

CONSOLIDATED REPLY

Climate Resilient Livelihood Option for the South West



**Climate and Disaster Risk
Reduction Community**



Compiled by Dilruba Haider, Community Facilitation Coordinator and
Md. Zahidul Abedin, Research Associate





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The Query

Naimul Islam

BDPC, Dhaka

Posted: 27 October 2012

Bangladesh Disaster Preparedness Centre (BDPC), with the support of Christian Aid Bangladesh, is currently implementing a project at Morrelganj Upazila under Bagerhat district titled "Community Based DRR and CCA Fortified Livelihoods Initiative through Good Governance". The objective of the project is to protect livelihoods of the poorest households through supporting livelihood practices which are climate resilient, and awareness creation about Disaster Risk Reduction and Climate Change Adaptation.

It's being implemented on a pilot basis in two Unions of Morrelganj Upazila: Khawlia and Nishanbaria with some 600 households. These areas are particularly grappling with increasing salinity problem in water and soil. Agriculture has become extremely challenging while shrimp farms are also facing huge losses due to unknown diseases which the local people attribute to extreme weather conditions. Grazing land is getting extinct fast making it tough to raise cattle.

Under the circumstances, we are seeking CDRR member's valuable advice and guidance from your vast knowledge and experience in terms of both successful and not so successful livelihood interventions in saline prone areas. Could you please comment on the following:

1. What types of livelihood practices would be more appropriate for saline and cyclone prone areas? Please share your successful and not so successful experiences.
2. What are the challenges you envisage/ or faced in implementing such climate resilient livelihood programme?


Your contributions will help us very much in defining the livelihood support for the poor and vulnerable people of Morrelganj, and we would be happy to share our learning with you as we move ahead with the project.



Photo Credit: Zahidul Abedin, UNDP

Responses received with thanks from:

1. Torsten Mandal
Denmark (Response 1; Response 2; Response 3)
2. M. Aminul Islam
UNDP Bangladesh, Dhaka
3. Naimul Islam
BDPC, Dhaka (Response 1; Response 2)
4. Mirza Shahidul Islam Khaled
Shankalpa Trust, Borguna (Response 1; Response 2)
5. Shakeb Nabi
Netherlands
6. Rezaur Rahman
Institute of Water and Flood Management, Bangladesh University of Engineering and Technology (BUET), Dhaka
7. Sanjib Kumar Saha
Comprehensive Disaster Management Programme (CDMP II), Dhaka
8. Dilruba Haider
Solution Exchange Bangladesh, UNDP, Dhaka
9. Abu Wali Raghieb Hassan
Department of Agricultural Extension, Dhaka (Response 1; Response 2; Response 3)
10. A.H.M. Saiful Islam
Department of Agricultural Economics, Bangladesh Agricultural University,
Mymensingh (Response 1; Response 2)
11. Monzurul Hasan Milon
Badhon, Bagerhat
12. SM Farid Uddin Akhter
Sasrai-Movement, Dhaka
13. Kamal Hossain
Comprehensive Disaster Management Programme (CDMP II), Dhaka
14. Mohammad Sahariar Mamun
Dhaka Ahsania Mission, Dhaka
15. Zahidul Abedin
Solution Exchange Bangladesh, UNDP, Dhaka
16. Shashanka Saadi
Dhaka
17. Sayeed Mahmud Riadh
USAID's Integrated Protected Area Co-Management Project (IPAC), Dhaka
18. Subindu Paul
Shushilan-PROSHAR Project , Khulna
19. Habibullah Bahar
Manab Mukti Sangstha (MMS), Sirajgonj*



Summary of Responses

Members advised BDPC to undertake a mapping exercise of current livelihood practices in their target areas; doing market analysis both in terms of inputs and sale and marketing chain, and of course the best possible and locally acceptable, climate resilient alternative livelihood options with possible costing. They suggested BDPC to deploy a mission consisting of one livelihood and one climate change expert to do the mapping.

According to the members, for **climate resilient livelihood options** there is a need for intensive and long term mapping, addressing the geographical, physical and economic status of each village, which are often quite varied. Identifying saline tolerant species for agriculture, fisheries, livestock and plants needs intensive and long term research, while taking into consideration peoples' perspectives. In some places resilient agriculture would be appropriate while in others cottage industry, even industrialization might be more befitting. Seasonality should be factored into the livelihood practice mapping. For agriculture, agro biodiversity and quality of soil and water need to be closely monitored. Explored options should be diversified and must have enough market value.

Various saline tolerant crops invented by Bangladesh Rice Research Institute (BRRI) and Bangladesh Institute of Nuclear Agriculture (BINA) were mentioned, which could be promoted amongst the farmers of the area; saline tolerant rice varieties: BRRI 47, BINA 8 (Boro season); BRRI 55 (Aman and Boro seasons); BRRI 53 and 54, BR 23, BRRI 40, 41,44 (Aman season). BRRI 51 and 52 are submergence tolerant.

Bangladesh Agricultural Research Institute (BARI) on the other hand have developed some saline tolerant crops like, Mungbean (BARI Mug 5 and 6), Soybean 5 and 6, Chinabadam (peanuts) 8. BINA developed Chinabadam 4, and a Maize variety. BARI has developed potato, sweet potato, turmeric, some fruits like Amra, coconut, guava and some vegetable varieties which are performing well in the target region. For potato cultivation BARI has developed some cultivation technologies, e.g. cultivation with mulch giving higher yield. From vegetable: chilli, soybean, sugarbit, bitter gourd, sweet gourd, ground nut, water melon, tomato, cowpea, mustard, and grass pea (Kheshari) can be cultivated. For fruit trees with saline resistance property: coconut, betelnut, amloki, amra, amrapoli mango, jujube, papaya, and Bangladesh Agriculture University invented plum (Kul) were recommended. Also recommended were Choi (a slender and climbing herb, popularly used as hot spice in the mutton curry in south west coastal area). Some Members also suggested cultivation of Reed (hoglapata) and drumstick (Sojne data)

Members suggested that BDPC should consult the local agriculture officials in selecting appropriate crop varieties for their target areas, since there are many variables which should be considered to get the maximum yield.

Land zoning was also suggested to ascertain which areas are suitable for what livelihood activities. Highly saline lands could actually be earmarked for shrimp cultivation, which would help save less saline and non-saline lands from the clutches of the shrimp farms. Through saline tolerant rice variety integrated rice-fish cultivation system could be promoted where 'golda' and other saline tolerant fish species like 'Telapia' could be cultivated. Sweet water rice fields could be used for sweet water fish cultivation. Crab fattening, suitable for poor community due to it's low investment and easy marketing, could productively use the highly saline water.

