Final Report on the Ganges Coordination and Change Enabling Project (G5)

Agriculture and Food Security Programme
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1.0 Introduction

The Ganges basin is one of the six basins (others are Mekong, Limpopo, Volta, Nile and the Andean Basins) that second phase of the Challenge Programme on Water and Food (CPWF) works in. The brackish water coastal zone of the Ganges is home to some of the world's poorest and most vulnerable people, whose livelihoods are exposed to tidal surges, increasing surface water salinity and a rising incidence of severe cyclonic storms. With the aim of improving the livelihoods of Ganges coastal zone farmers, the CPWF Ganges Basin Development Challenge (BDC) seeks 'to increase the resilience of agriculture and aquaculture systems in the coastal areas of the Ganges Delta'. This research for development (R4D) is designed to contribute to offering research solutions to the pressing issues of the Ganges BDC. The Ganges R4D program is made up of five projects of which one is coordination and change-enabling project responsible for fostering learning across the BDC in support of innovation and adoptive management. Therefore, the success of the Project depends not only on its own project team but also on excellent cooperation with the other projects in the BDC R4D programme and other such projects.

The Coordination and Change Enabling Project (G5) worked in providing an enabling environment that promote connectivity of project research across topics and scales, from household agriculture- aquaculture farming systems to community polder water management through broader land use planning. The project also served as an interface between the programme and a variety of existing and potential stakeholders and worked towards scaling out research results to multiple stakeholders with common interest in achieving the goals for the CPWF for the Ganges coastal zone. Another important feature of this project is to increase the farm household income and productivity through collaboration with CSISA-BD project principally focusing on improved cereal cropping systems including fish and use of improved varieties and crop management technologies as well.

The project also endeavors to place technologies in the context of markets, risk and other barriers that, without complementary strategies, can constrain advances in production, climate change adoption and improvements in livelihoods. To ensure participant's better access to timely and accurate information, capacity building among front-line extension agents and service providers is also a prime objective of the project. Adaptive research complements these strategies by refining technologies for local biophysical and socio-economic circumstances, and also identifying and evaluating emerging technologies to improve scope for future impact.

Initially BRAC and WorldFish signed a Letter of Agreement (LOA) for implementing the activities of the project on 10 September, 2011 continuing up to March, 2014. At the end of project duration, it was extended up to December, 2014. The project worked in the Southern hubs of Khulna and Barisal (Polder 30, 03 and 43/2F). Out-scaling activities have been carried out by BRAC, a leading Bangladeshi NGO. The project helped BRAC to establish an aquaculture team within its Agriculture and Food Security Programme through which BRAC conducted extension activities and training with farmer groups. This collaboration has allowed the project to introduce and train BRAC staffs on the new cropping systems being devised by CPWF projects. The Coordination and Change Enabling Project is currently engaged in identifying future opportunities for integration with the CGIAR Research Programmes on Water Land and Ecosystems, and Aquatic Agricultural Systems in addition to the interested bilateral donors supporting the complementary programmes.

2.0 Objectives

The overall objective of the Ganges programme was to improve resource productivity and increase resilience of agriculture and aquaculture systems in brackish water coastal areas of the Ganges. The specific objectives were:

- Identification of development actors and stakeholders who may use project outputs from GBDC.
- Engagement with development actors in disseminating research findings and sharing communication materials.
- Scaling of research findings to increase agriculture and aquaculture productivity.
- Assisting in organizing local level policy dialogue and advocacy to the major stakeholders.
- Capacity development of participants in increasing climate change adaptation and resilience.
- Help in building an aquaculture team in BRAC.

3.0 Major activities

Three divisional stakeholder workshops were organized. These workshops brought together as many team members as possible from GBDC projects, also key members of the public and private sector with an interest in the research from a range of perspectives. Common understandings of individual project research plans, inter-dependencies, personalities, partners, limitations and opportunities all helped to build a team approach to the GBDC. Coordination workshops were held in Khulna and Barisal to help identify a strong network of influential players who can help the G5 efforts in turning GBDC research outputs into outcomes.

