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Final Report

Disaster Risk Reduction, Climate change and livelihood of the poor and marginalized people

A framework for Oxfam-GB Bangladesh

ThinkAhead
CONSULTING LIMITED

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- Supporting leadership and management with strategic planning, staff training, and the development of systems and procedures.
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Oxfam

Acronyms

BDRCS	Bangladesh Red Cross and Red Crescent Society
CBO	Community Based Organisation
CC	Climate Change
CCA	Climate Change Adaptation
CSO	Civil society Organization
DFID	Department for International Development (of UK)
DM	Disaster Management
DP	Disaster Preparedness
DRR	Disaster Risk Reduction
FHH	Female Headed household
GBM	Ganges, Brahamaputra and Meghna (the south asia regional river basin)
GCM	Global Circulation Model
GoB	Government of Bangladesh
HFA	Hyogo Framework for Action
HH	Household
IFRC	International Federation of Red Cross and Red Crescent Society
IPCC	Inter-governmental Panel on Climate Change
LG	Local Government
NAPA	National Adaptation Plan for Action
NCS	National Change Strategy (of Oxfam)
NGO	Non-governmental Organisation
NGOAB	NGO Affaires Bureau
PCVA	Participatory Capacity and Vulnerability Analysis
OGB	Oxfam GB Bangladesh
SoD	Standing Order on Disaster
UDMC	Union Disaster Management Committee
UP	Union *Parishad*
VCA	Vulnerability and Capacity Assessment
VDMC	Village Disaster Management Committee
VGD	Vulnerable Group Development
VGF	Vulnerable Group Feeding

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1. INTRODUCTION TO LIVELIHOOD

Bangladesh is a densely populated country. The per capita income in Bangladesh is US$ 470. More than a third of the people still lives in extreme poverty (29% below $ a day and 84% below 2$ a day); the majority of whom live in rural areas, risk prone locations and urban slums. About one-quarter of the country's GDP comes from agriculture, which makes the country's economy relatively sensitive to climate variability and change. Access to income and employment is limited, with a large service sector, a climate sensitive agriculture sector, dependence on natural resource collections and industry. Access to drinking water is also insecure in some parts all year round due to saline intrusion in the coastal area, while in a large part of the country groundwater is contaminated with arsenic. The country is also yet to ensure health and education service to its nationals.

Household is the basic social institution that performs as an economic unit and draws from local recourse base (asset) depending on entitlement. Livelihood depends on geographical locations, e.g. marine fishers community lives along the coast, forest resource collectors tends reside in and around the forest. There are family occupations like weaver, blacksmith etc. Education and skills also determine livelihoods. Households make choices of concrete activities drawing upon assets and entitlements to generate income, which is disposed in various ways. Household members may pursue more than one livelihood and one person also might have more than one occupation. Households may decide to change its resource base by taking certain strategies and decisions. But there are processes and dynamics beyond the control of a household or even of a public authority to which a household may be vulnerable. A household tends to cope with the vulnerability factor using its resource base. If a household lacks resilience or coping capacity, it becomes more vulnerable. Some sections of the population within a seemingly homogeneous group may be more vulnerable than others. Livelihood conditions of the people largely depend on assets, entitlements (local resource base) and selection of gainful options of activities and coping with stress.

Human: Household members, health, education, training
Social: NGO/cooperative groups, UP, network/connection, relatives
Natural: Land, water, common property resources (CPR)
Physical House, tube well, latrine, electricity, cattle, poultry, tools and utilities
Financial: Savings, credit, safety nets
Source: PDO-ICZM, 2002

1.1. Around the household

Households exist in to certain geographical location having natural resources (ecosystems, *khas* land, wetland, forest etc.), physical infrastructures (road, telecommunications, school, hospital, polder, cyclone shelter, embankment, tube well, etc.), Social capital (formal institutions like *Union Parishad*, VGD committee, other service providers, legal regime, etc.) and informal institutions like *samaj*, *salish*, club, traditional laws and tenets, social sanctions, community regulations, etc.) and financial resources (growth center, bazaar, safety net programs, micro credit, relief, etc.). Entitlements and access to these resources determines livelihoods, in particular for the poor.

1.2 Choices and activities

Household members make choices of activities based on household assets and entitlements. Households having diversified assets and entitlements are better off in terms of selecting livelihoods. More diverse activities household members are engaged in, more they are resilient to stress. There are activities to earn cash, to save cost, self employment, selling labor (skilled and non skilled), petty business (weaving, shop) etc. Income generates from such activities goes to social payments (mosque, water committee, Bazar tolls etc.), consumptions (food, medicine, cloths etc) and investments (education, savings, maintenance of household assets etc)

1.3 Beyond and beyond of Household

As mentioned around the household is the local resource base which influences livelihoods of the households depending on the entitlements. Entitlements are beyond the jurisdiction of the households.

Again there are influences that are even beyond the purview of public authority and there are influences that are beyond the control of the mankind, e.g. extreme weather events having potential of disasters. Again to mention categorically, the global warming and climate change. Climate change impacts all spheres of life and livelihoods around the world now and will continue in coming future.