Bangladesh Livestock Research Institute (BLRI) can help in promoting a specific species of duck suitable for the coastal area. BLRI has also produced a fodder variety that can potentially be cultivated and promoted in the saline prone coastal belt. Some members suggested cash based interventions like Cash for Work (CfW) to create short-term community work.

Members talked at length about the need of afforestation and type of trees to retain the ecological balance as well as protection of the area from disasters. They preferred hedges and different saline tolerant mangrove trees.

For challenges, the members opined that emerging agricultural variabilities due to climate change is a big challenge to the age old knowledge base of coping with natural hazards. Structural and non-structural risk reduction is a need to ensure food and livelihood security in the hazard prone areas. The trend of incremental risks caused by climate change requires additional investment through adaptation support. Identification of such threat to coping wisdom gives indication of adaptation cost at household level; but valuation of the change of ecosystem and irreversible change in environment is another challenge.

The adaptation options need to be continuously monitored and updated as the agronomic conditions in the coast is continuously changing. A crop variety which is suitable this year may not remain suitable next year depending on change in salinity. On top of it, dissemination of the inventions of BARRI, BINA, BARI and their adoption by local people remain a challenge. Soil test, a crucial measure to ascertain the level of salinity is a challenge due to lack of sustainable investment in it. The soil of the region is clay type which makes it dry quickly making cultivation harder. Due to disasters harvest of local T. Aman rice is often late that delays the planting of Rabi crop, which is often damaged by tidal surge.

Most of the real farmers are marginal and share croppers, while the land tenure system is not favourable for them, hindering crop diversification and intensive crop cultivation. Market and supply-chain for the poor producers remains a challenge to get sustainable good price.

Most of the local vegetable varieties need access to sweet water, which of course is scarce there. Livestock rearing is a big challenge, especially which have been bred in non-saline areas. There are numbers of technology available at the institutional level (agriculture office, livestock office), which are not readily accessible by people.

According to the members, optimum utilization of available resources and their timing poses the supreme challenge; each household should be considered veteran climate crisis fighter.



Related Resources

Photo Credit: UNDP Bangladesh

Recommended Organizations and Programmes

From Sanjib Kumar Saha, CDMP II, Dhaka and Abu Wali Raghieb Hassan, DAE, Dhaka; response 1

Bangladesh Rice Research Institute (BRRI)

Joydebpur, Gazipur-1701; Tel: +880-2-9252736, 9257401-05; Fax: +880-2-9261110; dg@brii.gov.bd, brrihq@yahoo.com; <http://www.brii.gov.bd>

Prominent public research organization conducts research and has developed saline tolerant rice varieties that have high yield potential at the coastal saline prone areas of Bangladesh.

Bangladesh Institute of Nuclear Agriculture (BINA)

BAU Campus, Mymensingh 2202; Tel: +880-91-67834; Fax: +880-91-67842; dg@bina.gov.bd; <http://www.bina.gov.bd>

It undertakes research using nuclear techniques and has developed some popular saline tolerant rice, vegetables and other crop varieties especially suitable for coastal region saline areas.

Bangladesh Agricultural Research Institute (BARI)

Joydebpur, Gazipur-1701, Bangladesh; Tel: +880-2-9252715; Fax: +880-2-9261415; dg.bari@bari.gov.bd; <http://www.bari.gov.bd>

It is the largest multi-crop research institute developing saline tolerant crops, soil management, irrigation and water management, new technology development in coastal and other region.

Department of Agricultural Extension (DAE)

Khamarbari, Farmgate, Dhaka 1215; Tel: +880-2-9140857; Fax: +880-2-9111502; dgdae@dae.gov.bd; www.dae.gov.bd

It is the biggest public sector agricultural service provider providing technical knowledge, suitable crop varieties and production technologies at the grassroots level through their local offices

Bangladesh Livestock Research Institute (BLRI)

Savar, Dhaka 1341, Bangladesh; Tel: 880-2-7791676; dgblri09@yahoo.com, dgblri@bangla.net; <http://www.blri.gov.bd>

It is a public livestock research organization is advocating at least one duck breed in the coastal area and has also developed fodder variety that can potentially be cultivated in the saline area

National Agricultural Research System (NARS) Institutes, (from Abu Wali Raghieb Hassan, DAE, Dhaka; response 1)
Available at: <http://www.barc.gov.bd/nars.php>

NARS formed an apex body, Bangladesh Agricultural Research Council (BARC), for strengthening twelve public agricultural research organizations for an efficient & effective agro research system

Agriculture Information Service (AIS), (from Abu Wali Raghieb Hassan, DAE, Dhaka; response 2)
Khamarbari, Farmgate, Dhaka 1215, Bangladesh; Tel: +880-2-9112260; Fax: +880-2-9144644; dirais@dekko.net.bd;
<http://www.ais.gov.bd/>

It provides agricultural reports, leaflets, booklets, newsletters, magazines, etc. for creating awareness new technologies among farmers for boosting up agricultural productivity.

Recommended Documentation

Saltbush (Atriplex species), (from Torsten Mandal, Denmark; response 1)
Bulletin; by G. Moore, P. Sanford & T. Wiley; Department of Agriculture and Food Western Australia; Perth; 2006
Available at: http://www.agric.wa.gov.au/objtwr/imported_assets/content/past/saltbush.pdf (PDF, Size: 292.45 KB)

The document provides basic information about Saltbush species with description of the species, key features, soil-climate adaptation, nutrition value and production system.

Project Factsheet: Community-based Adaptation to Climate Change through Coastal Afforestation, (from Aminul Islam, UNDP, Dhaka)
Factsheet; by UNDP Bangladesh; Dhaka
Available at: <http://www.undp.org.bd/projects/prodocs/Coastal%20Afforestation/FINAL%20Coastal%20Afforestation%20factsheet%20-2012.pdf> (PDF, Size: 982.19 KB)

The document provides information of climate change project by which coastal beneficiaries and community get an opportunity to diversify their livelihood options.

