leading to crops being saved from water logging and tidal inundation.
- The midterm evaluation report notes that as a result around 60% of empoldered land has reduced soil salinity, flooding and improved drainage.
- The project strengthened and built capacities of Water Management Groups (WMGs) and Water Management Associations (WMAs), completed in December 2015. Since its formation the WMAs met more than 20 times and discussed issues such as: water management problems, membership of WMGs, participatory water management, land settlement issue, infrastructure development such as excavation of khals, protective works required to stop erosion, new earthen roads, construction of bridge/ culverts, raising of cyclone shelters campus including construction of pit latrines.
- It is reported that registration of WMOs (WMGs and WMA) is moving slow due to the procedure laid down in the rules (notably that at least 55% of the water users within the proposed operational area needs to be enrolled in WMG as members). Among the WMGs, in general all planned monthly meetings of the WMGs are being held, with average attendance around 55%. Relevant to our theme are the following problems that were discussed in WMA and WMG meetings:
 - the need for excavation of khals to resolve water logging and drainage problems;
 - more training of WMG and WMA members on accounts management, leadership and group management including O&M and feasible income generating activities;
 - creating more employment through Labour Contracting Societies works for WMG members during the slack period to reduce out migration;
 - Ten WMGs have accumulated a capital of BDT 2 million as their savings, share and profits from economic activities undertaken by them.
- Activities undertaken by WMGs included the removal of cross dams and fishing traps with the support of local governments from their respective canals to reduce water logging in the area.
- The last progress report concludes that Water Management Organisations appear as one of the vital instruments to maintain liaison with different implementing agencies to negotiate their work orders regarding O&M works, WMG centres and LCS works. Many WMGs in association with their respective UP took initiatives to repair roads and clean khals and identify scopes for new infrastructures. Due to WMG meeting and counselling, women are also said to be more empowered than before, by actively participating in meetings, events for world observing days, communicating with NGOs and GoB service providing agencies. WMG representatives emerge as informal social leaders of their respective areas. It has been observed that community people often come to them in case they have any problems instead of going to local UP. WMGs organized by CDSP IV are contributing significantly in changing the local power structure, putting the poor and marginalized class in the decision making process.

On the relation between agricultural production and water management

From the above data it clearly appears that in the CDSP areas there has been increased agricultural production during the last few years as well as improved functioning of water management organisations. The CDSP project did not specifically look into the relation between these two dynamics. However, from the above findings it can be concluded that:

- There is a decline of problems related to water management influencing agricultural production, including drainage. However, problems of soil erosion and water logging remain to be frequently mentioned by WMGs as priority issues to be addressed. Especially the cleaning of khals is a priority.
- There is good collaboration with local governments (Unions).
- The activities undertaken by WMGs include the removal of cross dams and fishing traps with the support of local governments from their respective canals to reduce water logging.
- For WMG members the social functions of credit and savings as well as organizing and providing labour opportunities (through LCS) appear to be very important.
- The above should be placed in the context of the CDSP project that continues to make available funding for the different institutions involved in maintenance of water infrastructure. The

contributions to O&M activities by BWDB and Local Government are still based on project funds reserved under the development budget, rather than a revenue budget.

- There are no indications that the WMGs acquire their own financial means. This raises questions about sustainability.

3. Improving Food Safety

For the project Improving Food Safety most relevant are the following 2 impact pathways towards improved food security:

- Value chain development, including access to good practices (extension), markets and finance
- Nutrition and food safety

We present the main results, based on project reporting and interviews held with project staff.

1. Value chain development

Access to knowledge, inputs and to markets

- In value chains, the strategy is to incentivize an expanded network of farmers and supply chain actors within the current upazilas and urban areas to connect with domestic and international markets.
- Nationwide a commodity survey was conducted, to select priority commodities, being fish, poultry and horticulture (brinjal, potato, tomato). In these commodities, the focus was at the analysis of food safety contaminants: pesticides, heavy metals, antibiotics, pathogens. The surveys took place in 22 districts, with >220 markets visited and >2,500 samples collected (end of 2015).
- The project developed food safety guidelines in the poultry, farmed finfish and horticulture supply chains and trained 1500 farmers in 75 upazilas through a cascaded farmer field school approach. In total nearly 100 Certified Master and 300 Lead Trainers within the relevant ministries for the poultry, fisheries and horticulture sectors were trained. Hazard assessment across the value chains have been carried out and points of intervention identified.
- For example, in the fishery sector, the project is collaborating with the Bangladesh Shrimp and Fish Foundation and the Department of Fisheries (DoF) to develop food safety guidelines for the fish value chain. Training was provided on Good Agriculture Practices to 30 Master Trainers, 100 Lead Trainers, 500 Lead Farmers and 200 Value Chain actors. These guidelines were converted into 10 operational controls at key points in the value chain including the hatchery, the nursery, pond preparation, inputs, harvest, post-harvest, transport, storage, wholesale and retail. The implementation of these guidelines at the upazila level was monitored by DoF officials.
- Value chain models were established to demonstrate impact of improved food safety, so far with four successful shipments of mango to Asda (part of Walmart Group) in UK.

Increased HH crop profitability and incomes

- In the selected value chains, training was provided, in order to implement food safety control measures and demonstrate how these can contribute to higher incomes (win-win options):
 - in fisheries, relevant improvements are reduced wastage and improved hygiene, leading to less fish losses, improved fish quality, improved incomes and improved food safety.
 - in poultry, rearing poultry using 'Zero' antibiotics can lead to dramatic decline of medicinal costs and improve profits from BDT 40-60,000 per 1000 chickens.
 - In brinjal (aubergine), pesticide and fertilizer costs can be halved, leading to better quality and appearance, thus reduced costs and increased price from BDT 14 to 28/kg

Improved revenues for value chain actors

- A pilot street food cart initiative in Khulna has transformed this city in South West Bangladesh into the street food capital of the country. In total 700 vendors were trained in Good Hygiene Practices, 500 provided with new carts, monitored by local agencies. In Khulna, this street food initiative was further expanded with the handing over of 200 more carts by the Programme to the Khulna City Corporation (KCC). Vendors report a doubling of incomes, consumers report lower incidence of illness, other carts are copying the design and learning the good practices. A framework for sustainability of the street food intervention and a model for its replication have been developed.
- Dhaka and a few other smaller towns are now the target of the Project's street food interventions. In April 2016 the Dhaka South City Corporation (DSCC) formally handed over 80 food carts to as many trained vendors at a ceremony with a view to ensuring safe street food and improving public health.
- The monitoring of farmers and supply chain actors shows that uptake and benefits are positive for both food safety and business income.

2. Access to nutrition and food safety

Improved access to knowledge on good nutrition and on food safety

- The project developed initiatives and Information, Education and Communications (IEC) materials to enhance awareness of food hygiene and safety among targeted groups – household food preparers, school children, street food vendors and advocacy groups – with a strong recognition of gender sensitivity. Through the Bangladesh Food Safety Network, comprised of five founding NGOs, advocacy activities have been organized in every division of Bangladesh and have involved among others opinion makers, community and religious leaders, politicians, civil servants and journalists.
- The Children's Education Programme reached 3 million primary school children and 8,500 Scouts villages, as well as 500 head teachers

Improved access to means to improve nutrition and food safety

- The other approach is to establish food safe upazillas, the first one has been Delduar.⁹ In this food safe upazilla there is joint monitoring by agriculture, fisheries and health departments, safe food selling at Union Parishad premises, discussion with food businessmen about food safety issues, awareness raising on use of formalin and other chemicals, and effective coordination and cooperation of all departments on safe food issues

Capacities to improve food safety system

- One main goal was to strengthen the national food analysis capacity, in order to generate reliable data on food hazards and risks. To do so, the following results were achieved:
 - National Food Safety Laboratory operationalized and Bangladesh Food Safety Laboratory Network comprising more than 20 food analysis laboratories in the country. Capabilities at five other laboratories – Bangladesh Standards and Testing Institution, Bangladesh Agricultural Research Institute, Department of Food, Dhaka University (Chemistry department) and Central Disease Investigation Laboratory – that are involved in food safety testing in the country have been enhanced by provision of training and equipment
 - Currently around 100 client tests are being analyzed/month with revenues of BDT 2 million annually
 - Reference test methods available for over 100 contaminants, including pesticides, mycotoxins, heavy metals, additives, food colours, antibiotics and food-borne microbes
 - Research and training activities, with over 25 analysts provided technical training in Bangladesh and abroad and over 20 laboratory managers trained in accreditation (ISO17025)
- Another goal was to establish risk-based food inspection and enforcement, including:
 - Risk categorization based on product and scale
 - Audits of hygiene and cleanliness in markets
 - >900 inspectors from 4 Ministries trained and resourced with motorcycles and sample collection kits

⁹ <http://www.fao.org/in-action/food-safety-bangladesh/news/detail/en/c/379839/>

- The development of risk-based food inspection plans (targeted in 64 districts)
- In terms of institutional and legal systems, the project participated effectively in development of the Codex Alimentarius and food standards development and national training workshops were held with international Codex experts. The project drafted the Food safety policy.

On sustainability and systematic changes

- In relation to the activities at value chain level, the uptake of food safety measures in many cases is related to the win-win option of reduced use of chemicals and increased profitability. In that case it will be a cost-effective measure to implement. However, there may also be instances where such win-win options are not available. Much will also depend upon the market demand for safe food products. It appears that domestic demand for such products is increasing, but there are still very few specific selling points.
- A 3 years extension of this project has been provided (up to end 2018). By that time it may be expected that capacities are sufficient to assure that the good results achieved will be sustained and expanded, especially by using the guidelines for improved food safety across selected value chains.

4. Scaling up rice fortification

For the project Scaling up Rice Fortification most relevant are the following 2 impact pathways towards improved food security:

- Value chain development, including access to good practices (extension), markets and finance
- Nutrition and food safety

We present the main results, based on project reporting and interviews held with project staff.

1. Value chain development

Access to knowledge, inputs and to markets

- The project aimed to introduce feeding with fortified rice in garment factories. By early 2016, this has started in 1 garment factory on a trial basis, one additional factory is expected to do soon. Fortified rice will be distributed through meals to 100 female workers, and will be accompanied by a monitoring system that also looks at a control group. This component has taken longer than expected as the factories are cautious.
- Another initiative has been to work with the Global Alliance for Improved Nutrition (GAIN), which is conducting a pilot project in Bangladesh that involves the introduction of meals to garment workers at Columbia garments. GAIN has agreed to include fortified rice in this pilot project. WFP and GAIN had a follow-up discussion with garment factories on issues related to the supply of fortified rice. Abdul Monem Limited will start supplying fortified rice to Columbia Garments directly from January 2016 for 1,967 workers, among whom 1,164 workers are females.
- In order to get more factories interested and participating in providing fortified rice to their workers, WFP is also working with Better Work Bangladesh (BWB). There is need for research on an upscaling strategy.

