



Improving water use for dry season agriculture by marginal and tenant farmers
in the Eastern Gangetic Plains

A Compilation of Case Studies Volume 2

Working Paper



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1. Documenting community engagement

1.1 Introduction

For any large and complex project introducing new and innovative technologies and institutional changes, it is important to continuously self-reflect on the process of project implementation, in particular, the process through which the team has been engaging with communities, what has went well, what was more challenging, and what was done to address these challenges. This section documents the process of engagement in each of the six study communities in West Bengal, Bihar and Nepal. It reviews the background to each community, how institutions were strengthened and interventions successfully rolled out. It also reviews how the project ensured maximum participation from community members, what it did to promote leadership, and how it engaged with stakeholders.

1.2 Documenting Engagement: A Case from Kanakpatti, Saptari

Background of the Community

Kanakpatti is a village in Sambhunath municipality of Saptari district in Eastern Nepal. It located near Churiya range in the Terai belt approximately 1.5 km north from Mahendra highway. Inhabited by Chaudary, Muslim and Dalit communities, the major source of livelihood of the region are agriculture, wage labor and remittance. Men out migration is very high and is one of major source of livelihood. Majority of the people are smallholder farmers but includes large proportion of landless households. Many of them are cultivating as tenants, mainly as sharecroppers of the landlords.

Farming is largely rainfed due to limited capacity to invest in irrigation infrastructures. Only few farmers have invested in irrigation infrastructures such as boring, water pumps for ground water extraction. However, it is limited. In the village. A community pond has been constructed with te support from GIZ which is being used as source of irrigation by some farmers whose land situated nearby the pond. They use it mainly in monsoon and initial part of winter season. There are two rivers near the village: Khado river and Khaduriya river both approximately 1 km. Water from these river have not been utilized for irrigation, rivers are in lower alleviation than the village's agricultural land.

Institutional Strengthening and Development

Historically, inhabitants of the village were involved in self-help group, community forest group and cooperative. Focus of these groups were mainly on saving and credit, agriculture and forest management. However, they were not actively engaged in the groups. Due to this, some of these groups dissolved. Even though the inhabitants had exposure to institutional processes, they were not organized systematically

With this background, the project started with community mobilization effort through a series of informal discussions and meetings. Three farmer groups of marginal and tenant farmers were established. Groups were introduced with the idea of working collectively sharing water infrastructure, labor and agricultural inputs. To sensitize the groups on these fronts, group management and agronomic trainings on savings, record keeping were organized to equip farmers with necessary skills for high value vegetable and crops cultivation. Eventually, farmers agreed to work in 3 different groups following different forms of collective model.

Consolidating Interventions

Several interventions have been laid in the field including biophysical and social interventions. Social and institutional interventions included group formation, collective/joint leasing. Groups also established the system of monthly meeting, maintaining meeting minutes, saving and seasonal planning. Bio-physical intervention started in 3 sites leased from landlords. The area of intervention plots are 0.8619 ha (0.2873 ha and 0.5746 ha), 0.9636 ha (0.22 ha and 0.7436 ha) and 0.8112 ha respectively for group 1, 2 and 3. They have lease agreement with landlords in group. They have to pay 560 kg of paddy per bigha as rent. The key bio-physical intervention included installation of tube wells; electric, solar and diesel pumps and micro irrigation technologies such as drip irrigation system. Farmers follow specific crop rotations in the specific plots. The table below provides quick overview of groups and key irrigation interventions.

Groups	Year established	Membership		cultivated land (Ha)	# STW in group	# pump-set in group	Type of pump	Other irrigation infrastructure	Water allocation mechanism	Pumping charge
		Female	Male							
Group 1	2015	8	0	0.2873(C) and 0.5746(I)	1	3	Electric and solar	Drip Irrigation	1 day electric, 1 day solar but flexible	Rs 10 per unit, solar no charge
Group 2	2015	7	1	0.22(C) and 0.7436(I)	1	2	Electric and solar	Drip Irrigation	1 day electric, 1 day solar but flexible	Rs 10 per unit, solar no charge
Group 3	2015	2	5	0.8112	1	2	Electric and sola	Drip Irrigation	1 day electric, 1 day solar but flexible	Rs 10 per unit, solar no charge

Following the institutional processes established, during the winter of 2016/17, they developed cropping calendar through group meeting. In group 1 and 2, farmers followed pure as well as part collective models in two separate plots. In pure collective plots, both groups cultivated wheat. In part collective, they cultivated seasonal vegetables such as egg plants, tomatoes, potatoes and beans. While group 3 cultivated potatoes, egg plants, radish, onion and cauliflower in part collective model.



Figure 1: Farmers participating at IPM training organized at Rupni, Saptari

Crop management and plant protection trainings were provided focusing on winter crops. Farmers were especially excited about using drip system for the first time. This demanded the need for regular trainings on system usage and maintenance (of irrigation infrastructures). Since, farmers were new to this kind of technology, they perceived benefit from the technology but faced challenges as well. On the basis of their experience with the system, they suggested the need for larger water tanks which could increase efficiency of the system as well as save their time. Project team has realized the need for regular and further trainings on agronomic, plant protection and water management.

Consolidating Participatory approaches:

Farmers suggested the need for on field training on use of technology. Considering their suggestion, the project team devised different mode of training. In this season, several on field training were organized along with class room ones.

Farmers expressed their views that practicing pure collective could be possible in case of some crops in some crops while it may not be effective in other crops. They suggested they can continue pure collective in wheat but opted to go for art collective in wheat.

Farmers also realized that they can avail different support from different government and non-government agencies. It could be possible only if farmers group is formally registered to District Agriculture Development Office (DADO). Project team helped community to find out details about the group registration process including the criteria for group registration. Due to the requirement of minimum group size, all three groups were merged into a single group. Project team facilitated the registration process including finalizing group constitution. Now the group is formally registered in the DADO office. In the winter season, farmers applied and received support from DADO. This includes 50% subsidy in wheat seeds. For the upcoming season, the groups anticipate receiving seed mini kit, power tiller and capacity building support.

Spreading and consolidating Leadership Base:

During this period, some of the group members have shown encouraging leadership potentials. The encouraging aspect is that female members have come forward as the future leaders of the group. They have been able to convince the members to attend regular meetings, contribute in group activities and put more attention on commercial farming. Though initially, land agreement was done through the facilitation by project team, farmers have started dealing directly with landlord. Selected group members have attended exposure visit to commercial vegetable production area in Sarlahi district. 4 farmer group representatives participated and in Collective Farmers meet organized at Madhubani, India. Exposures as such has ensured meaningful participation, nurtured leadership base and given them opportunity to share collective farming experience.

Enhancing and consolidating stakeholder's network:

With the support from the project team, farmers have started establishing linkages with governmental and non-governmental agencies. Current facilitation from project team to build linkages is being bridged to reduce project farmer dependence. So to enable farmers to take leadership role and ensure sustainability of the groups, stakeholder meeting with DADO representatives, local agro vet personnel was organized. DADO representative suggested to register farmers group at DADO. The officer suggested to gather necessary documents to register the group. The group should have 20 to 25 members, group bylaws, photocopy of member's citizenship and recommendation letter from municipality. It was suggested that doing so would open up opportunities to access support from local district offices. Agro vets personnel from Traffic Chowk, Rupni and Hanuman Nagar promised to provide seeds and fertilizers with the subsidy of Rs.1 per kg and agronomic advices whenever required.

Having registered the group and partaking in stakeholder meeting, farmers perceive this will bring long term benefit of generating capital for commercial farming, capacity building and market management opportunities.

Despite these perceived benefits, farmers realize there could be some practical challenges due to socio-cultural hierarchies among the merged group members. Members from Chaudary and Muslim community from group 1 and 2 are comparatively better off than Dalits in group 3. Group 3 members do not have regular income which makes it difficult to contribute for monthly savings. Such situation could create problem in future potentially hampering group dynamics. Sharing of subsidy among the three different groups could be another challenge. Even though the group members have passed certain stages of group formation, it has not reached maturity stage. Regular follow up, motivation and engagement activities are crucial at this stage. Building such linkages will give farmers confidence and create mechanism to fall back on when they require.

What is happening now?

For farmers who have been introduced to new farming methods in comparison to the conventional ones, continuous trainings are required. The trainings are necessary in different respects such as agronomic skill strengthening, group management, engagement with stakeholders and so on. Keeping these aspects in mind, continuous training activities are happening in Kanakpatti. Some of the list of trainings organized are presented in the table below:

SN	Activities	Main Objective	Process	Outcomes
1	Farmers group meeting	To strengthen the group capacity of the farmers groups.	Farmers' Group regularly conduct their meeting, and the project staffs assist in the conducting them.	The second irrigation of wheat crop in the collective land in kp1 and kp2. Was decided. All groups are the planting will of cucurbits crop in the empty land.
2	Vegetable production Training(Cauliflower, Tomato,Brinjal,Bittergourd etc)	The Group member trained to prepare the nursery seedling. The farmers will be learn about of these Vegetable production skills.	Training was conducted practically and Theoretically, the training was conducted by staff at Kanakpati and Koiladi. In the training, coconuts pits, traps and pure treated seeds were used.	Sponge gourd, bitter gourd seedling preparation demonstrated in traps. Farmers could observe and learn about the preparation of seedling trap and purification.
3	IPM Training(Solanaceous, Tuta absoluta, cucurbits pest	1. Skill transfer on use of insecticide and pesticide. 2 .Increase the knowledge on making the domestic chemical..	Training was conducted on farm and off farm. Theoretically, the training was conducted by staff at Kanakpati and Koiladi. Use of IPM tools (ferromin trap, tuta trap, heli etg) according to crop demonstrated.	1. Domestic Chemical prepared by Farmers.2.Traps are installed in farmers field for control of insecticide and pesticide 3.Increased the knowledge to farmers about use of IPM tools.
4	Group meeting	To conduct general group meeting and carry out financial documentation and transaction.	If the group was reformed, the disabled members of the group agreed with the approval and agreed to enter the interested members. 'Regarding the time, date and place for regular savings and issuance of loan was made. In the meeting, Raminada ji and Rai were present	From the K2, the members of the Jhabar Mandal and k1 Jas dev Mandal got out of the place and in this place Raso Devi Mandal, Ram Jitan Mandal and Jhari Lal Mandal have entered. 2. Started the Savings and Loans started.

5	Field visited and monitoring of water management by IWMI team(Mike and Bhesj)	3. The insecticide can be control by the IPM tools.	Onfield visited a nd monitred by IWMI team mr. Mike and Bhes ji. Supported and help to them by ray and Narayan.	The Kanakpati kp1, Kp2 and Kp3 field and pond monitored and tested of boring follow rate and water level(Bucket, follow meter Electric meter and ground water level) it has also been same activities in koiladi.
6	4 boring provided by DADO (Gos)	To ensure partnership with DADO and access schemes for water.	According to notice of Nakta Jhijha, Dhanusha ground water office, Kanakpati and Koiladi Farmer's Group filled up form to request boring on Oct 2017 and submitted to DADO .	4 boring approved by Nakta Jhijh from them 2 for in kanakpati and 2 in Koiladi. The boring was provided by Feb, 2018. The scheme provided boring, material and labor charge. It does not include the electric meter and Pump set. These have to be managed the farmers. The farmers got 4 boring and labor Charge.
7	Farmers Group Members participated in Gos mechanization exhibition in Dharan.	To observe New Agri-tools and agri machinary	On 24 Feb,2018, The exposure visit organized by DADO Saptari for mechanization exhibition in Dharan. Three farmers and 4 staffs participated.	Farmers and staffs observed and learned of new agricultural equipment and technology. Kanakpati and Koiladi interested in purchasing of hole Maker equipment (seed planting equipment)
8	Basin Irrigation trial	Basin Irrigation method trailed to see if it can be better than the delivery pipe irrigation.	Basin Irrigation trialed in Kp3 plot of Binda Devi Sardar. The total area covered is three meters and 5 holes in a pipe.	The performance about the basin irrigation will be observed.

Details of training organized and the respective dates are given below:

Date	Name Of Group	Name of Training	Resource Person	Duration	Methods to be covered	Materials used	Venue	Male	Female	Total	Target	Achieve	Total Budget	Total Expenses.	Remarks
Feb,2017	KP1,KP2,KP3,k1 and K2	Plant protection and IPM tools distr	Narayan Sah, R.K. Ray		Practical	IPM tools	all site				1	1	15000	8020	
Feb,2017	KP1,KP2,KP3,k1 and K2	Soil Test	Narayan Sah, R.K. Ray		Practical	Soil sample	all site				1	1	15000	17870	
3 Feb,2017	Mahila Utthan Krishak Samuh and Raja Jee Krishak samuh,gadhi mai	Nursery Management Training	Narayan Sah, R.K. Ray	1 day	Theory and Practical	Seed , Plltyien,polly bag,Plant Tray, cocopit.	Sukha Chaudhary ko bari Ma.	3	10	13	1	1	15000	9142	
23 March,2017	Mahila Utthan Krishak Samuh and Raja Jee Krishak samuh	IPM traing	Narayan Sah	1 day	Theory and Practical	Neem, cow urine etc.	Ram Kumari ko Ghar Ma, Kanakpati	1	11	12	1		15000	780	
17 March,2017	Mahila Utthan Krishak Samuh and Raja Jee Krishak samuh	Pound Management meeting	JT government	0.5 day	Theory		Kanakpati ko pound ko mohar ma.	3	9	12	1	1	17000	6050	
17 March,2017	Ma durga FG,Shiv Parbati FG	IPM training	Narayan Sah	1 day	Theory and Practical	Domestic and Harbal Materials	Sabita Devi Kamait ko Ghar Ma		8	8	2	1	15000	600	
2 April,2017	Mahila Utthan Krishak Samuh and Raja Jee	Mobile fishries training	Bandi lal Sah and Mala BK(DADO Saptari)	1 day	Theory	Brown paper, Marker	Kanakpati pound deal.	4	16	20	0	1		660	conducted by DADO

	Krishak samuh														Sapt ari
21-Apr-17	Ma durga FG, Shiv Parbati FG	Compost making with Trichoderma	Lalit Sah	1 day	Practical	Trichoderma dust, compost and sugar.	Koiladi	3	6	9	1	1	0	0	
1 June, 2017	Raja Jee Krishak samuh	Soil Solorisation	Narayan Sah	1 day	Theory and Practical	White Plastic and carbendazime		0	6	6					
2 June, 2017	Mahila Utthan Krishak Samuh	Soil Solorisation	Narayan Sah	1 day	Theory and Practical	, White Plastic and carbendazime		2	3	5					
4 June, 2017	Kp3	Soil Solorisation	Narayan	1 day	Theory and Practical			3	2	5					
21 Aug, 2017	KP1, KP2, KP 3, k1 and K2	Leadership development training	Shyam kant chaudhary(MCDC)	1 day	Theory, group discussion			7	14	21					
8 Sep, 2017	KP1, KP2, KP 3,	Nusey management Training	Narayan	1 day	Theory and Practical	Seed , Pillytien, polly bag, Plant Tray, cocopit.		1	17	18					
9 Sep, 2017	KP1, KP2, KP 3,	Paddy Plant Protection Trianing	Bandi Lal Sah (ADO)	1 day	Theory			1	15	16					
10 Sep, 2017	Koiladi	Paddy Plant Protection Trianing	Bandilal sah(ADO)	1 day	Theory and Field observation			6	7	13					
5-Oct-17	KP1, KP2, KP 3,	veg. Transplanting Training	Rk ray	1 day	Theory and Practical	Fertilizer and Seedling		2	17	19					
16, Oct, 2016	KP1, KP2, KP 3,	MIT Refresher Training	RK Ray	1 day	Practical			6	14	20					
18 Oct, 2017	KP1, KP2, KP 3,	IPM Trainig	LRP(Bauwa lal chaudhary)	1 Day	Theory and Practical	Fertilizer, Plastic		5	16	21					
30-Oct-17	Kp1 and Kp2	Bio Technology cultivation practice	Shibshakti bio plantic PVT., Lahan, Branch	1 day	Theory	Bio Fertilizer Demo		2	9	11					
17 Nov, 2017	KP1, KP2, KP 3,	Fish Farmers exposure Visit	all	1 day	Field observation			11	5	16					
7 Nov, 2017	all site	Stakeholder meeting	all	1 day	workshop			31	14	45					
14 Nov, 2017	KP1, KP2, KP 3,	Veg. production Training	Narayan	1 day	Theory and Practical	seed , fertilizer		2	15	17					

16 Nov,2 017	kanakpati	Stakeholder ield visit monitoring	Rk Ray	1da y	Field observation			8	3	11				
27 nov,2 017	All group, traders CM	linkage traders to FGs and Cm into CBF	Rk and N sah	1da y	Theory,group discussion			5	13	18				

On Stakeholder's Workshop:

Stakeholder workshop is an important event where the farmers and other important actors meet and discuss how the DSI4MTF activities are progressing and can be made better in the future. The section below presents details of stakeholder workshop organized in Saptari with farmers from both villages of Kanakpatti and Koiladi.

A one day stakeholder workshop was organized at Saptari on 7th November 2017 under the project "Improving Dry Season Irrigation for Marginal and Tenant Farmers in Eastern Gangetic Plains" DSI4MTF. The workshop was divided into two sessions: 1) Project Progress and Achievements and 2) Opportunities and Barriers for Upscaling and Outscaling. The first session on Project Progress and Achievements was led by the project team to share on the project status and progress; community engagement and field experiences; technical intervention and initial outcomes; socio-economic and institutional intervention and outcomes; value chain and market study followed by discussion with the participants. Second session on Opportunities and Barriers for Upscaling and Outscaling comprised discussions with the primary and secondary stakeholders on their thoughts about the project. Furthermore, the representatives from farmers' group, input supplier, vegetable trader, municipality, District Agriculture Development Office, Fishery Office, Department of Irrigation, Ground Water Board Resource Development Office shared on potential areas to collaborate. With Nepal going through new federal structure, the discussion also centered largely around the arrangement affects agriculture and farmer groups in terms of new policies, budget allocation, market, infrastructure development.

The project has come a long way since its commencement on 2015. With the formation of three farmer's groups at Kanakpatti and 2 groups at Koiladi in Saptari district, a range of agronomic, irrigation and community mobilization activities have been carried out. Some of these activities have been coordinated with governmental and non governmental agencies with the aim to inform, engage and expand the project activities in the district. For example, the project has closely worked with the personnel stakeholders from Ground Water Resource Development Board on constructing the irrigation infrastructure in the intervention sites. Irrigation Division Saptari has provided guidance and financial assistance to construct pump in the intervention fishery pond. Grain kit was provided to farmer groups under agricultural tool kit scheme by District Agricultural Development Office, Saptari. These efforts have proved valuable to build linkages and coordination of farmer groups with local agencies in Saptari.

Hence, the stakeholder workshop was organized at Saptari with the aim to bring all the relevant stakeholders together firstly to share the project progress and secondly to explore avenues to collaborate with them in the future. This can ensure the continuity of the good work of the project with the existing intervention farmers with the support from the stakeholders on one hand and seek opportunity to replicate from the learnings with new farmer groups.

Specific objectives of the stakeholder workshop are given below:

- To inform and update the stakeholders on the project activities and progress from the beginning of the intervention period till present
- To share challenges/opportunities faced while rolling out the intervention and seek feedback/practical solution from the stakeholders to work on the challenges
- To explore opportunities to collaborate with the stakeholders with existing policies and provision
- To understand the impact of new governance structure on the agricultural policies and marginal and tenant farmer groups
- To replicate the learning from the project in similar activities carried out by the agencies involved and facilitate long term upscaling and outscaling of the project

Discussions Pointers:

- The DADO personnel from Saptari, Mr. Bhagirath Yadav showed interest to engage more with the project. The interest shown on the project encouraged the project team more communication and coordination with activities in the future to bring about more synergic effect.
- The project has limited resource and is unable to do work on every aspects. This is where working alongside the stakeholders such as DADO is important. On the basis of experiences from the project, upscaling and outscaling the current intervention is essential together.
- Some personnel such as Bandi Lal Shah from fishery wing of Agricultural Service Centre pointed out mere availability of input is not enough. Application of right quantity of input in right time is vital. For example, fish feed should be applied in the pond when required.
- The event was a platform for farmers to seek information with experts in the matters of agriculture and irrigation. One of the farmer shared that plastic delivery pipe breakage poses problem for long term use. He asked if there are other methods such as installment of PVC pipes useful for long term usage. The representative from GWRDB informed the scheme to provide PVC pipe for 6 inch pipe. However, he recommended plastic delivery pipe as a better and cheaper method. He emphasized on the need for maintenance. Often leaving the pipe out in the sun without folding could lead to early breakage.