From Sanjib Kumar Saha, CDMP II, Dhaka

Reducing vulnerability to climate change: the pioneering example of community-based adaptation
Book; Edited by Ahsan Uddin Ahmed; Centre for Global Change in association with CARE Bangladesh; 2010

It compiles some key lessons learned through the RVCC project and adds to the body of knowledge which proves useful to both researchers and practitioners across the developing world

Reducing Vulnerability to Climate Change (RVCC) in Southwest Bangladesh Report of the Monitoring Mission
Report; by Barry Smit; Canadian International Development Agency (CIDA); February 2005
Available at: <http://www.careevaluations.org/Evaluations/BGD%20-%20RVCC%20-%20Progress%20Report%20-%20Feb%202005.pdf> (PDF, 134.72 KB)

The document discussed the progress of RVCC project toward achieving the expected results, primarily at the outcome level, and to provide some key recommendations

From Abu Wali Raghieb Hassan, DAE, Dhaka; response 1

Agricultural Adaptation Techniques for Saline Prone Areas
Report; Disaster & Climate Risk Management in Agriculture (DCRMA) Project; Khamarbari, Dhaka
Available at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res1-en.doc>, (DOC, Size: 46 KB)

The document provides various agricultural options for different seasons that are mainly suitable in the saline prone areas for sustainable crop production to climatic vulnerabilities.

Agricultural Adaptation to Climate Change in Bangladesh
Presentation; by Abu Wali Raghieb Hassan
Available at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res2-en.pdf>, (PDF, Size: 680 KB)

Presented during a workshop addressing country information, agricultural adaptation, key lessons from relevant projects, agricultural service providers of Bangladesh.

From Abu Wali Raghieb Hassan, DAE, Dhaka; response 2

Rice-Based Appropriate Technology in the Saline Area
Report; by Jibon Krishna Biswas, Md. Ansar Ali, Md. Abdullah-Al-Mahbub, Tahmid Hossain Ansari, Abu Wali Raghieb Hassan; Khamarbari, Dhaka
Available at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res3-en.pdf>, (PDF, Size: 87 KB)

The report discussed general information, suitable crops, soil & water managements, irrigation system and other adaptation system in the saline prone areas of Bangladesh

Agriculture in the South-Western Region of Bangladesh: Potential Adaptation Strategies and Research Progress

Research document; by Md. Ansar Ali, Jibon Krishna Biswas, Tahmid Hossain Ansari

Available at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res4-en.pdf>, (PDF, Size: 340 KB)

It stated saline tolerant varieties, soil salinity management strategies, agricultural adaptation strategies based on different risks, some recommendations, etc. in the South-western region

Relative Tolerance of Some Plants to Salinity

Document Available at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res5-en.pdf>, (PDF, Size: 195 KB)

The document speak about tolerance capacity of some plants species with different salinity

Master Plan for Agricultural Development in Southern Region of Bangladesh, (from Abu Wali Raghieb Hassan, DAE, Dhaka; response 3)

Report section; Department of Agricultural Extension (DAE)

Available at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res6-en.doc>, (DOC, Size: 71 KB)

The document provides districts wise land utilization and snap shot of cropping pattern information in the Southern region of Bangladesh

From Torsten Mandal, Denmark; response 3

Managing Climate Extremes and Disasters in the Agriculture Sector: Lessons from the IPCC SREX Report

Report; by Gemma Norrington Davies, Catherine Cameron and Emma Back; Climate and Development Knowledge Network (CDKN); 2012

Available at: <http://cdkn.org/wp-content/uploads/2012/10/SREX-lessons-for-agriculture-sector.pdf> (PDF, Size: 3.04 MB)

The summary report highlights lessons learned from the IPCC special report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (known as SREX).

Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change

Report; by Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley; Cambridge University Press, Cambridge, UK, and New York, NY, USA; 2012

Available at: http://ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf (PDF, Size: 31.06 MB)

The report focuses on the relationship between climate change and extreme weather and climate events, the impacts of such events, and the strategies to manage the associated risks.

Recommended Portals and Information Bases

Polypropylene (From Torsten Mandal, Denmark; response 2)

Available at: <http://en.wikipedia.org/wiki/Polypropylene>

It is a methyl group chemical which is widely used for making polybags, plastic materials. Polypropylene is tough, flexible and combustible material that is not easily biodegradable in soil.

Community Based Adaptation to Climate Change through Coastal Afforestation, (from Aminul Islam, UNDP, Dhaka)

Available at: <http://cbacc-coastalaffor.org.bd/>

The project is reducing vulnerability and ensuring sustainable livelihood & adaptive capacity of coastal communities to the impacts of climate induced risks in the coastal areas of Bangladesh

From Sanjib Kumar Saha, CDMP II, Dhaka

Reducing Vulnerability to Climate Change (RVCC) Project

Available at: http://www.carebangladesh.org/cw_pdetail.php?projectid=7

RVCC project was supported by CIDA with the aim to diversification of livelihood opportunities and food production for securing economic condition of the vulnerable communities.

Disaster & Climate Risk Management in Agriculture (DCRMA) Project

Available at: <http://dcrma-dae.gov.bd/>

The project is enhancing the capacity of the most vulnerable communities to the negative impact of climate change through livelihood adaptation options, sustainable cropping & public awareness



Responses in Full

Photo Credit: CDMP

Torsten Mandal, Denmark (Response 1)

In addition to more expensive standard measures, saltbush (*Atriplex* species) is good for removing salt and producing fodder (but please check if the type fits to humid climate). Drainage challenges are also important where salt is a problem.

Trees can help against strong winds but take care to get well scattered openings (30-50%) and no sharp ends or too hot and tight low parts. Scattered big stems will not help much against sudden flood waves, but hedges and mangroves will. Hedges on land can help retention of mangroves andland instead of all becoming mudplain by erosion and siltation. Salt tolerance of different types of trees varies and I can assist with details including improved low-cost establishment methods based on my published and unpublished research findings.

Access to good, low-cost, fast-growing, multipurpose wood (and trees that can be climbed) may help much more for the same money than concrete buildings (but they may be financed by credit). A raised store and survival shelter can help a lot too.

Battery operated phone and radio alert service and improved roads (or cheap road sides for slow and light traffic) to get off the coast can help too.