In achieving the project's key feature of increased farm household income and productivity, a total of 3,025 farmers were trained up with the collaboration of CSISA-BD project where 43 percent participants were female. This reduced the technology adoption gap between men and women by ensuring that both men and women farmers were involved in the technology dissemination process. Along with that, throughout the project period, refresher's training was also arranged for 1,823 farmers and 107 demonstration plots were set up in 8 upazilas of 6 districts.

4.0 Scale out of research findings of other G5 project

The Ganges Basin Development Challenge (GBDC) comprises five related projects (G1 to G5) which emphasize the huge potential for significant improvement in cropping intensity and diversification of the agricultural systems. Project G1 has set out to gather information on current land use. This has led to the publishing for the first time in Bangladesh of seasonal rice maps, which will give researchers and agriculturalists an understanding of the areas where the most can be made of land resources. G2 successfully demonstrated improved rice varieties that can double the yields that farmers currently gain with their local varieties. G3 project focused on community-based water management. G4 seeks to work for understanding the hydrological situation of the coastal zone. Through collaborative participation with stakeholders the team has nominated the key external drivers that are influencing the region, such as changes in transboundary flow (between river and sea), growth in population, changes in water management practices and changes in the way the land is being utilized. Finally, the project G5 worked to enhance impacts through stakeholder participation, policy dialogue and effective coordination

among other Government, NGOs, CGIAR and donor-sponsored projects and programs in the GBDC research program. Scaling out of G2 technology has been implemented in three commanding areas under the project G5. These are:

A. Community based water management under Polder 30 (Batiaghata, Khulna)
B. Brackish water aquaculture at Polder 03 (Kaliganj, Satkhira)
C. Scale out of productive, profitable and resilient agriculture system at Polder 43/2F (Amtoli, Barguna)

5.0 Methodology of scale out programme

The CPWF technologies are suitable for scaling within the coastal polder zones: Polder 30, 03 and 43/2F. Experiences were gathered on piloted technologies through direct visit and consultations with the respective core and secondary partners of CPWF both at central and field level in the commanding areas. Baseline survey was done at different locations after finalizing the technologies for scaling out. Accordingly, the Issue based farmers meeting, counselling sessions, FGD (following the PAR method) were arranged for several times. Simultaneously, the farmers exchange visits were conducted. These activities were performed to make awareness among the participants about the goals of the mission, to understand clearly about the objectives of the project along with land users, local water users association and public representatives. Flow chart of the methodology of scale out programme is given below:

