Char Development and Settlement Project Phase IV
Bangladesh

Feasibility Study on Incorporation of Food Security Issues in the Context of Climate Change in the CDSP Project Areas

Technical Report No 11

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Government of Bangladesh/ IFAD/Government of the Netherlands

Implementing Government Agencies

- **Bangladesh Water Development Board (BWDB)**
- **Ministry of Land (MOL)**
- **Local Government Engineering Department (LGED)**
- **Department of Public Health Engineering (DPHE)**
- **Department of Agricultural Extension (DAE)**
- **Forest Department (FD)**
  and NGOs

BETS **Euroconsult Mott MacDonald** **Socioconsult**

Table of Contents

Tables

List of Figures

List of Abbreviations/Glossary of Terms

(A)IGA	Alternative Income Generating Activities
AOS	Annual Outcomes Survey
ASPS II	Agricultural Sector Programme Support, Phase II (Danida)
aman	main monsoon season rice crop, usually grown from July to December
aus	spring season rice crop, grown from March to June
BBS	Bangladesh Bureau of Statistics
BCCRF	Bangladesh Climate Change Resilience Fund
BCCTF	Bangladesh Climate Change Trust Fund
BFRI	Bangladesh Forestry Research Institute
BRAC	Bangladesh Rural Advancement Committee (PNGO)
BRRI	Bangladesh Rice Research Institute
BWDB	Bangladesh Water Development Board
CBCAP	Community-based Coastal Afforestation Project (UNDP)
CBO	Community-based Organization
CC	Climate Change
CDSP (I – IV)	Char Development and Settlement Project (Phases I – IV)
CEAL	Community Extension Agent for Livestock
CEGIS	Centre for Environmental and Geographical Information System
CLW	Community Livestock Worker
CRIM	Climate Resilient Infrastructure Mainstreaming
CRPARP	Climate Resilient Participatory Afforestation and Reforestation Project
CS	Cyclone Shelters
CSG	Credit and Savings Groups
CSO	Civil Society Organizations
CV	Cluster Village
DAE	Department of Agricultural Extension
Dec	decimal (40 square metres)
DFO	Divisional Forestry Office(r)
DLS	Department of Livestock Services
DoF	Department of Fisheries
DOH	Department of Health
DPHE	Department of Public Health Engineering
DPP	Development Project Proforma
DUS	Dwip Unnayan Sangstha (PNGO)
ECNEC	Economic Committee of National Economic Council
ERD	Economic Relations Division of Ministry of Finance
FD	Forest Department
FF	Farmer Forums
FFS	Farmer Field School
FGD	Focal Group Discussion
FLI	Field Level Institutions
FS	Feasibility Study
GOB	Government of Bangladesh

GCF	Green Climate Fund
HH	Households
HHQS	Household Questionnaire Survey
Hilsa	a riverine fish, seen as the national fish of Bangladesh and much loved for its taste
HYV	High Yielding Variety
IDE	International Development Enterprises
IFAD	International Fund for Agricultural Development
IMC	Indian Major Carp
IWM	Institute for Water Modelling
Jatka	juvenile fish of hilsa species, usually under 25 cms in length
Khal	stream, canal
kharif (I-II)	two parts of the monsoon cropping season
KfW	Kreditanstalt fur Wiederaufbau (German Development Bank)
KII	Key Informant Interviews
Killa	artificial mound created for protection of livestock against extreme climatic events, usually managed by the community and incorporating water points
LCS	Labour Contracting Societies
LEAF	Local Extension Agent for Fisheries
LF	Local Facilitator
LGED	Local Government Engineering Department
LV	Local (rice) varieties
MoEF	Ministry of Environment and Forests
NATP II	National Agricultural Technology Project, Phase II
NDA	National Designated Authority
O and M	Operations and Maintenance
PHO	Public Health Officer
PKSF	Palli Karma Sahayak Foundation (Micro-Finance wholesale organization)
PMG	Producer and Marketing Group
(P)NGO	(Partner) Non-Governmental Organization
PPR	Peste de Petits Ruminants (goat disease)
PW	Poultry Worker
Rabi	dry season, usually from December to March - April
RFLDC	Regional Fisheries and Livestock Development Project (Danida)
RHH	Rice Husk Hatchery (for ducklings)
RIMS	Results and Impact Monitoring Survey
SAAO	Sub-Assistant Agricultural Officer
SARCCAB	Support to Agricultural Research for Climate Change Adaptation in Bangladesh
SDI	Society for Development Initiatives (PNGO)
SF(G)	Social Forestry Groups
Sharjan	Form of integrated farming based upon raised beds and ponds
SIIP	Social Infrastructure Investment Project
SPCR	Strategic Programme for Climate Resilience
SSUS	Sagorika Samaj Unnayan Sangstha (PNGO)
TA	Technical Assistance
Tk	Taka

UCNCD	Urir Char Noakhali Cross Dam
(S)UFO	(Senior) Upazila Fisheries Officer
ULDC	Upazila Livestock Development Centre
ULO	Upazila Livestock Officer
UNDP	United Nations Development Programme
UNICEF	United Nations Children's Emergency Fund
Upazila	Second-tier of local government/administration in Bangladesh
USD	US dollars
Uttaran	Local NGO
WASH	Water, Sanitation and Health
WFP	World Food Programme
WMG	Water Management Groups
XEN	Executive Engineer

Executive Summary

1. The Feasibility Study on Incorporation of Food Security Issues in the Context of Climate Change in CDSP Project Areas was conducted over a period of 8 weeks between May 7 and June 30, 2016. The study covered all phases of CDSP and involved: a combination of qualitative data collection including review of secondary data, Focal Group Discussions with local communities and NGO professionals and interviews with government officers and representatives of international agencies; and a modest household questionnaire survey of 220 households in different contexts of the CDSP program area. The sample framework for both the FGD and the household questionnaire surveys was based upon the assumption that lack of protection from climatic events and limited livelihood opportunities from agriculture were likely to be the causes of food insecurity and these areas were compared with those from the different phases of CDSP which were fully protected.
2. It was found that the areas of the CDSP which are currently unprotected comprise two groups: those which were never protected because of low population or instability at the time of the respective phases and those where lack of protection is relatively recent following river erosion of the original polder embankment. These areas, Polder 59/3C in Companiganj and, on a smaller scale, areas within Polder 73/1 in Hatiya, have suffered severe shocks to livelihood. In Polder 59/3C, an estimated 15 km2 of land has been lost and up to 5,000 households displaced (in the sense of loss of their homesteads and agricultural land. Since 2014, a further problem has emerged as a result of the erosion of the newly constructed sea embankment on the eastern side of Char Nangulia, which has also displaced a large number of families.
3. It was found from discussions with local Departments of Health that malnutrition of vulnerable groups, children under five, their mothers and adolescent girls indeed remains high in Noakhali. There was a vicious downward spiral in which women and adolescent tended to be those forced to compromise on food intake at times of shortage, in which girls were subject to early marriage and gave birth several times within a few years of marriage and in which mothers were unable to provide themselves and their children with adequate nutritious food. Poor levels of sanitation and hygiene tended to exacerbate food insecurity by causing poor absorption of available food.
4. Food insecurity was closely related to poverty in the region. The very poor and chronically poor households, usually had little land, what land they had was low productivity because of environmental factors, had little opportunity for productive non-farm employment in the growing regional economy and were frequently women-headed.
5. Food availability differed markedly between the different contexts of study. In protected areas, those households with arable land have been able to develop agricultural systems characterized by high cropping intensities (246% in Hatiya Upazila as a whole), use of high yielding varieties and the cultivation of both *rabi* season field crops and vegetables for market. Market access has been widely improved through the development of road infrastructure by CDSP through LGED. Cattle and poultry rearing and fish culture are important elements in livelihood.
6. There are some limitations to agricultural development in these areas. These are largely (a) by drainage impediment created by the lower levels of internal canals in relation to the Noakhali Khal in particular and exacerbated by more frequent heavy rainfall associated with changing weather patterns; and (b) local salinity related to recent drought conditions also related to

climate change effects. Limited operational capacity of Water Management Groups has contributed to these technical and environmental problems.

7. In non-protected area, the livelihood options in the agricultural land differ starkly. Regular intrusion of tidal water (twice a month at spring tide), supplemented by storm surges, have created a problem cluster also including chronic salinity, sedimentation of drainage canals and waterlogging. The cropping system is largely limited to a single crop of low-yielding *aman* rice, with little scope for *aus* rice, *rabi* crops and vegetables. Chickens are subject to high mortality in the floods and the availability of grazing for large livestock is also limited by salinity. Higher temperatures with changing climate are also contributing to the morbidity levels of livestock. Such areas have limited scope for market diversification and non-farm opportunity is largely confined to seasonal migration for casual labor opportunities in Chittagong and more prosperous regional centres like Feni and Comilla.
8. The special cases of largely landless households occupy an intermediate position. Many households have only homestead land, so that improved productivity of arable land is not relevant for livelihood improvement. Those resident in the old cluster villages of CDSP I and II have addressed the problem by developing land in the new chars, while others, over time have found opportunities in petty trading and salaried employment. In the more recent context of the Social Forestry Groups, however, lack of land may be compounded by the dependence of many households on a declining inshore fishing industry, also under pressure from government bans. This is also a cause of food insecurity for households in the traditionally unprotected area of Nijhum Dwip and the fisher communities in West Hatiya, some of them now also threatened by erosion of the dykes.
9. The issue of land availability may also be threatening food security in protected areas. Continuing high birth rates and land sub-division has reduced holding sizes to just over 1 acre; this is not considered to be adequate to offer a basis of food security from a family's farm production alone.[1]
10. Lack of food availability from own production or access through earnings off-farm is exacerbated by issues in food utilization. The lack of opportunity for production of protein foods – vegetables, eggs and meat from chickens, milk – in the non-protected areas and the SFG groups means a unsatisfactory dietary profile in these households, while coping strategies often involve the women – and therefore children - taking less and less nutritious food, often without the knowledge of their menfolk. Food absorption is hindered by gaps in the availability of clean drinking water (in some limited areas like Musapur) and especially in the access to sanitary latrines. Many households in unprotected areas in early CDSP phases are still using hanging latrines over canals; in these and newly vulnerable areas, ring-slab latrines are overtopped by tidal water and the fact that many of the ring-slabs are broken means that they contribute to a still high, even increasing, incidence of water-borne diseases.
11. The opportunity of addressing the basic problem of lack of protection of household assets and agricultural land caused by exposure to tidal surge and flooding by construction of external embankments would seem to be limited in the short-term and is probably beyond the budgetary scope of CDSP V. Specifically

[1] Many of these observations on livelihood constraints in the CDSP areas are also mentioned in the recent BRAC monograph (Shahed et al, 2016) based upon a comparison of the baseline survey in the CDSP IV areas covered by partner NGOs and a control group in non-intervention chars.

- The problem of erosion of older 59/3C can only be addressed by construction of a new sea embankment, a new Bamni river regulator and re-excavation of internal *khals* and /or the implementation of the Urir Char – Noakhali Cross Dam. Both these projects are expensive and will be long-term in their impact, from 2020 at the earliest
- The Polder 73/1 embankment restoration is complex in design, but may already be the focus of a project under the Strategic Programme for Climate Resilience.
- The problem of erosion of the embankment in Char Nangulia is already being addressed by CDSP IV, through a re-alignment of the embankment and an adjustment of budget to allow for continuation of the Project to 2018.
- Empolderization of Nijhum Dwip has been effectively prevented by the fact that the island is a reserved forest, with a large population of rare deer, and therefore the environmental impact becomes an issue.
- It is only in Char Gangchil –Torabali that there is obvious scope for embankment construction by extending the embankment proposed by the Cluster of Chars Feasibility Study already conducted for CDSP V; this will require revision of that study and this embankment may become rapidly redundant if the cross-dam project begins the sedimentation of the southern part of the Bamni channel.

12. Thus a degree of protection of the agricultural land and livelihood in the unprotected areas in the short-term can only be offered by local 'retired' embankments, such as those which were available until recently in Bamni and on a smaller scale constructed under the UNDP project in Nijhum Dwip. The location and benefits of such embankments should be based upon local consultations and involve local communities in monitoring and maintenance.
13. In Polder 59/3C this limited protection will not help the households who have already lost their land and homesteads. Many of these families have already migrated elsewhere, but perhaps 2000-3000 remain, squatting on public land and roadsides. While addressing the relief needs cannot be the responsibility of CDSP, support may be given to local authorities to develop a register of the displaced and developing priorities for future settlement. CDSP may also help to identify sites for new settlements, including new cluster villages, offering at least a basis of livelihood in the homestead agricultural system.
14. In the context of lack of protection, it is not envisaged that support to the field crop economy (to develop arable land) can be a main priority of a Food Security Component of CDSP V. The climate resilient rice varieties available through DAE may not be adequate to withstand the regular flooding and chronic salinity of the non-protected areas. Such varieties may be appropriate to address the localized problems of climate change in the protected areas, but access to such technologies appears limited by the shortage of DAE field staff in the 'post-project' contexts of CDSP II in particular. This problem may be solved when the NATP II project starts up in Noakhali, specifically in the three CDSP Upazilas of Companiganj, Hatiya and Subornachar. If this serves to intensify the presence of DAE in such areas, then a separate CDSP support may not be necessary.
15. Rather the Study Team believes that the main thrust of agricultural development in a Food Security Component should be intensification of the effort of CDSP IV towards the homestead agricultural system which has the potential to address the food security issue directly and, by being largely under the management of women, supports more directly the groups most vulnerable to food shortage. It is proposed that CDSP expand the current Livelihoods Support

Component of CDSP IV into the areas unprotected and to resource poor groups identified as the most vulnerable, contracting local NGOs to implement this program.

16. However, it is perceived that, for such a programme to be successful, it needs to be properly resourced and requires some changes from the present mode of operation. In particular CDSP should ensure that
    - The program should integrate the current homestead gardening thrust with the sub-sector programs on fisheries (aquaculture) and livestock rearing and even go beyond the homestead agricultural system to consider alternative (non-farm) livelihood opportunities
    - The program is guided by a strategy that recognizes the need for flexibility in the portfolio of livelihood opportunities according to context, in terms of the resource potentials of different areas and households
    - This flexibility should include the possibility of small grants for asset creation for the extreme resource-poor as a stepping stone towards investment through low-cost loans; in this regard, CDSP should consider the Social Fund model being promoted by the current CRPARP project in Noakhali, although this should not be confined to the Social Forestry context
    - The selected NGOs should conduct the livelihood development training in a more intensive participatory mode, along the lines of the successful Farmer Field School approach, with a revised and needs-based curriculum focused on the needs and capacities of the resource-poor
    - That curriculum should also help local communities identify and access promising value chains for accessing local and sub-regional markets and employment opportunities through development of producer and marketing groups. Again consideration should be given to offering such groups small grants (group credit) to facilitate develop of their enterprises
    - CDSP should emphasize the development of farm business advisors, possibly from the local facilitators, to be resource persons in the community after the withdrawal of the NGOs
    - CDSP will need to strengthen its support to the homestead agriculture and alternative livelihoods sub-sector through a long-term commitment to advisory staff, including advisors in value chain development and development of community level institutions.
17. The NGO programme should continue to include training activities on safe hygiene practices (food preparation and hand washing) and nutrition. The local NGOs may provide the channel for making nutritional supplementary food to pregnant and lactating mothers and children under 5 years in partnership with and under the technical guidance of the Department of Health. However, CDSP may wish to consider the development of local resource persons within the Field Level Institutions on the model of the Nutrition Sales Agent developed by the PROOFS project in order to ensure sustainability.
18. Specific to the Social Forestry Groups, CDSP should consider adopting a more flexible model, including a strong livelihood development dimension, including the Forest-Fish-Fruit (and perhaps Fodder) model pioneered by the UNDP CBACAF Project for the embankment plantations.

19. The Food Security Component should also be supported by strategic investments, through government partners in upgrading internal infrastructure facilities to climate resilient standards to facilitate improved access to market and other services, to safeguard assets and to reduce the incidence of water-diseases. These investments should include:
    - Upgrading of internal roads so that these are climate-resilient, i.e. above the level of the regular floods and more resistant to erosion;
    - Re-excavating local *khals* to minimize waterlogging and to offer opportunities for small scale irrigation to expand the integrated homestead agricultural system into adjacent arable lands on the *sharjan* model
    - Restoring cyclone shelters lost to erosion and rehabilitating non-functional cyclone shelters
    - Complementing these by expanding the *killa* concept for protection of large livestock in non-protected areas
    - Launching a new programme for climate-resilient WASH facilities in unprotected areas, including rainwater collection in areas where deep tube provision is not possible and, especially for provision of climate-resilient latrines including raising plinths above flood levels.
20. The above interventions largely imply the strong involvement and participation of the local government and local communities, in the identification, planning and implementation of the facilities. Where possible, CDSP IV's field level institutions should be extended to the target areas. LCS should be involved in the construction/excavation activities, perhaps including the maintenance of Cyclone Shelters. The development of small-scale water resources may serve to revive some of the more dormant Water Management Groups. Killa Management Groups will need to be created as a new Local Field Institution. A Food Security Component of CDSP V should thus include an important dimension to facilitate such cooperation and strengthen the role of community groups in the monitoring, management, operation and maintenance of the facilities. Consideration should be given to income generating opportunities for these local institutions to ensure long-term sustainability.
21. On the theme of participation, CDSP should seek to build upon the initiative of CREL in development of a co-management plan for Nijhum Dwip. In the absence of such a plan, the communities of Nijhum Dwip will be condemned to long-term food insecurity by the different priorities of government agencies. The CDSP IV Social Forestry Advisor could already take the initiative in this direction.
22. On the basis of the above analysis and recommendations, the Consultants propose a Food Security Improvement Component be included in CDSP V. This Component has the following Development Objective:
    - Enhanced Food Security in CDSP program areas, especially amongst communities with limited livelihood opportunity

    Its Immediate Objectives are:
    - More CDSP I-IV areas protected from tidal surge, salinity intrusion, sedimentation and waterlogging by climate resilient infrastructure
    - Food availability and dietary diversity increased through stable and productive livelihood systems developed in CDSP areas, especially amongst vulnerable communities

- Economic opportunity and protection against food insecurity enhanced by climate resilient infrastructure

A draft Logical Framework listing expected outputs and activities of the FSIC is provided in the main text.The main assumptions of this Component are largely implied in the above discussion.

23. The implementation of the Component will be through CDSP's existing governmental and non-governmental partners, with the shift in emphasis outlined above. Existing programs for climate-resilient infrastructure under CDSP IV will be extended (back) to the new Component target areas. Budgets for rehabilitation of infrastructure / operations and maintenance made need to be increased.
24. No comprehensive economic analysis of the Component has been attempted since it is anticipated that major infrastructure development will be covered by Government of Bangladesh agencies through various 'Climate Funds' and since the local infrastructure improvements proposed will be decided based upon a local planning process involving local government agencies and community groups. An illustration of the economic dis-benefits of the loss of productivity in agriculture as a result of the erosion of the embankment in Polder 59/3C is provided as an illustration of the impact of the failure to address this problem.
25. In the context of the above point, the Consultants reviewed the availability of various funding windows for Climate Change related infrastructural development (mitigation measures) to Bangladesh. There is obviously scope for GOB agencies like BWDB to tap the GOB's own Bangladesh Climate Change Trust Fund (BCCTF) but access to the international funds such as the Global Climate Fund depends on the accreditation either of the Netherlands funding agency or the local partner by the Fund managers. If, for example, BWDB were to seek such access to global funds, it appears that capacity building support would be needed from a key partner like the Netherlands Water Program.

Feasibility Study on Incorporation of Food Security Issues in the Context of Climate Change in the CDSP Project Areas

1. Introduction

1.1 Background

The programme of the Government of the Netherlands in support of Bangladesh has traditionally had a major focus upon water management. More recently, in order to address rural poverty more explicitly, it has also developed a major programme on food security issues and has proposed that these should be reflected in the various water resource development and management programmes and projects. One of the longest established of the interventions supported by the Government of the Netherlands has been the Char Development and Settlement Project, which began with a pilot phase (CDSP I) in 1994 and is now in its fourth phase (CDSP IV), due to end in 2017[2]. The successive phases of CDSP have been based upon a model which seeks to promote land development through empolderization of char lands, land allocation to recent settlers of these lands, development of key internal infrastructuressuch as rural roads, cyclone shelters and water and sanitation facilities, agricultural development, creation of local institutions for water management and social development activities, usually through partner NGOs. There has been some variation of the model according to the various contexts in the chars.

In the focus on food security, it has emerged from national surveys and from internal project studies that the Noakhali region and key Upazilas which are the focus of CDSP, continue to suffer from high levels of food insecurity, especially seen in the high proportion of chronic malnutrition (stunting) among young children. This situation, after over 20 years of CDSP interventions, is naturally of concern and it has been suggested that it relates to the vulnerability of the region to climate change which is already affecting the coastal regions of Bangladesh. In its current work programme, CDSP IV includes a series of Feasibility Studies to assess the scope for expanding the general approach to further newly emerged and settled chars in the estuary of the river Meghna. It has now been proposed that a further Feasibility Study should be undertaken to determine the possibility of addressing the perceived food security problem in the former and existing CDSP areas through focused interventions which assist in the mitigation of or adaptation to the pressures of climate change. A team of independent international and national consultants has been engaged to carry out this Feasibility Study on the basis of the Terms of Reference included as Appendix 1 of this Report.

1.2 Objectives of the Consultancy

In the above context, the Objectives of the Consultancy were set out in the TOR as follows:

[2]A proposal to extend the Project to 2018 is currently under consideration

1.2.1 General Objective

With reference to all areas covered by CDSP (I - IV), assess the feasibility of incorporating food security objectives in the context of climate instability and change in the next phase of CDSP.

1.2 2 Specific Objectives

- Identify the current *degree of* and *reasons for* food and nutrition insecurity in the project areas of Noakhali covered by the successive phases of CDSP (CDSP I - IV), with specific reference to the four dimensions of food security: availability, access, utilization and stability;
- Identify the further threats to food security **specific to various local contexts** which may be expected to arise through future changes in climatic conditions;
- Review the impact of the activities of CDSP I - III in terms of their adequacy to mitigate the threats of climate change with specific reference to rehabilitation of existing or additional infrastructural requirements and needs for further adaptation measures;
- Review the current activities of CDSP IV in mitigation of and adaptation to the impacts of climate change;
- Make recommendations on whether a future phase of CDSP should incorporate specific objectives for improving food security and, if so, the outputs and the expected activities to be included in the new project design;
- Assess what needs to be done for a possible CDSP-V to be financed out of climate funds rather than Official Development Co-operation.

1.3 Methodology

The study was carried out through a range of methods of investigation, both qualitative and quantitative as set out in the following paragraphs.

1.3.1 Review of Secondary Materials

Even before official start up, the study team had begun to review the literature on the impact of current environmental hazards (changes in weather patterns/incidence of extreme climatic events) and likely future impacts of climate change on dimensions of food security as they affect the coastal zone of Bangladesh from projects conducted by government agencies and donor partners and independent researchers. After start-up, this review continued to include Project Documents, Progress Reports, Project Completion Reports and other Technical Reports published by CSDP itself, especially those relating to climate change-related interventions in CDSP-IV. Time was spent in the CDSP IV Dhaka Office for document search. This proved extremely useful, especially in terms of information on CDSP I-III. It was found in particular that the Evaluation of CDSP I-III (Alamgir et al, 2011) offered major insights into the wealth/poverty profile of the area and the relation to food insecurity, which is serving to guide the team's thinking, while the successive monitoring reports of the results of selected interventions in CDSP I and II areas (Latif et al, 2009, Latif 2010) were instructive in relation to land retention and productivity. A preliminary Internet search was made to identify key policy documents related to the climate change funds being implemented in Bangladesh, with a view to addressing the final specific objective. The reference list for the study given in the TOR has been updated progressively and is included at the end of the main body of this report.

1.3.2 Field Study

On the basis of the review of existing documentation and initial information from key informants, immediately upon assembly in Dhaka, the study team began to develop appropriate survey instruments to address the key objectives of the study. A large quantity of secondary material is available from CDSP IV, including baseline and evaluation / annual outcome surveys (AOS), which have included a few rather conventional questions on food security (numbers of months of shortage of staple foods like rice and pulses from own production) and covered sub-samples of households from the CDSP I/II and CDSP III areas. The initial assumption had been that this information could be simply complemented by Focal Group Discussions at community level. However, it was later determined that the information in the AOS and other surveys was not sufficiently detailed and focused to address the questions raised in specific objectives 1 and 2. The AOS and the RIMS reports do not explore the range of factors behind the food security situation, they do not breakdown the sample according to the nature of the CDSP interventions and (see Appendix 1, Terms of Reference) there is no attention to the possible climate change effects.

1.3.2.1 Household Questionnaire Survey

It was therefore determined that the Focal Group Discussions should be complemented by a limited household questionnaire survey focused on CDSP beneficiaries in various intervention contexts. This focuses very specifically on searching for the reasons for food insecurity in the various CDSP areas and tries to tease out opinion on the degree to which livelihood is *at least perceived* to be affected by climate change. A draft questionnaire was drawn up in Dhaka, revised and then modified in consultation with CDSP management. This is presented in Appendix 2 of this report. It will be seen that the questionnaire comprises three sections: one on general information on the household and assets, the second on food security and livelihoods, the third on perceived impacts of changing weather patterns and extreme climatic events, seen as synonymous with climate change. However, in this third section, the Study Team took a broad view of climate change to include the cluster of changes related to the effects of river erosion of protective dykes, tidal flooding, salinity intrusion through regular high tides and sedimentation. The team recognized that these development *could* be related to the wider regional effects of climate change in the sense of changing, probably stronger river flows in the Ganges-Meghna-Brahmaputra (GMB) river system resulting in increased sedimentation and in turn changes in the hydrology of the estuary. Therefore a liberal interpretation of climate change was taken.

The draft was presented to an enumeration team recruited by CDSP IV on May 15, allowing them to raise numerous questions on meanings and emphases. It was subsequently translated into Bangala and printed. The questionnaire was tested in one of the sample sites on May 22 and was checked by the Local Consultants; although no changes in wording and structure were made, some gaps in the information were observed and the enumerators were advised on how to ensure such information. The enumeration then continued with their work, submitting the completed questionnaires for further review to the National Consultants for the second and third days. Some further advice was given.

It was determined that, given the very limited time available for primary data collection and analysis, the household questionnaire survey should be highly focused towards what were seen as key explanatory factors in relation to food insecurity, that sample size should be limited - to 220 households and it should be divided to ensure **adequate coverage of all areas covered by successive phases of the program and under different types of development interventions.** These were listed in Appendix II of the Terms of Reference and were amended through observations and discussions during the field reconnaissance on May 14 and discussions with the CDSP IV Technical Assistance Team at an orientation meeting on May 15. The field reconnaissance served to familiarize the Local Consultants with the different CDSP Project areas and to get the views of experienced project CDSP personnel who had worked in the programme during CDSP I and II in particular. The major change merging from the reconnaissance was the identification of the CDSP II areas, Polder 59/3C and a part of the South Hatiya Polder, as a separate category for analysis given the fact that the sea embankments had been eroded, in the first case for a length of 10 kilometres from Char Kalmi to the mouth of the Little Feni River (Figure 1.1), and in the second case in the shape of a series of breaches in the secondary canal which had replaced the already eroded main embankment of the original Polder 73/2.

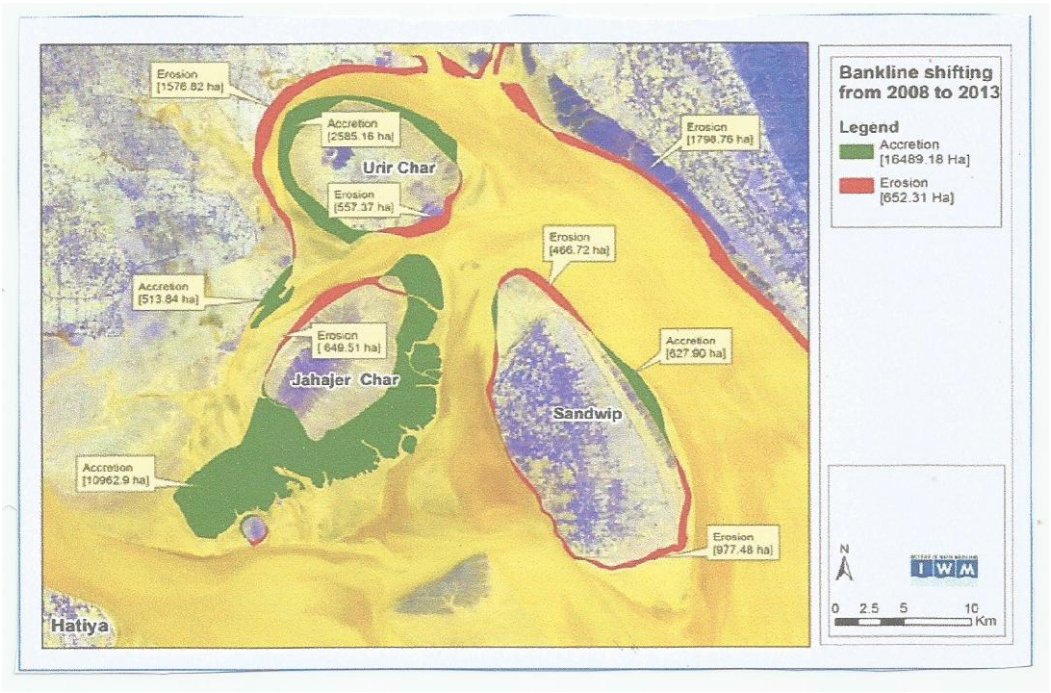


Figure 1.1:Accretion and Erosion in Bamni Channel 2008-2013

In the meeting with the CDSP IV Technical Assistance Team, the Consultants Team Leader presented the background to the Feasibility Study, concepts of food security and climate change and how these might interface with the different intervention and livelihood contexts of CDSP I-IV. The preliminary sample framework for the FGDs and the Household Questionnaire survey was presented and the survey instruments explained. Questions were raised in the discussion as to

- Why a random sample of households was not taken with a larger sample fraction
- Whether holding the FGDs with Water Management Groups would give a representative picture of the situation of the general population and the number of FGD sessions

- Whether small construction projects might be included in the possible food security component.

The Consultant Team explained that the time available for the survey, approximately 14 days, did not lend itself to a larger and broader sample. Even including Hatiya in the sample framework would absorb 3-4 days. Also, there was a good deal of information already available on the key factors which allowed for a much more focused sample framework. Typically, random samples were used in the absence of knowledge. Thus the Team had decided to focus broadly on comparison between the 'protected areas' under the full CDSP package program and those areas or groups of households which appeared to be contexts in which food insecurity was likely to be an issue based upon the different dimensions of food security, including likelihood of climate change impacts. The Team had proposed conducting the FGDs through WMGs/SFGs because these were the local institutions with the closest relation to CDSP and in which women were well represented. However, it was agreed that a larger number of FGDs possibly based upon other groups should be considered. The Consultant noted that a particular issue which required the TA team's consideration was the lack of obvious points for organization of the field survey and FGDs in some of the former areas where WMG did not exist or were not functional. This would be discussed further before finalizing the framework.

On the basis of these discussions, it was proposed to follow a sample framework, concentrating in particular on areas of CDSP I – III, as set out in Table 1.1.

Table 1.1: Provisional Sample Framework for the Household Questionnaire Survey

	Fully Protected Area	Unprotected Area	Older Polder with only Water Management	Special Groups
CDSP I	Char Bhatirtek (20)			Char Majid Cluster Villages (20)[1]
CDSP II	South Hatiya Polder (20), but see also Footnote 2 of this Table	Char Gangchil – Torabali (20)	Polder 59/3C (40)[2]	
		Char Osman Bandartila (20)		
CDSP III	Boyar Char (20)			Social Forestry Groups in Boyar Char (20)[3]
CDSP IV	Char Nangulia/Noler Char (40)*			

Notes: [1] Settlers in Cluster Villages were not allocated land; there were CVs in all three protected areas of CDSP I, but the greatest proportion of CV settlers was in Char Majid (40%)

[2] As stated above, this area is now largely unprotected because of erosion of the original main embankment of the Polder constructed with World Bank funding in the early 1990s. It was also established that the original main embankment of a similar project (Polder 73/2) in Hatiya had also been eroded away and that there were breaches in a secondary embankment constructed by BWDB.

[3] Concerns over short-term livelihood opportunities

*Process of empoldering not yet complete and held up because of erosion of the newly constructed embankment on the south-eastern side of Char Nangulia

The final sample corresponded exactly to the framework shown in Table 1.1.

There was a further problem with the questionnaire survey, namely that the M and E team of CDSP IV was not generally familiar with the 'old' areas of the previous phases. The assumption that the interviews could be arranged through the Water Management Groups did not prove to be correct, since some of these were not so active. In the end, the interviews took place on a random walk basis in communities selected by the CDSP IV Monitoring and Evaluation Officers without adequate prior communication.

1.3.2.2 Focal Group Discussions

As noted above, the household level questionnaire survey was complemented by Focal Group Discussions with community leaders in the same areas, in order to minimize the demands on CDSP resources and to allow for some interaction between the consultant team and the survey enumerators. The Focal Group Discussion checklist covered much of the same ground as the household survey questionnaire but allowed for more in depth and interactive discussion in such areas as the state of local infrastructure, dietary norms, including mother and child nutrition and the reasons for stunting of small children. The initial plan was that a minimum of 10 FGD would be conducted, but this number slightly increased because, having visited an area, it proved possible to arrange meetings in both morning and afternoon. In total 13 FGDs were conducted, including three in Polder 59/3C, 2 in Char Osman Bandartila and 2 in South Hatiya (See Appendix 3 for a draft of the Checklist for the Focal Group Discussions)

1.3.2.3 Interviews with Key Informants

In the preparation period in Dhaka, the consultants also made initial identification of key informants, with a view to seeking explanation of the issues raised in the TOR, including CDSP management and staff, local GOB officers and NGO management and staff involved in food security issues and research teams engaged in various studies of climate change and food security in the Noakhali area. Those identified included:

- Upazila Chairs and key officers of the local government and administration at the Upazila level
- District and Upazila Health Offices, with reference to child malnutrition
- NGOs in relation to food security, child malnutrition and nutrition training
- Department of Agricultural Extension at both District and Upazila levels, with reference vulnerable contexts and to context specific adaptation in cropping systems
- Department of Public Health Engineering, with reference to WASH adaptations to salinity intrusion and tidal surges/floods
- Local Government Engineering Department, with reference to adaptations in construction norms in relation to climate change.

A further round of key informant interviews was conducted after the Focal Group Discussions at the local level with a view to clarifying some of the comments made by the informants at field level. These included in Noakhali discussions at/with

- The Bangladesh Water Development Board to seek the details and status of projects to address the identified problems of water management in the region
- The Divisional Forestry Office, Coastal Forest Division to review alternative models of Community and Social Forestry and the current status of the reserved forest in Nijhum Dwip;
- A group of farmers from the Char Elahi Water Management Group in Polder 59/3C, who wished to make representations to the study team about the seriousness of their livelihood situation and to seek the team's support for prompt action to address their immediate problems. This was a remarkable event, which served to emphasize the critical status of food insecurity in this part of the CDSP program area. The study team sought to clarify the status and likely time schedule of proposed large-scale projects as far as they knew it and to assure the farmers of their concern for their situation.

and in Dhaka

- A meeting with the Assistant Country Director of UNDP in relation in Climate Change policy in Bangladesh and the status of UNDP and other donor initiatives in the sector.

Information was also sought from key informants via e-mail, notably from representatives of KfW and the Embassy of Denmark.

1.4 Work Schedule

The study was carried out in somewhat overlapping parts:

- A preparatory phase from the arrival of the International Consultant and Team Leader in Bangladesh on May 7, until his departure on May 27. During this period the study instruments were drawn up and tested in the field, a detailed sample framework and work plan for the field data collection was finalized, several key informant interviews were conducted and the Inception Report prepared. This was transmitted to the CDSP IV Team Leader in soft copy by May 17 and later discussed with him at a debriefing in Dhaka;
- A data collection phase from May 25 to June 8, during which time the household level questionnaires and remaining Focal Group Discussions were completed. A debriefing meeting was held with the field survey enumeration team on June 16;
- A data review and analysis phase from the return of the International Consultant on June 11 to June 24, during which the findings of the FGDs were collated and it was planned to analyze the tabular outputs of the household level questionnaires; and
- An overlapping report preparation stage, from June 17 – 30, leading to the preparation of the Draft Final Report of the Feasibility Study in mid-August.

1.5 Constraints and Limitations

It will be observed from the Terms of Reference that the original time allocated for the study was 12 weeks. Because of the delays of recruitment of the study team, this period was progressively squeezed to 8 weeks, although the national consultants were contracted for 9 weeks. From the outset, the Consultants expressed serious concern that, despite the streamlining of the

questionnaire schedule and the small sample size, there would be insufficient time for measured data collection processing and analysis and therefore for report writing before the beginning of July.

This concern was substantiated in two respects. First, the rush to organize the household level questionnaire survey and the lack of familiarity of CDSP IV with the contexts of the previous phases might have ledto some bias in the survey, particularly towards those present in the community at the time and engaged in agriculture and possibly towards male household members. As will be seen in Section II, this seems most obvious in selection of the location of the sub-sample for the South Hatiya Polder (CDSP II), where, although in the protected area, a fisher community was selected with little agricultural land and thus not reflecting the secondary data of the cropping system in Hatiya supplied by the Upazila Agricultural Office. In another case, in the Cluster Village community in Char Majid (CDSP I), it had been expected that the sample would demonstrate a high proportion of women-headed households – as in the FGD – but this was not the case. It is important that these possible sample biases are borne in mind in review of the primary data.

The second issue related to processing of the data. This was immediately held up by a delay of 3 days in the schedule before the person hired to conduct the data entry and processing was able to produce the first set of usable tables. Despite the fact that the need for comparison the different contexts had been made clear in the initial briefing of the survey team, the young man concerned initially produced only aggregate data. Such a request should not have been surprising since apparently the same team has been regularly employed by CDSP IV for collection and processing of its AOS data. A further delay arose from an initial lack of communication in the translation of the questionnaires whereby the conventional 'headers' on the questionnaire schedule giving name and location of respondent were omitted, so that the questionnaires had to be sorted by date and enumerator; initially some households were misclassified. The data processor also turned out to be working from Dhaka, on a part-time basis, which further slowed communication and feedback on the data issues. The study team's return to Dhaka, originally meant to be focused on meetings with national level organizations, thus began with a further review of the data.

There was also concern that political agitation or bad weather would exacerbate the pressures on the schedule. In the event, this was limited to the first phase of the work, when three working days were lost to public holidays and local elections. On May 21 also, the Noakhali area was hit by Cyclone Roanu which caused the postponement of the field programme planned. The FGD planned for this day was initially re-scheduled, but in the end was dropped because of the uncertainty in the delivery of the survey data.

2. Findings and Analysis

2.1 Levels of Food Insecurity/Malnutrition in CDSP Area in Noakhali

2.1.1 Evidence of Malnutrition

The Terms of Reference of this Feasibility Study cited evidence from two studies as the basic of concern over the Food Security situation in the Noakhali region and specifically the areas covered by the successive phases of CDSP. These studies were: the Undernutrition Maps of Bangladesh (WFP/BBS/IFAD, 2014), based on national surveys, which showed chronic malnutrition amongst children under 5 years of age in Noakhali to be amongst the highest in the country and that the Upazilas covered by CDSP (Companiganj, Hatiya, Subornachar, Ramgoti) contributed significantly to this overall District average; and CDSP's own Mid-Term Result and Impact Management System for 2014 which, in its independent anthropometric measurement of children under five years of age, showed that stunting measured at 52% of all children in the CDSP IV Baseline of 2009 remained at that level in 2014. The latter survey does show declines in the proportion of wasting and underweight children which may be figures more responsive to short-term impact of Project interventions, but the records for stunting are widely agreed to be disturbing.

This secondary data was confirmed through the key informant interviews with Department of Health officers at the District and Upazila levels in Noakhali, who also quoted a number of other secondary sources offering a wider range of indicators. It emerged that the Noakhali statistics compared to the national statistics and other important indicators for the District were as follows:

Table 2:1: Selected Indicators of Malnutrition: Noakhali and National Averages

Indicator	**National 2014**	**Noakhali 2013**
Percentage of children under 5 identified as malnourished under the following:		
Height for age (stunting): severe and moderate	36.1	49.1
Weight to height (wasting): severe or moderate	14.3	10.1
Weight for age (underweight) severe and moderate	32.6	34.6
Other key indicators which might affect malnutrition:		
Exclusive breastfeeding of children under 6 months	55.3	55
Children 6-23 months fed with appropriate infant and young child feeding practices	22.8	22
Adolescent girls (10-18) who are underweight		14
Inadequate dietary diversity among women		54

Pregnant women who are undernourished		23

The DOH team agreed that the stunting figures for Noakhali were higher than the national average, but noted (a) that figures of wasting were lower and (b) that the Noakhali figures had come down since the initiation of a Project supported by UNICEF which started in 2015. This Project, 'Mainstreaming Nutrition was in all districts in the country and comprised 16 different interventions (Table 2.2). They noted that there was negative change in certain indicators: the percentage of women exclusively breast feeding in the first six months of their baby's life had fallen from 63.5% in 2011 to 55.3% in 2015, while the percentage of mothers practicing complementary feeding has scarcely changed over the same period.