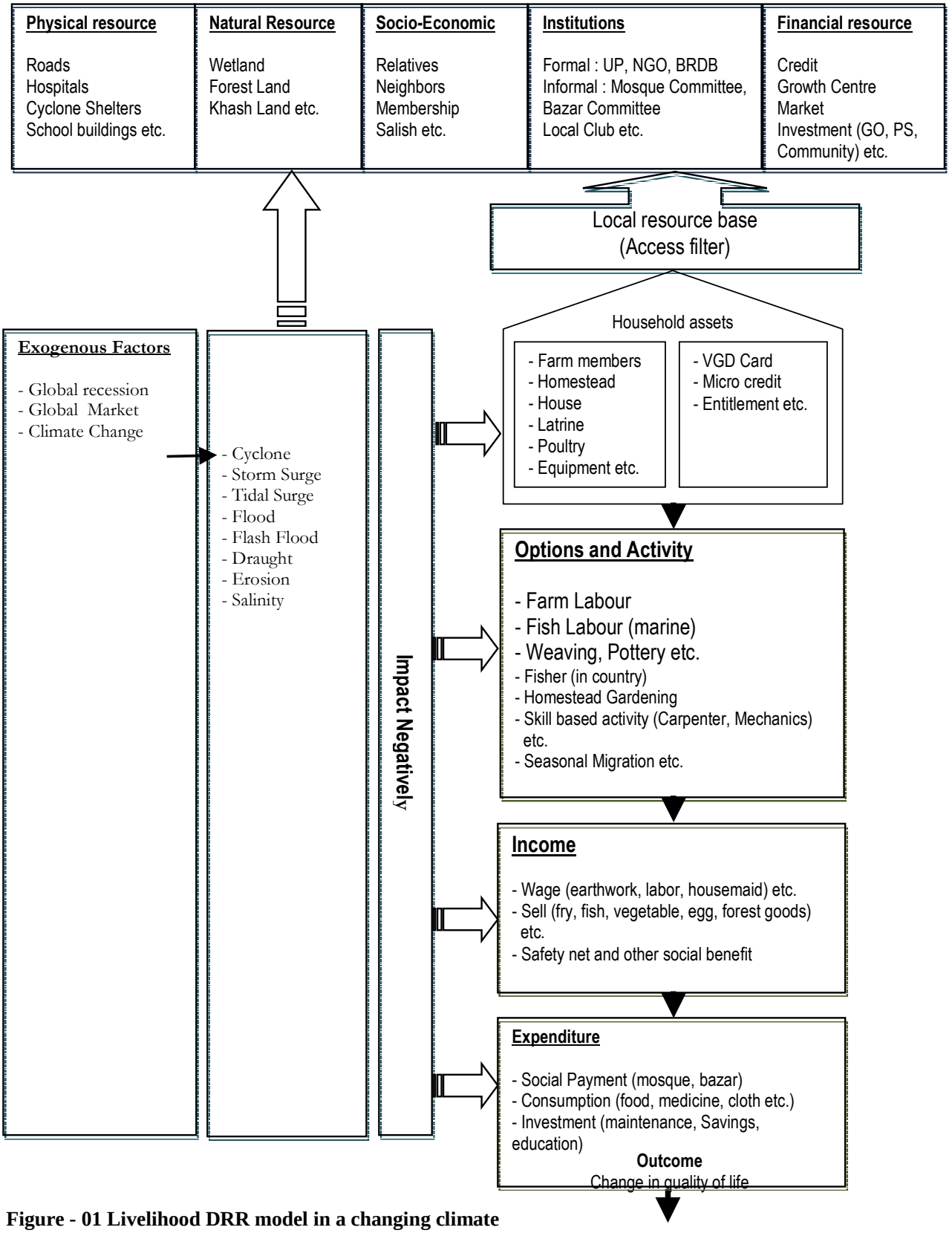


Figure - 01 Livelihood DRR model in a changing climate

2. AN OVERVIEW OF CLIMATE CHANGE IMPACT IN BANGLADESH

The geographic location and geo-morphological conditions of Bangladesh have made the country one of the most vulnerable ones to climate change, particularly to Sea Level Rise. Bangladesh is situated at the interface of two different environments, with the Bay of Bengal to the south and the Himalayas to the north. This peculiar geography of Bangladesh causes not only life-giving monsoons but also catastrophic ravages of natural disasters, to which now are added climate change and sea level rise (SLR). The country has a very low and flat topography, except the northeast and southeast regions. About 10% of the country is hardly 1 meter above the mean sea level (MSL), and one-third is under tidal excursions.

The community is complaining changes in the weather pattern, erratic behavior of precipitation, fluctuations of temperature and untimely and increased floods, droughts, salinity which is also expanding to new locations, according to the local community. Cyclones, storm surges are of bigger intensity and sea remaining rough more days than before.

The inter Governmental Panel on Climate change (IPCC) in its fourth assessment report, 2007 (AR4) confirms with very high confidence that climate are changing and describes scenarios and projections for different regions of the world including impacts on Bangladesh. The projections are:

- In Bangladesh, average temperature has registered an increasing trend of about 1°C in May and 0.5°C in November during the 14 year period from 1985 to 1998.
- The annual mean rainfall exhibits increasing trends in Bangladesh. Decadal rain anomalies are above long term averages since 1960s.
- Serious and recurring floods have taken place during 2002, 2003, and 2004. Cyclones originating from the Bay of Bengal have been noted to decrease since 1970 but the intensity has increased.
- Frequency of monsoon depressions and cyclones formation in Bay of Bengal has increased.
- Water shortages has been attributed to rapid urbanization and industrialization, population growth and inefficient water use, which are aggravated by changing climate and its adverse impacts on demand, supply and water quality.
- Salt water from the Bay of Bengal is reported to have penetrated 100 km or more inland along tributary channels during the dry season.
- The precipitation decline and droughts has resulted in the drying up of wetlands and severe degradation of ecosystems.

Increased vulnerability of women, children, elderly and disable persons social position of women and the vulnerable groups and their mobility suffer more than the other section of the community from any stress. In the changing climate their vulnerability has two dimensions under climate change:

- Geo-physical context of vulnerability
- Social context of vulnerability

2.1 IMPACTS OF CHANGING CLIMATE ON LIVELIHOODS

Poor people living in the marginalized lands perusing nature dependant livelihoods are facing barriers and constraints earning wellbeing in the changing climate. The climate change is pausing challenge to the livelihoods in two broad ways. Livelihoods are either disrupted by the extreme weather events like cyclone, heavy downpour, floods, erosion, storm surges, dense fogs, sea turbulence or by slow onset disasters like salinization, dryness, ecosystem degradation etc.

