

Char Development and Settlement Project CDSP B (AF) Bangladesh



Impact Assessment study on commercialization of extended Sorjon in CDSP

Technical Report No 7

November 2024



Government of Bangladesh / IFAD / Government of the Netherlands

Implementing Government Agencies:

- Bangladesh Water Development Board (BWDB)
- Ministry of Land (MoL)
- Local Government Engineering Department (LGED)
- Department of Public Health Engineering (DPHE)
- Forest Department (FD)
- and NGOs



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Abbreviations

BWDB	Bangladesh Water Development Board
CDSP	Char Development and Settlement Project
Dadon	Dadon (Persian word) meaning advance money for development purpose
DTW	Deep Tubewell
FF	Farmers Fourm
FLI	Field Level Institute
FGD	Focus Group Discussion
GoB	Government of the Bangladesh
GoN	Government of the Netherlands
HYV	High Yielding Variety
IGAs	Income Generating Activities
KII	Key Informant Interview
Khal	Canal, creek
Kharif-I	Mid-March to Mid-July
Kharif-II	Mid-July to Mid-November
Khas	Government owned land
Khatian	Record of right
MoL	Ministry of Land
Rabi	Mid-November to Mid-March
Sorjon	Cultivation of Vegetable cum Fish
STW	Shallow Tubewell
TA	Technical Assistance

Currency: Bangladesh Taka (BDT): Tk. 117.35 = USD 1, Tk.117.73 = EUR 1 (9 June 2024)

Conversions Area: 100 decimal = 1 acre (ac) =0.405 ha, 1 bigha=33 decimals,

1 Kani=160 decimals, 1 Kora = 2 decimal, 1 Gonda = 4 decimals, 1 maund=40 kg,

Acknowledgements This report was prepared by the Monitoring and Evaluation Unit, CDSP B(AF). Written: by Kiran Sankar Sarker, Monitoring & Evaluation and Knowledge Management Advisor.

Preface

This assessment case study report on commercialization of Sorjon in CDSP B(AF) has been written as a follow up step of recommendation and agreed actions of IFAD Implementation Mission 2023 fielded for the Char Development and Settlement Project-CDSP B(AF). IFAD IM's recommendation was to conduct a short study on commercialization of Sorjon system (cultivation of vegetable and rearing fish).

The Sorjon is a system of integrated vegetable and fish production. It is believed to have originated in Indonesia, where it is known by the same name. In the Sorjon system, production of vegetables cum fish was first piloted during CDSP III phase. During the CDSP IV period, Sorjon system was introduced in low-lying and water logging wet lands. Because farmers used to get only a single crop due to water logging and low-lying lands. As Sorjon allows farmers to grow vegetables round the three cropping seasons Kharif-I, Kharif-II and Rabi season along with fish culture into the channels of Sorjon system, many farmers of Char Nangulia and Noler Char have converted their low-lying and water logging land converted into Sorjon plots. During (2015-2018) farmers used hand tools and manual labours to convert their land to Sorjon. Part of char Nangulia is relatively poorly drained while being protected from severe flooding, and sorjon has been widely adopted here, with data from the impact study suggesting that it covers 5% of cultivable land and involves 11% of farming households. For more details, refer to pp. 8-9, Agricultural Developments, Technical Report No. 25, CDSP IV).

During CDSP B(AF), farmers used to convert their low-lying and water logging land into the Sorjon system using mechanized excavators. This time, they have used excavator for developing their lands in most areas of Char Nangulia, and Char Maksumulm Hakim which is actually part of future CDSP V phase. In those locations the Sorjon systems are being developed using mechanized excavators to develop Sorjon systems. Another mode of development is partnership with local money investors who used provide money/invest on to the Sorjon plots. The investors used to call "Dodonder". Dadon is a Persian word meaning advance money for development purposes.

This document combines and summarizes all efforts and initiatives of the commercialization Sorjon system by the farmers, brokers, whole sellers and Dadonders. The development of the Sorjon systems in five-locations within CDSP B(AF) command areas have considered for the study locations. Then three cropping seasons have been considered to aide economic analysis as per recommendations of IFAD ISM.

The author is very much thankful who have helped by providing relevant information. Special thanks to Mr. Liakat Ali, NGO Coordinator, CDSP B(AF), Mr. Nurul Amin Kamran, NGO Livelihood Facilitator (Agriculture), SSUS for their kind cooperation and participation into field trip to locations of different Sorjon systems.

The author will gratefully acknowledge and appreciate for comments, feedback and critical reflections from readers and users towards further updates and incorporations.

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Executive Summary

The **overall development objective** of Char Development and Settlement Project, CDSP was to reduce poverty and hunger for poor people living on newly accreted coastal chars, which are being achieved via improved and more secure livelihoods. To reduce the social, institutional and environmental vulnerability faced by coastal char dwellers Char Development and Settlement Project (CDSP) has been successfully implemented several development interventions for decades (since 1994) by phases (I to IV) and current CDSP phase B(AF). There have been five-project components (i) Component-1: Protection from climate change (water management infrastructure and social forestry), (ii) Component-2: Climate-resilient infrastructure (internal infrastructure and water & sanitation (DTW and household latrines), (iii) Component-3: Land settlement and titling, (iv) Component-4: Livelihood support (agricultural support and social & livelihoods support, and (v) Component-5: Technical assistance and management support.

Through implementation of component 3 (land settlement and titling) a total of 38,366 coastal landless families have been provided 49,875 acres of govt. khash land (@ 1.3 acres of land per family. Settled land titling created opportunities for coastal char dwellers to develop their own land for productive purposes. All settled coastal char families have also been supported by agriculture and livelihood component interventions from CDSP to ensure the development of improved and more secure rural livelihoods for char households.

Since inception CDSP has already introduced several salinity tolerant varieties of vegetables (i.e. HYV rice BIRRI 41, 42, 52 etc. and hybrid vegetables to increase both yields and production of such crops. To get more production round the seasons of the year, CDSP Phase III has introduced and piloted 'Sorjon' method of vegetable cultivation cum fish culture in the low-lying and water-logged areas. As a result, during CDSP Phase IV, this new method of integrated cultivation method has brought a revolution for the char farmers who were owning low-lying and waterlogged lands. Due to successful implementation of 'Sorjon' method of cultivation, the coastal farmers are now growing 300-400 times of crops from their land. The current impact study has been based on the positive changes and improvement brought to the lifestyle of char dwellers and have made a history of collaboration of commercialization of extended 'Sorjon' over some specific char and location of CDSP command areas.

The general purpose of this impact case study is to describe the situation of introduction of Sorjon systems by farmers onto their low-lying land for producing vegetables and fish; identify benefits accrued to farm households; and also, to document the cases of massive commercialization of Sorjon involving multiple stakeholders i.e., land owners, farmers, arotiders/wholesalers/seasonal money lenders.

Specific objectives are (i) To document traditional cropping system by char dwellers in the study areas, (ii) To explore the cases of changing cropping system (i.e., Sorjon), (iii) To determine extent of effectiveness of adaptation of Sorjon system, (iv) To determine profile of Sorjon farmers in different coastal chars, (v) To determine economics of Sorjon system adopted by char dwellers in chars, (vi) To identify the challenges of char dwellers in changing crop patterns using Sorjon system.

The study emphasizes the acts of commercialization and extension of Sorjon in new areas of CDSP B(AF). In low-lying and waterlogging wet lands of CDSP command areas, farmers are cultivating vegetables and fish adopting Sorjon system of cultivation. Specifically, there have been huge adoption of Sorjon system in Char Nangulia since CDSP IV phase due to availability fellow wetlands. In Char Nangulia all Sorjon plots have been converted using manual labours.

The Sorjon system is the cultivation of vegetables on ridges with fish in the ditches between these ridges. In Char Nangulia the ridges are mostly around one meter wide at the top and spaced two meters apart – although in places ridges and spacing can be wider than this. Ridges are about 60 to 90 cm high, which

means crops are kept above the water, even during the wet season. The ditches between the ridges hold water for six to eight months per year, and can be used to cultivate fish as well as being a source of water to irrigate the crops.