Table 2.2: Nutrition-specific interventions under UNICEF Mainstreaming Nutrition Project

Domain	**Direct Nutrition Interventions (DHIs)**
Infant and Young Child Feeding (IYCF)	1. Early initiation of breastfeeding within the first hour after birth 2. Exclusive breastfeeding from birth up to six months 3. Age appropriate complementary feeding of children from 6-23 months
Hygiene	4. Handwashing with soap at critical times –before eating/preparing food, before feeding a child and after defecation
Micronutrient Supplementation	5. Vitamin A supplementation for children 6-59 months once every 6 months 6. Iron Folic Acid supplementation for Pregnant and Lactating Women and adolescent girls 7. Multiple Micronutrient Powder supplementation for children 6-23 months 8. CRS with zinc in management of acute diarrhea
Deworming	9. Deworming for children 24-59 months once every 6 months
Consumption of nutrient-rich, fortified foods	10. Consumption of foods rich in iron and Vitamin A by PLWs, adolescent girls 11. Household consumption of iodised salt, fortified oil with Vitamin A
Management of acute malnutrition	12. Screening and referral of acute malnutrition in children 0-59 months 13. In-patient and out-patient management of children 0-59 months with acute malnutrition according to national protocols
Maternal nutrition	14. Adequate food intake and rest during pregnancy and lactation 15. Micronutrient supplementation (including folic acid, calcium) 16. Consumption of nutrient-rich food

In the discussion with the District DOH which followed the group claimed that mothers often perceived that they were not giving their babies enough milk and that their babies were not gaining enough weight, so they added other foods, while the media tended to be advertising the use of feed supplements. The group discussed the process of stunting, which they said could begin with malnutrition (and stunting) of the adolescent girls, or pregnant and lactating women, or the children

themselves (see Indicators in Table 2.1). It was not clear which was the main factor. Concern was expressed at early marriage leading to births by underweight mothers. The District Nutrition Specialist under the UNICEF Project also argued that a key issue after 6 months was the lack of animal protein in the diet: that the children should receive eggs, milk, fish or meat (chicken liver was specifically mentioned) regularly. Fish and chicken liver offered three benefits: protein, vitamin A and micronutrients.

It was not possible to obtain a breakdown of the malnutrition data by Upazila (what were originally thought to be Upazila statistics presented in the Upazila Health Office in Subornachar turned out to be for the District as a whole). However, the Upazila Public Health and Family Planning Officer in Hatiya stated that 'around 60% of mothers and children under 5 had acute malnutrition'. He noted that, although the Upazila hospital had an exclusive corner for treatment of Severe and Acute Malnutrition (as in Interventions 12-13 in Table 2.2), people were reluctant to get services, which, according to his counterpart at Subornachar was due to the distance (and cost) of travel. As a consequence, as the Hatiya PHO mentioned also that the incidence of acute malnutrition was greatest in the most remote areas.

It was not possible in the short period of time and the field work methodology for the study team to seek primary data on malnutrition. Only observations could be made at some of the sites of some of the FGDs, where evidence of stunting and malnutrition was obvious.

Figure 2.1: Apparent Evidence of Malnutrition among Children at Char Majid Cluster Village

2.1.2 Degree of Household Food Insecurity

The RIMS report quoted above specifically links such indicators to adequate food supply as a major factor in malnutrition and presents conventional data for households experiencing food shortage

during the year compared to the CDSP IV Baseline. Again this shows a positive trend, with the proportion of households recording 5 months and above of food shortage declining markedly from 46% at Baseline to 24%. These figures are provided also in the CDSP IV Annual Outcome Surveys, which valuably compare the changes in CDSP IV since Baseline with the current situation in the CDSP I/II (not separated) and III areas. Interestingly, in the latest report for 2015, the figures show that the proportion of households suffering acute food crisis at 37% in the CDSP IV areas is not notably higher than in the CDSP I/II and CDSP III areas (24% and 35% respectively). The average number of months in which families are able to meet their food needs from their own production, moreover, is actually higher now in CDSP IV than in the sample from CDSP I/II (8 months) and the same as CDSP III (9 months). It should be remembered, of course, that such figures are averages; nowhere in the CDSP standard reports are distributions offered and the averages may hide the fact that some households do not suffer crisis at all, whereas others may suffer shortages over almost all the year. Perhaps, just as important as the downward trends in these project reports is **the fact that 15-20 years after CDSP intervention in the previous phases**, **at leasta quarter to one-third of households – or more if the stunting figures are considered - arestill significantly food insecure.** Moreover, it is important to note that the sample base of the Annual Outcome Surveys may not cover all areas claimed as "CDSP"; for example, the "cohort" sample which is the same every year does not include any sub-sample from Polder 59/3C which, as we shall see, may be a significant gap.

The CDSP I-III Impact Evaluation (Alamgir et al, 2010) also examines the degree of food insecurity in the three phases of the Project, with data from 2009. This is mainly a conventional analysis of the critical months, when families do not have enough food to eat from their own resources. These critical months are identified as

- *Aswin* and *Kartik* (October-November), when stored food is beginning to run out and there is a lack of work before the harvest, except for fishing;
- *Aashar/Srabon* (July-August), at the beginning of the rainy season; and interestingly
- In the fishing industry, March-May,which are traditional the months between the different fishing seasons and appear still to be mentioned by fishers, because of the ban on catching linked to the conservation of juvenile *hilsa* (*jatka*).

Then the report gives the general picture about the AVERAGE number of shortages months falling in all areas over time (see Table 2.3 below):

Table 2.3: Changes in the Proportion of Households Suffering from Food Insecurity by Numbers of Months for CDSP I-III Areas (Source: Alamgir et al, 2010, Table 11)

	CDSP Phases/Years							
	CDSP I		CDSP II		CDSP III		All	
	2004	2009	2004	2009	2004	2009	2004	2009
Shortages	58.6	48.2	57.5	47.1	63.4	55.9	60.7	51.7
1-2 mths	11.4	23.2	16.3	23.8	17.3	21.1	15.6	22.3

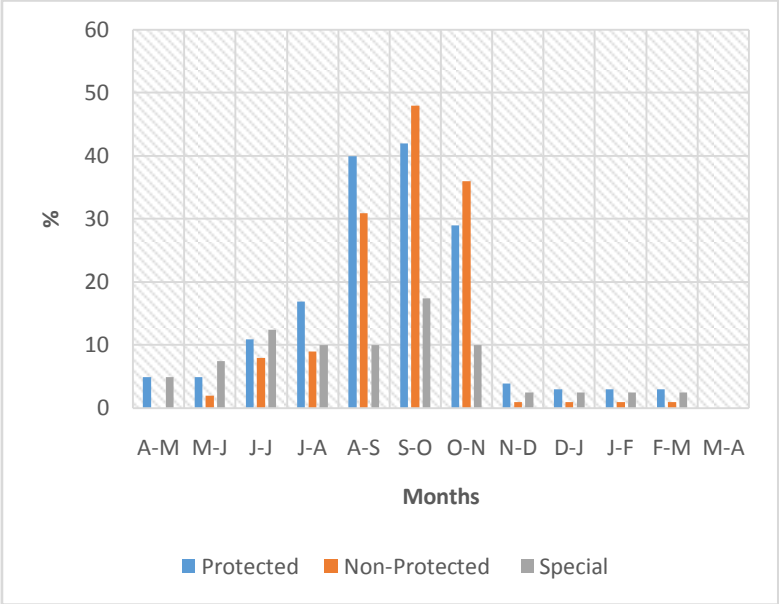
3-5 mths	35.5	19.1	32.1	20.8	32.7	23.6	33.2	21.8
Over 6	11.8	5.9	9.2	2.5	13.4	11.1	11.9	7.6
No shortage	41.4	51.8	42.5	52.9	36.6	44.1	39.3	48.3
No. hh	220	220	240	240	440	440	900	900
Mean shortage period	2.28	1.47	2.07	1.37	2.44	1.99	2.30	1.70

Armed with these data from secondary sources, the Feasibility Study Team sought to revisit the situation based upon questions included in both the household questionnaire and the Focal Group Discussions which, as we have seen above, targeted a number of areas of groups which were *a priori* considered as food insecure.

From the field information collection, early Focal Group Discussions in the Polder 59 3C area affected by tidal surge, salinity, waterlogging and sedimentation as a result of the erosion of the sea dykes provoked responses amongst local people that they were food insecure every month of the year as a result of the twice monthly flood tides. A similar statement was made at the FGD with the Social Forestry Group in Boyar Char; here the group consisted of 23 households, one a salaried employee, the rest earning their living from agriculture and fisheries. Just over half the households claimed that they were short of food throughout the year. This group was pushed about their food consumption patterns during the previous month, which overlapped with the Baishakh festival. During that period, not typically a crisis period, 7 households had eaten 3 meals a day, 3 two meals a day and 13 (over half) had had an average of less than two meals.

The quantitative data collected from the household level questionnaire survey regarding which months are the “hungry months” matches well with the qualitative data. As shown in the Figure below, the height of the hungry season peaks in *Bhadra,Aswin* and *Kartik (August – November),* that is, the greatest number of households mentioned lacking access to sufficient amounts of food during these months (Figure 2.2). About 47% of households under the protected areas, 60% of households under the unprotected areas and 25% of households living in the areas of special cases (Cluster Village; Social Forestry Group) remain in a state of moderate and highly food insecure conditions. It may be noted that the figures for the protected areas is inflated in the critical months by the sub-sample from the South Hatiya Polder, where the proportion of households with food shortage is as high as 75-80% in the months mentioned. Here 81% of households experience food shortage at some time during the year, while the equivalent figure in Bamni (Polder 59/3C) is 74%. The fact that the highest proportion in any one month in Bamni is 50% indicates the comments made in the FGDs that there is food crisis throughout the year.

Figure 2.2: Percentage of Households Claiming to be Food Insecure by Month
(Source: Household Questionnaire Survey)



2.1.3 Coping with Food Insecurity

The ability to coping at the time of an inadequate quantity of staple foods year round is a key marker of wealth and well-being status. During lean seasons, the more vulnerable households begin to limit consumption to one or two meals a day and the amount of rice and presence of other food items becomes limited. The resource poor families often struggle to manage adequate food with their own savings and tend to take less food and particularly the women and adolescent girls are more used to compromise with food than other members of the family. Ultimately this situation makes them victims of malnutrition.

Again both the FGDs and the HHQS explored the strategies followed by households to cope with such food shortages. In the SFG Group in Boyar Char, the following were mentioned:

- Loans from micro-finance institutions (20/23 households); it was confirmed that these had not been invested for productive purposes;
- Sale of crops in advance of harvest ('green sale'), but at reduced price;
- Selling their labor in advance;
- Taking loans from relatives and no interest;
- Taking less food, particularly among the women of the household, and more amongst girls than boys.

This qualitative data reveals much about the intra-household distribution of hunger in the lean period due to gender inequality and social customs in a male dominated society. In several villages, the pattern seen was that as food becomes less abundant, the women are the first to cut back on their consumption, before the children, men, and the elderly. This is always explained as being due to the men doing the physical work and needing strength.

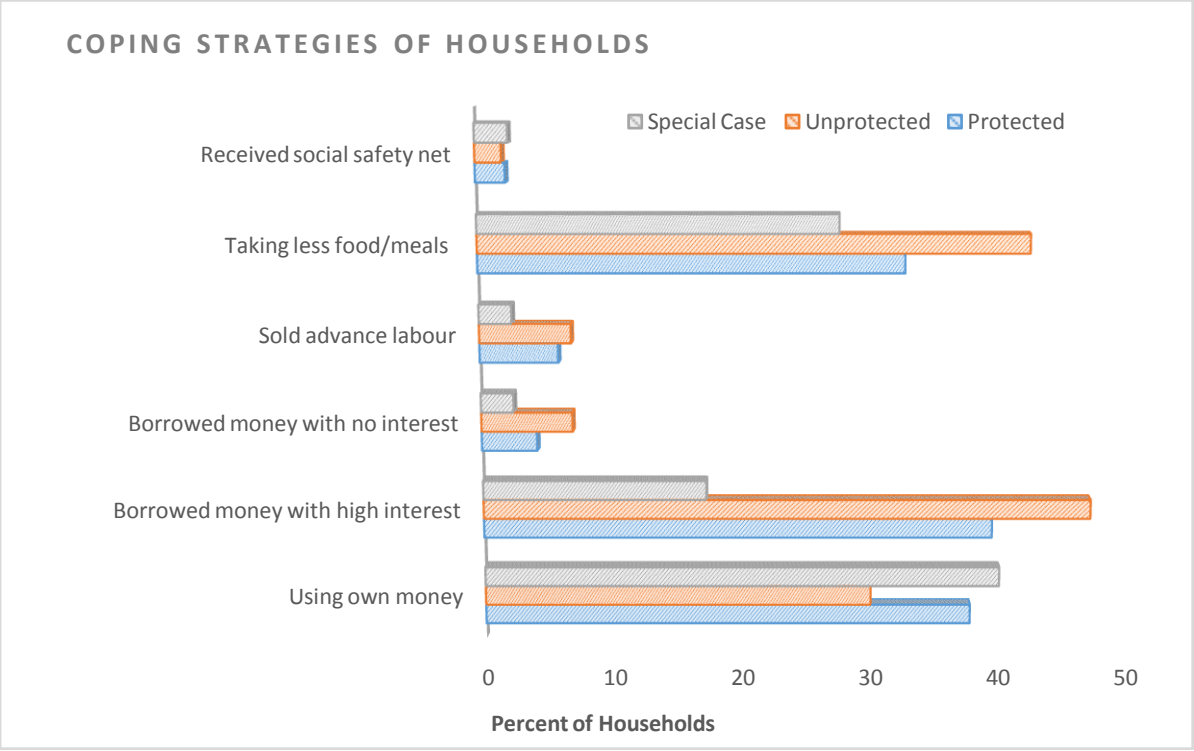
The study team notedparticularly that the situation of taking less food in Char Osman - Bandertila was extreme, with more than 63% of households following this strategy which is nearly double the average figure of 35%. The graph appended below (Figure 2.3) reveals that more than 40% HHs are

taking less food in the unprotected areas followed by protected areas (32%) and just 27.5% in case of Cluster Village context).

One of the coping options, taking loan with high interest and/or no interest, seems to be very common and creates pressure to those families when they are compelled to repay the lending individual or MFIs. It may be noted that overall 64.5% of all respondents in the household survey borrowed money in the year before the survey, with the proportion in the unprotected areas slightly higher at 65.8%. The bulk of lending was from NGOs (60%). While loans for agriculture constituted around a quarter of the stated purpose of those borrowing, it should be noted that 17% were for house repair (consistent with the date on the impact of climatic events presented in Figure 2.6, page 34 below), 6% for medical expenses, 4.5% for marriage ceremonies (including dowry) and a worrying 5% for the refinancing of previous loans. While it is not clear from the data analysis that these 'non-productive' loans are from NGOs, it is likely that a certain percentage are, suggesting a lack of detailed supervision.

Selling advance labor is also a factor of vulnerability as advance selling of labor means receiving lower wages than the market rate.

Figure 2.3: Coping Strategies during Period of Food Shortage (Source: Household Questionnaire Survey)



2.2 Analysis of Causes of Food Security

2.2.1 Overview: Food Security and Poverty

Secondary sources emphasize the normal link between food insecurity and poverty and, in the CDSP area, the CDSP I-III Evaluation Report (Alamgir, 2010) is particularly instructive with regard to the continuation of significant levels of food insecurity in the CDSP areas. As an element in the PRA study which forms part of the report, the main author conducted a participatory wealth ranking of

the sampled households. This identified four categories of household, with the following characteristics (pages 22-23), which sheds light on the key factors in food insecurity. The four categories, with their typical characteristics, are

(i) Not poor: households with regular income generating some surplus, no food insecurity, good housing and a range of consumer durables including furniture, mobile phones, etc and livestock assets. **By livelihood these people have a number of good sources of income such as agriculture, shops/trading, small jobs, owning fishing boats or owning a number of cattle.** Some may have brought assets with them at the time of migration to the chars;

(ii) Moderately poor: **households with sufficient income for household expenses throughout the year, no year-round food crisis, some household and livestock assets**;

(iii) Very poor: households lacking sufficient regular income throughout the year**,** weak house with almost no furniture, **food shortage for a number of months, may be women-headed.** They have the following features: **very large families with only one earning member, day labour either inside or outside the chars or on fishing boats, insufficient crop production to cover family needs and little or no skills other than manual labour;**

(iv) Chronic food shortage: **irregular income (may not have an adult male earner), land already sub-divided, may have chronic health problems.**

The results of this ranking in the different areas from the start of CDSP to the situation in 2010 are summarized in the following Table.

Table 2.4: Proportion of Households by Wealth Status in Different Phases of CDSP (Source: Sample Survey in Alamgir et al (2010))[3]

Wealth status								
	CDSP I			CDSP II			CDSP III	
	Before (1993)	Current (2010)		Before (2000)	Current (2010)		Before (2005)	Current (2010)
Not poor	0	27		1	17		0	16
Moderately poor	9	34		7	27		6	36
Very Poor	58	29		56	40		55	32
Chronic food shortage	33	10		36	16		39	16
Total	100	100		100	100		100	100

[3]This sample survey, carried out by Mitra Associates, had a sample size of 900 households. Unfortunately the full survey report has not been located in the various CDSP Offices, so that the sample distribution is not known. However, it is presumed that this covers all areas of CDSP II, both protected and non-protected.

This Table shows:

- A substantial reduction of poverty in all three areas; poverty levels in CDSP I may be considered as similar to other parts of rural Bangladesh;
- Despite the overall reduction, there remains a significant proportion (10-16%) of households in chronic food crisis [and between 39-56% are classified as very poor][4];
- Prior to development households in CDSP III appear slightly poorer than those in the two other areas, possibly because embankments had been developed in parts of CDSP I and II areas prior to the start of the CDSP programme.[5]
- While current poverty levels in CDSP I are lower than CDSP II, the wealth ranking suggests that current poverty levels in CDSP II are little, if at all, better than in CDSP III despite current conditions for agriculture (flooding and salinity) being significantly better. This could be partly attributed to inclusion of households in south Hatiya who are recent settlers and living outside the embankment in great poverty [and the inclusion of households in Char Osman - Bandartila and Char Gangchil –Torabali – the authors]
- In CDSP III, there remains a high level poverty as the full benefits of development have not yet been realized.
- In the CDSP II area, and to some extent in CDSP I, many of the very poor and chronic households are those who migrated to the area since CDSP I and II were completed. They have not benefitted from the CDSP land distribution and may have had to settle in vulnerable locations outside embankments [or have been settled in Cluster Villages with only homestead land – the authors].
- Poverty levels are also being pushed down by natural growth of population (and large family size), sub-division of land holdings and lack of local employment opportunities.
- This population pressure is reflected in the fact that the percentages of households with cultivated land in the CDSP I and II areas have fallen to 69% and 77% respectively and the size of holdings to 101 and 117 decimals, respectively. (Alamgir et al, Table 10).

2.2.2 Dimensions of Food Security

As stated in Chapter 1, the overall conceptual and data collection framework for the study was based upon the standard dimensions of food security: availability, access or affordability, utilization and stability. This section examines the possible factors behind the high levels of food insecurity in Noakhali discussed above in the context of the above four dimensions, again combining the evidence from secondary sources with that from the primary field study.

2.2.2.1 Food Availability

Food availability is usually focused on the aggregate production of key foodstuffs at national and regional levels. At national level it may be equated with national self-sufficiency in food. Regional is a vague term and in itself may be considered at several scales, for example, the Greater Noakhali region or various parts of it, such as the different sub-projects of the successive phases of CDSP. At the micro-scale it could be considered at the level of different agricultural ecologies within the

[4] The clauses in brackets are additional interpretative comments by the writers of this report

[5] Parts of CDSP II (Char Gangchil-Torabali, Char Lakshmi and Char Osman Bandartila) were, of course, not protected by embankments. It seems that the survey sample for CDSP II also covered these areas.

various sub-projects. Aggregate production depends on two key variables, the holding of agricultural land and its productivity.

During the field investigations, the FS Team acquired data from the District and Upazila Offices of the Department of Agricultural Extension. These refer to the administrative units, but there can be little doubt that aggregate agricultural production has been increasing steadily in the areas of CDSP. This may be attributed to two major factors; the protection of previously vulnerable agricultural systems from environmental shocks and stresses, allowing for intensification of agriculture; and the increasing opportunity for market oriented production facilitated by the construction of all-weather roads at different levels. Several reports emphasize this second factor as a major benefit of CDSP and, not surprisingly given its responsibility, it was the major factor mentioned by the Key Informant at the Local Government Engineering Department (LGED).

2.2.2.1.1 Agricultural Land Holdings

CDSP is frequently described as a water management project; however, a much better indication of its focus lies in its name, **land development** (of the chars) and **settlement** (of migrants through a structured process). In the second context, a major part of CDSP's work since the first phase has been to regularize and allocate land to poor households and the issue of land title deeds, notably offering joint ownership to men and women in the household. According to prevailing Bangladesh government regulations, in CDSP I, the project limited the area of agricultural land allocated to a single household to 2 acres; since CDSP II, again in relation to changing norms, this has been reduced to 1.5 acres. This figure was largely in line with the reality of informal settlement in the area, where land had been distributed by the agents of local influential people. Where a household had less than this area, then they were allocated the land they already claimed. However, during the successive phases, it was found that there were households newly arrived in the area who did not have claim to land; in an attempt to offer some basis of livelihood to such households CDSP set up the Cluster Village program, where most households did not have agricultural land and were given a homestead plot of 16 decimals (640 square metres) surrounding the common village pond. These villages, each comprising 30 households, were common especially in Char Majid and Char Bagga Dona II of CDSP I, in Char Osman – Bandartila of CDSP–II and in a revised form in Boyar Char under CDSP-III, where they were to be populated by the households losing land to the foreshore and embankment forests beyond the embankment. According to Latif et al (2009) and Latif (2010), Cluster Village dwellers made up 39.2% of all households in Char Majid and 32.9% of those in Char Bagga Dona II. Because of these different characteristics, while in Char Bagga Dona and Char Bhatirtek the modal size of the original land holdings was between 1.5-2.0 acres, in Char Majid, it was only 0.5 -1.5 acres. In Char Mora Dona (CDSP II), 51.5% of households had land less than 0.5 acres on allocation.

The above studies allow analysis of the changing situation in these same areas in 2007 and 2009.[6] It is now over twenty years since the original settlement of the CDSP I areas and over 15 years since the settlement of CDSP II. In the natural order of things – population growth, sub-division of households and the processes of economic development, it cannot be expected that these land holdings will have been maintained. It may be noted that the average family size in the CDSP areas

[6]Unfortunately these studies which were carried out under CDSP III have not been continued and because they were based on a cohort sample – the same families in each study as far as possible – they do not cover other parts of CDSP II (South Hatiya Polder, Gangchil, Osman – Bandartila) nor CDSP III (Boyar Char).

according to our household survey is 5.2 persons (reduced by the small size of households in the cluster villages mentioned above) and it may be larger in the more isolated areas where family planning services are not available. In the various FGDs in such areas, the study team recorded average household sizes of over 6 and as high as 7 amongst the participants and some women claimed to have had 6 children or more.

The implications in terms of land sub-division already and in the future are obvious. Moreover there has been sale of land and movement of households both to inside the CDSP areas and to outside, either to newer chars or elsewhere. A particular movement noted by Latif is households trying to increase their limited land area in Char Majid by acquiring land in the adjacent areas of Char Nangulia. There appears also to have been extensive buying and selling of land between settlers in Char Bhatirtek and the unempoldered area beyond the embankment in this area along the Noakhali Khal, which was not stable at the time of CDSP I. The points below summarize the situation in these areas and Table 2.5 summarizes the situation, mainly from the 2009 report:

- 13.7% has left the polder after selling land [2010 Report says 20%]. Especially in the last few years an increase in out-migration has been observed, probably mostly to new chars like CN, NC and CC
- 20.1% had sold some land and were still living in the areas
- The highest proportion was in Char Majid (38.9% sold), interpreted as relating to the proximity of this area to Char Nangulia ….. they sold a small piece of expensive land and bought a larger area of lower cost land
- Therefore 33.8% of settlers had sold land to some degree
- 25.4%, on the other hand, had purchased new land
- The figures for CDSP II (MD) are naturally lower, with 11.5% selling some part and 5.1% purchasing new.

In terms of land, this meant that

- 4.1% of the land area in CDSP I was sold by those leaving the polder and another 10.8% by those who stayed (Total 14.8%)
- Therefore 85.2% remained with the settlers
- There has been a 24.1% increase in the absolute area of land owned by the settlers, with the highest again being in CM (50%). The net increase (allotted-sold+purchased) was 9.3%, with the proportion in CM 28.7%.
- The 2010 Report says average land holding has increased from 1.25 acres to 1.44 acres.

Table 2.5 Distribution of Farm Size in CDSP I and CDSP II areas (2007) (Source Latif et al, 2009, Tables 4.5 - 4.6)[7]

Farm size (acres)	CM	CBD-II	CBT	MD	Total	Area	Inside Area	Outside Area	Total
0-0.50	16.4	27.0	29.8	13.4	19.4	CM	1.13	0.99	2.12
0.51-1.0	16.4	19.0	27.7	16.4	18.7	CBD II	1.27	0.15	1.43
1.01-1.5	9.1	17.5	17.0	20.9	17.4	CBT	1.84	0.47	2.31
1.51-2.5	23.6	25.4	8.5	22.4	21.1	MD	1.21	0.17	1.37
2.51-5.0	29.1	7.9	14.9	16.4	16.7	Total	1.50	0.45	1.94
>5.0	5.5	3.2	2.1	10.4	6.7				

Table 2.6 Distribution of farm size in CDSP I and CDSP II areas (2009) (Source Latif, 2010, Table 4.8 – 4.9)

Farm size (acres)	CM	CBD-II	CBT	MD	Total	Area	Inside Area	Outside Area	Total
0-0.50	6.3	17.9	8.7	15.2	11.0	CM	1.79	1.02	2.81
0.51-1.0	12.5	23.2	18.9	18.2	18.6	CBD II	1.31	0.16	1.48
1.01-1.5	14.6	25.0	18.1	24.2	19.7	CBT	2.13	0.33	2.46
1.51-2.5	22.9	21.4	23.6	21.2	22.7	MD	0.93	0.74	1.66
2.51-5.0	27.1	8.9	22.0	21.2	20.1	Total	1.75	0.47	2.22
>5.0	15.7	3.6	8.7	0	8.0				

[7] Tables 2.6 and 2.7 are effectively two sets of data in one table and are therefore shaded accordingly.

In their commentary on these trends, the authors of this report point to a process in which the proportion of households who are landless has increased and those with holdings of over two acres has also increased, in other words a growing economic differentiation between the households. Thus, in all areas in 2009, 11.0% of households were functionally landless, whereas over 28% had holdings larger than the standard 2.0 acre allocation at the original time of settlement.

These reports appear to show a holding size which has increased over time. However, the Annual Outcomes Surveys of CDSP IV, which also cover a cohort of households form CSDP I/II and CDSP III point to a steady reduction in holding size, with the successive studies in 2013 and 2015 show average holding sizes as follows:

CDSP I/II: 1.15 – 1.34 acres
CDSP III: 1.01 – 1.03 acres
CDSP IV: 1.25 – 1.37 acres

The household questionnaire survey carried out during this Feasibility Study also suggests a decline in holding size, although there are marked variations between the sub- samples. It will be seen from Table 2.7 that, for the total sample, the average size of holding is 1.42 acres, but that the area of arable land is just 0.79, the remainder being composed of 0.18 acres of pond, a similar area of homestead land and 0.07 acres for the house plot. An average area of 0.21 acres is classified as other land, with large areas in the 'special cases' under this heading. It may be surmised that some respondents have included their community ponds and their 'share of embankment or foreshore forest under this heading. The largest holdings are in the unprotected area of Char Gangchil – Torabali, where the area of arable land alone is 1.55 acres, presumably compensating somewhat for the instability of the rice production system. The smallest holdings are in the South Hatiya Polder, where we have already noted that the sample was taken from a fishing community with almost no agricultural land. Overall the most important finding is that the average size of arable/field crop land in most areas ranges from 0.5 acres (Char Majid) to 1.1 acres (Boyar Char), which is in line with the secondary data and scarcely adequate for food security even with intensive cropping.

Table 2.7: Average Land Holding Size (acres) by Sub-Sample from Household Questionnaire Survey[8]

Variables	Protected					Unprotected				Special cases (Landless)			Total	
	Bhatirtek	South Hatiya	Boyer Char	Noler Char and Char Nangulia	Mean	Gangchil	Nijhum Dwip (Char Osman - Bandertila)	Polder 59/ 3C (Bamni)	Mean	Char Majid Cluster Village	Boyer Char (SFG)	Mean	Total Area	Mean
House area	0.08	0.04	0.07	0.07	0.06	0.06	0.06	0.07	0.06	0.08	0.07	0.07	1437	0.07
Homestead area	0.19	0.10	0.18	0.20	0.17	0.20	0.21	0.11	0.17	0.29	0.20	0.24	3956	0.18
Arable (field crop) land area	0.78	0.11	1.07	0.83	0.72	1.55	0.61	0.67	0.94	0.50	1.10	0.80	17386	0.79
Pond area	0.17	0.05	0.14	0.24	0.17	0.41	0.13	0.12	0.22	0.18	0.16	0.17	3891	0.18
Other	0.03	0.18	0.00	0.04	0.06	0.01	0.34	0.29	0.21	0.73	0.35	0.54	4575	0.21
Total	1.25	0.47	1.45	1.37	1.18	2.22	1.36	1.25	1.61	1.77	1.87	1.82	31245	1.42

[8]For ease of reading, in some of these large tables, key figures showing differences between the contexts are shaded

2.2.2.1.2 Land Productivity

With reference to the second factor, various CDSP Reports emphasize the changes in the cropping patterns and therefore productivity in the Project areas in terms of

- Cropping Intensity, especially
- Expansion of *aus* cultivation in the Kharif I season
- Use of high yielding varieties, particularly of rice, both in the *aus* and aman seasons
- Expansion of *rabi* cropping
- Expansion of vegetable cultivation
- Diversification into high value crops

The report by Latif et al (2009), although mainly concerned with land settlement and holdings (see below), assembles internal data of CDSP on cropping patterns, coverage of HYV and soil salinity for 2007. It is particularly useful for our purposes since it breaks down the analysis into various sub-areas of CDSP I and II. There is a similar report published in 2010 covering data from 2009, but this involves a separate and less detailed survey.

In the CDSP I areas, all of which were protected

- The percentage of agricultural area under *aus* crops increased from 18% in 2000 to 48% in 2007. Of this, the percentage of HYVs went up from 2% in 2000 to 18% in 2005, but fell back to 14% in 2007. The percentage of *aus* HYV was consistently lower in Char Majid
- The percentage of HYV in the *aman* season increased from 0.5% in 2000 to 20% in 2004 and 2007.The percentage of *aman* HYV is again consistently lower in Char Majid.
- The areas planted to *rabi* crops was 39% in 2001 and rose steadily to 66% by 2007. It may be noted that the proportion in Char Majid was consistently lower than the other areas.

The data for CDSP II areas is somewhat more interesting since it involves two protected and two non-protected (Mora Dona and South Hatiya on the one hand and Char Laxmi and Char Gangchil-Torabali on the other) the equivalent data was:

- *Aus*: nothing in the year 2000, rising slowly to 31% in 2007, of which 6% was HYV
- *Aman*: HYV area increased from 2% in 2000 to 21% in 2006 and 20% in 2007
- The *rabi* areas increased from 9% in 2001 to 40% in 2007
- **Most significantly, there were major differences between the situation in the South Hatiya Polder and the other non-protected areas in terms of percentage area cropped under *rabi* crops and the percentage of *aus* area under HYVs. In South Hatiya, the *rabi* area goes up to nearly 80% in 2008, while that in Char Gangchil - Torabali fluctuates wildly and in Char Laxmi it is low. In relation to *Aus* HYVs, the proportion in all the other three areas, apart from SH, is low.**
- In the case of *aman* HYV percentage, South Hatiya and Mora Dona are similar with around 30% by 2007, while the figure for Char Gangchil -Toarabali is only about 10% and for Char Laxmi 15%.

The study notes: 'In the CDSP-II areas, the influence of the embankment can be seen, especially during *rabi* and in relation to *aus* HYV coverage, with the only protected area (South Hatiya) much

higher than the other areas.' The situation is Hatiya seems to have continued up to the present. In an interview with the Acting Upazila Agricultural Officer, it was stated that the cropping intensity in the Upazila as a whole (of which the South Hatiya Polder is a major part) is 246% and that the Upazila is now a food surplus area and that the production of rice is more than double the demand; a surplus of 75,000 metric tons over local consumption needs was reported from 2011-2012.

This situation is also reflected in soil salinity levels. In Char Gangchil-Torabali, the EC averaged around 3 throughout the period in February, 6 in April (and rising over the period), around 1 in August and 3-4 in December. It was greatest in the lower lands where it was 4-5 in February, 8-9 in April and 5-6 in December. The picture in Char Lakshmi seems a little better, starting around 3 in February, but falling to 1, fluctuating between 2 - 10 in April, but low in August and December. The gross fluctuations in April seem likely to depend on the rainfall in the dry season.

There are still problems of soil salinity in the CDSP I areas in April, especially in middle lands: Char Majid rising to 16 in 2005-2007, Bhatirtek to around 6 in 2003-2005 and 9 in February 2005 and a similar picture in Char Bagga Dona II.

The Impact Study of 2010 offers some figures for CDSP III (Boyar Char), which is now almost exclusively protected, but which at the time of the study was in the process of empolderization. This suggests an increase in cropping intensity from 131% to 185% and that HYV rice covers 37-39% of the T. Aman crop in CDSP III (cf 50-55% in CDSP I/II) [Agricultural Development and Social Forestry Activities in Boyar Char, 2010, Technical Report #6, CDSP-III]. The same study comments that 'conditions have not improved sufficiently in CDSP III for *aus* to be widely grown'. The authors compare this with CDSP I/II where 'little *aus* was grown prior to development, but it is now produced by 20-25% of households.' Prior to development, all farmers grew local varieties of T. Aman, such as Rajshail, which is adapted to a degree of saline damage (at the end of the season). The report comments that there is now a switch to HYVs such as BRRI dhan 32 and BR40, but that relatively little HYV aman is yet grown in Boyar Char.

The report shows that by 2009, most farmers grew *rabi* crops, especially country beans which seem to have a degree of salt tolerance. Okra, soyabean and water melon had become the most profitable and the first two were being supplied all over the country. Better yields would come with irrigation water, but most of the ground water is still saline. The report notes that there is some local lifting of water from a pond or *khal* and that one or two farmers have installed DTWs, used for *boro* rice

CDSP IV / DAE Annual Report 2014-2015 shows the typical difference between the pre-project situation and the present for Char Nangulia and Noler Char, the unprotected chars (Caring and Urir) and the interior char, Char Ziauddin, protected to some extent by the surrounding areas in terms of cropping intensity. According to the Periodic Agricultural Survey (2014) overall the average cropping intensity in all five chars increased by 35% to 162% in the period 2012-2014. The highest cropping intensity was found in Char Ziauddin (206%), followed by 172% in Noler Char and 164% in Caring Char. However, little improvement was observed in Char Nangulia (up 5% to 135%) and Urir Char (up 7% to 132%).

2.2.2.1.3 Evidence from the Field Studies

The field studies (Focal Group Discussions and Household Questionnaire Survey) were designed with the objective of exploring the differences in agricultural production and thus food availability between the different contexts.

What do these observations mean in terms of food availability amongst the households sampled in the questionnaire survey? In relation to the staple rice crop, first it should be noted that overall only two-thirds of the sample (67.3%) actually cultivated rice. In aggregate, the average area per household under rice production of these households in 2015 was 3,880 m2 (97 decimals) just less than one acre and therefore very much in line with the downward trends in holding size observed from the secondary data. From this area, each household produced a total of 912 kgs of unmilled rice, or 176.4kgs per caput for the average family size of 5.2 persons. However, each household sold 368 kgs of rice, roughly 40% of the total production, leaving a balance of 544 kgs for consumption or only 104.6 kgs per person (Table 2.8). These aggregate figures may be compared with the data form the CDSP AOS surveys, which in 2015 stated an average production per household ranging from 1,358 kgs in CDSP IV areas to 1,545 kgs in CDSP III and consumption figures ranging from 995 in CDSP IV to 1,282 kgs in CDSP III. These figures in turn may be compared with the calculation of per caput milled rice consumption in Bangladesh in 2009 of 173.3 kgs, roughly the equivalent of 260 kgs of unmilled rice (www.ricepedia.org), demonstrating that the average derived from the focused survey of this study is some 3% below the estimated average consumption requirements.

The survey figures show clearly the differences between the protected and non-protected areas (Table 2.8). The average planted area of rice in the protected area was some 66 decimals (0.66 acres), although this was reduced by the limited area of rice planted in the South Hatiya sub-sample (just 0.25 acres). The average yield per acre in this area was just over 1.1 metric tons (2.8 mt per ha). By contrast, in the non-protected areas, the average planted area was close to double at 1.17 acres, partly because of the larger planted areas in Char Gangchil, but the average yields were also lower at 763 kgs per acre (just under 2 mt per ha). Yields in the extremely vulnerable contexts of Nijhum Dwip and Bamni were lower still. Despite this, the respondents in the non-protected areas sold a rather higher proportion of their rice (45%), perhaps as an emergency sale to purchase other household needs immediately on harvest. The 'special cases' of cluster villages and social forestry groups were rather similar to the protected areas, since some respondents, as we have seen owned land within the dyke in Boyar Char or had acquired land in the new chars over time.

Of course, food availability is not just a matter of rice production. In conventional analyses, it is usually linked to other staples, such as pulses, the 'dal-bhatt' mentality. It is interesting to note therefore that, in aggregate, only 14% of households in the household questionnaire survey actually grew pulses (for dal), implying that, for many, this portion of the classic diet has to be purchased. By contrast, the aggregate statistics show that 63% of survey households grew vegetables, 98% of households reared poultry (and regularly consumed eggs, see below Section 2.2.2.4) and as many as 64% were raising fish in ponds, both for consumption and sale. The following paragraphs elaborate on this point with particular reference to the importance of livestock rearing, both poultry in all areas, but also cattle rearing in the unprotected and land-poor areas.

In terms of production of vegetables, it will be seen from Table 2.9 that 55.9% of the total sample grew vegetables in the traditional winter season, but that – and important in terms of food security

and nutrition, the proportion fell to just under 30% in both the summer season (March – May) and in the rainy season. The overall figures once again hide significant differences in the sub-samples. Vegetable growing is much more prevalent in the special contexts, where it may be associated with the limited area available for field crops. The proportion of households in the protected areas cultivating vegetables is high in Boyar Char and Char Nangulia – Noler Char and even reaches 60% in the summer and rainy seasons in Boyar Char. The overall average is deflated by the fact that nobody in the fisher community in the South Hatiya Polder grows vegetables. In the non-protected areas, the overall proportion of households rearing vegetables drops to 46%, with only 10% rearing in summer when the levels of salinity are likely to be highest and only 21% in the rainy season. These figures are also deflated by the fact that only one household out of 20 in the sub-sample for Nijhum Dwip grew vegetables at all. These data are consistent with the findings of the Focal Group discussions. The figures for Char Gangchil and Bamni are quite high in the winter season, but, especially in Bamni, they fall in the other two parts of the year, presumably in reaction to the problem of salinity. Table 2.10 shows the production of leafy vegetables by Upazila supplied by the Department of Agricultural Extension. These show that overall production in Hatiya and Subornachar is quite encouraging and appears relatively stable, but the problems of dyke erosion may be reflected in the figures for Companiganj.