Extreme weather events not only limits livelihood persuasion during the event but also has the potential to erode household assets, like destruction of house, trees and even it may kill people or injure them. The extreme events also destroy local resource base and thus limits livelihoods and wellbeing. The household assets including human health and motivation, houses, trees, other physical

assets, livelihood tools and equipments are destroyed in the extreme weather events and thus reducing capitals to pursue livelihoods and accordingly reducing resilience to extreme conditions.

The study reveals that wage labor in any discipline are not employed immediate prior, during or just after the extreme events. Agriculture wage labor including post harvest remain stop during these days, small farmers, homestead gardener, petty shop keeper, service provider like carpenter, mason etc. also loose their working days. Fisher or fry catcher can't work these days.. In the *Haor* basin, flash flood destroys single *boro* crop resulting unemployment for the rest part of year for wage earner because the farmer loosing single crop are not in a position to offer employment for any purpose. Women are even less employed during these days of extreme weather. The market can't remain operative and thus limiting livelihoods of hundreds.

Climate change impacts gradually over a wide range of livelihoods in different settings. The fisher fishing in the Bay are exposed to hazard like rough sea (more days remain rough following climate change) and are compelled to loose working days. Salinization of soil and water limits small farmer and homestead gardener to produce and gradually productivity of the soil decrease. Health of the poor people is increasingly threatened due drinking saline water or loosing their working hours collecting fresh water for drinking. Drought and siltation together are reducing over wintering habitat for the self recruiting fish species resulting in to less recruitment in to the grazing field to grow open water inland fisheries and limiting livelihoods of the thousands of the fisher who are poorest of the poor
Women face this gradual degradation of their wellbeing more acutely then their male counterparts. They have to collect drinking and household water, get kids and elders wellbeing and by then their wellbeing are lost in the distress time more than the normal time.

Reducing work days and e.g. reducing productivity of land (salinity) etc. are less impacted disasters but frequency of such disasters is increasing. Day to day impacts in fact gradually limits the capacity of the poor people to withstand extreme weather events or disasters, like cyclone, storm surge, flood etc. Livelihood of the millions suffers due to prevailing unsafe condition following climate change and extreme weather events. Income, production, livelihood tools and equipment and the physical assets faces degrees of negative impacts and households are to over come challenges to recover.

Table 01: Impacts on livelihoods and household challenges to recover

Types of impact on livelihood	**Degree**	**Factors creating unsafe condition**	**Key challenge HH face to recover**
Income e.g. wage	High in all disaster	Wage market not functioned Health and injury, trauma	Slow recovery of market, humanitarian assistance overlooks markets. Tools and materials lost.
Production: crop, poultry, livestock	High, especially homestead based.	Poor infrastructure to divert intensity Inadequate asset protection measures	Inadequate buffer, Inadequate assistance, no insurance. FHHs overlooked.
Livelihood tools: fishing gear, handloom	Low for all, high for cyclone and tornado.	Low HH preparedness, weak design of boats and fragile infrastructure	Slow recovery, Inadequate formal credit so getting indebted (Mahajan)
HH physical asset (house) and capital/materials	High	Infrastructure and design	Slow. Inadequate.

3. Enhanced livelihoods prepare against and recover from disasters.

Maintain and enhance livelihoods in the changing climate calls for protection, restoration, maintenance and enhancement of household assets and take appropriate options and activities to pursue sustainable livelihoods. In the changing climate we have to identify stepwise and asset wise impacts of changing climatic parameters on respective assets and production system. At the same time we need to find ways to protect and enhance assets. The study once again reveals diversities of hazards and accordingly various ways to protect assets. The household members alone can not ensure protection of the household assets. The central and local government through institutional support is to protect the entire area perhaps through building, increasing or maintaining embankments for example, for storm surge or flood. Similarly maintaining health of ecosystems (local resource base, say a wetland) in normal time or after extreme weather events are on the shoulder of the institutional player including community based or local government institute along with the central Government's operational arms at local level. Disaster risk reduction and protection of the household assets and local resource base are essential to maintain livelihoods. Promotion of new assets through maintaining livelihoods, pursuing additional and appropriate livelihoods in the changing climate, enhancing local resource base and ensuring access to poor people will increase capacity and resilience of the poor people to recover from the disaster and prepared for future extreme weather events (potential disaster)

Table 02: Increasing resilience to recover from present disaster and prepare for future disaster

Regions	Asset protection : Disaster risk reduction	Promote New Asset	
		Maintain livelihood Appropriate additional livelihoods	Enhance resource base and increase access
Riverine floodplain	Raise plinth Plant trees around homestead	See annex	Embankment, flood shelters, investment in to management of wetland, forest, kitchen garden, growth centers, establishing market mechanism, flood tolerant crops extension
Coastal zone	Raise plinth Plant trees around homestead protect livelihood equipments (e.g. boat, tools)	See annex	Polders, cyclone shelter, investment in to management of wetland, forest, kitchen garden, growth centers, establishing market mechanism, saline tolerant crops extension, support for better boats, wind resistant houses
Haor basin	Raise plinth Plant trees and chailla grass to protect homestead	See annex	Submersible embankment, investment in to management of wetland, wetland forest, Kanda garden, growth centers, establishing market mechanism, short duration rice variety and suit of vegetable extension

Barind tract	Ensure operational tube well	See annex	Investment in to management of orchards, kitchen garden, growth centers, establishing market mechanism, less water loving crop extension, support . Irrigation projects and drinking water

3.1 PROTECTION OF ASSETS AGAINST DISASTERS AND PROMOTE NEW ASSET

3.1.1 Early Warning and Disaster Preparedness

Extreme weather events erode assets of households, communities and beyond. Climate change and increased disasters destroy our past gains and make us even more vulnerable and exposed to next disasters. It also threats our future development. Bangladesh is historically prone to disasters which have now been further increased following the climate change. To protect our assets and to continue our development persuasions we must prepare and reduce disaster risks.

Disaster risk reduction is systematic approaches that in a given context takes elements of risks in to consideration and prepare the community to be able to withstand the impacts of hazards or at least reduces its impacts. Identification and locating hazards over time and space with sufficient lead time is a prerequisite to reduce the disaster risk providing early warning to the respective target community and institutions that are engaged in public property management and are designated to service communities.