Sorjon are used for intensive vegetable production, with a framework of bamboo, string and netting being built over the ditches to support a sequence of climbing plants. Before the rains start in March, cucumbers are planted, and these are followed by a variety of gourds (including snake, bottle, bitter and ribbed gourds) in the early monsoon, with yard long bean (asparagus bean) and country bean (lablab bean) in the later monsoon, with country beans continuing to be harvested through the dry season up to the following March. These crops overlap with each other, with relay cropping allowing more or less continuous harvesting for 9 or 10 months per year (early June to March).

Initially development of Sorjon system began with manual modes using manual hand tools used for excavation especially in the coastal chars like Char Nangulia and Noler Char. The hand tools include mostly hoe/spade locally called 'kodal' and 'belcha'. As mentioned above, Sorjon system is developed in low-lying land where only a single crop is cultivated annually. Manual excavation is highly time-consuming and costly, now-a-days farmers are hiring mechanized excavator (locally called 'Boga machine' for the development of Sorjon plots within short time. In general, the land owner used to develop his/her land into Sorjon to get more vegetable and fish, even rice from Sorjon plots in the beginning.

A sample of 60 Sorjon plots has been considered for this short survey. Sixty sample plots have been selected from five locations of CDSP B(AF) command areas. These were (i) Lakasmi Ghat, Char Alauddin, Maksumul Hakim, (ii) Mustafa Bazar, Char Alauddin, Maksumul Hakim, (iii) Montaj Khali, Char Torab Ali, Maksumul Hakim, (vi) Boroitola, Char Torab ali, Maksumul Hakim, and (v) Char Nangulia, UP-Char Clerk.

It has been found that Sorjon system has been established based on joint development partnerships between land owner, operating farmers, whole sellers (arotdars) with specified terms and legal entities. Legal entities come into force in two ways:

- The 1st agreement is held between the land owner and the whole sellers (arotdars) for transfer of specified lease money (re-payment annually).
- The 2nd agreement is held between the operating farmers and the whole sellers (arotdars) for transfer of their seasonal production with the price of the products based on open auction calls held locally.

Fish culture is done in the furrows/ditches of Sorjon plots. In most cases water area becomes 30% of Sorjon plot in Char Nangulia and nearly 50% in other locations of Maksumul Hakim. No other partners are to be involved with any financial support for fish culture. The operating farmers invest 100 cost of fish culture. The key inputs for fish culture are fingerlings, feeds and nets. Fish is reared round the year for 7-9 months depending availability of water. Fish is usually harvested during Rabi season.

Initially, CDSP IV created the physical conditions suitable for Sorjon production, along with communications infrastructure to link farmers to markets. Farmers have learned about the Sorjon system through technical training, visits to other groups, and membership of Farmers Forums and NGO groups. The project has also introduced some improved technologies into the system. New varieties of Sorjon vegetables have been introduced, including hybrid varieties of cucumber and gourd, and new varieties of yard long bean and new varieties of country bean that are more productive for produce an earlier crop of pods at a time when market prices are at their highest.

The study reveals that a total of 289.15 MT of vegetables grown during three seasons of the year of which 162.92 MT grown in Kharif-1 season, 14.25 MT in Kharif-2 period and 111.98 MT in Rabi season. Total

sales from vegetables were about 12482.69 thousand of Taka. Seasonally, 6192.33 thousand Taka at Kharif-1, 386.67 thousand Taka in Kharif-2 and 6160.46 thousand Taka in Rabi season.

Total fish production was 23585 Kgs which was sold at 3215.34 thousand Taka. It is noted that fish has been on 30-40% of water areas from total areas of Sorjon plots.

It has been observed that many Sorjon farmers of Char Maksumul areas are rearing livestock animal within the Sorjon plots. A total of 4-10 cows and 3-5 goats are being reared inside of Sorjon plots. The Sorjon farmers informed that due to availability of huge vegetable wastes they can rear domestic animals with minimum cost and saving times. Besides they can make and use green manures and composed fertilizer made from cow dung and green leafy vegetable waste.

Commercialization of Sorjon systems has taken place and spread over the locations of Boroitola, Montaz Khali, Mustafa Bazar and Laksmi Ghat. The contributing factors for success of commercialization here were active participation of multiple agencies who offered partnerships in arrangement of land through lease, excavation of land for Sorjon system using mechanized excavator to reduce development cost and time. In the case of manual mode earthworks for Sorjon takes min. of 30-40 days per 150 decimals in the areas of Char Nangulia whether in case of mechanized earthworks for Sorjon takes min. 30-40 hours only for 150 decimals in the areas of Boroitola, Montaz Khali, Mustafa Bazar and Laksmi Ghat.

Most interesting matter is that the farmers do not have to invest their own money for leasing land and earthworks for Sorjon development. The partner whole sellers/arotdars provide cost as credit which is reimbursable with equal annual re-payment for five years being a contract grower. The farmer is guaranteed for marketing his produce through an agreed auction price fixed by an auction committee.

Local farmers bring vegetables to the shops/stores of whole sellers/arotdars and the arotdars purchase their vegetables as per contracts. The whole sellers arotdars then send those vegetables to the up-markets through local carriers/vehicles like trucks/pickups. The most common markets are located in the districts of Comilla, Chattogram and even in the capital city of Dhaka. For transportation common vehicles are trucks and pickup vans and covered vans and rickshaw-vans for local transfers to the designated up-market centres. To get vegetable and fish that comes from far end of Boro Tola and Montaz Khali, Mostafa Bazar sale markets. Some noted areas are Urir Char and Kadirer Char located at the opposite side of the bank of Ziller Khal/river. There are couple of growth centre connecting routes which have been constructed by joint partnerships of local plot holders, Arotdars and brokers.

Sorjon system is usually established on the low lying and water logging lands where only crop is cultivated. After development of Sorjon system, the land becomes suitable for multiple cropping and year round therefore, vegetables can be harvested round the year covering three cropping seasons-kharif-I, kharif-II and rabi. Due to coastal char lands, salinity is the main problems. So, farmers are in demand of soil tolerant varieties. The project should make availability of soil tolerant vegetable seeds.

Farmers also need couple of growth centre connecting roads through which farmers will be able to carry the vegetables and fish production to the doors of whole sellers/arotdaers and participate auctions for marketing their produces up to the up-markets of neighbouring districts – Comilla, Chattogram and even capital city of Dhaka.

Impact Assessment study on commercialization of extended Sorjon in CDSP

1.1 Introduction and background

The **overall development objective** of Char Development and Settlement Project, CDSP is to reduce poverty and hunger for poor people living on newly accreted coastal chars, which are being achieved via improved and more secure livelihoods. To reduce the social, institutional and environmental vulnerability faced by coastal char dwellers Char Development and Settlement Project (CDSP) has been successfully implementing several development interventions for decades (since 1994) by phases (I to IV) and current CDSP phase B(AF) through five-project components which includes:

- Component-1: Protection from climate change (water management infrastructure and social forestry)
- Component-2: Climate-resilient infrastructure (internal infrastructure and water & sanitation (DTW and household latrines)
- Component-3: Land settlement and titling
- Component-4: Livelihood support (agricultural support and social & livelihoods support
- Component-5: Technical assistance and management support

1.2 Land settlement as a means of further land development

Through implementation of component 3 (land settlement and titling) a total of 38,366 coastal landless families have been provided 49,875 acres of govt. khash land (@ 1.3 acres of land per family. Land titles have been granted to the joint names of husband and wife having equal shares with wife's names in the first on the deed document. Receiving an official title to land is of tremendous importance for women, and has far-reaching positive consequences. Settled land titling created opportunities for coastal char dwellers to develop their own land for productive purposes. All settled coastal char families have also been supported by agriculture and livelihood component interventions from CDSP to ensure the development of improved and more secure rural livelihoods for char households.



In coastal context, implementing agriculture interventions have a number of significant challenges. Coastal land is highly saline, sandy and regularly inundated by sea water. Char dwellers' agriculture was based on traditional rice "Rajashail/Kajalshail" and vegetables available locally which were of very low yielding and less productive. There are couple of coastal chars (e.g., Char Nangulia and Noler Char) have large areas of low-lying and water logging lands where only a single crop used to be grown in a year of three seasons (Kharif-I, kharif-II and Rabi). Besides water logging conditions reduces the aeration of the soil, maturity time of the crop, increases carbon dioxide in the plant root resulting reduction of plant growth.