M. Aminul Islam, UNDP Bangladesh, Dhaka

Let me share Community Based DRR and CCA Fortified Livelihoods Initiative from UNDP supported community based adaptation projects experiences:

Agriculture, forestry and biodiversity based livelihood options in saline and cyclone prone coastal areas:

- Salinity tolerant crops and homestead based vegetables:
 - ▶ Rice crops: (i) BINA 8, BRRI-47 "Boro", BRRI 40 & 41 "T. Aman
 - ▶ Vegetables: chilli, soybean, sugarbit, bitter gourd, sweet gourd, ground nut, water melon, tomato, cowpea, mustard, mungbean (better in raised bed with mulching).
- Fruit trees with saline resistant capacity:
 - ▶ Coconut, betelnut, Amloki, Amra, Amrapoli Mango, Jujube, Papya
- Apiculture or bee keeping
- Cattle fattening (feeding prepared food) or lambs
- Aquaculture
- Mud crab fattening
- Integrated Rice and Fish farming
- Pigeon rearing

Forestry activities / Plantation:

- Mangrove: commercially important such as i) Golpatta; (ii) Keora; (iii) Kholsi; (iv) Kakra and Singra; (v) Sundori and so on
- Polybag nursery development
- Handicrafts / cottage industry

Challenges:

Livelihood options are developed through knowledge acquired against disaster risks and adaptation processes over time. Cropping season is a matter of knowledge and wisdom that shows how to avoid seasonal disaster / weather risk. Farmers go for crop selection as per soil suitability which is a natural process of DRR-CCA synergy. However, emerging climate change and climate variability is a challenge to this knowledge base, as it goes beyond the traditional coping wisdom. Structural and non-structural risk reduction is a need to ensure food and livelihood security against the confirmed hazard prone areas which are further threatened by climate induced disasters of higher intensity, severity and frequency. This trend of incremental risk aversion requires additional investment through adaptation programme. Identification of such threat to coping wisdom and damage gives indication of adaptation cost at household level; but valuation of the change of ecosystem and irreversible change in environment is another challenge.

Naimul Islam, BDPC, Dhaka (Response 1)

Thanks you so much for sharing experiences from UNDP projects. The suggestions are extremely helpful. May I request you to give us some further advice from the experience of this project how to (strategy/approach) provide these types of assistance to the vulnerable people? Should it be grant or credit? Should it be in kind or cash?

Secondly, you mentioned polybag nursery. After Sidr, some experts said that the huge number of tree felling happened due to polybag nursery, since the tree roots went sideways instead of downwards making the trees vulnerable to high speed wind. Could you please let us know if your project learning has proved that wrong.

Thank you once again for your valuable advice and support.

Mirza Shahidul Islam Khaled, Shankalpa Trust, Borguna (Response 1)

(Original post was in Bangla)

The debate of using polybag or earthen pot (commonly known as Tali) for growing sapling has been going on since 2007. A Ranger from Bangladesh Forest Department spoke in favour of polybag as the main root can easily penetrate the polybag through the tiny holes in it that assist the roots spread into soil. Moreover, these polybags are made of Poly Propylene (PP) which degrade anyway within months.

Torsten Mandal, Denmark (Response 2)

PP stands for polypropylene (<http://en.wikipedia.org/wiki/Polypropylene>) and is not biodegradable neither are PE (Polyethylene) more commonly used for bags. In coastal areas they will contribute to the recently discovered accumulation in the marine food chain of small plastic fragment with much adsorbed toxins. The bags can be removed when planting and burned under good condition if possible or recycled. Biodegradable plastic cost about 3 x normal cheap synthetic plastic like PP and PE. Planting with bags on limit essential root soil/water contact even if some root grows deep. In an experiment I was surprised how a flexible plastic film band made for marking trees restricted stem growth.

The most sustainable, cheap and smart methods (and best for taproots) are probably improved low-cost establishments used right and well organized based on direct seeding of at least tree-legumes (I have published much on) and other related methods I and some others have good experience with requiring much less water and soil (+pathogen) transport than the usually promoted methods. A lot of plants are needed to break impact of flood waves. Very cheap methods are needed for sustainable pro-poor results.

Shakeb Nabi, Netherlands

Congratulations to BDPC for building a consensus on different livelihoods initiatives that can be taken up in salinity prone areas. I am sure it will prove to be a great learning opportunity for all of us who are working with the marginalized communities in the coastal area.

For me the problem is complex and with the impact of climate change increasing with elevated frequency and intensity of natural disasters, the problem is going to get even worse in the future. One of the most important solutions for me is thinking out of the box and look at other livelihood options which are less prone to climate change or which can better endure the impact of climate change.

In some of the coastal areas in Bangladesh as the land has turned non cultivable due to increased salinity, the community has taken up prawn culture. There is a lot of debate about its implications in the long run. I feel that this area needs to be studied properly before drawing a conclusion.

There are some examples from the eastern coasts of India where immediately after the Tsunami, the community adapted and shifted to cattle rearing and dairy. This change presented a huge challenge as dairy farming requires cold storage facilities and it almost impossible in the coastal areas.. For a country like Bangladesh where fresh milk is a very rare commodity, this option could be explored.

For practicing the existing livelihood options, efforts need to be made to reclaim the land from salinity and also ensure further non-degradation. There are lots of scientific ways of treating the land which needs to be explored.

I would also suggest that investment is also made on creating infrastructure which prohibits further salinity of land.

In the end I would suggest that an emic study needs to be carried out with the community to find the solution

Rezaur Rahman, Institute of Water and Flood Management, Bangladesh University of Engineering and Technology (BUET), Dhaka

Agriculture based livelihood practices are more appropriate in saline and cyclone prone areas as these practices are more resilient than other types of livelihood practices.

Challenge:

The adaptation options need to be continuously monitored and updated as the agronomic conditions including soil salinity in the coast is continuously changing due to climate change. A crop variety which is suitable this year may not remain suitable next year depending on change in salinity. Agricultural extension services in the coast need to be appropriately trained and equipped in this regard.

Sanjib Kumar Saha, Comprehensive Disaster Management Programme (CDMP II), Dhaka

In addition to the list of Dr. Aminul Islam, UNDP, I would like to suggest the followings:

A. Agriculture

- Cultivation of grass pea (Kheshari) following Aman. It could be sown directly to the field (even before the rice harvest) while the soil retain some moisture
- Cultivation of sweet gourd and potato by using mulch (rice straw or water hyacinth). Mulch prevent capillary water evaporation and thus restrict salt to infiltrate inside the ground
- Bangladesh Agriculture University plum (Kul) Cultivation, which has been found suitable in the coastal area.
- Cultivation/promotion of Choi (a slender and climbing herb, popularly used as hot spice in the mutton curry in south west coastal area)
- Cultivation/promotion of Reed (hoglapata) - which is a local species and can withstand in the salinity as per the 'RVCC' experience
- Cultivate/promote Drumstick (Sojne data)

B. Livestock

- Duck - Bangladesh Livestock Research Institute (BLRI) has been advocating (at least) one duck breed that has potential in the coastal area
- Fodder cultivation - BLRI has produced/promoted a fodder variety that can potentially be cultivated in the saline area
- Can easily promote sheep, buffalo

C. Cottage/small industry

- Bamboo baskets, pati, fishing net etc
- Fish/poultry feeds

May find out 'RVCC' study report, experiences (Dr. Ahsan Uddin, CGC conducted a study). May also communicate with an ongoing CDMP II supported DAE Project called 'Disaster and Climate Risk Management in Agriculture (DCRMA)' Project. The project operates in coastal districts. DAE has also wealth of experience in the coastal area. May also contact local stations of BARI, BRRI, BINA for information and materials on their latest technologies.