3.1.2 Protecting household assets

Household assets and strategic selections of options determines livelihood outcome. In the changing climate the livelihood assets are threatened. It is essential to protect and enhance household assets to gain capacity to recover from disasters and prepare for future weather extremes.

Physical and natural household assets: Historically and still today richer people reside at higher elevation and the poorer section of the community does live in marginalized lands. Land elevation where the poor lives are usually lower and are subjected to inundation during heavy rain or floods or storm surges. Their homestead gets flooded or hit by wind from cyclone or storm surge and thus household capitals of the poor are always exposed to hazards. Low lying areas are not usually protected through polders because that calls for removing drainage congestions. The homesteads have to be raised and thus protecting houses, latrines, trees, poultry and cattle. The houses have to be resistant (for example wind resistant in CZ), flood resistant in Floodplain areas etc. It could be better approaching this in a collective way for collective living, the cluster housing. The idea of cluster housing is to make a cluster of selected group of households and shall make their homesteads on a common and raised land, will have tube well, latrine, *killa*, and common backyard etc. This involves bit of investment but will protect HH assets including houses, cattle, poultry, trees and others during disaster and also protect their health which is household's human asset.

Human, social and institutional resources: House hold members should be provided with skill based training, training on networking to enable them to claim services from the government and non government organizations. Membership to BRDB, NGOs and other societies shall increase their capacity. Household members (thus community) should be awre and trained on the disaster preparedness, management and response to protect themselves and their assets during, before and after the disasters. Enhance livelihood options (multiple livelihoods) and diversification, shifting

livelihoods to non climatic dependent, e.g. service sector, skill based occupation. Updated equipment and tools for livelihoods persuasion in changing climate

3.1.3 Protect and Enhance Local Resource base

People make their living and wellbeing drawing from the local resource base complying entitlements and using assets and taking strategic options and activities. Local level resource bases including institutional support the community use. To protect people in the vicinity of the sea or marginalized land, it is necessary to act nationally and even globally. The globe is now virtually connected and became almost a global village due interdependence of people and countries. Climate change reveals the fact once again. In the changing climate to protect assets against increased extreme events and maintain livelihoods it is necessary to protect local schools, growth centers, feeder roads, cyclone shelters, tube wells and other infrastructures that serves as local resource base. These are constructed and maintained through some national development agencies. In the first place these basic infrastructures have to be upgraded in the changing climate to continue service. These infrastructures must be climate resilient meaning these must withstand extreme weather events and gradual changes of climatic parameters. There should also be new infrastructures like polders, embankments, roads, flood shelters and cyclone shelters constructed taking climate change and its impact in to consideration in one hand and population growth and development on the other. So it requires a national action to bring all these sector agencies on board to make their sectors and cross sectoral entities climate resilient and even 'climate smart'. This calls for national development persuasion is accommodating changing climate parameters through appropriate policy, strategy and actions.

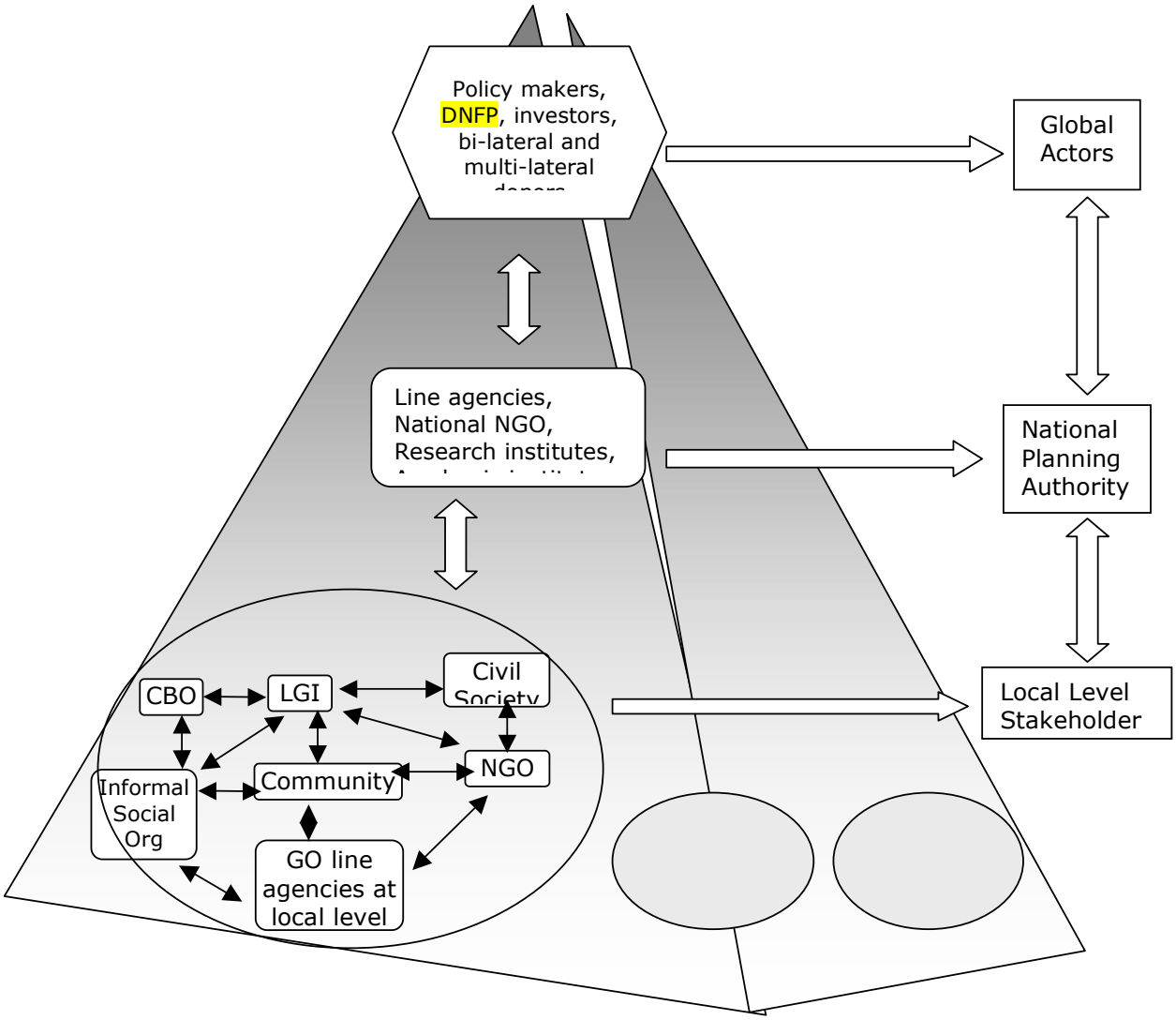
It is note worthy to mention stabilization of climate system is only possible through mitigation of green house gas emission beyond the threshold level, where the poor community has nothing to do. So sad, they are only to absorb shocks for what they are not responsible at all.