1.3 Introduction of salinity tolerant varieties of vegetable (hybrid vegetable and HYV rice)

Since inception CDSP already introduced several salinity tolerant varieties of vegetables (i.e. HYV rice BIRRI 41, 42, 52 etc. and hybrid vegetables to increase both yields and production of such crops. To get more production round the seasons of the year, CDSP Phase III has introduced ‘Sorjon’ method of vegetable cultivation cum fish culture in the low-lying and water-logged areas. As a result, during CDSP Phase IV, this new method of integrated cultivation method has brought a revolution for the char farmers who were owning low-lying and water logged-lands. Due to successful implementation of ‘Sorjon’ method of cultivation, the coastal farmers are now growing 300-400 times of crops from their land. The current impact study has been based on the positive changes and improvement brought to the life style of char dwellers and have made a history of collaboration of commercialization of extended ‘Sorjon’ over some specific char and location of CDSP command areas.

In many circumstances case studies are helpful for looking at unique situations like adoption of Sorjon systems and allow us evaluators to gather a great deal of information about stakeholders (farmers, land owners, investors, arotiders/wholesalers and value chain actors). This assessment case study has been planned to document the process of adoption and expansion of Sorjon system by farmers in Char Nangulia and further commercialization by joint partnerships in other char areas like Char Maksumul Hakim, Montaz Khali, Boritola, Laksmi Ghat and Mustafa Bazar of Char Alauddin.

1.4 Goal and Objectives of impact case study

The general purpose of this impact case study is to describe the situation of introduction of Sorjon systems by farmers onto their low-lying land for producing vegetables and fish; identify benefits accrued to farm households; and also, to document the cases of massive commercialization of Sorjon involving multiple stakeholders i.e., land owners, farmers, arotiders/wholesalers/seasonal money lenders.

Specific objectives

- To document traditional cropping system by char dwellers in the study areas
- To explore the cases of changing cropping system (i.e., Sorjon)
- To determine extent of effectiveness of adaptation of Sorjon system
- To determine profile of Sorjon farmers in different coastal chars
- To determine economics of Sorjon system adopted by char dwellers in chars
- To identify the challenges of char dwellers in changing crop patterns using Sorjon system

2.1 Study Methodology and Implementation

Commercialization and extension of Sorjon in areas of CDSP project

In low-lying and waterlogging wet lands of CDSP command areas, farmers are cultivating vegetables and fish adopting Sorjon system of cultivation. Specifically, there have been huge adoption of Sorjon system in Char Nangulia since CDSP IV phase due to availability fellow wetlands. In Char Nangulia all Sorjon plots have been converted using manual labours. During 2018 to 2022, commercialization and extension of Sorjon have taken place in larger areas of northern and eastern parts of coastal zones where mechanized excavators (5-teeth and 7-teeth types) have been used to convert normal low-lying land into Sorjon plots quickly. The study team has identified the following 5-locations where Sorjon cultivation have taken place profusely and therefore considered for this study. These are:

Table 2.1: Locations of Sorjon areas in CDSP

CDSP Phase	Locations and coastal chars, upazila and district	Mode of excavation Mechanized excavator/manual tools and labours	Dimensions of ridges & furrows
B(AF)	Laksmi Ghat, Char Alauddin, Maksumul Hakim, UP-Mohammedpur, Upazila-Subarna Char, Noakhali	Mechanized Excavator 5/7 teethes type and manual labours	Ridges: 3-10 ft. Channels/furrows: Width 5-10 ft and depth 5-9 ft.
	Mustafa Bazar, Char Alauddin, Maksumul Hakim, UP-Mohammedpur, Upazila-Subarna Char, Noakhali	Mechanized Excavator 5/7 teethes type and manual labours	Ridges: 3-10 ft. Channels/furrows: Width 5-10 ft and depth 5-9 ft.
	Montaj Khali, Char Torab ali, Maksumul Hakim, UP-Mohammedpur, Upazila-Subarna Char, Noakhali.	Mechanized Excavator 5/ teeth type and manual labours	Ridges: 3-10 ft. Channels/furrows: Width 5-10 ft and depth 5-9 ft.
	Boroitola, Char Torab ali, Maksumul Hakim, UP-Mohammedpur, Upazila-Subarna Char	Mechanized Excavator 5/7 teeth types and manual labours	Ridges: 3-10 ft. Channels/furrows: Width 5-10 ft and depth 5-9 ft.
IV	Char Nangulia, UP-Char Clerk, Upazila-Subarna Char, Noakhali	Manual labours	Ridges: 3-6 ft. Channels/furrows: Width 5-7 ft and depth 5-7 ft.

2.2 Assessment Process and Methodology

A case study has a tradition of collecting multiple data sets having both qualitative and quantitative to get more insights and understanding of the cases. A good study also integrates well with mixed methods that seeks more understanding through investigation, analysis of both qualitative and quantitative research. In the study of commercialization of Sorjon systems which have been being practiced in different locations of CDSP command areas, data have been gathered from the fields at different levels of sources involving different levels of stakeholders. The stakeholders have been contacted directly and made aware of the study in order to facilitate their maximum participation. Data have been gathered from them during the three cropping seasons i.e., kharif I, kharif II and rabi cropping seasons using multiple research tools and methods as briefly explained below.

FGD/KII interviews: Data have been gathered through group discussion and interviewing key members of participating stakeholders where that include Sorjon farmers, plot owners, leasing (investing) agencies of land, wholesalers (arotders), Key information sections included in the assessment (FGD and KII) tools are:

Table 2.2: List key indicators included in KII and FGD tools

Key variables in KII tool	Key information item in FGD tool
A1. Respondent's profile	1. Location and stakeholder in concern
B1. Land development for Sorjon	2. Brief profile of Sorjon farmer name, mobile etc.
B2. Earthworks	3. Total no. of Sorjon plots with areas in acres
B3. Input cost for sorjon plot preparation	4. Previous residency of farmer before joining sorjon
B4. Input cost for fish culture	5.legal arrangements/deed documents etc.
C1. Crop production during kharif I	6. How connected with arottdar?
C2. Crop production during kharif II season	7. How you will be paid?
C3. Crop production during rabi season	8. Average hours needed to excavate by the excavator
C4. Fish production and sales	9. Types of crops by season
	10. Types of fish cultured?
	11. Initial cost on first production
	12. Major problems faced
	13. Associated with NGOs

The key informant interviews (KIIs) have been interviewed with the concerned farmers and land owners for the sampled sorjon plots and the responses against pre-designed questionnaires been recorded in the KII data collection tool. On the other hand, focus group discussions (FGDs) have been conducted to gain more insights on adoption of Sorjon in their localities. In each FGD session 7-10 participants have been selected from a stakeholder's group who are involve with adoption of Sorjon system. The MEOs have played the role of key facilitators in FGDs. Refer to Annex-I for FGD and KII tools.

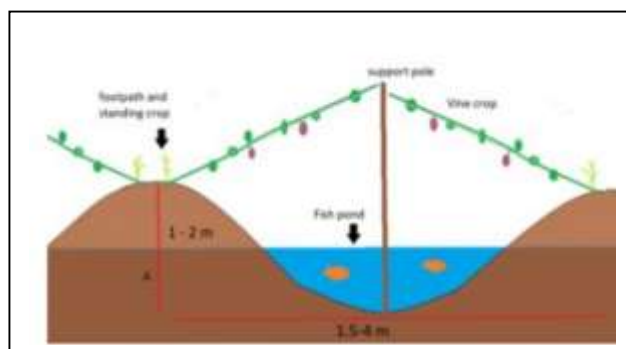
Data collection and analysis: Both qualitative data from FGDs and KII data have been collected by two Monitoring Officers (MEOs) under the guidance and supervision of Monitoring Evaluation and Knowledge Management Adviser. Respective evidences have gathered in the form of pictures and documents as when available for validation. Analysis has been done at ME&KM unit of CDSP B(AF). Summarized information has been organized to prepare a profile for each sampled sorjon plots. Assessment findings and results have been shared with relevant sector/units.