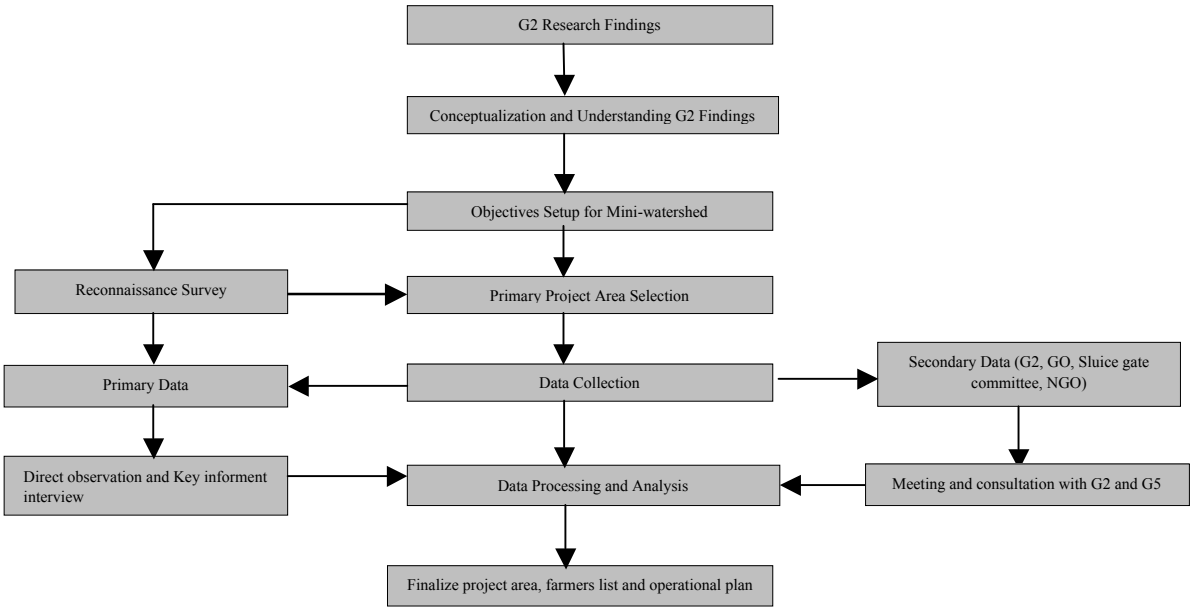

Fig. 1: Flow chart of scaling methodology

A. Community based water management under Polder 30 (Batiaghata, Khulna)

The hydrology of the polders of the coastal zone is completely different from other parts of Bangladesh governed by the sea tides, human interventions in the form of embankments, roads and topographic variations. Therefore, water management is usually impossible for an individual farmer. Community based approach of small water management units were demonstrated in Batiaghata upazila to realize the production potential by introducing mini sluice gates and ensuring water regulating infrastructures. The purpose was to demonstrate the benefits of

improved and modified water management technique at the community level working in a pilot watershed area. The technology package was selected from the findings of G2-IRRI research programme on HYV rice production through community based water management.

The ultimate objective of this initiative was:

- To adopt improved crop and crop management practices.
- To have a safe harvest of the dry season crops to achieve productivity.
- To develop the level of farmer's technical capacity.
- To develop the farmers as adaptive researchers and to make them confident.

There were two different locations under this initiative at polder-30. The detail description is given below in table 1.

Table 1: Cropping pattern of Par Batiaghata and Mailmara village

Village	Land (ha.)	No. of farmer's	Cropping pattern												
Par Batiaghata	16.21	51	Sesame (BARI Til-4)			Aman rice (BRRI dhan41, BRRI dhan52)					Sunflower (Hysun-33)				
Mailmara	15.56	55	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr

Fig. 2: Mailmara rice field

Fig. 3: Rice field of Par Botiaghata

The farmers of Batiaghata used to grow a single *aman* crop using tall, local varieties that can survive stagnant flooding, but are low yielding and low maturing approximately 2-3 tons per hectare. The *aman* crop is often followed by a late planted and low-yielding (approximately 0.5 tons per hectare) legume crop. In per Batiaghata and Mailmara village under polder-30, three crops were cultivated in a year and better water management was maintained by mini sluice gates. Improved variety of sesame (BARI Til 4) was cultivated and the yield was 1.24 t/ha which is around 30% more than the local variety. Sesame was followed by high yielding *aman* rice. The yield of BRRI dhan41 and BRRI dhan52 was calculated 5.82 t/ha and 5.93 t/ha in Per Batiaghata and Mailmara which is almost double than the locally cultivated variety. After harvesting of

aman rice, sunflower was introduced as rabi crop which is now at the growing stage and will be harvested at the end of March.

Table 2: Productivity and profitability of different crops in polder 30

Crop		Yield (t/ha)	Production cost/ha. in Tk	Gross return/ha. in Tk	Net profit/ha. in Tk
Sesame (BARI Til 4)		1.24	13,316	69,795	56,479
Rice	BRRI dhan41	5.82	37,183	103,436	66,253
	BRRI dhan52	5.92	35,403	104,382	68,980
Sunflower		Yet to harvest			

B. Brackish water aquaculture at Polder 03 (Kaliganj, Satkhira)

The coastal people generally used to culture shrimp along with some coastal fish species. Previous research indicates that agriculture and aquaculture production in the brackish water coastal zone can be further intensified and diversified. This project augmented previous endeavors in looking at the cropping intensification and diversification as a means to improve people's livelihood in the coastal zones of the Ganges.