Restoring and enhancing markets: The civilization and economy at present are thoroughly market based. Market determines development and business. Physically it is necessary to protect and enhance market places. More importantly marketing has to be diverse linking the producer and consumers. It means there shall be market system chain that enables primary producers and the service providers to access market beyond their immediate vicinity. In this regard, backward and forward linkages are important along with the transportation roads, vehicles, brokers and enabling institutional environment.

3.2 Enhanced Institutional support

People are living in institutional environments, be locally the UP, Upazila or district, nationally central government and globally international governments and others. All these institutions have bearing on the livelihood and wellbeing of the local people.
We have to consider that the resources that are following from out side the locality are also resources to that particular area, e.g. water flows from upstream. Similarly the national institutional and infrastructural coverage are of immense importance for the life and livelihoods of the local area. The most remote but most alarming is the climate change, which is global in nature and impacts locally. As such the global institutional actors and their functions impact our livelihoods now and in future.

Local institutions are very important to the community in pursuing their livelihoods. Formal institutions like Union Parishad (UP) should be strengthen to be able to provide more support to



community during disaster and in normal time. UP could use

Fig 02: Institutional environment of communities and thus household members

the national ID cards and their information and create a union level database that hosts information on the assets and vulnerability of the households. This shall enable them protecting most vulnerable people before and during the events. On the other hand post disaster relief could be reached to the households need most. Disaster Management Committees (DMCs) should be equipped, trained and coordinated with LGIs to operate and function to protect the community. Relief must be considered as right in need and local Government Institute like UP should coordinate all relief activities, development activities and other social protective and enhancing activities.
DMCs under supervision of the UPs should operate as a resource centre for the community from where they will be getting early warning, state of art technologies, extension services information and

others. This center should have direct connection with the national DMIC and FFWC and others to gather information. Establishing Cell broadcasting, it is now very easy to disseminate information to local resource center level.
NGOs along with the LGIs and various other formal and informal organizations may increase service accessibility to the community and can bring state of art technology to them, e.g. digital technology which shall increase employment. Access to loan and other services of the line agencies could be ensured through appropriate strengthening and orienting institutions at local level and office of the central government at local level

National level institutions like the line ministries and agencies and their respective local office at Upzila level (few up to union). The central Government plays their role in the local development through this set up. It is suggested that all these ministries and agencies need to take climate change issue seriously and be able to pursue climate friendly, climate resilient, or even climate smart development. Sectoral risk reduction and adaptation is necessary.

The figure 02 shows the horizontal and vertical coordination of the institutions at local and central level. At the same time the figure also highlights connectivity of the national through to the global institutions.

Global institutions: Climate change is a global phenomena that impacts locally. Naturally the global actors are of much relevance in this regards and functions of the global actor are visbale to us through the institutions reports and acts. It is worth mentioning the problem of climate change can only stop through reduction of green hose gas emission, which are not in the control of any country or person rather on nthe entire governmental regime of the globe. Emission reduction today is the best adaptation for future. There are huge numbers of global institutions, e.g. Governments in this instance are very important to reduce emissions to safe the earth. Similarly large numbers of global institutions emerged to help tackling impacts climate change globally. It is interesting to note there are some actions where we act locally and benefits are globally. Mitigation is all together a global matter though action has to be locally. All nations have to act together to reduce emission, only then the globe will remain inhabitable. Similarly technology transfer, funding for climate resilience and adaptation is also necessary to flow from the developed to the developing countries. In one hand developing countries like Bangladesh has to bank on the developed world for technologies and investments for cleaner energy for future and clean production machineries, on the other hand the developed world may need support from developing countries for disaster risk reduction and adaptation

3.3 SUSTAINED NATURAL ENDOWMENT

Bangladesh economy is predominantly agrarian and natural endowment dependent and variation in endowment pattern (e.g. precipitation and or sunshine) impacts yield and production system. The climate change parameters have direct bearing on the endowment and as such to the livelihoods. Local resource base like *khash* land for agriculture, forest or wetlands are part of the natural resources and are managed through respective sectors and agencies. It is necessary to work nationally and intervene to continue resource flow. Small farmers, farm labors are directly dependent on the agriculture production which in turn in Bangladesh depends largely on the water flow or rain and thus climate change dependant. Forest resource collector, shrimp fry collector, fisher, wetland resource collector to mention few are all dependent on the endowment and management of natural resources. In a country scale these are managed by various line agencies. Few examples could be maintenance of embankments, community based forest resource management, community based fisheries management in the changing climate etc by respective line ministries and agencies are required keep resource flowing.