3.1 Origin of 'Sorjon' system of integrated vegetable and fish production

Sorjon is a system of integrated vegetable and fish production. It is believed to have originated in Indonesia, where it is known by the same name. Over the last few years, it has been adopted at a number of locations in the coastal area of south-western Bangladesh. It is now being widely used in part of the CDSP IV area, having been introduced during CDSP III by Dr S A Sattar, Agricultural Consultant for CDSP III. Part of char Nangulia is relatively poorly drained while being protected from severe flooding, and Sorjon has been widely adopted here, with data from the impact study suggesting that it covers 5% of cultivable land and involves 11% of farming households.

3.2 Description of the Sorjon system and development modes

The Sorjon system is the cultivation of vegetables on ridges with fish in the ditches between these ridges. In Char Nangulia the ridges are mostly around one meter wide at the top and spaced two meters apart – although in places ridges and spacing can be wider than this. Ridges are about 60 to 90 cm high, which means crops are kept above the water, even during the wet season. The ditches between the ridges hold water for six to eight months per year, and can be used to cultivate fish as well as being a source of water to irrigate the crops. One ditch is dug deeper than the other ditches to hold water for longer period or even round the year that is used for rearing fish and let to grow market sizes.



Source: WOCAT SLM Technologies

For details refer to: 4. Technical specifications, implementation activities, inputs, and costs, WOCAT SLM Technologies having link: https://qcat.wocat.net/en/wocat/technologies/view/technologies_5613/

Sorjon are used for intensive vegetable production, with a framework of bamboo, string and netting being built over the ditches to support a sequence of climbing plants. Before the rains start in March, cucumbers are planted, and these are followed by a variety of gourds (including snake, bottle, bitter and ribbed gourds) in the early monsoon, with yard long bean (asparagus bean) and country bean (lablab bean) in the later monsoon, with country beans continuing to be harvested through the dry season up to the following March. These crops overlap with each other, with relay cropping allowing more or less continuous harvesting for 9 or 10 months per year (early June to March).



Impact survey (2018) data shows that the average size of a Sorjon plots in Char Nangulia is 56 decimals (0.225 ha). Around 15% to 20% of Sorjon farmers have converted virtually all of their land to Sorjon, and those farmers are becoming commercial vegetable and fish producers. The farmers buy rice and other foodstuffs from the market. In locations where drainage is better, Sorjon farmers have also been able to improve the productivity of paddy.

The technology has become very popular in Char Nangulia, Noler Char and Urir Char. Part of Char Nangulia is relatively poorly drained while being protected from severe flooding, and ‘sorjon’ has been widely adopted there, with data from the impact study suggesting that it covers 5% of cultivable land and involves 11% of farming households. Here ‘Sorjon’ plots have been smaller in size and developed through manual labours who uses manual excavation tool like locally called kodal and belcha.

Hand Tools for Excavation



Manual Excavation in Sorjon at CN



Manually Developed in Sorjon at Char Nangulia

In case of excavating larger Sorjon plots, mechanized excavators are used to reduce both time for development and cost compared to manual excavation. In the locations of Mostankhali, Mustafa Bazar, Boroitola and Laksmi Ghat of Char Maksumul areas, hundreds of Sorjon plots have been established with joint partnership among wholesalers, Arotiders, Brokers, Land Owners and local farmers. In those locations all Sorjon plots have been developed using mechanized excavators. It is observed that in these locations both the ridges and canals in between are quite larger than the Sorjon plots developed manually.



Mechanized Excavator (Seven Teeths)



Sorjon Plots at Laksmi Ghat of Char Maksumul



A case profile of Mr. Shiraz describes that he grows cucumbers, various types of gourds, and country and hard long beans. An income from only cucumbers has been Tk. 10,00,000 per acre which covers all his costs for the entire year, so the income from other crops - Tk. 150,000 to Tk. 200,000 per acre has been the net profit for all.

Source: para 3, pp. 69, New Land New Life, A success story of new land re-settlement in Bangladesh, CDSP having link: <https://www.cabidigitallibrary.org/doi/book/10.1079/9781789246049.0000>

3.3 Investment cost for developing Sorjon system by locations

Initially development of Sorjon system began with manual modes using manual hand tools used for excavation especially in the coastal chars like Char Nangulia and Noler Char. The hand tools include mostly hoe/spade locally called 'kodal' and 'belcha'. As mentioned above, Sorjon system is developed in low-lying land where only a single crop is cultivated annually. Manual excavation is highly time-consuming and costly, now-a-days farmers are hiring mechanized excavator (locally called 'Boga machine' for the development of Sorjon plots within short time. In general, the land owner used to develop his/her land into Sorjon to get more vegetable and fish, even rice from Sorjon plots in the beginning. To develop land the owner needs to invest quiet a significant amount of money in line of several cost items. These include:

- Excavation cost in terms of manual labours
- Excavation cost in terms of hiring mechanized excavator (locally called Boga machine')
- The value of leasing other's land
- Cost of hiring labours
- Hiring daily labours
- Input cost for making pit/mada
- Input cost for nets and bamboos
- Input cost for seeds, fertilizers and pesticides

3.4 Establishment of Sorjon plots by locations/sites

A sample of 60 Sorjon plots has been considered for this short survey. Sixty sample plots have been selected from five locations of CDSP B(AF) command areas. These were (i) Lakasmi Ghat, Char Alauddin, Maksumul Hakim, (ii) Mustafa Bazar, Char Alauddin, Maksumul Hakim, (iii) Montaj Khali, Char Torab Ali, Maksumul Hakim, (vi) Boroitola, Char Torab ali, Maksumul Hakim, and (v) Char Nangulia, UP-Char Clerk. Excavation and development of Sorjon system data have been gathered from concerned plot owners/farmers which have been summarized and presented as shown below.

Table 3.1: Description of Sorjon Plots with areas, lease value, input cost

Location of Sorjon Plots	No. of Sample Sorjon Plots	Area of sorjon plot (deci)	Lease value for the land (5-year) ('000 Tk.)	Excavation cost ('000 Tk.)	Labour for earthwork cost ('000 Tk.)	Lease and excavation cost ('000 Tk.) by Arroidar	Input cost ('000 Tk.) by farmer	Labour cost ('000 Tk.) for cropping by farmer	Misc. cost ('000 Tk.) by farmer	Input cost for cropping ('000 Tk.) by farmer	Fish culture cost by farmer ('000 Tk.)	Total Dev cost for Sorjon operation ('000 Tk.)
1	2	3	4	5	6	7	8	9	10	11	12	13
Laksmi Ghat	16	2710	3738	1656	165	5558	1979	69	54	7659	408	15727
Mustafa Bazar	12	1838	2428	1102	139	3669	1753	81	50	5553	170	11276
Montaz Khali	12	2210	2463	1329	113	3904	2273	80	52	6308	780	13397
Boroitola	10	2695	3160	1513	148	4821	2224	70	55	7170	320	14660
Char Nangulia	10	1161	595	218	712	1524	1483	63	64	3135	254	6524
Total	60	10614	12383	5818	1276	19476	9712	362	275	29825	1932	61582
Average		177	1167	548	120	1835	915	34	26	2810	182	24633



Use of Excavator in Sorjon Plot



Sorjon developed at Laksmi Ghat, Maksumul



Sorjon developed at Montaz Khali



Sorjon developed at Char Nangulia

Note: More disaggregated analysis/summary on areas, lease value and input cost has been made available for all 60 Sorjon plot holders placed in [Annex II, Table A3.1](#) and also [Annex II Table A3.1A](#)

3.4.1 Areas (in decimals) of Sorjon plots

Table 3.1 reveals that a total of 10,614 decimals constitute 60 Sorjon plots of which 2710 decimal belongs to Laksmi Ghat, 1838 decimals to Mustofa Bazar, 2210 decimals to Montaz Khali, 2695 decimals to Boroitola and 1161 decimals to Char Nangulia. Average plot size was 177 decimals.

3.4.2 Ownership, leasing and repayment system in place

It has been found that Sorjon system has been established based on joint development partnerships between land owner, operating farmers, whole sellers (arotdars) with specified terms and legal entities. Legal entities come into force in two ways:

- The 1st agreement is held between the land owner and the whole sellers (arotdars) for transfer of specified lease money (re-payment annually).
- The 2nd agreement is held between the operating farmers and the whole sellers (arotdars) for transfer of their seasonal production with the price of the products based on open auction calls held locally.