Since the project activities involve awareness development, it is critical that it also collect, translate and disseminate updated information, data on the scientific study on climate parameters and other features of the coastal area. This is demand of the time and the affected population. We cannot afford any more just SAYING that climate is changing in our coast; we have to have proof and its our responsibility to downscale (as far as possible), translate and interpret the predictions in local language so that the local community understand and use the information. The technological suggestions, options or measures we are suggesting/testing could be better promoted in a package with the updated data and information (say for trend or prediction of rainfall or temperature or salinity intrusion and how these can potentially influence the adaptation of the technologies).

As we all know the challenges of our coastal area are enormous and we have to bear the brunt of the emerging climate change crisis and the related displacement which might entail local level (if not national) socio-economic unrest and uncertainty. The challenge of adaptation or adoption is regular and continual process and we have to be able to introduce, trial and learn new technology and so on.

Dilruba Haider, Solution Exchange Bangladesh, UNDP, Dhaka

We have received some good responses to the ongoing query on 'Climate Resilient Livelihood Options', which have cited some conventional and some unconventional options with regards to agriculture, forestry, fisheries, livestock and cottage industry. In the course of discussion the query poser sought the community's advice regarding the strategy/ approach to implementing those suggested livelihood options.

I would like to touch upon the strategy question, but starting with the forestry issue especially in the backdrop of the storm that lashed some coastal districts of the country last Wednesday.

Several members have talked about tree variety and nursery system in the coastal belt both in terms of salinity resistance as well as deep root to withstand high wind, in the course of discussion of this ongoing query. We saw during last Wednesday's storm that many of the 22 deaths were caused by falling trees. During Sidr in 2007 the picture was the same. It's high time that we really invest some time and effort in identifying the root causes of this massive tree felling and do something to stop it. Is it the type of trees or the way the saplings are grown in nurseries, or both? In 90s the disaster reduction community took a strong stand against CI Sheet roofing since those were causing massive injuries during cyclones, flying like lethal blades. That resulted in improved house building techniques that minimized that horrible flying of CI sheets during storms (couldn't replace CI sheets though, since we couldn't find any affordable alternative). The issue of felling of trees in storms/cyclone also has to be addressed seriously by the disaster reduction community.





Now coming back to the livelihood option issue; one member pointed out that although there are huge arguments and views against shrimp cultivation in the coastal belt of Bangladesh, this particular type of livelihood practice needs to be carefully examined under the current circumstances. In one of our previous discussion on land use planning, members suggested that we need to do land zoning to ascertain which areas are suitable for what activities. Lands in the coastal zone which are already highly salinized could actually be earmarked for shrimp cultivation and support could be provided by livelihoods support group/programmes for that, as opposed to blanket criticism against it. This would also help lands outside the earmarked areas to remain free from the clutches of shrimp cultivators.

Rice/fish cultivation is a good option for the area. Shrimp farms where 'golda' variety is cultivated, could be used for saline tolerant rice (BR 47) cultivation. Sweet water rice fields could be used for white fish (sweet water fish) cultivation, especially by digging drains surrounding the rice field which would act as shelter/safe abode for the fish as well as breeding ground as water reservoir.

As for the strategy, BDPC should undertake a mapping exercise of current livelihood practices in their target areas, doing market analysis both in terms of inputs and sale including the marketing chain, and of course the best possible and locally acceptable, climate resilient alternative livelihood options with possible costing. BDPC should deploy a mission consisting of one livelihood and one climate change expert to do the mapping. The mission could take the CDRR query outcome as the basis for the mapping. If necessary the donor for the project should be approached for approval of this task, if not there already in the budget. Once done, this would give BDPC the firm ground to move ahead.

Abu Wali Raghieb Hassan, Department of Agricultural Extension, Dhaka (Response 1)

Below please find some suggestions for agro based climate resilient livelihood options:

Technologies Available for Saline prone areas:

National Agricultural Research System (NARS) Institutes have given special trust to develop salt tolerant crop varieties suitable to cultivate in the region. Bangladesh Rice Research Institute (BRRI) and Bangladesh Institute of Nuclear Agriculture (BINA) have developed some rice varieties which perform well in the region. Some of the rice varieties for Boro season are: BRRI dhan (rice) 47 can tolerate EC 12 dS/m at seedling stage and 8-10 dS/m at mature stage with the potential of 6.5 t/ha yield. BINA dhan-8 can tolerate EC 8 -10 dS/m at mature stage with potential of 6.0 t/ha yield. BRRI dhan 55 is a newly developed variety which can be grown in both Aman and Boro season.

BRRI dhan 53 and BRRI dhan 54 are also suitable for Aman season which can tolerate EC 8-10 dS/m. Other rice varieties performing well are: BR-23, BRRI dhan 40, 41, 44, and getting popularity as aman variety. BRRI dhan 51 and 52 are to some extent submergence tolerant. One salt tolerant line BR 7105-4R-2 is in the pipe line. This will be suitable for Boro Season.

Bangladesh Agricultural Research Institute (BARI) has developed a number of crop varieties other than rice suitable to cultivate in Southern delta. BARI developed Mungbean varieties: BARI Mug 5 and 6 are very good for the region. BARI Scientists reported that BARI Mung 6 gave 1423 kg/ha yield against local variety which gave only 400 kg/ha in Noakhali. Oilseed Research Centre of BARI developed some other crop varieties of Oil crops, Soybean and groundnut. BARI Soybean 5 and 6 yielded up to 2750 kg/ha against traditional variety (Sohag - also a BARI variety) which gave 2100 kg/ha. BARI Chinabadam 8 and BINA Chinabadam 4 yielded 1850 - 2600 kg/ha. BARI developed Maize varieties are getting popularity. BARI developed Potato and Sweet Potato Varieties are very popular in the region. BARI also developed some fruits like Amra, Coconut, guava and some vegetable varieties which are performing well in the region. BARI Halud is very popular there. Among other BARI developed a lot of production practices for the region.

BARI also developed some other technologies on management practices such as Potato cultivation with and without mulch where it is reported that Potato cultivation with mulch gave 23 t/ha against without mulch 14 t/ha at Noakhali.

BARI Scientists working at Noakhali reported that Cowpea yield can go upto 1400 kg/ha against 470 kg/ha by changing the management practices.