4. Livelihood Options in the changing climate

Changed climatic parameters like erratic precipitation and temperature intern impact on the ground as flood or drought etc. have implications on livelihoods. These impacts have to be identified and delineated at various stages of production/service delivery systems. For example, there are changes in the precipitation pattern on which Bangladesh crop agriculture is highly dependent. Analysis shall provide departure from historical endowment to climate change regime endowment pattern. This might have implication in yield and even may become non productive. Systematic analysis shall pin point risks and define specific problem statement to research and to find options to treat such risks. One common example could be salinity intrusion in new area where there was no salinity before. To continue crop agriculture as livelihood in the area requires changing in the cropping pattern, and could be saline tolerant rice variety and combination of vegetables which grows in salinity. It could be stated that in one hand it is necessary to invent such variety (Bangladesh has this variety) and on the other hand requires action research to find out farmers adaptability with new variety. Similar example could be for *haor* area, e.g. short duration rice variety to escape flash flood and a suit of vegetables that are comfortable in the changed climatic parameters. Research is necessary to find the impacts of changing climatic parameters to steps and stages of livelihood and find the options to treat such risks. AT the same time, the good and best practices around the country could provide us options. The salinity front along the coast and in the estuary and associated lands were enjoyinbg productivity naturally which are shifting in to the country side and we should learn and shift livelihoods accordingly. Best practices, research results and observations in to the study sites allowed us to make a matrix of livelihood options to enjoy appropriate additional livelihoods in different regions and seasons to prepare community recovering from current disaster and prepare against future disasters (Annex 01)

Protecting and enhancing assets will allow household members to take strategic options to enhance their livelihoods. Support to increase assets means increasing local resource base which means more investment in infrastructure (cyclone shelter, embankment, road network, hospital, schools, growth centers etc), education, natural resource management, increase safety net coverage etc. This bunch of work again calls for policy support, more budget allocation, more skilled professionals, practitioners, policy makers etc. On the other hand providing more skills to the family members, credit facility, strengthening houses, drinking water and sanitation coverage could be the result of some national policy.

The livelihood is a broad concept and involves a wide range of actions from within the household, immediate context (local resource base) and remote context (national and international institution, policy, legal bearings and exogenous factors like climate change etc.). As such to increase the opportunities for livelihoods at household levels, it is necessary to undertake multi dimensional activities. For example to maintain and enhance natural resource flow out of the resource base (say a beel), it is necessary to practice sustainable wetland management which calls for a certain skill, investment, ownership etc. Similarly to enhance local resource base (Cyclone shelter, embankment, roads, growth centers, plantation, sand mines, wetlands etc) it is necessary to advocate, bring more investment in all sectors. At the same time to increase access of the poor people in to the local resource base requires policy support, capacity building, licensing etc. on the other hand to increase the household assets, it is necessary to provide skill based training, savings, credits, protect health and properties of the households.

5. STRATEGIC UPTAKES FROM THE STUDY

Assets are exposed to hazards and exposure are increasing following climate change and increasingly eroding assets. Having appropriate understanding of the impacts of the changing climatic parameters

on the livelihoods, we have to capitalize opportunities if any and combat or remove constraints and over come challenges to continue our living in the changing climate.
It is very clear from the study that the women are differently vulnerable then their male counterparts. Among the poor households a considerable numbers are female headed households. In protecting the household members, in particular the olds, children and disabled, women take the lead. Protecting household physical assets and health of the family members are also taken care of by women. To improve the wellbeing of the poor, wellbeing of the women is a must. Improving access to services for women along with man is necessary and has to promote. Children are the future generation and will be genuinely exposed to the impacts of the climate change, so it is necessary to involve children in combating CC activities.

Resource generation and growth can not guaranty wellbeing of the poor because of the access factor. At local resource base, the access of the poor has to be ensured otherwise growth will be deformed.

This report attempted analyzing livelihoods of poor people in the changing climate drawing from the study outputs from different ecosystems, geographical locations, hazards, livelihood groups. It is clear from the findings that the household assets are used as capitals to earn an income to realize wellbeing. On the other hand the activities will be required at Household level, community level, institutional level and systematic level
Again, types of activities include natural resource management, policy adjustments, inclusion of women and poor, increase institutional capacity and access. It is understandable reducing vulnerability and increasing capacity of the people to reduce disaster risks in the changing climate involves huge array of stakeholders, livelihood groups, ecosystems, process and legacy. As such, it is also necessary to be strategic in deciding, selecting, approaching, maintaining, expanding and sustain the livelihoods. Oxfam, at this end could internalize these findings and recommendations in to their new change strategy.

5.1 ACTIONS NECESSARY AT DIFFERENT LEVEL

Bangladesh a small country in terms of space but very big in terms of diversified livelihood groups, landscapes and ecosystems. The institutional regime that governs the country including central government and the local government has to take on board to service the needs to the community to protect their assets, increasing assets to recover from the disaster and to prepare better for future disasters. People have to take their own initiative at their household level drawing from the local resource base and household assets. Community at local level (Village or para) has to be active and undertake social responsibility to protect them. Protecting local resource base and increasing definitely requires institutional level action both from the central government covering national level, district level and Upazila level and the LGI should assist at Union level and village level. Central Government should take responsibility of systematic actions required to support at macro level to increase local resource base.

5.1.1 Household level

- Aware and assess house hold risks
- Prepare for HH level risk reduction and adaptation (Wind resistant house)
- Prepare to protect homestead from erosion (plant trees, vetiver grass etc.)
- Raised homestead, tube well, pond bund
- Store seeds, essentials (emergency medicine, food grain, dry food, match, fodder etc.)
- Diversified crop/vegetable/alternate livelihood
- Plan/orient to evacuate to shelters for children, elderly and disabled persons if any

5.1.2 Community level

- Prepare for recovery arrangement/services

- Community seed store, seed bed
- Raised seed bed, Killa for cattle (common for the village)
- Plant trees around village/hour bank/coastal zone/river bank
- Evacuation plans for poor community before hand and mock practice.
- Access and disseminate early warning (flood, cyclone, storm etc.) to the community.
- Floating agriculture
- Prepare to shift to cyclone/flood shelter (orientation approach road/practice)
- Arrangement for disable, old, children to shift to shelters
- Membership of organizations
- Area based participatory planning for disaster risk reduction and adaptation and implementation by the community.
- Shelters should be women friendly, there should be women volunteers.
- Special awareness/orientation for women at village, union and upazila level for climate change and disasters
- Include children/old in discussion, sharing knowledge and activity with them.
- Special measures for children living in disaster prone areas
- Gain experience from old people, use them in various works related to disaster preparedness and response