According to agreement farmers have to pay 10.5% of money from his sale value to the whole sellers as a commission for accepting all his products. The whole sellers used to pay 0.5% money to the auction committee for successful auction events.

The leasing mode has been in force with transfer of cash money/value of products for a period of equal repayment installments. In most cases it was for 5 year's period with payment of equal installments for five years. Data from Table 3.1, reveals that average lease value has been Taka 175,000 per 150 decimals having average Tk. 35,000 per year. It is noted that in case of any loss/failure of crop production due to drought, excess rainfall or flood, the farmers are allowed to re-pay their current installment during the next season.

3.4.3 Re-payment of cost of excavation of Sorjon kathis (ridges and channels)

In compliance of the 2nd agreement between the operating farmers and the whole sellers (arotdars) are liable to handover all products to the whole sellers. By virtue, the whole sellers are responsible to purchase all the products at the price fixed by open auction calls held locally (at Montaz Khali) . At the same time farmers need to re-pay the cost of excavation and the input cost as per set rules i.e., 1/5th of total excavation. It is

noted that in case of any crop loss/failure of crop production due to drought, excess rainfall or flood, the farmers are allowed to re-pay their current installment during the next season. Data from Table 3'1, reveals that average cost for excavation has been Taka 1,00,255 per 150 decimals having average Tk. 688 per decimal and re-payment Tk. 20,050 per year.

3.4.4 Cost of input and labour for vegetable production

The input cost for growing vegetable on the Sorjon plots, the operating farmers generally buy such on credits from the local markets. The cost includes price of seeds, fertilizer, sticks used to support young plants, nets for cropping, and physical labours. They used to re-pay the input cost after harvesting. Data from Table 3'1, reveals that average input cost for production of vegetables has been Taka 198833 per 150 decimals having average Tk. 1325 per decimal of land.

3.4.5 Input cost for fish culture

Fish culture is done in the furrows/ditches of Sorjon plots. In most cases water area becomes 30% of Sorjon plot in Char Nangulia and nearly 50% in other locations of Maksumul Hakim. No other partners are to be involved with any financial support for fish culture. The operating farmers invest 100 cost of fish culture. The key inputs for fish culture are fingerlings, feeds and nets. Fish is reared round the year for 7-9 months depending availability of water. Fish is usually harvested during Rabi season. In Sorjon system, 30-50% of water area is available for fish culture. Table 3'1, reveals that average input cost for production of fish has been Taka Tk. 19,32,000 for 4250 decimals and Tk. 455 per decimal.

4.1 Growing vegetables and rearing fish and ducks in Sorjon plot

Initially, CDSP IV created the physical conditions suitable for Sorjon production, along with communications infrastructure to link farmers to markets. Farmers have learned about the Sorjon system through technical training, visits to other groups, and membership of Farmers Forums and NGO groups. The project has also introduced some improved technologies into the system. New varieties of Sorjon vegetables have been introduced, including hybrid varieties of cucumber and gourd, and new varieties of yard long bean and new varieties of country bean that are more productive for produce an earlier crop of pods at a time when market prices are at their highest.

Table-4.1.1: Sorjon systems developed during 2015-2022 in Char Nangulia

Union/Char	Sorjon plots (2015-2018) No. (acre)	Sorjon plots (2019-2022) No. (acre)	Total Sorjon plots No. (acre)
Purbo Char Bata (Char Nangulia),	200 (112)	300 (168)	500 (280)
Mohammedpur (Char Nangulia)	1000 (560)	1000(560)	2000 (1120)
Char Cleark (Char Nangulia)	800 (448)	400 (224)	1200 (672)
Total Nos. (Acres)	2000 (1120)	1700 (952)	3700 (2072)

Table-4.1.1 reveals that a total of 2072 acres of low-lying land has been converted into 3700 Sorjon plots in and around Char Nangulia. The average size of Sorjon was 56 decimals.

Table-4.1.2: Sorjon system developed during 2015-2022 in Char Maksumul Hakim

Union/Char	Sorjon plots (2015-2018) No. (acre)	Sorjon plots (2019-2022) No. (acre)	Total Sorjon plots No. (acre)
Boroi Tola, Char Maksumul Hakim,	200 (300)	300 (450)	500 (750)
Montaz Khali (Char Alauddin/Maksumul Hakim)	50 (75)	300 (450)	350 (550)
Mostafa Bazar (Char Alauddin/Maksumul Hakim)	1900 (2850)	100 (150)	2000 (3000)
Laxmi Ghat, Char Maksumul Hakim	150 (225)	250 (375)	400 (600)
Total Nos. (Acres)	2300 (3450)	950 (1425)	3250 (4900)

Table-4.1.2 reveals that a total of 3450 acres of low-lying land has been converted into 3250 Sorjon plots in and around Char Maksumul Hakim. The average size of Sorjon was 150 decimals which were about 256% larger than sizes of Sorjon plots in Char Nangulia.

4.2 Types of crops grown round the year (three cropping seasons)

Due to availability of water in Sorjon system, farmers can grow vegetables and rear fish and ducks in Sorjon plots during all the three seasons of the year (Kharif-1, Kharif-2 and rabi).

Table-4.2: Sorjon plots with area(acre) developed during 2015-2022

Kharif-1	Kharif-2	Rabi
Cucumber, bitter gourd, snake gourd, brinjal and yard long bean (as fencing crop).	Cucumber, bitter gourd, snake gourd, brinjal and yard long bean (as fencing crop).	Country bean, cucumber, okra, bitter gourd, chilly, papaya and irrigated boro-rice (Hira-2)
<p>Note: * Fish and Ducks are reared for six to nine months and usually annually harvest</p> <p>* Some farmers keep and rear livestock animals within Sorjon their Sorjon plots due availability of green fodders and vegetable wastes.</p> <p>* Nearly, 50% farmers rear ducks in the channels until water is available in the channels.</p> <p>* Couple of farmers cultivating locally called hodaina irri rice (Hira-2) when they can ensure availability of water.</p>		





Farmers used to develop Sorjon system in their low-lying land to grow more vegetables cum fish at the same time. After development of Sorjon system, farmers can grow vegetable round the three seasons of the year – Kharif-I, Kharif-2 and Rabi. During Kharif-I, farmers grow cucumber, bitter gourd, snake gourd, brinjal and yard long bean (as fencing crop). During Kharif-2, farmers grow cucumber, bitter gourd, snake gourd, brinjal and yard long bean (as fencing crop) and during Rabi season, farmers grow country bean, cucumber, okra, bitter gourd, chilly and papaya.

Farmers have been trained to practice innovative agricultural technologies and methods like inter cropping, vertical gardening involving Farmers Forum (FF) members who have received agricultural inputs (vegetable seeds, rice seed, pheromone traps-popular pest management tool).



Vertical Gardening in Sorjon, Char Nangulia



Inter-cropping in Sorjon, in Sorjon, Char Nangulia

Farmers rear fish during the all seasons of the year until sufficient water is available in the channels between the channels. Many farmers also rear ducks in those channels. Fish is harvested during Rabi season before drying out of the channels which are of 3-5 ft depth) in general. An ideal Sorjon plot has a special reservoir channel (8-10 ft depth) having plenty of water so that fingerlings can be stored and reared for the next round of fish culture.



Water Area in Sorjon plot for fish culture at Mostan Khali



Fish catch (final harvest) from Sorjon plot at Mostan

4.3 Production of vegetable and fish in Sorjon plots

To get an estimate of production of vegetables and fish from Sorjon plots during Kharif-1, Kharif-2 and rabi seasons of the year, data on production and sales have been gathered from 60 sample plots scattered in five locations. Summary of analysis has been presented in Table 4.3

Table 4. 3 reveals that a total of 10,614 decimals constitute 60 Sorjon plots of which 2710 decimal belongs to Laksmi Ghat, 1838 decimals to Mustofa Bazar, 2210 decimals to Montaz Khali, 2695 decimals to Boroitola and 1161 decimals to Char Nangulia. Average plot size was 177 decimals.