Table 2.8: Average Area, Production and Sale of Rice by Vulnerability Context (Source: Household Questionnaire Survey)

Variables	Protected					Unprotected				Special cases (Landless)			Total	
	Bhatirtek	South Hatiya	Boyer Char	NolerChar & Nangulia	Total	Gangchil	Nijhum (Osman Bandertila	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%
Average area of land cultivated for Rice: (in Decimal)	75	25	99	66	66.20	155	90	112	117	130	136	133.0	148	67.3
Quantity of Rice produced in last year (KG)	850	174	1097	783	737.40	1433	701	722	895	1448	1320	1,384.0		
Yield/acre	1133.00	696.00	1108.00	1186.00	1114.00	925.00	779.00	645.00	763.00	1114.00	971.00	1041.00		
What quantity of Rice sold in the market in last year (KG)	491	0	399	195	256.00	431	65	416	332	559	590	574.5	65	29.5
Total Production	17000	3480	21940	31320	73,740.00	28660	14020	28880	71,560	28960	26400	55,360.0	200660	
Total Sale	9820	0	7980	7800	25,600.00	8620	1300	22360	32,280	11180	11800	22,980.0	80860	
Average production for sub-sample					737.40				894.50			1,384.0	912.1	
Average sale for sub-sample					256				403.50			574.50	367.5	
% Produce sold					34.72				45.11			41.51	40.30	

Table 2.9: Distribution of Vegetable Cultivation by Context and Season (Source: Household Questionnaire Survey)

Variables	Protected					Unprotected				Special cases (Landless)			Total	
	Bhatirtek	South Hatiya	Boyer Char	Noler Char and Char Nangulia	Total	Gangchil	Nijhum (Osman Bandertila	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%
Percentage of HH cultivating vegetables	70	0	95	90	69.00	75	5	58	49	75	75	75.0	138	**62.7**
Percentage cultivating by season					-				-					
Summer (%)	30	0	60	50	38.00	5	5	20	13	40	40	40.0	64	**29.1**
Winter (%)	55	0	85	78	59.20	65	5	55	45	75	65	70.0	123	**55.9**
Rainy season (%)	30	0	60	42	34.80	40	5	17.5	20	30	40	35.0	65	**29.5**

Table 2.10: Area Planted under Leafy Vegetables by Upazila (hectares) (Source: Department of Agricultural Extension, Noakhali

Upazila	2012-2013	2013-2014	2014-2015
Companiganj	450	850	422
Hatiya	1358	1450	1434
Subornachar	1530	1675	1255

Tables 2.11 and 2.12 offer a brief profile of fisheries and livestock production, consumption and sales from the household questionnaire survey carried out under this study. As might be expected, the same variations emerge between the different sub-samples: the highest proportion of households involved in fish culture are in the special cases (90%), although it is not clear whether the respondents in Char Majid are here referring to individual household culture or culture in community ponds; similar high proportions are recorded for Boyar Char and Char Nangulia – Noler Char. These figures are not surprising, since digging a pond, to create a house platform is part of the process of settlement in the chars. Of course, fish culture is absent in those communities mainly concerned with capture fisheries and the proportion of households involved falls to only 55% in the Bamni sub-sample, where the FGDs revealed the devastating effect of the tidal surges on the growing investment in fish ponds. In Char Fakira, for example, mention was made of 21 large fish ponds of around 1.5 hectares in the area, of which 13 had already been destroyed through the tidal surges and floods. The remainder were no longer suitable for culture because of the saline water. One pond owner with a much larger holding of 11 acres of pond, attended the FGD in the fond hope of obtaining compensation after his ponds had been washed out by the previous day's cyclone.

Most aquaculture in the area is small-scale and average household production is typically less than 100 kgs, with higher averages being recorded in Gangchil, Char Nangulia – Noler Char and Char Majid, where some rather larger operations may have been caught in the sample. Interestingly, almost half of the total sample sold a proportion of their fish; in the case of Gangchil, probably this corroborates the observation above of more commercial operations, but the large numbers of households selling suggests that many households sell their fish as a cash crop to buy in alternative food resources (see Section 2.2).

Table 2.12 shows a similar pattern. As stated above, almost all households rear poultry, not only chickens (96.4%), but, importantly in terms of possible project focus, ducks (90.5%). Almost all operations may be described as family poultry production, with flocks between 7.2 (South Hatiya) and 14.6 (Char Majid) chickens and 4.2 (South Hatiya) and 8.4 (Char Majid) ducks. All households consumed eggs and meat from their flocks, but 85% also sold poultry birds to market and over 61% sold eggs. 41% of households reared large livestock (cattle), mainly for fattening, with some concentration of larger herds in all of the unprotected areas, where they may be associated with the so-called *bathan* system[9]. In both Gangchil and Nijhum Dwip this system seems to include buffalo rearing. Niijhum is also surprisingly the most important location of rearing of milking cows. Of the 37.3% of households raising cattle for milking, almost all consume some of their own production,

[9]Whereby owners of large herds hire 'cowboys' or poor local households to local after the herd, for a share of the sales of animals or milk

with a concentration in Gangchil, the special contexts, and Nijhum Dwip. However, once again the enterprise is partly-oriented to market and in Gangchil, Char Nangulia – Noler Char and amongst the SGF group in Boyar Char, an average of over 20 litres of milk was sold by rearing households each month.

It may be noted that, despite in being seen as 'the poor man's cow' only 19.5% of households in the survey were rearing goats. However, Table 2.11 also seems to suggest that goat rearing is most important in the more vulnerable and land-poor areas (amongst the SFG group, where they are probably reared on the embankments, in Nijhum and in the Cluster Villages).

Table 2.11: Percentage Households Rearing Fish, Average Production and Sale by Context (Source: Household Questionnaire Survey)

Variables	Protected					Unprotected				Special cases (Landless)			Total	
	Bhatirtek	South Hatiya	Boyer Char	NolerChar & Nangulia	Total	Gangchil	Nijhum (Osman Bandertila	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%
Percentage of HH rearing fish	70	0	90	90	68.00	75	0	55	46	90	90	90.0	141	**64.1**
Total Fish Production in Last Year	90	0	80	123	83.20	142	0	54	63	131	87	109.0	145	**65.9**
Amount of Fish Sold in Last Year	52	0	37	55	39.80	91	0	23	34	68	29	48.5	103	**46.8**
Percentage of Productions Sold	57.8		46.3	44.7	47.8	64.1		42.6	54.8	51.9	33.3	44.5		

Table 2.12: Average Livestock Holdings per Households and Consumption and Sale of Livestock Products by Context (Source: Household Questionnaire Survey)

Variables Average Nos. of Livestock Owned	Protected					Unprotected				Special cases (Landless)			Total	
	Bhatirtek	South Hatiya	Boyer Char	NolerChar & Nangulia	Total	Gangchil	Nijhum (Osman Bandertila	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%
Chicken	9.5	7.2	11.9	9.9	9.7	12.7	8.9	10.5	10.7	14.6	9.3	11.9	212.0	**96.4**
Duck	6.9	4.2	7.4	6.4	6.3	8.2	5.0	6.0	6.3	8.4	4.5	6.4	199.0	**90.5**
Goat	0.5	0.2	0.1	0.6	0.4	1.2	2.0	0.4	1.0	0.2	5.0	2.6	43.0	**19.5**
Cow (Milking)	0.1	0.8	4.0	1.0	1.4	0.0	1.5	0.6	0.7	0.9	1.2	1.0	82.0	**37.3**
Cow (Fattening)	0.6	0.0	0.3	0.9	0.5	1.7	0.6	1.3	1.2	0.9	0.6	0.7	90.0	**40.9**
Buffalos	0.2	0.0	0.0	0.0	0.0	0.7	0.8	0.2	0.5	0.0	0.5	0.3	7.0	**3.2**
Percentage HH consuming eggs / chickens from own farm in last month	100.0	100.0	100.0	97.5	99.0	100.0	100.0	95.0	97.5	100.0	100.0	100.0	217.0	**98.6**
No eggs sold to the market in last one month	24.5	1185.0	19.5	10.9	250.1	24.4	11.5	11.7	14.8	16.9	11.1	14.0	135.0	**61.4**
No. poultry or ducks sold to the market in last one year	10.9	7.1	10.8	7.7	8.8	13.0	9.0	8.6	9.8	8.8	10.3	9.6	187.0	**85.0**
Percentage households consuming milk from own production	15.0	30.0	15.0	50.0	32.0	50.0	40.0	22.5	33.8	40.0	50.0	45.0	77.0	**35.0**
Amount of milk sold to market in last one month	2.8	10.0	9.5	20.6	12.7	31.0	15.0	6.2	14.6	17.8	20.3	19.0	73.0	**33.2**

2.2.2.2. Stability of Food Production: Climate Change

The figures regarding food production derived from the present field studies may reflect some changes in the cropping pattern in the last few years, which appear to be related to what might be described as climatic change effects. Both in the Focal Group Discussions and in the household questionnaire survey, participants/respondents were asked the basic question of whether they had noticed any changes in weather patterns or in extreme climatic events in recent years and how these changes might have affected their livelihood. It was explained it Section 1 of this report that the definition of climate change adopted in these questions, which invited response to a list of possible answers, was broad, including impacts which may be attributable to wider regional climatic changes affecting hydrology and sedimentation, such as river erosion, tidal flooding, consequent sedimentation of the local drainage network and related waterlogging. This definition should be borne in mind in reviewing the subsequent paragraphs, as well as those dealing with the problems of water supply and sanitation facilities in Section 2.2.4.2.2below.

Figure 2.4 begins to explore the first of these questions divided according to the different groups in the analysis, those in protected areas, in the unprotected areas and the special contexts, where relative lack of agricultural land had been seen as a constraint to food security. All respondents in the household survey in all 3 areas (protected, unprotected and special) stated that they had been observing such changes in climate. Figure 2.4 shows that in all three groups most respondents began to observe such changes between 6-10 years ago (between 2006-2010), although, perhaps not surprisingly because of their general vulnerability, more of the respondents with little land and those in unprotected areas tended to see such problems even earlier from around the year 2000.

Figure 2.4: Observations on Date of Emergence of Climate Change among Household Survey Respondents

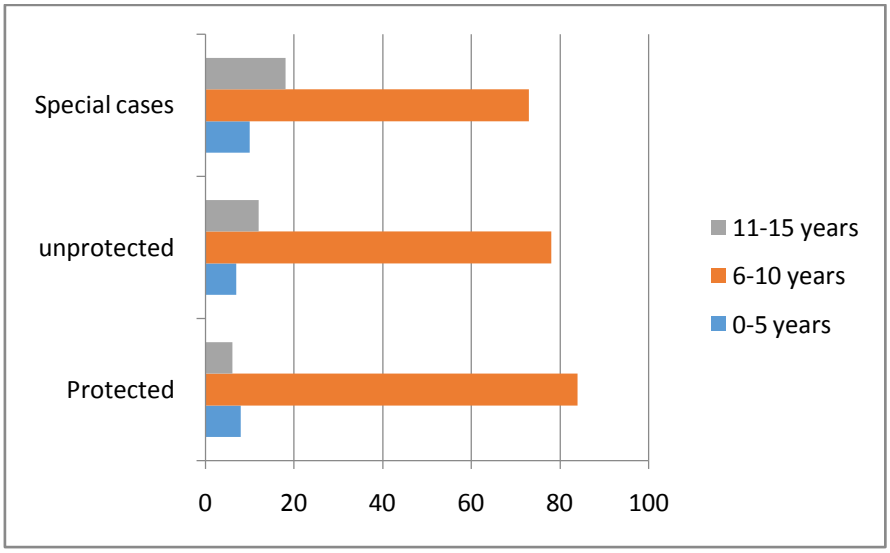


Figure 2.5 then explores precisely what changes had been observed by each of the groups. Here the pattern of responses differs substantially according to context. In the unprotected areas the highest response, from nearly half of the respondents was flooding, which may be linked to the second and third problems, cyclonic storms (26%) and tidal surge (24%). In the protected areas, by contrast, the most frequent response was river erosion (29%), probably coming largely from the respondents in Char Nangulia where this has been a sudden and recent problem. In these protected areas, the second and third ranked problems are drought or extreme rainfall and the essentially similar

reduced rainfall. The problem of drought or extreme rainfall was also seen as the main problem in the areas with limited agricultural land, although here cyclonic storms ranked as the most important event. Both the 'special areas' in Char Majid and in Boyar Char are close to the coast and have been especially vulnerable to these storms in recent years.

Figure 2.5: Major Climatic Events impacting on Livelihood as seen by Household Survey Respondents

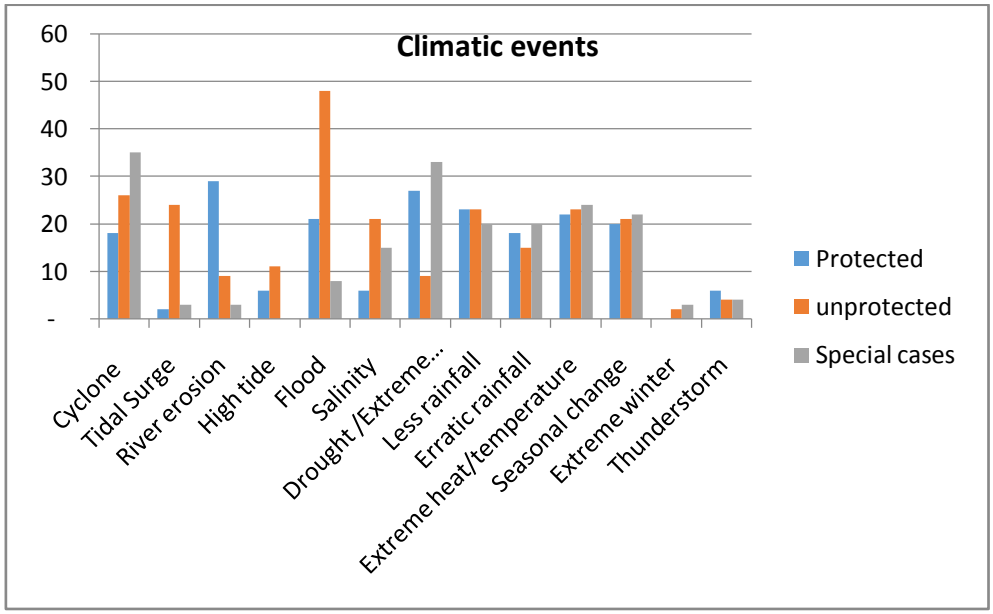


Figure 2.6 then shows the different impacts of the various climatic events in aggregate. Overall the biggest single impact of these events, mentioned by as many as 43.6% of respondents was the loss of their houses, a response which increased to nearly 54% of the sub-sample in the non-protected areas and 95% in Nijhum Dwip. Interestingly, the second most frequently mentioned impact was the loss of soil fertility, mentioned by 25.9% and by over a third in the non-protected areas, presumably linked to the tidal surge and salinity intrusion mentioned above. Although this obviously has an effect on agricultural production, only 8.6% of respondents mentioned this directly, with the special areas slightly higher than the overall average. The third ranked impact was seen to human disease, mentioned by 17.7% overall and by over 20% in the protected and special areas, while the fourth was the damage to infrastructure, mentioned by 11.4% with the protected areas again exhibiting a higher percentage (16.3%). Livestock disease was mentioned by only 7.7% of respondent overall, but most of these were in the unprotected areas (17.7% of the sub-sample) where households tend to be more dependent on the rearing of cattle and other ruminants for livelihood. Unfortunately there was no detailed breakdown of the 'other' major category of impacts.

Figure 2.6:Overall Impacts of Climatic Events on Households (Source: HH Survey Questionnaire)

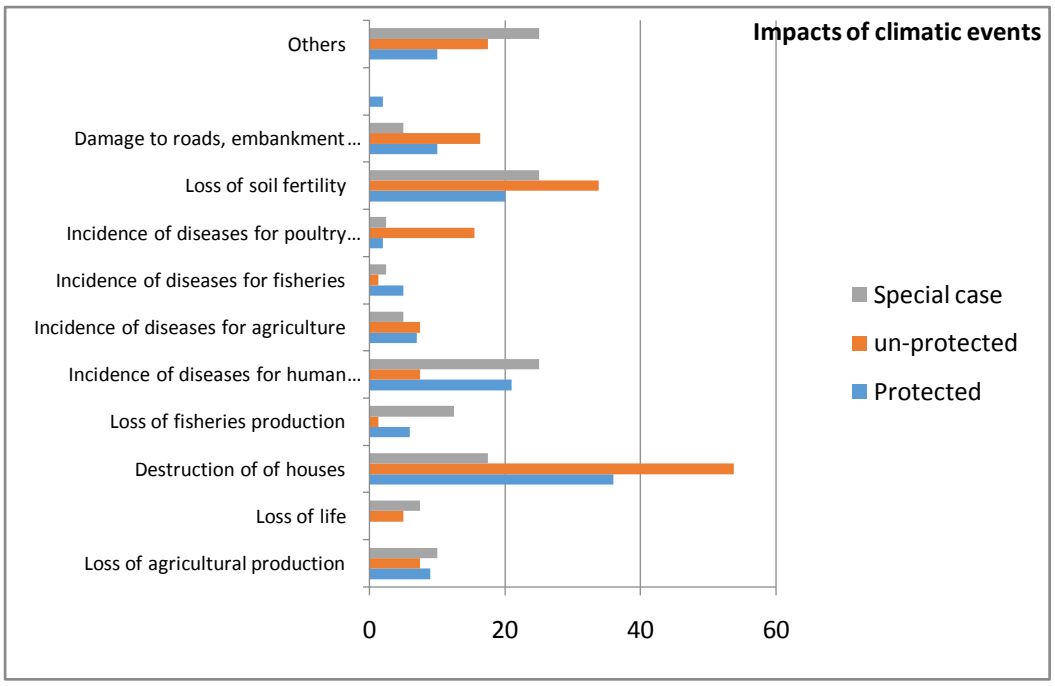


Figure 2.7 shows the respondents perceptions of impact of climate change on the crops sector in more detail. Although the most important impact overall is seen to be increase in soil salinity, some significant differences between the protected, non-protected and special (landless) areas emerge. For the non-protected areas, this is associated to the greatest degree with a loss of soil fertility, soil productivity and, of course, in some cases, the outright loss of agricultural land. On the other hand, the loss of standing crops is felt most by the farmers in the 'special cases' and they are also the group who complain most about increased incidence of disease and pests on their crops. Apart from soil salinity, this is also the most important impact felt by the respondents in the protected areas, although almost two-third of that group also mention loss of soil fertility as a problem.

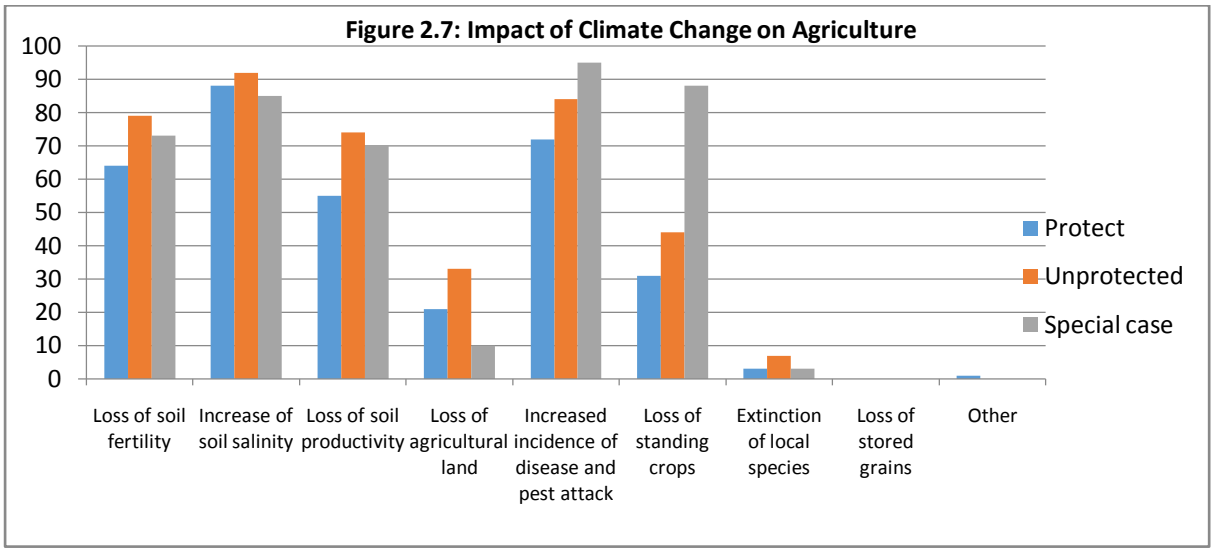


Figure 2.7: Impact of Climate Change on Agriculture

Figure 2.8 looks specifically at the impact on water supply for agriculture. This confirms salinity intrusion as the major problem, but it is interesting to note that for all the three variables listed it is the special case contexts which rank highest in their perception of problems. For these households in Char Majid and with land inside the embankment in Boyar Char, smaller holdings mean that water shortage in terms of less or irregular rainfall and lack of stored water become a more signficant problem.

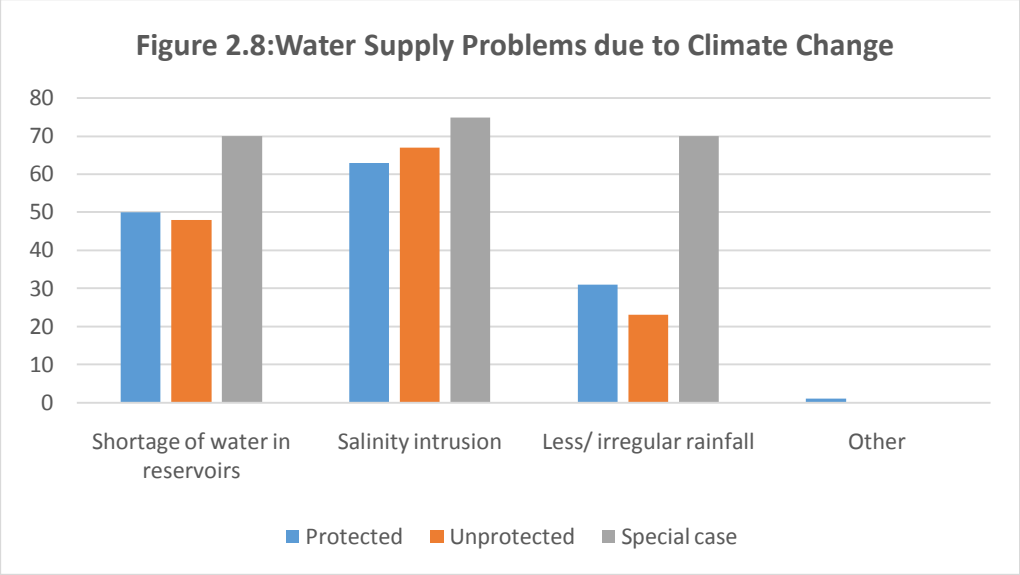


Figure 2.8: Water Supply Problems due to Climate Change

Figure 2.9 offers the respondents views on the possible intreventions to overcome climate change impacts and so create a more resilient agriculture. The responses are naturally varied according to context. For the non-protected areas, the main needs are to excavate possible areas of fresh water storage in a bid to overcome salinity, introduction of saline and flood resistent varieties and new technologies in general. Households in the protected areas see the introduction of HYVs in general and the introduction of organic fertilizers as more important, essentially the technologies which are currently being promoted by DAE. They are the group who see training on climate-resilient agriculture as most important. Relatively speaking the 'special case' group tended to follow their fellows in the protected areas in their priorities.

Figure 2.10 offers the respondents' views on interventions in aquaculture where the typical problems were common in respect of salinity intrusion and flooding. In all three groups of respondents, there was a recognition of the need to raise (and strengthen) pond embankments as the main response. However, there was also a feeling that a shift in the varieties of fish stocked might also assist, particularly in the 'special cases' where aquaculture may already be a little more intensive. This may refer to the idea of introducing tilapia, which is more tolerant of saline conditions than the standard Indian Major Carp polyculture.

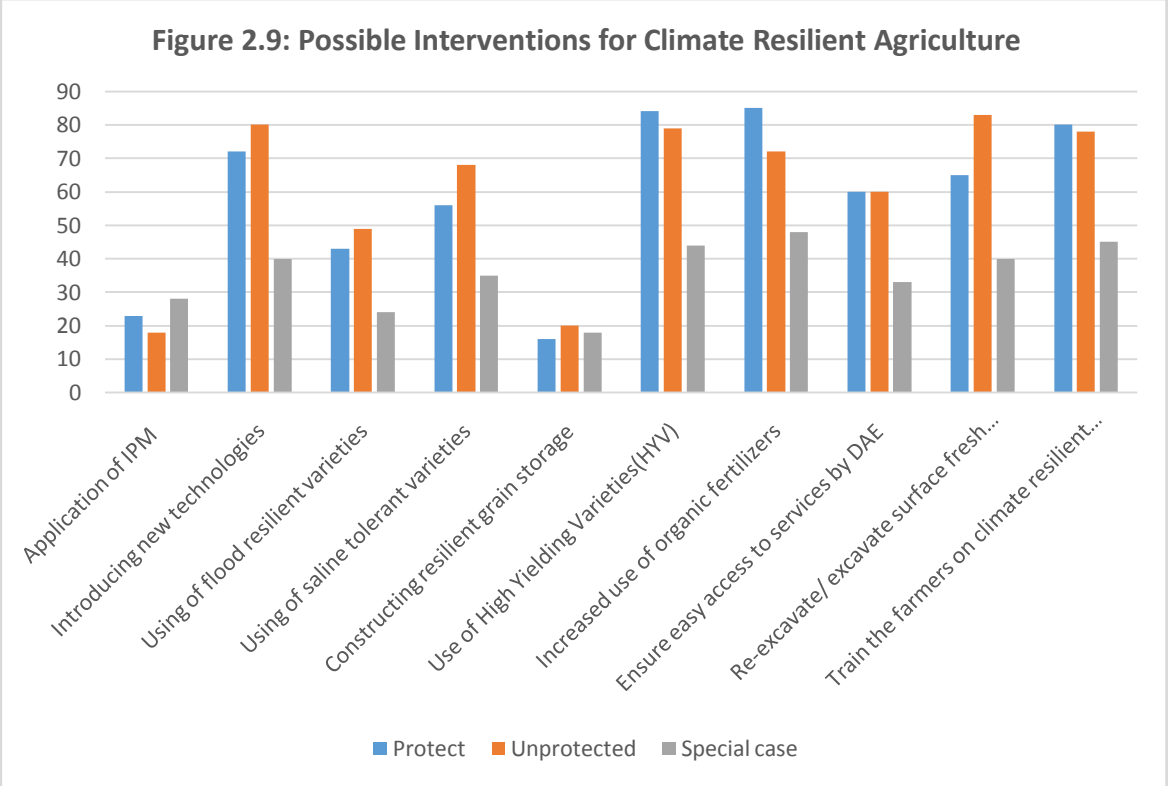


Figure 2.9: Possible Interventions for Climate Resilient Agriculture

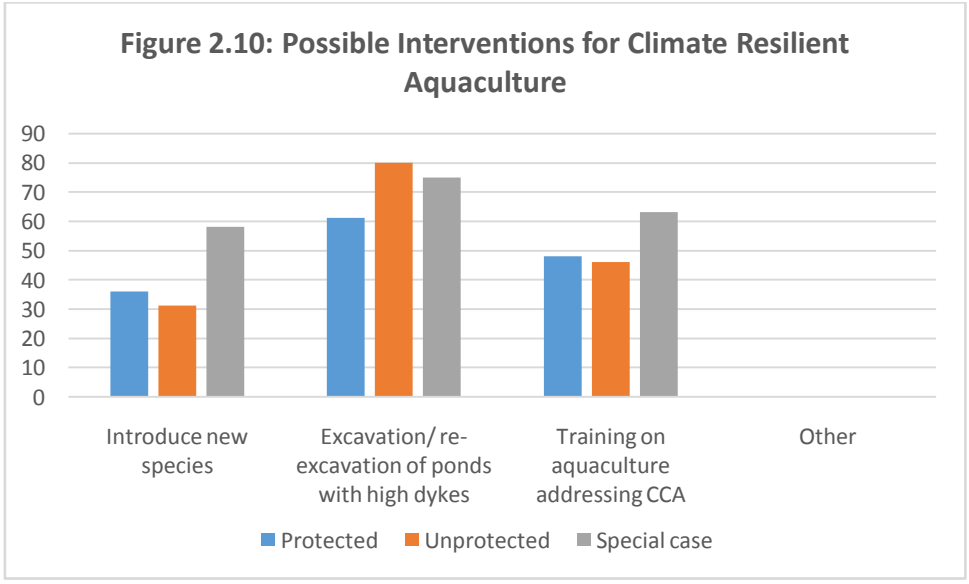


Figure 2.10: Possible interventions for Climate Resilient Aquaculture

The impacts of climate change factors on the livestock sector are separated for poultry (Figure 2.11) and large livestock (Figure 2.12). In the case of poultry, there were only minor differences between the different study contexts, with the main impacts being seen as the increased incidence of disease, decreased food availability and increased mortality. A scarcity of fresh drinking water was mentioned more frequently in the non-protected areas. In the case of large livestock, largely cattle, the same major impacts were mentioned, although the differences between the contexts were a little more pronounced in that the increase in mortality, decreased availability of fodder and lack of

fresh drinking water were mentioned more frequently in the non-protected areas, in reflection of the relatively greater importance of large livestock in livelihood. The problem of loss of grazing land reflected in the decreased availability of fodder is amply illustrated in Figure 2.13.

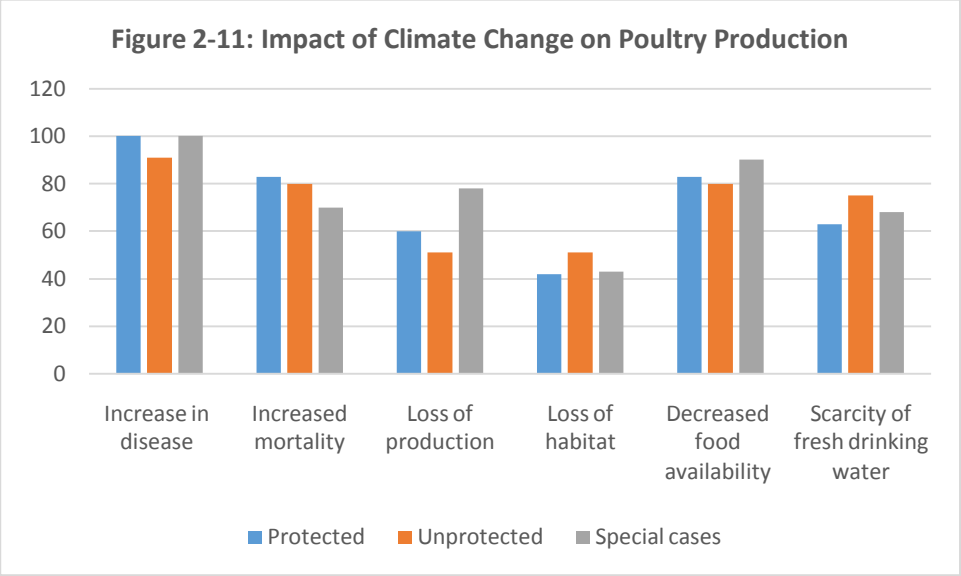


Figure 2.11: Impact of Climate Change on Poultry Production

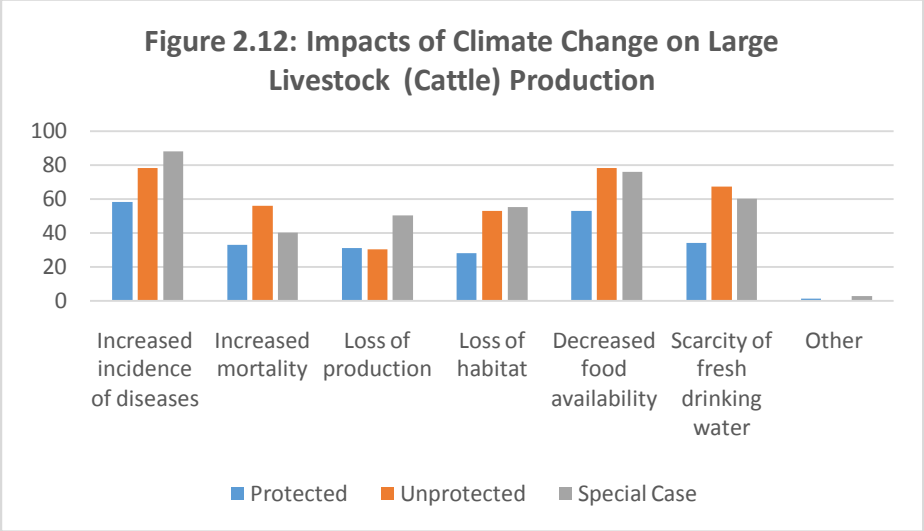


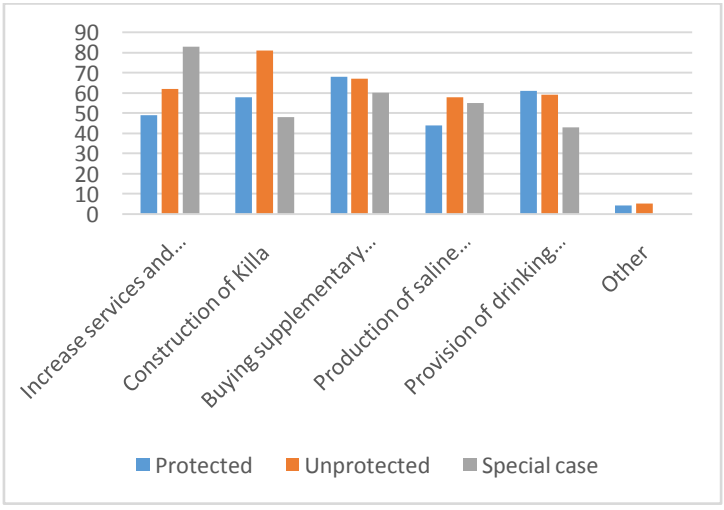
Figure 2.12: Impacts of Climate Change on Large Livestock production

Figure 2.13:Regular tidal flooding of unprotected areas

Regular Tidal Flooding in the Unprotected Areas of CDSP causes problems for cattle and sheep rearing in terms of temporary loss and salinity of grazing land and lack of fresh water (Figure 2.12). The local population is demanding expansion of the 'killa' concept to offer protection for their large livestock which are a crucial part of livelihood and a buffer at times of food shortage (Figure 2.13)

The different perceptions, especially in terms of large livestock, are in turn reflected in the survey respondents views on the interventions needed in the livestock sub-sector. While in the non-protected areas, the emphasis was overwhelmingly on the need for protection of stock through the construction of *killas*, followed by purchase of supplementary feed (for poultry?) and cultivation of saline tolerant fodders, in the special areas the main intervention required was improvements in veterinary and animal health care services. Both the protected and unprotected areas saw improvement in fresh water supplies as important.

Figure 2.14: Respondents Views on Interventions Required to Offset Problems of Livestock Rearing in the Face of Climate Change



The study team attempted to examine the impacts of these changes on the stability of agricultural production in the area, both from secondary data at Upazila level and in the household level questionnaire, although in both cases the analysis was limited, in the case of the secondary data largely to rice and in the case of the primary data to rice and vegetables.

Both key informants at Upazila level and the participants in the Focal Group Discussions commented on a decline of '*aus*' paddy cultivation in the last 2-3 years due to a combination of environmental – drought conditions and/or delay in rains in the kharif I season – and economic factors - increasing production costs comparative to selling prices. These trends and a similar downward trend in *rabi* cropping are reflected in CDSP's own AOS survey reports. In 2013, the proportion of households engaged in *aus* cultivation in CDSP I/II and CDSP III had fallen from 17% and 39% respectively to only 4% and 12.5%, while the proportions for *rabi* crops fell 13% and 8% to 4% and nothing.

The study team attempted to obtain secondary data on the current cropping patterns in the three Upazilas covered by CDSP over the past 3-5 years with a view to elucidating how recent events – the erosion in Companiganj and drought conditions in general – might have affected these. Obviously these figures are only a general guide, since there are considerable areas of both Companiganj and Subornachar Upazila which were not covered by any phase of CDSP and Upazila statistics are not noted for their reliability. However, the figures for cropping intensity show that the well protected Hatiya now has the most intensive agricultural system, with 246% of available crop area planted, compared to 205% in Subornachar and only 176% in Companiganj. It should be noted that these figures still compare well with the cropping intensity in the waterlogged paddy lands of northern Noakhali, where Begumgonj only records 112%, Chatkhil 124% and Sonaimuri 151%.

The figures for *Aus* cultivation do point to considerable differences between the trends in the largely protected areas of CDSP II-IV in Hatiya Upazila, where the total area and the area under HYV is more or less constant and the dramatic fall in the area in Companiganj (Table 2.13). We may speculate that this is indeed a reflection of what was heard in the FGDs and the result of the regular intrusion of saline water with the high tides. In the case of Subornachar, there is considerable fluctuation from year to year, which appears to relate to the differences in rainfall patterns and amounts, particularly in the El Nino year of 2015.

Table 2.13: Trends in Cultivation of Aus Paddy in CDSP Upazilas, 2012-2016.
(Source: Department of Agricultural Extension)

Area Cultivated under Aus by Upazila			
	Year	Total	HYV
		hectares	Hectares
Companiganj	2012	3,130	1,732
	2013	1,470	850
	2014	1,870	1,057
	2015	430	270
	2016	305	170
Hatiya	2012	35,330	17,747
	2013	38,415	22,920
	2014	33,771	21,150

	2015	32,230	21,995
	2016	38,525	31,150
Subornachar	2012	7,500	2,700
	2013	5,300	2,100
	2014	5,610	3,330
	2015	2,850	1,650
	2016	4,000	2,500

Figures for the last three cultivation seasons of *Aman* are also given below (Table 2.14). These show a steady increase in production in Hatiya under the influence of the spread of HYV, but some indications of the same downward trends in Companiganj and fluctuations in yields from year-to-year in Subornachar again maybe due to climatic variations. Since the northern part of Companiganj is mainly characterized by waterlogged paddy lands in the wet season, in the case of *Aman* rice, these figures can be safely said to refer to the char area.

Table 2.14: Trends in Cultivation of Aman Rice, including HYV Area in CDSP Upazilas, 2013-2015 (Source; Department of Agricultural Extension)

Area Cultivated under Aman by Upazila				
		Total Area	HYV Area	Production
Companiganj		Ha		Tons
	2013	23,155	8795	51,201
	2014	23,135	9550	50,789
	2015	22,770	7090	46,154
Hatiya				
	2013	59,265	4,910	100,225
	2014	59,505	9,150	105,273
	2015	59,530	13,220	109,458
Subornachar				
	2013	37,100	24,000	85,105
	2014	37,000	28,500	111,775
	2015	38,500	29,500	94,050

These figures were partly corroborated in the household questionnaire survey which asked farmers about the trends in their rice crop production over the previous four seasons from 2012-2015. Indeed the overall trend was that over the four years fewer and fewer farmers regarded their rice production as normal, more and more felt it was less than normal and the degree to which it was less than normal increased over time. Thus in 2012, 45.5% of respondents said their crop was normal and in 2015 only 22,3%; conversely the percentage regarding their crop as less than normal increased from 18.2% to 33.6% and the percent below normal from 8.6% to 18.2%. As might be expected, the non-protected areas showed the largest downturn as the effects of high tide, flood and salinity began to kick in in places like Nijhum Dwip and Bamni. The proportion of households regarding their crop as less than normal increased steadily from 24% in 2012 to 45% in 2015. In both the protected areas and the special cases, there was actually an increase in the 'degree of normality' between 2012 and 2013, but both 2014 and especially 2015 seem to have been regarded as poor years. In 2015, only 21.5% of households in the protected areas regarded their crop as normal, due

to a combination of flood and salinity, while the figure in the special cases was down to 40%, for a variety of reasons, excessive rains causing floods and droughts (Table 2.15).

The trends in relation to vegetable cultivation were not consistently downwards, although once again 2015 was regarded as a poor year, with only 47 households, 21.4% of the sample, claiming a normal yield. The general pattern that the special cases were least affected was repeated, although in the protected areas both Boyar Char and Char Nangulia – Noler Char also had high levels of normal production until 2015. However, vegetable cultivation was badly affected in the unprotected areas throughout the period; in all years, more than 55% of respondents in Char Gangchil – Torabali saw their vegetable production as being below normal, while the proportion of households in Bamni with normal production went steadily down from 40% in 2012, through 27.5% in 2013, 22.5% in 2014 and just 15% in 2015. The actual reduction in production seems remarkably small, but appears to be a data error (Table 2.16).

2.2.2.3 Food Access

The previous section has focused upon the ability of the households in the various areas and under particular programs of the successive phases of CDSP to provide adequate food for their families from their agricultural and, especially their arable land. While this is important in terms of the Theory of Change inherent in the CDSP approach, it is important to realize that livelihood in the Noakhali region for many families no longer depends directly on the agricultural sector and especially upon field crop agriculture[10]. We have addressed this in terms of the importance of the homestead economy - homestead vegetable gardening, small livestock rearing, fish culture – above. Here we set that discussion in the wider context of livelihood.

The successive Annual Outcomes Surveys of CDSP IV are useful for setting the overall livelihood situation in perspective since the sample in these surveys includes sub-samples from the CDSPI/II and CDSP III as well as the baseline and current situation in CDSP IV. From the latest AOS Report for 2015, we may focus on two issues: (a) the profile of the principle occupation of the household head (Table 2.7) and (b) breakdown of annual family income from various sources. Table 2.7 demonstrates clearly that the largest proportion of households in all sub-groups (Phases) is not agriculture, but day labour (30% of households in CDSP I/II, 33% in CDSP III and 36% in the ongoing CDSP IV). In CDSP III (Boyar Char), moreover, agriculture is even ranked third, behind petty trading. Petty trading is also the principle occupation of 18% of households in CDSP IV areas at present, up from 9% at the time of the Baseline survey. These figures suggest the importance of the opening up of the chars to the wider regional economy, especially through bridges in the case of Boyar Char and internal roads in the CDSP IV areas. In CDSP I/II areas, it is also worth noting that 18% of household heads now see their principle occupation as regular/salaried job, which is also an indicator of the maturing economy/alternative employment opportunities in the area.

[10]Indeed, it has not done so for quite a number of years. The whole region of Noakhali is extremely densely populated, with densities of over 1,000 persons per square kilometer in most parts – except the chars. The northern part of the region has long been an area of massive outmigration in search of alternative economic opportunity. It was estimated in the early years of the Danida RFLDC intervention (2006-2013) that only 30% of households actually owned agricultural land.