Through demonstrating appropriate alternative culture pattern, farmers were experienced with some small fresh water species aiming the following objectives:

- Risk minimization for both climatic and disease aspect
- Introducing alternative culture pattern
- Adoption of climate sound modern aquaculture techniques
- Develop the farmers as self researcher

Total 22.06 hectares of water body including 31 participants at Golkhali village in polder 3 under Kaligong, Satkhira district was under intensive culture. The selected fish species were native Magur (*Clarius batrachus)*, Vietnamese Koi (*Anabas testidineus*) and Mono-sex Tilapia (*Oreochromis niloticus*). Stocking ratio was 120/decimal (40 fry/fingerlings for each species).

Fig. 4: Fish stocking at Kaliganj

Fig. 5: Nursing of fish fry

Different varieties of vegetables such as country bean, wax gourd and bottle gourd were cultivated in selected gher dykes and this initiative was completely new for these areas. The project is located in a high saline area where the aquaculture farmers used to culture the shrimp as main species along with some brackish water fish species where the viral attack is a regular

incidence in their farms. In the last season there was no significant return from shrimp culture for the viral attack. Ultimately to minimise this risk, some adaptive species (magur, tilapia and koi) have been introduced under this scale out programme.

Table 3: Productivity and profitability comparison of aquaculture practices under polder 3

Variety	Production/ ha (kg)	Expenditure/ ha (Tk)	Total Income/ha (Tk)	Net Profit/ha (Tk)
Aquaculture (Monosex Tilapia, Koi, Magur)	1,803.1	91,683	288,990	197,306
Previous Practice: Aquaculture (*P.monodon*, Khorshula, Parshe, etc.)	780.52	85,363	176,605	91,241

C. Scale out of productive, profitable and resilient agriculture system at Polder 43/2F (Amtoli, Barguna)

Primary function of the polders was to prevent tidal flooding and salinity intrusion. Most polder farmers grow a single crop *aman* during the rainy season using tall, local varieties that can survive stagnant flooding, but low yielding (2 to 3.5 tons per hectare). Aus-aman-rabi pattern was demonstrated in Bazar khali village covering 5.5 hectares of land where the number of participant was 22. Sunflower was introduced as rabi crop along with two rice crops which is now at the growing stage.

Fig. 6: Aman rice field

Table 4: Cropping pattern of Bazarkhali village

Village	Upazila	District	Land (ha)	No. of participants	Cropping pattern
Bazarkhali	Amtali	Borguna	5.5	22	*Aus-aman-rabi* (Hybrid dhan Alloran-BRRI dhan52-Sunflower)

The yield of hybrid dhan Alloron was 6.42 t/ha whereas the production cost was 56,687 Tk/ha and the calculated profit was 39,644 Tk/ha. After harvesting of Aus rice, BRRI dhan 52 was introduced in aman season and yield obtained 4.94t/ha. Total production cost was 86,450 Tk/ha for *aman* rice and profit calculated 44,040 Tk/ha.

Table 5: Productivity and profitability of different crop varieties at polder 43/2F

Variety	Production t/ha	Production cost Tk/ha	Total Income Tk/ha	Net Profit Tk/ha
Hybrid dhan Alloron	6.42	56,687	96,330 Tk.	39,644 Tk.
BRRI dhan 52	4.94	42,410	86,450 Tk.	44,040 Tk.
Sunflower (Hysun-33)	Yet to harvest			

6.0 Wrap up workshop

Workshop or seminar is a prime activity to achieve the project objectives. It is necessary to build-up coordination among stakeholders and related links such as researchers, entrepreneurs, development and extension agents, and service sectors from GO-NGO and private agencies. The outcome of the workshop was targeted on awareness building of the local stakeholders on the Ganges BDC, threats and opportunities of Ganges coast in respect of external/internal drivers of water resources to be known to concerned officials, beneficiary-understanding on the opportunities of agriculture and aquaculture under the changed situation and to increase out-scaling opportunities of research products of Ganges BDC.