4.3.1 Production of vegetables and fish by seasons of the year

In Sorjon plots, operating farmers used to grow vegetables on ridges and slopes of such ridges using nylon nets. Use of nets had multiple benefits that includes farmers gets increased cropping areas over the water areas.



Vegetable in Sorjon plot of Mostan Khali



Vegetable in Sorjon plot of Mostan Khali

Fish culture is done in the channels (furrows) of Sorjon plots. It has been observed that the channels of Sorjon plots in Char Nangulia are of 3-5 ft depth, but the channels of Sorjon plots of Maksumul Hakim locations are quite bigger ones (average depth 5-9 ft, and average width 4-7 ft). Farmers reported that they have at least one deeper channel in each Sorjon plot to store and retain rainwaters to irrigate during dry season and to rear fingerlings and small fishes.

Table 4.3: Summary on Vegetable and Fish Production and Sales from 60 Sorjon Plots

Location of Sorjon Plots	Number of Sample Sorjon Plots	Area of sorjon plot (deci)	Vegetable Production ('000 Kg)			Total ('000 Kg)	Vegetable Sales ('000 Tk)			Total ('000 Tk.)	Fish Culture	
			Season Kharif-I	Season Kharif-II	Season Rabi		Vegetable Production	Season Kharif-I	Season Kharif-II		Season Rabi	Vegetable Sales
1	2	3	4	5	6	7	8	9	10	11	12	13
Laksmi Ghat	16	2710	17.46	2.92	10.60	30.98	486.52	82.32	644.89	1213.73	4073	502.18
Mustafa Bazar	12	1838	54.90	5.32	23.73	83.95	1585.94	144.08	1800.43	3530.44	4058	543.30
Montaz Khali	12	2210	37.19	2.84	24.76	64.79	1028.53	77.52	1776.96	2883.01	8238	1157.33
Boroitola	10	2695	46.33	1.05	29.14	76.51	1272.70	22.00	1914.42	3209.13	4165	558.77
Char Nangulia	10	1161	7.04	2.11	23.76	32.91	1845.65	60.75	23.76	1646.39	3051	453.76
Total:	60	10614	162.92	14.25	111.98	289.15	6219.33	386.67	6160.46	12482.69	23585	3215.34

Table 4.3 reveals that a total of 289.15 MT of vegetables grown during three seasons of the year of which 162.92 MT grown in Kharif-1 season, 14.25 MT in Kharif-2 period and 111.98 MT in Rabi season. Total sales from vegetables were about 12482.69 thousand of Taka. Seasonally, 6192.33 thousand Taka at Kharif-1, 386.67 thousand Taka in Kharif-2 and 6160.46 thousand Taka in Rabi season.

Total fish production was 23585 Kgs which was sold at 3215.34 thousand Taka. It is noted that fish has been on 30-40% of water areas from total areas of Sorjon plots. For more disaggregated status please refer to Table 4.3 below. For more disaggregated analysis/summary on production and sales of vegetable and fish culture has been made available for all 60 Sorjon plot holders placed in Annex II, Table A4.3.



Growing Okra in Sorjon plot of Boroitola



Growing Country Beans in Sorjon plot of Mustafa Bazar



Cucumber



Sweet Gourd



Country Beans

4.4 Rearing livestock animals in Sorjon plots

It has been observed that many Sorjon farmers of Char Maksumul areas are rearing livestock animal within the Sorjon plots. A total of 4-10 cows and 3-5 goats are being reared inside of Sorjon plots. The Sorjon farmers informed that due to availability of huge vegetable wastes they can rear domestic animals with minimum cost and saving times. Besides they can make and use green manures and composed fertilizer made from cow dung and green leafy vegetable waste.



Cow Rearing in-side the Sorjon plot of Char Maksumul



Cow Rearing in-side of Sorjon plot at Boroitola

4.5 Cultivating rice in the channels of Sorjon plots

It has been observed that farmers cultivate locally called hudainna irri rice (Hira-2) in the channels. In Nangulia farmers practice this in the beginning (usually first two years of Sorjon development). They consider the seasonal rainfall timing or availability of water for irrigation. Couple of farmers of Boroitola and Montaz khali areas are also cultivating hudainna irri (Hira-2) in the channels of Sorjon plots. The water areas of Sorjon plots are quite larger than Char Nangulia.



Cultivating Rice (Hira2) in the channels of Sorjon plot in Char Nangulia



Cultivating Rice (Hira2) in the channels of Sorjon plot in Boroitola (Char Maksumul Hakim)

4.6 Loss of vegetable and fish production in the first year of Sorjon establishment

The farmers engaged in Sorjon system of cultivation practices have reported that the Sorjon plots near to the river banks and outside of embankment suffer higher risks of crop production due to salinity and drought. The current study selected 60 Sorjon plots out of 3700 Sorjon plots from 5 coastal regions/locations. For more details refer to Table 2.1 shown above. Out of 5 locations Laksmi ghat location is the new areas where Sorjon plots have been established using mechanized excavators. The production data shows that there have been two plots having only 80-100 kgs production and one having 200-500 kgs production in one year (i.e. three seasons). This was due to operation of Sorjon cultivation just after completion of earthworks.

Table 4.4: No. of Sorjon plots by amount of Production

Location of Sorjon Plots	Number of Sample Sorjon Plots	Area of sorjon plot (deci)	No. of Sorjon plots				No. of plots with Vegetables
			Production in 80-100 kgs.	Production in 200-500 kgs.	Production in 500-1000 kgs.	Production in 1000 plus kgs.	
2	2	3	4	5	6		7
Laksmi Ghat	16	2710	2	1	7	6	16
Mustafa Bazar	12	1838	-	-	5	7	12
Montaz Khali	12	2210	-	-	7	5	12
Boroitola	10	2695	-	-	4	6	10
Char Nangulia	10	1161	-	-	4	6	10
Total:	60	10614	2	1	27	30	60



Sorjon plots affected by salinity and drought in Laksmi Ghat

4.7 Economics of Sorjon systems in regards to establishment and production

Commercialization of Sorjon systems has taken place and spread over the locations of Boroitola, Montaz Khali, Mustafa Bazar and Laksmi Ghat. The contributing factors for success of commercialization here were active participation of multiple agencies who offered partnerships in arrangement of land through lease, excavation of land for Sorjon system using mechanized excavator to reduce development cost and time. In the case of manual mode earthworks for Sorjon takes min. of 30-40 days per 150 decimals in the areas of Char Nangulia whether in case of mechanized earthworks for Sorjon takes min. 30-40 hours only for 150 decimals in the areas of Boroitola, Montaz Khali, Mustafa Bazar and Laksmi Ghat.

Most interesting matter is that the farmers do not have to invest their own money for leasing land and earthworks for Sorjon development. The partner whole sellers/arotdars provide cost as credit which is reimbursable with equal annual re-payment for five years being a contract grower. The farmer is guaranteed for marketing his produce through an agreed auction price fixed by an auction committee.

The Sorjon farmers reported that in the 1st year, production of vegetables used to become very less than the subsequent years. There are three cropping seasons in a year. These are (i) Kharif-1, (ii) Kfarif-2 and (iii) Rabi. In Sorjon system vegetables grow more during Kharif-1 (e.g. Kharif-I cash crop is Cucumber) and Rabi season cash crop is country beans). Fish is harvested during Rabi season because at that season many furrows and channels of Sorjon becomes dry.

After analyzing investment and production data from 60 sample Sorjon plots, it is found that there was devastating drought in this year across southern coastal regions. Due to drought about 50-70 percent of Sorjon farmers have lost their kharif-I crops especially seasonal cucumbers which are considered as main cash crop for the Kharif-I season. All farmers more or less suffered a lot due to drought.

5.1 Marketing of vegetable and fish produced in Sorjon plots and value chain links

The unique feature of Sorjon commercialization in coastal areas of CDSP B(AF) is that participation of multi-agency setup. This includes the land owner who provides the land on lease for a period of minimum of five years, local whole sellers/arotdars who invest money for lease value and excavation cost of Sorjon system development and the key farmers are responsible to operate the cycles of production of vegetable and rearing fish. How they have engaged themselves have been described in section 3 and 4. As per agreement the whole sellers/arotdars get the total production from operating farmers (who are considered

as contract growers). The farmers get the value of production at the rate fixed by local auction committee who decide the price of the commodities for the day.