Table 2.15: Fluctuation of Rice Production 2012-2015 and Causes by Vulnerability Context (Source: Household Questionnaire Survey)

	Protected					Unprotected				Special			Total	
	Bhatirtek	South Hatiya	Boyer Char	Noler Char & Nangulia	Total	Gangchil	Nijhum (Osman Bandertila	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%
In the year 2012														
Normal (%)	28	19	80	38	40.60	55	46	26	38	65	70	67.5	100	**45.5**
Less than Normal (%)	20	6	5	21	14.60	25	29	19	23	15	15	15.0	40	**18.2**
Percent less than normal (%)	1.2	0	0	2	1.04	0	0	2.96	1	1.9	0.5	1.2	19	**8.6**
In the year 2013					-				-					
Normal (%)	20	8	75	75	50.60	30	38	26	30	75	70	72.5	94	**42.7**
Less than Normal (%)	40	26	5	15	20.20	45	38	19	30	5	15	10.0	47	**21.4**
Percent less than normal (%)	2.8	0	0	2	1.36	1.75	0	3.15	2	0.5	0	0.3	20	**9.1**
In the year 2014					-				-					
Normal (%)	24	13	60	36	33.80	15	25	22	21	45	45	45.0	70	**31.8**
Less than Normal (%)	32	12.5	15	17	18.70	60	46	22	38	35	25	30.0	62	**28.2**
Percent less than normal (%)	2	0	0	1.15	0.86	4	2.23	3.33	3	3.25	1.6	2.4	24	**10.9**
In the year 2015					-				-					
Normal (%)	4	13	50	19	21.00	10	17	19	16	35	45	40.0	49	**22.3**
Less than Normal (%)	52	6.25	20	29	27.25	70	37.5	26	40	45	15	30.0	74	**33.6**
Percent less than normal (%)	21.6	0	2.5	1.73	5.50	5.25	2.63	3.52	4	4.75	0	2.4	40	**18.2**
Reason for Reduction					-				-					
Salinity	2	3	1	10	16	7	12	7	26	2	1	3	45	**20.5**
Floood	12	0	0	7	19	9	0	6	15	7	0	7	41	**18.6**
High tide	0	2	0	4	6	3	13	6	22	0	0	-	28	**12.7**
Drought	0	0	2	1	3	0	0	1	1	2	3	5	9	**4.1**
Others (Heavy rainfall, Cyclone,Negligence)	1	0	4	3	8	1	0	2	3	4	3	7	18	**8.2**

Table 2.16: Fluctuation in Production of Vegetables and Causes, 2012-2015 (Source: Household Questionnaire Survey)

	Protected					Unprotected				Special			Total	
	Bhatirtek	South Hatiya	Boyer Char	Noler Char & Nangulia	Total	Gangchil	Nijhum (Osman Bandertila)	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%
In the year 2012														
Normal (%)	40	0	75	35	37.0	5	5	40	22.5	50	60	55.0	83	**37.7**
Less than Normal (%)	30	0	10	50	28.0	60	0	15	22.5	25	20	22.5	48	**21.8**
Percent less than normal (%)	1	0	0	2	1.0	0.5	0	1	0.6	3.25	1	2.1	20	**9.1**
In the year 2013					-				-			-		**0.0**
Normal (%)	40	0	85	72.5	54.0	10	5	27.5	17.5	60	60	60.0	92	**41.8**
Less than Normal (%)	30	0	5	15	13.0	55	0	30	28.8	15	15	15.0	42	**19.1**
Percent less than normal (%)	1.5	0	0.05	1.63	1.0	0	0	4.2	2.1	2	0.25	1.1	19	**8.6**
In the year 2014					-				-			-		**0.0**
Normal (%)	15	0	55	60	38.0	5	5	22.5	13.8	55	50	52.5	70	**31.8**
Less than Normal (%)	50	0	35	27.5	28.0	60	0	37.5	33.8	20	20	20.0	63	**28.6**
Percent less than normal (%)	3.9	0	2.05	1.8	1.9	0.75	0	2.63	1.5	1.5	0	0.8	23	**10.5**
In the year 2015					-				-			-		**0.0**
Normal (%)	5	0	40	37.5	24.0	15	5	15	12.5	30	40	35.0	47	**21.4**
Less than Normal (%)	65	0	35	42.5	37.0	55	0	27.5	27.5	45	20	32.5	72	**32.7**
Percent less than normal (%)	2.75	0	0.75	1.75	1.4	3	0	2.75	2.1	5.75	0.75	3.3	36	**16.4**
Reason for reduced production					-				-			-		
Salinity	35	0	15	35	24.0	30	0	37	26.0	25	25	25.0	55	**25.0**
Floood	25	0	5	17.5	13.0	20	0	10	10.0	0	0	-	21	**9.5**
High tide	0	0	0	0	-	0	0	10	5.0	0	5	2.5	5	**2.3**
Heavy rainfall,	25	0	20	17.5	16.0	20	0	17.5	13.8	25	15	20.0	35	**15.9**

Table 2.17: Principle Occupation of Household Head (%) (source: CDSP AOS, 2015)

	CDSP-IV Baseline	CDSP-I & II	CDSP-III	CDSP-IV
Agriculture	37	24	18	24
Day Labour	31	30	33	36
House keeping	3	5	3	4
Fisherman	3	1	5	2
Job	3	18	10	2
Petty trading	9	14	20	18
Rickshaw/ Van/ Boat puller	4	1	3	3
CNG Driver	0	2	2	3
Old age	6	5	6	2
Others	5	0	0	3

Turning to the distribution of income, we find a similar pattern. In all three phases, income from wage and salary employment, in this case including day labor, is the highest proportion of total income, ranging from 35.4% in CDSP I/II to 27.6% in CDSP IV. Petty trading ranks second, percentages ranging from 19.1% in CDSP III to 14.2% in CDSP I/II. It may be noted that the average income from petty trading is the CDSP IV areas has increased by almost 400% since Baseline, further evidence of the impact of opening the area. Income from field crop agriculture ranks only third, at around 12% in all areas. It is instructive in the context of the previous section that income from the homestead agriculture system contributes over 30% in CDSP IV, and 26.4% and 27.6% in CDSP III and CDSP I/II respectively. In all sub-samples, this contributes between Tk44,000-51,000 to the total.

Table 2.18: Annual Household Income from Different Sources (Source: CDSP AOS, 2015)

	CDSP-IV Baseline	CDSP-I &II	CDSP-III	CDSP-IV
Wage/Salary	33,378	61,594 (35.4)	49,524 (29.5)	44,946 (27.6)
Field Crops	15,617	21,303 (12.2)	21,377 (12.7)	19,113 (11.7)
Petty Trading	6,879	24,644 (14.2)	32,143 (19.1)	24,912 (15.3)
Homestead Gardening	3,115	13,899	13,031	18,143 (11.1)
Rickshaw/Van Pulling	2,749	690	2630	3503
Pond Aquaculture	2,713	17358 (10.0)	8277 (4.9)	15633 (9.6)
Livestock Rearing	2,666	12,249 (7.0)	14,846 (9.9)	17,282 (10.6)
Fishing/PL Catching	2,093	4,047(2.3)	8815 (5.3)	6,022 (3.7)

Poultry Rearing	1,887	4,461	8,191	10,647
Remittance	601	12,365	8,594	1,900
Handicrafts	252	1391	443	908
Total	**71,951**	**174,001**	**167,871**	**163,009**

The reference to fishery in the homestead agriculture section here refers of course to fish culture in ponds, not to the capture fisheries in the rivers and local streams. It may be noted that in the AOS surveys, very few households claim fishing as their principle occupation, a maximum of 5% in the CDSP III area (Boyar Char) in 2015. Similarly fishing contributes only between 2.3% of total income in CDSP I/II and 5.3% in CDSP III. These figures suggest that the AOS sample does not adequately reflect the situation in some of the unprotected chars, since in places like Char Osman – Bandartila and on the western coast of Hatiya, as many as 90% of households stated in the FGDs that fishing is their main source of livelihood. In this context, it is important to consider how this and not rice and other related field crop cultivation can provide for livelihood and food security. Unfortunately the answer appears to be that it is becoming increasing difficult for it to do so. In the FGD, in the fishing communities, group members commented that they had not been catching sufficient fish to maintain their livelihood; in Koralia Village of Tamaruddin Union in Hatiya, this was put down to environmental factors, the siltation of the river, arising from the rising of new chars, and leading to a reduction of the water flow. It appears that these factors have pushed the main fishery further offshore, which puts the inshore fishermen at greater risk in the event of bad weather. The dangers of sudden squalls leading to boats capsizing were mentioned in the fisheries community at Tankhir Khal during the initial field reconnaissance. When added to the government ban on catching related to the conservation of hilsa, the trends have meant that the fishers can only fish for about half the year and need to seek off-farm employment for the other 6 months.[11]In Nijhum Dwip, where

[11]The necessary legislation related to control of jatka/hilsa fisheries has been on the statute books since 1950 with the Protection and Conservation of Fish Act; this was further supported by the Marine Fisheries Ordinance of 1982. The GOB began to pay greater attention to the need for control of this fishery on the basis of evidence that Hilsa catches were declining in 2000-2003. *Jatka* (juvenile hilsa, less than 25 cm in length) catching was already banned by the 1950 Act from the period November to April, immediately after the peak hilsa spawning period in September-October, but in 2005, they started to designate areas which were identified as key *jatka* nursery sites where fishing of any type was banned for that period. The period was extended first to May and then in 2013 to June.

The support to the fishing communities affected by such bans consists of two parts:

- The 40 kgs of rice per month, which has been given to increasingly large numbers of families over time. The study by Islam et al (2016), however, reports that fishers only received 25-32 kgs a month because DOF had to sell some of the rice to pay for distribution costs. There is no difference according to size of household and the fishers feel that 50kgs is the minimum needed
    - Alternative Income Generating Activities, which offers training and microfinance for such things as rickshaw ownership, cattle and goat rearing, sewing machines and cash grants for small business. This part of the scheme has contracted over time to only 1,165 households in 2013-14, because the support offered is not helpful given the skills of the fishermen……arguably DOF does not have the skills and experience to conduct this sort of IGA training.

The same study also cites disturbing evidence that the consumption of fish among households affected by the ban has fallen to nothing during the ban period and comments on the obvious effect on nutrition of mothers and small children.

agricultural production is particularly limited, the group mentioned migration for off-farm employment for as much as eight months.
Although in Table 2.18 above fishing is linked with the catching of prawn post-larvae (PL) and other fish dry for income 9, it should be stressed that these are quite different occupations. The catching of PL with small set nets and push nets close to the river banks, often by women and children, is part of the crisis response of households seeking any sort of way to make a living. It was mentioned particularly in these terms by the FGD group at Char Balua Guchagram in Char Fakira as one of few livelihood options now available to them after the destruction of their livelihood with the erosion of the Polder 59/3C embankment.

The picture of an increasingly diversified livelihood given in the CDSP IV reports is substantiated by the information available from the household questionnaire survey conducted in this study. This data confirms that only 28.2% (62 out of 220) of the survey respondents claimed that agriculture (in the sense of production from their own land) was their primary occupation, compared to almost 40% (87 out of 220) who saw their primary livelihood as casual labour, whether in agriculture or outside agriculture. A further 11.4% regarded petty trading as the chief occupation, followed by 6.8% in regular wage or salaried employment and 5.9% in fishing. Among the sub-samples, only in the 'special case' (in the SFG group in Boyar Char) and in Bamni did the proportion of households with primary occupation in agriculture exceed that in casual labour. In the fisher community in the South Hatiya Polder, fully 65% said their primary occupation was now casual labour and the percentage was 45% in Bhatirtek, Nijhum Dwip and in the Char Majid Cluster Village. On the other hand, 15% of the latter sample stated that their primary occupation was in regular wage or salaried employment (Table 2.19).

Translating these views of primary occupation into earnings, we get a rather more refined picture. In terms of the percentage of households deriving income from each sector, the most widespread source of earnings is poultry rearing (90.9%) of the sample, followed by field crop agriculture (65.5%) and homestead gardening (62.3%). Rearing of large livestock is a source of earnings for 51.8% and aquaculture for 48.6%. Only 40.9% of households engage in casual employment and 29.1% in regular wage employment. 31.4% are engaged in capture fishing.

The problem with this profile is that most of the more widespread and agricultural sector occupations offer a limited contribution to total income. Dividing the total earnings from each sub-sector by the total sample size, it is important to note that rearing of large livestock ranks first in terms of contribution to livelihood (16.1% of the average total household income) with Tk22,576 per household, followed by regular wage and salary employment (Tk21,620; 15.4%), casual employment (Tk20,068; 14.3%), petty trading (Tk17,090; 12.2%) and fishing (Tk13,276; 9.5%). Of the other agricultural sub-sectors, field crop agriculture only ranks 7th in importance with an average of Tk10,490 (7.5%) per household (Table 2.20).

The point is that the main income generating opportunities which contribute to total earnings in the sample survey are available to relatively few households, with only the sale of large livestock and products (milk) contributing widely (over Tk20,000 per rearing household in Bhatirtek, Noler-Nangulia, Gangchil, Bamni, Char Majid CV and Boyar Char SFG). In some of the context sub-samples, the earning opportunities are dangerously narrow. In the fishing village in the South Hatiya Polder, fishing and casual employment probably make up as much as 90% of total income, while in Nijhum

Table 2.19: Primary Occupation of Household Survey Households (Percentage)

Variables	Protected					Unprotected				Special cases (Landless)			Total	
	Bhatirtek	South Hatiya	Boyer Char	Noler Char and Nangulia	Total	Gangchil	Nijhum (Osman Bandertila	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%
Agriculture (%)	20.00	-	25.00	30.00	21.00	35.00	20.00	35.00	31.25	35.00	45.0	40.00	62	28.2
Fishing (%)	-	25.00	-	2.50	6.00	5.00	10.00	-	3.75	-	0.0	-	13	5.9
Regular Wage and Salary (%)	5.00	-		10.00	5.00	5.00	5.00	10.00	7.50	15.00		7.50	15	6.8
Casual Labor(agriculture and non-agriculture) (%)	45.00	65.00	35.00	40.00	45.00	35.00	45.00	30.00	35.00	45.00	25.0	35.00	87	39.5
Petty Trading(%)	15.00	-	25.00	15.00	14.00	25.00	10.00	7.50	12.50	-	5.0	2.50	25	11.4
Services (e.g rickshaw/van)(%)	-	-	10.00	-	2.00	10.00	-	7.50	6.25	5.00	0.0	2.50	8	3.6
Fish Culture(%)		10.00			2.00				-			-	2	0.9
Other	10.00	-	5.00	2.50	4.00	-	5.00	5.00	3.75	-	5.0	2.50	8	3.6

Table 2.20: Sectoral Income Distribution of Survey Households by Vulnerability Context

Source of Income	Protected					Unprotected				Special cases (Landless)			Total			
	Bhatirtek	South Hatiya	Boyer Char	Noler Char & Nangulia	Total	Gangchil	Nijhum (Osman Bandertila)	Polder 59/ 3C (Bamni)	Total	Char Majid Cluster Village	Boyer Char (SFG)	Total	Number	%	Total Amount	Average (N=220)
Field Crops including rice	9,625	1,375	10,839	5,519	6,575	14,241	5,997	12,125	11,122	17,773	20,245	19,009	144	65.5	2,307,726	10,489.66
Homestead Garden	2,545	-	6,995	5,875	4,258	3,170	1,000	1,401	1,743	2,755	4,785	3,770	137	62.3	716,050	3,254.77
Large Livestock	15,775	5,800	10,500	20,425	14,585	43,660	8,850	34,950	30,603	27,600	25,400	26,500	114	51.8	4,966,700	22,575.91
Poultry	2,772	1,150	2,575	1,913	2,065	2,815	1,625	1,696	1,958	7,874	2,318	5,096	200	90.9	566,650	2,575.68
Aquaculture	5,240	60	5,622	7,526	5,195	14,590	-	3,060	5,178	10,247	3,477	6,862	107	48.6	1,208,180	5,491.73
Fishing	700	48,150	20,385	5,135	15,901	1,300	4,750	9,605	6,315	13,560	27,715	20,638	69	31.4	2,920,800	13,276.36
Regular Wage and Salary	21,560	2,400	15,750	34,650	21,802	19,200	4,800	19,506	15,753	59,200	6,600	32,900	64	29.1	4,756,450	21,620.23
Casual Labor (agriculture and non-agriculture)	19,300	46,600	31,975	4,169	21,243	18,450	46,050	9,387	20,819	6,587	24,680	15,634	90	40.9	4,415,100	20,068.64
Petty Trading	25,000	5,200	38,550	15,412	19,915	28,400	11,400	7,150	13,525	5,010	29,300	17,155	36	16.4	3,759,700	17,089.55
Services (e.g rickshaw/van)	4,000	1,250	5,000	1,000	2,450	1,000	10,000	5,150	5,325	-	-	-	9	4.1	671,000	3,050.00
Remittances	13,500	-	7,500	17,600	11,240	25,000	7,200	4,375	10,238	1,500	-	750	15	6.8	1,973,000	8,968.18
Handicrafts/stitching etc.	-	-	50	550	230	425	1,200	50	431	65	1,500	783	15	6.8	88,800	403.64
Others	10,400	7,800	7,925	662	5,490	52,250	5,015	16,650	22,641	250	7,465	3,858	42	19.1	2,514,600	11,430.00

Dwip, casual employment offers much the most important source of earnings in aggregate, followed by pettytrading and services like ricksha pulling. This situation confirms the information obtained from the FGDs, in which local people claimed that they could be away from the island for up to 8 months involved in casual employment in regional cities. In other cases, the profile of earnings seems rather broader, so that in the Boyar Char SFG there are important contributions from livestock, casual employment, petty trading and fishing and in Char Majid from salaried employment. The issue, of course, is again the number of households involved in the respective pursuits.

2.2.2.4 Food Utilization

The third common dimension of food security is how households utilize the food available to them, whether from their own production and from purchase in the market or acquisition by other means. This dimension of food security includes four questions:

- household dietary composition in terms of the range and nutritional quality of the food eaten;
- food absorption, especially related to the health condition of household members and in particular the adequacy of provision of clean and safe water and adequate sanitation facilities and hygiene practices (WASH); and
- intra-household distribution of the food available and particularly the provision of appropriate foods to vulnerable groups in the household, young children, pregnant and lactating women and adolescent girls.

The nature of this study precludes detailed investigation of the third of these factors. We have already discussed the issue of intra-household distribution in relation to the evidence on malnutrition in the Noakhali area in general in Section 2.1. Expert opinion seems to suggest that traditional attitudes on intra-household food distribution are changing; on the other hand, it is also clear from the primary data from the FGDs and the household survey that cutting back on food and even whole meals is a common coping strategy amongst households faced with food shortage (see Section 2.1.3). In this Section, therefore, we focus on the first two elements of food utilization, dietary profile and food absorption.

2.2.2.4.1 Profile of Household Dietary Composition

Once we used to see dal-bhatt (pulses and rice) as main food of the people of Bangladesh but this has been changed due to availability and affordability of poor people as the price of pulses is much higher than other commodities, partly due to reduction of planted area in recent years. Preferences may be inclined towards more diversity, but availability and access is of course the limiting factor. In some of the Focal Group Discussions, an attempt was made to ascertain the quality of the diet available to the participants. In Koralia Village in Hatiya, affected by the erosion of the secondary dyke, it was stated that, in the previous 7 days:

- 70% of households had not taken eggs;
- 50% of households had not taken vegetables
- No family had taken milk, even in the month or year before
- Only 10% of households had taken meat in the previous month.

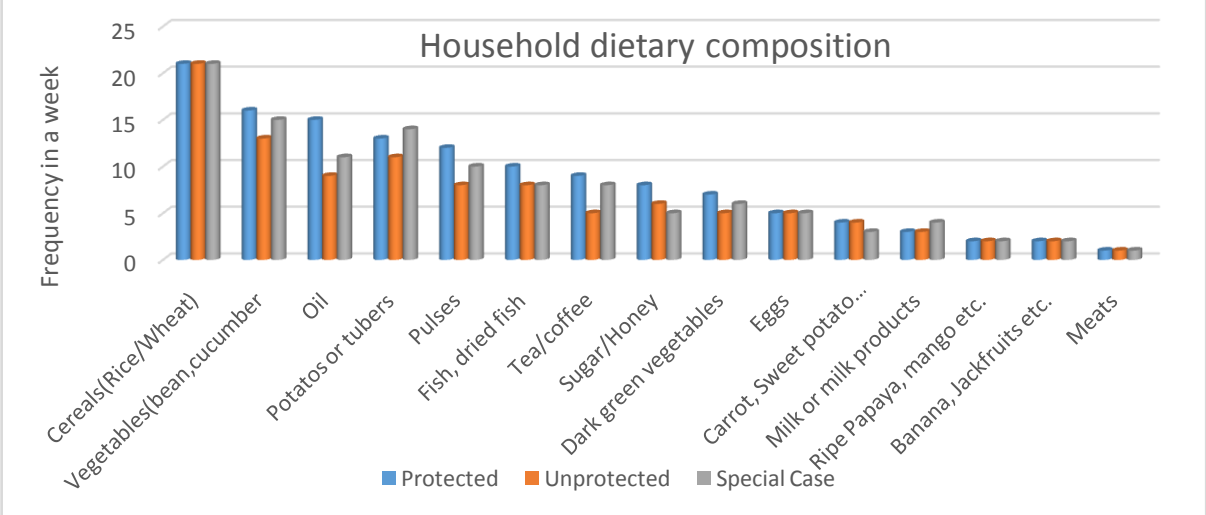
The only positive factor was that 40% had taken fish, but even this may be considered low in a fishing community. At the SFG FGD in Boyar Char, of the 23 households represented, the following emerged:

- Only 10 households had taken meat in the previous month, and all of them only once
- Only 7 had taken milk (seven households owned milking cows), although this was more than twice in the month
- All had taken vegetables regularly, put only potato
- Almost all had taken fish (20/23), albeit some only once; all had taken pulses; and most had taken eggs, usually twice or more in the month.

In another unprotected area in Ward 2 of Nijhum Dwip, food diversity is minimal, vegetables are not cultivated in the area and households commonly take their meal with just pulses and chillies, both ground and green. In the newly unprotected part of Polder 59/3C, the group claimed that meals were often just rice with potato and pulses. Indeed, during the fieldwork (carried out in May and June), the study team rarely found a stock of vegetables in the market. These trends are reflected in the chart below (Figure 2.15) which shows that virtually all households were consuming rice, fats/oils, vegetables and tubers in the 24 hours prior to the interview. Fish is clearly the primary source of protein for these households with nearly 90% of households overall consuming fish at least once a week. Tubers (potatoes) are normally prepared with other vegetables or smashed and are widely taken with rice.

All households have 3 full meals at the time of interview (reflected in the consumption of cereal foods 21 times a week, therefore three times a day) but some differences may be seen in type of food in the protected and unprotected areas. However, it was revealed through quantitative and qualitative study that in some unprotected areas members of the households had no vegetables in their meal for more than one week other than Chili and no animal protein were taken for last one month (Osman Bandertila, Musapur). In Musapur, the Monitoring Officer supervising the field survey commented in a report back that some households had commented that they had not taken certain foods in the last year, indeed they had not even seen these foods in that time. In an aside in relation to food preparation, the same group (and one in Nijhum) added that sometimes they could not even complete cooking of food because of the level of the regular tidal inundation.

Figure 2.15: Household Dietary Composition (Frequency of Consumption of Different Foods per Week Maximum Score = 3 meals per day by 7 days= 21) (Source: Household Questionnaire Survey



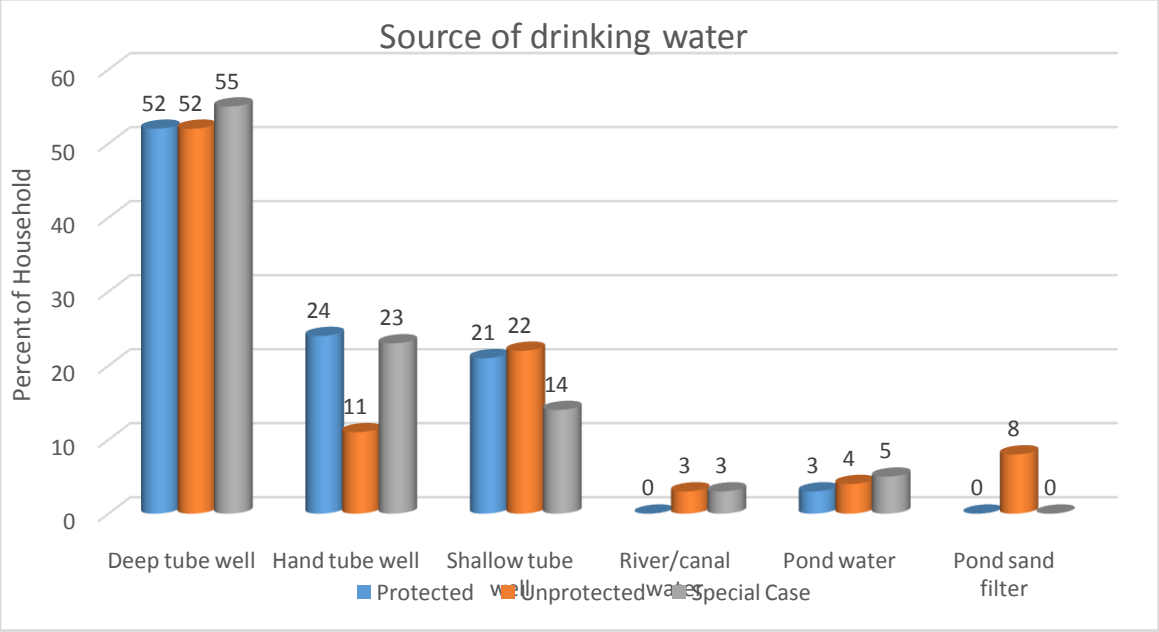
2.2.2.4.2 Food absorption: Water, sanitation and hygiene as a factor

Current situation: drinking water supplies

Sustained access to safe drinking water is an essential condition for any healthy community. It was revealed from the quantitative data that the majority of households in the CDSP areas have safe sources of drinking water but still there is some evidence of scarcity of drinking water in some places. Figure 2.16 below shows that around 7-8% households (especially in contexts like Musapur) have no options of safe water and are taking water from ponds or canals with only limited purification measures such as by halogen tablets or alum.

As surface water is prone to contamination, this suggests that coastal households may have greater incidence of water-borne diseases and their relative isolation may increase cost of treatment of the poor char dwellers.

Figure 2.16: Sources of Drinking Water by Vulnerability Context (Source: Household Questionnaire Survey



Current Situation: Sanitation and Hygiene

Hygiene practices are an important parameter of standards of livelihood which also varied between the various contexts, both in terms of access to safe latrines and practices of hand washing. People often cannot afford high cost latrines but they should at least have a one ring slab latrine and wash their hands after defecation with soap. In relation to access, Figure 2.17 below suggests that a large number of households have no hygienic latrines, especially in the unprotected areas and in some cases in the land-poor special cases. There are two situations in this regard. The first is where households have ring slab latrines but where the water seal has been broken thus leaving them vulnerable to inundation by tidal flooding; this situation is most common in the 'special cases", where 65%of households in the Cluster Village context of Char Majid suffered this problem. However it was also a problem in the older non-protected areas where 55% of households in Char Gangchil and 54% in Nijhum Dwip mentioned this situation. The second situation is where the families never

had a sanitary latrine and have continued to use open defecation or hanging latrines over canals. This is most common in the non-protected areas, especially in Nijhum Dwip and Bamni, and in the so-called protected area inside the South Hatiya Polder in Sonadia Union (81% of all households and so inflating the picture for this sub-sample). Figure 2.18 shows the typical character of these hanging latrines in the latter area.

Hygiene: Hand washing practices

There are five critical times at which it should be common practice to wash ones hands: before eating, after defecation, after cleaning a child that has defecated, before cooking/preparing food and before breastfeeding or feeding a child. Data collection emphasized collection of information on hand washing behaviors after using latrines which is most important for children as well as for the adults. Figure 2.19 appended below shows that nearly 50% respondents of special areas like cluster villages are using soap and water for washing their hands, followed by 32% from protected areas, but the figure in unprotected area is only 22% respondents. Figure 2.19 also shows that hand washing is likely limited by lack of awareness. The Figure shows that many households only wash their hands with water and in both the non-protected areas and the special cases 30% were using ash and even mud to clean their hands.

Figure 2.17: Types of Sanitation Facility by Vulnerability Context (Source: Household Questionnaire Survey)

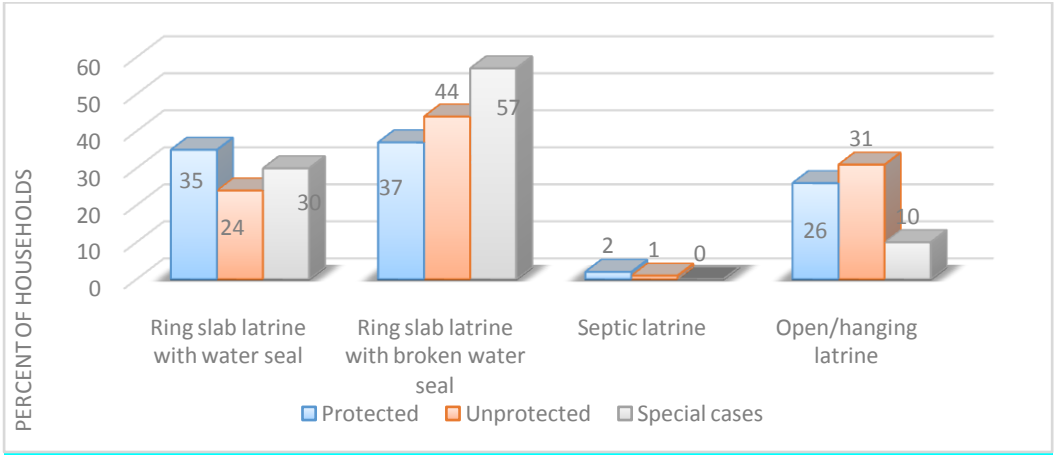
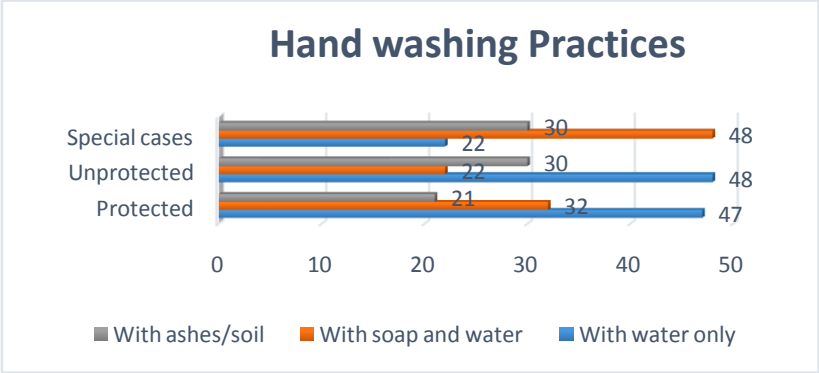


Figure 2.18: Typical Hanging Latrine used widely by respondents in earlier phases of CDSP (picture from South Hatiya Polder, the canal is just visible though the undergrowth)

Figure 2.19: Hand Washing Practices by Vulnerability Context
(Source: Household Questionnaire Survey)



Climate Change and WASH

The household questionnaire survey investigated whether the water, sanitation and hygiene situation in the CDSP program areas was being affected by perceived changes in climate and extreme climatic events. Figure 2.20 shows the overall views of the household survey respondents. Perhaps surprisingly, the highest response from almost all respondents was environmental pollution, which may be taken as a 'catch-all' term for many of the other answers. In the context of the non-protected areas this may be translated into three elements: scarcity of drinking water, through pollution of the water by flood, cyclone and most especially salinity. While pollution of drinking water is also seen as a major impact in some of the protected areas, in the special cases, respondents viewed the major impact as spread of vector-borne and other diseases. As Figure 2.21 shows, almost all respondents commented on the increased incidence of water-borne diseases. In these 'special areas' also, an increase in pollution by arsenic and iron was also mentioned, related probably to a drop in the water table. The responses focused mainly on water supply problems and only obliquely on sanitation via the factor of water-borne disease.

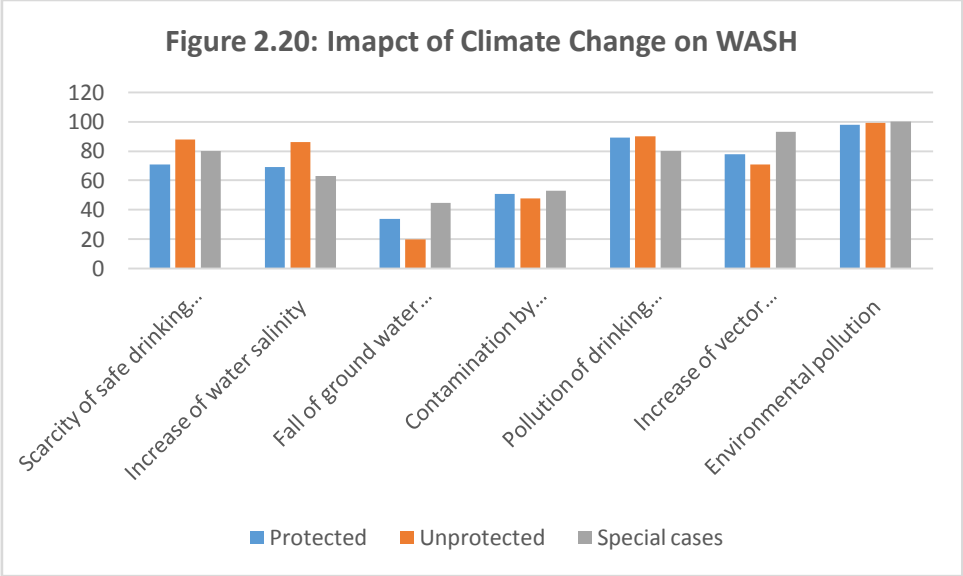


Figure 2.20: Impact of Climate Change on WASH

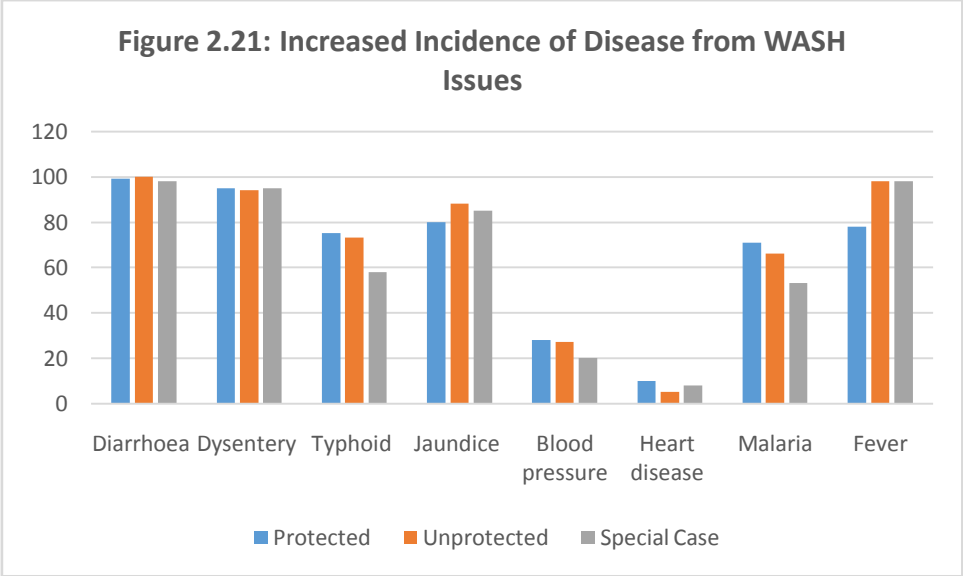


Figure 2.21: Increased Incidence of Disease from WASH Issue

Respondents were also asked if they were already making any adaptations in their behavior with regard to WASH facilities. It is interesting to note in the context of pollution of drinking water that the largest number of responses to this question was the collection of rainwater for drinking, mentioned by over 80% of respondents in all three context (Figure 2.22), while a slightly smaller proportion also mentioned merely seeking treatment for water borne-diseases. This was the most frequent response in the 'special areas', where also sealing the well head and the use of water purification tablets ranked high.

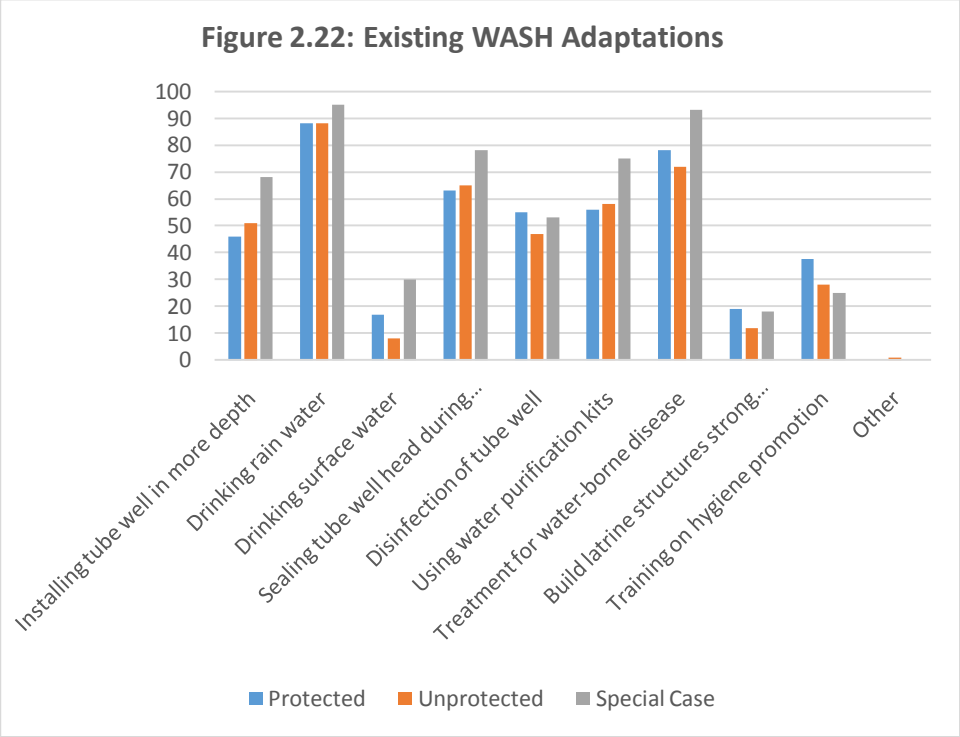


Figure 2.22: Existing WASH Adaptations

The existing adaptations do not appear to address the key problem of flooding of unhygienic latrine facilities or overtopping of damaged ring-slab facilities, presumably because such adaptation is beyond the technical skills/economic means of the respondents. This is partly covered in Figure 2.23 which sets out what the respondents feel are key interventions which need to be taken by the authorities / development agencies to address WASH problems. While the sinking of more deep tube wells is the highest priority in the non-protected areas, most of which date from earlier phases of CDSP when coverage was not so dense, and while water purification kits are a priority for all, the development of strong and climate resilient structures for both water supply and sanitation facilities comes as a strong third priority. The overall percentage of respondents mentioning this is high in many sub-samples (100% in Char Majid, 98% in Bamni, 95% in Boyar Char 85% in Bhatirtek, 83% in Noler-Nangulia and 80% in the SFG case) and the overall figures are only deflated by the smaller percentages from areas where there are few existing sanitary latrines like the South Hatiya fisher community and Nijhum Dwip. The mention of 'proper waste management' by a similar number of respondents appears to have been understood also as addressing sanitation.

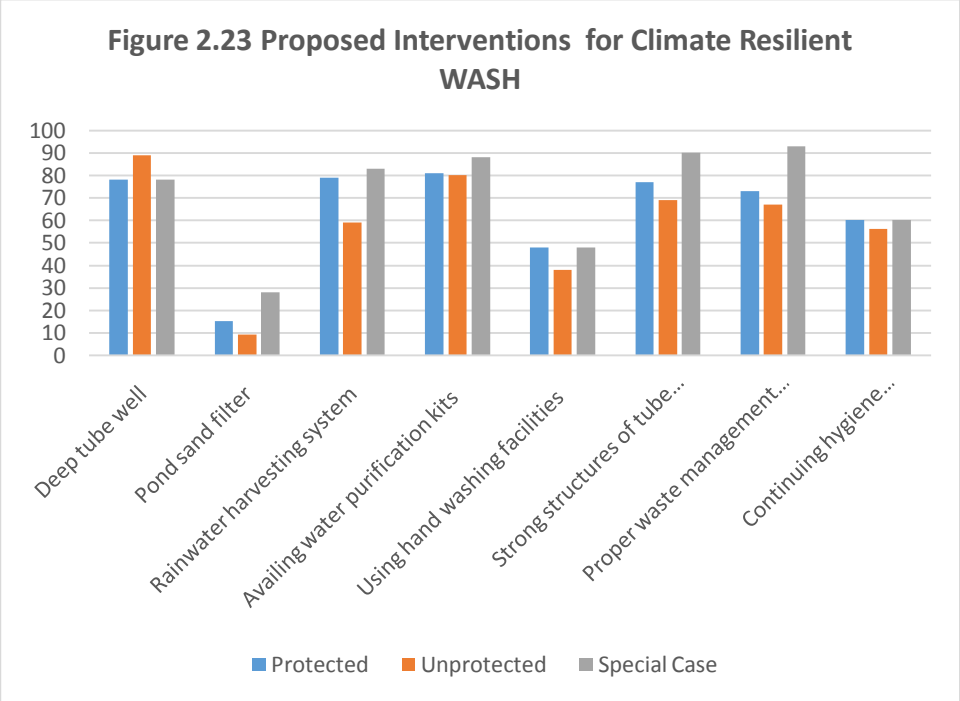


Figure 2.23: Proposed interventions for Climate Resilient WASH

Although the tendency in any discussion on the health factors in food security tends to emphasize WASH issues, another important factor which was mentioned in particular by the Upazila PHO in Hatiya is that de-worming of children is not widely practised and is a factor in malnutrition.