Increased HH crop profitability and incomes

- The interest for garment factories to introduce fortified rice is to (i) reduce the large turn-over of employers, (ii) reduce absenteeism, and (iii) reduce faults. In parallel with the introduction of fortified rice, there will be training on improved working conditions.
- A monitoring protocol was developed to measure the outcomes of the introduction of fortified rice in garment factories. A baseline survey has been done. The assessment is aimed at:

- The changed prevalence of anemia
- The change in food consumption patterns
- The change in gender relations.

2. Access to nutrition and food safety

Improved access to knowledge on good nutrition and on food safety

- Awareness raising within HHs and especially among men and women is undertaken, in order to generate nutritional awareness among women of fortified rice, and thus assure that women with support by men are able to act on their knowledge for purchasing fortified rice.
- An acceptability study was conducted, which shows that there are no difficulties among target groups on the acceptability of fortified rice.

Improved access to means to improve nutrition and food safety

- The Directorate General of Food procured 42 mt of fortified kernel from Abdul Monem Limited (AML), for blending with normal rice for distribution in the in the ten upazilas where the Government is distributing fortified rice under VGD. AML imported extruder (twin screw) machines from China and carried out several trial production runs of fortified rice kernel. The samples were tested in international independent laboratories to check for quality and the standard of the micronutrient status in the fortified rice kernel was finalized. For the blending and mixing of kernels with normal rice, the selection process of local millers is ongoing as per the extension of VGD coverage areas. Thus far, four blending facilities have been established and five more are underway.
- By the end of 2015, a total of 66,107 participants and a total of 272,545 beneficiaries received fortified rice through different programmes supported by the project. We highlight two programmes:
 - The project mainstreamed fortified rice in Government safety programs have so far reached a total of 150,280 beneficiaries through VGD with fortified rice distributed in 13 upazilas of 8 districts. Further scaling up is expected to be done with Government resources, to reach 250,000 participants, as part of the vulnerable group development programme (VGD). Beyond 2016, WFP expects the Government of Bangladesh to take over all of the WFP-funded upazilas.
 - The project also introduced fortified rice in two WFP-supported programmes, being the school meals initiative and the enhancing resilience to natural disasters and the effects of climate change programme. The school meals programme is government funded and used to hand out fortified biscuits, which is intended to change to meals with fortified rice. In 2015, a total of 19,000 school children were beneficiaries of the programme, with 100 percent of the targeted children receiving 235 mt of fortified rice served as a hot meal.
- There has been training of VGD participants on the nutritional benefits and use of fortified rice as well as its socio-economic advantages, focused on women, reaching in total 30,056 VGD participants.
- There has been awareness raising among District and sub District agencies on the importance of fortified rice. Fortified rice will in the market place mid 2016. DSM notes that a 3-4% price increase is required.

Appendix 5: Detailed study on water management

1. Purpose

This Appendix presents the findings and conclusions of the Water Management Component (in relation to food production) of the IOB commissioned Impact Evaluation of the Dutch Food Security Program, Country Study Bangladesh. The water management component focused in particular on the Blue Gold Project.

The main ToR for the FS Evaluation formulates the overarching questions as follows:

1. What has been the effect (outcome) of Blue Gold on the sustainable functioning of water management institutions and what was the resulting effect on the water infrastructure?
2. What has been the effect (impact) of the functioning of water management institutions and water infrastructure on household level production, income and food security?

In addition, a third objective was added to this study, as follows:

3. What are relevant experiences of development projects concerned with participatory water management and rehabilitation of water management infrastructure in polders in Bangladesh, other than the Blue Gold Project.

To do so, the following projects water management projects were analysed for this study.

1. IPSWAM: Integrated Participatory Sustainable Water Management Project (2003-2011); BWDB, GoN; large coastal polders; first project to pilot WMA/WMG systematically with BWDB; rehabilitation and WMA/WMG formation; strengthening of BWDB in PWM (establishing a water management cell). Water management mainly based on primary level water management.
2. SWAIWRMP: Southwest Area Integrated Water Management Project (2006-2023); BWDB, ADB, GoN; large further inland polders close to the coastal zone; rehabilitation and WMA/WMG formation; in 2015/2016 extended with new funding. Water management initially focused on primary water management, but in due course sub-unit water management addressed as well.
3. (SSWRSDP: Small Scale Water Resources Sector Development Project (1998-2017+); LGED, ADB, GoN (+JICA, IFAD); series of 4 projects, concerned with the smaller polders (<1,000 ha); rehabilitation and WMCA formation; completed almost 1,000 schemes, throughout Bangladesh. Water management focused on primary water-management.
4. KJDRP: Khulna-Jessore Drainage Rehabilitation Project (1994-2003). Improving water management in polders which by the Coastal Embankment Project first of all were protected against floods / cyclones without due regard for water management. Main concern was the internal drainage and that of adjacent rivers. The project represented a mix of tidal river management and the solution of polder infrastructure.
5. WMIP: Water Management Improvement Project (2007-2016). BWDB, WorldBank (+GoN). Rehabilitation and formation of WMA/WMG, following principles developed by IPSWAM.
6. CDSP: Char Development and Settlement Project (1995- ongoing). BWDB, GoN, IFAD (+DFID a.o.). Reclamation of large new tracts of coastal chars (accreted land) by turning them in “polders”, including the formation of water management organisations and an array of Local Field Institutions (LFI). Under CDSP a great number of government organisations cooperate.

2. Background

Policy context and government regulations

In Bangladesh participatory water management is a formal policy. Its implementation is mainly supported by a range of donor projects. The following are the main relevant policy frameworks:

- NWPo: National Water Policy (1999). Established responsibility for small (<1,000 ha) and large (>1,000 ha) water management schemes, introduced the need for stakeholder participation and public/private contributions, including the gradual handover of responsibilities for management to local and community organisations, beginning with the ones that are in good condition and satisfactorily managed. States that cost recovery is not the first aim. A period for implementation of the policy is not mentioned. For organising stakeholder participation, it refers to the GWPM, and to the need to develop a legal regulatory framework. For the small schemes it talks about local ownership, for large schemes it talks about joint management.
- GPWM: Guidelines Participatory Water Management (MoWR, 2000). Joint effort of all agencies concerned. Serves as a code of good practice for stakeholder participation in all stages of water management “projects”. Stakeholder participation is not limited to WMOs, but the GPWM sees the WMOs as the central organisation for water management in which participation of others come together. No formal rule on institutionalization as yet, but proposes tasks and responsibilities of WMG, WMA, WMF. Each agency may set its own detailed practices.
- PWMR: Participatory Water Management Rules (GoB, 2014). The legal follow-up as announced in the NWPo. Published in the Government Gazette, referring to the Water Board Act, 2000. Established the institutionalisation of the WMO. Ruled that the in the larger polders (>1,000ha) the WMF, WMA, WMG would be registered with the BWDB. In the smaller polders the registration of the WMCA is with the DoC. Registration gives the different WMO amongst others the right to levee fees from members, engage in contracts and operate a saving- and loans facility. All “beneficiaries” in the broadest sense may register as members WMO, with 55% of beneficiary households being the minimum requirement. Describes the shared responsibilities of WMO and GoB, the role of WMA and WMG, but is very cautious about financial contributions of WMOs, which will be a gradual process “infusing”.

Different models in implementing water management organisations (WMOs)

Building upon above mentioned government regulations and referring to positive project experiences, the benefit of having WMOs is undisputed in any project report and (external) evaluation, the concern is their sustainability in performing especially water management operational tasks and lower than expected contribution to maintenance (see list of specific definitions of different water management organisations at the end of this Appendix).

Development projects do play the important role in the formation of the different WMO. Although the approaches differ somewhat in detail, in general they all follow the principles as defined in the GPWM/PWMR, guiding the formation of WMO by placing facilitators in the area and involving the WMO in the full “project cycle”. In Bangladesh, there are hardly WMO which not have been formed in the context of development projects. Although the formation of WMO is a government policy, it only occurs in those “project” areas¹⁰.

The main difference between the development projects is the extent to which WMO are to be involved in activities other than water management. The BGP has chosen to use WMG as the entry point and involve the WMG also in the project activities related to improving agriculture and the agricultural value chain, with the FFS as a main vehicle. IPSWAM was restricted to water management, but SWAIWRMP and SSWRSDP both have a more inclusive approach like BGP and differences between these projects are in the details. The reasoning is that WMO will be more sustainable if they are capable of having more

¹⁰ It is sometimes hypothesized that this makes it more difficult to ask contributions to maintenance from WMO members, because in neighboring areas no such contributions are asked.

responsibilities than water management alone, including possibilities for gathering funds, which would then benefit operation and maintenance. However, their formal mandate, as described in the PWMR, is concerned with operation and maintenance of water management infrastructure.

The need to rehabilitate water management infrastructure

The polders have a long history of interventions by dedicated development projects. In spite of these various interventions, water management infrastructure and water management organisations require renewed support to be rehabilitated or revitalised. The following gives an overview of the background of the polders in this study:

- In beneficiary Polder 30 (Khulna District), IPSWAM has been active in the years 1999-2011, including the formation of WMG and rehabilitation of infrastructure; BGP activities have started in 2013.
- In beneficiary Polders 43/2D (Patuakhali District), IPSWAM has been active in the years 1999-2011, including the formation of WMG and rehabilitation of infrastructure; BGP activities started in February 2014.
- In control Polder 27/1+28/1 (Khulna) activities of the Khulna-Jessore Drainage Rehabilitation Project (KJDRP) took place in the years 1994-2002 and included the formation of community level water management groups.
- Control Polders 47/3 and 47/4 (Patuakhali) have been rehabilitated by ECRRP in 2007, which focused on rehabilitation of infrastructure, but did not include organisational management such as the formation of WMG, which to date do not exist in these polders.