- Last year, The Prime Minister Agriculture Modernization Project commenced on 2016 has come up with the concept of dividing the agricultural land into pocket, block, zone and superzone. There was a discussion on how inclusive PIMP is of marginal and tenant farmers. Saptari has been divided into pocket. There is a provision for co-investment between the government and farmers whereby 50 to 80% investment on agricultural machinery is done by government and rest by the farmers. NPR 3 lakhs is allocated for new pocket and 5 lakhs to the old ones. Due to the new federal structure creation, the budget allocation is done directly to local government not the agencies such as DADO. Hence, the local government should prioritize agricultural sector and deployment of fund under the PAMP. The ward representatives from Kanakpatti mentioned the agricultural budget on agriculture to be 2 crore. The priority area here is pond and fishery activity.
- Discussion on crop insurance was of particular interest to the farmers given the loss they incurred following the extreme rainfall on monsoon of 2017. Government has a scheme which provided 75% subsidy to farmer on crop insurance. The crop premium is Rs. 5000 based on the estimated production cost.
- The agrovet from Rajbiraj shared the tendency among farmers to use especially the poor farmers about the lack of information on input application. He stressed the need to use right amount of input. Otherwise the input be of little benefit. Often poor farmers go for cheaper options and when the germination rate is low, they complain on the quality of seeds. Additionally, they demand for the banned items. There was suggestion from farmer and fellow participants that agrovet should not be guided by business motive entirely and supply quality inputs. There is quality inspection from DADO personnel in agrovet outlets time to time.
- Finally the discussion led to the realization on linkage between farmers and DADO officials to materialize information dissemination and support on right input usage. Time to time training to agrovet proprietor is essential so that they can help farmers in best way possible.
- A local vegetable trader who sells at Traffic chowk, a weekly market 1 km far from Kanakpatti shared on what would attract traders like her to procure the vegetables produced by the intervention farmers. She purchases the vegetables mostly from Golbazaar and Lahan (markets 50 km and 30 km distant from the Kanakpatti village) . Procuring vegetables from these markets put relatively higher transaction. However, she gets different varieties of vegetables in as much quantity she wants. She shared the cultivation of off season vegetables, multiple varieties and large quantity would motivate her to purchase from the intervention farmers.
- The newly elected ward representative from Kanakpatti and Koiladi shed some light on their vision on agricultural development during their tenure. Although, the representative was unsure about the specific plans until the provincial election on November- December

2017, they shared the need to advance in agriculture through farmer groups. The emphasis was put on selecting the agricultural crops as per the location (such as soil type for crops, potential to expand animal husbandry etcetera). Fishery is identified as a priority area considering the suitability in the area. For some deprived groups such as Dalits, their engagement in agriculture will be encouraged especially in the fallow land landlords have. In the new governance structure, the local representatives have the most say. So, the need for them to coordinate with agricultural departments and experts was emphasized.

- The representative from Koiladi mentions lack of clarity in the budget allocation. The local representatives have not had time to work as of yet and the preparation for provincial election would be vital to shed light on these matters. Due to engagement in these activities, the representatives considers the need for at least 6 months to learn and roll out targeted activities. The need for coordination with other departments and offices was considered.
- Farmers expressed the tendency of leaders to prioritize infrastructure building such as roads in the name of agricultural development. While building such infrastructures is important, this should not be done at the expense of cutting off schemes for farmers.
- Farmers pointed out the need for agricultural mechanization such as tractor, storage facility. The accessibility of marginal and tenant farmers with existing infrastructure such as storage facility is a major concern. For example, there is a storage facility for potato at Saptakoshi, Sunsari district. However, transporting potato from Kanakpatti and Koiladi becomes expensive for marginal farmers. Hence, one of the major challenges to be addressed is devising marginal and tenant farmer friendly infrastructure. This will ensure the inclusion and prosperity of marginal and tenant farmers who comprise the major categories of farmers in Nepal.
- When farmers asked if the machineries such as power tillers will be provided to farmers, the DADO personnel mentioned the high application for limited schemes. He gave example of application from 200 farmers when they had the provision to provide for 27 power tiller.
- Crop insurance provided by government can be taken from Krishi Sewa Kendra referred as Agricultural Service Unit in the local level. Within 7 days of crop plantation, it has to be done. If the insurance amount is 1 lakh, the premium is Rs 5000. The insurance amount is subsidized up to 75% by the government.
- There are still some practical difficulties for marginal and tenant farmers to access such schemes. There is the need for land ownership certificate or tenancy certificate to apply for such schemes. Marginal and tenant farmers are not given such certificates by the

landlord with the fear of their land being transferred to the tenant in case there is any land reform policies in the future.

Beyond the Stakeholder's Workshop:

After the stakeholders' workshop, a group of officials from the governmental departments visited the intervention farms in Kanakpatti. The idea was to observe the ongoing activities in the intervention farm and build partnerships in days to come in terms of accessing the resources offered by the governmental agencies. The stakeholders were interested about the collective model of farming as wanted to learn more as well as replicate the activities in future. On 16th November 2017, DADO chief, DIO chief and chairperson of Kanakpatti ward visited Kanakpatti Saptari sites. Through the dialogue, an exposure visit of the fishery group was organized to on 17th November 2017.

How can such initiatives work better?

During the discussion, the stakeholders agreed on a couple of aspects necessary to create suitable environment for conducive environment for agriculture and farmers to thrive.

- Introduction of water efficient crops for farmers with limited infrastructure investment capacity.
- Linkage and coordination required among all the stakeholders especially now when there is much confusion around restructuring of governmental ministries and departments. Especially for the farmers, the clarity on who to approach for different agricultural related schemes is important.
- The lack of assurance on whether the inputs procured by the farmers was one major point of discussion. The agrovet representative assured the quality of seeds he supplies are subject to differentiation on the basis of companies. He assured dissemination of clear information about the product quality to farmers before selling them.

1.3 Documenting Engagement: A Case from Koiladi, Saptari

Background of the Community:

Koiladi is a village in Saptari district, Terai, Nepal. It is located around 12 km from district headquarter Rajbiraj and 7.5 km from Hanumannagar, small town for trading activities. Inhabited by Rajput, Mandal, Kamait and Dailit communities, the major source of livelihood of the region are agriculture, wage labour and remittance. The majority of land is owned by few households who are mostly from the Singh community. Most of the family members of these landlords reside in urban centers of Nepal like Kathmandu or in India. Marginal and tenant farmers lease (adhiya) or practice share cropping (batiya) in the rented land. "Batiya" is a system of share cropping under which cost for input as well as production are shared by the landlord and tenant

throughout the year. Adhiya is the system of leasing land in which fixed rental charge or produce is given to landlord in paddy season.

During the paddy and wheat season, Vice Canal from Koshi Paschimi is used to irrigate some farms. The area has more than 20 ponds, which are used for fishery as well as day to day domestic use. Diesel operated pumps are privately owned by water lords and are rented by marginal farmers at a rental charge of Rs 150 per hour. The high rental charge of pump increases the financial burden for small scale farmer to go for year round agriculture. Hence, they retort to farming wheat in Rabi in limited land and leave the land fallow or with legumes in summer.

Institutional Strengthening and Development:

Historically, inhabitants of the Koiladi, mostly men had engagement in informal water/ irrigation committees. Some women seem to have organized themselves in groups formed by organizations such as Save the Children. Even though the inhabitants had exposure to institutional processes, they were not organized systematically for farming or agricultural groups as such.

With this background, the project started with community mobilization effort through a series of informal discussions and meetings. Community mobilization work started in December/January 2015/16. During group mobilization, work was hampered by the 2015 political blockade in Nepal which affected Terai region of Nepal. Amidst the delay, existing tenants had already planted cropped in the intervention site. So, intervention crops could not be cultivated. Discussions and meetings were being held and three farmer groups of marginal and tenant farmers were established. Collective farming approach was introduced. Farmers were initially reluctant to be part of the group but they came on board as the idea of working collectively sharing water infrastructure, labor and agricultural inputs was shared. Finally, three different farmer groups were formed. To provide an exposure to work in groups, trainings on group management savings, record keeping and agronomic skills were organized to equip farmers with necessary skills for high value vegetable and crops cultivation.

Consolidating Interventions:

Several interventions have been laid in the field including biophysical and social interventions. Social and institutional interventions included group formation, collective/joint leasing. Groups also established the system of monthly meeting, maintaining meeting minutes, saving and seasonal planning. Bio-physical intervention started in 2 sites leased from landlords. Group 3 comprising of members from Dalit community started facing some challenges stemming from pre-existing conflict with the landlord. Eventually intervention with group 3 was withdrawn.

The area of intervention plots are 0.8112 ha and 0.507 ha for group 1 and 2 respectively. They have collectively leased the land drawn the agreement from the landlords. Group 1 has to pay to pay 1600 kg of paddy per bigha as rent on an annual basis. The arrangement of group 2 is slightly different, they pay 1400 kg of paddy and half of hay per bigga as rent on annual basis. The key

bio-physical intervention included installation of tube wells; electric, and micro irrigation technologies such as drip irrigation system. Farmers follow specific crop rotations in the specific plots. The table below provides quick overview of groups and key irrigation interventions.

Koiladi, Saptari groups	Year established	Membership		cultivated land (Ha)	# STW in group	# pump-set in group	Type of pump	Other irrigation infrastructure	Water allocation mechanism	Pumping charge
		Female	Male							
Group 1	2015	4	2	0.8112	1	1	Electric	Drip Irrigation	1 day each member but flexible	Rs 10 per unit
Group 2	2015	2	4	0.507	1	1	Electric	Drip Irrigation	1 day each member but flexible	Rs 10 per unit
Group 3	2015	8	0	-	-	-	-	-	-	-

Farming vegetable for the first time required assistance and suggestion from project personnel to develop cropping calendar for the groups. In the monsoon of 2016, the groups cultivated paddy in pure collective model. For the winter of 2016/17, both groups decided to go for part collective for vegetable farming. While following pure collective model, both groups faced the challenge to manage time and contribute labor. Anticipating the continuous need for labor for vegetable farming, they decided to share the pump and inputs occasionally and lease the land collectively but farm in individual plots. Cropping calendar for Rabi 2016 was made through group meeting in presence of the project staffs. Group 1 cultivated cauliflower, cabbage and wheat. Group 2 cultivated cauliflower, cabbage, onion and garlic.

Despite this, nursery raising, group management, compost making training were organized for the capacity building of the group. The project team provided training on saving and credits. The farmers currently meet every month and have started saving of Rs. 100 per month. Assistance was provided to develop institutional capacity through regular meetings, record keeping, linkage and coordination. Farmers were assisted in crop calendar development. Training on nursery raising, IPM, compost making, record keeping were organized.

Realizing the need to equip farmers with necessary vegetable farming skills, crop management and plant protection trainings were provided focusing on winter crops. Enthusiasm among the farmers could be observed to farm vegetable for the first time. However, the untimely labor contribution in the monsoon season under pure collective lead to delay in transplanting cauliflower and cabbage for winter season. There were some pumping issues in the tube well resulting in delays in irrigating the crops. Pest attack was another issue which damaged the vegetable crops to some extent affecting the quality of the produce. With the withering interest

of the farmers, project team realized the need for continuous crop specific agronomic, plant protection and water management trainings.

Consolidating Participatory approaches:

Several on and off field trainings were organized to equip farmers with necessary group management and agronomic skills. With the experience of pure collective mode, farmers expressed their views that practicing pure collective may not be effective for vegetable crops. Apart from the intervention plots, they farm in other crops and carryout other livelihood activities.

To expand the network of farmers with the governmental and non-governmental agencies, the personnel of District Agriculture Development Office (DADO) were approached. On the basis of suggestion from DADO personnel, the registration of the farmer's group at DADO was facilitated by project team. Having registration at governmental office as a farmer group opened up the possibility to apply for input support and subsidies. The formal registration of farmer groups had certain criteria. To meet the criteria on group size, Koiladi group 1 and 2 were merged into one. Group constitution was finalized with the support from project staffs. In the upcoming seasons, the group members are excited to apply for input and capacity building training support.

Spreading and consolidating Leadership Base:

Leadership development in the Koiladi groups seem encouraging. While there are male lead farmers in each group with prior experience of working in informal groups, women members are starting to develop confidence. Existing landlord and tenant relationship gives little space for marginal and tenant farmers to bargain with the landlord. Female members who silently participated in the group meetings initially, have started speaking in the discussions. There are still instances where the male farmers take the lead in activities such as irrigation and negotiation with the landlord.

Women starting to participate is a positive sign and hints leadership development potentials. Some group members have attended exposure visit to commercial vegetable production area in Sarlahi district. 1 farmer group representative participated and in Collective Farmers meet organized at Madhubani, India. It is still a challenge for women members to participate in events such as overnight exposure visits due to cultural norms guiding gender roles. Reforming existing practices stemming from cultural basis is a gradual process. There was also an instance where farmers demanded for training participation fee citing "other project provide us money when we attend trainings". Engaging with the farmers more and cross site exposure has potential to ensure meaningful participation.

Enhancing and consolidating stakeholder's network:

Establishing linkages with governmental and non-governmental agencies has introduced farmers with the kind of agricultural support they can receive from departments such as DADO. This is an

important step for farmers to get the support on one hand and have access to information on them.

Participation fee:

With the support from the project team, farmers have started establishing linkages with governmental and non-governmental agencies. Current facilitation from project team to build linkages is being bridged to reduce project farmer dependence. This has enabled farmers to take leadership role and ensure sustainability of the groups. Stakeholder meeting with DADO representatives, local agro vet personnel has helped in this regard. Advice from DADO representative on group registration guided the farmers to formally register the group. Agro vets personnel from Hanuman Nagar have shown interest promised to provide seeds and fertilizers in subsidized rate to the farmers.

Despite these perceived benefits, farmer's expectation from the project can be a challenge in their engagement in project related activities. Project team has communicated about the importance of training and participation enriching their agronomic skill. Further communication on this regard can eliminate the dependence mentality from "the project". Even after engaging with the group for some time now, regular follow up, motivation and engagement activities are crucial. It is equally important to continue building linkages to enhance farmer confidence and create mechanism to fall back on when they require.

What is happening now?

For farmers who have been introduced to new farming methods in comparison to the conventional ones, continuous trainings are required. The trainings are necessary in different respects such as agronomic skill strengthening, group management, engagement with stakeholders and so on. Keeping these aspects in mind, continuous training activities are happening in Kanakpatti. Some of the list of trainings organized are presented in the table below:

SN	Activities	Main Objective	Process	Outcomes
1	Farmers group meeting	To strengthen the group capacity of the farmers groups.	Farmers' Group regularly conduct their meeting, and the project staffs assist in the conducting them.	The second irrigation of wheat crop in the collective land in kp1 and kp2. Was decided. All groups are the planting will of cucurbits crop in the empty land.
2	Vegetable production Training(Cauliflower, Tomato,Brinjal,Bittergourd etc)	The Group member trained to prepare the nursery seedling. The farmers will be learn about of these Vegetable production skills.	Training was conducted practically and Theoretically, the training was conducted by staff at Kanakpati and Koiladi. In the training, coconuts pits, traps and pure treated seeds were used.	Sponge gourd, bitter gourd seedling preparation demonstrated in traps. Farmers could observe and learn about the preparation of seedling trap and purification.
3	IPM Training(Solanaceous, Tuta absoluta, cucurbits pest	1. Skill transfer on use of insecticide and pesticide. 2 .Increase the knowledge on making the domestic chemical..	Training was conducted on farm and off farm. Theoretically, the training was conducted by staff at Kanakpati and Koiladi. Use of IPM tools (ferromin trap, tuta trap, heli etg) according to crop demonstrated.	1. Domestic Chemical prepared by Farmers.2.Traps are installed in farmers field for control of insecticide and pesticide 3.Increased the knowledge to farmers about use of IPM tools.
4	Group meeting	To conduct general group meeting and carry out financial documentation and transaction.	If the group was reformed, the disabled members of the group agreed with the approval and agreed to enter the interested members. 'Regarding the time, date and place for regular savings and issuance of loan was made. In the meeting, Raminada ji and Rai were present	From the K2, the members of the Jhabar Mandal and k1 Jas dev Mandal got out of the place and in this place Raso Devi Mandal, Ram Jitan Mandal and Jhari Lal Mandal have entered. 2. Started the Savings and Loans started.
5	Field visited and monitoring of water management by IWMI team(Mike and Bhesh)	3. The insecticide can be control by the IPM tools.	Onfield visited a nd monitred by IWMI team mr. Mike and Bhesh ji. Supported and help to them by ray and Narayan.	The Kanakpati kp1, Kp2 and Kp3 field and pond monitored and tested of boring follow rate and water level(Bucket, follow meter Electric meter and ground water level) it has also been same activities in koiladi.

6	4 boring provided by DADO (Gos)	To ensure partnership with DADO and access schemes for water.	According to notice of Nakta Jhijha, Dhanusha ground water office, Kanakpati and Koiladi Farmer's Group filled up form to request boring on Oct 2017 and submitted to DADO .	4 boring approved by Nakta Jhijh from them 2 for in Kanakpati and 2 in Koiladi. The boring was provided by Feb, 2018. The scheme provided boring, material and labor charge. It does not include the electric meter and Pump set. These have to be managed the farmers. The farmers got 4 boring and labor Charge.
7	Farmers Group Members participated in Gos mechanization exhibition in Dharan.	To observe New Agri-tools and agri machinery	On 24 Feb,2018, The exposure visit organized by DADO Saptari for mechanization exhibition in Dharan. Three farmers and 4 staffs participated.	Farmers and staffs observed and learned of new agricultural equipment and technology. Kanakpati and Koiladi interested in purchasing of hole Maker equipment (seed planting equipment)
8	Basin Irrigation trial	Basin Irrigation method trailed to see if it can be better than the delivery pipe irrigation.	Basin Irrigation trialed in Kp3 plot of Binda Devi Sardar. The total area covered is three meters and 5 holes in a pipe.	The performance about the basin irrigation will be observed.

Details of training organized and the respective dates are given below:

Date	Name Of Group	Name of Training	Resource Person	Duration	Methods to be covered	Materials used	Venue	Male	Female	Total	Target	Achieve	Total Budget	Total Expenses.	Remarks
Feb,2 017	KP1,KP2,KP 3,k1 and K2	Plant protection and IPM tools distr	Narayan Sah, R.K. Ray		Practical	IPM tools	all site				1	1	15000	8020	
Feb,2 017	KP1,KP2,KP 3,k1 and K2	Soil Test	Narayan Sah, R.K. Ray		Practical	Soil sample	all site				1	1	15000	17870	
3 Feb,2 017	Mahila Utthan Krishak Samuh and Raja Jee Krishak samuh,gadhi mai	Nursery Management Training	Narayan Sah, R.K. Ray	1 day	Theory and Practical	Seed , Pilytien,polly bag,Plant cocopit.	Sukha Chaudhary ko bari Ma.	3	10	13	1	1	15000	9142	
23 March ,2017	Mahila Utthan Krishak Samuh and Raja Jee Krishak samuh	IPM traing	Narayan Sah	1 day	Theory and Practical	Neem, cow urine etc.	Ram Kumari ko Ghar Ma, Kanakpati	1	11	12	1		15000	780	
17 March ,2017	Mahila Utthan Krishak Samuh and Raja Jee Krishak samuh	Pound Management meeting	JT government	0.5 day	Theory		Kanakpati ko pound mohar ma.	3	9	12	1	1	17000	6050	
17 March ,2017	Ma durga FG,Shiv Parbati FG	IPM training	Narayan Sah	1 day	Theory and Practical	Domestic and Harbal Materials	Sabita Devi Kamait ko Ghar Ma		8	8	2	1	15000	600	
2 April,2 017	Mahila Utthan Krishak Samuh and Raja Jee Krishak samuh	Mobile fishries training	Bandi lal Sah and Mala BK(DADO Saptari)	1 day	Theory	Brown paper, Marker	Kanakpati pound deal.	4	16	20	0	1		660	cond ucted by DAD O Saptari

21-Apr-17	Ma durga FG, Shiv Parbati FG	Compost making with Trichoderma	Lalit Sah	1 day	Practical	Trichoderma dust, compost and sugar.	Koiladi	3	6	9	1	1	0	0
1 June, 2017	Raja Jee Krishak samuh	Soil Solorisation	Narayan Sah	1 day	Theory and Practical	White Plastic and carbendazime		0	6	6				
2 June, 2017	Mahila Utthan Krishak Samuh	Soil Solorisation	Narayan Sah	1 day	Theory and Practical	, White Plastic and carbendazime		2	3	5				
4 June, 2017	Kp3	Soil Solorisation	Narayan	1 day	Theory and Practical			3	2	5				
21 Aug, 2017	KP1, KP2, KP 3, K1 and K2	Leadership development training	Shyam kant chaudhary (MCDC)	1 day	Theory, group discussion			7	14	21				
8 Sep, 2017	KP1, KP2, KP 3,	Nusey management Training	Narayan	1 day	Theory and Practical	Seed , Pillytien, polly bag, Plant Tray, cocopit.		1	17	18				
9 Sep, 2017	KP1, KP2, KP 3,	Paddy Plant Protection Trianing	Bandi Lal Sah (ADO)	1 day	Theory			1	15	16				
10 Sep, 2017	Koiladi	Paddy Plant Protection Trianing	Bandilal sah (ADO)	1 day	Theory and Field observation			6	7	13				
5-Oct-17	KP1, KP2, KP 3,	veg. Transplanting Training	Rk ray	1 day	Theory and Practical	Fertilizer and Seedling		2	17	19				
16, Oct, 2016	KP1, KP2, KP 3,	MIT Refresher Training	RK Ray	1 day	Practical			6	14	20				
18 Oct, 2017	KP1, KP2, KP 3,	IPM Trainig	LRP(Bauwalal chaudhary)	1 Day	Theory and Practical	Fertilizer, Plastic		5	16	21				
30-Oct-17	Kp1 and Kp2	Bio Technology cultivation practice	Shibshakti bio plantic PVT., Lahan, Branch	1 day	Theory	Bio Fertilizer Demo		2	9	11				
17 Nov, 2017	KP1, KP2, KP 3,	Fish Farmers exposure Visit	all	1 day	Field observation			11	5	16				
7 Nov, 2017	all site	Stakeholder meeting	all	1 day	workshop			31	14	45				
14 Nov, 2017	KP1, KP2, KP 3,	Veg. production Training	Narayan	1 day	Theory and Practical	seed , fertilizer		2	15	17				

16 Nov,2 017	kanakpati	Stakeholder ield visit monitoring	Rk Ray	1da y	Field observation			8	3	11				
27 nov,2 017	All group, traders CM	linkage traders to FGs and Cm into CBF	Rk and N sah	1da y	Theory,group discussion			5	13	18				

On Stakeholder's Workshop:

Stakeholder workshop is an important event where the farmers and other important actors meet and discuss how the DSI4MTF activities are progressing and can be made better in the future. The section below presents details of stakeholder workshop organized in Saptari with farmers from both villages of Kanakpatti and Koiladi.