3. Assessment of Interventions

3.1 Overview and Targeting

It will be clear from the analysis in the previous section that there is a major difference in the livelihood status of those parts of the overall CDSP programme which are largely protected from major natural hazards, especially tidal and storm surges, consequent flooding and sedimentation, waterlogging and chronic salinity and the unprotected zones. The lack of protection is the major cause of livelihood vulnerability leading to food insecurity and malnutrition. In such areas, farmers find it impossible or extremely risky to make the investment required for agricultural intensification and diversification and are largely restricted to a single T. aman (kharif II) rice crop. Means that lack of adequate food production on their own farm, coupled with isolation, means that shortages are largely made up by out-migration of male household members for poorly paid and seasonal casual labor, leaving women folk to cope in the homestead. The major concentration of any Food Security Component should concentrate on these areas.

However, even within the protected (empoldered) areas, there are concentrations of households which are also vulnerable. These are mainly to be found in the so-called Cluster Villages (CVs), which were established in the earlier phases of CDSP for households who had recently arrived in the CDSP target areas and had not established claims to land. These households were allocated a homestead plot in the CVs, but little or no arable land. There are significant numbers of these villages to be found in such protected areas as Char Majid, Char Bhatirtek and Char Bagga Dona II (Char Mohiuddin), mainly developed by LGED. As will have been observed from the livelihood profile of the household survey sub-sample, for Char Majid, some families have established themselves in the more than two decades further since settlement both by claiming new land in nearby Char Nangulia and by diversification into trading and salaried employment. Nevertheless other households in these communities continue to struggle.

In Phase III, another round of settlement villages were established in Boyar Char by the Ministry of Land, partly to accommodate households living outside the polder embankment who had lost land to the embankment construction and the foreshore afforestation. As such, these households tend to have overlapping membership with the social forestry groups. Both these groups lack the basis of livelihood development in the form of main field agricultural (arable) land, so that the typical indicators of achievement of CDSP in agricultural development (cropping intensity of arable land, use of HYVs, diversification into commercial *rabi* cropping) and with them the work of DAE becomes irrelevant to such households. It is recognized that the limited short-term income generating benefits of social forestry cannot be a basis to fulfill livelihood needs; the problem is that many such households do not have other livelihood options, or, in the case of fishers, are faced with declining earnings from changes in the fishery resource system and government restrictions on catching. These households are an important secondary target group for any Food Security Component.

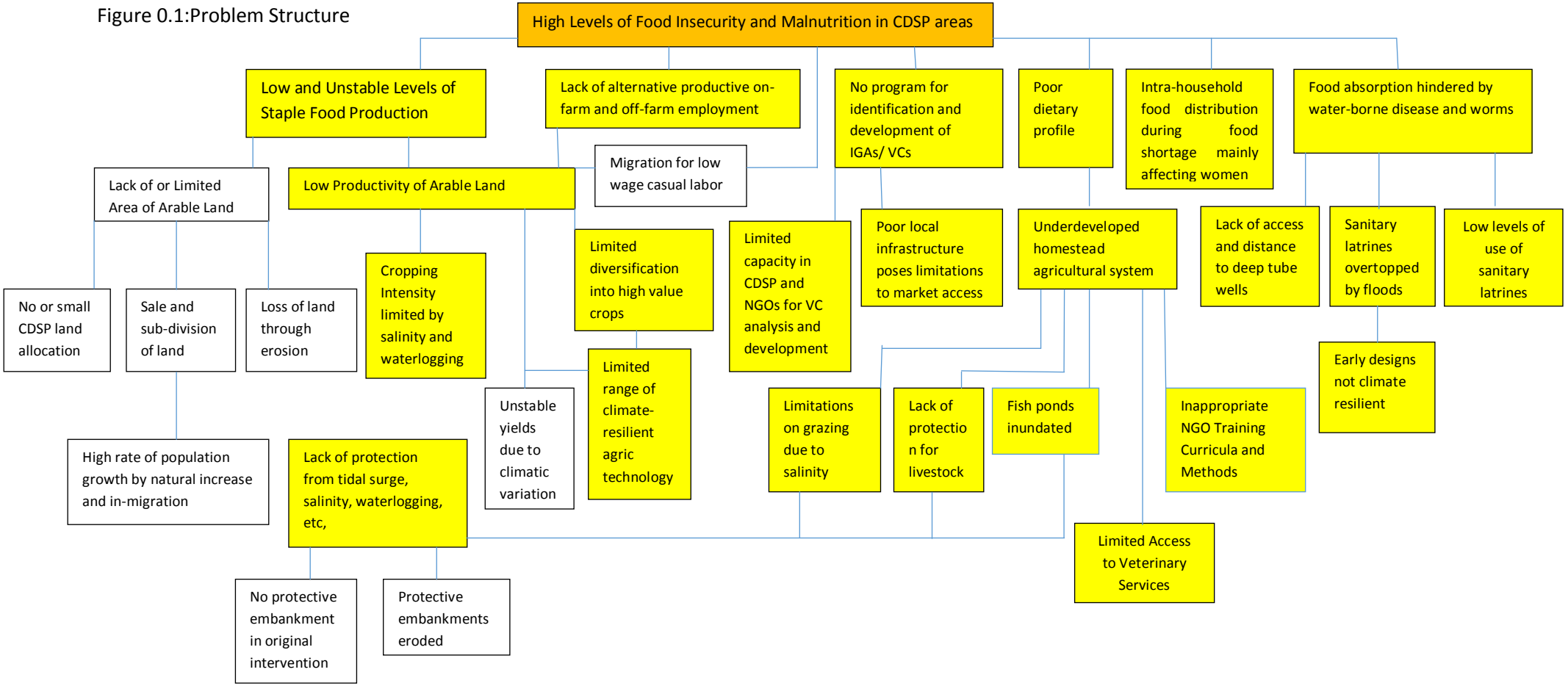
Where their agricultural livelihood is compromised by lack of land and the low productivity of the agricultural system, mainly brought about by lack of protection, households continue to struggle in terms of utilization of food. Diets are limited by the lack of opportunities for vegetable growing and poultry rearing and the same factors of regular flood and salinity which affect agricultural productivity also prejudice water and sanitation facilities. A significant number of households in the now unprotected areas dating from earlier phases of CDSP do not have sanitary latrines and where

these exist, they are broken so that overtopping presents a real risk of waterborne disease and consequent problems of food absorption. Coping strategies to deal with food shortage mostly still affect the female members of the household.

The problems underlying food insecurity in the CDSP program are summarized in Figure 3.1 setting out cause-effect relationships in the classical problem structure, typically a first step of project planning. The Figure shows the complexity of the problem and attempts to identify which boxes in the cause – effect structure a 'Food Security Component' in CDSP V might be able to address (highlighted in yellow).

The target areas groups for such a Component are summarized in different sub-categories in Table 3.1. It will be noted that the Table includes some secondary groups in the 'unprotected category' framework. One of these is the Bagga Dona Catchment area, where livelihoods were threatened by waterlogging but were expected to improve following the excavation of the cut to the Hatiya River in CDSP III. However, there is some suggestion that this area is now suffering from flooding as a result of river bank erosion along the Meghna River in Ramgoti. A second area is that outside the Bhatirtek polder, which is strictly not a CDSP area, but which is intimately linked in terms of land holdings to the text to continue till where discussion re Table 3.1 starts

Figure 0.1:Problem Structure



area inside the dyke. It will also be noted that the recent erosion (since July-August 2014) of a stretch of 5kms from Drainage Sluice 2 to Bashar Bazar the embankment on the south-eastern side of Char Nangulia (see Figure 3.2) warrants its inclusion here even though it is the focus of ongoing rehabilitation in CDSP IV. According to the FGD held in Char Nangulia at Kaladur Bazar, this is affecting areas around Bashar Bazar, Hemayetpur Bazar and adjacent parts of Caring Char.

Table 3.1 also suggests nuances of the vulnerability in the protected areas, where there are some places where drainage impediment leading to waterlogging and capillary salinity, especially in times of low rainfall linked to climate change, may be a limitation on agricultural and therefore livelihood development. At present, in areas like Char Bhatirtek, these problems are exacerbated by the blocked drainage in the Noakhali Khal, partly resulting from the erosion of the Polder 59/3C embankment and the subsequent flooding, sedimentation and waterlogging. These areas are to some extent highlighted in the various CDSP exercises in defining Productivity Zones (PDZs) (see, for example, Bhattarcharjee et el, 2015). Since it is an area/context based classification, Table 3.1 cannot pinpoint those households with agricultural land in which land holding size has fallen below what might be seen as the minimum for food security as discussed in the previous Section.

Table 3.1: Possible Focal Areas of a Food Security Component

Vulnerability Scale	**Unprotected**			**Protected**			
	Never protected	Polder largely eroded	Polder partly eroded	Land poor households	Land Quality Limitations, caused by local waterlogging and capillary salinity, but could be addressed by rehabilitation works (WMG) and by DAE if resource available (NATP?) on same basis as no limitation areas		No major limitations with potential for field cop intensification with water lifting, RWH, soil protection, etc
	Gangchil – Torabali	Polder 59 3C	Hatiya West Coast	CVs	Prone to capillary salinity	Prone to waterlogging	Most areas of Bhatirtek, 59 3B, Majid, CBD II, Ziauddin, South Hatiya
	Char Osman –Bandartila		Bagga Dona catchment?	Char Majid	Some parts of Char Bhatirtek, Char Majid, and at present Char Nangulia		
	Char Laxmi? (assumption is that it is protected by other chars)		Char Nangulia, since July-August 2014	Char BD-II(Mohiuddin)			
	Bhatirtek outside embankment			Boyar Char SV which may overlap with			

				SFG Groups in Boyar Char and CDSP IV, including fishers			

3.2 Review of Possible Interventions

Based upon the above contextual framework, we now turn to review of the possible Interventions for a Food Security Component in CDSP V. The discussion in this Section is structured generally in line with the various sub-components of CDSP IV and is summarized in Table 3.2 according to the different target contexts of food insecurity outlined above.

Table 3.2 Summary of Possible Interventions by CDSP Components

Intervention/Area	**Polder 59/3C**	**West Hatiya**	**Osman-Bandartila; Gangchil-Torabali**	**Land Poor households in CV and SFG**
Infrastructure, including Social Forestry as a Protection Measure	Awaits Cross-Dam; retired embankments for temporary relief?	Repair to the Beri Bandh	Scope for empolderization, including social forestry component	Monitor erosion in SFG areas
Land Settlement	Register of landless families; structured resettlement, giving priority to displaced	Still to check whether there is a problem of displaced		
Agriculture	Depends on protection, but should emphasize integrated agricultural development May be covered by expansion of NATP Project in CDSP areas	Depends on protection, but should emphasize integrated agricultural development May be covered by expansion of NATP Project in CDSP areas	Depends on protection, but should emphasize integrated agricultural development May be covered by expansion of NATP Project in CDSP areas	Little scope for field crop agriculture
Social and Livelihood Development (NGO Programme) Homestead Agriculture	Concentration on homestead systems for resource poor; strengthen vegetables, fruit, poultry, aquaculture (including community ponds), small ruminants in CDSP profile. Emphasize Value Chain development for group marketing of these commodities. Implementation largely by NGOs, but quality control on curricula; change training mode to more participatory approach, ideally in the Farmer Field School mode. In Social Forestry areas, pay greater attention to the SF model, so that it offers more and earlier income, especially through integration of livestock/fish culture and alternative IGA. Provision of small grants for IGA among poorest groups, along CRPARP model. Support to nutrition training, hygiene and climate change / disaster preparedness			
Internal Infrastructure	Raise roads and particularly WASH facilities	Raise roads and particularly WASH facilities	Re-examine how far these are climate resilient; if not, raise roads and WASH	

			facilities	
Local Institutions	Involve community and develop these institutions as appropriate, especially development of improved value chains			

3.2.1 Review of Scope for Protection Measures

3.2.1.1 Areas of CDSP II never empoldered

Technically there appears to be no reason why embankments should not be built around Char Gangchil – Torabali and Nijhum Dwip.

Char Gangchil-Torabali

According to the Char Executive Engineer of BWDB, Char Gangchil Torabali has been included as an empoldered area with Char Maksumul Hakim in the first CDSP V Feasibility Study. However, it appears that the XEN is confused on this, since the Cluster of Chars includes

- Char Khandaker, Char Mozammel, Char Banani, Char Akramuddin, Char Aladuddin and Char Torab in Mohammedpur Union of Subornachar and
- Char Pallobi and Char Gangchil in Char Elahi Union of Compnaiganj

The area was not included in Polder 59/3B, which was created in the 1950s and 1960s, which was the period also when the coastal area of Noakhali, including Polder 59/3B was brought under protection against river flooding and salinity intrusion. However, the area of Char Maksumul Hakim was not included in Polder 59/3B, since most of the area emerged after that period. This area began to be settled around 15 years ago, leading to the removal of the trees planted by the Forest Department. This is different from the area known as Char Gangchil – Torabali, which was already settled enough to be included in CDSP II (2001-2005), even though as an unprotected area.

The original area known as Char Gangchil – Torabali lies immediately north of the area of the proposed new development, north of the Gangchil Khal (Figure 3.2). It appears that the Feasibility Study for Char Maksumul Hakim, now known as the Cluster of Chars, did not consider extending the embankment to this former area. The proposal involves the construction of a 15.85 km sea facing peripheral embankment, as well as 7 km of internal embankments along the Gangchil and Meghna Khals. Moving ahead with this proposal creates the bizarre situation that the new polders will be embanked, while the old non-protected area will remain unprotected!

However, a further factor complicates the situation. Like Polder 59/3C discussed below, this area will be affected by the decision to go ahead with the construction of the Urir Char – Noakhali Cross Dam (UCNCD). Indeed this is the chosen assumption of the Feasibility Study for the Clusters of Chars/ The alignment of the UCNCD in fact is just south of the Gopal Khal and the approach road for this will run from Akter Miah Hat /Balen Bazar on the Noakhali Bheri Bandh road. The Gopal Khal will be immediately affected by the sedimentation caused by the Cross Dam and the FS proposes a line

canal to divert the drainage of this Khal southward so that its waters flow out beyond the dam. It seems that the sedimentation caused by the dam will slowly extend northward and in time the outflow from the combined Gangchil, Zillur and Momtaz *Khals* will be blocked. It is proposed to excavate a similar canal to drain their waters northward so that they flow into the Bamni river upstream of the regulator. It is curious that the map showing this diversion of drainage appears to relate to a situation prior to the erosion of the Polder 59/3C embankment.

In these circumstances, given the sedimentation of the the question may be asked why it is necessary to construct an embankment in Char Maksumul Hakim north of the Gopal Khal at all; a similar question may be asked of a proposal for an embankment in Char Gangchil – Torabali. The answer appears to lie in the time framework which, once all preparation steps have been finalized, envisages a construction period for the cross-dam of four years (work only in the dry season) and the gradual sedimentation of the land behind the dam over a period of ten years or more. The sedimentation will only reach the mouth of Char Gangchil around 2024-25 (see below, discussion of the Urir Char Noakhali Cross Dam)

The only major concern of the Executive Engineer was that the normal earthen embankment for Char Gangchil might be inadequate in view of the experience with Char Nangulia; he felt that protection in the form of concrete blocks would be better, but this would increase the costs. This does seem to be considered in the Feasibility Study.

Figure 0.2: Char Gangchil-Torabali (CDSP V) in relation to proposed area of CDSP V Component on Cluster of Chars (Char Maksumul Hakim)

Nijhum Dwip

The situation in Nijhum Dwip is even more complex, in the sense that it does not depend only upon technical feasibility.Although, there is no feasibility study specifically for the constructing a surrounding embankment for Nijhum Dwip, apparently BWDB have proposed a project for the construction of a cross dam between the southern edge of Hatiya and Nijhum, which would also serve to link with a new char area emerging to the east of Nijhum. However, this Project was rejected by the Department of the Environment (of the Ministry of Environment and Forests), which is responsible for the conduct of Environmental Impact Assessment for the GOB on the grounds that it would affect the integrity of the reserved forest on Nijhum Dwip and therefore the population of deer. In 2014, the High Court in Bangladesh ruled that there should be no further settlement and development in the reserved forest of Nijhum Dwip. This appears to be a judgment aimed at projects like CDSP, but also against the growing tourist trade on the island, which has led to the creation of chalets for overnight stay and, according to press reports, a thriving trade in the sale of venison (deer meat) to those resorts.[12]With the population of Nijhum Dwip having grown rapidly, there are obvious pressures on the integrity of the forest and there are also reports of deer competing with cattle and buffalo for grazing land in the dry season. Thus the issue of empolderization of Nijhum Dwip is complex, requiring a fresh look at the conflicting priorities; this has been recognized in a recent initiative under the Climate Resilience for Environment and Livelihood (CREL) Project which held a workshop in 2015 to introduce the idea of co-management of the forest between the local people and the authorities for mutual benefit. This is a useful initiative and may be the basis of useful livelihood and food security intervention in the absence of empolderization (see below, Section 3.3.4).

3.2.1.2 Areas of CDSP II where embankments have been eroded

Polder 59/3C (Bamni)

It emerged that BWDB has developed a DPP for a new sea embankment to replace the eroded World Bank Embankment. This project proposal is termed 'Flood Control Improvement Project for Removal of Drainage Congestion in Noakhali' and involves an investment of Tk329 crore (Tk3,290 billion or USD 42.7 million), including a 10 km earthern embankment of a height of 7-8 metres, protective works, 182 kms of *khal* excavation and a new regulator at the mouth of the Bamni river. The DPP has apparently reached the PAC (Project Appraisal Committee) in the Planning Commission in preparation for submission to the ECNEC. The construction period of this Project is expected to be 4.5 years, with the original intention of finishing in June 2020. The Project Analysis, Appendix E, mainly emphasizes the value of properties protected. These include 3335 homesteads of different types, 2000 ha of agricultural land and 43 fish ponds. The value of crops saved would be 292,000 mt x 20000 Taka or 58,400 lakh over a period of 20 years. The Proposal acknowledges the fact that there has already been destruction, but does not address the issue….in short it is a construction project.

[12] These reports also mention collusion of the authorities in the trade, with Local Government blaming the Department of Forests and vice versa. At an earlier date, the population of deer was reported to have grown so large – upwards of 15,000 – that the Wildlife Department was recommending a program of culling in any case.

The EIA of this Project – if it is for this Project, since the title differs, somewhat from the BWDB DPP, namely 'Rehabilitation of the Coastal Embankment Polder 59/3C at Companiganj Upazila in the District of Noakhali to Mitigate the Risk of Disaster due to Climate Change.' – was done by CEGIS (2014). Despite the different name and the specific mention of Polder 59/3C, the EIA seems to cover the same area (so including Polder 59/1A in Feni), but the list of proposed interventions does not appear to be the same.

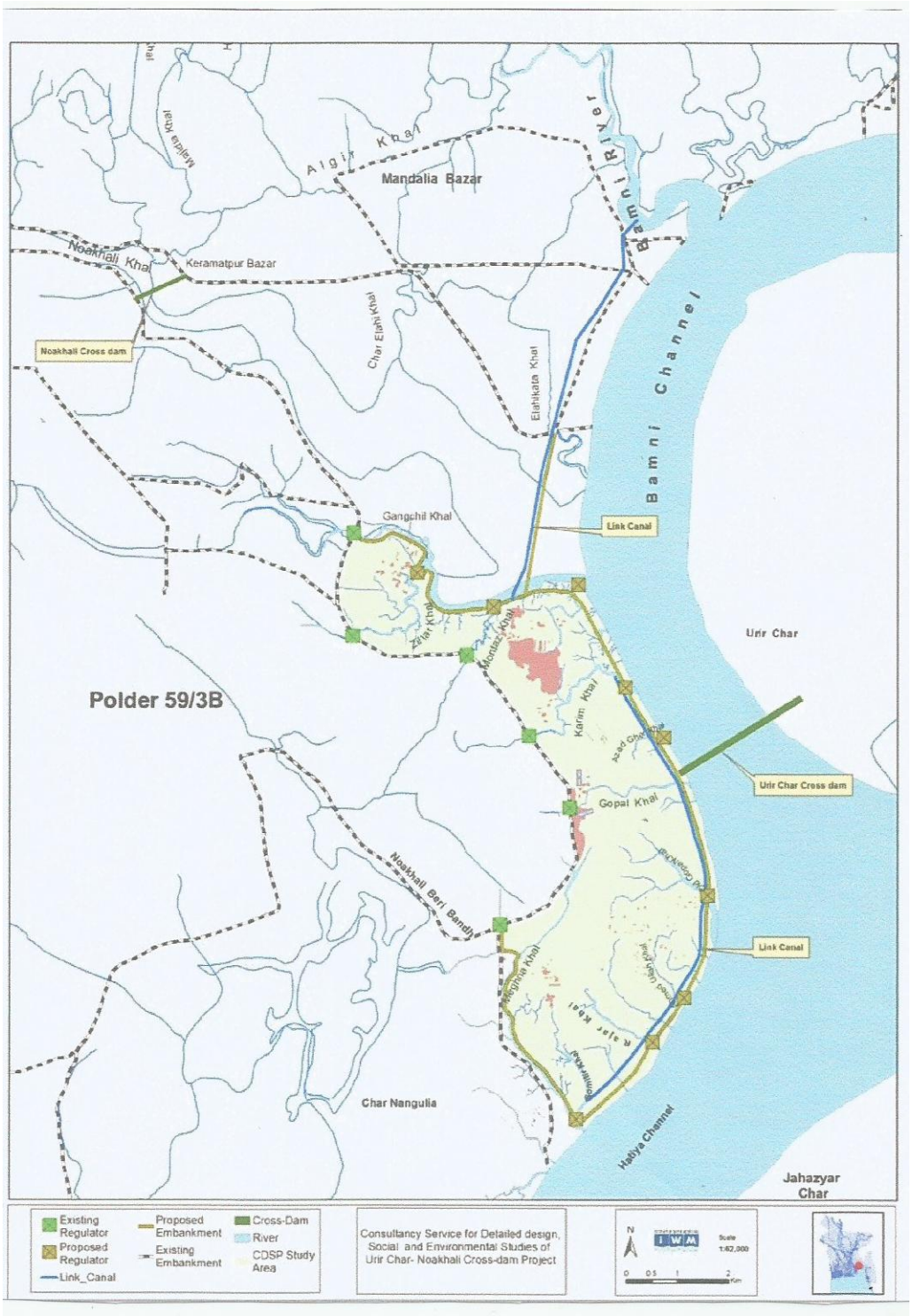
This proposal is not seen as conflicting with the Urir Char – Noakhali cross dam proposal. Indeed this part proposed under a 'pre-appraisal / pre-investment study' conducted by IWM (2011) has been omitted from the BWDB DPP. The UCNCD project would take up to ten years to complete (seven years from closure and four years in the preparation and construction process[13]), so would not be ready for any new settlement until around 2025, i.e. beyond the end of CDSP V. In the UCNCD FS, it is envisaged that land begins to become available by Year 8 from the start of work. Indeed, since the Cross Dam location is some 10 kilometers southward, it appears that the Bamni Channel along the stretch of the former (and proposed new) embankment will not be immediately accreted and that the Bamni river will continue to be open for drainage not only from the polder, but also the Noakhali Khal and parts of the newly empoldered Cluster of Chars proposed for CDSP V (see above). The UCNCD FS report states that sedimentation will not take place at the outfall of the Bamni river for a period of at least ten years; rather sedimentation will be up to the outfall of the Noakhali Khal, which is the same as the Gangchil Khal (Haskoning at al, 2014, Main Report) (Figure 3.3)

The alignment of the new embankment will be along the new shoreline, i.e. at least 0.6 kms (based on the Urir Char FS and probably more) inland. It will mean that the land already lost to erosion over the last 7 years will not be restored and the displaced persons will not be able to go back to this land.

Already BWDB has carried out some works termed the Musapur closure (on the Little Feni River?), which should prevent further tidal surge into this particular area of the Polder. These works are more or less complete, apart from some protection measures on the closure. It includes improvements to the drainage canals also to reduce the waterlogging. However, one assistant engineer noted that this would not make any difference to the problem of use of pond water for drinking in the Musapur area since the deep tube well water here is saline. Alternative solutions will be needed to that problem.

13 Construction is scheduled to take place in the dry season over a period of four years. (UCNCD, Main Report page 96)

Figure 0.3: Location of Urir Char – Noakhali Cross Dam and Link Drainage Canals



South Hatiya Polder

The XEN agreed that in this area, the original World Bank Polder 73/1 Embankment had been eroded away and that the BWDB had replaced this with a lower secondary embankment with a height expected to offset the effects of high tide, even the normal spring tide. However, it was not able to offset the impact of storm surges and he also agreed that this embankment was now broken in several places, partly as a result of the recent Cyclone Roanu. It was now a major task and expensive to close in the secondary embankment with the funds typically available from the GOB budget. At present there appears to be no solution here. Having said that there is mention in the comparative cost analysis in the DPP for Polder 59/#C of a Project ongoing in 2015 for River Bank Protection at Tamaruddin and Banglabazar of Polder 73/1 at Hatiya, with reference to construction of a sea-dyke, an interior dyke and concrete block protection.

Figure 0.4: State of Erosion of Secondary Embankment along west coast of Hatiya, Tamaruddin Union

Further south, near Jahazmara, there has been erosion to the South Hatiya Polder itself. A Memorandum from the XEN, BWDB to CDSP IV mentions that the affected section is part of the 21.050 km embankment constructed by CDSP II on the outer side of Polder 73/1 and that the section from Km17.460 to 17.860 is now under threat due to erosion from the Muktaria Channel. Thus, the CDSP II Polder may be open in this area in a short time. BWDB has proposed construction of a 'marginal dyke/retired embankment from Km17.160 to Km18.260 to save the local peoples land and property from tidal water. This embankment will be lower (at 5.00 metres above sea level) than the existing embankment (6.10 metres), so that while it may be expected to prevent the intrusion of normal peak tides, it may not be able to offset major cyclonic surges.

3.2.2 Issue of Settlement of Displaced Persons

The problem of the erosion in Polder 59/3C and Polder 73/1 in west Hatiya is not confined to the protective embankments, but it has also washed away the homesteads and the agricultural land of the people living on and behind the dykes. There is no firm figure of the number of households displaced by the erosion. In the Focal Group Discussions in Polder 59/3C it was stated that the erosion of the dyke has washed away around 15 square kilometers of land (although it is not so clear whether this referred to Char Elahi alone or the whole stretch of coastline) This amounts to 1,500 hectares or 3,600 and, based on the fact that some of the households were probably functionally landless (living on the dyke) and an average holding size of about 1 acre, it may be calculated that some 4000-5000 households have been displaced. In the FGDs, in Char Fakira, a figure of 1,000 displaced households was mentioned, in Char Elahi 3,500. No figures were mentioned in Musapur. Some of these households have left the area (1,500 from Char Elahi though not necessarily out of Companiganj), but around 3,000 (1,000 + 2,000) remain and are living on roadsides and other public land. Detailed figures need to be collected. The particular problem now is that more permanent settlement for the displaced households is needed, as well as the construction of cyclone shelters – also some like the CS at Char Lengta have also been washed away - since these people are vulnerable in the case of extreme events. Based on the comments of the Minister of Communications during his visit to the area immediately after Cyclone Roanu, some local people have a grossly over-optimistic view of the possibility of being allocated land in the new char which may be created by the UCNCD; this will take 8-10 years to be habitable / cultivable at best. If the BWDB embankment is built, it will be on the new shoreline so it will not restore the lost land. The delegation from the Water Management Group in Char Elahi who came to see the study team in the CDSP office had a more realistic view, noting that there was land in Urir Char on which people were already settling; they felt that they should have priority in allocation.

This situation poses a real dilemma for CDSP and the authorities in general. There is a common attitude in Bangladesh that river erosion is a 'normal phenomenon' and that people are accustomed to move from areas affected by erosion to seek settlement elsewhere. In the case of Noakhali, this usually means moving to another new char. The restoration of the embankment in Polder 59/3C will take a long time and the area is already densely settled. Lack of response to this situation, which is obviously severely affecting livelihood and therefore food security, has the danger of undermining the community as more and more people join the ranks of 'climate change displaced migrants' entering the urban areas, a focus which receiving more and more attention from climate change researchers in Bangladesh. Taking a human rights perspective, such displaced households should have the right to remain in their home area – Polder 59/3C has been settled since the early 1970s – if they wish. The question is how this can be made possible.

The Union Parishad Chair in Char Fakira has offered some elements of an answer. He has bought 5 areas of land, apparently with his own (the Union Parishad's?) money and has thought to allocate 5 decimals of land for each of 100 displaced households in the form of a Cluster Village, but is looking for support. Such a scheme would at least offer a more permanent residence for the displaced and the scope for homestead agriculture and other Income Generating Activities (IGA). Of course, such a scheme covers only a few households and it is unlikely that there is enough public land available in such a relatively long settled area. The idea of purchase for such settlements has precedent in the

area. The NGO, CODEC, purchased land in Kamalnagar Upazila of Lakshmipur District for settlement of some 600 fishers displaced from the banks of the River Meghna with a grant from the Embassy of Denmark. A basic livelihood was created on the basis of the homestead agriculture, community ponds and handicrafts, partly with grants managed by a Community Based Organization. Such types of development may be seen as relatively 'quick impact' solutions(see also Section 3.2.4).

A question, of course, with such schemes, is who is given priority for settlement. The displaced families in Companiganj almost certainly vary in background; some may have been functionally landless before the erosion; others may have been relatively well off with holdings of an acre or more as described by the delegation from Char Elahi. At present there is no record which would enable the authorities to set priorities for whatever settlement option were available, be it a resettlement village or rights to land in Urir Char or, in the future, rights to be considered for settlement in the new lands created by the Cross Dam. A register giving livelihood details prior to the erosion is surely needed. CDSP has experience of this sort of work and arguably as responsibility for it, having 'adopted' Polder 59/3C in CDSP II. The Feasibility Study Report of the UCNCD also sees CDSP playing a role in the Resettlement Action Plan for that project, although the perception of the 'Project Affected Persons' in that Study is relatively narrow, confined to those affected by the approach works to the cross-dam in Urir Char and in Char Maksumul Hakim and the construction sites/camps.[14]This report stresses the need for a structured and orderly approach to settlement, not based on the 'first come first served' process which may have started in the northwest of Urir Char to which the Char Elahi WMG delegation was referring and has been typical of the previous colonization of new chars.

3.2.3 Agricultural Development

The above discussion has focused on those households who have been displaced through the erosion both of their homesteads and agricultural land by the erosion of protective embankments. This occurrence has also affected the livelihood of second group of people, who, while still living in their original villages have seen the productivity of their agricultural system decline or even collapse as a result of the combined effects of tidal surge, salinity intrusion sedimentation and waterlogging. These areas, once protected, have now reverted to the same situation as those areas which were never empoldered and will be considered together. The differences in the agricultural economy, including fish culture and animal husbandry have been described in Section 2.1. It cannot be expected that such areas, Char Gangchil-Torabali, Char Osman-Bandartila, Polder 59/3C, Tamaruddin Union and adjacent areas of West Hatiya can develop a productive, diversified agricultural system until they have protection. In this Section, we examine whether there is scope for improving productivity in such areas.

With regard to salinity intrusion and waterlogging, the Department of Agricultural Extension is now able to offer rice varieties tolerant of saline soil conditions and deep water. These varieties include BRRI-40, 41 for salinity and BRRI 49, 52, 54 and 11 for waterlogging. According to the Deputy Director of Agriculture, there are also saline tolerant varieties of some *rabi* cash crops like sunflower and soyabean available, while *kheshari* (green gram) appears to be somewhat saline tolerant. Acccording to data obtained from the Upazila Agricultural Office in Subornachar, the area of HYVs of aman rice has expanded dramatically, doubling from 5,000 ha in 2005 to 12,080 ha in 2012 and to

[14]A typical narrow and mechanical view of ESIA

29,500 ha in 2015. Similarly, the area under both kheshari and soyabean has expanded steadily from 3,040 ha to 7,500 ha and from 5,890 ha to 9.500 ha over the same period. The neighboring district of Lakshmipur is the largest producer of soyabean in the whole of Bangladesh.

What is not clear is just how tolerant these varieties are to the chronic salinity which affects these areas with the regular tidal surges, which may be getting higher, presumably with rising sea level.[15] The latest report of the Agricultural Program of CDSP IV mentions that the rice varieties BRRI *dhan* 51 and 52 targeting the *aman* season are tolerant of waterlogging for a period of 10-15 days. Local DAE staff identified BRRI *dhan* 40 and 41 are saline tolerant, but that same report explains the non-adoption of HYVs as due to a number of factors, including

- Damage to seedlings because of their short stature;
- Farmer preference for short grain rice;
- The greater investment required;
- The more flexible planting time of local varieties which are photo-period sensitive; and
- **'inadequate saline tolerant varieties'.**

The Department of Agricultural Extension feels that crop productivity could increase further with irrigation water, but it appears to be generally accepted that the standard technology of irrigation through pumping of groundwater is not feasible and may be restricted by the authorities[16], although there is some evidence of deep tube wells being sunk by individual farmers in places like Char Gangchil and Char Nangulia.[17]Due to the nature of the soil, it is generally not possible to keep water in canals and ponds all-year round, but re-excavation would help to keep water for longer periods. The DAE is hopeful also that some water for small-scale irrigation can be made available through rain water harvesting, which is being promoted. Productivity could also be increased by improving soil quality through green manuring and the DAE is promoting the use of cultivation of Daincha *(Sesbania aculeata)* for this purpose. On the same theme, it is encouraging farmers to adopt vermiculture for composting.

The Department recognizes that many of these interventions can only be applied over a relatively small area and that vegetable cultivation is also important in diversifying the agricultural system, creating more income generating opportunities and reducing food insecurity. There has been a steady expansion of vegetable cultivation in Noakhali in the last several years, with cultivation of country bean and cucumber expanding rapidly outside the homestead and significant areas being devoted to okra, water melon and various gourds. Some of these are being grown under the *Sharjan* system, whereby fields are excavated to make ponds and dykes and vegetables grown on the dykes

[15] Estimates of sea level rise for the whole of Bangladesh have been mentioned in the Terms of Reference for this study at 6 mm per year and at 32 cm in the remaining years to 2050. These do not necessarily apply to the Noakhali chars because of the counter-balancing high rate of sedimentation. Nevertheless, participants in some of the FGDs (Char Gangchil in particular) commented that tides were getting higher and, perhaps more interestingly because it was unsolicited, the Executive Director of the partner NGO, Sagorika SUS, who has been working in the area for other two decades, said much the same of the tides in Noler Char

[16]Presumably for fears that widespread pumping of the deep aquifer will lead to salinity intrusion. This was denied by the Executive Engineer of the Department of Public Health Engineering who stated that the deep aquifers are 'confined' and nobody is clear from where the restriction derives.

[17]In the FGD it was said that the number of farmers with such private deep tube wells in Char Gangchil was over 50 , especially in Keramatpur and Char Clerk areas.

and trellises over the ponds in which fish may also be cultured. This attention to food security issues and to integrated agriculture seems to mark a change in the policy rhetoric of DAE away from its traditional focus on main field agriculture, especially rice. A new project has been initiated under government funding for increasing food security and nutrition, entitled 'Integrated Agricultural Development Project to Ensure Food Security and Nutrition'. In Noakhali, this covers the two CDSP Upazilas of Hatiya and Subornachar and has the following components:

- Vegetable and Fruit Gardening without use of harmful chemicals;
- Promotion of the use of Organic Fertilizer
- Mechanization in Farming.

However, the Project is small in scale and covers only 15 groups to date.

This appears to be a fundamental problem with the Department of Agricultural Extension operating on its own resources. Although it is one of the best resourced departments in Bangladesh, with staff (the Sub-Assistant Agricultural Officers) working at the Union Parishad and even *Mouza* levels, there appears to be problems of maintaining the intensity of field activities in the absence of 'project assistance'. Several times in the unprotected areas, the survey team heard that either farmers did not know about saline tolerant rice varieties or had attempted to address the problems by accessing these, only to be frustrated by the lack of contact with the agricultural officers. The other problem with the role of the DAE in addressing food security is that it is largely restricted in its activities to crop cultivation, including fruit and vegetables. It has no formal mandate for offering extension support in aquaculture and livestock rearing, which are the mandates of the Department of Fisheries and Department of Livestock Services respectively. Recently, starting in 2013, DAE has being playing a coordinating role in the Integrated Farm Management Component, a project funded by Danida's Agricultural Growth and Employment Programme, which follows a Farmer Field School approach and under which the learning sessions include modules in fish culture and poultry and livestock rearing. The farmer training under this project is conducted by Farmer Facilitators, local young farmers who receive and honorarium from the Project. This Project operates to some extent in the CDSP areas in Noakhali and the Deputy Director of DAE spoke positively about this arrangement, but this Project will end in 2018. Even more recently, DAE has signed an agreement as a major player in the National Agricultural Technology Project, Phase II, which has funding from the World Bank. Unlike the first phase, this covers Noakhali District and, based on a list of selection criteria, in particular the four Upazilas of Chatkhil, Companiganj, Hatiya and Subornachar, the three latter the key areas of CDSP discussed in this study. NATP II follows the previous concept of development of Common Interest Groups (CIGS) among farmers and also includes the Departments of Fisheries and Livestock Services. Because of the lack of grass roots level staff in these Departments, the Project will hire local extension agents known as LEAF and CEAL for fisheries and livestock respectively. However, each Department has its separate component, so that the CIGs are established separately. The Appraisal Report of NATP II claims to address the implementation problems of NATP I, especially in terms of integration, but this is mainly in the vertical perspective of the classical links between research, extension and now the post-harvest value chain, not so much the integration between sectors. Local officers are not yet clear about the content and design of this project, but appear to accept that this may be a problem in addressing the integrated agricultural development based on the homestead system which is central to food security.

3.2.4 Social and Livelihood Development

Of course, under the current phase of CDSP, agricultural development is divided into two parts, with DAE responsible for the field crop sector and the contracted NGOs responsible for the homestead sector, including homestead gardening, poultry and livestock rearing and fish culture, under the separate Social and Livelihoods Support Component. Using successive CDSP IV Progress Reports, it is stated explicitly that the 'Homestead Agriculture and Value Chain Development' program aims to reduce malnutrition and increase the earnings of beneficiaries through technology transfer using training, demonstration plots and motivational tours. The training focuses on techniques in fruit and vegetable cultivation, supported by provision of inputs (seeds, saplings, fertilizer. Demonstrations have included foci on mixed fruit and mango orchards, vegetable seeds, use of pheromone traps for pest control and, as a pilot project, rainwater harvesting for small-scale irrigation. While the training and demonstrations appear to differ little from the curricula promoted by the Department of Agricultural Extension (which trains the NGO trainers), there are two important features:

- The development of nurseries for seedling and sapling production, operated, it is presumed by selected participants from those trained in homestead gardening. By the end of 2015 110 such were active.
- The formation of Producer Groups and Collection Points for organization of market-oriented production, mainly for vegetables such as okra, country bean seed, cucumber, bitter gourd and water melon. The Collection Points are equipped with plastic cases and measuring balances for weighing and transport of the produce. Importantly, each Collection Point is managed by a Management Committee. By the end of 2015, 12 groups, each comprising 40 growers had been established. This initiative is very similar to the Producer and Marketing Groups (PMG) developed by the former Danish-funded RFLDC in Noakhali, which worked in essentially the same areas (especially Char Nangulia and Noler Char) and which developed market linkages for some of the same commodities (such as country bean and okra) to regional markets under a pilot project with International Development Enterprises (IDE). In this project, the PMG were often organized at grass roots levels by Local Facilitators who had previously been involved in farmer training and who were offered a share of the market price for their services.

The livestock and fishery sub-sectors in this homestead agriculture sub-component have been added only since 2014 as a result of the withdrawal of the Danida-funded, Regional Fisheries and Livestock Development Component from Noakhali, a project upon which CDSP had previously relied to provide complementary services in this area. The NGOs employ staff responsible for carrying out the technical training of farmers in these fields, while CDSP has hired technical advisors in fisheries and livestock to backstop those sub-sectors. This development responds to a Technical Report drawn up in 2013 for the design of a fisheries and livestock extension service in CDSP IV.

The new fisheries and livestock sub-component in CDSP IV has made solid progress in the last 18 months. Especially with regard to the poultry and livestock sector, this has included the training of Poultry Workers and Community Livestock Workers, setting up a regular cold chain for vaccine supply through the NGO offices and forging links with the Department of Livestock Services for training of these local service providers. In the fisheries sector, training has been provided to a group of nurserers, who are expected to provide quality seed to farmers in their locality through links with quality hatcheries, and to a group of model farmers, who will provide demonstrations of improved

grow-out technology to their neighbors. Thus, in parallel to the development of nurseries in the homestead gardening sub-program, the approach involves the creating of local resource persons as a basis of sustaining the supply of key inputs/services down to the grassroots level.