The need to rehabilitate water management infrastructure is the starting point of all projects and all projects have an investment component. Investments are paid from both the GOB development budget and the loans, while technical assistance is paid fully from loans or grants. The following testifies the need for rehabilitation:

The BGP formulated Polder Development Plans (PDP). The PDPs of P30 and P43/2D list a great number of rehabilitation needs of the primary infrastructure (amongst others 30 of the 38 sluices, 40 of the 80 km embankment). These polders were also rehabilitated by IPSWAM, less than a decade ago. The FGD (2014 and 2016) confirm the strong wish of polder inhabitants to improve the water management infrastructure. The baseline survey in 2014 are as follows.

HH experiencing water management problems in the past 2 years (% of HHs from HHS)

| | P30 | P43/2D |
|---|------|--------|
| Water management problem | | |
| Lack of water | 29.5 | 22.5 |
| Water logging | 4.0 | 28.0 |
| Salinity | 32.0 | 22.5 |
| Other | 11.0 | 1.0 |
| Consequence for agricultural production | | |
| Crop yield less | 75 | 57 |
| Crop destroyed | 35 | 39 |
| Planting postponed | 23 | 20 |
| Fish/livestock affected | 18 | 6 |
| Land cannot be used | 16 | 1.8 |

The first BGP monitoring report (2016) on mung bean and sesame production, the cultivation of which was encouraged and guided by the project, stated that above all water management problems should be addressed. In the very first year (2016) harvests failed because of exceptional rainfall in the dry season with which the (local) water management system could not cope.

The O&M manual (2011) of the SWAIWRMP states that “for the BWDB it is at this moment very difficult to provide the required level of operation and maintenance because of shortage of funds, lack of clear

procedures geared to O&M, lack of co-ordination, no participation of beneficiaries”. The Feasibility Study for Beel Sukunia (2011) says “maintenance of the system is at present negligible”.

The assumed relation between water management and agricultural productivity

All project preparatory documents of the different development projects and the project evaluation reports are (very) positive about the potential increase of agricultural production as a result of improved water management made possible by the rehabilitation of the existing water management infrastructure. All analyses also report that the rehabilitation is necessary, generally because of deterioration of existing infrastructure due to insufficient periodic maintenance, but also because of extreme events, notably cyclones¹¹. All projects embrace the approach of PWM for three main reasons: (i) better (equitable) decision-making on complex water management interventions, (ii) encouraging more sustainable maintenance, and in the later projects (iii) optimizing agricultural benefits from improved infrastructure. The NWPO, the GPWM and later the PWMR guide the methodology applied. Consequently, all projects have (had) three main components: (i) rehabilitation of main water management infrastructure (funded by GOB and donors), (ii) formation / strengthening of water user organisations (mainly funded by donors), and (iii) improving agricultural production, often through involving WMO and FFS.

3. Effectiveness: Operation and Maintenance

3.1 Operation of water management infrastructure

Operation of the Khal

At the ‘highest level’ of the water resources system we find the main *khal*. Its management (ownership) falls under the responsibility of the BDWD. For the upstream (inland) WMG and for the lower lying areas, the effectiveness of drainage through the main sluice is often reduced by the fact that the main *khals* are not in good condition. This is not only frequently mentioned in the FGDs conducted by this study, but also a recurrent issue mentioned in other PWM projects, in the past (IPSWAM, SSWRSDP-1) and present (SWAI, SSWRSDP-2, BGP). This is partly due to other uses of the *khals* and partly due to negligent maintenance¹². Actually, the IPSWAM (PCR, 2011) concluded that all infrastructural works were finalized except the restoration of *khals*. This would be undertaken by BWDB in the years after the project, but it seems that that did not happen.

Generally, development projects handover a *khal* in fairly good condition: clean, with smooth slopes and embankments; they cannot always restore the *khal* to a kind of design cross-section (if it exists), but major bottlenecks will have been removed. WMGs are generally able to keep the *khal* clean by removing water hyacinth and repairing slopes, but they consider removing silt often beyond their capacity and energy¹³, also because it is a problem only (slowly) accruing over-time and as such difficult to manage. The WMG often face two operational issues, typical for quite some of the water schemes in Bangladesh, which they find difficult to address because they involve influential persons (FGDs 2014 and 2016, and reports from other projects):

Khals are (often) used for cultivating fish, and for that purpose private persons build small cross-dams to conserve water and occasionally force drainage to happen (cutting dams and if necessary opening the

¹¹ The coastal area in which BGP is active, was struck by two successive cyclones in 2007 (Sidr) and 2009 (Aila). The IPSWAM project was extended until 2011 with the specific purpose to restore damage to its’, at the time recently, rehabilitated infrastructure.

¹² In some cases, the river on which the *khal* drains is silted up as well, which constrains drainage (this is partly the case in P30); the development projects considered here generally do not tackle this constraint, for which no easy sustainable solutions exist (for reference see for example the KJDRP and CEP projects).

¹³ The (expected) rate of siltation is an unresolved point of discussion in Bangladesh, with high differences between *khals*.

main sluice) to be able to catch the fish. The license for cultivating such fish is given formally by the BWDB or informally by dominant persons. Cross-dams are also built to maintain water-levels for higher lying areas at the cost of lower lying areas; this would especially lead to different potential for the cultivation of dryland crops in the dry (*rabi*) season. These cross-dams often constrain drainage of upstream areas and debris causes further siltation.

Next to the erection of cross-dams, people tend to encroach upon the *khals*, by using different levels of the levees of the *khal* for cultivation of crops on residual moisture. This restricts the drainage function of the *khal* and increases sedimentation, for example because vegetation is not removed after harvest.

WMG have frequently stated (FGDs 2016) that they have requested BWDB to be allowed to take over the right to lease out the use of water bodies, but this has not happened as yet. Actually, the PWMR encourage this role of the WMG, especially because it is seen as a fund raising mechanism for WMO to cover O&M costs¹⁴.

Operation of the Main Sluice

The main and most important operation carried out by the WMA/WMG is the operation of the main sluice, essentially closing or opening it. It provides flood protection, prevents salt intrusion and maybe most importantly it influences the water-level in the polder, facilitating drainage, irrigation and water conservation. As water management interests differ, there are different (opposing) wishes with respect to the operation of the main sluice. Compromises have to be made and groups of people exercise influence.

All projects provide for well working main sluices and train the operators. While in the smaller polders the mandate for operating the sluice was fairly well defined to be with the WMCA, the projects in the larger polders were much less clear on this. This has changed for the better since the introduction of the PWMR.

The WMG report (FGD, 2016) that they now have better control of the operation of the main sluice than before as a result of the re-registration of the WMA/WMG with the BWDB, rather than with the DoC. As a result, they now have the mandate to operate the sluice, which actually is “owned” by the BWDB. When WMG were still registered with the DoC, the operation of the main sluice in the larger polders was less clearly defined and often dominated by a specific interest group with good connections to a more distant BWDB. The better control of the operation of the main sluice in the larger polders is considered one of the main benefits of the reregistration and consequent formal closer connection to BWDB and the renewed interest of BWDB in PWM. This observation is corroborated by other PWM projects, notably SWAIWRPMP¹⁵.

Nevertheless, the operation of the main sluice remains a challenge and the influence of dominant interest groups cannot always be prevented¹⁶. Also, WMG further away from the main sluice complain that they insufficiently can influence the operation, while they often have different wishes because for these more inland areas drainage is often more difficult (BFG 2016, P43/2D).

Operation at Block – and Field Level

The operation of the main sluice can only provide water management conditions which are a compromise of different wishes. At the local block level, small structures (inlets, pipes, small (temporary) gates, pumps) may help to cope with local differences. These are operated by farmer

¹⁴ In the smaller projects (LGED with SSWRSDP) the licensing is a lesser issue (*khals* are short, there is only one WMCA, and clearer rules and practices have developed over a time span of 15 years with support of DoC and LG). Experience and practices in larger polders is much more recent.

¹⁵ Also the baseline FGDs of 2014, which were conducted before reregistration, elicited more complaints about the interest groups in this respect than the FGDs of 2016 did.

¹⁶ Also in the smaller polders under LGED custodianship, where the mandate for operating the main sluice is clearly with the one and only WMCA, the difficulty of resisting interest groups is frequently mentioned.

groups, but the system is not well developed at all. The custodian to promote this level of water management and guide farmers is not well defined, would most likely be the DAE. It is too detailed for the BWDB, which handles the main infrastructure. DAE is present in all polders, (in)formally liaised with the offices of Local Government. Earlier projects (IPSWAM) and also current SSWRSDP, cooperated whenever possible with the regular programme of activities DAE, but this regular programme hardly has an adequate water management component. Both in SWAIWRMP and in BGP, DAE is a partner in the project and shares in the facilities provided. DAE has only recently embraced the aspect of block-level water-management and is building up capacity.

Infrastructure for this level of water management operations is modestly provided by projects. The attention for this level of water-management is growing. While IPSWAM paid scantily attention to it, the SWAIWRMP considers it as one of the main achievements and recently also BGP is paying (much) more attention to it after a successful pilot¹⁷. WMG or Farmer Groups have taken up a role, either by coordinating water management operational aspects or by coordinating cropping (type and timing). One of the movers behind this level of water management is the FFS, which especially in BGP pursue the diversification of agricultural cropping focusing on vegetables and cash crops (sesame, mung bean, sunflower, etc.) in the non-monsoon seasons. While in the baseline FGD (2014) the main crop discussed was rice, in the impact FGDs (2016) the *rabi* crops were most prominently discussed. Unfortunately, local water management was not always sufficiently developed as yet to cope with occurrences, such as the unexpected rainfall in February 2016. BGP mentions that the productivity gain that the project can achieve is probably much higher in the dry season than in the wet season (personal communication, April 2016).

The BGP Strategy for upscaling CWM does not provide quantitative data really on the goal to be reached. The pilot included 22 ha, in which IRRI provided the agricultural inputs and BGP the water management knowledge and infrastructure. The target is to have a demonstration pilot on 10 polder catchments and focus on horizontal learning. CWM does not only include improved water management but also a highly improved mix of crops, seeds and fertilizers¹⁸.

3.2 Maintenance of water management infrastructure

Approach to maintenance

Establishing sustainable maintenance is a major goal of all development projects. This in fact started as early as 1990 with the Sustainable Reclamation Project, but received an important boost in attention with the introduction of the concept of Participatory Water Management in the late 1990s. All projects now have extensive O&M manuals.