With the support of WorldFish, BRAC Agriculture and Food Security Programme organized the concluding workshop under the Coordination and Change Enabling Project at CSS Ava Centre, Rupsha, Khulna on 22 December 2014. A total of 80 participants from different Government and Non-government organisations like DoF, BFRI, BARI, DAE, IRRI, CREL, Winrock, SRDI etc. were present at the workshop which was arranged to share the knowledge and learning from G5 scale out activities that could be usable for the participants own sectors.

Fig. 7: Closing workshop of G5

Objectives of the workshop were:

- To acquaint the representatives of local stakeholders about the Ganges BDC and CPWF as a whole.
- To explain the aims, objectives and outcomes of Ganges BDC.
- To explain the research programs and related activities of different G-projects.
- To engage the concerned staff to BRAC and G5 with a view to out scaling the research findings of Ganges BDC.

Points raised during the workshop:

- Drainage system should be updated.
- Shrimp culture should be made adaptive with the climate changes.
- Importance on crop diversification should be given (e.g. jute can be introduced in the cropping pattern).
- Electricity power could be generated from water current of Polder area through a minor modification of the sluice gates.
- Climate change impact must be brought into concern.
- Cluster approach is needed for agro based development of coastal region.
- Shrimp/fish culture could be done by developing mini ponds (dry season) at the water logging area.
- Agro processing and developing market value chain is necessary at the coastal Bangladesh.

Achievements:

- An aquaculture technical team has been established in BRAC.
- Research result is disseminating through farmer groups.
- Stakeholders' workshops arranged successfully.
- High Yielding Variety (HYV) crops have been introduced to coastal farmers.
- Farmers' awareness level has been enriched both on climate change adaptation and food security.
- Diversified and risk 10inimizing adaptive technology for brackish water aquaculture has been introduced.
- Resilience of participating farmer has been increased.

Limitations:

- Increased soil salinity
- Water logging
- Lack of fresh water in dry season
- Farmers likeliness to previous practices
- Lack of appropriate water management
- Impacts of climate change

7.0 Lesson learned from the project

- There is a vast scope for agro based development in coastal zone and for its effective use initiatives regarding coastal water management and build up the farmer's awareness level is necessary.
- Different types of agro based technologies should be introduced at the coastal zone.
- Proper solution of the water logging problem can create a positive impact for agricultural development in coastal region.
- Stress tolerant varieties should be introduced to address salinity.
- Most of the rural farmers used to practice traditional methods of cultivation and it is somewhat difficult to bring them out of their circle.
- Yearly three times crop production is possible, where the general practice is two (Polder 43/2F).
- Unfamiliar crops like sunflower, maize etc. will be a good option for diversified agriculture and minimizing climatic risk in coastal belt.
- For broader dissemination of the research findings, appropriate water management is a limiting factor where the major initiatives for sustainable infrastructural development should be taken from government level.

8.0 Recommendations

The situation could be improved by suggesting action to be taken:

- Updating sluice gate operation system
- Repairing sluice gates and dragging of canals
- Introduction of short duration stress tolerant and high yielding varieties
- Raising awareness among the community through distribution of communication materials, campaigns
- Strengthening network among all related stakeholders

9.0 Conclusion

Improved technology adoption can meet the future food security requirements. For the sustainability of the project, it is necessary to develop infrastructures related to water management system and increase of the awareness level rather than the financial aid. During the implementation of CPWF research findings, initially the team had to face so many barriers to motivate the community specially for selecting the high yielding crop and stress tolerant varieties instead of local varieties. But at present, participants are happy with the newly adopted crop varieties. Moreover, BRAC is working with almost same goal and objectives in the coastal Bangladesh and will provide continuous supports with its experienced workforce to make the programme sustainable.