The training of farmers through the NGOs livestock and aquaculture coordinators also continues. The Consultant Team continues to have some of the same concerns that were expressed in the 2013 Report, namely that

- The curriculum for farmer training is too short (2 days), too content heavy with material not suitable for small-scale farmers, such as rearing of hybrid chickens, culture of Indian major carp in small ponds, an over-emphasis on feed;
- The training mode is too classroom oriented; and
- The Fisheries Advisor has not accessed tilapia seed from the hatchery near Sonapur which was involved in the former World Fish Seed Quality project.
- Perhaps because of their relative novelty, the Value Chain Development dimension of the Homestead Gardening program has not yet been extended the fisheries and livestock sub-sectoral programs, although there is evidence from RFLDC that there is ample scope for development of egg marketing (both chickens and ducks).

Nevertheless it is felt that, with careful guidance from the CDSP advisors, this program, renamed and brought together as "integrated homestead agriculture", including vegetable and fruit gardening, poultry and small ruminants (goats) and low-input fish culture could and should play the key role in improving the food security situation in the areas identified as requiring assistance in CDSP V. Many of the food insecure only have homestead land so that the concentration on main field agriculture passes them by. Homesteads are often raised somewhat above the normal tidal surge level as a matter of course in the process of settlement.

It is important, however, that such a program being extremely focused and flexible enough to cater for different contexts and different levels of resource poverty. The NGOs involved should have the ability or be advised by the CDSP Advisors to adapt the livelihood options to the farmer needs and, in the case of the extreme poor, they and CDSP should have an option for provision of small grants for asset creation, especially for the families displaced by the embankment erosion, and or faced with threats to traditional livelihood, like fishers. The example of Uttaran's work in the Climate Resilient Participatory Afforestation and Reforestation Project (CRPARP) is instructive here.

This Project was discussed with the Divisional Forestry Officer (DFO) of Noakhali in the context of the particular issue of the need for specific livelihood development activities in the context of the CDSP Social Forestry intervention. During the interview, the DFO admitted that Social Forestry 'will not fulfill the livelihood demands of the people' and that focus on food security and livelihood was a new idea for the Department of Forests, which was much more oriented to the biodiversity issues in climate change. He then explained that CRPARP was different from the CDSP SF strategy in the sense that it did include a livelihood component for those people who were 'dependent' on the forest. This livelihood component was managed by the national NGO Arannayk, sometimes known as the Bangladesh Tropical Forest Conservation Foundation. Uttaran were the local NGO implementing the Project in Noakhali. The Local Area Coordinator of Uttaran explained that the project concept involved the organization of local groups (*samiti* / pre-cooperatives) which were given Block Grants

for onward lending to group members totaling Tk9,300 per household to be used for alternative income generation activities. The interaction started with local consultations and some modest hand-outs of inputs such as seeds, saplings, chicks and ducks. Groups number 30 households and are predominantly women. After the initial support, the individual households move on to low-cost (5% service charge) loans, initially for no more than Tk10-15,000, which must be for IGAs and which involved careful scrutiny by group management, the Uttaran volunteer contact point and the Uttaran local staff.

Although the Bangladesh Climate Change Resilience Fund combines financial support from as many as nine donors which are the overall supervision of the World Bank, the CRPARP is said to be World Bank-funded. It is therefore not surprising that it bears the trademark of the Social Development Foundation, which was established in 2000 under the Ministry of Finance, as recently stated by its Chairman, as 'an alternative to micro-credit-based development approach' (Chowdhury 2016). The Social Development Foundation began its activities in 2003 with the Social Infrastructure Investment Project (SIIP) and expanded in 2011 through the Empowerment and Livelihood Project (Nuton jIbon) in 15 Districts. In 2015 it began a further 6-year project, the Nuton Jibon Livelihood Improvement Project in 13 Districts. None of these cover the Greater Noakhali region. All have been funded through the World Bank.

The SDF channels funds to village organizations and clusters of such organizations in each District. At village level there are three sub-funds:

- Institutional Development Fund, which is in turn sub-divided into funds for
    - Project Development of the Gram Samiti (or other local institution's) infrastructure and for its capacity building
    - Youth Development Fund, for skills
    - Vulnerability Fund, for small grants to the poorest, from which they are supposed to graduate to
- Shabalombi Fund, which offers loans to the poor
- Community Infrastructure Fund, as it implies for village infrastructure.

How the grant to the GS is divided between these funds depends upon the decision of the local people.

A new UNDP-managed project has close parallels with CRPARP, as the name implies: 'Integrating Community-based Adaptation into Afforestation and Reforestation Programme in Bangladesh.' This Project is the second such project under the Least Developed Countries Fund (LDCF) of the Special Programme for Climate Resilience under the Global Environment Fund and follows the Community-Based Coastal Afforestation Project (CBCAP), in which one focus Upazila was Hatiya. Under CBCAP, UNDP stressed the importance of developing income generating opportunities in the afforestation/reforestation model, especially the development of the so-called FFF (Forest-Fish-Fruit) model in embankment plantations, using the borrow pits created for the embankment construction as ponds and growing fruit trees (and vegetables) on the pond banks. This view was echoed in the Technical Report for the CDSP Fisheries and Livestock extension system (Demaine, 2013), which also proposed the integration of fodder crops into that system. In the Project Document of the new project, sometimes termed LDCR II, UNDP emphasize the complementarity of

this project to CRPARP in stressing that CRPARP only dedicates 10% of the fund to alternative income generating activities so that it covers only very few households (780 households in the case of the Uttaran intervention in Hatiya) and does not give enough attention to diversification in the coastal forest model. Both of these create problems for the sustainability of the community forestry approach, since inevitably lack of livelihood opportunities cause the participants to put pressure on the forest they are expected to manage. Of the 7 coastal Upazilas in the new UNDP Project, Hatiya is the only one which continues from the previous phase.

The discussion immediately above has focused particularly on the incorporation of alternative income generation activities into the social forestry model as one of the specific elements of CDSP in which participants are likely to suffer from food insecurity. However, the starting point here was wider, namely that, the CDSP livelihoods program as a whole should be given more emphasis and should learn from the examples of these 'social development fund' type programs if it is to address the food security problem. The funding of the sub-component and the approach of the NGOs involved needs to change accordingly in any CDSP V Component.

3.2.5 Need for Climate Resilient Internal Infrastructure

As we have seen in Section 2.3, not only does the lack of protection from natural hazards to livelihood in the coastal zone and from extreme climatic events make people's livelihood vulnerable, it also affects key economic and social infrastructure. This is particularly the case if indeed the sea level and therefore associated high tides / tidal surges are rising overtopping with flood waters infrastructure such infrastructure as has been provided by CDSP and others. With regard to infrastructure provision, two key points need to be made. First, it is only in CDSP IV that there has been explicit attention to possible climate change effects in the design of such infrastructure, such as raising the plinth level of WASH facilities or the crest level of roads. Second, it should be pointed out that the density of provision of such infrastructures has tended to increase over time. In CDSP IV a deep tube well has been sunk for every 15-20 households and the ring and slab for a sanitary latrine to every household. This inevitably affects the quality of provision, which then becomes a serious issue as vulnerability increases through the breakdown of protection. In this Section, we discuss the needs and potentials for the improvement of these various infrastructural facilities under four heads: internal embankments; roads; cyclone shelters and water and sanitation (WASH) facilities.

3.2.5.1 Internal "Retired" Embankments

In the face of regular tidal flooding, farmers seek whatever protection is available for their crops. In the FGDs in Companiganj, the participants in Char Fakira were positive about the impacts of a 'retired embankment', although it was reported that this had been damaged by the recent Cyclone Roanu. Both here and in Char Elahi, the groups were seeking that these should be repaired or constructed. Given the need for short-term relief until such time as major projects come on stream this would seem to be a reasonable investment as part of the FS component. CDSP should investigate possible alignments for such facilities in cooperation with the local communities. In some cases, like at Koralia Village in Hatiya, the local community tried to repair the secondary BWDB embankment themselves but it is recognized as too complex a job. In Ward 8 of Nijhum Dwip, a 2.5 km embankment has been constructed by a UNDP Project in 2014, which local people felt was a great support against tidal surge.

3.2.5.2 Climate Resilient Roads

In several places in this study, the importance of the road construction component of CDSP in opening up the chars to economic opportunity has been emphasized, both in terms of opportunity for sale of high value agricultural products and in small-scale trading (see Section 2.2.2.3, Food Access). However, in the absence of protective embankments and without adaptation of design to the changing environmental conditions, the benefits of this road network may be lost. In Char Gangchil during CDSP II, a dwarf embankment was constructed which is a valuable means of communication for the local population, but this is now regularly inundated even by the regular high tide across the area and this is hampering its use. It is not known whether the recent erosion in Polder 59/3C has affected road links, but the embankment itself was a prime means of communication for the area and this has disappeared. Under the cooperation with the Local Government Engineering Department, there is a rolling maintenance program for roads and associated infrastructure, but the budget is quite low at only 10-15% of the total for the sub-component. According to the Senior Assistant Engineer of LGED, road design has been somewhat modified in the unprotected areas In CDSP IV (Caring Char, Urir Char), from the normal 5 feet to 6.5 – 7 feet. In the absence of protection, these adjustments should be extended to the old areas too.

As in the case of embankments, it will be important to take into account work by other projects in such areas. Near Namapara Bazar in Ward 2 (Muktijoddha), a road is being built from the bazar to the sea shore. This is apparently part of the Danida Climate Change Adaptation Project, a part of a larger Climate Change Adaptation and Mitigation Program under Danida's Green Growth Strategy. This Project is being implemented by LGED in five Districts of the southern coast, including Noakhali and Lakshmipur. The objective is to improve access to Cyclone Shelters, markets and social service institutions by construction and maintenance of climate-resilient rural roads, constructed by contracts with Labor Contracting Societies, mainly comprising poor women. This approach is the same as that adopted by CDSP IV (LCS are one of the local institutions being promoted for future operations and maintenance of the system).

3.2.5.3 Cyclone Shelters, including Killas

The focus of the Danida project mentioned above emphasizes comments made by the participants in several of the group discussions that the Cyclone Shelters in many of the older CDSP areas are either too few or are too far way. In Polder 59/3C the Cyclone Shelter at Char Lengta has been washed away by the erosion and for the displaced population access to a Cyclone Shelter is a very basic need. In Char Osman – Bandartila on Nijhum Dwip, the participants in the FGD calculated that the available Cyclone Shelters could not hold more than 5% of the people on the island during a major climatic event. Three of the FGD meetings took place in Cyclone Shelters – at Boyar Char, Dakshin Gangchil and at Muktijoddha on Nijhum - and in the latter two cases it was observed that the Cyclone Shelters were in poor repair, to the degree that the local population was reluctant to use the one at Nijhum. As long as such areas remain unprotected it is important that there are adequate numbers of these facilities and that they are fit for purpose. The lack of adequate shelter during major climatic events serves only to increase the difficulty of recovery and thus food security.

The comment that the Cyclone Shelter was too far away was made at Koralia Village, where it was specifically linked to refuge not only for the people but for their livestock. The importance of income

from large livestock to income and therefore to food security has been highlighted in Section 2.2.2.3 (Food Access) and loss of such stock is a major blow to poor households in the chars (a contribution to instability). In Nijhum and in Char Elahi, cattle were seen taking refuge on roadsides and embankments (see Figure 2.13). It has also been shown that even normal tidal surges make it difficult for households in unprotected areas to maintain their stock of poultry (chickens are washed away and drown). Throughout the unprotected areas, there were calls for construction of *killas* at community level for ruminant livestock – some owners of large herds of cattle and sheep construct their own in places like Urir Char. This is not an easy concept, since it requires organization, in the form of a specific *Killa* Management Committee, a dedicated water supply and the provision of fodder, but, given the importance of cattle rearing in livelihood as a source of savings, protection of the enterprise is fundamental. CDSP IV has a program to develop 17 *killas* in Caring Char (7), Urir Char (6) and in other new chars (4), some of them the candidate areas for CDSP V (Char Mozammel and Dhal Char). This program should now be extended to the areas included in the proposed Food Security Component.

Figure 0.5: Poor State of Repair of Cyclone Shelter at Dakshin Char Gangchil

3.2.5.4 Water Supply and Sanitation Facilities

It was noted from Section 2.1.3.4 (Food Utilization] that lack of adequate provision of or inundation of water supply and sanitation facilities is seen as a significant contributory factor in food insecurity at the household level. This is despite the reassuring words of the Executive Engineer of the Department of Public Health Engineering, who claimed in interview that DPHE has provided clean water and sanitary latrines to 80-90% of all households in CDSP II – IV. Certainly in CDSP IV, where the targets are for one deep tube well for every 15-20 households and one sanitary latrine (ring/slab) for each household (although the household must take care of the superstructure), the coverage seems to be almost complete (99.7% of households have access to DTWs within 120 metres according to CDSP RIMS survey of 2014 and over 15,400 single pit latrines already distributed). However, in earlier phases, the coverage was not as dense and there are obviously gaps in the coverage, which other more recent projects such as HYSAWA working in the same areas under Danida's Water Supply and Sanitation Component have only partly filled. The XEN noted that there is some unpredictability in the quality of deep tube well water for example in both Char Ziauddin and Boyar Char and that ground water in Char Bhatirtek is both saline and ferrous. More importantly,

however, he admitted that, for sanitation, waterlogging has become an issue. In CDSP IV, the plinth of 30% of tube wells had been raised and some public toilets in Boyar Char had also been maintained with raised plinths. However, budget limitations prevented this on a widespread basis. Thus, while climate-resilient infrastructure is available in the latest phase it has not been extended to the most vulnerable.

3.2.5.5 Field Level Institutions

Part of the problem of the unprotected areas in the former phases of CDSP is that inadequate attention was paid to the sustainability of the interventions. It is true that, in each successive phase, there has been an operations and maintenance (O and M) budget for repair of infrastructure for the previous phases (both for embankments and internal infrastructure) and there has been regular follow-up for capacity building of the Field Level Institutions, particularly the Water Management Groups. This is reflected in the most recent CDSP IV Progress Report which lists continuing meetings, activities and interactions between the management of the current phase and the Water Management Groups in the CDSP I, II and III areas. Unfortunately these provisions appear to have been inadequate compared to the needs (O and M budgets are said to be only 10% of the budget for new construction) and, in cases where the program has been heavily dependent upon the government personnel, as in the case of the agricultural program supported by DAE, the end of the project has resulted in a reduction in the intensity of contact between project beneficiaries and government officers. The study team heard many complaints of such lack of contact during the FGDs.[18] Many of the possible interventions discussed in the previous sections demand input/contribution into the identification, planning, implementation and operation and maintenance of new / improved infrastructures from the local community so that a further investment is not lost.

With an increased view to sustainability, CDSP IV has placed considerable importance on the involvement of Field Level Institutions (FLI) in its activities. Under the current phase, there are now 6 types of FLI, namely:

- Water Management Groups, charged with the operations and maintenance of water management facilities, especially sluice gates and drainage canals;
- Social Forestry, to support the management of the various Social Forestry plantations;
- Farmer Forums, the main focus of extension activities of field crop agriculture;
- Labor Contracting Societies, formed largely from poor, often landless, men and women to contract the construction and maintenance of internal infrastructure, especially roads;
- Tube Well User Groups (TUG), which are charged with the maintenance of the tube wells constructed for groups of 15-20 households by DPHE and which contributed Tk4,500 for the construction; and
- Micro-credit Groups, formed for all participants by the partner NGOs for savings and credit provision.

It should be noted that the Partner NGOs play a role in support of these groups, including the training of resource persons. In the case of the TUGs, for example, Care Taker Families are trained on the care and maintenance of the tube wells and on water supply and sanitation issues in general;

[18]This is exacerbated by the highly 'projectized' approach to development activities in Bangladesh

these families are supplied with kit boxes for maintenance of the tube well facilities. The NGOs have also developed other field institutions. As we have seen above (Section 3.2.4), the Homestead Gardening and Value Chain Development program promotes the establishment of Collection Point Management Committees, while the Health and Family Planning program supports a regular health forum, for discussion of and dissemination of information on family planning, nutrition, hygiene and immunization. This latter sub-program of the Social and Livelihood Support Program also trains traditional birth attendants.

All of these groups are largely single focus and they differ in their design. Some are mainly a basis for training and service provision from their sponsoring department (Farmer Fora) or for the administration of credit provision and repayment (NGO MCG); the continuation of the latter will very much depend upon the continuing presence of their NGO sponsors. Others, however, have some potential to develop into community-based organizations to ensure that CDSP's investments are maintained beyond the end of the current phase. This requires a source of earnings / income stream and management capacity at a high level, especially in financial management. The Labor Contracting Societies, the Social Forestry Groups and, on a small scale, the TUGs, have this built into their design and CDSP has long been seeking to facilitate 'own income' for the WMG. Suggestions that the Water Management Groups should play a wider role in local development activities such as in the operation of fish seed nurseries and facilities for maintaining the vaccine cold chain (see Demaine, 2013) do not appear to have been taken up, in that the fish nursers and various livestock development resource persons are not attached to the WMG and the vaccine cold stores are located in the NGO offices (Interviews with NGO Sectoral Specialists). From the commentary in the latest Progress Report, it would seem that among the WMG from Phases I – II, activities remain largely confined to upward reporting. Only in the case of the CDSP III area, do we read of practical activity such as removing cross dams and fishing traps from *khals* and repair of an approach road to a local market, both with the support of the Union Parishad. It appears that the new emphasis in FLI has not yet resulted in local organizations which are self-sustaining. Particularly since it is likely that this will be the last chance for CDSP to work in these areas, it is imperative that a strong effort be made under any Food Security Component to ensure that the capacity of key local organizations, (the WMG, LCS, SFG), including embedded resource persons, be strengthened and widened (to include *Killa* Management Committees), as a major part of the Component design.

4. Component Description

Based on the above discussion, we may now turn to the framework of a Food Security Component to be included in CDSP V. This is summarized in Table 4.1 in the Logical Framework Format.

4.1 Objectives and Outputs

As will be seen from the Table, the **Development Objective** of such a Component will be

> *Enhanced Food Security in CDSP program areas, especially amongst communities with limited livelihood opportunity*

The **Immediate Objectives** of the Component are

1. *More CDSP I-IV areas protected from tidal surge, salinity intrusion, sedimentation and waterlogging by climate-resilient embankments*
2. *Food availability and dietary diversity increased through stable and productive livelihood systems developed in CDSP areas, especially among vulnerable communities*
3. *Economic opportunity and protection against food insecurity enhanced by climate resilient infrastructure.*

The **Outputs** of the Component are as follows:

1.1 New external embankments constructed in previously unprotected areas, with associated Social Forestry development as appropriate
1.2 'Retired' embankments constructed for local protection of agricultural land in areas unable to be protected

2.1 Land settlement opportunities available for households displaced through recent river erosion
2.2 Climate-resilient cropping patterns developed for arable land
2.3 Increased productivity and returns from homestead agricultural systems (homestead vegetable gardens, poultry and livestock rearing and fish culture)
2.4 Flexible and context-specific alternative income generating activities identified and developed, especially for the poorest households (the displaced, social forestry groups, fishers)
2.5 Promising agricultural and non-agricultural value chains identified and commercially viable market systems developed

3.1 Roads and associated structures in environmentally vulnerable areas built / rehabilitated to withstand tidal surge/waterlogging
3.2 Khals re-excavated in co-operation with Water Management Groups and Labor Contracting Societies for alleviation of waterlogging and to offer opportunities for small-scale irrigated agriculture
3.3 Eroded and damaged cyclone shelters rebuilt and rehabilitated in still vulnerable areas
3.4 Killas for protection of livestock assets constructed in still vulnerable areas in cooperation with community groups
3.5 Increased provision of climate resilient water supply facilities (deep tube wells or rainwater catchment) and sanitary latrines

.

The Indicators of Achievement associated with the Immediate Objective and Output levels are proposed in the Logical Framework (Table 4.1)

The main **Activities** associated with these Outputs are also set out in the Logical Framework (Table 4.1). It will be observed that some of these are in the form of proposed follow-up activities to this study since there is a deal of uncertainty as to whether some of the large infrastructure projects which might affect the area will be implemented and, if so, when they will get off the ground. In the case of Char Gangchil – Torabali the proposed activity involves revisiting the Feasibility Study already conducted for the Cluster of Chars. There is also an element of uncertainty in the proposed activities for the agricultural sector. While it is perceived there is a need for development of climate-resilient agricultural practices in those areas with some element of protection, these activities may be included in the National Agricultural Technology project, Phase II, recently signed and now covering all three of the CDSP target Upazilas. Whether there will be a need for separate CDSP funding remains to be seen.

The Terms of Reference of this Study identified as one of the Outputs an inventory of possible mitigation measures which needed to be taken, especially in the CDSP I – III Project areas to offset the effects of Climate Change. Quite apart from the issue of what may constitute the 'effects of climate change', the short time period available for the study has precluded a full inventory. Specific infrastructure problems have been identified at the highest level of the protective embankments and discussed above and a number of issues in internal infrastructure also identified, for example:

- The level of the dwarf embankment in Char Gangchil – Torabali;
- The disappearance due to erosion of the Cyclone Shelter at Char Lengta;
- The poor repair of the Cyclone Shelters at Dakshin Gangchil and Muktijoddha;
- The issue of lack of availability to water from deep tube wells in the Musapur area of Polder 59/3C, requiring an alternative solution to the problem of use of pond water for drinking.

However, because of the broad geographic scope of the Feasibility Study, the Focal Group Discussions could only be conducted on a sample basis and it is expected that problems identified in these discussions, such as low density of deep tube wells in some of the early CDSP areas (Char Balua Guchagram) which was not CDSP's responsibility or the limited use of sanitary latrines in many of the unprotected areas, will not be confined to the sampled communities. Inventorization of such issues needs a much more comprehensive survey than could be done in this study; indeed, ideally, it needs a community level data base to identify such problems and the relative priorities. Thus, this study has proposed that the detailed inventory of possible interventions should be done in preparation for CDSP V by the current CDSP IV project in consultation with local authorities and possible target locations/schemes prioritized. LGED may already have such a data base for roads and associated works, but there may be doubts about the level of local consultation.

4.2 Risks and Assumptions

Table 4.1 sets out the main assumptions and risks associated with the Component. The Component is based upon several major assumptions, starting at the level of the Immediate Objectives. These are:

- That it will not be possible with the resources available for CDSP V to undertake the major investments in the new embankment and / or the Urir Char – Noakhali Cross Dam which will be required to control erosion and restore the agricultural productivity of Polder 59/3C. Nor will it be possible in the short-term to empolder Nijhum Dwip because of objections on environmental impact
- Therefore, that short-term measures will be necessary to offer some basis of livelihood improvements in these still non-protected areas
- That the development of a climate-resilient cropping system in arable land will be focused on the largely protected areas, where investment is not at risk from major environmental hazards such as tidal surge and associated problems
- That the Non-governmental Organizations assumed to be the main implementing agencies for the intensified program of homestead-based agricultural development and alternative livelihood development will have the capacity and will be offered the resources for this work
- That the wider dimensions of improvement of food utilization through improved mother and child health care will be covered by the Department of Public Health, under existing and future co-operation with such agencies as UNICEF. The role of CDSP should be to assist in ensuring the **availability** of nutritious foods.

4.3 Component Implementation Modalities

The Component has been designed as far as possible to fit in with the existing framework of CDSP activities, involving continuing partnerships with Government of Bangladesh partners and contracted Non-governmental Organizations. It envisages that many of the activities for climate-resilient infrastructure being implemented by the government partners in CDSP IV will now be expanded to the areas of CDSP I - III where they have hitherto not been considered. This applies to the development of new embankments, both external and internal, by BWDB, roads and cyclone shelters / *killas* by LGED and climate-resilient WASH structures by DPHE. It applies also to the process of land allocation and settlement carried out by the Ministry of Land. The main question for those partners involved in the rehabilitation of infrastructure would be whether the budget allocation for the Component was seen as a separate allocation or as the normal and limited operations and maintenance budget which has been included in successive phases of CDSP for use for the previous phases. If a Food Security Component were to have real impact, it would need to supplement those O and M budgets.

The major difference in the implementation of the Food Security Component would be the importance given to the Livelihood sub-component. This would be larger and would need to be better resourced to allow for expansion of the fishery, livestock and non-farm IGA sub-sectors as well as for a different, more participatory and, consequently, more expensive training mode. As well as a different mode of operation of the NGOs, it would require a long-term commitment of CDSP advisory staff with specialisms in homestead gardening, livestock rearing, fish culture, capacity building of local institutions and value chain analysis. By contrast, the resources for the agricultural

component might be reduced to the level of technical backstopping from DAE, especially if the NATP II project covers all of the CDSP areas in the target Upazilas.

Given the importance of local 'field level' organizations in ensuring the long-term sustainability of the interventions, the new Food Security Component will also have a much greater emphasis on institutional capacity building.

Table 4.1 CDSP V: Food Security Improvement Component (FSIC)

Logical Framework

Narrative Summary	Indicators of Achievement	Means of Measurement	Risks and Assumptions
Enhanced Food Security in CDSP I-IV Areas, especially amongst Communities with Limited Livelihood Opportunity	Proportion of households experiencing food shortages in critical periods reduced Improved dietary profile of target households Levels of malnutrition amongst vulnerable groups (women, adolescent girls and children under 5 years) reduced	Baseline and Monitoring Surveys in Target Areas Secondary Data from UNICEF Regular Anthropometric Surveys	No major cyclonic events during the Project period
Immediate Objectives			
1. More former CDSP I-IV areas protected from tidal surge, salinity, sedimentation and waterlogging by climate-resilient embankments	Improved protection to reduce tidal surge, salinity, sedimentation and waterlogging in *selected* CDSP I-IV areas)		Major investments in large embankments addressed by other projects Detailed designs are technically feasible and have minimal environmental impact
2. Stable and productive livelihood systems developed in all CDSP programme areas, especially among vulnerable communities	Areas able to cultivate field crops at least twice a year on a regular basis increased Integrated agricultural systems expand to field crop area	Baseline and monitoring report	Available climate change tolerant technologies Adequate protective infrastructure exists Activities in CDSP do not duplicate those

	Numbers of promising agricultural and non-agricultural value chain Identified and established. Increased productivity and diversity in homestead agricultural systems from vegetable gardening, livestock and fish culture Groups for alternative IGA established and offering livelihood to the most food insecure households	Value chain analysis report and monitoring report.	of NATP II Development of local small-scale water resources NGOs can develop appropriate curricula and participatory training methods NGOs capable of analysis and development of viable options
3. Economic opportunity and protection against food insecurity enhanced by climate-resilient infrastructure	Climate resilient communication links to market and key social facilities established Reduced incidence of waterlogging and small scale irrigation facilities created. Increased facilities for saving lives and livelihood assets from cyclone/tidal surge Increased proportion of families in unprotected areas using climate resilient water-supply and sanitation facilities		Appropriate designs available for local conditions Close cooperation with local communities in identifying options
Outputs			

1.1 New external embankments constructed in previously unprotected areas, with associated Social Forestry development as appropriate 1.2 Retired embankments constructed for local protection of agricultural land	Length of embankment constructed by CDSP Length of 'retired' embankments constructed with community support Cooperation agreements with other projects to build environmentally friendly and resilient embankments	Report of Embankment construction	Close cooperation with local community to identify options and for involvement in construction and maintenance
2.1 Land settlement opportunities available for households displaced through recent river erosion 2.2 Climate-resilient cropping patterns developed for unprotected and semi-protected arable land 2.3 Increased productivity of and returns from homestead agricultural systems (homestead gardens, poultry and livestock rearing and fish culture)	Number of displaced HHs having land settlement document) Number of people rehabilitated in resettlement villages) Areas under integrated agricultural development systems Production trends in homestead products Development of producer groups for organized sale of high-value produce to	Register of displaced households in recently eroded areas Periodic assessment of homestead production	Public land available or private lands can be purchased Households have not moved from the area Favorable markets for local produce; NGOs have capacity to support such as strategy

	markets		
2.4 Identification and development of flexible and context-specific IGAs, especially for the poorest households (displaced / social forestry groups / fishers)	Viable IGAs identified Number of HHs involved in self-managed IGAs	Beneficiary training register	NGO partners have capacity to support community in identification and training
2.5 Identification of promising agricultural and non-agricultural value chain and establish commercially viable market system	Number of new value chains established for IGA and homestead-based agricultural products	List of Beneficiaries Monitoring report	Positive attitude of market actors. NGOs capacity in managing Value Chain program implementation.
3.1 Roads and associated structures in environmentally vulnerable area built/rehabilitated to withstand tidal surge/waterlogging	Length of road built / rehabilitated to climate-resilient standards	Office records	Appropriate designs available
3.2 Khals re-excavated in cooperation with WMG groups and LCS for alleviation of waterlogging and to offer opportunities for small-scale irrigated agriculture	Area of land under small-scale irrigation systems managed by communities / WMG	Monitoring reports and outcome survey reports	Cooperation from local communities in identification and management
3.3 Eroded and damaged cyclone Shelters restored and rehabilitated in still vulnerable areas	Number of functional cyclone shelters increased	Office record on Cyclone Shelter and monitoring reports.	
3.4 Killas constructed in still vulnerable areas in cooperation with community groups for production	Killas being successfully managed by local communities, leading to decline of	Monitoring reports and outcome survey	Cooperation from local communities in

of livestock assets 3.5 Increased provision of climate-resilient water supplies (DTW or rainwater catchment) and sanitary latrines	mortality of large livestock No. of households with access to safe drinking water. No. households using sanitary latrines Reduction of incidence of water borne diseases	reports Monitoring reports and outcome survey reports	construction and management
Activities			
1.1 Regular dialogue with BWDB and CC Trust Fund authorities on status of development of UCNCD , Polder 59/3C and West Hatiya Embankment Proposals 1.2 Review of Feasibility Study of Cluster of Chars (Char Maksumul Hakim) with a view to extending embankment to Char Gangchil-Torabali 1.3 Dialogue with stakeholders to develop integrated management plan for Nijhum Dwip 1.4 Revive/retrain Water Management Groups in former CDSP I – III areas 1.5 With local authorities and Water Management Committees, identify sites for internal embankments offering maximum protection for agricultural land against tidal surge 1.6 Identify priority projects, design and construct, with local labor contributions where possible			

2.1 Assist local authorities in drawing up register of families displaced by river erosion (in Polder 59/3C and other areas affected by river erosion) 2.2 Assist local authorities in identifying sites for resettlement of the displaced (including sites for possible cluster villages) 2.3 Liaise with DAE to identify activities to be implemented under NATP-II in CDSP target areas 2.4 Identify possible CDSP target interventions under DAE, including support up NGOs 2.5 Draw up TOR for revised framework of homestead agricultural development and alternative IGA program in Component target areas, with emphasis on a participatory training methodology, nutrition, scope for small grants and value chain development a 2.6 Contract qualified NGOs and CDSP advisors with a focus on the homestead agricultural and value chain development 2.7 Train local trainers and conduct			

participatory farmer training on Market-Oriented FFS model 2.8 Form Farmer Producer and marketing Groups and develop linkages with local market actors 3.1 With local authorities and WMGs, identify specific locating for building/upgrading internal roads to climate-resilient standards 3.2 With local authorities and WMGs, identify specific locations for excavation of *khals* 3.3 With LCS and WMGs, develop operations and maintenance plans 3.4 With local authorities and communities, identify locations of restoration of Cyclone Shelters and for killa development 3.5 Construction /excavation programme for selected infrastructure (roads, *khals,* Cyclone Shelters, *killas*) 3.6 In agreement with DPHE, in former CDSP I-III areas, develop water-supply and sanitation facilities to climate-resilient standards.			

4.4 Economic Analysis

Just as it has approved impossible to develop a detailed inventory of the mitigation measures which need to be taken throughout the broad area covered by this Study, it is not possible to undertake a comprehensive Economic Analysis for the Component. On the costs side, there remain question marks about the possible input of CDSP as such in development or rehabilitation of the protective infrastructure at the highest level (such as the UCNCD or the replacement embankment of Polder 59/3C. We have assumed that both of these will have to be undertaken by GOB funds or through one or other of the Climate Change Trust Funds (see Section 5 below). The calculation of costs and benefits of these Projects has been made in their respective Feasibility Studies. We have suggested that the possibility of protection of Char Gangchil – Torabali depends on review of design of the polder for the Cluster of Chars component. In relation to internal infrastructure, we have noted above that the decision on this would / should depend on a process of identification involving a dialogue with local communities; costs would therefore be on a sub-project basis. On the benefits side of the equation, for the small internal infrastructures, these would depend on the specific context and assumptions on the productive use of the improved facilities in terms of enhanced access to market or area cultivated from a water resource.

In Section 2.1.1.2, we have demonstrated the difference in the agricultural economy in the largely protected areas of CDSP and the unprotected areas, leading to a greater cropping intensity (two-three crops a year, compared to a single low yield *aman* rice crop), secure vegetable cultivation in both summer and winter seasons and more secure fisheries and livestock production. If the major investments were made in protective embankments, the benefits in terms of the intensified system could be measured, but such projects are as yet uncertain for one reason or another. It is possible to calculate the net benefits gained from a single rice crop in a non-protected context to the intensive cropping system facilitated by protection by combining data from second sources and CDSP's survey data. Table 5.1 combines the data from the Economic Analysis carried out for the UCNCD Feasibility Study by Haskoning et al (2014) with the different cash incomes for the homestead economy from the CDSP Annual Outcomes Survey (2015), which compares the CDSP IV Baseline with the situation in 2015 to stand for the unprotected and protected situation respectively. The table uses the median cropping intensity for 2015 for Hatiya and Subornachar Upazilas of around 220% from DAE data and also takes into account the difference in yields and therefore returns between local and HYV of rice based on the same DAE records. The calculation is based upon a one acre farm of arable land, in line with the average holdings being recorded in recent surveys.

From the Table, it will be seen that the incremental net benefit of intensification under protection compared to the baseline of a single Transplanted *Aman* crop with some modest income from the homestead is some Tk38,000 or over 3 times the baseline. The figures for average crop incomes are broadly in line with those recorded in the AOS surveys. Based on such figures, the loss of earnings from agriculture from the reversal of the agricultural economy following the erosion of the embankment in Companiganj could also be calculated. For those households who still have agricultural land, the incremental net benefit would become an annual loss; unfortunately the actually area suffering from the regular monthly inundation is not available. For those households who have lost their land, the net

benefit would increase to Tk. 53,272. On the assumption that 3,000 households are in this situation the loss would be Tk159.816 million per year, not taking into account the large fish ponds mentioned in the discussion in Section 2, nor the loss of property as calculated in the BWDB project DPP.

Table 4.2: Net Benefits for a One Acre Farm comparing Unprotected and Protected Situation

		Unprotected	Net Benefit	Protected	Net Benefit	Remarks
			Taka/acre		Taka/acre	
1. *Aman* rice		100% LV	15,169	80% LV	12,135	
				20% HYV	6,833	
2. *Aus*				20% LV	4585	
				30% HYV	16707	
3. *Rabi* (Vegetable)				70% of cultivable area	17132	
Total Field Crops			15,169		57,392	per hectare
			6068		22957	per acre
Homestead			3115		7721	
Poultry			1887		8326	
Livestock			2666		5065	
Aquaculture			2713		10483	Incremental Net Benefit
			16448.6		54551.8	Tk38103.2
					Ratio: 3.3165	

Note: for assumptions and sources of data, see text commentary.

4.5 Exit Strategy and Sustainability

The continuing food insecurity of many areas and communities previously covered by the CDSP program is at least partly the result of inadequate follow-up of the situation in the project areas after the end of each phase. CDSP has moved on to new areas, without an adequate exit strategy, ensuring the maintenance of the facilities created and the continued provision of agricultural and social development services. This has condemned a large number of communities to continuing food insecurity and, in the worst case, has undermined the positive progress of livelihood improvement that was initially achieved. At the same time as CDSP has rolled out its model of land settlement and development to new areas, some areas in previous phases of the program have gone backwards due to failures of maintenance, accompanied by the growing pressures of extreme climatic events/climate change.

If CDSP is now to go back to these areas to address and/or restore the situation, provision must be made to ensure the sustainability of its further interventions. This is particularly the case since there is a growing consensus in the donor community that project grant support to Bangladesh, especially with regard to infrastructure development, will be phased out as the country moves to middle-income status after the Government's own targeted date of 2021.[19]

[19]A point made strongly in interview by the Assistant Country Director of UNDP. Of course, it may be expected that funds will be available through various windows for development of climate-resilient infrastructure (see Section 5).

With regard to infrastructure development, a simple response would be to ensure an increased operations and maintenance budget, but experience suggests that this will not be forthcoming from government departments. In the case of livelihood development activities, experience also suggests that the level of services also declines with the withdrawal of donor support, both in the case of GOB technical departments and amongst NGOs. Thus as far as possible, the design of the new Component recommends that local communities should take a wider role in the various interventions, reducing their dependence on outside assistance.

It will be seen in the list of Activities in Section 4.1 that many place strong emphasis on the participation of the local community through several of the field level institutions already promoted by CDSP IV in the identification of interventions, implementation, operation and maintenance of facilities in climate-resilient infrastructure, as well as the development of farmer organizations to maximize the returns from the development of homestead-based agriculture and alternative income generating activities. The proposed Food Security will place considerable emphasis on capacity building of these institutions, including their embedded resource persons.As stated in Section 4.3, CDSP V would need to recruit technical advisory staff in support of this capacity building.

5. Review of Sources of Funding

In the last few years, there has been a strong increase in finance for the climate change, both in relation to adaptation and mitigation. The increase has been in the form of an increasing number of funds dedicated to the issue, both at national and international level. Given the link between Food Security and Climate Change in the Terms of Reference for this study, the Consultants were requested to explore the opportunity for the Netherlands Government to avail of funding from these sources complement its own funding for a future phase of CDSP. The following paragraphs present a brief review of the funding situation as it applies first within Bangladesh, then in the wider international context. The review has been supported by a very recent study by van Bork and Berentsen (2016) exploring opportunities for the Dutch Water Sector.

5.1 Bangladesh Funds

In its report on the Climate Fiscal Framework of June 2014, the Finance Division of the Ministry of Finance identified three source of supply of Climate Finances in Bangladesh. The first two of these are:

5.1.1 Bangladesh Climate Change Trust Fund

To promote implementation of the Bangladesh Climate Change Staregy and Action Plan (BCCSAP, 2009), the Government of Bangladesh established the Bangladesh Climate Change Trust Fund and enacted the Climate Change Trust Act of 2010. A trustee board has responsibility for the overall direction and administration of this fund. , supported by a technical committee of experts and representatives from the Planning Commission, the Department of Environment, the Department of Forests, CEGIS and social organizations/NGOs. The Committee screens project proposals and recommends to the trustee board for their approval.

The BCCTF is a block budgetary allocation in the form of a government endowment established with the revenue budget. From 2009-10 to 2013-2014, a total of 2,700 crore Taka, equivalent to USD 360 million had been allocated to the BCCTF. By the end of 2013, some 270 projects had been undertaken under the fund with a total estimated cost of Tk1,937 million crore (USD 224 million). Of this, Tk. 1,679 million was from the original fund, while a further Tk258 miilion came from interest on the one-third of the fund which the trustees had required should be put on fixed deposit. The sorts of projects which had been funded through the BCCTF can be seen from the list below:

- 15.4 kilometres of coastal sea dyke;
- 6,760 cyclone-resilient houses;
- 142 kilometres of embankments;
- 122 kilometres of riverbank protective work;
- 555 kilometres of khals excavation or re-excavation;
- 44 water-control infrastructures, including regulators and sluice gates;
- 143.5 million trees planted and 4,971 hectares of land reforested;

- 550 rainwater reservoirs established.

The Environmental Impact Assessment of the Proposed BWDB Project on Polder 59/3C conducted by CEGIS in 2014 states clearly that the Project is one of 30 projects of different categories for EIA by the Ministry of Water Resources and appears to link these back to the Government of Bangladesh's climate change initiatives to be financed under its own resources under the Climate Change Trust Fund. Curiously the title of the EIA differs somewhat from the BWDB DPP, namely 'Rehabilitation of the Coastal Embankment Polder 59/3C at Companiganj Upazila in the District of Noakhali to Mitigate the Risk of Disaster due to Climate Change.' Despite the different name and the specific mention of Polder 59/3C, the EIA seems to cover the same area (so including Polder 59/1A in Feni), but the list of proposed interventions does not appear to be the same.

Apparently the BCCT has proposed that a further Tk2 billion should be allocated to the fund for the period 2014-2017. Given the orientation, it is easy to see that the BCCTF could be seen as a source for funding of such major projects like the proposed Polder 59/3C embankment or even the UCNCD project.

5.1.2 Bangladesh Climate Change Resilience Fund

This fund is a partnership between the GOB, development partners and the World Bank and is a trust sponsored by the international community to fund-climate change related activities in Bangladesh. It stems from the aftermath of the UK-Bangladesh Climate Change Conference held in London in 2009 and was proposed as a modality for the development partners to support implementing the BCCSAP. The fund was established with contributions from donors – over 50% from the UK - through a Memorandum of Understanding in 2010.[20] The Governing Council comprises a core group of ministers, plus representatives of CSOs and development partners. A Management Committee under the Ministry of Environment and Forestry reviews grant requests. All investment projects are recipient-executed grants, executed by GON and its designated agencies or other eligible institutions. It was expected that 84.6% of the total activities would be implemented by government departments, 10% by NGOs and CSOs and 2% by the World Bank for analytical and advisory studies and fiduciary risk management. By February 2014, about 83% of the fund of USD 188.2 million had been approved for 13 projects. These included

- USD33.8 million for the Climate Resilient Participatory Afforestation and Reforestation Project (CRPARP) discussed in Section 3.2.4 above and implemented by the Department of Forests and Arannayk; and
- USD0.7 mln under analytical and advisory assistance for the 'Detailed design of the environmental studies for the construction of the Urir Char – Noakhali Cross Dam.