I am also sharing a report (can be found at: <http://www.solutionexchange-un.net/repository/bd/cdr/cr21-res1-en.doc>, DOC, Size: 46 KB) on agricultural adaptation in saline prone areas, produced by the DCRMA project of DAE, supported by CDMP. It gives various agricultural options for different seasons. Finally I am sharing a presentation (can be found at: <http://www.solutionexchange-un.net/repository/bd/cdr/cr21-res2-en.pdf>, PDF, Size: 680 KB) I made at Vietnam on agricultural adaptation in Bangladesh. Hope these would help BDPC to identify the most suitable livelihood options for their target population.

A.H.M. Saiful Islam, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh (Response 1)

It is a very good news that our National Agriculture Research System (NARS) Institutes have developed several crop varieties which can be adopted under different extremities of climate change scenario. We appreciate this contribution as well as hope that in future they will develop more suitable varieties which can be produced in different disadvantaged agro-climatic environment, which is essential to feed the growing population.

I would like to know if there is any information as to how many farmers are now cultivating these hazard tolerant crop varieties (salt tolerant, flood tolerant, drought tolerant etc.) and in which districts/areas.

Naimul Islam, BDPC, Dhaka (Response 2)

Assalamu Alaikum. Thank you very much for coming up with your valuable comments.

Since you are an expert in Agriculture, may I request you to advise us if the rice varieties suggested by some members: BR 47 and BINA 8 would be quite cultivable in Morrelgonj Upazila of Bagehat District (one of the most salinity affected district in Bangladesh). Are there any specific measure, cultivation method, land preparation that need to be followed to cultivate these rice varieties? Could you also please advise us about some seasonal vegetable cultivable at the household level in that saline prone area, where sweet water availability in the dry season is extremely limited.

Thanks again for your support and suggestions.

Monzurul Hasan Milon, Badhon, Bagerhat

Greetings from BADHON. We work in saline prone Bagerhat district.

The information of farmers who are cultivating hazard tolerant crop varieties in our working area is given below:

Bagerhat Sadar Upazila	500 Farmers
Fakirhat Upazila	500 farmers
Morelgonj Upazila	140 Farmers

Thanks for your cooperation.

A.H.M. Saiful Islam, Department of Agricultural Economics, Bangladesh Agricultural University, Mymensingh (Response 2)

Thanks for your mail. In fact I am not an Agriculture expert because I am from faculty of Agricultural Economics and Rural Sociology not pure Agriculture. Basically I would like to see the adaptation pattern as well as impact of those stress tolerant varieties in different climate change affected areas in Bangladesh. For this reason I was seeking information about cultivation areas as well as number of farmers.

So, I think if anyone from BRRI or from BINA or IRRI gives detail information about the crop physiology (like cultivation method, season, duration etc.) of different stress tolerant varieties that would be very much useful for the farmers as well as other expert.

Mirza Shahidul Islam Khaled, Shankalpa Trust, Borguna (Response 2)

The discussion on the current query must be very useful for any current and future livelihood and agricultural project implementation. Relief activities are executed post cyclone and many organizations implement livelihood and/or recovery projects after emergency situation is over. Unfortunately many a times these rehabilitation works are not very effective since they seldom address the affected people's real needs. There are some local plant varieties which could help the people in the coastal/saline area to recover soon. Agricultural research could help develop some improved varieties of these local fruit species which can endure higher salinity that can be planted right after cyclone.

Abu Wali Raghieb Hassan, Department of Agricultural Extension, Dhaka (Response 2)

I am sharing three Bengali documents which might help BDPC to implement their livelihood project at saline prone Morrelganj area. 'Rice-based appropriate technology in the saline area' (can be found at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res3-en.pdf>, PDF, Size: 87 KB) discussed some agricultural adaptation options; 'Agriculture in the South-western region of Bangladesh: potential adaptation strategies and research progress' (can be found at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res4-en.pdf>, PDF, Size: 340 KB) which is a research document stated general geographical setting, agricultural researches, potential saline tolerant varieties, soil salinity management strategies, agricultural adaptation strategies based on different risks, some key recommendations, etc. in the greater Khulna area; and the last document 'Relative tolerance of some plants to salinity' (can be found at: <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res5-en.pdf>, PDF, Size: 195 KB) speak about tolerance capacity of some plants with different salinity. BDPC should also contact OFRD, BARI, Satkhira and SRDI, Khulna for further information about Bagerhat area.

I am also suggesting BDPC to go through Agriculture Information Service website, www.ais.gov.bd, and can also visit IRRI or BIRRI websites where they can get many information about cultivation procedure of different saline tolerant varieties of Rice and others crops.

Torsten Mandal, Denmark (Response 3)

I am happy to see agroforestry is mentioned as a win-win and low-regret solution in the new IPCC report on climate change adaptation for DRR for agriculture <http://cdkn.org/wp-content/uploads/2012/10/SREX-lessons-for-agriculture-sector.pdf> forming part of the basis for http://ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf

SM Farid Uddin Akhter, Sasrai-Movement, Dhaka

The climate crisis has baffled Global community. Nature's behavior has been regularly irregular and erratic. The basic securities of food, water, energy, livelihood and human lives are highly threatened. Finding the climate resilient livelihood option is really tough and it needs deep pondering as well as much trial. Knowing nothing about project goal and objective, budget, duration, man power and their skill, types of activities designed/planned - putting comment or suggestion regarding climate resilient livelihood options might be like providing description of an elephant by a blind. Your information doesn't visualize the project mode whether it is to address running problem (conventional project implementation) or beyond.

Does your project intend to address the apprehended sea level rise that might affect the country by inundating coastal areas of Bangladesh - ecosystems, water, agriculture and food production? Experts opine that one meter sea level rise may dislocate about 35 million people from coastal districts by the year 2050, if not earlier. These may create severe problems for rural livelihood, local, regional and sectoral development such as agriculture, water and health.

If we really mean 'Climate Resilient Livelihood Options', it needs intensive long term Area Based Coping Development (ABCD) plan. It should focus/encompass each and every village. A program is needed to be designed according to geographical, physical and economic status of each village. As per my limited experience many successful projects were being implemented but community is still in the same situation. I think this is the peak time to have a pause and ponder for needed work and avoid the conventional project implementation.

If we consider the last 30 years project across the country - prominent feature/activities was the same other than project title. It was seen time and again that projects were implemented for the organization's sustainability and staff member's job continuation in the name of community development. So far I am informed BDPC is a renowned and responsible organization. You cannot implement any project like ordinary NGO with money making mood in the name of community development, disaster risk reduction and so on.

Identifying saline tolerant species in agriculture, fisheries, livestock and plant needs long term incessant/tenacious research of scientists based on peoples' voice. To get the peoples' voice we must have a long term effort from expert for patient hearing and discussion. Unfortunately our experts seldom stay long time in rural areas. We really need to do authentic baseline survey and collect information rigorously.