Introduction:

A one day stakeholder workshop was organized at Saptari on 7th November 2017 under the project "Improving Dry Season Irrigation for Marginal and Tenant Farmers in Eastern Gangetic Plains" DSI4MTF. The workshop was divided into two sessions: 1) Project Progress and Achievements and 2) Opportunities and Barriers for Upscaling and Outscaling. The first session on Project Progress and Achievements was led by the project team to share on the project status and progress; community engagement and field experiences; technical intervention and initial outcomes; socio-economic and institutional intervention and outcomes; value chain and market study followed by discussion with the participants. Second session on Opportunities and Barriers for Upscaling and Outscaling comprised discussions with the primary and secondary stakeholders on their thoughts about the project. Furthermore, the representatives from farmers' group, input supplier, vegetable trader, municipality, District Agriculture Development Office, Fishery Office, Department of Irrigation, Ground Water Board Resource Development Office shared on potential areas to collaborate. With Nepal going through new federal structure, the discussion also centered largely around the arrangement affects agriculture and farmer groups in terms of new policies, budget allocation, market, infrastructure development.

The project has come a long way since its commencement on 2015. With the formation of three farmer's groups at Kanakpatti and 2 groups at Koiladi in Saptari district, a range of agronomic, irrigation and community mobilization activities have been carried out. Some of these activities have been coordinated with governmental and non governmental agencies with the aim to inform, engage and expand the project activities in the district. For example, the project has closely worked with the personnel stakeholders from Ground Water Resource Development Board on constructing the irrigation infrastructure in the intervention sites. Irrigation Division Saptari has provided guidance and financial assistance to construct pump in the intervention fishery pond. Grain kit was provided to farmer groups under agricultural tool kit scheme by District Agricultural Development Office, Saptari. These efforts have proved valuable to build linkages and coordination of farmer groups with local agencies in Saptari.

Hence, the stakeholder workshop was organized at Saptari with the aim to bring all the relevant stakeholders together firstly to share the project progress and secondly to explore avenues to collaborate with them in the future. This can ensure the continuity of the good work of the project with the existing intervention farmers with the support from the stakeholders on one hand and seek opportunity to replicate from the learnings with new farmer groups.

Specific objectives of the stakeholder workshop are given below:

- To inform and update the stakeholders on the project activities and progress from the beginning of the intervention period till present
- To share challenges/opportunities faced while rolling out the intervention and seek feedback/practical solution from the stakeholders to work on the challenges
- To explore opportunities to collaborate with the stakeholders with existing policies and provision
- To understand the impact of new governance structure on the agricultural policies and marginal and tenant farmer groups
- To replicate the learning from the project in similar activities carried out by the agencies involved and facilitate long term upscaling and outscaling of the project

Discussions Pointers:

- The DADO personnel from Saptari, Mr. Bhagirath Yadav showed interest to engage more with the project. The interest shown on the project encouraged the project team more communication and coordination with activities in the future to bring about more synergic effect.
- The project has limited resource and is unable to do work on every aspects. This is where working alongside the stakeholders such as DADO is important. On the basis of experiences from the project, upscaling and outscaling the current intervention is essential together.
- Some personnel such as Bandi Lal Shah from fishery wing of Agricultural Service Centre pointed out mere availability of input is not enough. Application of right quantity of input in right time is vital. For example, fish feed should be applied in the pond when required.
- The event was a platform for farmers to seek information with experts in the matters of agriculture and irrigation. One of the farmer shared that plastic delivery pipe breakage poses problem for long term use. He asked if there are other methods such as installment of PVC pipes useful for long term usage. The representative from GWRDB informed the scheme to provide PVC pipe for 6 inch pipe. However, he recommended plastic delivery pipe as a better and cheaper method. He emphasized on the need for maintenance. Often leaving the pipe out in the sun without folding could lead to early breakage.
- Last year, The Prime Minister Agriculture Modernization Project commenced on 2016 has come up with the concept of dividing the agricultural land into pocket, block, zone and superzone. There was a discussion on how inclusive PIMP is of marginal and tenant farmers. Saptari has been divided into pocket. There is a provision for co-investment between the government and farmers whereby 50 to 80% investment on agricultural machinery is done by government and rest by the farmers. NPR 3 lakhs is allocated for

new pocket and 5 lakhs to the old ones. Due to the new federal structure creation, the budget allocation is done directly to local government not the agencies such as DADO. Hence, the local government should prioritize agricultural sector and deployment of fund under the PAMP. The ward representatives from Kanakpatti mentioned the agricultural budget on agriculture to be 2 crore. The priority area here is pond and fishery activity.

- Discussion on crop insurance was of particular interest to the farmers given the loss they incurred following the extreme rainfall on monsoon of 2017. Government has a scheme which provided 75% subsidy to farmer on crop insurance. The crop premium is Rs. 5000 based on the estimated production cost.
- The agrovet from Rajbiraj shared the tendency among farmers to use especially the poor farmers about the lack of information on input application. He stressed the need to use right amount of input. Otherwise the input be of little benefit. Often poor farmers go for cheaper options and when the germination rate is low, they complain on the quality of seeds. Additionally, they demand for the banned items. There was suggestion from farmer and fellow participants that agrovet should not be guided by business motive entirely and supply quality inputs. There is quality inspection from DADO personnel in agrovet outlets time to time.
- Finally the discussion led to the realization on linkage between farmers and DADO officials to materialize information dissemination and support on right input usage. Time to time training to agrovet proprietor is essential so that they can help farmers in best way possible.
- A local vegetable trader who sells at Traffic chowk, a weekly market 1 km far from Kanakpatti shared on what would attract traders like her to procure the vegetables produced by the intervention farmers. She purchases the vegetables mostly from Golbazaar and Lahan (markets 50 km and 30 km distant from the Kanakpatti village). Procuring vegetables from these markets put relatively higher transaction. However, she gets different varieties of vegetables in as much quantity she wants. She shared the cultivation of off season vegetables, multiple varieties and large quantity would motivate her to purchase from the intervention farmers.
- The newly elected ward representative from Kanakpatti and Koiladi shed some light on their vision on agricultural development during their tenure. Although, the representative was unsure about the specific plans until the provincial election on November- December 2017, they shared the need to advance in agriculture through farmer groups. The emphasis was put on selecting the agricultural crops as per the location (such as soil type for crops, potential to expand animal husbandry etcetera). Fishery is identified as a priority area considering the suitability in the area. For some deprived groups such as Dalits, their engagement in agriculture will be encouraged especially in the fallow land landlords have. In the new governance structure, the local representatives have the most

say. So, the need for them to coordinate with agricultural departments and experts was emphasized.

- The representative from Koiladi mentions lack of clarity in the budget allocation. The local representatives have not had time to work as of yet and the preparation for provincial election would be vital to shed light on these matters. Due to engagement in these activities, the representatives considers the need for at least 6 months to learn and roll out targeted activities. The need for coordination with other departments and offices was considered.
- Farmers expressed the tendency of leaders to prioritize infrastructure building such as roads in the name of agricultural development. While building such infrastructures is important, this should not be done at the expense of cutting off schemes for farmers.
- Farmers pointed out the need for agricultural mechanization such as tractor, storage facility. The accessibility of marginal and tenant farmers with existing infrastructure such as storage facility is a major concern. For example, there is a storage facility for potato at Saptakoshi ,Sunsari district. However, transporting potato from from Kanakpatti and Koiladi becomes expensive for marginal farmers. Hence, one of the major challenges to be addressed is devising marginal and tenant farmer friendly infrastructure. This will ensure the inclusion of and prosperity of marginal and tenant farmers who comprise the major categories of farmers in Nepal.
- When farmers asked if the machineries such as power tillers will be provided to farmers, the DADO personnel mentioned the high application for limited schemes. He gave example of application from 200 farmers when they had the provision to provide for 27 power tiller.
- Crop insurance provided by government can be taken from Krishi Sewa Kendra referred as Agricultural Service Unit in the local level. Within 7 days of crop plantation, it has to be done. If the insurance amount is 1 lakh, the premium is Rs 5000. The insurance amount is subsidized up to 75% by the government.
- There are still some practical difficulties for marginal and tenant farmers to access such schemes. There is the need for land ownership certificate or tenancy certificate to apply for such schemes. Marginal and tenant farmers are not given such certificates by the landlord with the fear of their land being transferred to the tenant in case there is any land reform policies in the future.

Beyond the Stakeholder's Workshop:

After the stakeholders' workshop, a group of officials from the governmental departments visited the intervention farms in Kanakpatti. The idea was to observe the ongoing activities in the intervention farm and build partnerships in days to come in terms of accessing the resources offered by the governmental agencies. The stakeholders were interested about the collective model of farming as wanted to learn more as well as replicate the activities in future. On 16th November 2017, DADO chief, DIO chief and chairperson of Kanakpatti ward visited Kanakpatti Saptari sites. Through the dialogue, an exposure visit of the fishery group was organized to on 17th November 2017.

How can such initiatives work better?

During the discussion, the stakeholders agreed on a couple of aspects necessary to create suitable environment for conducive environment for agriculture and farmers to thrive.

- Introduction of water efficient crops for farmers with limited infrastructure investment capacity.
- Linkage and coordination required among all the stakeholders especially now when there is much confusion around restructuring of governmental ministries and departments. Especially for the farmers, the clarity on who to approach for different agricultural related schemes is important.
- The lack of assurance on whether the inputs procured by the farmers was one major point of discussion. The agrovet representative assured the quality of seeds he supplies are subject to differentiation on the basis of companies. He assured dissemination of clear information about the product quality to farmers before selling them.

1.4 Documenting Engagement: Impacts and Implications, Case study –West Bengal

The background:

Dry season irrigation for marginal and tenant farmers (DSI4MTF) adopts ethical community engagement (ECE) perspective in implementing its research agenda. The project components include mobilization and collectivization, installation and management of various irrigation technologies and agronomic trials and institution building. Further it aims at understanding and analysing their combined impacts in terms of crop intensification, equality of distribution of benefits characterizing inclusion and fairness. The outcomes have important potential to influence existing national and global policies on intensification in dry season scenario. CDHI is involved in community mobilization, institutional development and capacity building.

The project has covered substantial time and space in the field using ethical community engagement perspective. CDHI has been facilitating and documenting the process of engagement and its impact covering different aspects of the projects. This is in this context that an attempt is made to collate, integrate and analyse the process of engagement and its impact. Although the engagement is facilitated by the core team of CDHI we have the benefit of collaboration and support from different partners such as UBKV, existing line departments and other stakeholders.

Refreshing ECE:

As opposed to a conventional method of deciding on the nature and process of top down implementation strategy, following a specialist's view, the project prefers and practices collaboration and partnering with the community. Communities are not their subjects but partners and collaborators. Communities' perspectives, wisdom and priorities are respected and given due credence to. These are considered and function in an environment of mutual trust and respect and decisions that follows and are based on objective parameters mutually agreed. Rather than maintaining a stiff stance the researchers and the community deliberate and dialogue as equal partners retaining and demonstrating their strengths and weaknesses in the most transparent manner. The case presents an analysis of the extent to which the approach has influenced certain important variables under the project.

The conceptual framework

Not to get led into an academic discourse, veering around intricate theories and conceptual complexities, an attempt has been made to define the variables, under analysis, in their possible simplest form. For us intensification is *incremental coverage of land with different crops during different crop seasons*. The assessment is made using crop data per season. *Inclusion is considered across gender and class in the implementation of various operations and appreciation of their contribution and perceived impact. Inclusion is considered in terms of participation in institutions, interventions and benefits what so ever*. This is captured through physical participation in different operations and processes, membership to different collectives and groups and benefits sharing practices. *Collectivization is seen as joining and acting together to achieve common goals by group of people following a mutually agreed normative structure. Ethical engagement is seen as collaborative interaction and partnership between the researchers and the community each valuing others for their wisdom, insights, value system, intellectual, creative and physical endowments in evolving and analyzing concepts, methodologies, strategies, process and outcome. The engagement also includes interaction among stakeholders who join and participate in the research endeavour under similar conditions*.

Based on their direct participation and observations, during the last two years, the authors advance a central hypothesis that ethical engagement has led to catalyze enabling conditions where the researchers, community and other stakeholders have worked in tandem and have collectively influenced, among others, impact pathways prominently reflected in intensification,

inclusion and collectivization. The hypothesis is supported by analysis of quantitative and qualitative evidences explaining the changes. An attempt is made to explain what and how the community engagement perspective has proved critical in influencing the impact as hypothesised.

The engagement impact interface:

In the following section an attempt has been made to analyze interface between ECE and various impact pathways – (1) intensification, (2) inclusion and (3) collectivization. While doing so each of the impact pathways are considered in terms of:

1. Determinants –what determines the specific impact
2. The dynamic contribution of each of the determinants independently and in various combinations in tandem,
3. Gaps –what possibly obstruct(s) seamless influences of determinants
4. What ECE has done and how it has brought about seamless and composite impacts
5. Evidences and
6. Analysis and potentials for generalization

We shall independently discuss and elaborate each of the impact pathways. Subsequently, possible learning would be identified and a way forward would be recommended. We begin with the impact pathways.

Intensification:

As has been indicated earlier, in the beginning, for us intensification is incremental coverage of land with different crops during different crop seasons. The assessment is made using crop data per season.

Determinants – what are the determinants of intensification: For intensification basic elements may include – (1) land, (2) cultivators, (3) technology-irrigation, agronomic, harvesting, processing, (4) Knowledge and expertise to harness the productive potential (5) Value chain and market (6) Policy support. The intensification (or lack of it), to our understanding, can be explained around these factors interacting in appropriate combination. Let us discuss various factors.

Land – In case of the project villages the following table presents distribution of **land** among the farmers participating in the project (farmers perspective):

Table 1: Distribution of Households by Size of Landholding		
Land (Acres)	Dhoulaguri (DH) (%)	Uttar Chokuakheti (UC) (%)
Landless	55 (21.7)	14 (5.7)
Less than 5	193 (76.0)	211 (85.8)
05+ to10	4 (1.6)	14 (5.7)
More than 10	2 (0.8)	7 (2.8)
Total	254 (100.0)	246 (100.0)

According to Base Line Survey*:

Land (Acres)	Dhoulaguri (DH) / Total HHs surveyed	Uttar Chokuakheti (UC) / Total HHs surveyed
Landless	56/243	133/264
Less than 5	176/243	129/264
05+ to10	10/243	1/264
More than 10	1/243	1/264

**According to the baseline survey done by IWMI specially for UC the number of landless show higher than Dhaloguri. The above two tables show different information owing to different level of interaction / interview with farmers. In UC most of the farmers are not having land papers in their own names but enjoying the agriculture land in legal way for last few decades. Now government is in the process to provide land papers to the current land owners throughout the West Bengal. When people from external agencies are approaching with questionnaire to the villagers, especially tribal community like UC for survey then they have common tendency to tell "I am landless". Because they are not having land papers though land is registered under his / her grandfathers. This is to be noted that landless is considered as BPL-below poverty line and BPL family can access different facilities quite easily.*

The average land distribution at Dhaloguri is 2.80 bigha (approx one acre) per household /HH and 6 bigha (2 acre) per HH at UC according to farmer's account of the villages. This contrasts with the baseline survey land holding of HH of Dhaloguri is 5.42 bigha (1.81 acre) and for Uttar Chakwakheta land holding per HH is per household 3.12 (1.04 acr

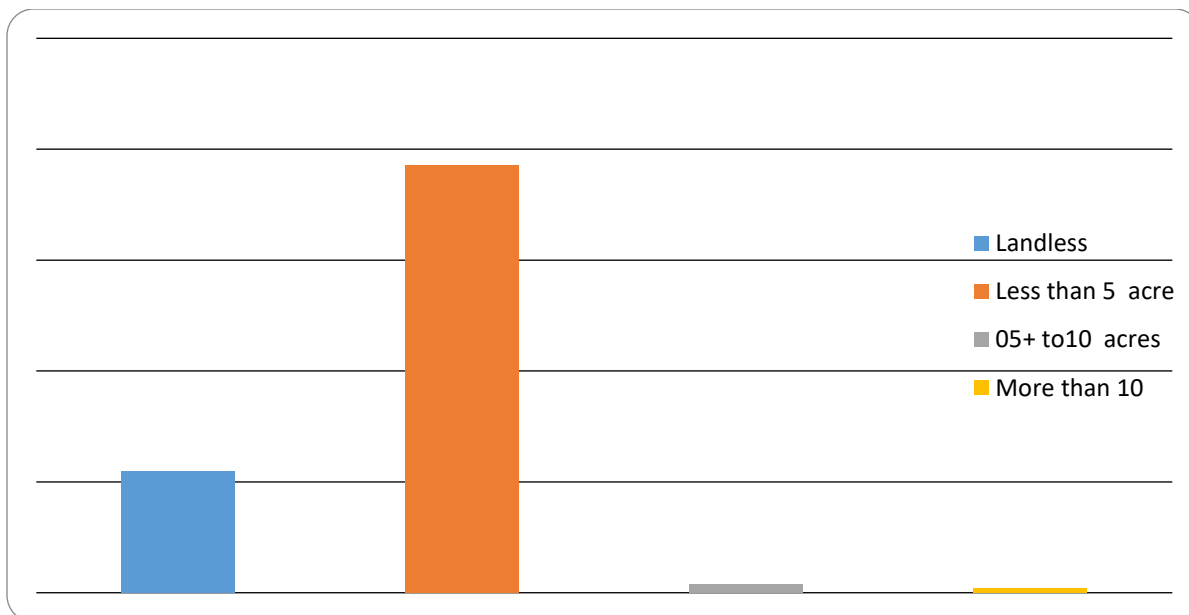


Figure 2: Land typology at Dhaloguri (Total 254 HHs)

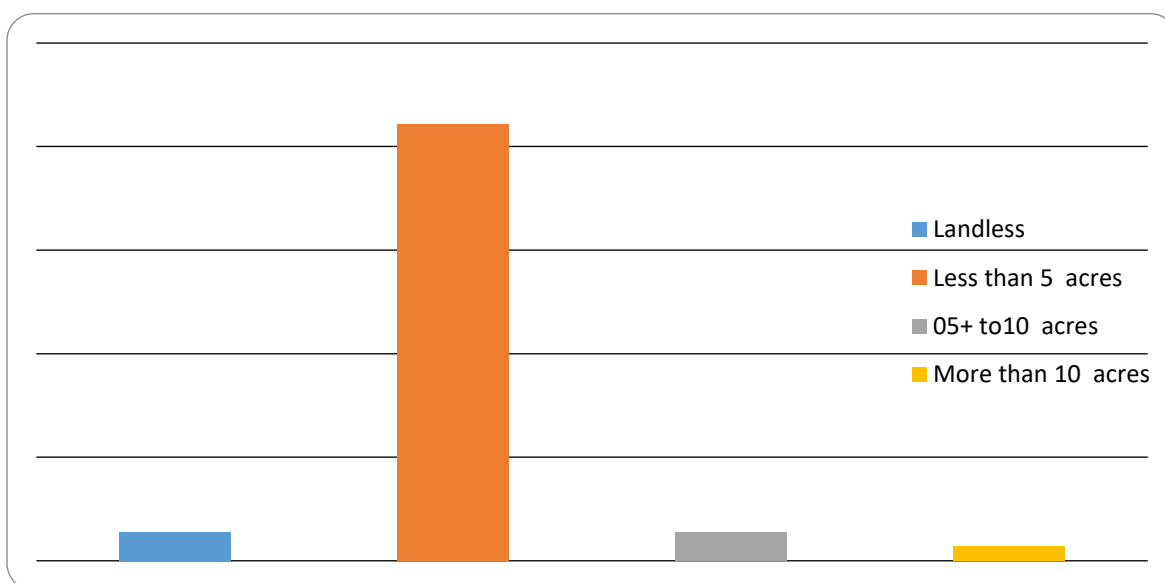


Figure 3: Land typology at UC (Total 246 HHs)

The scenarios are tilted toward small and marginal and land less. The distribution of land ownership varies in the two villages. While Dhoulaguri (DH) has per capita land ownership at 1 acre with some 21.6 % as land less. Uttar Chakwakheta (UC) has 5.70% landlessness and all of them have almost at least 2 acres of land. Both the graphs show that UC has ownership of larger landholding and number of landless households is negligible. In UC there are few landlords who are having more than 5 acre lands. DH has a cropping intensity of 200% and UC 120%. Both suffer dry spell 7 months (November to May) rendering the soil face drought like situation. The type of soil and water table also differ in the two villages. While DH has loamy soil (clay 55% and sand

45%), UC has sandy loam (sand 60% and clay 40%) and the water tables are 22 fts and 24fts respectively in dry season. The average annual rain fall is 3200mm. The pace of intensification (if any) would need to be analyzed in the context of above geo-cultural and bio-physical realities.