The larger polders (>1,000 ha, responsibility BWDB) use all the same paradigm: there is a shared responsibility, where beneficiaries represented by WMOs contribute to the maintenance next to the responsible government agencies. The BWDB and the WMA / WMG will sign an agreement on the maintenance of the polder, based on an annual maintenance plan, which is jointly prepared. The BWDB,

¹⁷ The BGP Inception report does not yet pay attention to this level of water management. The pilot was initiated with a student from Wageningen University (Martina Groenmeijer, 2015. Baseline Community Water Management Pilot) and followed by a BGP Strategy Document on Community Water Management (March 2016).

¹⁸ The lessons of the first year are: (i) a motivated and active WMG is of major importance when it comes to implementing CWM, (ii) a good relationship between WMG members, and between neighbouring WMG/farmers at WMA level is important, (iii) giving the WMA a leading role in the facilitation of the decision making process helps, (iv) The WMG/WMA should maintain a linkage with LGs for conflict resolution (e.g. contribution of land for improving drainage), (v) adoption of improved varieties is not in all communities an easy process due to differences in: mind-set, marked-linkages, or cultural beliefs, (vi) trainings on field channel construction are successful as part of on-farm water management and have resulted in improved yields even though main *khals* were not yet fully excavated, (vii) the technical knowledge that was provided on operation of structures has been implemented by the WMG successfully, (viii) rice-fish culture (inter crops) was successfully adopted by another WMG in polder 30. But it became clear that rice-fish culture can only be implemented at specific locations.

WMA and WMG will organize their own commitments, from funding to implementation. BWDB is encouraged to contract maintenance out to WMA and WMGs. Especially LCSs are considered suitable for this.

In smaller polders (<1,000 ha, custodianship with LGED) the situation is theoretically more straightforward: completed projects (rehabilitation) are handed over to WMCAs, which are then fully responsible for O&M. However, in practice to date, the actual maintenance situation and practices do not differ much from the larger polders. The SSWRSDP O&M Strategy report actually advises a shared responsibility of WMCA and LG as WMCA cannot bear all the responsibility. The PWMR is not explicit on the distribution of responsibility for maintenance. The PWMR text transpires that “handing-over” of responsibilities is a longer term process (‘infusing the spirit of ownership among the local people”, “infusing the beneficiaries with zeal and enthusiasm to realize irrigation service charges”). SWAIWRMP has defined three forms of maintenance, which is largely followed by other projects, sometimes with different wordings¹⁹:

- a. Preventive (or routine), which is the “day to day” cleaning of canals, repairing small holes in embankments, revetments etc.²⁰; preventive maintenance is the responsibility of the WMA/WMG.
- b. Periodic, which covers large-scale non-emergency work requiring greater resources²¹; periodic maintenance is the responsibility of BWDB.
- c. Emergency, which is concerned with unexpected damage that threaten the project or scheme; emergency maintenance is the responsibility of the BWDB.

Estimated Costs

The operation and maintenance costs as estimated by BGP, IPSWAM, SWAIWRMP and SSWRSDP are given below in Tables 1 and 2. The estimated costs between polders differ by a factor 2-3. There is no clear relation between unit costs and polder size. The estimated costs (BDT/ha/yr) by the different projects in the larger polders (BWDB) are of the same order of magnitude. The estimated costs of the smaller polders (LGED, SSWRSDP) are clearly lower than the larger projects²².

Table 1 – Range of O&M costs as estimated by different projects (not corrected for inflation)

| All costs in BDT/ha/yr | BGP (2014) | IPSWAM (2008) | SWAIWRMP (2011) | SSWRSDP (2009) |
|------------------------------|---------------|------------------|--------------------|-------------------|
| Total O&M Cost | 900 - 1,900 | 636 - 980 | 380 - 1,700 | 200 - 300 |
| Preventive O&M | | 62 - 98 | 60 - 400 | 80 - 180 |
| Periodic O&M | | 574 - 883 | | 104 - 181 |
| Labour costs of preventive | 840 - 1,650 | | | |
| Material costs of preventive | 130 - 250 | | | |

¹⁹ E.g. BGP in its O&M manual mentions only routine, but it appears to be the combination of periodic and preventive maintenance

²⁰ SWAIWRMP lists the following. Embankments and roads: Repair of slips, Drainage and filling low pockets, filling of animal hole, repair of rain cuts, sealing of minor leaks from river side, prevent concentrations of water, removal of any obstruction, clearing bushes, repair and encourage growth of turf. Drainage Channels: removal of floating debris and water hyacinth, removal of any drainage obstruction, clearing of grass and weeds, sealing of minor leaks from the river, filling bank slip and sloughing

²¹ SWAIWRMP lists the following. Construction of new structures to enhance water resources management, major structure repairs and modifications, replacement or major repairs of gates and hoisting mechanisms, re-sectioning of flood embankments, re-excavation of drainage channels, repair of major erosion including slope protection, cross-dam construction.

²² There are a number of factors which may cause this difference: (i) on average these polders are located much more inland than the polders of the other projects, facing smaller rivers, etc., (ii) canal systems are generally short.

Table 2 – BGP (2014): Estimate of O&M costs for routine maintenance (responsibility WMG)

| BGP Polder: | P22 | P43/2F | P30 | P43/2D |
|---------------------------------|-------|--------|-------|--------|
| O&M cost total (BDT/ha/yr) | 1,901 | 1,625 | 1,080 | 969 |
| Labour Costs (BDT/ha/yr) | 1,651 | 1,395 | 941 | 837 |
| Material Costs (BDT/ha/yr) | 250 | 230 | 139 | 132 |
| Cost per household (BDT/hh/yr)* | 1,133 | 856 | 603 | 620 |

* BGP derives a cost per hh/yr, based on the total cost for O&M (labour and material costs) to be borne by the WMG divided by all the households in the polder²³. The HHS of 2016 gives an average ownership of 0.636 ha of cultivable land. This would bring the cost of O&M for an average household owning land to the following:

| | | |
|---|----------------|-------------------|
| Cost per land owning household (BDT/hh/yr)* | Polder 30: 686 | Polder 43/2D: 616 |
|---|----------------|-------------------|

BGP has distinguished labour costs and material costs, at respectively 84% and 16% of the estimated costs to be borne by the WMG. The SWAIWRMP has similar figures. This distinction between costs responds to the fact that most beneficiaries, if contributing (see below), prefer to contribute in-kind, i.e. labour.

SWAIWRMP has estimated an average cost for maintenance to be borne by the beneficiaries. of 150 BDT/ha/yr. This standard is applied in their development projects as a target for beneficiary contribution.

All projects state that the contribution demanded from the WMG for O&M is only a small percentage of the increased value of production as a result of the project interventions:

- The HHS of 2016 in P30 and P43/2D give an average household farm income of 190,000 BDT²⁴, indicating an increase of some 120,000 BDT since 2014. Additional non-farm income is twice this amount. It appears that the farm income per se, but also the increase of income alone easily covers the O&M costs (Table 2 above). The range of incomes however is very high and requires further study in this respect.
- The BGP, in their report on Maintenance Cost Analysis of WM infrastructure (2014) state that: "This implies that, for FFS participants, around 8.5% and 17.4% of the productivity increase will have to be invested to maintain the productivity gains. If only the real monetary contribution required is taken into account (material cost), this drops to between 1.1% and 2.3%. For landless households, an increase in workdays is expected of 252 hours. This means between 6.2% and 31.6% of the gain would have to be reinvested in labour."
- The IPSWAM Impact Evaluation Report (2009) mentions an average annual increase of household income of BDT 25,000, which is mainly attributed to the rehabilitation of the water management infrastructure. The SWAIWRMP Final Report (2015) observes that the annual average income per family has increased with BDT 14,250. The SSWRSDP in their 2003 EME report mention an average increase of 1.87 t/ha of yield of cereals and 1.5 t/ha of yield of non-cereals; it does not mention income. Also these figures suggest that O&M costs can be "easily" covered.

Actual Maintenance Activities

There are as yet only few useful quantitative data on the actual expenditure on maintenance. However, even if the data are available, it is difficult to draw relevant conclusions on actual maintenance for several reasons. One reason is that the projects BGP and SWAIWRMP are still operational and that maintenance expenses have not yet been made. Another reason why the data are often not easy to explain is the fact that the contribution of the WMG is mainly in-kind, which is not well recorded. Monitoring of expenditures in the IPSWAM polders stopped after the conclusion of the project in 2011,

²³ Such a figure is of course rather questionable. Would all hh pay?

²⁴ Report on HHS mentions USD. Exchange rate in this paragraph taken at 78 BDT for 1 USD.

but the baseline surveys for BGP may shed some light, as discussed below. Also the well documented SSWRSDP stopped monitoring of completed projects at the conclusion of each phase (2003, 2010), but some special studies provide indications. Finally, the actual expenditures by BWDB and LG on maintenance in a particular project are difficult to trace.

The IPSWAM Completion Report mentions that in the period 2006-2008 (i.e. after rehabilitation, but still during the project active period), the WMO conducted O&M more or less in line with the estimated average need for preventive maintenance, as follows:

- a. P30: 3746 person-days (pd) and 13,600 BDT material costs; with valuing 1 pd at 100 BDT, this amounts to 390,000 BDT, of which 96% is in-kind
- b. P43/2D: 4212 pd and 79,960 BDT material costs; with valuing 1 pd at 100 BDT, this amounts to 501,000 TK, of which 96% is in-kind.

The IPSWAM Evaluation (2011) rated the condition of the infrastructure (as per December 2009) as follows: P30: “Good to Very Good”, and P43/2D “Moderate to Good”. However, the Polder Development Plans (2016) prepared under the BGP for the two polders, apparently indicate that the infrastructure has started to deteriorate substantially, as they list the need for substantial improvements in those polders:

- a. P30: requires improvement of 17 km of embankments (39 km existing), 13 gates and gate-hoists (21 gates existing), 3 irrigation inlets, 20 km of *khal*s (168 km existing); total costs estimated 121 million BDT.
- b. P43/2D: requires improvement of 33 km of embankments (42 km existing), 17 gates and gate-hoists (17 gates existing), 32 km of *khal*s (180 km existing) and a great number of drainage outlets and irrigation inlets; total costs estimated 115 million BDT.