Other investment projects include those for

- Multipurpose cyclone shelters (USD25 million)
- Agricultural adaptation (USD22.8 million)
- Community climate change (USD12.5 million)

[20]There have been further contributions from Denmark, the EU, Sweden, Australia, Switzerland and the USA.

Apparently, in its role in management of fiduciary risk, the World Bank has been dissatisfied with the management of the fund amongst some of the government agencies involved and the BCCRF is now not functional. It is reported that the remaining funds will be handed back to the donors, porbably in 2017. (Soares da Silva, personal communication) Thus, despite the fact that the BCCRF funded the AAS on the UCNCD, there is no scope for financing of this project through the Fund.

5.2 Global Funds (non-Bangladesh-specific)

The third source of funds identified by the Ministry of Finance belongs to funds available at the international level for which Bangladesh and its development partners could apply with a suitable proposal. The fund identified by the Ministry was

5.2.1 Strategic Programme for Climate Resilience

This programme, sometimes known simply as the Strategic Climate Fund (SCF), is part of the so-called Climate Investment Fund (CIF) managed by the World Bank, which became operational in 2008. The CIF consists of two multi-donor trust funds, the SCF and the Clean Technology Fund. The latter focuses on climate mitigation, especially development and transfer of low-carbon technologies. The SCF itself is a framework for three separate programs:

- Forest Investment Program (FIP), which provides support to developing countries in their efforts to reduce deforestation and forest degradation (thus REDD);
- Scaling-UP Renewable Energy in Low Income Countries Programme (SREP), supporting renewable energy use; and
- Pilot Program for Climate Resilience (PPCR), in support of climate-resilient national development plans, which integrate climate risk and resilience issues into core development planning.

Under the PPCR, under the Strategic Programme for Climate Resilience (SPCR) Bangladesh, the GOB was able to choose how to use this fund from among the 44 priority themes detailed in the BCCSAP and the National Adaptation Program of Action and in October 2010, USD110, USD50 million in the form of grants and USD60 million in concessionary loans was approved for Bangladesh. The Asian Development Bank was the lead agency for operationalizing this programme. The SPCR(B) has primarily focused for integrating climate resilient interventions into specific sectors, agriculture, water and sanitation and climate-proof coastal infrastructure, WASH facilities, roads and embankments. GOB decided to allocate the funds to 12 polders, one each in the coastal districts of the country, including Lakshmipur, Noakhali and Feni. Van Bork and Barentsen identify the PCCR as the most relevant funding mechanism for the Dutch Water Sector, having funded several investment projects in Bangladesh include:

- Promoting Climate Resilient Agriculture and Food Security (involving DAE, and probably one source of funds for the Integrated Agricultural Development Project for Food Security mentioned above in Section 3.2.3 and focused on Hatiya and Subornachar. USD325 million is available under a loan and grant, from SPCR and IDA
- Coastal Embankments Improvement and Afforestation (involving BWDB and the Department of Forests/BFRI) USD325 million is also available, again from both SPCR and IDA. Since the Noakhali polder selected is Polder 73/1 in Hatiya, it is presumed that this is the source of the

funds for rehabilitation of the embankment which was mentioned in the BWDB's DPP on the Polder 59/3C (see Section 3.2.1)

- Coastal Climate Resilient Water Supply Sanitation and Infrastructure Development, involving LGED and DPHE. USD281 million is apparently allocated from SPCR and AFB.
- Coastal Climate-Resilient Infrastructure Project (CCRIP), jointly funded by ADB (USD50 million), IFAD (USD40 million), GOB (USD31.2 million) and KfW (USD 8.8 mln). The Project, which began in 2013 and runs to 2017, is implemented by LGED and involves improved road connectivity to markets and social services, improved market services, including upgrading market facilities and the development of collection points, and enhanced climate change adaptation capacity, through construction and upgrading of Cyclone Shelters, improved radio communications and enhanced disaster management capacity. The project covers 12 Upazilas in Khulna and Barisal Divisions.

5.2.2 Global Environmental Facility

This fund, established in association with the Rio de Janiero Earth Summit in 1992, is the longest-standing climate change fund, Again the Fund is independently managed by the World Bank. To date, it has provided USD14.5 billion in grants and mobilized another USD75.4 billion in additional funding for over 4,000 projects worldwide. The GEF Trust Fund finances projects through 18 accredited implementing partners. It is also responsible for administering the Least Developed Country Fund (LCDF) and the Special Climate Change Fund (SCCF) which were established under the UN led-process known as the Conference of Parties (COP), from 2002. Both are focused on the adaptation needs of the LDCs, with the LDCF facilitating the preparation of National Adaptation Plans of Action (NAPAs) to identify country priorities and follows up with funds for implementation. It was under this fund that the successive UNDP projects in afforestation and reforestation discussed in Section 3.4 have been supported. These funds are managed in largely the same way as the GEF itself, which is now in its 6th phase (2014-2018).

More recently in 2009, in relation to the Kyoto Protocols, a further fund, the Adaptation Fund was set up, with rather similar objectives. This is also in its second phase (2013-2020) and is again managed by the World Bank, through a total of 35 implementing agencies, 23 national, 6 regional and 12 multinational designated implementing agencies.

5.2.3 Green Climate Fund

Since 2015, a further source of international funding for climate change related projects has emerged, namely the so-called 'Green Climate Fund', which is the long-promised fund to be made available by the developed countries for countries specifically affected by climate change emerging from the UN Climate Change Conference in Cancun in 2010. It is reported that the funds available globally in this fund are USD102 bn. In 2015 Bangladesh signed its first project under this fund under an agreement with the German development bank, Kreditanstalt fur Wiederaufbau (KfW), for a total of USD80 million, of which USD40 million comes from the GCF, USD15 million from the German Ministry of International Cooperation (BMZ) and USD25 million from the Government of Bangladesh itself. The KfW involvement appears to be an expansion of its limited involvement in the CCRIP mentioned above. Although

apparently this was not initially clear, it seems that the GCF requires matching funds from the international designated authority and/or recipient government. It seems not to matter where these matching funds come from. The project termed “Climate Resilient Infrastructure Mainstreaming (CRIM)” involves the construction of 45 new Cyclone Shelters/Schools, climate-proofing of 20 existing Cyclone Shelters and construction of 80 kms of ‘storm-proof’ access roads in three coastal districts of Bangladesh.

The GCF apparently has three funding windows, for adaptation, for mitigation and for joint initiatives with the private sector and may be accessed either indirectly through accredited implementing agencies in the developed world (like KfW or IKI (International Climate Initiative, also established by the Federal Republic of Germany)) or directly by the application and approval through ‘National Designated Authorities (NDA). In Bangladesh, the Economic Relations Division (ERD) of the Ministry of Finance is the NDA and has the responsibility of approving the accreditation of other organizations, in government, civil society or the private sector for access. The process of accreditation appears to be stringent, at least in terms of the indicators required for assessing ability to manage the fund. In workshops conducted in 2015, ERD appeared to identify a number of government agencies apparently well-qualified for accreditation, including the BCCTF, LGED, the Department of the Environment and PKSF. LGED are the implementing agency for the CRIM Project. In the case of CDSP, it may be assumed that if it was seen that there was an argument for funding of the new Polder 59/3C embankment under CDSP V from this Fund, then BWDB would have to be accredited.

5.3 Other Donor Projects

In the above discussion, it has been observed that there are other donor-funded projects working on climate-resilient infrastructure and climate change adaptation in the proposed area of the new CDSP V Component, notably UNDP and, in extension of its long-standing presence in Noakhali, Danida. Efficiency in use of funds and donor harmonization demand close liaison with these projects. The recent study by van Bork and Berentzen (2016) also identifies a number of funding instruments available from the European Union, which, as in the case of IKI (see above) can generally be accessed by responding to calls for proposals for project funding.

6. Conclusions and Recommendations

The Study Team found that the areas of the CDSP which are currently unprotected comprise two groups: those which were never protected because of low population or instability at the time of the respective phases and those where lack of protection is relatively recent following river erosion of the original polder embankment. These areas, Polder 59/3C in Companiganj and, on a smaller scale, areas within Polder 73/1 in Hatiya, have suffered severe shocks to livelihood. In Polder 59/3C, an estimated 15 km2 of land has been lost and up to 5,000 households displaced (in the sense of loss of their homesteads and agricultural land.

It was found from discussions with local Departments of Health that malnutrition of vulnerable groups, children under five, their mothers and adolescent girls indeed remains high in Noakhali. There was a vicious downward spiral in which women and adolescent tended to be those forced to compromise on food intake at times of shortage, in which girls were subject to early marriage and gave birth several times within a few years of marriage and in which mothers were unable to provide themselves and their children with adequate nutritious food. Poor levels of sanitation and hygiene tended to exacerbate food insecurity by causing poor absorption of available food.

Food insecurity was closely related to poverty in the region. The very poor and chronically poor households, usually had little land, what land they had was low productivity because of environmental factors, had little opportunity for productive non-farm employment in the growing regional economy and were frequently women-headed.

Food availability differed markedly between the different contexts of study. In protected areas, those households with arable land have been able to develop agricultural systems characterized by high cropping intensities (246% in Hatiya Upazila as a whole), use of high yielding varieties and the cultivation of both *rabi* season field crops and vegetables for market. Market access has been widely improved through the development of road infrastructure by CDSP through LGED. Cattle and poultry rearing and fish culture are important in elements in livelihood

There are some limitations to agricultural development in these areas. These are largely (a) by drainage impediment created by the lower levels of internal canals in relation to the Noakhali Khal in particular and exacerbated by more frequent heavy rainfall associated with changing weather patterns; and (b) local salinity related to recent drought conditions also related to climate change effects. Limited operational capacity of Water Management Groups has contributed to these technical and environmental problems

In non-protected area, the livelihood options in the agricultural land differ starkly. Regular intrusion of tidal water (twice a month at spring tide), supplemented by storm surges, have created a problem cluster also including chronic salinity, sedimentation of drainage canals and waterlogging. The cropping system is largely limited to a single crop of low-yielding *aman* rice, with little scope for *aus* rice, *rabi* crops and vegetables. Chickens are subject to high mortality in the floods and the availability of grazing

for large livestock is also limited by salinity. Higher temperatures with changing climate are also contributing to the morbidity levels of livestock. Such areas have limited scope for market diversification and non-farm opportunity is largely confined to seasonal migration for casual labor opportunities in Chittagong and more prosperous regional centres like Feni and Comilla.

The special cases of largely landless households occupy an intermediate position. Many households have only homestead land, so that improved productivity of arable land is not relevant for livelihood improvement. Those resident in the old cluster villages of CDSP I and II have addressed the problem by developing land in the new chars, while others, over time have found opportunities in petty trading and salaried employment. In the more recent context of the Social Forestry Groups, however, lack of land may be compounded by the dependence of many households on a declining inshore fishing industry, also under pressure from government bans. This is also a cause of food insecurity for households in the traditionally unprotected area of Nijhum Dwip and the fisher communities in West Hatiya, some of them now also threatened by erosion of the dykes.

The issue of land availability may also be threatening food security in protected areas. Continuing high birth rates and land sub-division has reduced holding sizes to just over 1 acre; this is not considered to be adequate to offer a basis of food security from a family's farm production alone.

Lack of food availability from own production or access through earnings off-farm is exacerbated by issues in food utilization. The lack of opportunity for production of protein foods – vegetables, eggs and meat from chickens, milk – in the non-protected areas and the SFG groups means a unsatisfactory dietary profile in these households, while coping strategies often involve the women – and therefore children - taking less and less nutritious food, often without the knowledge of their menfolk. Food absorption is hindered by gaps in the availability of clean drinking water (in some limited areas like Musapur) and especially in the access to sanitary latrines. Many households in unprotected areas in early CDSP phases are still using hanging latrines over canals; in these and newly vulnerable areas, ring-slab latrines are overtopped by tidal water and the fact that many of the ring-slabs are broken means that they contribute to a still high, even increasing, incidence of water-borne diseases.

The opportunity of addressing the basic problem of lack of protection of household assets and agricultural land caused by exposure to tidal surge and flooding by construction of external embankments would seem to be limited in the short-term and is probably beyond the budgetary scope of CDSP V. Specifically

- The problem of erosion of older 59/3C can only be addressed by construction of a new sea embankment, a new Bamni river regulator and re-excavation of internal *khals* and /or the implementation of the Urir Char – Noakhali Cross Dam. Both these projects are expensive and will be long-term in their impact, from 2020 at the earliest
- The Polder 73/1 embankment restoration is complex in design, but may already be the focus of a project under the Strategic Programme for Climate Resilience. Empolderization of Nijhum Dwip has been effectively prevented by the fact that the island is a reserved forest,

with a large population of rare deer, and therefore the environmental impact becomes an issue.

- It is only in Char Gangchil –Torabali that there is obvious scope for embankment construction by extending the embankment proposed by the Cluster of Chars Feasibility Study already conducted for CDSP V; **it is recommended that this Feasibility Study be reviewed with a view to extending the external embankment to Char Gangchil-Torabali, although** it will need to be borne in mind that this embankment may become rapidly redundant if the cross-dam project begins the sedimentation of the southern part of the Bamni channel.

Thus a degree of protection of the agricultural land and livelihood in the unprotected areas in the short-term can only be offered by local 'retired' embankments, such as those which were available until recently in Bamni and on a smaller scale constructed under the UNDP project in Nijhum Dwip**. It is recommended that CDSP investigate the possibilities of constructing such embankments in such areas as Polder 59/3C and Nijhum. The location and benefits of such embankments should be based upon local consultations and involve local communities in monitoring and maintenance.**

In Polder 59/3C this limited protection will not help the households who have already lost their land and homesteads. Many of these families have already migrated elsewhere, but perhaps 2000-3000 remain, squatting on public land and roadsides. While addressing the relief needs cannot be the responsibility of CDSP, **it is recommended that support should be given to local authorities to develop a register of the displaced and developing priorities for future settlement. CDSP may also help to identify sites for new settlements, including new cluster villages, offering at least a basis of livelihood in the homestead agricultural system.**

In the context of lack of protection**, it is not envisaged that support to the field crop economy (to develop of arable land) can be a main priority of a Food Security Component of CDSP V.** The climate resilient rice varieties available through DAE may not be adequate to withstand the regular flooding and chronic salinity of the non-protected areas. Such varieties may be appropriate to address the localized problems of climate change in the protected areas, but access to such technologies appears limited by the shortage of DAE field staff in the 'post-project' contexts of CDSP II in particular. This problem may be solved when the NATP II project starts up in Noakhali, specifically in the three CDSP Upazilas of Companiganj, Hatiya and Subornachar. If this serves to intensify the presence of DAE in such areas, then a separate CDSP support may not be necessary.

Rather the Study Team recommends that the main thrust of agricultural development in a Food Security Component should be intensification of the effort of CDSP IV towards the homestead agricultural system which has the potential to address the food security issue directly and, by being largely under the management of women, supports more directly the groups most vulnerable to food shortage. It is proposed that CDSP expand the current Livelihoods Support Component of CDSP IV into the areas unprotected and to resource poor groups identified as the most vulnerable, contracting local NGOs to implement this program.

However, it is perceived that, for such a programme to be successful, it needs to be properly resourced and requires some changes from the present mode of operation. **In particular CDSP should ensure that**

- **The program should integrate the current homestead gardening thrust with the sub-sector programs on fisheries (aquaculture) and livestock rearing and even go beyond the homestead agricultural system to consider alternative (non-farm) livelihood opportunities**
- **The program is guided by a strategy that recognizes the need for flexibility in the portfolio of livelihood opportunities according to context, in terms of the resource potentials of different areas and households**
- **This flexibility should include the possibility of small grants for asset creation for the extreme resource-poor as a stepping stone towards investment through low-cost loans; in this regard, CDSP should consider the Social Fund model being promoted by the current CRPARP project in Noakhali, although this should not be confined to the Social Forestry context**
- **The selected NGOs should conduct the livelihood development training in a more intensive participatory mode, along the lines of the successful Farmer Field School approach, with a revised and needs-based curriculum focused on the needs and capacities of the resource-poor and training carried out by local facilitators trained by the NGOs/TA advisory staff**
- **That curriculum should also help local communities identify and access promising value chains for accessing local and sub-regional markets and employment opportunities through development of producer and marketing groups. Again consideration should be given to offering such groups small grants (group credit) to facilitate develop of their enterprises**
- **CDSP should emphasize the development of farm business advisors, possibly from the local facilitatorsmentioned above, to be resource persons in the community after the withdrawal of the NGOs**
- **CDSP will need to strengthen its support to the homestead agriculture and alternative livelihoods sub-sector through a long-term commitment to advisory staff, including advisors in value chain development and development of community level institutions.**

The NGO programme should continue to include training activities on safe hygiene practices (food preparation and hand washing) practices and nutrition. The local NGOs may provide the channel for making nutritional supplementary food to pregnant and lactating mothers and children under 5 years in partnership with and under the technical guidance of the Department of Health. However, CDSP may wish to consider the development of local resource persons within the Field Level Institutions on the model of the Nutrition Sales Agent developed by the PROOFS project in order to ensure sustainability.

Specific to the Social Forestry Groups, it is recommended that CDSP should consider adopting a more flexible model, including a strong livelihood development dimension, including the Forest-Fish-Fruit (and perhaps Fodder) model pioneered by the UNDP CBACAF Project for the embankment plantations.

It is recommended that the Food Security Component should also be supported by strategic investments, through government partners in upgrading internal infrastructure facilities to climate

resilient standards to facilitate improved access to market and other services, to safeguard assets and to reduce the incidence of water-diseases. These investments should include:

- **Upgrading of internal roads so that these are climate-resilient, i.e. above the level of the regular floods and more resistent to erosion;**
- **Re-excavating local *khals* to minimize waterlogging and to offer opportunities for small scale irrigation to expand the integrated homestead agricultural system into adjacent arable lands on the *sharjan* model**
- **Restoring cyclone shelters lost to erosion and rehabilitating non-functional cyclone shelters**
- **Complementing these by expanding the *killa* concept for protection of large livestock in non-protected areas**
- **Launching a new programme for climate-resilient WASH facilities in unprotected areas, including rainwater collection in areas where deep tube provision is not possible and, especially for provision of climate-resilient latrines including raising plinths above flood levels.**

The above interventions largely imply the strong involvement and participation of the local government and local communities, in the identification, planning and implementation of the facilities. **Where possible, CDSP IV's field level institutions should be extended to the target areas. LCS should be involved in the construction/excavation activities, perhaps including the maintenance of Cyclone Shelters. The development of small-scale water resources may serve to revive some of the more dormant Water Management Groups. Killa Management Groups will need to be created as a new Local Field Institution. A Food Security Component of CDSP V should thus include an important dimension to facilitate such cooperation and strengthen the role of community groups in the monitoring, management, operation and maintenance of the facilities. Consideration should be given to income generating opportunities for these local institutions to ensure long-term sustainability**.

On the theme of participation, **CDSP should seek to build upon the initiative of CREL in development of a co-management plan for Nijhum Dwip**. In the absence of such a plan, the communities of Nijhum Dwip will be condemned to long-term food insecurity by the different priorities of government agencies. The CDSP IV Social Forestry Advisor could already take the initiative in this direction.

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APPENDICES

Appendix I: Terms of Reference

Terms of Reference for Consultant Services to Conduct a Study on the Feasibility of Incorporating Food Security Issues in the Context of Climate Change in the CDSP Project Areas in a Further Phase

1. Introduction

1.1 Impact of Climate Change in Bangladesh

Bangladesh is often cited as one of the world's most vulnerable countries to climate change. It ranked first in the 2014 Climate Change Vulnerability Index and, in one view, it will likely suffer more from climate change by 2025 than any other country (Maplecroft, 2014). This vulnerability is caused by a combination of biophysical factors, the country being flat, low and deltaic, and socioeconomic factors, such as high dependence on agriculture, high population density and poverty. Bangladesh has a unique geography, situated on the Bay of Bengal and forming one of the largest deltas in the world, with a dense network of distributaries of the Ganges, Brahmaputra and Meghna (GBM) rivers. Most of the country is less than 10m above sea level and 10% is less than 1m. Due to its location, topography and climate, Bangladesh is subject to devastating **cyclones**. UNDP has ranked the country first in the world in terms of vulnerability to tropical cyclones; on average it is hit by a severe cyclone once every three years. Bangladesh is also vulnerable to **flooding**. Floods originate from the precipitation from the whole of GBM Basin and in an average year about 25% of the country is flooded; this increases to 60% during years of severe flood. The floods have devastating effects. **Riverbank erosion** results in the loss of thousands of hectares of agricultural land and can affect the displaced population for decades. Moreover, floods from **tidal surges** contribute to the further **salinization** of coastal land, causing not only loss of harvest, but loss of productive land. It is estimated that 1.2 million hectares of arable land in coastal and offshore areas are affected to varying degrees by soil salinity. While many parts of Bangladesh suffer from widespread and regular floods, other parts experience **seasonal droughts**, mainly in the northwest of the country and in the months leading to the main rice harvest in November-December.

Already changes have been observed in the climate of Bangladesh which promise to exacerbate these existing threats. Overall weather patterns have been erratic and less predictable than before. Although average annual rainfall has not changed over the last 50 years, there has been an increase in pre-monsoon rains and a decrease in monsoon rainfall. The rainy season has become shorter and heavier rainfall occurs in a shorter period. Average temperatures show an increasing trend both in the monsoon season and early winter. The incidence of extreme events is also changing. A significant increase has been observed in cyclone frequency and some regions are increasingly prone to drought. Significant rise in sea level has already been measured in Bangladesh at a rate of 6 mm per year in the centre of the Delta. Sea rise is contributing to an increase in soil salinity.

Future projections suggest that both temperature and rainfall will increase further in the next 50 years, by around 1.8C degrees and 4%, respectively. Rainfall increase is expected to be higher in the north and lower in the south of the country. It is expected that there will be an increasing portion of the rainfall

from 'heavy rainfall events'. Extreme events like cyclones and floods will be both heavier and more frequent and floods will cover a larger land area with a greater inundation depth. Sea level will continue to rise by an estimated 32cm by 2050, although this will be exacerbated in some areas by the gradual submergence of coastal lands. As many as 27 million people may be at risk from the effects of sea level rise; together sea-level rise and cyclones, with associated storm surges are projected to inundate 15% of the coastal areas.[21]

The effects of climate change will differ from region to region. The **coastal area and islands** such as those in the Noakhali region will experience the effects of sea level rise and salinity intrusion, as well as increase cyclone frequency and intensity and, in some areas, drainage congestion.

Climatic changes will influence both food security and water availability, thus

- Increased temperatures, combined with increased areas of standing water, will lead to an increase in diseases, pests and insect attacks;
- Changing seasons and erratic rainfall will lead to lower crop productivity and harvest failure;
- Increased glacial melt water and increased monsoon rains, will increase the risk of flooding and requirements for drainage;
- Floods will in turn lead to harvest failures, destruction of vital infrastructure and increased sedimentation in river beds causing drainage congestion and waterlogging;
- River erosion will lead to loss of agricultural land and production;
- Sea-level rise will negatively affect conditions for crop cultivation and decrease the availability of freshwater for consumption and production. Pumping of freshwater in coastal aquifers in adaptation will further accelerate saltwater intrusion in a vicious cycle;
- Cyclones and storm surges will destroy vital infrastructure and contribute to harvest failures

1.2 Incorporation of Climate Change Dimension in CDSP IV

The Government of the Netherlands has been engaged in the development of the char areas of Noakhali District in the central part of the delta of Bangladesh for a period of over two decades. After the initial Land Reclamation Project (LRP) beginning in 1978, it has supported successive phases of the Char Development and Settlement Project (Phase I: 1994-1999; Phase II: 2000 - 2005; Phase III: 2005-2010; and, in partnership with IFAD, the ongoing Phase IV: 2011 – 2017. Whereas, as the name implies, the Land Reclamation Project was chiefly focussed on accelerating the process of accretion on the eastern side of the Meghna Estuary, the successive CDSP projects have been wider in their objectives, seeking to improve the livelihoods of often extremely poor households, many of whom had migrated from lands affected by river erosion. The basic model of CDSP followed in the successive phases has been to: consolidate the existing char areas and provide protection against extreme climatic events through the construction of embankments, drainage facilities and, in areas outside the embankments, social forestry plantations; provide secure land title deeds to the settler population; provide basic infrastructure such

21 There are different estimates and different reference dates for these various impacts. A USAID source puts the increase in monsoon rainfall at 10-15% by 2030 and 27% by 2075, 120,000 square kilometres will be inundated by 2050; 14% more of the country will become prone to floods by 2030; cyclone intensity is expected to increase by 10% and 'overall crop production might be reduced by 30% by the end of the century, rice production by 8% and wheat production by 32% by 2050.

as cyclone shelters, internal roads, deep tube wells and in some cases, new settlement villages; promote new agricultural technologies suitable to the specific conditions of the chars; promote rural institutions (Water Management Groups) for the further operation and maintenance of the water management facilities, and, from CDSP-III, for support to the livelihood interventions; and, through contracted NGOs, provide social services in areas not yet served by government. While, the focus in CDSP I and CDSP II was mainly on development of new polders, in CDSP III, the scope of the project extended to a number of areas unprotected by external dykes and to water management activities in already existing polders, especially in the Bamni catchment area in Companiganj (see Appendix II). In CDSP III also, a wider objective was to provide lessons for policy and practice of Integrated Coastal Zone Management in Bangladesh.

These interventions have variously served to address the vulnerability of the settler population to the harsh physical environmental conditions of the chars, including frequent cyclones, storm and tidal surges and associated flooding, salinity intrusion and, to some extent, riverine erosion. However, in CDSP I-III the project objectives did not explicitly mention the added threats posed by climate change. The objectives of CDSP IV on the other hand, in line with the growing emphasis in sustainability in the development paradigm, lay stress on this issue. A recent CDSP project brochure and the recently revised website of the Project (http://www.cdsp.org.bd/), perhaps influenced by an early CDSP IV Mission Report (Joosten 2012), take as their major heading 'Protection from Climate Change on Coastal Chars' and at least three of the Project Components (Outputs) are couched explicitly in these terms, thus

- Component/Output 1: Protection from Climate Change, enhanced by building embankments, sluices, channels, closures and by the social forestry sub-component, with its establishment of shelter belts to protect the chars from storms and cyclones;
- Component/Output 2: Climate-resilient infrastructure (within the polders), including notably roads, culverts and bridges, cyclone shelters and the equivalent for livestock in the form of raised areas known as *killas*, domestic water supply and sanitation facilities;
- Component/Output 4: Livelihood Support, in which interventions are technologies specifically suited to saline conditions and for resilience to climate change; in the sub-component of livelihood support through NGOs, the project carries out awareness raising and piloting of disaster preparedness and climate change

1.3 Food security

1.3.1 Concepts of Food Security

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food which meet their dietary needs and food preferences for an active and healthy life" (FAO, World Food Summit, 2008) This definition is commonly broken down into three interrelated elements, all of which are essential to achieving food security and, which may be seen as a succession of three *levels*, thus:

- **Food availability**: the physical presence of safe food; having sufficient quantities of food from household production, other domestic output, commercial imports and market purchases (respectively at national and household levels) or food assistance;

This is a necessary but not enough for

- **Food access**: people's ability to obtain food, having adequate resources to obtain appropriate food for a nutritious diet, which depends on available income, distribution of the income within the household and food prices;
  This is necessary but not enough for
- **Food utilization**: use of food, the proper biological use of food requiring a diet with sufficient energy and essential nutrients, potable water and adequate sanitation, and knowledge of food storage, processing, basic nutrition and child care and illness management. These last items are sometimes seen as the basis of differentiation between food security and nutrition security, which is "when food security is combined with a sanitary environment adequate health care and proper care and feeding practices to ensure a healthy life for all household members." (CFS, 2012)

A fourth element has more recently been added, emphasizing the time dimension of the concept, issues of risk and vulnerability and the ideas of shocks and stresses on the food system which can undermine normal availability and access; this is usually termed **Food Stability**.

Poverty remains the primary cause of food security in Bangladesh. Bangladesh has made strong progress in reducing poverty, which declined at an annual rate of 2.7% between 1991 and 2010. Per capita GDP grew by 5% per year in the period 2004-2012 and the upper poverty level ($1.25 per day) fell from 50.5% in 2005 to 45.3% in 2010. Although the numbers of children suffering from stunting fell from 51% in 2004 to 41% in 2011 and the numbers underweight from 43% to 37%, nevertheless, the levels of child malnutrition remain very high and large numbers of poor and vulnerable households remain food insecure, unable to attain a minimum level of food items through their own production, product sales, off-farm employment and other resources. A recent study (USAID/FFP, 2015) has identified a number of key factors for this situation, broadly listed according to the elements of food security set out above:

- High poverty and food insecurity rates are associated with small size of agricultural holdings. Loss of agricultural land from a variety of processes, including urban encroachment, development of infrastructure, waterlogging, erosion (40% of the land loss along the banks of the major rivers) and salinity (an estimated 170,000 ha in the last thirty years). This significant land loss combined with population growth has led to a decrease in the size of cultivated area per farm from 0.81 ha to 0.51 ha between 1984 and 2008. The majority of farm households (62.1%) farm less than 0.4 ha (one acre) and 51% of households in rural Bangladesh are functionally landless.
- Lack of diversification in agricultural cropping systems. The agricultural crop sector in Bangladesh is dominated by cereals, especially rice. Rice productivity has been an important success story for Bangladesh and improvement in rice yields over the last decade or more offers potential for releasing land to other crops without negatively affecting rice self-sufficiency, which could help food security both in relation to direct consumption and improved farm incomes.
- Low productivity of the livestock sector, leading to extensive imports of eggs and dried milk

- Despite the positive contribution of fisheries and aquaculture to nutrition – fish is the main protein source for all income groups -, the poor quality of genetic stock in hatcheries die to inferior brood fish and inbreeding which depress productivity and increase production costs.
- Low wages and uncertain employment amongst wage labourers.
- Seasonal lean periods, in March-April prior to the *boro* harvest and especially in October-November prior to the *aman* harvest. The worst off households have adequate food for only 25% of the year.
- Increasing household expenditure on food, from 51% in 2000 to 62% in 2008, and especially amongst female-headed households.
- Pervasive gender inequality, restricting womens freedom of movement and limiting their ability to access markets and to work for cash income. Within the household, distorted distribution of food resulting in women and adolescent girls eating less and last.
- Limited coping capacities in the face of stresses such as food price inflation, asset shocks such as extreme climatic events (cyclones, floods) and health shocks (sudden medical expenses). As many as 45% of households had no specific strategy, while 21% took help from others or took informal loans; 6% reduced food consumption or the quality of food intake. Another study found that about 60% of households were specifically unable to cope with climate-related shocks.
- Low and declining real benefits of Government safety net programmes.

1.3.2 Specific food security context of Noakhali

Despite the progress being made in general in alleviating food insecurity in Bangladesh, significant problems remain in certain parts of the country. Measured by typical indicators for vulnerable groups in the population, especially nutritional indicators for children under five years of age such as 'stunting' and being underweight, the highest concentrations of malnutrition are to be found in the east of the country (the Sylhet Basin and the Chittagong Hill Tracts), along the Jamuna River and, interestingly on either side of the Meghna Estuary. At District level, Noakhali and Bhola show levels of stunting amongst children under 5 years-old of between 42.5 – 45.1%, while the percentage of children underweight is above 38.2% (the highest quintile) in both Noakhali, including Hatiya, and Lakshmipur. At Upazila level, levels of stunting above 45% are found in Hatiya, Ramgoti, Subornachar and Kabirhat, while the percentage of underweight children is above 38% in Hatiya, Noakhali Sardar, Lakshmipur Sardar, Ramgonj, Sonagazi, Sonaimuri and Subornachar. Other parts of Noakhali fall into the second highest quintile. It may be noted that the areas covered by successive stages of CDSP suffer from the highest levels of child malnutrition.

An interesting observation about this pattern of food insecurity/malnutrition is that according to the Poverty Line maps for 2010, the Noakhali region does not figure amongst the poorest areas of Bangladesh, which are to be found in Khulna Division, the northern part of Barisal Division, and parts of Rangpur Division along the Yamuna River. This pattern, which probably reflects the relative recent impact of successive cyclones in Khulna and Barisal, is the basis of the rhetoric of concentration of development activities in those Divisions. The question then remains why the Greater Noakhali region and specifically the Upazilas which have been covered in part by successive phases of CDSP,

demonstrate such high levels of food insecurity despite the positive evidence of reduction of levels of soil salinity and increases in cropping intensities recorded in evaluation surveys (IFAD, quoted in Joosten, 2012). Although there are large areas, especially in Subornachar and Hatiya, which have not been specifically targeted by CDSP or are only the focus of intervention in CDSP IV, this situation suggests that the various infrastructural and livelihood development interventions of the program have not been entirely successful in reducing poverty and food insecurity. One reason may be that in some areas under the earlier phases of CDSP (western coast of Hatiya, Bamni), there has been erosion of the dykes which has increased recent vulnerability. Empolderization may also have increased drainage congestion in certain areas, as seen in adjacent areas of northern Noakhali. However, it has been suggested also that too much emphasis may have been placed upon availability and access levels of food security at household and larger scales and not enough the intra-household dynamics (Paardekam, 2015). Two other maps from the Bangladesh Food Security Atlas may hold part of the answer, a relatively low proportion of households with access to sanitary toilets (although this is fairly widespread in many parts of the country) and the low proportion of females above 18 years of age completing secondary education (especially Hatiya, Ramgoti and Subornachar), both of which may relate to the 'utilization factor' or to nutrition security (health and sanitation, inadequate child care practices), rather than food availability and accessibility. While CDSP interventions partly cover the first of these, they obviously do not address the second of these elements in the food security equation. The issue remains whether widening of the CDSP interventions, especially in the areas covered by the earlier phases when Climate Change considerations were not included, could help the disadvantaged rural population to improve their food security and whether this would be a suitable and feasible intervention for a future phase.

2. Objectives of the Consultancy

2.1 General Objective

With reference to all areas covered by CDSP (I-IV), assess the feasibility of incorporating food security objectives in the context of climate instability and change in the next phase of CDSP

2.2 Specific Objectives

- Identify the current *degree of* and *reasons for*food and nutrition insecurityin the project areas of Noakhali covered by the successive phases of CDSP (CDSP I-IV), with specific reference to the four dimensions of food security: availability, access, utilization and stability;
- Identify the further threats to food security **specific to various local contexts** which may be expected to arise through future changes in climatic conditions;
- Review the impact of the activities of CDSP I - III in terms of their adequacy to mitigate the threats of climate change with specific reference to rehabilitation of existing or additional infrastructural requirements and needs for further adaptation measures;
- Review the current activities of CDSP IV in mitigation of and adaptation to the impacts of climate change;

- Make recommendations on whether a future phase of CDSP should incorporate specific objectives for improving food security and, if so, the outputs and the expected activities to be included in the new project design.

3. Tasks to be Performed (Approach)

3.1 Review of Secondary Materials

The study team will be expected to review the literature on the impact of current environmental hazards and likely future impacts of climate change on dimensions of food security as they affect the coastal zone of Bangladesh. This review will include Project Documents, Progress Reports, Project Completion Reports and other Technical Reports published by CSDP itself, especially those relating to climate change-related interventions in CDSP-IV. The review should also cover other studies conducted by government agencies and independent researchers on the area.

3.2 Field Study

On the basis of the review of existing documentation, the study team should develop appropriate survey instruments to address the key objectives of the study. Since a large quantity of secondary material is available including baseline and evaluation surveys, it is anticipated that the field survey can be done through participatory rural appraisal methods (focal group discussions, etc). The consultants must justify in detail the perceived need for a household level questionnaire survey, if they feel that this and the associated data processing are necessary. In whatever case, the consultants must share any survey instruments and the sample design with CDSP management in order to ensure **adequate coverage of all areas covered by successive phases of the program.** Particular attention should be given to those areas covered in CDSP I – III, especially those not protected by peripheral dykes (such as Char Gangchil Torabali, Nijhum Dwip) and those not yet empoldered, such as Caring Char and Urir Char. Appendix II gives a breakdown of the different sub-project areas under CDSP by phase and type of intervention. In the areas covered by CDSP I-III, the field study should include an inventory of the status and adequacy of the protective infrastructure developed during these phases in the face of the new expectations of climate change impact.

3.3 Meetings with Key Informants

Meetings will be held with a range of key informants, with a view to seeking explanation of the issues raised in these TOR, including CDSP management and staff, local GOB officers and NGO management and staff involved in food security issues and research teams engaged in various studies of climate change and food security in the Noakhali area. The experience of recently completed and on-going projects dealing with the interface between climate change and food security should be gathered.

3.4 Report and Presentation

The chosen consultants will produce a brief inception report within the first ten days of their assignment outlining their approach to the study, especially the methodology for field data collection and the list of key informants to be consulted. A draft final report will be prepared and presented for comment by CDSP IV management and by representatives of the Embassy of the

Kingdom of the Netherlands two weeks before the end of the assignment. The report will be finalized incorporating the comments of management and the Embassy.

4. Outputs

The Output of the study will be a full Feasibility Report on the scope and nature of incorporating food security issues in the context of climate change in the next phase of CDSP, including activities in the areas covered by all previous phases of CDSP. The report will include an inventory of any additional infrastructure developments (higher embankments, increased drainage capacity) required in the CDSP I – III areas in which climate change was not fully considered.

5. Organization, Timing, Reporting

5.1 Profile of the Consultant Team

The Consultant Team for the study will consist at the minimum of three persons, an International Consultant familiar with climate change and food security issues in rural and preferably coastal Bangladesh, and two national consultants with strong background in food security and both adaptation and mitigation measures towards climate change in the coastal zone, respectively. The Consultants may propose a number of field staff to conduct the field survey according to the nature of the study approach (see Section 3.2 above).

5.2 Schedule (Timeline)

The study should be conducted as soon as possible after contracting, during the first quarter of 2016. It is anticipated that the study will require a period of up to three months (12 weeks), consisting of

a) In-house preparation, including drawing up of the Inception Report, for an initial period of two weeks (10) days
b) Eight weeks (50 days) for field level investigations and necessary data processing (See Section 3.2 above)
c) Two weeks (10 days) for report preparation, presentation and finalization

5.3 Reporting

The Consultants will be expected to produce the following documents:

a) An Inception Report within 10 days of the start of the assignment
b) A draft Final Report / Feasibility Study after a period of seven weeks
c) A completed Final Report / Feasibility Study at the end of the assignment

6. Commitments of the Contractor

6.1 Provision of Background Materials (Further Resources)

The Embassy of the Kingdom of the Netherlands and CDSP IV will provide all documents relevant to the study. Appendix 1 lists documentation perceived to be useful at this point and consulted in preparation of the Terms of Reference, but there may be other documentation from earlier phases of the programme which should be provided. Other references in this TOR are derived from the primary literature listed

6.2 Provision of Transportation and Translation Services

CDSP IV will provide the use of a dedicated four-wheel drive vehicle for the local transport and field activities of the study and the regular services of a qualified staff member to act as translator to English. CDSP staff will assist the consultants in making arrangements for the desired field meetings according to the work plan proposed in the Inception Report and agreed with Project Management.

Appendix I-II: Areas and Population under Successive Stages of LRP/CDSP Development in Noakhali Chars(N.B. Original Appendix I was Reference List)

Phase	Char	Area (ha)	Population	Remarks
Land Reclamation Project (1981-1991)	Char Baggar Dona I	1, 688	8,328	Polder Development (pilot)
CDSP I (1994-2000)	Char Baggar Dona II	2,065	15,077	Polder Development
	Char Majid	1,320	15,541	Polder Development
	Char Bhatirtek	1,748	16,451	Polder Development
CDSP II (2000-2005)	Muhuri Accreted Area	1,981	3,478	Polder Development
	South Hatiya Polder	2,759	21,223	Polder Development
	Char Mora Dona	1,793	19,043	Unprotected Area Development*
	Char Lakshmi	944	6,600	Unprotected Area Development
	Char Gangchil-Torabali	743	2,123	Unprotected Area Development
	Nijhum, Char Osman	519	5,236	Unprotected Area Development
	Nijhum, Bandartila	650	6,916	Unprotected Area Development
	Polder 59 3B	3,486	24,662	Water Management in existing polder
	Polder 59 3C (Bamni)	12,825	94,189	Water Management in

				existing polder
	Baggar Dona Catchment	59,921	592,158	Water Management in existing polder
CDSP III (2005-2010-11)	Boyar Char	6,500	65,000 (8,500 hh)	Polder Development
CDSP IV (2011-2017)	Char Nangulia	8,990	67,000 (12,000 hh)	Polder Development
	Noler Char	2,690	33,000 (6,000 hh)	Polder Development
	Char Ziauddin	1,943	11,000 (2,000 hh)	Polder Development
	Caring Char	6,850	33,000 (6,000 hh)	Unprotected Area Development
	Urir Char	10,300	11,000 (2,000 hh)	Unprotected Area Development

Note: *No peripheral dykes, but land allocation, internal infrastructure, agricultural development and institutional development (WMG) activities

Appendix 2: Household Level Questionnaire Survey Instrument Final Draft (edited 16/05/2016)

Study on the Feasibility of Incorporating Food Security Issues in the Context of Climate Changein a Further Phase of CDSP

Household Level Questionnaire

SECTION A: General Information

A1. Demographic Information

A.1.1 Gender of Household Head……..Male/Female

A.1.2 Total Number of Household Members: ……..