The farmers in DH are descendent of a migrant community from the then East Bengal –East Pakistan now Bangladesh. They settled on the present location in year 1968 on the local land lord of Cooch Behar with local communities-relatives and acquaintances coming forward in support. Faced with a serious identity crisis and an uncertain future the farmers were driven by the instinct to survive and prove. Also as East Bengal farmers they were familiar with the agricultural practices and local livelihoods endowments and trajectories.

The UC farmers are also migrants in nature –being descendent of the tribal community from Jharkhand to work as tea garden/forest labourer. They were familiar with the work they were supposed to undertake and also the bio-physical conditions which is more or less similar to the ones in Jharkhand. They also carried with them the necessary skills. The Government had leased/settled certain piece of land to work. Belonging to the tribal community they were more inclined to eke out living out of the natural resources around-forest/mines etc. The man-animal conflict and hostility might have led them not go for organized agriculture in comparison to the Dhoulaguri.

With the above strands of similarities and contrasts the two villages have joined the DSI4MTF as collaborators. It would be interesting to understand the dynamics of implementation and impacts from the two villages. If intensification has taken place what possibly made it possible and what are the differences in the intensity and dynamics of intensification?

Technology, being used in both the villages, has been traditional with some modern technologies slowly taking sufficient space. The farmers use manual and oxen driven ploughs also commonly known as Country Plough and land levellers. Tractors/ power tillers are also available to be hired but are not affordable considering the cost. Irrigation uses electrical and mechanical technologies and is owned by the individual farmers. They are also rented from others which are often uncertain in availability and high on cost. The two villages also have ponds which are intermittently used but they are not perennial and do not assure timely supply of water. Seeds are procured from the private markets and the farmers have to trust the suppliers. Some seeds are also provided by the government agencies which are neither trusted by the farmers nor are regular in their supply. Pest control depends on chemicals and medicines supplied by different agencies –manufacturers and suppliers. UC is more traditional in adoption of technologies. Also on hiring technologies, UC, does not seem to be keen.

The project –DSI4MTF- has introduced shallow-tube wells, solar pumps, drip irrigation and protected agriculture technologies to the farmers on experimental basis. The project has facilitated operational training and also does hand holding. Happily, the farmers, in both the

villages, are gradually showing interest and ease in operation. Most of the technologies are to be collectively operated and managed. There is visible impact in coverage and yield due to available technologies.

Knowledge, related to agriculture, has transcended through generations of farmers **till now**. Both the villages have some farmers with better knowledge and linkage with the sources of knowledge outside the villages. *Such villagers are reference farmers.*

Extension and experts are provided by the Government to the farmers. Government of West Bengal has an elaborate system to offer extension services to the farmers. The services are available but are sporadic in nature. There is an Agriculture University –UBKV-in the neighbourhood which has carried out some field experiments in the two villages in the past. These experiments have been project based and miss on continuity and follow-up. The UBKV is also a project partner in the current project –DSI4MTF. Their involvement is important to influencing diversity. Each of the villages / areas have farmers with good practices and their practices are often referred to and used by the fellow farmers.

State and central governments have pro-farmers policies in favour of the small and marginal farmers. The policies provide for institutional credit and input support, support prices, insurance and marketing. In the two villages we did not find these policies being systematically and practically available for the benefits of the farmers. We realize that although these policies are useful their implementation follows a complex bureaucratic route making it difficult for the small and marginal farmers to access and avail the intended benefits. The farmers, in the two villages, lack awareness and instrumentalities to access them. The agriculture extension and grassroots development agencies are not sensitized to keep the priorities of the farmers in mind. As a result policies fail to get translated into real implementation and impact on the ground.

Farmers' aspirations and risk perceptions are important to understand. During our initial engagement we observed that farmers were not optimistic about intensification considering the current environment –persisting dry spell, dependence on the traditional technology, weak and indifferent extension services and blurred policy prescriptions. The farmers lacked clear vision and aspiration about life and livelihoods. One could often come across observations like – *'several such initiatives have come and gone but our plight continues to be as they were for years. The researchers and researches have come about but nothing significant has happened'-farmers would invariably say.'* *Our plight is going to be the same –no big change is anticipated'.* ... *If you are serious tell us clearly what the project is going to offer'? '...give us pumps, seeds, fertilizers and chemicals and market and we will manage to subsist'!* *"...Our crops suffer because of unpredictable climate conditions; we often suffer market fluctuations owing to unpredictable market. Minimum support prices and assurance against crop losses and glut are completely absent. Under such circumstances dreaming for a clear future is like day dreaming and cruel joke".*

With the above benchmark DSI4MTF began its journey by launching modest level of agriculture technologies, collectivization and institutional development and capacity building. The background and profile as discussed were captured through a well structured baseline using quantitative and qualitative methods.

The balance sheet-whither intensification!

Considering its goal of intensification and its impact on inclusion and innovation, this document attempts, tentative analysis of the trend and direction. Ethical Community Engagement (ECE), being central to DSI4MTF, through this case, attempt is made to analyze whether the approach (ECE) has helped inclusive intensification and collectivization. The analysis is based on the available data –qualitative and quantitative and observations and is an attempt by CDHI and UBKV team to understand the dynamics and extent of changes. The objective is to share the data with the larger research communities involved in the implementation of the project. The document may stimulate discussion. The first task, in this case is to assess the changes in cropping pattern and the resultant coverage- whether intensification has happened? Having achieved this, factor contributing to intensification would be identified. Among the factors role of ECE would be analysed.

The physical data over the last three years cropping seasons suggest an incremental rise in cropping intensity although the intensity is not yet substantial. The following table presents crop coverage in the two villages over time.

Table 1: Changes in Area under Dry Season Crops														
Cropping Season	Dhalogru							Uttar Chakoakheti						
	Site1		Site 2		Site 3		Poly house	Site1		Site 2		Site 3		Poly house
	Crop	Area (m2)	Crop	Area (m2)	Crop	Area (m2)	Crop	Crop	Area (m2)	Crop	Area (m2)	Crop	Area (m2)	Crop
Season Rabi 2015-16 (13 crops)	Potato	4457	Potato	523	Potato	6836	Cucumber	No		Lentil	1183	No		No
	Cabbage	330	Lentil	1890			Lady finger (off season)							
	Cauliflower	133	Mustard	4670										
	Tomato	387	Maize	739										

	Radish	165												
	Chilli	442												
	Onion	33												
	Mustard	627												
	Garlic	100												
Season Pre – Kharif / Summer 2016 (12 crops)	Jute	1896	Jute	523	Boro Paddy	4681	Capsicum	Brinjal	200	Beans	67	Basela alba	70	
	Boro paddy	3129	Boro paddy	2727	Jute	2052		Jute	1830	Jute	1420	Ridge gourd	184	
			Taro	1666				Beans	65			Cucumber	243	
			Chilli	666				Okra	71			Beans	196	
			Elephant footyam	668				Chilli	65					
								Cucumber	65					
								Ridge Gourd	65					
Season Rabi 2016-17 (14 crops)	Potato	9990	Wheat	5576	Potato	5980	Spinach	Maize	2277	Maize	2149	Maize	2763	
	Cabbage	538	Onion	129	Garlic	318	Coriander	Mustard	11459	Mustard	1870	Mustard	1000	
	Cauliflower	536	Garlic	420				Besns	1002	Wheat	4654	Wheat	1012	
	Tomato	430	Potato	538				Potato	459	Garlic	100	Potato	2066	
	Garlic	62	Maize	2180				Coriander	60					
			Coriander	67										
			Chilli	722										
			Radish	533										
			Cabbage	1000										
			Spinach	129										
Season Pre – Kharif / Summer 2017 (1 Crop)	Jute	552	Jute	523	Jute	950	Capsicum	Jute	1732	Jute	874	Jute	0	Capsicum
Kharif 2017 (6 crop)							Spinach							Cauliflower
							Cauliflower							Spinach

							Coriander							Coriander
							Asparagus							
							Onion							
							Radish							
Season 2017-18 (Proposed)	Cabbage		Cabbage		Garlic		Capsicum	Mustard		Mustard		Mustard		Cauliflower (early variety)
	Broccoli		Cauliflower		Beans		Spinach	Wheat		Wheat		Wheat		Broccoli
	Beans		Broccoli		Potato		Coriander	Maize		Maize		Radish		Spinach
	Cauliflower		Garlic				Beans					Turnip		
	Radish		Beans				Radish					Chilli		
	Tomato		Cucumber									Potato		
	Potato		Potato									Maize		
	Pumpkin											Broccoli		

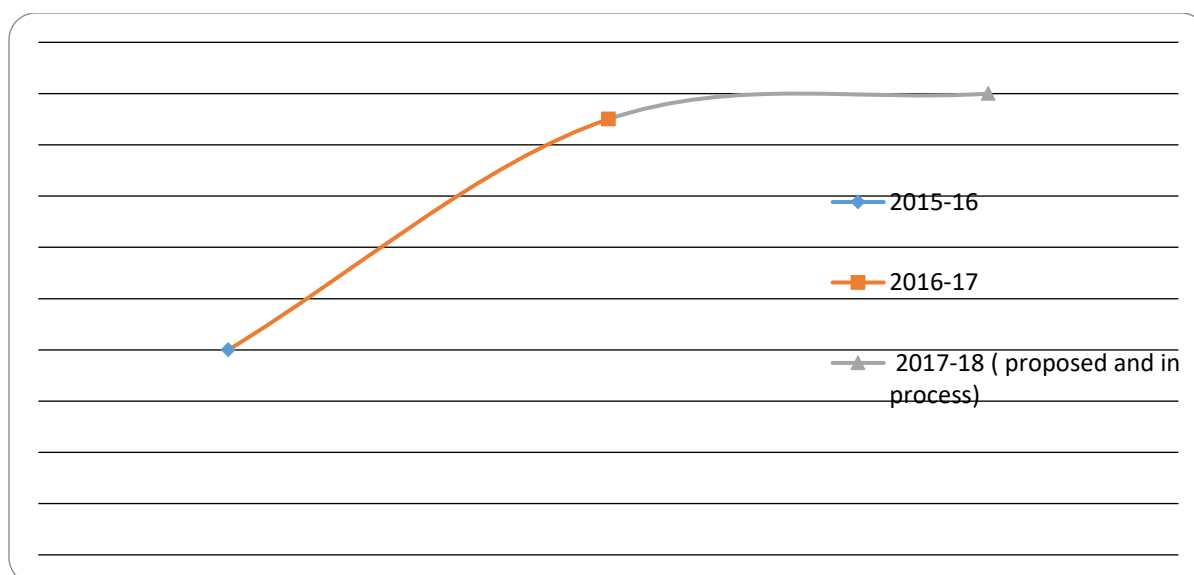


Figure 4: Year wise number of dry season crops in all six sites.

The data and graph in the above table suggests that there has been incremental rise in the cropping intensity in both project villages. The first season has been a season of Rabbi. The coverage of area also show increase in some . Out of six sites, in total, land coverage has increased at four sites.

Then we try to present the profit –losses across the sites in the two villages. More than gross profit and loss scenario we tried analysing the practice and process farmers adopt while arriving at the profit –loss scenario. Sometimes one’s own labour is discounted some times partial involvement of men and women is not considered. This has implications for evolving ad formulating a business model.

Land coverage of different crops for the respective sites in the following table-5 and diagram shows that three sites of UC is increasing steadily. Two sites (1 and 2) of Dhaloguri village almost doubled their cultivation. In both villages farmers are increasing cultivable land in Rabbi and summer season as well as increased crop intensification though this is happening in small scale. Interestingly farmers are not gaining so much profit from it so far but enjoying in doing experiments with new crops and new technology.

Table 2 Site wise land coverage (Sq. meter) in both village.

Season	DH site 1	DH site 2	DH site 3	Total land (Sq. m)	UC site 1	UC site 2	UC site 3	Total land (Sq m)
Rabi 2015-16	6674	7822	6836	21332	00	1183	00	1183
Summer 2016	5024	6250	6733	18008	6733	2361	1687	4729

Rabi 2016-17	11556	11294	6298	29148	15257	8773	6348	30378
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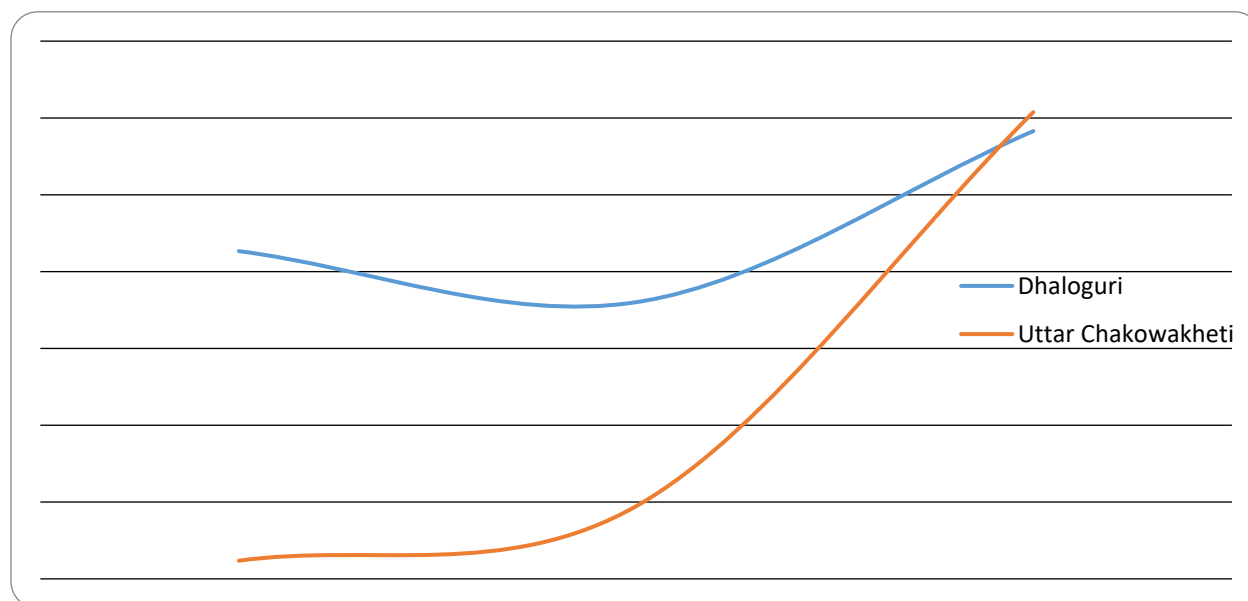


Figure 5: Shows the season and year wise land coverage (Sq. m) in the respective sites.

The figures and the graph indicate growing land coverage. This may be an indication of how intensification is growing.

Surplus generated

Table 3 Surplus generated from different crops (Profit-Loss)*									
	Dhoulaguri –(INR)					Uttar Chakoakheti –(INR)			
	Cluster 1	Cluster 2	Cluster 3	Protected 4		Cluster 1	Cluster 2	Cluster 3	Cluster 4 / protected
Rabbi 2015-16	Cost 115700 Income 193402 Profit 77702	Cost 21158 Income 53039 Profit 31881	Cost 85512 Income 199548 Profit 114036	NA		NA	NA	NA	NA
Summer 2015-16	Cost 48321 Income 104111 Profit 55790	Cost 55890 Income 16836 Loss 39054	Cost 68767 Income 49420 Loss 19347	NA		Cost 13036 Income 7395 Loss 5641	Cost 8462 Income 12745 Profit 4283	Cost 1139 Income 93 Loss 1046	NA

Rabbi 2016-17	Cost 129456 Income 83530 Loss 45926	Cost 37462 Income 20327 Loss 17135	Cost 81731 Income 77107 Loss 4624	Cost 5800 Income 2000 Loss 3800		Cost 52929 Income 16133 Loss 36796	Cost 36982 Income 11006 Loss 25976	Cost 10160 Income 00 Loss 10160	NA
Summer 2016-17	Cost 50929 Income 87637 Profit 36708	Cost 57833 Income 16836 Loss 40997	Cost 70898 Income 49420 Loss 21478			NA	NA	NA	Cost 1300 Income 480 Loss 820

***Home consumption and distribution among the neighbours and relatives as part of cultural economy which suggests sharing with the relatives and neighbours important. This was shared by Mrinalthe farmer from Dhoulaguri –the spinach and capsicum being new crops in the village Mrinal distributed among friends ,neighbours and well wishers. This is common practice –as part of moral/cultural economy. This is not calculated while considering profit.*

The figures in the above table suggests that profit has not been substantial and very difficult to conclude the overall scenario of profit and loss. The protected area farming has offered a controlled environment but there has been scepticism about the performance. Technical support and gradual hand holding led to the intensification happened both in the field and protected structure although the profit quotient has not been significant rather loss. What has held the farmers on the intensification drive? The current levels of planning show clear intent toward adding more crops and varieties.



Figure 6 Profit-Loss calculation and ranking of farming activities by the farmers in project villages

The following diagram based on table-3 (Profit loss) shows the village and site wise collective cultivation in Rabbi / winter and summer season since 2015-16 to 2016-2017. The blue colour indicates the expenditure / cost of cultivation and red colour indicates the return or income

whereas green colour shows both profit and loss. If we go through all sites in both villages, we will found all three sites of Dhaloguri village in 2015-16 gained good profits due to good market price of potato and other vegetables. Otherwise the scenario of overall picture is not so encouraging but same time right now very difficult to draw the final conclusion. The research 4 development for next 2/3 years is going to be very crucial.

Profit- Loss account-complex calculation

The table of profit-loss account shows that farmers at Dhaloguri, especially site one and three earned the money exceptionally well in 2015-16. It looks contrast to other sites of both villages. It happened due to exceptionally higher price of potato and vegetables in 2016. It revealed from discussion and field notes that the production cost of potato is normally Rs. 3.00 per kg (including marketing / transport cost and without cold storage charge) and Rs. 5.50 (including cold storage charge) for last few years. The yield of potato is always very high i.e 3200kg to 4000kg per bigha (0.33 acre) resulted in almost all farmers are trying to produce potato. In 2016, the farmers throughout the West Bengal gained profits and farmers sold the potato at Rs. 10.00 to 12.00 per kg which is considered as very good market price. This is not happening in every year but not so much loss if it does not happen as production is very high. In site three farmers gained net profit of Rs.5.00 to 7.00 from 1 kg potato and land coverage of the potato was larger than other sites. The farmers in site one, unfortunately did not gain profit from potato due to poor storage at home or lack of preservation but gained good price from tomato, cabbage and cauliflower. Another common reason for both Dhaloguri sites –I &III is that both farmers group led by two progressive and experienced farmers – Nirmal Das and Rajoni Karjee respectively.