5.1.3 Institutional level

- Enhance capacity of LGI and other active institutions and activate dormant local institution
- ensure effective participation to bring local knowledge of all occupational group and others
- Create livelihood database at union level and map vulnerable HH to reach relief in time.
- Local resource center at union level to provide information and receive people's view and demand for knowledge
- Ensure access of the poor to the local resource base, e.g. arrange leasing beel to local community
- Ensure access to extension services, micro credit for the poor
- Provide skilled based and market based training/capacity building
- Community based early warning system with special emphasis for offshore islands.
- Enhance safety net, recovery and rehabilitation services and ensure access of the poor
- Promote, facilitate education, training for women. Ensure their access to local resource base (services)
- Develop materials for school children so that they learn climate change, disaster adaptation etc.
- Teacher/guardian must help kids learn adaptation DRR etc.

5.14 Systematic

- Build, manage, upgrade infrastructure
- Identify risky land and control settlement in risky land.
- Introduce short duration, saline tolerant, drought resistant rice variety
- Introduce adjusted cropping extension services
- Extension of options generated from adaptation research and good practices
- Enhance provision for micro credit and ensure access for the poor
- Community based insurance for livelihoods
- Sustainable ecosystem/natural resource management efforts to ensure resource flow.
- Promote saline tolerant development materials in coastal zones.
- Include climate change/disaster reduction in school curriculum.
- Investigate/research impacts of climate change on children and take actions to reduce.

Annex 01 : Livelihood Adaptation Options in different hazard prone areas for different seasons

Areas	Farm and non farm Adaptation Options		
	Rabi	**Kharif-I**	**Kharif-II**
Flood Prone area (Riverine)	• Homestead Vegetables Gardening • Hybrid Maize Production • Short Duration *Boro* rice cultivation (BRRI *dhan*-28, BRRI *dhan*- 29) • Pulse crop Production (Lentil, Mung Bean) • Suitable Crop cultivation (Maize, Wheat, Mung bean, Sesame, Ground nut, Chilli, Country bean, Yard long bean, Okra, Knolkohl, Brinjal, Tomato etc.) • Mini Nursery Establishment • Use of Improved Stove • Wage Labour • Rikshaw/Van Pulling • Petty Business • Vegetables/Grossary shop • Skill Based work (Carpenter, Mason) • Handicrafts	• Mixed fruit gardening (Jujube- BAU *Kool*, Apple *Kool* & Litchi-*China-3*) • Improve Stove & FYM (BARI Model) • Green Manuring crop cultivation • Early variety of *Aus* Rice Cultivation • Homestead Vegetable Cultivation • *Latiraj* Cultivation as High Value Crop • Vegetables cultivation (Pumkin, Sweet guard, Tomato, Bitter gourd etc). • Cultivation of Napier and Para grass • Fruit tree Garden (Litchi, Jujube, Guava) • Improved stove • Rikshaw/Van Pulling • Petty Business • Fish fry supply (Middleman) • Vegetables/Grossary shop • Mango business (Middleman)	• Quick growing vegetables cultivation (Leafy vegetable, Red Amaranth, Chili Kangkong, Okra, Stem Amaranth, Indian Spinach). • Double transplanting of T. *Aman* cultivation • Community seedbed preparation • Seed sowing in *Dapog* method • Double chambered Farm Yard Manuring (FYM) • Pit method for vegetables cultivation in Char land • Pottery, • Rice husking, • Early variety of T. *Aman* cultivation (BRRI *dhan* 33, 39 etc.) • Community Fish production in open water • Fodder Cultivation • Late variety of T. *Aman* cultivation in flood prone area (*Binashail Nazirshail*)
Drought (Barind)	• *Boro* rice cultivation with proper management (System of rice intensification) • Vegetable cultivation on improved pit • Wheat Cultivation • Homestead Vegetables Gardening • Hybrid Maize Production • Short Duration Boro rice • Lentil, Mustard, Mung Bean, Sweet Gourd Production	• Homestead Vegetable gardening (BARI Kalikapur Model-*Spinach, Ladies finger, Kangkon, Stem Amaranth, Red Amaranth* etc) • Drought resistant rice varieties cultivation • Green Manure – T.*Aman* system Cultivation • T. *Aus* – T. *Aman* (*Chini atap)* system • Mung bean Cultivation (BARI *Moog* 6, BINA *Moog* 5) • Sesame Cultivation (T- 6, BINA *Til* 1, BARI *Til*) • Mixed gardening (Jujube- BAU *Kool*, Apple *Kool* & Litchi- China-3)	• Homestead vegetables gardening (Kangkong, Okra, Stem Amaranth, Red Amaranth, Indian Spinach). • Strengthening field bunds (*Ail* lifting) • Direct sown rice (drum seeder) • Seedbed method for T. *Aman* cultivation • Jujube gardening (BAU *Kool*, Apple *Kool* etc)