A.1.3 Total Number of Members of Working Age: …….Number Males……Number Females

A.1.4 Total Number of Children (below working age): ……Number Males……Number Females

A.1.5 Number of children below school age/5 years: ……..

A.1.6 Are any regular members of the household currently working away from home on a long-term basis: Yes/No

A.1.7 Number……. Length of absence……years/months

A.1.8 During the past year, did any household members go for seasonal employment off the farm? Yes/No

A.1.9 Number…….

A.1.10 Number of months away (which months?)

A2: Agriculture Assets Holding

A2.1 Please provide the following details of your land holding

Type of Land	**Area(decimal)**	**Ownership[1]**	**Method of Acquisition[2]**
House			
Homestead			
Arable (field crop)Land			
Pond			
Other			

Codes: Ownership 1: Owned with Title Deed, 2: Owned with No Deed; 3 Rented; 4 Share Cropped
Acquisition: 1 Allocated by CDSP; 2 Purchased from Previous Owner; 3 Inherited

A.2.2 Has the area of your land holding changed from the amount allocated by CDSP?Yes/No

A3. Primary Occupation and Income

A.3.1 Please state what you regard as the primary occupation of the family……

A.3.2 Please give the approximate income (cash and, for consumed products, value of production) obtained from the following sources over the previous 12 months (to Boishakh 2016)

Source of Income	Amount	Remarks
Field Crops including rice		
Homestead Garden		
Large Livestock		
Poultry		
Aquaculture		
Fishing		
Regular Wage and Salary		
Agricultural Labor		
Casual Labor(non-agriculture)		
Petty Trading		
Services (e.g rickshaw/van)		
Remittances		
Handicrafts/stitching etc.		
Others		

SECTION B: Household loan and savings

B.1 Loans

B.1.1 Do your household currently have any loans? Yes/No

B.1.2 What was the **source** of the loan? Banks/CBO/MFIs/ Mohajan/others

B.1.3 Total amount **borrowed** (Taka) …….

B.1.4: What was the **main** reason for taking out the loan?.....

B.2 Savings

B.2.1 Do your household have any cash savings (money put aside for some future use)? Yes/No

B.2.2 Total amount of savings till to date: …….Taka

SECTION C: AGRICULTURAL PRODUCTION, FISHERIES AND LIVESTOCK REARING

C. 1 Field Crops

C.1.1 In the last year did your household cultivate any of these crops?

a. Rice (HYV)
b. Pulses
c. Wheat
d. Vegetables (e.g. okra)
e. Oilseeds (e.g. soyabean)
f. Spices (e.g. chillies)
g. Fruits (commercial) e.g water melon
h Groundnut
i. Sweet potato
j. Tobacco
h. Other (Specify: _)

C.1.2 What was the area cultivated for Rice: …….Decimal

C.1.3 What quantity of Rice produced in last year: …….

C.1.4 What quantity of Rice sold in the market: ……..

C.1.5 In the last four years has your total rice production fluctuated from year to year? Please indicate the degree to which production was less than normal

Status (put √ tick mark)	Y 2012	Y2013	Y2014	Y2015
Normal				
Less than normal				
Per cent less than normal				
Increase				

C. 1.6 What was the reason for production being less than normal

C.2 Vegetable Production/Gardening

C.2.1 Do your household cultivate vegetables? Yes/No

C.2.2 In which season you cultivate vegetables (circle as relavant)? Summer/Winter/Raining season

C.2.3 In the last four years has production of vegetables changed from year to year. If production has been less than normal, please indicate the decrease to which is was less

Status (put √ tick mark)	Y 2012	Y2013	Y2014	Y2015
Normal				
Less than normal				
Percentage decreased				
Increased				

C.2.4 What were the reasons for production being less than normal?

C.4 Fish Production/Rearing

C.4.1 Do you have a fish pond?

C.4.2 In the last year did your households raise/rear any fish? Yes/No

C.4.2 What was the total fish production in last one year: ……..Kg

C.4.3 How much fish sold to the market during last one year: ……Kg

C.5Poultry/Cattle Production/Rearing

C.5.1 Please give details of your current livestock assets

Types	Number	Approximate value	Remarks
Chicken			
Ducks			
Goats			
Sheep			
Cow (Milking)			
Cow (fattening)			
Buffalos			

C.5.2 Do you/your family members take egg/chicken from your own production? Yes/No

C.5.3 Can you estimate how many eggs your family consumed last month……

C.5.4 How manyeggs sold to the market in last one month: ……Number

C.5.5 How many poultry or ducks sold to the market in last one year: ……Number

C.5.6 Do you/your family members take milk from your own production? Yes/No

C.5.7 How much milk do you selling in the market in last one month: ……Liter

SECTIOND. HOUSEHOLD FOOD SECURITY

D.1 Food consumption

D.1.1 Please mention which types of foods that you or anyone else in your household ate yesterday during the day or at night.

	Food types	1=yes 2=no	Frequency in a week	Trends in consumption over the last 4-5 years				
				Large decrease	Decrease	No changes	Small increase	Major increase
1	Any cereals, e.g. rice, bread, wheat, wheat bread,							
2	Any pumpkin, carrots, squash, or sweet potatoes or vegetables that are yellow or orange inside?							

3	Any white potatoes or other foods made from roots and tubers?							
4	Any dark green, leafy vegetables, e.g. ipomoea, amaranth, spinach etc.							
5	Any other vegetables, e.g. cucumber, radish, pepper, string beans, radish, onion?							
6	Any ripe papaya, mangoes or other fruits that are yellow or orange inside?							
7	Any other fruits, e.g. banana, papaya, grapefruit, apple, orange, jackfruit, jambu fruit, melon, tomato, date, lemon etc.?							
8	Any meat, such as, liver, beef, poultry etc.?							
9	Any eggs?							
10	Any fresh or dried fish or shellfish?							
11	Any legumes/pulses, e.g. Bengal gram, black gram dal, lentil, Khesari, Mung bean?							
12	Any Milk or Milk products, e.g. cow milk, buffalo milk, goat milk, yogurt, curd, cheese?							
13	Any foods prepared using fat, e.g. oil, butter, dalda or ghee?							
14	Any sugar or honey?							
15	Any other foods such as condiments, coffee, tea?							

D.2. Months of Insufficient Food

D.2.1 Were there months, in the past 12 months, in which you did not have enough food to meet your family's needs? Yes/No

D.2.2 Which were the months in the past 12 months in which you did not have enough food from your own production?(Please, write Bangla months)……..

D.2.3 If yes, which were the months in the past 12 months in which you did not have enough food to meet your family's needs from your own production and from other sources? (Please, write Bangla months)……

D.2.4 If you could not provide from your own production, how did you meet up your family needs?

a. Purchased with own money

b. Borrowed money with interest for purchasing food

c. Borrowed money with no interest for purchasing food

d. Sold labour in advance

e. Taken less food in meal/two meals a day/one meal in day

f. Received social safety net support

SECTION E. WATER AND SANITATION

		Codes
E.1.1	What is the main source of drinking water for members of your household?	1=Hand tube well 2=Tara pump 3=Deep tube well 4= Shallow tube well 5=Ring well/ indara 6=Pond 7=River/canal 8=Pond sand filter 9=Rainwater harvesting system 10=Other (specify) _____
E.1.2	Does the household have access to a toilet facility?	1=Yes, 2=No
E.1.3	What kind of toilet facility do members of your households usually use?	1=Ring-slab/offset latrine (water seal) 2=Ring-slab/offset latrine (water seal broken) 3=Pit latrine (covered) 4=Pit latrine (uncovered) 5= Septic latrine 6=Hanging/open latrine 7=Local adopted hygienic latrine 8=Other
E.1.4	Hand wash practices in your family after using latrine	1= with water only, 2= with soap and water 3= with ashes /soil and water 4= others (specify)

E 1.5	When do you wash your hands? (Check all answers given.)	1= After going to the toilet, 2= After cleaning babies' bottoms, 3= After returning from outside, 4= After handling garbage, 5= Before food preparation 6= Before eating, 7= After eating, 8= Before feeding children, 9= Before praying

SECTION F. Environmental (Climate change impact) and food security

(General)

		Codes
F1	Have you been observing any changes in weather or the frequency of extreme climatic events like flood, extreme heat, tidal surge etc. in your area?	1 = Yes 2 = No
F2	If yes, since when have you been observing it? **Circle code number of response. Prompt if needed.**	1 = 0-5 years 2 = 6-10 years 3 =11-154 = 16-20 5 = 21-25 6 = 26 -307 = Other
F3	What are the Climatic events happening in your area and what are their impacts?	

Sl	Climatic events	Impacts of each events (please list down for each)

Climate change and agriculture

		Codes

F4	What are the impacts of the climatic events you mentioned on your agricultural system? **Circle code number of response. Prompt if needed.**	1 = loss of soil fertility 2 = increase of soil salinity 3 =loss of soil productivity 4 = loss of agricultural land 5 = increase of diseases and paste attack 6 = loss of standing crops 7 = Extinction of local species 8= loss of stored grains 9= other
F5	Are you been able to address this problem?	1= yes 2= no

F6 How are you overcoming the situation (adaptation)?

Impact of climatic events	Adaptation	By themselves (if please tick)	By CDSP (if please tick)	By GOB relevant dept. (if please tick)	By other (if please tick)

F7	Is the change impact causing problems for irrigation in your area?	1= Yes 2= No

F8	How is irrigation problem happening? **Circle code number of response. Prompt if needed.**	1= shortage of water in reservoirs/ponds/khals 2= salinity intrusion / water is saline 3= less/ irregular rainfall 4= waterlogging 5= sedimentation 6=other
F9	What are the interventions do you think those could ensure climate resilient agriculture? **Circle code number of response. Prompt if needed.**	1 = Application of IPM 2 = Introducing new technologies 3 = Using of flood resilient varieties 4 = Using of saline tolerant varieties 5 = Constructing resilient grain storage 6 = Use of High Yielding Varieties(HYV) 7 = Increase use of organic fertilizers 8= Ensure easy access to services by DAE 9 = Excavate surface fresh water reservoir(pond) for irrigation 10= Rainwater harvesting 11= Train the farmers on climate resilient agriculture 12= Other

Climate Change and aquaculture/ fisheries

		Codes
F10	Do you observe impact from the changing situation on aquaculture/ fisheries?	1 = Yes 2 = No

F11

If yes, how the climate change is impacting on aquaculture/ fisheries and how are you coping/adapting with the situation?

Impacts	Coping/adaptation	By own	By CDSP	By GoB (DF)	By other NGO

F12

What other interventions could be effective in terms of improving aquaculture?

Circle code number of response. Prompt if needed.

1 = Introduce new species

2 = excavation/ re-excavation water ponds with high dyke

3 = training on aquaculture addressing CCA

4= other

Climate Change and poultry

		Codes

<table>
<tr><td>F13</td><td>What are the impacts of changing situation on poultry livestock?
Circle code number of response. Prompt if needed.</td><td>1 = increase diseases
2 = increased mortality
3= loss of production
4= loss of habitat
5= decrease food availability
6= scarcity of fresh drinking water
7= other</td></tr>
<tr><td>F14</td><td>What are the diseases increasing as a result of the changing conditions?
List down the name. Prompt if needed.</td><td></td></tr>
<tr><td>F15</td><td>How are you tackling/ adapting to the situation?
Circle code number of response. Prompt if needed.</td><td>1 = converting poultry rearing to duck rearing
2 = vaccination and other veterinary treatment
3 = receiving training
4= increasing drinking water sources
5= purchasing supplementary food
7= other</td></tr>
<tr><td>F16</td><td colspan="2">From where are you getting these supports?(√)
<table>
<tr><th>Coping/adaptations</th><th>By own</th><th>By CDSP</th><th>By GB(DL)</th><th>By Other NGO</th><th>By other</th></tr>
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<tr><td>F17</td><td>What are the other interventions could be effective to overcome the changing situation?</td><td>1= increase receiving services and treatment from DLS
2= Using supplementary food
3= production of saline tolerant fodder
4= increase provision drinking water
6= other</td></tr>
</table>

Climate Change and livestock

<table>
<tr><th></th><th></th><th>Codes</th></tr>
<tr><td>F18</td><td>What are the impacts of changing situation on ruminant livestock (cattle, buffalo, goats, sheep?

Circle code number of response. Prompt if needed.</td><td>1 = increase diseases
2 = mortality
3= loss of production
4= loss of habitat
5= decrease food availability
6= scarcity of fresh drinking water
7= other</td></tr>
<tr><td>F19</td><td>What are the diseases happening for climate change?

List down the name. Prompt if needed.</td><td></td></tr>
<tr><td>F20</td><td>How are you tackling / adapting to the situation?

Circle code number of response. Prompt if needed.</td><td>1 = converting poultry rearing to duck rearing
2 = Placing them in Killas during major climatic events
3 = treatment
4 = receiving training
5= increasing drinking water sources
6= purchasing supplementary food
7= other</td></tr>
<tr><td>F21</td><td colspan="2">From where are you getting these supports?(√)
<table>
<tr><th>Coping/adaptations</th><th>By own</th><th>By CDSP</th><th>By GB(DL)</th><th>By Other NGO</th><th>By other</th></tr>
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F22	What are the interventions could be effective to overcome the changing situation?	1= increase receiving services and treatment from DL 2= Building more killas 3= Using supplementary food 4= production of saline tolerant food species 5= increase provision drinking water 6= other

Climate Change and Water, Sanitation and Hygiene (WASH)

		Codes
F23	What are the impacts of the changing situation on WASH in your area? **Circle code number of response. Prompt if needed.**	1 = scarcity of safe drinking water 2 = increase of water salinity 3= declining of ground water table 4= contamination by arsenic and iron 5= pollution of drinking water sources by flood, cyclone, tidal surges 6= increase of vector born and other diseases 7= environmental pollution 8= other

F24	How are you overcoming the situation (adaptation)? **Tick the options which are managed by themselves** **Circle code number of response. Prompt if needed.**	1 = installing tube well in more depth 2 = drinking of rain water 3 =drinking of surface water 4 = sealing of tube well head during major disastrous event 5 = disinfection of tube well 6 = using water purification kits 7 = treatment while facing disease 8= build latrine structures strong enough and raise the plinth above the highest flood level 9= having training on hygiene promotion 10= other
F25	From where else are you getting these supports? **Circle code number of response. Prompt if needed.**	1 = CDSP (including partner NGOs) 2 = Other NGO 3 = DPHE 4 = Other
F26	What are the diseases your communities are facing due to changing situation (focusing WASH)? **Circle code number of response. Prompt if needed.**	1 = diarrhea 2 = dysentery 3 = typhoid 4= jaundice 5= blood pressure 6= heart disease 7= malaria 8= dengue fever 9= other

F27	What are the interventions do you think those could ensure climate resilient WASH? **Circle code number of response. Prompt if needed.**	1= deep tube well 2= pond sand filter 3= rain water harvesting system 4= availing water purification kits 5= availing hand washing facilities 6= strong structures of tube wells and hygienic latrines with raised plinth above highest flood level 7= proper waste management interventions 8= continuing hygiene promotion activities in communities 9= other

Climate Change and social forestry

		Codes
F28	Is here social forestry in your community?	1 = yes 2 = no
F29	Is social forestry is beneficial in your community, if yes why?	1= yes 2= no Because-
F30	Where the intervention is being implemented? **Circle code number of response. Prompt if needed.**	1 = embankment 2= foreshore 3= roadside 4=other

F31	What are the benefits of it in terms of climate change? **Circle code number of response. Prompt if needed.**	1 = reducing erosion 2 = protecting communities from tidal surge and cyclone 3= reducing river sedimentation/ siltation 3 = reducing Green House Gases(GHGs) 4= other
F32	Is the intervention giving livelihood opportunities, if yes then how? **Circle code number of response. Prompt if needed.**	1 = yes 2 = no Write down how-
F33	Who are getting the opportunity? **List down**	
F34	Who are implementing the intervention? **Circle code number of response. Prompt if needed.**	1= CDSP 2= Forest department of GoB 3= UN 4= other NGO 5= other
F35	Where are the areas it need more to implement the intervention **List down please**	

Appendix 3: Checklist for Community Level Focal Group Discussions on Food Security and Climate Change

Part I: Food Security: Availability, Utilization and Access (Livelihood Opportunities)

Main Topics

In this part of the discussion, we would like to ask you about your food security situation. Specifically we will ask questions about:

- Is there evidence of food insecurity in their area and what are the factors influencing / triggering food insecurity
- What are the common problems they facing in providing enough nutritious food for their families
- What are the social and economic characteristics of people in the area who commonly suffer from food insecurity / are there particular groups of people who suffer from food insecurity
- What are the major constraints to improved production of crops, livestock, fish, and vegetables
- What are the major constraints to reducing crop losses
- Food security should not be seen purely in terms of household production, but can be improved by improving returns from market-oriented production. What factors contribute to reduced market access for women and men
- What aspects of food security is not addressed by CDSP

Food Insecurity Issues

Degree of Food Shortage

- Which months do local people usually facing food shortage? Why?

- Specifically, how many and which months do they have enough food production from their own agricultural land?

- What are the reasons that food is scarce in those months? If their food is produced locally, but is insufficient to meet all needs, what constraints are faced in local food production and storage?

- How do peoplerespond / adjust during periods of food shortage or crisis period

- What sorts of main foods do people buy from market and generally how does this vary from season to season? (Types of rice purchased at different times).

Family Food Intake/ Adjustment of Food Intake

Sometimes the problem of food shortage/insecurity relates to particular people in our families, in other words our eating habits and distribution of food

- During the lean period and food is insufficient, who gets the priority in relation to the available food, children (boys or girls), adults (husband or wife)? Why do you think this is? Put in another way, during the lean period and food is insufficient, who is compromising in taking less food.

- Do they have knowledge on the consequences of women taking less food during pregnancy or lactating period?

- Who is given less food during lean period - boys or girls? Why?

- Do they have knowledge on the consequences of taking less food by adolescent's girls

- Which crops are consumed at home, and which are sold. (This may to lead into discussion on seasonal differences in food consumption, and on issues relating to food preservation and storage)

.

- How frequently do people take specific nutritious foods like vegetables, eggs, milk, fish, meat, fruits etc. during lean months? Frequency……or not at all?

- Do people grow vegetables in homestead for own consumption? Are vegetables grown throughout the year?

- How frequently do your children are taking vegetables, eggs, milk, fish, meat, fruits etc. during lean months? Frequency…… or not at all

- What is the perception of the community on nutrition situation of different age (<5 children (male and female, adolescent boys and girls).
-
- Do they notice any symptoms of malnutrition to their children below 5 years or have no idea

Issues in Water and Sanitation

The benefits of improved food production may be reduced by health problems from poor quality water supplies and sanitation, especially amongst young children**.** Briefly, tell us

- What is main source of drinking water?

- Do you have safe latrine facilities?
-
- With reference to young children in particular, how prevalent are cases of diarrhea and pneumonia

Occupation and Income.

Increasingly in the Noakhali region people are not dependent on just field crops for their livelihoods (meeting their food security from what they produce on their farm). Food security could be obtained from increasing their agricultural production, cultivating other crops, rearing livestock and fish or taking employment off- farm Now we would like to ask you about you occupations and sources of income

- What are the main occupations of this community?

Type	Average monthly income
1.	
2.	
3.	
4.	
5.	

- Is the income is sufficient for managing family consumption needs? Are there particular households who do not have sufficient income?

- What are their social and economic characteristics?

- What do such families do?

- To what extent are women in this area involved as earning members of the family

- What scope is there for diversification of income options?

- Is there any scope to increase the income from existing sources?

- In your opinion, what would be the best options to increase family incomes in this area?

Land available for food production and its utilization
Agricultural production depends on land. Part of the programme of CDSP has been to allocate land for agriculture.

- Is land a constraint to agricultural production in any way?

- Do the members of the local community have agricultural land allocated by CDSP?

- Do they own the land (or rent or share crop)?

- Is the land sufficient for family food production; if not why not?

- Is there any problem is being facing by the communities who have allocated land but no protection from climatic events like tidal surge or flood? If yes, what are those?

- Is the allocated land is suitable for agriculture?

- Can land be used in all seasons?

- What are the constraints to all year round land utilization?

- Is the protection infrastructure (like dykes or khals) in the area degraded which affects land use?

- What actions have been taken by the concern authority, if any?

Crop and Vegetable Production.
Now we would like to ask about agricultural production, to what extent this facilitates food security

Field Crops

- What are the major crops grown in this area?
- Has this changed from the past?

- Is the crops are profitable and have market demand?

- Which crops are expanding in area?

- Do you think it is good for you the changes of cropping pattern?

- What do they think about productivity of the crops? Is it increasing or decreasing than the past years?

- What are the reasons for less production? (if it is decreasing)

- What do you think could be done to improve productivity?

- What support do you need to increase production / address constraints?

Vegetable gardening

- Are people usiing homestead for vegetable cultivation?

- Is the productivity declining or increasing? Reasons for the changes

- Do they get technology and technical support as they need?

- Are the inputs (disaster tolerant variety of seeds, fertilizer) available in the local market.

- What could be down to improve productivity?

- What support is needed to address constraints to productivity improvement?

Livestock, fodder and disease

Food security could be improved by rearing livestock, including fish culture. Please give us some ideas about your livestock and fish production and the problems/possibilities of improvement.

- What proportion of people in the community own livestock…….cattle……..buffalo …….goats……sheep

- Is it good to have livestock in the family? If yes, why, if no, why
- When are there shortages in feed for livestock , how do they cope during periods of scarcity
- What are the main animal diseases, how do they respond
- Potentials to increase productivity of livestock farming
- Threats/ constraints of livestock farming
- What further support may be needed to overcome these constraints

Poultry farming

- What proportion of households in the community rear poultry? Chickens….. Ducks……Pigeons……
- What are the main benefits from poultry rearing
- Do the poultry suffer from disease?
- How do people address the problem?
- Do you see potentials for increasing poultry production?
- What are the constraints/threats to increasing poultry production?
- What further external support is needed to overcome those constraints?

Fish production:

- Do they have ponds?
- Are all the ponds are used for fish cultivation?
- Are the ponds are used for throughout the year?
- Is it profitable? Is the production decreasing/Increasing?
- Is there any scope for increasing production further? How?

- What further support is needed to increase production?

- Are they consuming fish in their family? Frequency……

Market access.
Food insecurity could also be addressed by improving access to markets which increases returns from agriculture and allows people to buy their food

- Do people in this area sell their products in local markets within CDSP area?
- What are the main products sold?
- Are they satisfied with marketing facilities and price of commodities they are selling?
- Are there any constraints to marketing farm products and if so, what?

- Specifically to women, are women allowedby their families to sell or buy products as they need?

Checklist for Focal Group Discussions on Food Security and Climate Change

Part II: Observations and Opinions on Climate Change

General

During the discussion on food supply and security, there was some mention of changes in the environment for agricultural production (pattern of weather, changes in the seasons, lack of or increased intensity of rainfall) or the frequency and intensity of extreme climatic events (storms, high winds and cyclones, floods, tidal surges, causing salinity) as being responsible. [Or you can say that nobody mentioned these things] We would now like to ask you about these (in more detail)

1. Have you been observing any environmental/ weather pattern changes in your area, from when have you been observing it?

2. What are the changes observed compared to the past?

3. What are the impacts of these changes in your area on your life / livelihood?

4. What are the major extreme climatic events that have been happened in the past (five / ten? years) and how does the intensity compare with the past?

Agriculture

5. What are the climatic trends / eventscausing problems to agriculture?

6. What are the impacts of those changes on agriculture?

7. How are you addressing the problem and from where you are getting support for it?

8. Is there irrigation problem due to those changes, If so, how are managing it and taking any support from any institution/org?

9. Which interventions would be more effective considering the situation?

Poultry and Climate Change

10. What are the impacts of climatic events on poultry rearing?

11. Hasthere been any shortfall in livestock in the area due to climatic trends / extreme events and how does it compare to the past?

12. Is there any problem of drinking water for poultry due to climatic events, if so how do you handle the situation?

13. Is there greater incidence of disease due to the changed situation? What diseases have increased……

14. Is there scarcity food for poultry due to climate event, if how do you tackle?

15. Are you managing the situation by your self or support from anywhere else (please discuss in details)

16. What interventions do you think which could be adopted to better adapt to climate trends /extreme events in the poultry sector?

Livestock and Climate Change

17. What are the impacts of climatic events on livestock?

18. Is here food crisis for livestock in the area due to climatic events, if so how and how was it in past?

19. If so, how are you tackling this problem?

20. Is there any place in your community to keep livestock in safe place during major climatic event, who made the provision?

21. Is there any problem of drinking water for livestock due to climatic events, if so how do you handle the situation?

22. Are you observing an increased incidence of livestock diseases due to the changing situation? What diseases?

23. Are you managing the situation by your self or support from anywhere else (please discuss in details)

24. What interventions do you think which could be adopted to better adapt to the changing climate situation in the livestock sectors?

Aquaculture/ Fisheries

25. Is the aquatic habitat for disturbed by climate change, how?

26. What are the impacts of climatic events/change on fisheries?

27. Do you think the changing climate is affecting fish culture in this area? If so how?

28 How are you coping with the situation in fisheries and/or aquaculture and which organizations are assisting you to address the issues?

29. What are the interventions should be implemented to address the climate change issues?

Water, Sanitation and Hygiene (WASH) and Climate Change

30. What are the impacts of changing situation on water supply and sanitation?

31. What are the drinking water options in your area?

32. Is salinity found in ground and surface reservoir, if yes then in what depth it is found and when it has been finding/ increasing?

33. Are the sanitation impacted due to changing situation and how?

34. Are the structures of the latrines are strong enough to climatic event and who are ensuring it?

35. Are the plinths of toilet structures above the highest flood level?

36. What are diseases associated with poor water supply and sanitation increasing in the area (focused on climate change)……..

37. Are people in the community aware on hygiene issues relating to changes in climate and who are playing role to do this?

38. How are you tackling these andwho are assisting you?

39. What are the actions being taking by government/development actors to address the climate change and who are doing these?

40. What interventions would be best to address climate change impacts on WASH?

Infrastructures(you should try to link this with Part 1 and the discussion on effects on agricultural land)

41. What are local infrastructures (dykes, roads, canals) impacted by climate change/ climatic events?

42. Are the structures and designs considering the need to adapt / offset climate change and, if so, how? [I am not sure that they will be aware of this at local level?]

43. Who are doing this?

44. How the infrastructures reducing the climate change vulnerabilities of the communities?

45. What are the interventions you think further to reduce climate change in your communities?

Social forestry

46. Is here social forestry in your community, if where?

47. Who are implementing this intervention?

48. How is Social Forestry beneficial for your community and if si what are the benefits of it in your community in relation to climate change?

49. Is the intervention giving livelihood opportunities, if then for whom?

50. Do you think more is needed in implementing this intervention. If so, how and where?

Alternative livelihood opportunities and climate change

51. Are the normal livelihood activities of the community disrupted by major climatic events, if so what activities?

52. Do the people have alternative livelihood opportunities during or after any major climatic event, if then what are those?

53. What alternative livelihood innervations could be implemented in that situation?

Appendix 4: Detailed Work Schedule

Date and Time	Event	Details	Responsibility	Remarks
May 7, 12.10 p.m.	International Consultant arrives Dhaka Airport; Arrange Telecoms		Aristocrat Inn	Pick-Up arrangements made
Sunday, May 8, 10.00 a.m.	SCB, for cash withdrawal and account closure		HD	
Sunday, May 8, 11. a.m. onwards	Meeting with National Consultants	1. Personal introductions 2. Review of TOR and Individual Responsibilities 3. Clarification of Concepts (FS/CCA and CCI) 4. Review of Immediate Work Programme (identification of any Dhaka KII requiring transport)	HD/DE/RHK	Aristocrat Inn, for convenience and because of hartal
Monday, May 9, from 9.00 a.m.	Administration at CDSP IV Dhaka Office	Hotel Bill / DSA	HD/DE/RHK CDSP Car	CDSP Dhaka
	Preparation of Survey Instruments Decision on Date of Departure and Communication with CDSP Noakhali	HH Questionnaire drafting (stress on value addition over and above CDSP reports)	HD/DE/RHK	CDSP Dhaka or Aristocrat Inn
Tuesday, May 10	Redrafting of HH Questionnaire and Start of FGD Drafting Solution of DSA Issues		HD/DE/RHK	CDSP Dhaka
Wednesday, May 11	Drafting of Inception Report, FGD and KII Checklists		HD/DE/RHK	CDSP Dhaka

Thursday, May 12	Documentation; Final Dhaka Preparation; Drafting Presentation for CDSP Noakhali			Aristocrat Inn. National Hartal
Friday, May 13, 08.00 – 13.00. 15.30 -17.00	Travel to Noakhali Meeting with Kiran Sankar Sarker, MEKM Advisor	Finalize programme for next three days		CDSP IV vehicle
Saturday, May 14	Preliminary Field Reconnaissance and discussions with CDSP I and II staff	Familiarize National Consultants with context and tap institutional memory	FS Team, Kiran Sankar Sarker, Liaquat Ali, Nurul Islam, Zulfiqur Ahmed	CDSP IV vehicle
Sunday, May 15	Meeting with CDSP M and E Team, Local Enumerators and Data Processor Initial Meeting with CDSP Management	Introduction to the Study and review of HH Questionnaire. Introduction to the Study and proposed survey framework; initial feedback	Kiran Sankar Sarker, M.A. Kader, Khaleda Akhter CDSP TA Team	CDSP. CDSP Management engaged in morning meeting
Monday, May 16	Further Meeting with CDSP M and E Team	Translation of HH Questionnaire; Decision on Sample Framework; Development of Work Plan for Further Period Finalization of Inception Report Mapping of eroded embankment in Polder 59/3C	FS Team	CDSP
Tuesday, May 17, 10.00 a.m.	KII with Deputy Director, Department of Agricultural Extension	Food Insecurity Issues; Climate Change Adaptation	FS Team	Maijdee
3.00 p.m	KII with Executive Engineer, Department of Public Health	Climate Change Adaptations	FS Team	Maijdee

	Engineering			
Wednesday, May 18, 10.00 a.m.	FGD at SFG Group in Boyar Char	Food Security. Livelihood resilience	FS Team, Md. Robiul Islam	CDSP Vehicle to Field
1.00 p.m.	Discussion on Study objectives with Chairman, Subornachar Upazila	Briefing, with a view to later meeting	FS Team	Sagorika SUS, Khasherhat
2.00 p.m	KII with Upazila Agricultural Office Subornachar	Review Issues in the Upazila	FS Team	
3.30 p.m.	KII at Upazila Health Office, Subornachar	Food Insecurity and Malnutrition Status in Upazila	FS Team	Aktopalia
Thursday May 19, 10.00 p.m	KKI with Provincial Health Department, Noakhali	Food Insecurity and Malnutrition	FS Team	CDSP Vehicle
12.00 p.m.	KKI with Senior Assistant Engineer, LGED	Climate Change Adaptations	FS Team	
2.00. p.m.	Further Planning of Field Work, Finalization of HHQ		**FS Team,** MEKM Advisor	
Friday, May 20 and	Holiday, Desk Work			Note May 21 is Buddha Purnima
Saturday May 21	FGD with WMG at Boyar Char (empoldered area)			Cancelled because of Cyclone Roanu in Noakhali area
Sunday May 22	First Round of HH Questionnaire Survey (two sites)	Polder 59/3C: Char Balua Guchagram; Char Lengta	FS Team, MEKM Advisor, ALS Advisor, MEOs, Enumeration Team	CDSP Vehicle to Field
Monday, May 23	Review Questionnaire and Printing			Shab-e-Barat Holiday
Tuesday, May 24	HH Questionnaire HHQ Survey continues	Wide ranging		CDSP Vehicle to

	(Bhatirtek) KII with NGOs at Khasherhat Discussion with Deputy Team Leader	 Agriculture and preliminary ideas		Field
Wednesday, May 25	HHQ continues (Gangchil-Torabali) Consultants Return to Dhaka	20 sets		Local Elections in Noakhali
Thursday, May 26 2 p.m	HH Questionnaire Survey continues (Boyar Char regular area) Consultants Meeting at CDSP Meeting with CDSP Team Leader in Dhaka	20 sets		
Friday May 27	Holiday International Consultant departs for Bangkok			
Saturday, May 28	Household Questionnaire (HHQ) Survey continues (Boyar Char SFG area)	20 Sets	CDSP MEOs	
Sunday, May 29	HHQ continues, Noler Char	20 sets	CDSP MEOs	
Monday, May 30	HHQ continues (South Hatiya/Nangulia) National Consultants return to Noakhali FGD at Gangchil	8+12 sets DE/RHK	CDSP MEOs	
Tuesday, May 31	HHQ continues (Hatiya(and Nangulia); FGDs in	8+12 sets	CDSP MEOs	

	Polder 59/3C		DE/RHK	
Wednesday, June 1	HHQ continues (Hatiya/Nangulia/Char Majid)Team travels to Hatiya KII at Hatiya Upazila	8+12 sets	CDSP MEOs DE/RHK	
Thursday, June 2	HHQ survey continues (Hatiya and Char Majid) FGD at South Hatiya	8+12 sets	CDSP MEOs DE/RHK	
Friday, June 3	HHQ survey continues (Hatiya/Polder 59/3C eastern) FGD at Bandertila	8+12 sets	CDSP MEOs DE/RHK	
Saturday June 4	Travel back to Noakhali			
Sunday, June 5	Data entry begins FGD at Bhatirtek		Lore Gomes DE/RHK	
Monday, June 6	FGD at Char Nangulia		DE/RHK	
Tuesday, June 7	FGD at Noler Char		DE/RHK	
Wednesday, June 8	FGD at Char Majid		DE/RHK	
Thursday, June 9	Consolidate FGD findings (but see remark)		DE/RHK	
Friday, June 10	Holiday			
Saturday June 11	Consolidate FGD Findings International Consultant returns to Bangladesh			

Sunday, June 12	Consultants travel to Noakhali; Team Meeting on Review of Results of FGD	Nice Guest House	HD/DE/RHK	
Monday, June 13	Morning: Review of new materials, integration of FGD reports Afternoon: Meeting with DD, DAE on projects and data	CDSP Office, Sonapur	HD/DE/RHK	
Tuesday, June 14	Team Leader meeting with CDSP Team Leader, Deputy Team Leader, Social Forestry Advisor Work on Reports	CDSP Office and Nice Guest House Progress Update, including administration; discussion on possible embankment plans; Discussion of Uttaran CRPARP	HD/DE/RHK	
Wednesday, June 15	10.30 Meeting with Executive Engineer, BWDB	Discussion on various planned projects	HD/DE/RHK	
	14.30 Meeting with Divisional Forestry Officer, Department of Forestry	Discussion on Community Forest Model and Status of Nijhum Dwip reserved forest	HD/DE/RHK	
Thursday, June 16	10.30 Meeting with Farmer Delegation from Char Elahi and Land Settlement Advisor	React to request for support in relation to river erosion and resettlement	HD/DE/RHK	
	14.00 Debriefing Meeting with Household Survey Enumerators	Field experiences feedback	HD/DE/RHK	
Friday June 17	Holiday			

Saturday, June 18 – Wednesday, June 22	Work in CDSP Office, Noakhali	Review of documents, initial feedback on data processing, start of report drafting	HD/DE/RHK	
Thursday, June 23	Consultants return to Dhaka		HD/DE/RHK	
Friday, June 24	Holiday			
Saturday, June 25	All-day Meeting with Data Processor	Sorting of group classification; guidance on tables	HD/DE/RHK	Data processing delay demanded urgent meeting
Sunday, June 26 and Tuesday June 28	Team Meeting in CDSP, Dhaka Office	Working on revised data tables and report writing	HD/DE/RHK	Monday, June 27, Holiday in lieu. CDSP Office not free
Wednesday, June 29	Meeting with Assistant Country Director, UNDP	Follow-up on UNDP Projects in coastal region; climate change policy	HD/DE/RHK	Contract administration with TL and BETS
Thursday, June 30	Final Team Meeting. CDSP Office	Summary of Progress; print working draft of FS and Executive Summary	HD/DE/RHK	
Friday, July 1	International Consultant departs for Bangkok		HD	

Appendix 5: Persons Met in Noakhali and Dhaka Meetings

Date	Name	Designation	Remarks
May 13	Kiran Sankar Sarker	Monitoring, Evaluation and Knowledge Management Advisor, CDSP -IV	Planning Meeting
May 14	Bazlul Karim	Agricultural Advisor, CDSP-IV	Field Reconnaissance
	Md. Nazrul Islam	Assistant Land Settlement Advisor	
	Md. Liaquat Ali Khan	Project Area Coordinator, Urir Char	
	Md. Zahirul Islam Chowdhury	Social Forestry Coordinator	
	Md. Zulfiqur Ahmed		
	M.A. Kader	Monitoring and Evaluation Officer	
May 15, 9.00 a.m. – 3.30 p.m.	Kiran Sankar Sarker	Monitoring, Evaluation and Knowledge Management Advisor, CDSP -IV	Meeting with Enumeration Team
	M.A. Kader	Monitoring and Evaluation Officer	
	Khaleda Akter	Monitoring and Evaluation Officer	
	Lore Gomes	Data Processing Specialist	
	Sahida Akther Poli	Enumerator	
	Amran Hossain	Enumerator	
	Abdullah Al Mamun	Enumerator	
	Jashim Uddin Siddique	Enumerator	
	Md. Farooque Hossain	Enumerator	
4.00 – 5.45	Mihir Kumar	Deputy Team Leader,	Meeting with TA Team

p.m.	Chakraborty	Infrastructure	
	Md. Bazlul Karim	Deputy Team Leader, Agricultural Advisor	
	Irin Sultana	Gender and Social Advisor	
	Jannatul Naim	NGO Sector Specialist (Livestock)	
	Md. Liakat Ali	Agriculture cum Forestry Coordinator	
	Md. Amdazuddin	NGO Sector Specialist	
	Md. Zulfiqur Ali	NGO Sector Specialist	
	Motaher Hossain	NGO Sector Specialist	
	Md Nurul Islam	Assistant Land Settlement Advisor	
	Kiran Sankar Sarker	Monitoring, Evaluation and Knowledge Management Advisor	
	Md. Rezaul Karim	Land Settlement Advisor	
	Md. Robiul Islam	Social Forestry Advisor	
	Sailendra Saha	Institutional Advisor	
	Saajjad Ahmed Khan	Financial Advisor	
May 17, 2016, a.m.	Krishibid Pranab Bhattarcharjee	Deputy Director, Department of Agricultural Extension, Noakhali	
	Md. Jalal Uddin	District Training Officer, DAE, Noakhali	
p.m.	Engineer Md. Rowshan Alam	Executive Engineer, Department of Public Health Engineering, Noakhali	
May 18,	AMN Khairul Anam	Chairman, Subornachar	

2016, p.m		Upazila	
	Babul Chandra Shil	Senior Sub-Assistant Agricultural Officer, Subornachar	
		Upazila Health Office, Subornachar	
May 19, 2016, a.m.	Dr. Md. Mozibul Hoque	Civil Surgeon, Noakhali	
	Dr. Depan Chandra Mazumdar	Civil Surgeon's Office, Provincial Department of Health, Noakhali	
	Md. Abu Bakr Siddique	District Nutrition Support Officer, Noakhali, UNICEF Consultant	
p.m.	Ferdous Alam	Senior Assistant Engineer, Local Government Engineering Department, Noakhali	
May 26, 2016	Jan van der Wal	Team Leader, CDSP-IV	In Dhaka, for presentation of Inception Report
The period May 20 – 26 and May 29 – June 8 were dedicated to the field level FGD and the household questionnaire survey apart from			
June 1, 2016, p.m.	Jashim Uddin Khan	Upazila Agricultural Officer in Charge, Department of Agricultural Extension, Hatiya	
	Mahbub Morshed	Chairman, Upazila Parishad, Hatiya	
	Dr. Nazim Uddin	Upazila Health and Family Planning Officer, Hatiya Upazila	
A further period of key informant interviews began with the return of the International Expert to Bangladesh from June 13			

June 13, 2016, p.m.	Pranab Bhattarcharjee	Deputy Director, DAE, Noakhali	Follow-Up Meeting
June 14, 2016, a.m.	Jan van der Wal; Mihir Chakraborty	Team Leader and Deputy Team Leader, CDSP IV	In Noakhali. Progress Report
June 15, 2016 a.m.	Engr Md. Zohirul Islam	Executive Engineer, Bangladesh Water Development Board, Noakhali O and M Division	
p.m.	M. Amir Hosain Chowdhury	Deputy Conservator of Forest, Divisional Forest Officer, Coastal Forest Division, Noakhali	
	Ashraf-ul-Karim	Site Coordinator (Noakhali), Uttaran, Climate Resilient Participatory Afforestation and Reforestation Project	
June 29, 2016	Md Khurshid Alam; Arif M. Faisal	Assistant Country Director, Climate Change, Environment, Energy and Disaster Programme Specialist, Climate Change, Environment and Resilience Cluster, UNDP	