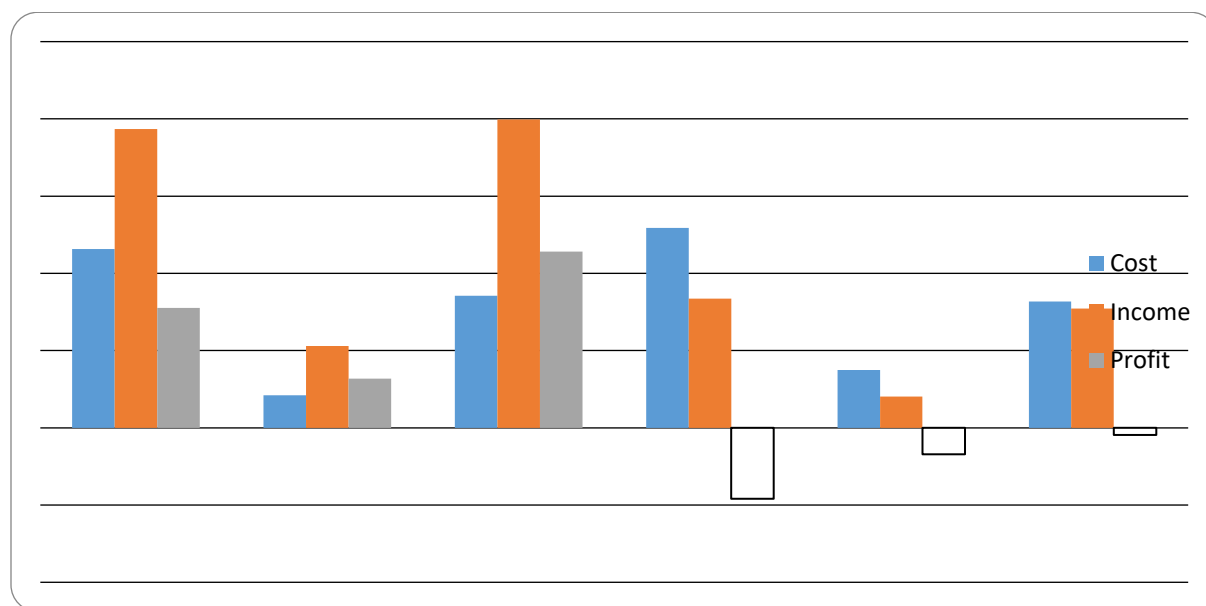


Figure 7: Profit-loss of Rabbi season cultivation in Dhaloguri

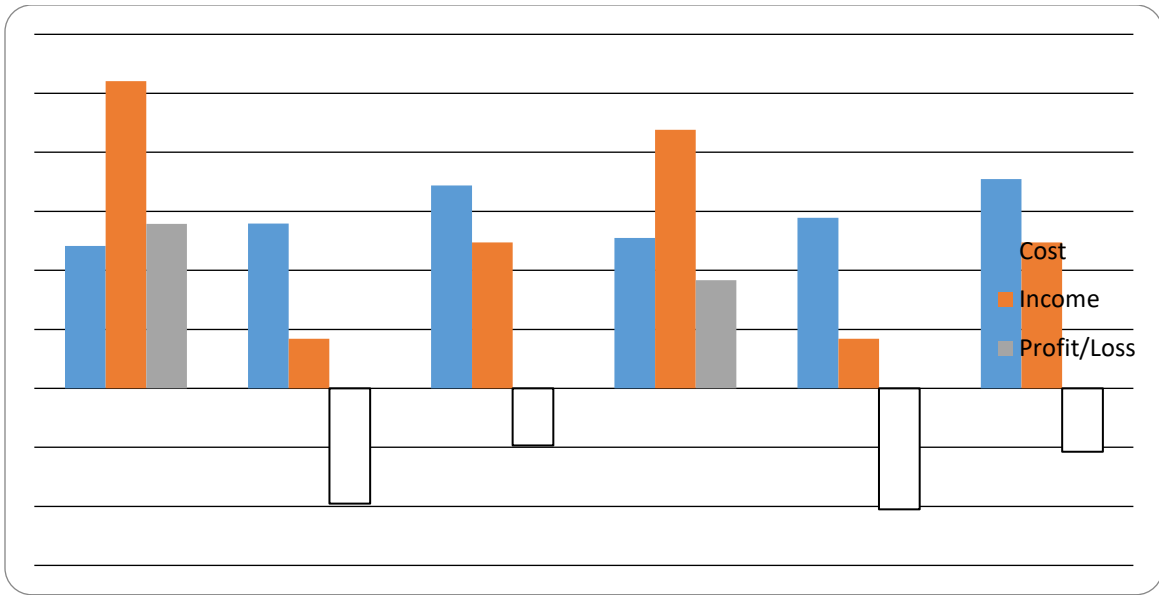


Figure 8: Profit –loss of summer season cultivation in Dhaloguri

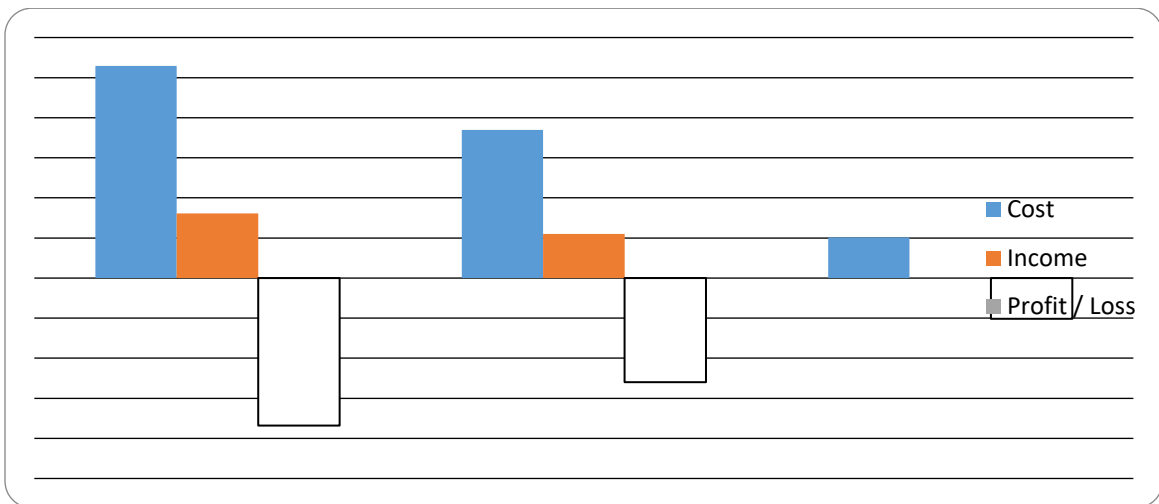


Figure 9: Diagram: Profit-loss of Rabbi season cultivation in Uttar Chakowakheti

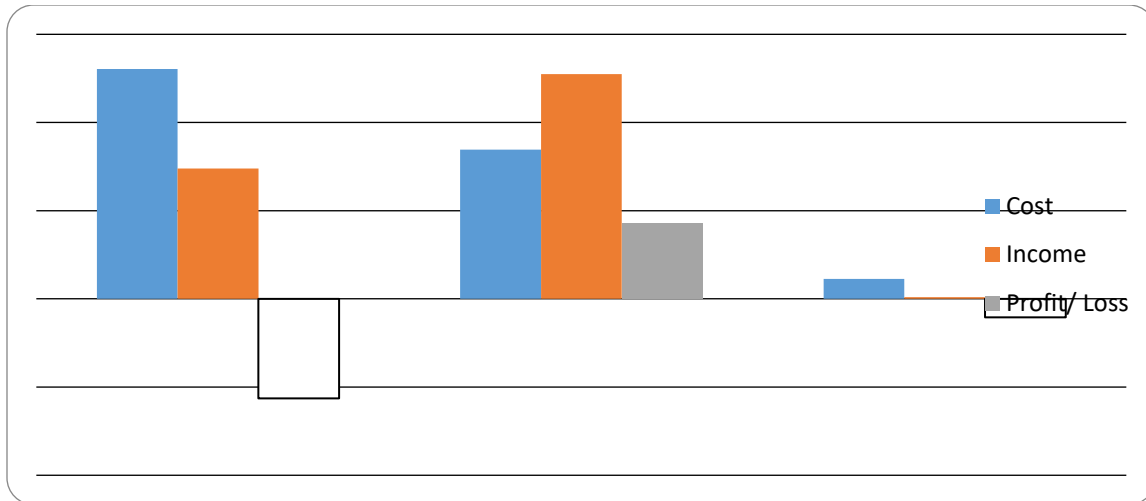


Figure 10: Loss-profit of summer season cultivation in Uttar Chakowakheti

What made intensification possible: Has ECE mattered?

Over the project period we find intensification progressing in the project villages. There has been noticeable *increase in the coverage of land and* also adding variety indicating *a push toward diversity*. There has, however, been different pace of progression which shall be explained later. If the current indications confirm intensification happening there is a need to identify and attribute to the factors. In our earlier discussion we identified the following factors that have the potential to contribute to intensification. Let us make a repeat presentation of the factors which include:

- Bio-physical conditions including land and water
- People-farmers –their aspirations/vision/ risk sensitivity
- Technology
- Knowledge
- Extension support and
- State policies

As has been explained in the earlier section of the write-up both:

- Villages have small and marginal farmers with small land holdings. UC, in contrast to DH has almost zero incidence of landlessness though survey data is showing different scenario.
- The soil has low water holding and moisture retaining capacities which render them dry during the drought spell –on an average of three months in a year. This adversely impacts crops and intensity,
- The use of modern technology is still to pick up and the farmers depend upon traditional technologies though few of them recently started to use the tractor and thrasher on rental basis. The technology available in the open market may not be affordable by individual farmers making a strong case for collectivization,

- The knowledge about agriculture is still farmers' centred –some of them showing better use and practice which they informally access and acquire. There is less of sharing. This makes a case for creation and imparting of knowledge by specialized agencies –individuals,
- The state has elaborate agriculture extension system. Unfortunately, the same is neither systematically organized nor farmers have confidence in them,
- The research centres and scientists are perceived as somebody with special qualification and position. The farmers feel hesitant to approach and interact as they seem to use a different epistemology. Scientists, on their own, also have limited willingness as the hand holding the farmers is considered as the job of the extension functionaries.

The above offers a mirage like scenario. There is abundance of water -rainfall and ground water. But a dry spell renders the land infertile. There are technologies available to deal with intermittent drought and compensate for and optimize the productivity, diversity and intensity but they are not affordable for the average farmers. The elaborate extension system is not able to address the farmers' impending needs! The state policy having a pro-farmer agenda does not match enormity of socio-cultural and technological issues. The presence of premier institutions of science and scientists does not help appropriate and adequate knowledge transfer from lab to field. Social fragmentation, characterized by weak social network and solidarity, renders institutional development difficult and notional. This is also reflected in inadequate transfer of knowledge using individual innovations and excellence at the local level. It, therefore, leads the small and marginal groups, with limited options for survival, to develop cynicism and loss of confidence. There is missing self-efficacy and vision to excel and innovate. There is a scenario of disconnect and missing empathy which call for urgent and immediate attention.



Figure 11: Irrigation in the field of collective farming – cabbage at Dhaloguri.

ECE catalyzes synergy and empathy across those who matter in intensification:

For those involved in research for Development (R4D) there seems to be a need to look at ECE from a much broader lens. In the evolving scenario, that we have just come across, there are different partners and collaborators in the research enterprise who have significant stake and who invariably make significant contribution to the research outcome. The partners and collaborators may differ in their professional, personal and social background, orientation and intent. All, invariably, have the intent to contribute positively. But at the same time they also carry their individual perspectives, priorities and preferences with them. ECE, therefore, has the important role in smoothening the differences by creating an enabling space for mutual appreciation of their respective world views, facilitating condition(s) for rational and objective reflection, dialogue and discussion and encouraging questioning and contestation around relevant issues. The process, gradually, tends to catalyze synergy among the collaborators and stakeholders to reach common understanding and action. Such a space /condition is made possible using different platforms/formats – a person to person dialogue, community level collective meetings, popular professional and socio –cultural events, scenario analysis, storytelling and story building and policy and multi-stakeholders consultations. This may not sound conceptually or theoretically apt but this is what we have experienced over the period of our engagement with the two projects. We would like to share our learning of engagement which, combined with other sites may offer opportunity for generalization and theory building.

In the following section let us present our explanation of how ECE has helped intensification by catalyzing appropriate conditions for constructive communication among the stakeholders who

matter in intensification. While doing so we would also like to present various forums/ formats and strands of engagement.

Strands of Engagement:

The following matrix presents strands of engagement at different levels and during different points of time. These are simple and chronological presentation of how we have moved and progressed and how it has impacted intensification. This would be followed by cases and anecdotal accounts to support explanations.



Figure 12: SHGs members and women members of collective farming groups-engagement with a purpose

As the matrix depicts we began with initial interaction with the community post inception during (2013-17). The occasion was to have community's views on site selection. A situation analysis of the two villages was carried out following an iterative interaction on village/community realities. A subsequent stakeholders' consultation helped in appreciating their perspectives and also in sharing the project goals and perspectives. Stakeholders' consultations continued at different points of time during the implementation. The project had clear focus on institutional analysis which subsequently helped in evolving local institutions. Technological interventions were planned combined with crop planning. Having laid the basic framework monthly meetings, review and planning meetings continued. As the project progressed peer-group sharing, through inter-village visits and visits to locations of excellence and good practices, helped embedded learning. Special events like social audit and analysis of outcome were made regular events. Since February 2017, bi-monthly sharing and review meetings are organized at Jalpaiguri attended by the farmers from both the villages.

The following matrix presents the strands of engagement which suggests frequency and intensity of engagement.

Table 4: Strands of engagement				
Strands of engagement	DH-frequency	Impact	UC Frequency	Impact
The post inception farmers meeting(s)	47	Enhancing knowledge and confidence for dry season cultivation. Slowly and steadily implementing new technologies.	29	Enhancing knowledge and confidence for dry season cultivation. Slowly and steadily adopting new technologies.
Situation analysis	2	Engaged with the farmers towards understanding the village realities	2	Engaged the farmers towards project and created ownership.
Focus Group Discussions	31	Issue based discussion on different topics and strengthened the internal governance.	23	Issue based discussion on different topics and strengthened the internal governance.
Stakeholder's consultation	3	Insight and action plans emerged from different agencies and convergence created.	3	Action plans emerged from different agencies and convergence created. Also accessing government facilities.
Institutional development and capacity building	22	Strengthening the community based organization and engaging towards active participation. Relationship building with service providers.	17	Strengthening the community based organization and engaging towards active participation. Relationship building with service providers.
Planning for technological location	6	Ensured the community engagement towards technology and proper installation of irrigation systems and equipment's.	6	Ensured the community engagement towards technology and proper installation of irrigation systems and equipment's.
Participatory crop planning	4	Cultivation based on farmers choice and introduced new crops.	5	Cultivation based on farmers choice and introduced new crops.
Monthly meetings	27	No major conflicts among the women, landless, tenant and rich farmers.	24	Common decision and trust building.
Review workshops and night stays	4	Reviewed the outcomes, introduced innovative ideas and trust building between community and project team.	4	Reviewed the outcomes, introduced innovative ideas and trust building between community and project team.
Exposure visits –between the villages and outside the villages	3	Enhancing knowledge and confidence. Adopting new technologies and improved relationship between farmers and service providers. They are also process in adopting low cost green house for off-season vegetables.	3	Enhancing confidence and adopting new technologies. Improved relationship between farmers and service providers. Also learning from Dhaloguri farmers.
Bi-monthly meetings in Jalpaiguri –peer-group learning interactions	3	Learning from each other's in aspects of crop, market value, technologies resulted in building the confidence to promote the crops in dry seasons.	3	Learning from each other's in aspects of crop, market value, technologies resulted in building the confidence to promote the crops in dry seasons.
Special events	2	Participated in international women day and enhancing the aspiration level. Interacted with scientists from SIAGI project.	5	Participated in international women day and enhancing the aspiration level. Directly communication with higher authority of government line

				departments and jointly organized the caste certificate distribution programme. All most all tribal members received the certificate to access government facilities including irrigation systems. Interacted with scientists from SIAGI project.
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The above table is important. There are differences in the organization of various engagement events but not substantial. UC has witnessed more special events owing to engagement with the government agencies. In the initial engagement UC shows low because of its late entry. These differential engagement events may also show some difference in the progression to be explained later.



Figure 13: Special events by SIAGI team members

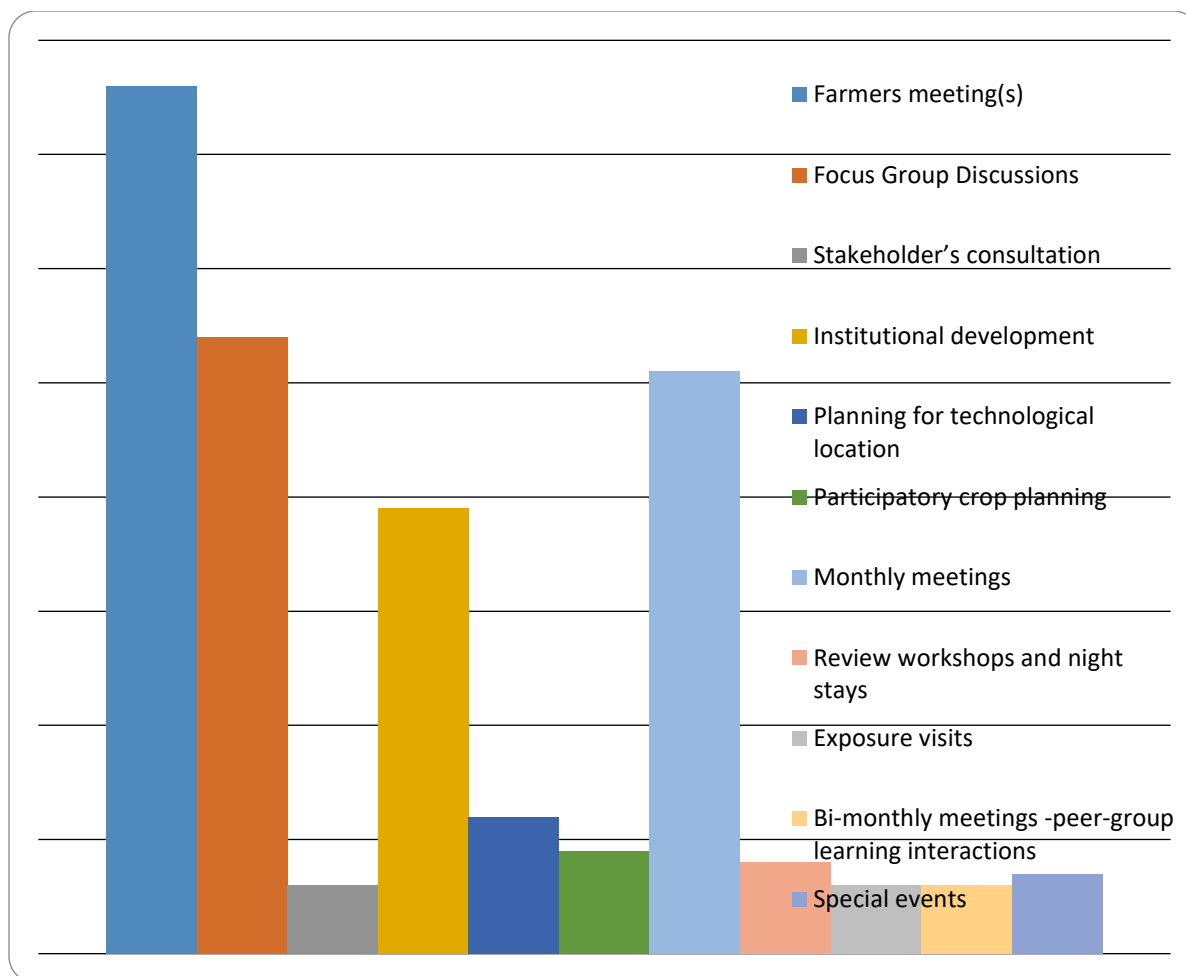


Figure 14: Strands of community engagement in both villages

In the following section let us elaborate various strands of engagement used at various levels. Apparently, they may look like usual project activities which indeed they are. We would, however, especially want to share the pedagogy used and follow-ups evolved and implemented. Based on our understanding we may like to, tentatively, attribute the impact of engagement on intensification:

The Post-inception interactions: After the inception workshop of the DSI4MTF we all moved to the fields to have communities' views on the project. It all began with Dhaloguri. CDHI's familiarity with the prevailing development asymmetries, in the region, made us conscious of the embedded dependency and lack of trust over different projects among the farmers. Our primary goal, therefore, was to share with the community the nature of the project. We would *repeatedly emphasize that this was a research initiative and the farmers had the opportunity to be partners and through this could contribute to the critical knowledge on dry season agriculture and ensure involvement of the small, marginal and tenant farmers*. All the discussions would lead to a final question- "What we are going to get"? "What the project had to offer"? We had patience and firmly maintained the position –'we would like to work as equal knowledge partners' and the

opportunity for the farmers was to contribute to evolving an approach and strategy for the development of small and marginal farmers-they being the primary beneficiary'. Visits after visit were made to remain inconclusive for months together. We continued visiting and interacting – to the indifference and, may be, annoyance of the farmers who had witnessed several projects in the past – there has not been any follow-up and efforts at consolidation.