The base-line surveys (FGD, WMG and HHS, 2014) for this study in BGP polders P30 and P43/2D (which were IPSWAM polders) and conducted at the start of BGP, showed that the WMG had collected very few funds and that these funds were hardly spent on maintenance. The WMG surveys in 2014 in P30 and P43/2D qualitatively estimated that the actual implementation of O&M plans in the two polders were as follows:

- a. P30: WMG performed 60%, BWDB 28% and LG 18% of their respective commitment
- b. P43/2D WMG performed 40%, BWDB 20% and LG 10% of their respective commitment.

The actual maintenance under BGP is not yet known as BGP has, at the time of writing this report, not yet formulated the O&M plans with the different WMA/WMG as investments in infrastructure were still due.

The SSWRSDP O&M Strategy Report (2009) (which also could review longer time series after completion of WMG) states that most projects tend to deteriorate and fall into a “build-neglect-rebuild” cycle. The same report also concludes that the WMCA has the technical capacity to conduct the preventive maintenance. The report however also states that the WMCA cannot fully maintain the schemes (as was the original concept) and that joint maintenance with LG is required. The EME reports (2003, 2008) of SSWRSDP provide data on both capital and in-kind contributions to maintenance, state that progress is being made, but that contributions are still well below the “engineers estimate”.

The actual expenditures by BWDB and LG in particular polder areas are not known to us. As stated above, surveys in 2014 indicated that both BWDB and LG invested little in maintenance in the polders studied, but this could be because of the recent rehabilitation and little need for periodic maintenance. Still the BWDB has a fairly poor record of maintenance, as also stated in many evaluation reports and O&M manuals, quoted above. It is reported that the allocation for O&M from the GoB to BWDB is well below the requirements estimated by BWDB. But it is also said that BWDB is rather ineffective and inefficient in implementing the maintenance program. Finally, it is noted that the “demand” is inflated, as BWDB anticipates an allocation lower than demanded.

Table 3 – Demand and allocation of O&M budget to BWDB (in Million BDT)

| Fiscal year | Demand (million BDT) | Allocation (million BDT) | Allocation (%) |
|-------------|-------------------------|-----------------------------|-------------------|
| 2006/2007 | 3,500 | 1,500 | 43 % |
| 2007/2008 | 4,000 | 1,515 | 38 |
| 2008/2009 | 5,290 | 3,050 | 58 |
| 2009/2010 | 8,460 | 4,020 | 48 |
| 2010/2011 | 17,990 | 2,551 | 14 |
| 2011/2012 | 30,000 | 3,170 | 11 |

4. Conclusions on the Effectiveness of Operation and Maintenances

Notwithstanding the constraints described above with respect to operation and maintenance of water management infrastructure, which is typical for Bangladesh with its' complex water management issues, all evaluations of PWM projects note the positive and important role of WMGs in operational water management. All project reports and evaluations mention the positive effect of WMOs being involved in decision-making on operation and maintenance. Finally, all project reports and project evaluations acknowledge that the sustainability of maintenance, both from the side of the WMO, as well as from the side of the GoB is an issue. This is the case for all projects.

The effectiveness of operation and maintenance with respect to agricultural production is discussed in the following chapter.

All projects prepare O&M manuals, have a system of preparing annual plans which strive to define roles and responsibilities of WMOs, BWDB, and LG, and extensively train the WMOs. All projects have evidence that during the project period, the WMOs contribute to operation and maintenance. Studies show that WMO have the capacities to carry out their share and that the costs of operation and maintenance are sufficiently covered by increased benefits from improved water management. Nevertheless, in completed projects, the water management infrastructure is deteriorating after closure of the project; this is the case in “older” projects, but also in more recently concluded projects. It is the case in the smaller (LGED) polders and the larger (BWDB) polders. Even if preventive maintenance is conducted, it cannot prevent that periodic maintenance is required and if this is overdue, then preventive maintenance becomes less effective, leading to the typical cycle of build-neglect-rebuild. And leading to the WMO losing interest or feeling incapable to address the situation and consequently also losing interest in operation.

Apparently there is a precarious balance between (i) what the WMO are willing to invest in maintenance, (ii) what they are capable to invest in maintenance, (iii) to which extent the WMO are able to prevent deterioration of infrastructure, and (iv) how fast deterioration occurs under “normal” conditions and for example because of “extreme” events²⁵.

The following challenges to sustainability of operation and maintenance are mentioned:

- a. With respect to WMOs:
 - i) lack the required mix of competencies and entrepreneurial attitude,
 - ii) have a dependency or expectancy culture, only carry out minor maintenance such as vegetation clearance and gate greasing and expect periodic assistance for *khal* desilting,

²⁵ It is often said that emergency repairs are so prominent because periodic maintenance is lacking; the BGP MTR mentions a study which states that emergency repair is not well organized, so that by the time it is carried out, the “problem” has grown bigger than originally was the case; which means that budget estimates are inadequate, maintenance consequently not carried out well and a vicious circle is borne.

- iii) rely on rather ad-hoc community communal and voluntary labour for maintenance, and on voluntary gate operators,
 - iv) lack transparent / fair / systematic and accepted procedures to raise funds for maintenance,
 - v) are overwhelmed by maintenance tasks once a first deterioration has set in, amongst others by lack of periodic maintenance,
 - vi) internal conflicts,
 - vii) receive too little guidance and support from BWDB (and LGED)
- b. With respect to BWDB (and in fact LGED and LG):
- i) the annual O&M budgets of the BWDB are far below the needs based assessment,
 - ii) lack of effective practices / procedures of O&M,
 - iii) lack of beneficiary participation / centralized structure,
 - iv) lack of interagency planning: water management is not a task of BWDB alone, other agencies have to contribute as well,
 - v) inadequate skill-mix at BWDB, with a construction bias and lack of institutional support: O&M is but a small component,
 - vi) incomplete schemes,
 - vii) changed hydrologic conditions around schemes,
 - viii) the occurrence of too many “extreme” events, leading to reliance on the “emergency” budget
 - ix) lack of a clear GoB policy on maintenance, relying too much on “projects”.

Maybe one reason why the contributions to maintenance decline after the project is that the GoB does not yet have a clear and convincing policy, strategy and message on maintenance in the PWM context: the new PWMR are ambiguous and not very strict on how the WMA/WMG will contribute to maintenance; most of it is voluntary and to be based on social responsibility, while all is linked to development projects only. At the same time, different projects have different approaches to how funds are collected: WMG members and also non-members? Based on landholding? Also the role of Local Government in O&M is unclear. Especially in case of emergency maintenance, LG plays an important role. The division of roles between LGF and BWDB is unclear.

Success factors are not easily derived, mentioned are:

- WMOs with a mix of competencies including farming, entrepreneurial, management and leadership skills;
- WMOs which have a transparent system for raising O&M funds.

There is no evidence that WMOs are better in raising capital in areas where agricultural production has increased as compared to other areas, and are therefore performing better in maintenance.

It is noted that “funds collected and spent”, although frequently used as indicator, are in fact a poor indicator for judging the contribution of WMOs to O&M. First of all because most of the contributions are in-kind. Secondly, there are quite a number of cases the WMO have proven to be able to mobilize local action and address problems when they arise.. Although the formation of WMO alone may not lead to sustainable O&M, their positive contribution to O&M and WM is appreciated in all evaluation reports. Nevertheless, it is also acknowledged, that WMO contributions are well below needs and expectations raise and that maintenance is not on the forefront of the WMO activities.

5. Effectiveness: Improved Agricultural Production

5.1 Agricultural Production

Observations

There is a range of data from the different projects on the effects of on agricultural production, generally showing positive results on cropping intensity, yields, production volume and sometimes even on income – see the summary in Table 4 below.