Therefore, to find the 'Climate Resilient Livelihood Options' first and foremost job is bringing significant change in the mindset of each individual and community. Each and every individual must have belief and confidence that 'I must face my problem through optimum utilization of available resources and time.' Each household should be considered veteran climate crisis fighter. To get this we must invest laborious effort of experienced/expert field worker; need continuous, constructive dialogue and discussion having mindset of sharing the experience, and honor the differences. In absence of said mindset and belief - distribution of cow, poultry, sapling, sewing machine, food item, microcredit wouldn't breed any result. Yes it is good to show in television, video films but contribute little in poverty or risk reduction or combat climate crisis.

Finally I like to conclude that each development worker should be pragmatic and prudent. Organization should be keen and responsible to uphold the programs, activities that are really needed for the betterment of community, nation and humanity. NGOs need to come up with appropriate, purposeful, logical plan and action. We all should be keen to initiate long cherished mindset and work together that could put a footprint of a next generation friendly earth. Our first consideration must be tomorrow, future of the next generation not the present organization's earning/sustainability or staff nourishment.

Please let us know the outcome of your project, and I welcome your views about my opinions.

Kamal Hossain, Comprehensive Disaster Management Programme (CDMP II), Dhaka

The discussion on the climate resilient livelihood for the South West generated lot of experiences, lessons, insights and recommendations so far. The dilemma and conflict regarding the shrimp cultivation could be solved through zoning as rightly mentioned by some members. However, the concern of the agricultural farmers, particularly rice producers should be addressed by ensuring that no new land is occupied in the name of shrimp cultivation.

Crab fattening has become popular in the south west and it is found to be good solution for productive use of highly saline water. It is most suitable for poor community as investment wise it is quite cost effective compared to cost intensive shrimp cultivation, while marketing wise easier than shrimp.

Producing saline tolerant rice variety can be promoted in rice-fish cultivation system where *Telapia* would be most suitable fish species because of its adaptability in salinity.

Indigenous adaptation strategies of the local community on the natural resource based adaptation can be incorporated with the new and innovative technologies.

Mohammad Sahariar Mamun, Dhaka Ahsania Mission, Dhaka

I have read all the responses to this ongoing query. I'm going to respond from the perspective of a layman, since I am no climate change or livelihood expert.

1. What type of livelihood practices would be more appropriate for saline and cyclone prone areas? Please share your successful and not so successful experiences.

Actually it depends on various factors. For example although Koyra in Khulna and Morrelganj in Bagerhat are both saline and cyclone prone areas, but can we propose same livelihood practices? Also can we propose same practice for 'South Betkashi' and 'Koyra' although both are in 'Koyra' Upazila of Khulna District. I think for some places resilient agriculture is appropriate whereas for some other places may be cottage industry, even industrialization would be more befitting.

2. What are the challenges you envisage/ or faced in implementing such climate resilient livelihood programme?

- Dissemination of knowledge of new livelihood technologies
- Build market linkage (backward and forward)
- Motivate people to follow new strategies
- Change social 'Tabu'
- Recover economic loss due to changed livelihood strategy

Build trust on functionality of new programme.

Zahidul Abedin, Solution Exchange Bangladesh, UNDP, Dhaka

Some members have suggested crop varieties which are supposed to be suitable in the coastal areas like Morrelganj. May I suggest BDPC to sit with the beneficiaries and local agriculture office before final selection of the crop variety. Of course the varieties developed by BRRI or BINA give higher yield, but there are many variables which should be considered with it to get the maximum yield.





When I was involved in a livelihood project in Shyamnagar, Assasuni area, one of the project activities was to provide cash support during the Aman season among the disaster affected farmers to restart their agricultural activities and suggested them to cultivate a rice variety developed by BIRRI for getting good yield. But our beneficiary farmers mentioned that farmers from 1-2 unions in Shyamnagar and Assasuni could get good crops if they choose BIRRI rice variety, as these areas are elevated than other unions. Most of the beneficiaries preferred to grow Kakshail, a local Aman variety which has more survival rate withstanding saline high tide and waterlogging condition, although yield is lower than BIRRI variety. But during Boro season, all of these farmers grow BIRRI variety (most probably BIRRI-47) as they do not have any fear of high-tide and waterlogging.

As Dilruba apa suggested mapping of livelihood practices should be priority-1 task for the livelihood project. This would also help BDPC to organize their activities- which activities to do when. Most of the people in the coastal areas are poor who work in either agriculture or fishing sectors, sometimes both, or as a day labourer. When I worked in Shyamnagar and Assasuni area we prepared a seasonality analysis (can be found at <http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res7-en.pdf>, PDF, Size: 9.8 KB), which was also some sort of livelihood practice mapping, of our project area that should help BDPC of their mapping exercise of Morrelganj area.

Finally, BDPC could consider some cash based interventions as an alternative livelihood options for their project that will help meeting up people's specific needs. All beneficiaries requirements are not similar - farmers need fertilizer or freshwater support for their agriculture, fishermen need money for going to sea for fishing. BDPC can do cash based intervention through Cashfor Work (CfW) which could be short-term community work, such as repairing roads, embankments, clearing debris or re-building infrastructure or Cash for Training (CfT) among the women who can use some extra income.

Abu Wali Raghieb Hassan, Department of Agricultural Extension, Dhaka (Response 3)

I am sending some more information from the 'Master Plan for Agricultural Development in Southern Region of Bangladesh' (<http://www.solutionexchange-un.net/repository/bd/cdrr/cr21-res6-en.doc>, DOC, Size: 71 KB) on the cropping pattern of that region. Along with that below please find some further relevant information and observations from a preliminary fact finding reports which have been collected from the field by personal visit, consultation with the DAE personnel, farmers, local elites and others departments like NARS Institutes: BARI, BIRRI, BINA and SRDI.

Bagerhat:

According to SRDI report in Khulna a total of 75% classified and 25% misc. Land out of which 61% is MHL and 7% MLL and 2% LL. Only 5% HL is being used for domestic and other purposes. In this district the major cropping patterns are:

- Fallow - Fallow - T.Aman
- Boro - Fallow - T.Aman
- Boro - Fallow - Fallow

Problems of Crops Intensification

Late harvest of T. Aman resulting in Rabi crops cultivation becoming late causing poor yield
Most of the years in the month of November heavy rainfall along with storm resulting loss of "zoo" condition of land.

After harvest of Local T.Aman variety late planted Rabi crops most of the times is affected by tidal surge.