	• Mini Nursery Establishment • Use of Improved Stove • Mango Orchard Management • Wage Labour • Rikshaw/Van Pulling • Vegetables/Grossary shop • Skill Based work (Carpenter, Mason)	• Improve Stove & FYM (BARI Model) • Litchi gardening (China-3) • Fast food preparation (Puri, Singara etc.) • Mini pond excavation and green manuring crop cultivation at the bottom (12m X 12m X 03m) • Re-excavation the traditional pond of the community people • Community based homestead vegetable Cultivation (Species- *Snake gourd, White gourd, Bitter gourd, Okra, Stem Amaranth, Kangkong*) • Green Manuring-by Mung bean Cultivation (BARI Mung-05) • Community based Pigeon pea cultivation (I kilometer, at the *Khari* bank side, pond side, road side & around Eidgah field) • Community based Palm *(Tal)* tree plantation in the feeder roar side • Silage preparation through Maize Cultivation (BARI Technology- BARI Hybrid maize 2) • Sheep rearing (5 months old, 2 calves) • Green mannuring – T. *Aman* system • Mango business (Middleman) • Stock Business (Grain) • Skill Based work (Carpenter, Mason)	• T. *Aman* cultivation (BR 23, BRRI *dhan* 39, 41; as per the local acceptance, suitability and availability of seed/seedlings) • Rice husking, • Fodder cultivation (Para grass, Napier grass, German grass, *Jambu* (Hybrid sorghum) grass) • Cropping Pattern *(*T. *Aman* – Mustard/linseed system T. *Aman* – Chickpea; T. *Aman* – Mung bean) • Duck rearing (Local or Khaki Kamble) • Fruit tree plantation in the homestead (Olive, Pomegranate, Mango, Sweet Carambola, Sweet Plum) • Pottery • Handicrafts • Fish rearing in the mini pond • Improved stove making • Dry Seed Bed Preparation for T. *Aman* Rice • Mini Pond Excavation and surplus Irrigation Management of T. *Aman* Rice
Salinity (Coastal)	• Suitable Crop and vegetable production (Maize, wheat, lentil, Sweet Potato, pumpkin (khira), Mung bean, Sesame, Ground nut, Chilli, Country bean, yard long bean, okrs, Knolkohl, Brinjal, bittergourd Tomato etc.) • Zero tillage potato cultivation-water hyacinth • Boro rice cultivation (BRRI *dhan*-28, BRRI *dhan*- 29, Local- *Ratna*)	• Cultivation of Aus rice (HYV- BR-21 BRRI *dhan* 27 and Local-*Adakatji, Panbira, Bao*i) • Re-excavation of small pond for rain water harvest, fish culture and irrigation (Species- *Rui, grass carp, Galda shrimp/mrigal*) • Jujube cultivation (BAU *Kool,* Apple *Kool*, *Narkeli Kool* etc) • Cultivation of Napier and Para grass • Petty Business (Fry selling, green coconut selling, snail business)	• Homestead vegetable gardening Bed–1: Kangkong Bed –2: Okra Bed–3: Stem Amaranth Bed –4: Red Amaranth Bed –5: Indian Spinach. • Jujube gardening (BAU *Kool,* Apple *Kool* etc) • T. *Aman* cultivation (BR 23, BRRI dhan

	• *Dhaincha* (Sesbania) cultivation • Duck rearing (Khaki Cambel) • Farm yard manure FYM (2–Chambered farm yard manure) • Salinity tolerant BR- 47 Boro rice cultivation • Compare between BR-29 and Local boro name *Sylhety* Boro cultivation • Compare between BR-28 and Local boro name Ratna variety cultivation • Fish culture with vegetables by using *Sarjan* method • Dry Fish processing, • Turmeric and Garlic cultivation • Vegetables/Grossary shop • Motorbike driving (Motor Cycle) • Homestead vegetables gardening • Seasonal dam & subsequent sluice gate • Khandi-Ber/Sarjan method for Integrated Vegetable-Fish cultivation • Zero tillage *Khesary* (grass pea) cultivation • Melon cultivation • Honey bee culture in box • Mushroom culture • Spices (Garlic) cultivation • Van pulling • Motor driving *(Nosiman)*	• Fish fry supply (Middleman) • Vegetables/Grossary shop • Pottery • Motor drivers *(Nosiman)* • Handicrafts • Mixed fruit garden with Guava, and Jujube • Duck rearing (*Khaki Cambel)* • Homestead vegetable garden (BARI recommended model-Indian spinach, *Stem Amaranth, Gima Kalmi, Yard long bean*, Okra etc) • Improved Cook Stove and FYM (2 – chambered) together • *Sesnbania* green manuring in fallow land • Community based Coconut garden (10 households in a village) • Farm Yard Manure (FYM) (2 Chamber) • Petty Business (Fry selling, green coconut selling, snail business) • Banana in *kandi* method • Rice-fish Culture (Rice-27, Variety-*Vozon, Raz puti, Nilotica, Mirror carp*) • Homestead herbal garden-locally available species (*Aloe vera, Asparagus, Patharkuchi, Ashwagandha, Ulatkambal, Padmaguruj, Kalamegh, Thankuni, Bashak* etc) • Mini nursery-at least 10000 saplings (*bel, am, neem, amlokhi, mehgini, raintree, chamble, argun* & so on) • Homestead Tree plantation (*Jam*) • Vegetable production (white gourd, teasel gourd, Indian spinach) in the boundary of the *gher*/crop field (BARI LAU-2, BARI Korla-1; Goz Korla; Tia;Taj, BARI Puishak-1 & 2) • Fish culture in local small pond (*Carp*, GIFT *telapia, koi, shing* etc)	39, 41; as per the local acceptance, suitability and availability of seed/seedlings) • Rice-fish cultivation (Rice: Lalmota, Sadamota, Vojon, Moynamoti, Kachra and Nonakochi; Fish: *Common carp, Sarputi, Nilotika*, Telapia, *Tengra*) • Fodder cultivation (Para grass, Napier grass, German grass, *Jambu* (Hybrid sorghum) grass) • Improved stove • Fast food preparation (Puri, Singara etc.) • Rice husking, • Van pullers • Motor drivers (Nosiman)
Flash Flood *(Haor)*	• Short duration *Boro* rice cultivation (BRRI *dhan* 45, 29) • Pulse crop cultivation (Mung Bean, Lentil)		

	• Vegetable cultivation (Radish, Spinach, French bean, Garden Pea, Sweet guard, Red Amaranth, Steam Amaranth, Bitter gourd, Potato, Ash gourd, Ariod) • Oil seed production (Mustard) • Spices production(Onion, Garlic)		