Table 4 – Changes in agricultural production and related benefits

| Project (and source) | Increased agricultural production and other benefits | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------|--|---------------------|-----------------------|---------------------|-------------------------|-----------------|-------------------------|------|------|-------|------|-------|-------|-----------|--------|-------|------|-------|-------|--------|------|-------|------|-------|------|------|------|--|--|-------|-------|---------|------|--|--|-------|------|
| BGP | <ul style="list-style-type: none">• The HHS (2014 and 2016) indicate the following:<ul style="list-style-type: none">○ Production of other crops and aquaculture volume per HH has increased, but remains higher for the control group. Most HHs now produce both crops and fisheries (67%), increasing from 36% and 49% for beneficiary (B) and control (C) group in the baseline. The production volume per HH of other crops than rice has slightly increased for the B group (about 10%) and more for the C group (40%). The aquaculture production volume per HH has declined for both the B and C groups, but is still 50% higher for the C group. Taking together the increase in number of HHs producing and the changes in production volume per HH, total production of ‘other crops’ and aquaculture have both increased, in both the B and C groups. The total production of all crops is higher in the C group for all product categories.○ Yields have doubled for aquaculture, for both B and C groups, while yields for all product categories are higher for the C group. We observe that both for rice and for other crops, yields have declined for the B group but have increased for the C group. Yields for aquaculture have doubled for both B and C groups. Yields for all product groups already were higher during the baseline survey, but are now considerably higher in the C group area as compared to the B area.• The BGP Report Economic Impact & Maintenance Cost Analysis of Water Management Infrastructure (draft, 2014), mentions the following estimates: “Since there are different impacts per FFS, the table below provides more detail in the average increase in income that is possible. The first column indicates the additional money earned by the productivity increase in the topic of the FFS. The increase in productivity for homestead vegetable is included in the second column. If an additional crop is grown, or farmers are part of the Producer Groups of component 4, the additional income can be found in column three and four. The additional benefits of an additional crop or market linkages are significantly higher than the FFS on its own.”<table><tr><th>Type of FFS</th><th>Increase productivity</th><th>Homestead vegetable</th><th>Cropping intensity</th><th>Income increase</th><th>Potential impact per hh</th></tr><tr><td>Rice</td><td>€ 37</td><td>€ 5.7</td><td>€ 80</td><td>€ 116</td><td>€ 238</td></tr><tr><td>Mung bean</td><td>€ 8.56</td><td>€ 5.7</td><td>€ 80</td><td>€ 116</td><td>€ 210</td></tr><tr><td>Sesame</td><td>€ 12</td><td>€ 5.7</td><td>€ 80</td><td>€ 116</td><td>€213</td></tr><tr><td>Fish</td><td>€ 19</td><td></td><td></td><td>€ 116</td><td>€ 135</td></tr><tr><td>Poultry</td><td>€ 77</td><td></td><td></td><td>€ 116</td><td>€193</td></tr></table> | Type of FFS | Increase productivity | Homestead vegetable | Cropping intensity | Income increase | Potential impact per hh | Rice | € 37 | € 5.7 | € 80 | € 116 | € 238 | Mung bean | € 8.56 | € 5.7 | € 80 | € 116 | € 210 | Sesame | € 12 | € 5.7 | € 80 | € 116 | €213 | Fish | € 19 | | | € 116 | € 135 | Poultry | € 77 | | | € 116 | €193 |
| Type of FFS | Increase productivity | Homestead vegetable | Cropping intensity | Income increase | Potential impact per hh | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rice | € 37 | € 5.7 | € 80 | € 116 | € 238 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mung bean | € 8.56 | € 5.7 | € 80 | € 116 | € 210 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sesame | € 12 | € 5.7 | € 80 | € 116 | €213 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fish | € 19 | | | € 116 | € 135 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Poultry | € 77 | | | € 116 | €193 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IPSWAM | <p>From the BARD impact evaluation study (2011) (comparing roughly years 2003/2004 and 2008/2009, i.e. start and conclusion of project interventions)</p> <ul style="list-style-type: none">• Cropping intensity changed from 120% to 137%, 135% to 153% in P22 and P43/2E resp.• Yields of rice increased by 15-20% and 25% in P22 and P43/2E resp.; total rice production increased by 21% and 34% in P22 and P43/2E respectively.• Cropped areas and yields of oilseeds, pulses and vegetables increased significantly.• The annual average income per household increased from TK 39,300 to BDT 64,200 and | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Project (and source) | Increased agricultural production and other benefits |
|----------------------|--|
| | <p>from BDT 46,100 to BDT 70,500 for the Khulna and Patuakhali polders respectively; adjusted for inflation this is an increase of 33% and 22% respectively.</p> <ul style="list-style-type: none"> • The number of people experiencing an endemic deficit (extreme poverty) decreased from 50% to 16%. |
| SWAIWRPMP | <p>The SWAI Project Final Report gives the following data (2013/14 compared to 2004/05):</p> <ul style="list-style-type: none"> • Broadcast <i>Aman</i> yield increase from 1.2 to 2.56 t/ha • Local, transplanted <i>Aman</i> yield increase from 1.57 to 1.7 t/ha • HYV, transplanted <i>Aman</i> yield increase from 2.35 to 3.04 t/ha • Total rice production from 72,103 to 138,664 tons from 34,248 ha and 38,566 ha resp. • Other crops planted increased from 14,600 to 23,300 ha • Cropping intensity increased from 190 to 210% |
| SSWRSDP | <ul style="list-style-type: none"> • EME (2003): in a total of 280 subprojects the average increase of cereals and non-cereals is 1.5 t/ha and 1.3 t/ha respectively over a period of some 2-4 years after completion of subproject interventions; the cropping intensity increased from 171 to 194%. • The BUET/BIDS (2003) survey (of 30 randomly but geographically well ell distributed subprojects, 2-3 years after handover to beneficiaries) notices an increase of cropping intensity from 176% to 237% from before the start of the project. Yield increases for <i>Aman</i> rice are reported to be 63% and for <i>Boro</i> rice 31%. Yield rates of wheat and onion have increased with a modest 3 and 6% respectively. • EME (2008): in a total of 60 subprojects the average increase of cereals and non-cereals is 0.85t/ha and 2.98 t/ha respectively over a period of 2-4- years after completion of subproject interventions; the cropping intensity increased from 163 to 186%. |

Discussion

The methodologies that were used for the above data vary much and most of above data cannot be considered as very robust. The IPSWAM estimate is mainly based on the IMED/BARD study of 30 house hold surveys in each of two rehabilitated polders, supported by focus group discussions. It compares figures of pre- and post IPSWAM, mentioning a period of 5 years²⁶. The study mentions that improved water management infrastructure is the main contributing factor. The SWAIWRPMP makes use of the information from the DAE, which collects and publishes seasonal production statistics from every union. SWAIWRMP considers these figures representative for its projects²⁷. The SSWRSDP maintains its own Effect Monitoring and Evaluation (EMED) system, for which it maintains an extensive database, which unfortunately is not maintained after the closure of the project, when monitoring in fact also stops. The EME report 2003 concerns the SSW-1 project, rehabilitating 280 subprojects between 1998 and 2003. The EME report 2008 considers only the 60 subprojects of the SSW-2 project of which relevant longer term relevant were available.

The extent to which the increased agricultural production is sustained after the project is not well known because monitoring is generally not systematically done.

²⁶ Note: the sample is small and it is probably not so that the figures of five years back were from the same area, let alone plot of land.

²⁷ It is difficult to say how representative or accurate the figures are for the purpose of project activities; but government agencies and donors appear to use these figures more and more rather than doing specific surveys, including control areas to be able to attribute increases to specific interventions.

Relation between agricultural production and water management

Generally, the reports of different projects clearly link the increased agricultural production to improved water management, but also acknowledge that other factors play a role. All project reports indicate that the rehabilitation of infrastructure is the main contributing factor.

In addition to that, the FS surveys show the dramatic effects of excessive rainfall during the 'dry' season, destroying many crops. Both beneficiaries and control groups experienced a strong increase in the experience of excessive rain, especially among the beneficiaries (B: 49%; C: 37%). The proportion of HHs facing natural disasters has not changed (around 60% for B and C groups), but the proportion of HHs who experienced crop loss or failure increased strongly, from 8% to 27% (B) and from 3% to 20% (C). (Table 6). The same changes can be found as water related problems whereby lack of water and flooding were the main problems in 2014, but these were replaced by water logging caused by excessive rainfall in 2016. (Table 7). This corresponds to information from FGDs.

The IMED/BARD study (see above) concludes that improved water management infrastructure is the main contributing factor to agricultural production. The KJDRP independent evaluation (ADB, 2007) is the most outspoken on the contrary: the claim of the project that it contributed to the measured increase in production is (completely) unwarranted, control areas show the same increase, which is due to other supported activities. It should be noted that the KJDRP was considered a rather complicated and unsuccessful project with many diverging views, also between GOB/BWDB and local stakeholders, while the formation of stakeholders in these large polders was still in its infancy, only being more systematically addressed in the later project IPSWAM.

6. Effectiveness: Internal functioning of Water Management Organisations

There is little doubt amongst government agencies, non-government organisations and donors alike, that the concept of participatory water management has highly improved the decision-making on and implementation of polder rehabilitation projects. All project reports and evaluations testify this view. All projects have followed the GPWM and PWMR and fulfil criteria on membership (% of hh) and organisational requirements, such as composition of committees (including % of females). It also means that mandates, responsibilities and expectations are fairly similar in the different projects. Project reports are generally positive about the role and capability of the WMOs, which the projects facilitated to establish. The (semi-)external²⁸ evaluation reports are all much more cautious about the functioning of the WMOs. Many mention that follow-up is required and that the agencies (BWDB, LGED) are often not yet ready to provide this.

Observations from other projects

The IPSWAM MTR, PCR and Evaluation (2011) are positive about WMO development and conclude "WMOs likely to be sustainable"; information is essentially qualitative. In IPSWAM the WMO were primarily dealing with water management. In the section on O&M above it is reported how (well) they contributed to maintenance. However, in more recent surveys in the context of this evaluation and analyses carried out by BGP at the start of the project, the following appears:

- a. The PDPs developed by BGP in former IPSWAM polders show the need for further rehabilitation works (see above)

²⁸ Not all external evaluations are independent. For example, an evaluation is carried out by the funding agency to prepare for an additional funding or a new loan. Although often critical, the basic concepts are not questioned and information comes mostly from the project documents rather than from new independent surveys.

- b. BGP has classified the WMG in 4 categories, which may be interpreted as follows: A=Good, B=Fair, C=Poor, D=Dormant²⁹ and it concludes for two former IPSWAM polders (Technical Reports No.3 and 10 in 2013 and 2014):
 - i) P30: 41 WMGs of which category A: 5%, B: 19%, C: 27%, D: 49%
 - ii) P43/2D: 30 WMGs of which category A: 0%, B: 17%, C: 43%, D: 40%
- c. For the same IPSWAM polders, the baseline surveys (Household, WMGs and FGDs) carried out for this FS evaluation in 2014 at the start of the BGP, provide the following insight in the functioning of the WMA/WMG: in P30 only 32% and in P43/2D only 14% of the household report to be a member; activities in maintenance are at a low ebb; WMG find it difficult to cope with vested interests of influential people in water management; contacts with BWDB and LG are scarce³⁰.

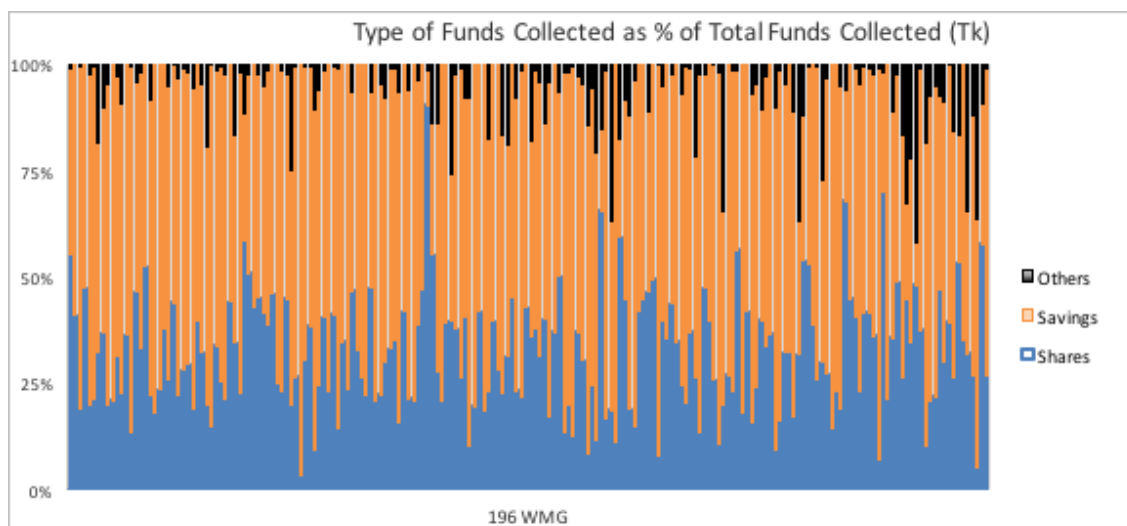
The SSWRSDP have given the WMCAs³¹ a broader role than water management alone. One main reason was that water management alone would constitute of too few activities, which would make the WMCA dormant for a large part of the year. Especially the activity for savings and loans (micro-credit) has developed as an important activity. Other initiatives of SSWRSDP and parallel miscellaneous support projects (agricultural extension, income generating activities, fisheries) have used the WMO as an entry point. This would also provide more income for the WMCA to conduct maintenance. The SSWRSDP reports give much anecdotal information on the good performance of WMCA with respect to operation and maintenance. Still the following is noted:

- a. The SSWRSDP O&M strategy is very concerned about the actual contribution of the WMCA to O&M (see discussion above).
- b. DOC (2014) classified the functioning of 747 (of the total of 929) WMCAs, established since 1998 in LGED projects as follows: Good 9%, Fair 41%, Poor 35%, Very Poor 5% and Bad 10%. It is especially concerned about O&M as only 77 of the WMCA are holding O&M committee meetings.
- c. The BUET/BIDS Evaluation (2003) of SSW-1 contains a table which classifies 103 WMCAs as follows: very good: 4%, good: 16%, average: 28%, poor: 32% and very poor: 19%. It states that WMCA members see micro-credit as the main benefit and do pay little attention to maintenance.
- d. The EME report (2003) provides the following information on the % of type of funds collected by the WMCAs in 96 (out of 280) WMCA by which maintenance spending was more than zero. Please note that the type *shares* is a one-off registration payment used for WMCA operational purposes, *savings* are meant for savings- and loans activities and *others* are meant to cover activities like operation and maintenance.