5.1.1 The Auction committee in force

The auction committee of Montaj Khali bazar provide the auction price for all local markets. The committee in charge sits in meeting in their office at Montaz Khali bazar everyday evening to set the auction price of commodities for the next morning. The collects the prices of commodities of interest from upmarket from nearby districts (e.g. Comilla, Chittagong, Laksmipur) and even capital city of Dhaka and after analyzing the prices fix the auction price. The auction committees arrange broadcasting of prices using mikes, mobile system for well circulation.

5.1.2 Exporting vegetables and fish to the up-markets located in neighbouring districts

Local farmers bring vegetables to the shops/stores of whole sellers/arotdars and the arotdars purchase their vegetables as per contracts. The whole sellers arotdars then send those vegetables to the up-markets through local carriers/vehicles like trucks/pickups. The most common markets are located in the districts of Comilla, Chattogram and even in the capital city of Dhaka. For transportation common vehicles are trucks and pickup vans and covered vans and rickshaw-vans for local transfers to the designated up-market centres. To get vegetable and fish that comes from far end of Boroi Tola and Montaz Khali, Mostafa Bazar sale markets. Some noted areas are Urir Char and Kadirer Char located at the opposite side of the bank of Ziller Khal/river. There are couple of growth centre connecting routes which have been constructed by joint partnerships of local plot holders, Arottdars and brokers as shown below:

- Boritola-Char Torab Ali to Ziller Khal 2 km earthen road to the river bank. The second road Char Torabb Ali Modho Mosjid to Ziller Khal nearly 2 km earthen road



Earthen road from Boroitola embankment to Ziller Khal river bank during Rabi season



Earthen road from Boroitola embankment to Ziller Khal river bank during Rainy season

The Sorjon farmers have mentioned that these roads play vital roles in value chain development especially for exporting green vegetables through which these roads are used to carry vegetables to local auction centers of Mostafa Bazar during dry season i.e. rabi season. During rainy season the roads become muddy and un-suitable for mechanized vehicle. The farmers use alternative carriage mode of dragging plastic bags and rope pulling all vegetables bags on floating condition through near by channels. (Refer to the images as shown above).

- Montaz khali Mohila 1.5 km earthen road to Ziller khal river bank



Earthen road from Montaz Khali to Ziller khal river bank

- Mostafa Bazar to Char Elahi Abashon locally named South Gangchil Mosjid road which is about 2 km from Mostfa Bazar (1 km HBB road) earthen road.



HBB and Earthen Road from Mustafa Bazar to Char Elahi Abason river bank point

- 4 no. ward Golapi market to Eusuf professor project 2 km length upto river bank.



Golapi market Embankment to Eusuf Prof. project Meghna River bank

- 6 no. ward Sagar Kamal Jame Mosque (old ghat road) 1.5 km to the river bank.

It is reported by local farmers that through ghat (old Laxsmi ghat huge vegetables are imported from Urir Char. The common vegetables are cucumber, country beans, bitter gourd and also fish (e.g. Rui, tilapia, kali baoush etc.)

Initially above-mentioned earthen roads were built by joint partnerships of local Sorjon plot holders who donated Tk. 1000-5000, and those who could not support directly by cash many have provided physical labour for road constructions, dressing and repairs. All these roads are connected with the 70 km embankment recently built HBB road by LGED, an implementing agency CDSP B(AF). When farmers could not find nearby channels for dragging vegetables bags, they are bound to carry those bags by head-load manually in lieu of extra investment.

Vegetables carried to the Wholesale market of Mostofa Bazar



6. Benefits of 'Sorjon' Systems

Case studies (Ref: Appendix-2, pp.21-29, Agricultural Development, TR25, CDSP IV) and calculations in crop budgets show that one acre of Sorjon (on average a Sorjon household will have half an acre of Sorjon) can give a farmer a net income of about Tk100,000 per year. This land was previously growing a single crop of a low yielding paddy (locally called 'Rajail' paddy).

6.1 Improved road communications: Development of sorjon on this large scale has been enabled by the greatly improved road communications that has linked producers to national markets for fresh vegetables. Much of the country bean crop is sold as dried seed. Some of this is grown on contract farming arrangements, including linking farmers to a food processor in Chittagong (it is an ingredient in some snacks). Country bean seed is also exported (including to Japan for use as bean sprouts).

Intercropping: Farmers quite often practice intercropping i.e. cultivating two or more crops in close proximity. Due to intercropping soil health is maintained naturally. It also controls pests.



Use of vertical garden & Intercropping with leafy vegetables and tomatoes

6.2 Household food security: Sorjon also generates benefits in terms of household food security and nutrition. Yard long beans are a good source of protein, vitamin A, thiamin, riboflavin, iron, phosphorus, and potassium, and a very good source for vitamin C, folate, magnesium, and manganese. Country bean is one of most nutritious of all pulses, being high in calories, protein, unsaturated fat, vitamins (especially B1), and minerals (iron, copper and zinc). These beans are said to be good for brain and cardiovascular health, prevent cancer, assist respiration, and supports digestion.

6.3 Production of fish and ducks: The impact survey shows that virtually all (98%) sorjon plots also produce fish. However, fish is very much a secondary product with an average production (per plot of 56 decimals) of 52 kg per year (compared with an average of 204 kg for a fish pond household). These fish are worth Tk7,470 – compared with Tk100,000 or more from Sorjon vegetables. Eggs from ducks are mostly consumed by the farmers.

6.4 Climate smart agriculture: Lastly, Sorjon has been cited as an example of climate-smart agriculture. Climate-smart benefits are in terms of: (i) productivity (increase vegetable production throughout the year, with an economic return from fallow land); (ii) adaptation (increases farmers' capacity to limit the crop exposure to tidal water submergence; and (iii) mitigation (contributes to increase the above-ground biomass constituting a carbon sink). (Source: pp. 8-10, Agricultural developments, Technical Report No. 25, January 2019, CDSP IV)



Low lying land developing as 'Sorjon' plot at Soleman Bazar, Char Nangulia



Vegetable cum fish production in 'Sorjon'



Vegetable cum fish production in 'Sorjon'

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Lastly, Sorjon has been cited as an example of climate-smart agriculture. Climate-smart benefits are in terms of: (i) productivity (increase vegetable production throughout the year, with an economic return from fallow land); (ii) adaptation (increases farmers' capacity to limit the crop exposure to tidal water submergence; and (iii) mitigation (contributes to increase the above-ground biomass constituting a carbon sink).

7. Conclusions and Ways Forward

The Sorjon is a system of integrated vegetable and fish production. It is believed to have originated in Indonesia, where it is known by the same name. In the Sorjon system, production of vegetables cum fish was first piloted during CDSP III phase. During CDSP IV period, Sorjon system was introduced in low-lying and water logging wet lands. Because farmers used to get only a single crop due to water logging and low-lying lands. As Sorjon allows farmers to grow vegetables round the three cropping seasons Kharif-I, Kharif-II and Rabi season along with fish culture into the channels of Sorjon system, many farmers of Char Nangulia and Noler Char have converted their low-lying and water logging land converted into Sorjon plots. During (2015-2018) farmers used hand tools and manual labours to convert their land to Sorjon.

During CDSP B(AF) Sorjon system has been found to be extended several new locations. Specifically, there have been huge adoption of Sorjon system in Char Nangulia since CDSP IV phase due to availability fellow wetlands. In Char Nangulia all Sorjon plots have been converted using manual labours. During 2018

to 2022, commercialization and extension of Sorjon have taken place in larger areas of northern and eastern parts of coastal zones where mechanized excavators (5-teeth and 7-teeth types) have been used to convert normal low-lying land into Sorjon plots quickly. The study team has identified the following 5-locations where Sorjon cultivation have taken place profusely. These are (i) Lakshmi ghat, (ii) Mustofa bazar, (iii) Montaz khali, (iv) Boroitola, and (v) Char Nangulia. Except Char Nangulia rest four locations farmers used to develop their Sorjon plots using mechanized excavators due to savings of both time and money invested.