In Barisal region most of the soils are clay type so becomes late for "zoo" condition and soils become dry quickly that makes cultivation very hard.As the Canals and River beds are high so water cannot run off or irrigation water not available.

Land tenure system - Real farmers are marginal and small category. Poor farmers have to hire, lease land from others to maintain their livelihood. Land tenure system is not favourable for tenants. Outputs sharing for owner and tenant 3:1, 2:1, 1:1 varied from place to place and for crop to crop. Land tenure system hinders crop diversification and intensive crop cultivation.

Crop productivity of coastal area can be increased in the following ways:

- a) Reducing yield gaps with improved management practices
- b) Introducing short duration T. Aman and facilitating cultivation of Rabi crops
- c) Cultivation of high value crops like water melon, vegetables, mung bean, soybean, chili, etc.
- d) Modernize the farmer's innovative practices such as Sorjan, raised bed plantation of vegetables, fruits, spices and some other horticulture crops.
- e) Expanding crops storage, processing and value added activities

Shashanka Saadi, Dhaka

I have been following up an interesting and in-depth discussion on climate resilient livelihoods for South West. I would like to thank the Mr. Naimul Islam to raise the issue and triggered a critical discussion. I have learned some very good points from the discussions.

I would like to keep my comments on two issues:

- a. Climate resilient livelihood
- b. Institutional Challenges

a. Climate resilient livelihood

Livelihoods of the people in South west region of Bangladesh, tormented by human made and natural hazards for more than three decades, cannot be identified from a uniform characteristic. And, as livelihood defined by experts like all of you, it is not only dependent on Agriculture (though majority of the population in Bagerhat, Khulna, Satkhira, district dependent on agriculture as direct and indirect means of livelihood in more than half of the time of the year). In last four years, after SIDR and then AILA, I have got the chance to talk with a good number of affected families, especially women, children, aged about the livelihood issue. Recently I am involved in an Impact Assessment Study for Christian Aid at regional level which gave me the following insights which I am sharing here:

- Climate Resilient Livelihood cannot depend on one income sources for the people of Bagerhat, Khulna and Satkhira. It should be a combination of agro and non-agro options.
- Most of the people want to move back to Rice and production of other agricultural commodities because the shrimp cultivation is not generating any sustainable income base for the middle income and poor families (only few families can get job for certain amount of time in the farms)
- In Satkhira, Shushilan with funding from Christian Aid, is working with the poor and middle income families to promote Saline Tolerant rice variety that you all have mentioned already. They are also working on vegetable seeds. One success I have heard about 'Math Kalmi' which can grow in saline water. But most of the vegetable seeds need access to sweet water what they documented so far.
- Livestock rearing is a big challenge and I am not sure how it can be climate resilient. After SIDR and AILA, a good number of goats, cows and poultry died in the saline affected areas when these were imported from outside of saline prone areas.
- Crab fattening becoming a popular livelihood option for many Poor & 'Poor Plus' families who can get access to small ponds near to river or canal. The profit is also good as the export of crab has increased in Bangladesh. But, again, it is dependent on saline water, which is not good to protect the agriculture.
- Technology is a major challenge for the people (institutions, organizations and people) as local knowledge cannot cope with the changed climate in those areas.

b. Institutional Challenges

- There are number of technology available at the institutional level (agriculture office, livestock office) but those are not accessible by people. There is no investment from national government to promote those technologies which can bring a bigger change.
- Before piloting any saline tolerant seed, soil test is a major step because the level of salinity is not same, even in a village. However, there is no sustainable investment to do that.
- Saline tolerant agriculture has become a synonym of climate resilient livelihood. First one can be a part of climate resilient livelihood but not the main part. Reasons of salinity intrusion include failure of embankments, shrimp cultivation, lack of sweet water flow from upper streams of the rivers etc. which are not a direct climate reason, I guess.
- In some areas, the productivity increased due to a combined effort of GO & NGOs, but there is a lack of strategy to create enabling market and supply-chain for the poor & 'Poor Plus' producers. For example, crab fattening becomes a popular activity, and mostly families are involved. But there is no such initiative from any actor to establish a supply-chain for the producers so that they can get sustainable good price.

Therefore, it's not only saline tolerant agriculture, climate resilient livelihood need to include small trade, handicrafts, market place protection (where many poor families work), etc. at the same time, we need to invest more on institutional capacity building, so that people can get access to available technologies, knowledge, information on climate resilient livelihood.

Sayed Mahmud Riadh, USAID's Integrated Protected Area Co-Management Project (IPAC), Dhaka

Like other members of this forum, I have learnt a lot from this discussion. I am not a livelihood expert but as a development practitioner in NRM I am also very concern about climate change and livelihoods issue. Through my professional work I have got the scope to visit and work in Sundarban areas.

I appreciate Mr. Saadi for his organized comments and suggestions. I agree with his opinion. To build a base for climate resilient livelihoods we need to broaden the options. Though most people prefer to depend on agriculture, we have to create opportunities for them to take other option of livelihoods like non-farm activities, small trading etc. Again, access to technology, micro finance support and institutional capacity building is important to develop a base for climate resilient livelihoods.

Subindu Paul, Shushilan-PROSHAR Project , Khulna

I am happy to get so much information on climate resilient livelihood options for south west and thanks to all of you. As a learner, expert's opinion and suggestions are invaluable to enrich my knowledge.

For South-west selected livelihood options should be traditional and 'modified-traditional' and must comply with physical environment. In line with decreasing upstream freshwater inflow non saline to saline delta building process is continuing here. So agro based livelihood should be 'modified-traditional'. In that case we have to consider both the visible and invisible factors. Consideration of only visible factors will increase risk to agriculture for example outbreak of pest. We have to be vigilant about agro biodiversity and quality of soil and water. Only production does not indicate good option. So explored options should be diversified and must bear enough market value. We can think about agro-based off firm activities also.

In references to previous suggestions and comments, I think increasing production might not necessarily indicate good adaptation strategy rather sustaining optimum production level for many years will be the best adaptation for not only coastal inhabitants but also the entire Bangladesh in the field of agro practice. Risks to maintain such production level should be identified and addressed. In that case we can explore indigenous practice for better climate resilient livelihood/adaptation option for south west.

Habibullah Bahar, Manab Mukti Sangstha (MMS), Sirajgonj*

I would like to go with plinth raising activities which help to keep continue daily life even though low land flooded during high tide. Moreover, home gardening vegetables can be planted at the slope of the raised plinth and it would not only increase extra nutrition to the family but also avoid soil erosion because of water current.



Photo Credit: Zahidul Abedin, UNDP

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Comprehensive Disaster Management Programme (CDMP II) **Ministry of Disaster Management and Relief**