The village (DH) has a young farmer leader enthusiastic about forming a farmer's club. His intention was to have a club, mobilize funding and create opportunity for oneself and few other members. During one of such visits and interaction we organized a SWOT analysis of the village which brought out potentials and opportunity to test certain possibilities which, if proved successful, could lead to sustainable opportunities. The analysis led to identifying weaknesses which included dry spell and low crop intensity besides lack of cooperation and network. The farmers, themselves, identified dry spell. The farmers saw availability of shallow-tube wells as an opportunity which led to positive nods-'lets' try and see how far we go. The first nod was a big spark showing willingness of the farmers to join the project and be part of the same.



Figure 15 Self-efficacy explained at community meeting

Another opportunity came shortly when we explained how effective the proposed farmers club could be if they develop competencies to manage the club well. We offered to facilitate capacity building for the club and functionaries. We were firm and persistent with our promises and the club leader agreed to organize logistics for the training including trainers' lodging and boarding in the village school.

Night stay and training event proved a turning point when the community got convinced about the objective of the project and our commitment to be with them. We enjoyed warm hospitality and more than that a promise to collaborate rather than be a recipient of doles. Farmers' willingness to participate was perhaps the first step toward a concerted action on intensification as without their willingness nothing could have happened.

Situation analysis: With the community gradually getting on board a situation analysis was carried out in both the villages. The situation analysis included an analysis of the origin and evolution of the village, bio-physical characteristics, ***cropping pattern and intensity***, leadership dynamics , champion farmer leaders-male and female , gender, climatic narratives-best and worst climate scenarios in the past 50 years-, employment and enterprises, food situation under various scenario, dynamics and history of conflict and cooperation, cultural practices and belief systems, agriculture extension and support system (*Situation analysis report,2015*).

The situation analysis followed participatory and appreciative learning process as opposed to questionnaire survey methods. The process, carried out during extended interactions, attracted curious and enthusiastic attention and indulgence of the community members who took extra pride in developing deep understanding about themselves and their community. This understanding influenced their future action.

The exercise was quite revealing and offered an opportunity for self-discovery by the community and dynamic learning by the research team. The members relating to specific milestones and incidences would invariably relate to their fore fathers and ancestors. It brought and proved emotional moments where recall loss was possible but complete suppression of truth unlikely. Exposed to and face to face with their own realities community members started relating to them and doing something serious about them. The exercise helped identify leaders in agriculture and their innovative practices. Subsequent community engagement led to acknowledging their innovative endowments. They emerged as the community icons to spearhead and support innovative practices. They subsequently became prime movers for the project activities. In Dhoulaguri Nirmal, Rajni, Jharna, Bilal assumed visibility as leaders who also took various responsibilities as part of the DSI4MTF project. Their subsequent action shows substantial mobilization and group activities. Crop coverage has gone several folds with varietal diversity. In UC the situation characterized complete indifference and very few showing interest and coming forward.

A special case from UC-‘...from indifference to active participation

UC has been a late entrant in the project because of various reasons and the community felt quite alienated. When one would visit the village, people would tend to ignore and nod yes to any proposal for action to be subsequently forgotten.

During one such visit CDHI team arrived at one of the community places and initiated informal conversation. The farmers expressed their disillusionment with all the past promises by various state and non-state agencies. They did not look welcoming the team and in a way showed collective gestures of disapproval- ‘you better go’ was the mood. The delayed start in the village was already a matter of deep concern and there have been occasional disappointments expressed on various occasion by the research team. But changing the

location and community could also not be a good idea-this would rather be an insult to the community and the team may also have to explain for its inability to make break through.

Under such a vicious environment one of the members ventured to pick- up the conversation. It went like as follows:

The member: What is the issue?

The farmer: The project does not offer anything –only talk and talk and plain talk!

The member: Can you cite some concrete example?

The farmer blurred: My land has lot of weeds?

The member: So? what do you want? Let us discuss. There was silence and in the meanwhile a farmer joined the group with a robust cucumber in his hand and a woman with fresh sweet gourd.

(It offered a plausible pretext to take the discussion in a positive direction)

The member: You have good potential for growing vegetable! What other crops do you have?

Community members together: We have paddy but not so much. This year the crop is not so good!

The member: Let us resume the discussion over weeds –so the weeds in your field-who should have cleaned it?

(Again some reflective moment)

A farmer quipped with a counter question-‘When you play football and the ball has to be shot in the goal post-who should do? Whom should we wait to shoot the ball?-there is laughter and sarcasm and the farmer with weeds quipped –‘of course the player and in the same spirit I should clean the weeds from the field.

This offered a good environment for extending the discussion. The researcher team offered to visit further and join the community in understanding the situation. As it was already quite long and late it was decided to have a meeting on a fix day and discuss further and decide how to move further. The time afterwards is a history now with several stories (Field notes -1916-1917) of the community conveying collective farming, crop diversity, gender justice and institutional development. UC is often mentioned as a village where mobilization begins around non-agriculture issues-entitlements of caste and schematic support by the Government.

The situation that got revealed is common to both the villages with some special issues emerging from UC. There are some champion farmers and women leaders. Some enthusiastic youths have turn around crop coverage using field and protected farming. UC today is an icon with increasing crop diversity mobilization for entitlements. Today farmers meetings attract overwhelming participation of the community members.

Stakeholders’ consultations: The DSI4MTF-SIAGI’s presence with different activities has attracted the attention of various institutions and expert communities. This has been possible

through regular consultation with the stakeholders who include scientists from the Agriculture University, line departments, representatives from the PRIs, NGOs and the like. The outcome, as reported and shared during the consultation, has prompted relevant stakeholders to make their own contributions. Consider the stakeholders consultation organized at UBKV on the 13th of July- (Consultation Minute, 2017).

The line departments of agriculture and water resources have similar components as the ones made available under the DSI4MTF. The farmers have to organize themselves in groups (clusters) with their land entitlement documents. Both Dhoulaguri and UC have applied for the same and the officials are processing the application.

The irrigation, as one of the essential factors for intensification, is made available which may lead to more cultivation and subsequent intensification.

Institutional analysis and development: Rural India has several institutions to initiate and sustain various schemes and programs for the rural communities. Panchayats, farmers clubs, self-help groups, producers' groups are some of the important ones etc. These institutions vary in their functioning. The institutions, by definition, are collectives of shared goals, mission and norms. In order for these institutions to contribute to agriculture intensification by leveraging credit and other resources these institutions must stand true on the goals specificity, focus on mission and normative conformity. We found that understanding about these was limited and farmers often found themselves in a blind and disillusioned. If the institutional benefits for intensification have to be optimum there is a need to have clear understanding about their functioning. Participatory institutional analyses are regularly carried out which offers opportunity for the members to appreciate and analyse the gaps.

This process has led to strengthening of these local institutions as without having clarity about processes and procedures it would be difficult to avail institutional support for intensification. Although in an initial stage there is visible sign for institutional strengthening –streamlining governance, connecting and establishing linkage and standing collateral.

UC and DHG have applied for shallow tube wells to be made available under the government scheme. Since the two villages already have practiced collective management of such shallow-pumps the new set of pumps, under the cluster approach, may offer extra and expanded potential for irrigation for agriculture.

Technological interventions – participatory planning, management and capacity building: The technological interventions, comprising of shallow tube wells, solar pumps, drip irrigation and protected farming are important elements of the project to support crop coverage and diversity. The technology, used by them, may not bring about the optimum impact if they are not properly

planned and managed. This calls for appropriate planning and management considering the needs, knowledge and capacity of the farmers. Involvement of the farmers in planning and management may offer sense of ownership and a strong need to plan appropriately and manage effectively. Farmers have unique skills and endowments but the emerging technologies may need special understanding and capacity. The project is adopting participatory approaches and technical support persons –local as well as overseas are facilitating both participatory planning and management and technical skills. An Australian engineer, Mike, is always presenting technology using a play way method and that leads to easy learning by the farmers. Local technological (pump) specialist Subrata, University scientists Rupak, Biplab and Ranjeet are around to help them.



Figure 16: Handholding by scientist for transplanting and follow-up plan discussed with farmers.

Both the villages have witnessed appropriate location of the implements –shallow-pumps, solar pumps, protected structures. Farmers are also complementing some of the implementing costs and resources. Local technology experts from UBKV and CDHI are supported by overseas experts from University of South Queensland and IWMI, Nepal. This has resulted into proper functioning of the technology. The technology is located where they are considered appropriate and managed by the farmers themselves ensuring that there is no or minimum fault.

The technology has helped contribute to cropping intensity- there is increase in both coverage and diversity.

Crop planning: Crop planning is an important component to harness and utilize the available opportunities provided by the technology, institutions and collective endeavours. We consider farmers experiential learning and knowledge endowment as important who have better understanding of the context. At the same time emerging knowledge, based on latest research findings, can address to several issues which might skip farmer’s attention and their scientific

understanding. Crop planning brought both the agricultural scientists from UBKV and farmers together to share their experience, deliberate around issues, discuss possibilities and potentials of different varieties and technologies. Exposure to various research stations and demonstration also help import technology and variety to the optimum use by the farmers. Bio- economic modelling is introduced by SIAGI (a sister project of DSI4MTF, under ACIAR support) though it is in piloting stage and it would be emerging an effective tool for crop planning as profit –loss analysis would be easier for the farmers.

For example, a year of failure of lentil led to change in variety and technology. Zero-tillage method applied only for wheat in Dhaloguri yielded good result and the farmers planning to adopt zero tillage on larger scale. Addition of maize, elephant foot yam, spinach, cucumber, and capsicum, this year may add to the diversity.

The common choices are evolving through a friendly discussion, respect and appreciation for each other's. ECE seems to have brought about this behavioural and attitudinal change- a good reflection on the power of empathy created by ECE.

In the above section we discussed the factors as pre-requisite. In the following section we present the processes essential to implement the program effectively. Our highlight, however, is on how these processes and factors interact in a way that may add intensification and how ECE explains these happening.

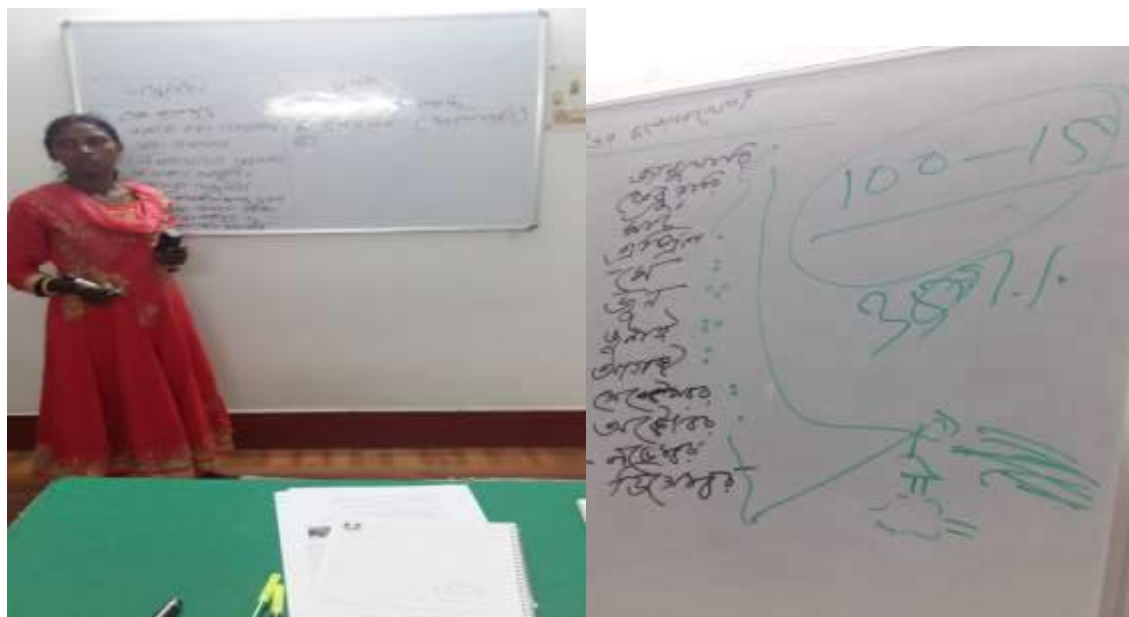


Figure 17: Farmers view on dry season (Part of Crop Planning Meeting, CDHI, Jalpaiguri)

Monthly meetings: One of the important strategies/steps of implementation is monthly meetings in both the villages. The monthly meetings, usually, are attended by the two

implementing agencies –UBKV for bio-physical and CDHI for social and community interventions. The meetings are devoted to crop planning /performance and necessary remedies if any, institutional functioning and linkages. These meetings have been extremely useful in identifying high and low points and in also identifying strands of engagement found relevant and useful.

Depending upon the needs one of such meetings are used to discuss and finalize important concepts relevant for the project and review follow-ups and action plans. Such meetings are also organized to coincide with some of the visiting partners. The outcome of such meetings is used for modifying strategies and processes.

For examples:

At the end of a cropping season (2016) a meeting was organized in both Dhoulaguri and UC to analyse performance of the collective farming. The meetings, which continued long hours during night, discussed important aspects – (1) wage parity between male and female farm labourers and (2) planning for the early variety of next crop. The occasion was also used to have community dinner.

In Dhoulaguri cost benefit analysis was made by the members of the collectives and next morning early variety of next crop was planned. In UC the meeting was also planned in the school and next day analysis was carried out about crop coverage and cost benefit at each of the sites.

The farmers, in both the villages, evinced interest in expanding coverage and variety. Such events sensitize the farmers and create environment for positive actions.

During the visit of USQ –Erik and IWMI –Ram and Manita- teams’ special interactions were organized in Dhoulaguri and UC to especially deliberate around technology, institution and diversity interface. Such interactions help in driving the issues and the possible ways they can be resolved. Subsequent plenary discussion with the teams deliberated around *how ECE are useful in sensitizing the farmers and local stakeholders*.

Field visit by Christian and Wendy (SIAGI, April,2017) and interaction with the district level stake holders worked out to be useful in understanding the interface between the policy makers and the community (Visit report-April,2017). Their visit to the field and interaction with the district level stakeholders-mostly government functionaries-prompted the stakeholders to commit linkage with the Government schemes on intensification.

Exposure visits: The farmers, in both the villages, are quite confined to their villages with rare opportunities to see the world outside their village. This limit and restricts their world view. Under the project the farmers are practicing and experiencing various methods and processes under a control situation and close guidance.



Figure 18: Exposure to CPCRI (A wing of ICAR) and outside farmers field in Jalpaiguri.

In north Bengal different centres and individuals are practicing different practices and methods some of them being completely farmer driven. These could be important opportunities for the farmers from the two villages to learn from the field with the farmers. The project organized multiple visits to such centres/ individual initiatives.

Visit to the regional horticultural research station –Mohitnagar (Jalpaiguri) by the farmers helped them see new opportunities in their fields. They visited field demonstrations and had intensive interaction with the scientists of the research station. The research scientist was quite impressed with their inquisitiveness and shared with them the technical feasibility of various horticulture varieties. The farmers returned well enthused.

As a return visit the scientists from the research centre visited the two villages and observed the bio-physical characteristics. They also came to interact with the local community. They recommended various horticulture varieties which could add to the diversity and economic return.

Peer-group learning is as important as the learning under the shadow of scientists and experts. There are several individual entrepreneurs who are trying with different technologies and methods. One such entrepreneur is Mr. Pranab Roy from Pandapara (Jalpaiguri). Mr. Roy is using protected structure customised to suit his own level of capital with optimum technical accuracy and compatibility. Mr. Roy uses the protective structure to grow early varieties of spinach, capsicum, tomato, cauliflower etc. This helps him earn good price.

Farmers from both the villages visited Pandapara and observed his technology and methods. They also discussed with Mr. Roy the economics of the farming. Back home Dhaloguri farmers are planning protected farming technology beyond the current project.

Bi-monthly joint meetings at CDHI: As the projects have graduated there has been earnestness to benefit from shared learning. It happens at multiple levels-(1) exchange of insights and experiences across different collectives/clusters using regular meetings, (2) interaction across farmers from the two villages by cross visits and (3) reflective learning during bi-monthly meetings in Jalpaiguri (CDHI). Beginning since February 2017 farmers from the two villages gather together at CDHI for shared reflection and future planning. They present their respective key learning, discuss evolving perspectives and planning. The learning has been extremely insightful (Minutes, 2017). For examples

1. In one of the meetings both male and female farmers expressed their crop choices for the next season. The choices are including – mustard, wheat, garlic, spinach, potato, capsicum etc.
2. Progressive farmers of Dhaloguri will be visiting UC for handholding training on potato cultivation.
3. Debate on variety of different paddy and duration. Finally, it is decided that farmers need more exchange visit to enhance their knowledge.
4. Quick fluctuation of market price is an issue. Farmers from both village agreed upon that market demand based crops to be cultivated.
5. In another engagement session the agriculture scientist explains about the government support available for the small and marginal farmers. The support also included purchase of machines for oil extractor. The UC farmers showed interest in the technology in the light of their robust mustard cultivation, the last season.

More than the project based sharing the farmers share with each other their family and personal issues and concerns during their shared accommodation. In the process they, invariably, solicit advises from others. This improves and strengthens the quality of network and social capital. The occasion is also an opportunity for shared vision, well-being and how they can fructify (Ram, 2017).

Special Events: As the projects progress they attract outside attention. Outside visitor's plan visits to the villages to see how the activities are unfolding. Such visitors come not only to learn but also bring with them their background and learning. This helps sharing and exploration about

what can be disseminated from the villages and what can diversify consolidate their existing knowledge. Both are mutually beneficial.

During a community engagement orientation training event (SIAGI, 2017) participants visited UC for a day long interaction with the farmers. Participants from Bangladesh and other parts of India visited the village and discussed their agriculture practices especially how cropping pattern has changed over time. The villagers felt happy to tell the story of their indifference turning into active participation. The participants, with agriculture and similar background, offered useful suggestions on how their projects have mobilized community and how they have been able to plan and execute water irrigation system. For example- *“Mahanam Das from Bangladesh (Amtoli, Khulana) shared the story of brackish water having been checked from intrusion and use of the sweet water for irrigation. The available water has changed the agricultural landscape and farmers are producing water melon”*. The story really inspired the UC farmers. This could be an inspiration for creating crop diversity.

During the same visit a photo competition was organized depicting community engagement. The UC women had to judge the photographs for their focus and depiction. Most of the photographs touched agriculture and water management themes. The women from UC showed extra ordinary sense of analytical depth about the appropriateness of the photographs and their evaluation thereafter.

It is important to underline how this process helped the UC women while analysing and assessing the photographs. The scenarios, captured in the 21 shortlisted photographs, must have influenced their cognition and perceptual field to reflect around how and why the photographs could be judged for their accuracy and focus.

Such events are useful to sensitize the community and help them revisit their own fields of activities. Such visits are planned for the future.



Figure 19: Group discussion with DSI4MTF's sister project, SIAGI team members from CSIRO, BAU, IIT etc

How the world looks like beyond intensification-evolving vision and aspiration of the farmers?