It has been found that Sorjon system has been established based on joint development partnerships between land owner, operating farmers, whole sellers (arotdars) with specified terms and legal entities. Legal entities come into force in two ways (i) the 1st agreement is held between the land owner and the whole sellers (arotdars) for transfer of specified lease money (re-payment annually) and (ii) the 2nd agreement is held between the operating farmers and the whole sellers (arotdars) for transfer of their seasonal production with the price of the products based on open auction calls held locally.

The leasing mode has been in force with transfer of cash money/value of products for a period of equal repayment installments. In most cases it was for 5 year's period with payment of equal installments for five years.

It has been observed that many Sorjon farmers of Char Maksumul areas are rearing livestock animal within the Sorjon plots. They are making and using green manures and composed fertilizer made from cow dung and green leafy vegetable waste.

To get optimum return value from Sorjon system, farmers cultivate locally called hudainna Irri rice (Hira-2) in the channels. In Nangulia farmers practice this in the beginning (usually first two years of Sorjon development). They consider the seasonal rainfall timing or availability of water for irrigation. Couple of farmers of Boroitola and Montaz khali areas are also cultivating hudainna irri (Hira-2) in the channels of Sorjon plots. The water areas of Sorjon plots are quite larger than Char Nangulia. The farmers reported that production of rice in the channel provide 2-3 months food security for rice as main food grains.

Commercialization of Sorjon systems has taken place and spread over the locations of Boroitola, Montaz Khali, Mustafa Bazar and Laksmi Ghat. The contributing factors for success of commercialization here were active participation of multiple agencies who offered partnerships in arrangement of land through lease, excavation of land for Sorjon system using mechanized excavator to reduce development cost and time.

Most interesting matter is that the farmers do not have to invest their own money for leasing land and earthworks for Sorjon development. The partner whole sellers/arotdars provide cost as credit which is reimbursable with equal annual re-payment for five years being a contract grower. The farmer is guaranteed for marketing his produce through an agreed auction price fixed by an auction committee.

The unique feature of Sorjon commercialization in coastal areas of CDSP B(AF) is that participation of multi-agency setup. This includes the land owner who provides the land on lease for a period of minimum of five years, local whole sellers/arotdars who invest money for lease value and excavation cost of Sorjon system development and the key farmers are responsible to operate the cycles of production of vegetable and rearing fish.

To export vegetables and fish to the up-markets located in neighbouring districts and capital city of Dhaka. The local farmers bring vegetables to the shops/stores of whole sellers/arotdars and the arotgars purchase their vegetables as per contracts. The whole sellers arotgars then send those vegetables to the up-markets through local carriers/vehicles like trucks/pickups. The most common markets are located in the districts of Comilla, Chattogram and even in the capital city of Dhaka. For transportation common vehicles are

trucks and pickup vans and covered vans and rickshaw-vans for local transfers to the designated up-market centres. To get vegetable and fish that comes from far end of Boroi Tola and Montaz Khali, Mostafa Bazar sale markets from char areas are Urir Char and Kadirer Char located at the opposite side of the bank of Ziller Khal/river.

The Sorjon farmers have mentioned that these roads (shown in section 5.1.2) play vital roles in value chain development especially for exporting green vegetables and fish production through which these roads are used to carry vegetables to local auction centers of Mostafa Bazar during dry season i.e. rabi season. During rainy season the roads become muddy and un-suitable for mechanized vehicle. The farmers use alternative carriage mode of dragging plastic bags and rope pulling all vegetables bags on floating condition through nearby channels.

Ways Forward

Sorjon system is usually established on the low lying and water logging lands where only crop is cultivated. After development of Sorjon system, the land becomes suitable for multiple cropping and year round therefore, vegetables can be harvested round the year covering three cropping seasons-kharif-I, kharif-II and rabi. Due to coastal char lands, salinity is the main problems. So, farmers are in demand of soil tolerant varieties. The project should make availability of soil tolerant vegetable seeds.

Farmers also need couple of growth centre connecting roads (refer to proposed routes in section 5.1.2) through which farmers will be able to carry the vegetables and fish production to the doors of whole sellers/arotdaers and participate auctions for marketing their produces up to the up-markets of neighbouring districts – Comilla, Chattogram and even capital city of Dhaka.

Annexes

Sorjon Data Collection Tool on Climate Adopted Extended Sorjon System

ME and KM Unit, CDSP B(AF)

A. Respondent Profile:	(name, sex, age, widow (Y/N), address, family size, mobile number, principal profession, secondary profession, land title (Y/N), areas of land etc.)
B1: Sorjon land development	<p>Ownership by title:</p> <p>Ownership by lease:</p>
B2. Earthwork	<p>a. Total hours for plot development:hours</p> <p>b. Type excavator: 5-teeth @ Tk./hour</p> <p>c. Type excavator: 7-teeth @ Tk./hour</p> <p>d. Manually using labours: Total man-days @ Tk.</p>
B3. Input cost Sorjon plot preparation	<p>a. Cost for development of pit/mada: Tk.</p> <p>b. Cost for nets/bamboos: Tk.</p> <p>c. Cost of fertilizers: Tk.</p> <p>d. Seed cost Tk.</p> <p>e. Cost of pesticides: Tk.</p> <p>f. Total labours: man-days</p> <p>g. Misc. cost: Tk.</p>

B4. Input cost for fish culture	a. Cost for development of ditch/canal: Tk. b. Cost for lime and fertilization: Tk. c. Cost of fingerlings: Tk. d. Cost for feed: Tk. e. Cost for netting: Tk.
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*** Refer to C4 for value of partial and final harvest of fish culture

C1. Crop production (kg) by seasons (Kharif-I)	Sale prices at beginning and late/end season
a. Cucumber:	
b. Bitter gourd	
c. Sweet gourd	
d. Misc. crop	
C2. Crop production (kg) by seasons (Kharif-II)	Sale prices at beginning and late/end season
a.	
b.	
c.	
d.	
C3. Crop production (kg) by seasons (Rabi)	Sale prices/kg at beginning and late/end season
a.	
b.	
c.	
d.	

*** For recording extra information please use separate sheets/pages

C4. Fish production (kg) by seasons (Rabi)	Sale prices/kg at beginning and late/end season
a. Partial harvest: Kg.	
b. Final harvest: Kg.	
c.	
d.	

*** Refer to B4 for input cost of fish culture

Signature of MEOs:

Date: ____/____/ 2022

FGD Tool for interview with Sorjon Farmers

Participants per FGDs = 8-12 Farmers/Aratders/Market actors/value chain actors

Locations of FGDs will be sampled sorjon plot/household located at:

- Char Malsomul Hakim and nearby areas,
- Mustafa bazar/Char Alauddin areas
- Boroitola/Gangchil Torabali/
- Other Sorjon areas of CDSP IV areas e.g. Char Nangulia

Facilitators: MEKM Adviser, CDSP-B(AF)

Co-Facilitator(s): Liakat Ali, NGO Coordinator, and two MEOs of MEKM Units.

Estimated budget: Tk. 6000 for 10 FGDs (Tk. 600 per FGD)

Key information to be gathered through FGD

1. Location of Sorjon plot where adoption or 'sorjon' taking place and developed by which agency:

Land marks/permanent for identification: (Collect pictures/evidences on location/site)

2. Brief profile of the 'sorjon' plots in concern: (Name, mobile no., how many families, arotdars, types of inputs/support received, area of land per family for homestead, type of lease, cost of lease, etc.

3. How many sorjon plots developed/under developments in your localities

4. Due to river erosion how many somaj lost to the river? (Name of those, number of families affected, how may Sorjon plots affected, where are now those families settled?

5. Currently how many sorjon plots in these areas? How many farmer have sorjon on their own land? How many sorjon on leased land?

6. How you are benefited by sorjon system of cultivation?

7. Where did you sell your products? How those have taken to other locations?

8. Average hours to develop plots using Excavators including hourly rate?

Name and Signature of Facilitator(s)/Co-facilitator/MEOs/Record Keeper

Date: / / /2022

CDSP-B(AF)

Signatures of a couple of elite people/residents associated with the Sorjon plot?

- 1.
- 2.
- 3.