²⁹ Actual description of categories is more extensive, relating to the goals of BGP

³⁰ Note that the FGD of 2016 paints a more positive picture, but that is after BGP activities

³¹ As explained earlier, WMCAs in small polders more or less resemble the WMG in the large polders



- e. Analysis of the SSWRSDP EME data, when comparing WMCAs, do not show a clear positive linkage between (i) the capital collected and the expenditure on maintenance, or (ii) the increase in agricultural production and expenditure on maintenance.
- f. The SSWRSDP reports also mention that schemes in which the WMCA delivers a well-defined service, notably their CAD schemes (Command Area Development = irrigation), fare comparatively well³².
- g. The O&M study of SSWRSDP (2009) is critical and states that the following is often not fulfilled as WMCA are also dominated by interest groups; quotes are:
 - i) Successful WMCAs have: (i) members willing to work together, to represent and benefit the local community; (ii) a mix of competencies including farming, entrepreneurial, management and leadership skills; (iii) pay a cashier to keep accounts; (iv) maintain good records; and (iv) have a transparent system for raising O&M funds.
 - ii) Concerning attitudes and mind-set, the study found that many WMCAs: (i) lack the required mix of competencies and entrepreneurial attitude; (ii) have a dependency or expectancy culture, only carry out minor maintenance such as vegetation clearance and gate greasing and expect periodic assistance for *khal* desilting; (iii) rely on rather ad-hoc community communal and voluntary labour for maintenance, and on voluntary gate operators; and (iv) lack transparent / fair / systematic and accepted procedures to raise funds for maintenance. Further in some relations with the UP are not mutually supportive.

The SWAIWRMP project reports and the BARD mid-term evaluation are positive about the performance of the WMA/WMG and the role they play not only in water management, but also in the improvement of agricultural production, encouraging and linking with the activities of DAE, FFS etc. SWAIWRMP is the first project in which BWDB facilitators were active in facilitating the formation of WMA/WMG (facilitators employed on a project basis by the newly formed BWDB water management cell, initiated under IPSWAM). This involvement of BWDB facilitators took place after an initial, unsuccessful start with facilitators provided by NGOs³³. SWAIWRMP introduced the notion of CAP (Collective Action Plans) for the WMG to develop income generation activities. The final report writes that by the end of the project 81 WMGs (involving 23,921 members) had taken up 167 CAPs in which profit stands at BDT 61.2 per member, against a target of BDT 500. The effectiveness of the formation of WMA/WMG is hard to judge, as all activities still take place in a “project environment”. Reports say the following:

³² Note that the coastal polders (such as BGP) are so-called FCD (Flood Control Drainage) schemes, in which the service is less identifiable or well defined. It should be noted that the number of CAD projects under SSWRSDP is (very) small, hence it is difficult to draw conclusions from that.

³³ The usual practice was and often is that NGOs help to form WMOs. However, with the new PWMR (2014) and the commitment of BWDB to strengthen its water management office (cell), the BWDB has become more ambitious in this respect,

- a. The SWAIWRMP Final Report (2015) writes: WMOs have been developed but sustainability of the WMOs needs to be ascertained further. The intended extension with one year of the project till 2015 might provide further lessons. One still has to assess issues like why CAPs are working in one WMG and not in another, and what are the pre-requisites for an effective training programme and not simply producing figures on number of trainings held. Similarly, for WMGs the question is put forward how the access to markets further can be enhanced. This project deviated from earlier projects as it worked in a holistic/integrated manner, with water management, agriculture, fisheries, environment and livelihood support activities (with IWRM at the basis of all activities) being implemented together to develop a true local water management.
- b. The IMED MTR (2014) of SWAIWRPMP writes: "The community groups formed under the project conducted close supervision for which the works could be executed properly. But necessary steps are required to be taken up so that the groups formed under the project can continue the works properly even after completion of the project".

Blue Gold Project - Observations

The effectiveness of WMO under the BGP cannot as yet be easily assessed. The formation of WMO by the BGP was delayed because in 2014, one year after the start of the project, the PWMR was introduced, which changed the institutionalisation and setup of the WMA and WMG. Also because of a delay of investments in infrastructure, the formation of WMA/WMG could not easily refer to its main task of Operation and maintenance. the FGD and HHS of 2014 and FGD of 2016 under this study give a first indication of effectiveness:

- a. 2014. In P30 only 32% of the households reports to be a member In P43/2D, only 14% of the hh reports to be a member. In practically all of the WMG covered in the FGD, there are serious reservations about the functioning of the WMG.
- b. 2016. In the two polders, 77% of the households reports to be a member. In P30, the FGD indicate that 5 out of 5 WMGs interviewed function fairly well to good. In P43/2D, where at the time of the survey only 2 of the 5 WMG interviewed had benefitted from BGP activities as yet, 1 of the 2 WMG functions fairly well and 1 rather poorly; the other 3 are (still) dormant.

Results from Focus Group Discussions and Household Surveys in 2016:

- a. The water management situation and functioning of the WMG has improved, much more so among beneficiary (B) than control (C) groups, with benefits for food production and incomes, but hardly any financial or in-kind contributions to the WMG. Of BG beneficiaries, the proportion of HHs that believe the water management system is good for agricultural production (cropping and aquaculture) has slightly declined (from 65% to 60%) , but for the C group it has strongly declined (from 47% to 19%). This shows a strong advantage for the beneficiary group, and might be explained by improved possibilities by beneficiaries to cope with the difficult climatic conditions. (Table 8a). This finding is in line with the fact that for BG beneficiaries 34% state that water management has improved during the last 2 years, as compared to only 5% among the C group. (Table 8b). However, it seems in contradiction with the findings that 36% of BG beneficiaries report that water management has improved, but of the control group 58% state it has improved. (Table 8c). An explanation might be that the improvements for the C group have been relative to the (poor) state. Irrigation and flood protection have improved most, while drainage remains the main problem, both in B and C groups. (Table 8c). The detailed questions about the current state and functions of the WMG and its relation with food production show much more positive scores for the B groups as compared to the C group. Of the B group, 43% perceive better access to water for food production (as compared to 6% in the C group), and 95% perceive this has lead to better yields and higher incomes (as compared to 65% in the C group), 54% have more trust in the WMG group (5% in the C group) and 54% believes the WMG can help solve problems related to access to water (7% in C group). (Table 9).

- b. There are indications that the awareness on the role of WMGs has improved. It seems that the FFS activities have started to play a role in this, but there is also relation with the rehabilitations that took place. This could explain why in polder 30 the WMGs appear to be more active in water management operations than in polder 43/2D. However, there can be significant differences. In one WMG far in-land (9 km from the river), the recently improved sluice gate has not benefited the area, but has led to more conflicts on water management of high- and low lands. Another WMG mentioned improved water management as well as a 33% increase in rice production and 60% increase in yield of lentils. Fallow land is being cultivated again.
- c. WMGs generally mention the important role of the FFS, in terms of:
 - i) Decisions on cropping systems, especially dry season crops and kitchen gardens
 - ii) The relevance of small-scale water management systems
 - iii) Collective purchase of inputs and selling of produces.
- d. However, the water situation is still far from ideal to assure a good crop. In one WMG where the main sluice was improved, the canals still are said to require improvement. Even a little rain may lead to water logging in lower lying areas. The drainage is also hampered by the fact that the river has become shallow, ideally that should be addressed as well. Control of the main sluice is in the hands of the WMG, which is seen as positive, but the means are not there.
- e. Little has changed on the financial capacities of the WMGs. The WMGs have very modest membership fees, often with 50 BDT at time of registration and some 10-20 BDT yearly. WMGs do not collect funds for major improvements. Some WMGs have substantial income (up to 20,000 BDT) from renting out equipment provided by projects (FAO low lift pumps, tiller, thresher). It is as yet unclear how this money is spent. The active WMGs operate a savings- and loan facility (5% interest). For WMGs savings and loans have always been an important function for its members.
- f. WMGs still play a modest role in maintenance of water management infrastructure. Their inputs are mainly in-kind, are voluntary and are mobilized in case of a specific problem, such as a threat to an internal embankment, silt removal around a sluice, etc. Also action against illegal blocking of canals by “outsiders” is mentioned often, strengthened by the notion of being united in the WMG. It is recognised that the “WMG can only do small things”.

Discussion

As described above, BGP uses the WMGs (next to water management) as an entry point for activities to improve agricultural practices and to strengthen the agricultural value chain. An important vehicle for this are the FFS. The FFS are very positively mentioned in the FGDs. However, it is as yet unclear to which extent the WMGs really fulfil, are needed to fulfil, or are able to fulfil a role in future in this respect. One reason for this uncertainty of the role of WMG is the fact that the agriculture related activities are carried out through DAE, which is used to work with Farmer Groups, or Producer Groups, which often are in existence already and themselves do not necessarily see a role for the WMG. Of course, many of the farmers are member both of the FG or WMG. In any case, the situation cannot be generalised.