The positive trend toward intensification may not be substantive especially considered in terms of their small experimental areas. Most of the stories, about intensification, are woven around these modest initiatives covering small plots/clusters of land and technical support as explained earlier working in a control condition. Even with this modest spark our engagement with the community suggests an inspiring story line and narrative confirming that these initiatives have evoked some different feeling- *'it feels better to see new crops are flowering and fruiting'*. Capturing these feelings is important but may prove difficult –one (researcher) may ask well-articulated set of structured questions from the farmers to describe state of being in the light of the growing intensification. One may not get a measured response as the impact is yet to occupy a stable space in their cognitive spectrum. The responses have the risk of being blurred or lost by lack of expression, lack of proper word. Aware of these limitations we have tracked and followed various narratives of the farmers –male and female-about their life and unfolding of future life events. Such narratives, captured during various stages of the project, reveal growing intensification-more crops-more areas. They also reflect what do they mean for them, for the present and future. Aware that these nuanced expressions may not appear second time we have picked up some of such narratives and nuances which can clearly be read and explained as perceptible changes. What are these changes? What do they offer and to what extent the farmers can build through a sustainable livelihoods trajectory using the changes as initial opportunities?

What strikes us most is that this is time to see the changes as starting points. The farmers have limited land and other physical endowments and the interventions of the project are also experimental –not to continue longer and forever. Some potential seems unfolding for the present. Early-in Dhoulaguri- they had paddy and potato but now the potentials for capsicum and broccoli seem to be opening up. In UC the farmers did not think beyond summer paddy. Today they have seen yellow flowers of mustard with robust crops and the protected farming has offered spinach, coriander and cauliflower to their basket. How to build through this? Where to Go? Time to be careful! We tried to look at the future in the light of the new crops and practices unfolding. How do the farmers look to the evolving value chain?

Evolving value chain: When we first visited Dhalguri we came across a progressive farmer – Nirmal Karjee who informed us that his main source of profit was cultivation of *early variety of vegetables* –more so that of cauliflower/cabbage/tomato and local leafy vegetables and others. There were few others –Rajni, Dheeman and Bilal following the same. Bilal's rag to riches story is inspiring who has developed into an entrepreneur of a different kind. He has developed expertise in potato cultivation and combines several activities under his portfolio –crop cutting/harvesting, transporting, threshing. These are the same set of farmers who are key players and partners in the DSI4MTF project.

Has current set of activities, within the project, more so perceived intensification, influenced their ideas for improved value chain? The answer could be misleading but one will have to read their nuanced and anecdotal expressions related to the project and changing scenarios. There is

discernible change. With the change in the cropping pattern due to available irrigation facilities, exposures, visit of the scientists and professionals the perspective on value chain seem to be changing. There is preference for early variety of spinach, capsicum, cucumber and of late maize. There is also a planned shift in the market strategies. They feel -as the produce grow the retailers would be encouraged and invited with some of them keeping eye on local markets. So far, the value chain is only visible in terms of product mix.

There is perceived preference for business value chain to earn cash. During one of the engagement sessions it was indicated that the produce –especially new and niche ones-are also shared with neighbours and co-villagers as a cultural practice. Women shared that children had the priority in getting the new menus which are now visible on the household platters. Children’s nutrition was emerging as priority. Not explicit yet as part of the focused discourse on nutrition for women there seems, however, a positive indication. Pregnant and lactating mothers are seen to attract family care and attention and the availability of nutrition may reveal its distribution. During a session with agriculture official they came to know about the facilities for food processing which they wished to add to their value chain.

UC, earlier, had crops and varieties only for subsistence and there was no question of creating value chain beyond their household consumption. Now that cropping intensity has increased there is aspiration of getting good price-at the farm gate or elsewhere. This time, with spinach and cauliflower round the corner, they are thinking for early variety for the market. The performance of mustard and wheat, last cropping season, and availability of institutional support has encouraged the community to go for processing and organized marketing as strategy for improving value chain. Clarity, however, is yet to settle as cropping pattern is yet to take a shape and stabilize.

During various engagement sessions improving value chain seems high on agenda-developing transportation facilities, using farmers club as assurance and security for credit and insurance and developing cold chain.

Building through the current levels of perceived intensification: The current level of intensification offers some better hope for well being and there is need to reflect around the potential value chains which can optimize the benefits of intensification.

Understanding value chain: We have some impressions on current value chain from these two villages. There is clear indication that the community is serious about improving their value chain. The project interventions have added to their aspirations. In the light of the technological and institutional interventions and considering the fact that these are going to change the cropping pattern there is a need to have a clear perspective on value chain. Let us consider the followings:

- For the farmers of the project villages agriculture is at a subsistence level. Transitioning/ shifting from a subsistence to business would require careful analysis of the societal value system,

cropping and consumption pattern, existing skills, /current levels of skills, level of entrepreneurship, institutional landscape, vulnerabilities available market, risk absorbing abilities etc.

- Following from this and perhaps equally important is the choice between the business/market and social value chain or a balanced combination of the two. We have proposed to pursue our value-chain goals using private –public partnership. There are institutional support as well. Combining all could be a strategic decision. ‘Yes’ bank’s initiatives (as revealed during our Delhi round table) have examples-they need to be further explored aligning with the West Bengal situations.
- From an inclusion and gender perspective value chain has to be examined in terms of whether the improved value chain are going to address the subsistence and nutritional needs of the vulnerable section of the society more so women and children. What is the community perspective on these-there is a need to understand.
- Understanding these would call for methodological compatibility. ECE has proved to be compatible and effective. This needs to focus, now, on capturing VC environment viz-a-viz nutrition sensitivity and distributional dynamics.

Perceived intensification and evolving value chain must have influenced communities’ aspirations. The aspirations are reflected in terms of plans for increased coverage of land- more fields to be brought under new crops and technologies. Logically, these are implicit in their inspiration toward improving family’s well being.

Women SHG members (landless) plan to lease land for maize in Dhoulaguri. The farmers club has initiated plans to build another green house by accessing outside support. UC women are determined to have better vegetable cultivation, using the protected farming technologies, and farmers from both the villages seem prepared to access institutional support to expand and consolidate their current as well as new initiatives. ECE has helped solidarity and constructive action.

Inclusion:

Inclusion, in case of intensification, can be considered at two levels-inclusions of women in the so far male dominated domains. We try and see involvement of male and female in the collective and protected farming in both the villages.

There are 62 members including 28 women (32%), 34 male (39%) and 26 landless (29%) are involved in collective farming in UC-Uttar Chakowakheti and Dhaloguri villages (pls. See the following diagram). Most of the landless agriculture labours are considering their occupation as farmer. The mixed CFGs – collective farming groups (6) are building their confidence in cultivating different crops in dry season as well as introducing new crops. The community mobilization, development of irrigation facilities and linkage building are the key for building the trust towards collectivization. To see the initial results and social bonding among the male-

female-land owner-landless, one new group is formed at UC to initiate the collective farming. The linkage between community and line departments is also creating new dimension for holistic development in increasing crops intensification.

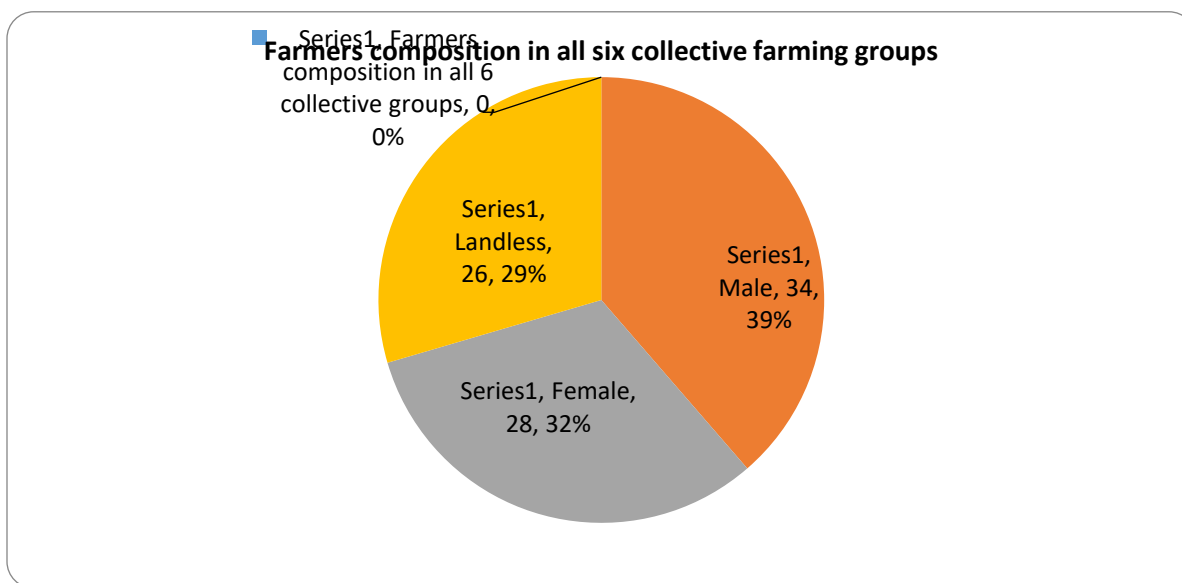


Figure 20: Inclusion women and landless

The following table shows the profile of the CFGs members

Site 1 (Chakwokheti Krishi Unnayan Samity, Uttarpara)

Sl. No.	Name of farmers	Sex	Age	Land ownership status	Land contributed to Collective Farming	Agriculture practices	Primary occupation / livelihood
1	Panchu Baraik	M	47	Land owner	3 bigha and 3.5 katha	Own land, moonson paddy and this year Jute	Farmer (farming – agriculture and livestock)
2	Subhash Oraon (Secretary)	M	26	Land owner	3 Bigha and 11.5 Katha	Provide land to other as share	Works as Supervisor under MGNREGA
3	Sanju Chick Baraik (Treasurer)	M	25	Land owner	3 Bigha and 7 Katha	Monsoon Paddy	Farmer (farming – agriculture and livestock)
4	Suren Chick Baraik	M	47	Land owner	2 Bigha and 7 Katha	Paddy and jute and this year chilli, brinjal, gourds.	Farmer (farming – agriculture and livestock)
5	Ranjit Oraon	M	27	Land owner	2 Bigha and 19 Katha	Monsoon paddy	Farmer (farming – agriculture and livestock)

6	Ranjit Kindo	M	36	Landless		Paddy, jute, ladies finger , bitter gourd, brinjal, long yard beans	Farmer (farming – agriculture and livestock)
7	Arun Oraon	M	40	Landless		Paddy	Daily wage labour

Site 2 (Madhyapara Krishi Unna, UC)

Sl. No.	Name of farmers	Sex	Age	Ownership status	Land contributed to Collective Farming	Agriculture practices	Primary occupation / livelihood
1	Rakhi Baraik	F	32	Land owner	3 Bigha and 11 Katha	Paddy and jute	House wife and Tea garden labour
2	Birsha Oraon	F	45	Land owner	3 Bigha and 19 Katha	Only monsoon paddy	Farmer (farming – agriculture and livestock)
3	Surju Oraon	M	54	Land owner	4 Bigha and 16 Katha	Paddy, Jute	Farmer (farming – agriculture and livestock)
4	Kaliram Oraon	M	24	Land owner	1 Bigha and 10 Katha	Monsoon paddy, jute, and this year long yard beans, ridge gourd, bitter gourd	Farmer and seasonal migrant works as mason
5	Tapan Baraik	M	46	Landless			Tourist Guide
6	Niro Oraon	M	71	Land Owner	1 Bigha and 10 Katha	Monsoon Paddy	Farmer
7	Dukha Oraon	M	62	Land Owner	3 Bigha	Monsoon Paddy	Farmer

Site 3 (Sabuj Kalyan Krishak Gosthi, Bholarghat, UC)

Sl. No.	Name of farmers	Sex	Age	Ownership status	Land contributed to Collective Farming	Agriculture practices	Primary occupation / livelihood
1	Jyoti Dung Dung (Oraon)	F	28	Land owner	1 Bigha and 2 Katha	Monsoon paddy and this year long yard bean, ridge gourd, cucumber, brinjal, chill.	Farmer, Gram Panchayat Pradhan (Head of the Local Governance)
2	Laxmi Oraon	F	52	Land owner	1 Bigha and 1 Katha	Monsoon paddy	Housewife and Farming

3	Shanti Oraon (Secretary)	F	21	Land Owner	15 Katha	Monsoon paddy	Housewife and farming
4	Kabita Oraon Bhagat	F	30	Land Owner	1 Bigha and 5 Katha	Monsoon paddy	Housewife and farming
5	Sabitri Bhagat	F		Land Owner	3 Bigha	Monsoon paddy	Housewife and farming
6	Lalita Oraon	F	28	Land Owner	1 Bigha and 3 Katha	Monsoon paddy	Housewife and farming
7	Merry Oraon	F	45	Land Owner	3 Bigha	Monsoon paddy	Housewife and farming
8	Rita Oraon	F		Land Owner	3 Bigha and 3 Katha	Monsoon paddy	Housewife and farming
9	Silo Oraon	F	35	Land Owner	12 Katha	Monsoon paddy	Housewife and farming
10	Santoshi Oraon	F	32	Land Owner	1 Bigha	Monsoon paddy	Housewife and farming
11	Choto Oraon	F	50	Landless		Monsoon paddy	Housewife and farming
12	Bikash Oraon	M	23	Landless			Daily wage labour
13	Kishun Oraon	M	23	Landless			Daily wage labour
14	Ganga Chowdhury	M	22	Landless			Daily wage labour
15	Maya Oraon	F	47	Landless			Housewife and farming
16	Ram Kali Oraon	F	45	Landless		Monsoon paddy	Housewife and farming

Site 4 (Jelepara Krishi Swanirvar Gosthi, Dhaloguri)

Sl. No.	Name of farmers	Sex	Age	Ownership status	Land contributed to Collective Farming	Agriculture practices	Primary occupation / livelihood
1	Nirmal Das	M	55	Land owner	3 Bigha 12 Katha	Own land and even goes for seasonal lease	Farming and livestock
2	Bimal Das	M	59	Land owner	3 Bigha 19 Katha	Own land especially paddy, Jute and potato	Farming and livestock
3	Bappa Das	M	19	Land owner	2 Bigha 18 Katha	Paddy, Jute, Veg	Farming and livestock

4	Boidda Burman	M	35	Land owner	1 Bigha	Have a small holding and goes for seasonal farming specially paddy in monsoon	Farming and fishing
5	Prasanta Roy	M	32	Landless		Have a small holding and goes for seasonal farming specially paddy in monsoon and potato during winter	Farming and livestock
6	Sajal Burman	M	33	Landless		Some time more as agriculture labour	Fishing and fish selling business
7	Monila Roy (Secretary)	F	35	Landless		First time engaged as farmer to any field, never worked as farmer but only as labour	Agriculture daily wage labour
8	Ramani Rabi Das	F	39	Landless		Same as Monila Roy	Agriculture daily wage labour

Site 5 (Krishi Ankur Sanirbhar Gosthi, Dhaloguri)

Sl. No.	Name of farmers	Sex	Age	Ownership status	Land contributed to Collective Farming	Agriculture practices	Primary occupation / livelihood
1	Bhuman Karjee	M	52	Land owner	3 Bigha	Paddy, jute and mustard	Farming
2	Dhiman Karjee (Secretary)	M	46	Land owner	3 Bigha 6 kata	Seasonal crop in his own land. Monsoon paddy, jute etc	Farming and livestock
3	Mrinal Karjee	M	34	Land owner	2 Bigha 4 Kata	Paddy and mustard	Farming
4	Pushpa Roy	F	40	Land Owner	2 Bigha 12 Kata	Not as person but her husband	GP member and farming
5	Suresh Roy	M	62	Land Owner	2 Bigha 10 Katha	Only monsoon paddy and rest provided in lease	Farming and livestock
6	Jharna Karjee	F	28	Landless		First time engage as farmer to any field, never worked as farmer	Grocery shop

						but now learning by doing	
7	Tuli Burman	F	34	Landless		Others agriculture field as labour	Agriculture labour
8	Shymol Roy	M	42	Landless		Paddy, jute, mustard	

Site 6 (Colony Krishi Unayan Samity, Dhaloguri)

Sl. No.	Name of farmers	Sex	Age	Ownership status	Land contributed to Collective Farming	Agriculture practices	Primary occupation / livelihood
1	Bellal Miah	M	24	Land owner	14 kata	Paddy and potato in own field	Farming and livestock
2	Rajanee Karjee	M	60	Land owner	1 Bigha 7 katha	Paddy, Mustard, Potato, Garlic	Farming and Livestock
3	Megan Roy	M	72	Land owner	8 katha	Paddy and jute	Farming and Livestock
4	Bhola Miah	M	65	Land owner	2 Bigha 2 kata	Paddy and potato in own field	Farming and Livestock
5	Nanibala Roy	F	41	Landless		Others agriculture field as labour	Agriculture labour
6	Minoti Adhikari	F	33	Landless		Others agriculture field as labour	Agriculture labour
7	Lipika Adhikary	F	32	Landless		Others agriculture field as labour	Agriculture labour

Both in Dhoulaguri and UC one can see presence of women in different clusters. Over the period we have observed the quality of participation-participation in critical decisions and participation in the process of intensification as independent entrepreneurs.

A year ago the late night meeting was due to discuss differential wage rates for male and female farmers. The males' perspective was that women, traditionally, have been getting a lower wage rate even under government prescription . Then meeting discussed why this has been happening? Several aspects were discussed-low productivity, specialization-etc. The women, first hesitant to join the issue, made analysis of their contribution and importance of their contribution under different domain. Unanimity prevailed and it was decided to go for equal wages '*at least under collective farming*' to begin with. This perhaps assumes and achieves a strategic importance in move toward gender justice.

Both in UC and DH women are managing the protective farming. The situation in UC assumed interesting dynamics. First, the protective farming was managed by the men which did not show good promise and women unanimously decided to replace management and take it over. It went well and women faced some problem while men watched curiously. Not to be vindictive a decision was taken to manage the protective farming jointly. The scientists from UBKV support participation of women as technically and socially important.

In Dhoulaguri the landless women are planning to take some land on lease and cultivate maize independently. The male farmers do not see any problem and decide to encourage and support them.

We have observed on several occasions that women have a different perspective on VC which emphasise and include VC related to small household based products and processes.

Sulagna's case, as presented and discussed during the August (2016) VC workshop in Jalapaiguri, reflects gender barriers in VC and the way that can be dealt with. The case evolved out of series of discussion in both the project villages.

These specific cases apart, women are showing interest and males are all supportive not as favour but in consideration of the quality of decisions they (women) suggest and implement. They are attending meetings in and outside the village, on exposure visits and so on.

The 23rd of September, 2017 can be considered a land mark in UC. The planned meeting in UC witnessed pouring in of 46 women SHG members to take call on various subjects which took note of various concerns and entitlements. The meeting, chaired by two women Bhagwati and Rita prepared a detailed framework on how they are going to function next few years (Minute, September 23, 2017). The men were not only supportive but also agreed to respect the decision.

In DH the women farmers are partners in the next protective structure which is proposed after considering its potentials. They have been critical and objective in their observations and firm in their contribution.

Another facet of inclusion is inclusion of the farmers with differential land ownership. This becomes more glaring in DH than UC as DH has clear stratification in land ownership. Even land less women are members of the collective. The above table shows representation of different category of farmers in land ownership. They are seen sharing concerns and also potentials in growing intensification and how the same could be addressed. There does not seem to be unheard voices. Although not quite clear and loud there is evolving agreement strengthening value chain to accommodate different interests and concerns.

Consider the case of Bilal from DH. He does not have large land ownership compared to Mrinal, the active secretary of the farmers club. Bilal is otherwise an entrepreneur showing interest in technology and agriculture. The meetings are considered incomplete without his presence. His ideas are cutting edge and practical and his credibility quite high. The community has offered enviable space for him.

The above show the wide spectrum of inclusion and one may need to examine the dynamics of inclusion and the way inclusion is constructive and resilient. Our observation of the last three years suggest that inclusion has been gradual driven by an approach to synergize people toward a common goal –the goal of creating prosperity and well being of the community using technology with its multifaceted dimensions leading to intensification. ECE has been critical and decisive working silently and evolving as a societal value system.

ECE and Collectivization:

Small, marginal and landless farmers lack adequate physical endowment, technologies and credit to work through sustainable livelihoods. However, their collective endowments and endeavour can harness and optimize productive potential of resources –whatever they are and whatever they have access to. Historically, there has been tradition of collectivization in societies with meagre individual resources and /or for accomplishing goals which are not possible to be accomplished individually. India also has the tradition of cooperation and cooperative farming with varied learning. Even before nation's independence cooperative and collective farming have been a known practice.