The WMA and WMG have played a consultative role in the formulation of the PDPs prepared under BGP. However, the role that WMA/WMG will play in the implementation of the PDP, in the maintenance of infrastructure and in being the counterpart of the BWDB and contact organisation for local government is as yet unclear, because the plans for this are only in their initial stages (situation mid 2016).

The membership of the WMO in BGP poses a challenge³⁴. During project implementation there is a drive to enlist members. This attracts also members, who are not necessarily interested in water-

³⁴ From interviews with BGP staff, but also mentioned by other persons involved in other projects.

management or not necessarily those who are landowners, but also persons who see a possibility to benefit from the opportunities provided by a development project³⁵. Consequently, the initial membership is not necessarily a representation of the membership needed for sustainable functioning after completion. On the other hand, in forthcoming cases, it appears that the WMO do not limit their activities to members alone when it concerns to mobilize people or to raise funds for certain activities. In other words: being a member gives rights, but not being a member does not mean that there should not be a contribution to for example O&M³⁶. The PWMR considers a WMG representative if there will be at least 55% representation from among the families of the beneficiaries of the related area of the WMG, where beneficiary can virtually be anyone living in the polder. Evaluations of other projects have indicated that WMOs can only function well if they are well connected with a host of organisations, primarily with local government. The BGP project did not have this connection as an important goal, but in 2016 it started to formulate strategies on this with publishing two technical reports: (i) Engaging Local Government Institutions in Water Management – Draft Sourcebook. Technical Report 13. April 2016, and (ii) Sustainability from The Start. Exit Strategy (draft final); Working Paper 2A; 26 February 2016.

7. Conclusions on the Effectiveness of Formation of WMOs

On water management, the overall conclusion is that water management and the functioning of WMGs has improved more in the beneficiary area. The perceptions are that this is also good for agricultural productivity. However, we do not see evidence that this has led to concrete improvements in terms of vulnerability, crop damage, production per HH, yields, incomes or food security, and thus no changes when compared with the control area.

There are mixed reports on what role WMOs play and can play with respect to decision making on water management infrastructure and influencing responsible agencies, once the project is completed. The relation with local government is very mixed indeed. There is consistent information that WMOs have helped to assure quality of implementation investments in construction in projects.

In the last decade the thought emerged that WMOs would be more sustainable if they would take up more responsibilities than water management alone, which for a large part of the year would not require action anyhow. At the same time other activities would generate funds for O&M which beneficiaries would not easily provide. And finally, the insight emerged, that providing infrastructure alone was not sufficient and that attention should be paid to the related agricultural development as well. This is the approach of BGP, but is also practiced in SSWRSDP and SWAIWRMP.

Analyses show that active WMOs are able to generate more capital, but this capital is mainly used for Savings and Loans, rather than for O&M. The activities of WMO in cooperative activities in agriculture (e.g. purchase of inputs and sale of produce) remains very limited, partly also because other organisations exist to promote this.

To facilitate the WMOs, the BWDB has established a Water Management Office, already at the time of the IPSWAM project. The staffing and funding of the Office remained very limited, but the recent larger number of projects (WMIP, SWAIWRMP, BGP) have given possibilities for the Office to develop further, albeit on a project basis. It remains to be seen how much BWDB will be able to sustain these activities after conclusion of the projects.

³⁵ Examples are: participate in FFS, eligible for agricultural support and inputs, access to micro-credit, access to lease of equipment, eligible to carry out work under a project-contract (amongst others the LCS system), opportunity to influence choice of contractor, right to lease land or water bodies, etc.

³⁶ As testified in the SWAIWRMP.

8. Sustainability

Maintenance

Generally, all independent evaluations and all project-conducted monitoring -, technical - and completion reports of the development projects (KJDRP, IPSWAM, SWAIWRMP, SSWRSDP) are very cautious about the potential sustainability of maintenance and consequent sustainable functioning of the water management infrastructure. Sustainability of O&M will require a continued attention of the responsible agencies after completion of the projects, for their own operations and for guiding the WMOs. All evaluation reports agree on this and are very cautious about this.

In completed projects, the water management infrastructure is deteriorating after closure of the project; this is the case in “older” projects, but also in more recently concluded projects. Even if preventive maintenance is conducted, it cannot prevent that periodic maintenance is required and if this is overdue, then preventive maintenance becomes less effective, leading to the typical cycle of build-neglect-rebuild. And leading to the WMO losing interest or feeling incapable to address the situation.

Water management organisations

A main difficulty of evaluating the sustainable performance of the WMOs in the larger polders is the fact that almost all still operate in a “project environment”. Project completion reports are invariably positive, but later surveys tend to be more cautious³⁷. The only project completed some years ago (IPSWAM, 2005-2011) has a mixed to negative record in this respect. However, IPSWAM was also a kind of pilot project for BWDB, and since then a great number of projects have started (SWAIWRMP, WMIP, BGP). The common impression is that over time, BWDB has recognized that it needs to address participatory water management seriously. BWDB established a Water Management Office which is tasked to guide the BWDB efforts towards PWM.

The BWDB Water Management Office responds well to the general remark made in all evaluation reports that the sustainability of performance of water management organisations and sustainability of operation and maintenance requires continuing attention and support. The Office is still very modestly staffed and mainly on a project basis, hence still has to prove its effectiveness.

Quantitative surveys on the level of performance of the WMOs in Bangladesh are rather negative on the sustainability. However, it is questioned whether the indicators used are appropriate. Indicators tend to look at measurable indicators such as capital collected, meetings held, number of members. These indicators are hardly able to adequately describe the functioning of the WMOs:

- a. With respect to maintenance, the in-kind contributions (which is by far the largest portion) are often not recorded, nor are the number of interactions with agencies and within the community. Unfortunately, the actual performance of the water management system is not easily registered and government agencies do not systematically do this. Consequently, the success stories are essentially anecdotal. However, all reports indicate that the required inputs in maintenance by both WMOs and BWDB are not sustained after the project.
- b. With respect to operation, an important role of the WMOs is to find compromises in a complex water management environment with opposing wishes. Another role is to be able to mobilize the community when the need arises, be in contact with BWDB and local government on a sort of regular basis, and these activities are also not recorded. Consequently, the success stories are essentially anecdotal.

³⁷ Actually, there is one project with a very positive record on participatory management: CDSP. However, the nature of CDSP is quite different from the mainstream polder projects, and is not easily representative in that respect.

It is concluded, that there are sufficient indicators that the formation of WMOs has not been the simple panacea with respect to the two main reasons for which PWM became the leading principle of polder rehabilitation (i) sustainable O&M, and (ii) well-functioning equitable water management. On the other hand, it should be noted that WMOs as organisations have proven to remain sustainable. The IPSWAM WMO, although not performing very well in many respects could still be identified. The SSWRSDP, with a long history of WMCAs, shows that the WMCAs are still identifiable and active. However, the activities generally relate to other aspects than water management, with micro-credit being a prime activity.

9. Conclusion on the Impact of BGP

Agricultural Production

It is likely that the investments in water management will lead to increased agricultural production:

- BGP carries out needed rehabilitation of infrastructure, which is generally acknowledged as a prime activity to increase agricultural production

In order to sustain the increased agricultural production, some major constraints of water management will have to be addressed:

- It remains to be seen to what extent the WMG will be better able to address the influence of interest groups leading to inequity. BGP may have insufficiently been able to influence this in time.
- In some polders (e.g. P30), the internal water management depends upon the condition of the boundary rivers, which presently prevent drainage and lead to water logging. BGP cannot influence this.
- The budget for excavation of *khals* is likely to be insufficient to address all needs. BGP may not be able to influence this.
- It remains to be seen what the success will be of the pilots to improve lower level of water management and how sustainable the pilots will prove to be. BGP may have too little time and influence on other agencies (e.g. DAE) to achieve this on an appreciable scale.
- As current maintenance may very well not be sufficient to prevent deterioration of water management infrastructure, as constraints in water management will remain, and as the sustainable functioning of WMG is not certain (see below), there is a high risk that the achievements of improved agricultural production will not be sustained over time.

Operation and Maintenance

Following are the main remaining challenges for the functioning of WMGs:

- Dealing with different interest groups, especially aquaculture farmers using and obstructing the main canals
- Current conditions and required rehabilitations and sluice repairs in boundary rivers, which may prevent proper drainage in polders, leading to problems of water logging in case of high rainfall.
- No indications that WMGs have an increased interest in collecting funds for O&M; members continue to perceive the micro-credit opportunities as the main benefit of WMG.
- No indications that the BWDB revenue budget for O&M will sufficiently increase.
- Lack of clarity on the functioning of the BWDB Water Management Office to support the WMGs.
- Lack of collaboration by WMGs with local government and other service providers next to BWDB.
- No indication that WMG membership will evolve towards a truly water-management driven interest.

It is not likely that the maintenance in the polders will be more sustainable than in the past:

- There are no indications that WMO collect funds better or get more systematically organized towards providing own contributions in O&M. Members perceive the micro-credit opportunities as the main benefit of WMG. BGP can probably only marginally influence this.
- There are no indications that the BWDB revenue budget for O&M will sufficiently increase. This is essential for sustained O&M. BGP cannot influence this.
- It remains to be seen to which extent the BWDB Water Management Office will be able to maintain the guidance of the WMOs after the project. BGP cannot influence this.

Water Management Organisations

It is not very likely that the WMOs will be more sustainable than in the past, unless follow-up support and guidance is provided, which is not assured, although there are opportunities:

- It remains to be seen to which extent the BWDB will be able to support the WMOs in the future; the indications are not yet positive. BGP cannot influence this easily. On the other hand, PWM in larger polders has received much more attention by GOB and BWDB in the past and experience is building up.
- It remains to be seen to which extent WMO can meaningfully influence water management: sustainable maintenance is not guaranteed, the effect of water management through major structures alone has its limitations and detailed lower level water management requires inputs and guidance which are not easily available. BGP can influence this only in a limited way.
- It remains to be seen how successfully the WMOs will liaise with local government and other service providers next to BWDB. BGP can only influence this in a limited way and has started to devise a strategy of activities in this respect at a late stage of the project.
- There is no indication as yet that the BGP WMOs will become very active in income generating activities. There is no clear evidence which shows that WMO, which take up a broad array of activities and generate more income, are performing better in maintenance. Encouraging these approaches are still very much in the pilot stage.
- It remains to be seen to which extent the initial membership will evolve towards a truly water-management interest driven membership. BGP can partially influence this.