DSI4MTF emphasizes collectivization to optimize the gains of technical interventions. The efforts have led to understand the dynamics of collectivization and its impact. Collectivization functions differently depending upon the context and situation. In a situation of urgency and crises collectivization evolves as a natural response but it may disappear once the situation turns normal. Collectivization, as a planned endeavour, is influenced by several factors:

- Societal past experience with collectivization
- Intentionality of the mediation-why some body –individual, institution wants this?
- Existing power relations
- Perceived costs, benefits and conflict of interest
- Nature of facilitation

Collectivization, under DSI4MTF, has also undergone these experiences. When the project was initiated with collectivization as agenda their questions about why there should be new arrangement. Also, past experiences of -self-help groups, farmers clubs etc had not been positive. Although the farmers in the project villages show homogeneity in effect they are not. There are various levels of unequal power relationships-some of them may be around education, social position and acquired instrumentality. And there is implicit and explicit analysis of costs and benefits and perceived conflicts of who gets what. Free riders often create situations which they

consider beneficial to them at the cost of collective good. There has also been fears and apprehensions-unfounded or may be real in some cases.

During the situation analysis we came across these realities and had these captured. We felt that collectivization has to be pursued keeping the above realities in mind. The ECE perspective adopted, during situation analysis, helped us assess the issues. We felt that collectivization, in environment of distrust, conflict of interest, failed earlier promises and initiatives cannot be functional unless they are replaced by positive conditions. ***Ethical Community Engagement (ECE) perspectives helped in dealing with the adverse environment and helped stimulate spirit of collectivization.*** Let us elaborate:

Dealing with failed past experiences: During the engagement community members would often quote-‘there has been several such initiatives launched by the state and non-state agencies- nothing happened-nothing worked! See the self-help groups are notional and few are benefitting’. When one would ask to be specific about the ‘few persons’ there would be no response. The suspicion with the ‘few persons’ got systematically dealt with and extra benefit perceptions discussed using open forum.

Intentionality of the mediation: This has been discussed earlier also. The project was discussed as research initiative and outcome could have long term impact rather than immediate ones. The long-term impact was hard to convince but constantly being with the community, visits and cross visits of the scientists and other visitors helped to some extent.

Collectivization, as it exists now, is embedding slowly and gradually. The social and group dynamics, governing collectivization, is complex. It would be naive to claim and get collectivization realized with all its defining characterization. In a complex socio-cultural milieu initiative toward collectivization would offer important insights rather than prescriptions for replication. It is context and culture specific and has strong interface with the existing politico – economic implication. One thing which seems to hold true is that bringing people together is an act of creating synergy around common goal and build confidence around the outcome of collectivization. ***ECE seems to be an important approach and strategy toward this end –this is what our current level of engagement suggests.***

Making intensification work and continue: Way forward by UBKV-CDHI

As the project shows better outcome in terms of intensification both CDHI and UBKV have been preparing strongly to keep the momentum going. The team’s constant engagement helps prepare engagement strategies with the farmers better. Regular team meetings and action plans between the team and subsequently with the farmers has yielded positive result.

In order to plan for the next rabbi season both the teams sat together to decide on the cropping pattern and other activities. To be able to catch on the evolving enthusiasm of the farmers the scientists from UBKV have planned day long training for the farmers in both the

villages on the 13-14 of October 2017. This proves the seriousness of the CDHI-UBKV team in taking forward the intensification drive .

In summary

The impact of ethical community engagement approach on intensification, inclusion and collectivization should be seen with some degree of caution. What ECE does and how it is instrumental in influencing the perceived changes, as explained in the preceding sections, need to be understood properly. ECE would be an effective strategy so long as it respects individual virtues, values, empathy and celebrates and acclaims self –efficacy of others. It may sound to be guided by a sense of euphoria. Making these virtues showing in concrete forms is a challenge –a challenge that has strong opportunity. In the context of DSI4MTF and SIAGI, ECE has been effective and shows important trend. This needs to be constantly pursued and its efficacy assessed and analysed in different contexts. Opportunity for cross learning, between different geo-demographic groups across verticals, would help sharpen our understanding about how ECE can decide future path of research & development.

The community engagement and collectivization have helped the farmers in understanding production even in dry season. They are also motivated to introduce new crops and off-season cultivation. The ECE has encouraged them to know the climate, environment and market related risks. As a result, farmers can make crop choices and mitigate various risks in a better way.

The current phase(s) of the project can only offer indication and not confirmation and generalization. The process of intensification, inclusion, equity and collectivization is passing through a complex phase and the final outcome would depend upon how these creative and constructive processes are allowed to / facilitated to sustain. The project structure, in its existing form, is inadequately planned to achieve a sustainable framework. It would take time and restructuring to achieve. The current indicators are all positive however and needs to be pursued.

We are in the process of analyzing what strands of community engagement works and works better. The matrix (Table- 5) of strands offers interesting reading. They represent various forms of interactive sessions. And we have found the potential of different strands in creating impacts. A meeting may not always be appropriate. An exposure visit may enthuse the community to question various developments and accordingly can generate change proneness.

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2. Household or individual case studies

2.1 Introduction

A core aim of the project DSI4MTF is to transform the livelihoods of marginal and tenant farmers, who often are sidelined by large scale agricultural development programmes through a radical new approach to managing land, combined with innovations in water management. As one would expect however with any new approach, there will be certain households or individuals who excel but other who struggle to realise the same benefits. The purpose of this section is to review some of the positive stories, trying to understand the roots of success, as well as some of the less positive household experiences. Both are critically important as the project refines its models of intervention. It will allow an iterative process of learning from mistakes which have led to less favourable outcomes for certain people. The project team can identify what can be done to prevent households experiencing negative outcomes again, while also being aware that some problems are outside of our control, and need to be worked around. At the same time, by looking at successful households, the team can seek to replicate best practices which have perhaps enabled these households to excel.

The household unit of analysis is important, as although the group is the core unit of production and recipient of support, one cannot assume that all members of the group will benefit the same way from the interventions, given the complexity of livelihood patterns, mixed leadership and learning abilities, and pre-existing household assets.

2.2 Engagement of landless non-cultivators in agriculture

Background of Household:

Sushila Devi Ram is the treasurer of the farmer's group Gadhi Mai Krisak Samuha from Kanakpatti, Saptari. There are 4 members in her family: her husband, and 2 children. She is from the Dalit¹ community and as the source of livelihood carries out day to day wage labour activity. Her husband is an unskilled migrant to Saudi Arabia since 2 years.

¹ *In Nepali caste system, dalits are considered as the lowest caste because of which they have been subjected to oppression by so called higher castes.*

Farming and Irrigation Practice Before Intervention:



Sushila Devi Ram had never practiced farming prior to the project intervention. Neither Sushila nor any of her household member own any land. Her house is built in 3 khatta *ailani*² land. Although, she was not involved in agriculture, she used to carry out agricultural wage labor activity. The tasks involved weeding, transplanting and harvesting activities for which Rs. 200 was paid per day. Further, she did not have any experience with

irrigation and crop water requirement. She had not heard of any modern irrigation tools and techniques as well.

Another major source of Sushila's household livelihood was firewood collection from nearby forest (towards Churiya range) for selling purpose³. However, in the recent years, the stricter regulation against forest encroachment made this livelihood source a difficult option. Going to the forest is restricted and selling at the market is prohibited. Collection of firewood was tiring and labor intensive. It would take them entire day to go to the forest and bring one *boojh* (stack) of firewood. Due to these reasons, alternative options to livelihood had to be explored. Consequently, her husband migrated as an unskilled labor to Saudi Arabia in 2015. Since Sushila did not cultivate any crops, consumption of staple grains and vegetables was dependent on the income made on day to day basis. Availability of work everyday was uncertain, so was the consumption of food. When money was limited, vegetable consumption was compromised.

2.3 Joining the Group and being part of intervention

At present, Sushila Devi Ram is part of a mixed farmers' group comprising of 2 women and 4 men members. The name of the group is Gadhi Mai Krisak Samuha. Along with her group members, she is practicing part collective farming by leasing the land from the local landlord. As the project commenced in 2015, Sushila was eager to be part of the Dalit farmer group. She considered this as an opportunity to learn agricultural practices adding to her income from vegetable sale. However, the group was already formed, land leased and divided among the members when she

² *Ailani land is the public land. This is not owned by the Sushila Devi Ram but her family have been residing in the land for more than 3 decades.*

³ *Selling firewood used to be and still is one of the main source of income for Dalit community in the Kanakpatti village.*

decided to join. Despite this, she attended the meetings and trainings organized for/by the group. When one of the charter member left the group, it gave her the window of opportunity to finally be part of it.

Under the part collective, she cultivates vegetables in 10 khatta (0.338 hectare) out of 0.8112 hectare of jointly-leased land. In the group, they have jointly leased the land, share water infrastructure (1 electric and 1 solar pump) and pesticide sprayer occasionally.

Perceived economic and livelihood benefits:



Sushila Devi considers the major benefits of being part of the group in terms of income and skill development. Additionally, another primary advantage perceived by her is the availability of self grown vegetables for consumption. She started the first season of intervention by growing maize in her plot. Although she did not make any income from maize, it was used for self-consumption. She started making income by selling brinjal the

next season. Apart from consumption, she sold 30-40 kg of brinjal. She started selling it from Rs. 40 per kg in the beginning of the session and towards the end fetched Rs. 15 per kg. She made around Rs. 3000 to Rs4000. When she earned this money, Sushila realized vegetable farming can actually be a source of income.

In the summer and monsoon of 2017, she planted bottle gourd, cowpea and ladyfinger in her plot. Land her group has leased is comparatively high land and can cultivate vegetable in monsoon season as well. She planted radish and leafy vegetables in the monsoon of 2017. She made an income of . While deciding what to crop, Sushila takes the decision based on not just income factor but the household consumption purpose as well. For winter 2017/18, she has planted brinjal and potato taking in consideration the consumption as well as selling side.



Sushila is among three of her group members who showed interest to farm in an additional leased land in the monsoon of 2017. She along with two male members from her group have leased a land where they cultivated paddy. The primary motivation to do so was from her prior experience of cropping under the project. She had to purchase food grain and vegetables before. Farming ensured the availability of vegetable for consumption. To some months, she and her two children are able to consume from what she grows. Hence, she anticipates the paddy cultivation to help her consume rice for some months.

Another aspect of the project Sushila values is learning agronomic skills. Prior to the project, she had no experience and understanding on farming practices or irrigation techniques. She recalls the initial intervention season, she ended up over irrigating the crops. She says, “*paili paili bari gareko, nabhujera pani dher pathauthea*” (I farmed for the first time and due to lack of understanding, I irrigated more water). She continues, “*jati pani dher pathaye, tyei dher tarkari falcha jasto lagtheo*” (I used to think, the more water I irrigate, the higher vegetables production would be possible) . As the field officers instructed and trained her on irrigation, she has limited over water application on the crops.

Perceived social benefits:

After being part of the group, Sundari has started participating in project activities such as trainings, exposure visits and monthly meetings. Being a person from oppressed Dalit community and that too a women, Sushila did not have a lot of opportunity to participate in societal activities before. When she became part of the group, she used to feel shy to speak her mind and raise concerns initially. Talking to male project officers was something she had not imagined as a possibility for her. Nevertheless, due to frequent exposure, interaction and engagement, she has started feeling comfortable to raise her voice her ideas and concerns. She is still hesitant to lead the interaction with the landlord alone, she says she is comfortable when done in group.

Management of resources:

Not everything comes easily. Managing irrigation equipment among the group members was certainly not easy. Electric and solar pumps are shared among her group members. When her group started out, there was no formal schedule to allocate pump use. Hence, the member who turned up at the field early irrigated their plots. It was difficult for Sushila to manage time between household activities, child care and agricultural work. While for other members, the husband and wife could share labor at home and field, she only had two small children at home and noone to share the work with. She used to be busy in household work early morning and when she got at the field, another farmer member would already be irrigating their land. This resulted in water use conflicts among the members. She raised this concern with the group and after some discussion, they came up with allocating water use through a schedule. Now one farmer gets one day to irrigate from solar and one day from electric pump. Now everyone follows the rules, so the conflicts have subsided relatively.

Lesson for the project:

Agriculture is normally perceived as unprofitable by farmers. Usually the profit is done in terms of monetary value. This is an absolutely correct measure to understand benefits received from farming. In some cases such as Sushila, with time to time guidance on agronomic and other skilled development necessary for agriculture, income as well as availability and access to good diet can be ensured. Due to poor financial circumstance, Sushila used to purchase rice and lentil from the limited wage and firewood sale income her family had. Often the consumption of vegetable was

a matter of having relatively higher income. So, eating vegetable was not a regular item in her and her family's meal. Now that she cultivates vegetables, Sushila and her children have relatively higher access, availability and utilization of vegetables.

2.4 Vegetable farming for women in the context of male out-migration

Background of the household:

Jaja Devi Mandal is the member of Shiv Parbati Krisak Samuha from Koiladi, Saptari. She lives in a nuclear family comprising of 4 members: 1 husband and 2 daughters. Her husband, Ram Kumar Mandal the household head and makes major household decisions. She is a landless farmer cultivating 5 khatta rented land. Her husband is a seasonal migrant to India where he does unskilled wage labor. He visits Nepal in some months in a year.

Before the project intervention, Jaja Devi Mandal used to cultivate paddy in 5 khatta of land. During winter, she cultivated wheat and lentil. She cultivated some seasonal vegetables for self-consumption in kitchen garden in small quantity. Table below provides an overview of her cultivation practices prior to being part of intervention. Jaja Devi has little exposure to vegetable farming for commercial purpose.

Table 5: Cropping pattern by season before intervention

Season(Reference year-2014)	Crops	Cultivated Area (Khatta)	Total Yield (kg)	Yield sold (kg)	Rate (Rs)
Monsoon	Paddy	5	600	0	15
Winter	Wheat	5	120	0	20
Summer	Fallow	0	0	0	-

(Note: 1 khatta= 0.0338 hectare)

She used to irrigate the cultivated land using rented Shallow Tube Well in the landlord's land. She does not own either an electric pump. She does not rent the pump. She can access water for one or two round of irrigation from canal for wheat irrigation in winter.

Joining the Group and being part of the intervention:

Jaja Devi Mandal is part of Shiv Parbati Krisak Samuha. It comprises of 6 members: 4 women and 2 men. Before the project, Jaja Devi has some experience working in groups. She is a member of group formed by Save the Children in the village. At present, she is practicing part collective farming, leasing the land from the local landlord. The first intervention season in monsoon 2016, the group started cultivating paddy in 30 khatta of land following pure collective model. Due to difficulty in managing time by the members and anticipating continuous labor requirement for vegetable farming, the group decided to go for part collective. Under the part collective, from Rabi 2017, Jaja Devi has started cultivating in 2.5 khatta land individually. The group now shares water infrastructure: 1 electric pump, occasionally purchase input and hire machinery such as tractor for land preparation together.

Perceived economic/ livelihood benefits and perceived loss:

Jaja Devi Mandal managed the agricultural activity on her own. The workload is high as her husband being the seasonal migrant to India. She realized the importance of irrigation especially in the dry season. She had to rent the due to poor financial condition attributing to lack of irrigation infrastructure. So, she cultivated limited land in winter and left the land fallow in the summer. When Jaja Devi learned about the intervention, she was excited to take on commercial vegetable farming. The provision of irrigation infrastructure offered possibility to gain agronomic skills and diversify livelihood from vegetable farming. She has started using drip kit to irrigate some of the vegetables.

Having cultivated paddy in the monsoon season of 2016, Jaja Devi like other farmers of her group opted for cauliflower and cabbage for Rabi 2016-17. Although she irrigated the crops and applied fertilizers, she did not get a good yield. On the contrary to her expectations, pest attack damaged the vegetable. She could only make an income of around Rs. 500 from cauliflower and cabbage. This was very low return from investment made in terms of money and time she put in. She received Rs. 10 per kg for cauliflower and cabbage in local weekly market at Koiladi. She had little motivation while beginning the next season. For the summer of 2017, she has planted crops such as chili, bitter gourd, cowpea, onion and ladyfinger. On contrary to the discouraging result in the winter, Jaja Devi is looking up to make some profit this season. "Yield is looking good this season, Now I have more experience in vegetable farming and understand how to cultivate vegetable more clearly". Lady finger had some pest issues. So, she sprayed pesticide consulting with the local the input supplier. The details of vegetables planted in summer and sale made so far is given in **Table 6**:

Table 6: Crops cultivated by season by household

Vegetable	Quantity (kg)	Sold (Yes/No)	Rate (Rs)
Chili	4-5	Yes	40
Bitter gourd	45	Yes	20 -30
Cowpea	10	Yes	30-40
Onion	150	No (Self consumption)	-
Ladyfinger	5	Yes	20

After the project, she has started using drip irrigation system for the first time. She says, “I am operating the system. I like the system and I am learning.” The advantage with drip system is that it irrigates water in plant root. She says, once the drip system was not working. So, she repaired the system and now it is working well. One of the difficulty, she is facing is filling the drum of drip kit. Drum is placed in higher level. So, she puts a ladder to fill it, required two people. “Delivery pipe we have is not long enough. So, I and my husband fill it with bucket. This is what I do not like about drip. Otherwise, it is good.”

Lessons for the project:

Jaja Devi has recently been introduced to vegetable farming. Although, she did not have a very encouraging experience in the first season of Rabi 2016/17. She is more confident in the summer 2017. This has been possible through continuous and time to time work in the field supported by the increased agronomic knowledge and increased experience. Although, Jaja Devi is starting to learn vegetable farming skills in some respects, the efficient use of technology still needs more work. The current practice of filling drip kit drum with bucket in turn increases the time and labor contribution. This completely eliminates the original idea behind efficient use of drip system.

This hints insufficient training and engagement with farmers. Drip system is supposed to reduce labor but two members of the household are working on the system. Proper training and provision or purchase of pipe to fill drip the drum is essential. Doing so will pave the way towards proper use of the existing micro irrigation technology i.e., drip. Only then, the question of up scaling the system is possible after the neighboring farmers observe perceived benefit of Jaja Devi.

Revamping the livelihood status of the landless woman in collective farming through improving water use in dry season agriculture in Dholaguri

Background:

In the changing global scenario, the availability, accessibility and appropriate mobilization of different resources are believed to make the important contributions towards rural livelihoods. Rural livelihood strategies appear characterised by diversity, with water being one of a number of assets drawn on. Gender, water and livelihoods appear to interface via the household division of labour, the gendered nature of access to resources, and influence of the sustainable agricultural innovation system. In EGP wherein the livelihood purely depends on agriculture and women play a pivotal role in case of ensuring food security and uplifting the household socio-economic status, there is a great challenge of empowering the rural women through the agricultural development by improving the water use efficiency. The techno-managerial, socio-economic constraints and the enabling environment are the predominant limiting factors to access and to utilize ground water as well as surface water in an effective manner by the women for agriculture in EGP. In addition to that the scarcity of water during dry season also limits the EGP dwellers to restrict their cultivation, contributing towards facing extreme food insecurity and poverty. In other way, the enhanced availability and accessibility of water during dry season along with scientific technology, transport and capital creates possibilities to enhance livelihoods, which improves livelihood outcomes and makes other assets more available to empower the rural women. In this perspective, a project funded by the Australian Centre for International Agricultural Research (ACIAR) is initiated to work with communities across Nepal (Saptari), India (Cooch Behar and Madhubani) and North West Bangladesh, to research and demonstrate improved collective farming systems for marginal and tenant farmers and improved water management and irrigation practices using efficient systems appropriate to the needs of the marginal and tenant farmer communities including women.

Village description:

The village Dholaguri is located in the Ambari GP, Block II of the Cooch Behar district of West Bengal, India. The village is located in the sub-himalayan *terai* region of West Bengal. The region is characterized by high monsoonal rainfall and comparatively dry winter months. The village community is mainly dominated by the lower caste population and pro-active women with agriculture as a major livelihood options. The average size of land holding is low with a high proportion of marginal and tenant farmers. Most of the tenant farmers work as agricultural labourer. The migration of youth to other states in search of alternate livelihoods has left many families to be led by women. The village is rich in both surface and subsurface water resources. There is one perennial river called Ghargharua flowing through the village. However, most of the ponds are seasonal and only 20-25 ponds retain water throughout the year. The groundwater

table is available at about 1.5 to 4.5 m below ground level. There are three self help groups, one fishery cooperative and one Farmers' Club (Alor Dishari) at the intervention sites of the village.

Site specification and Interventions:

At the site Karjeepara of Dhaloguri village the project is working with group of eight members consisting of four male marginal farmers with one male landless member and three landless women members. This group was renamed by the members as Krishi Ankur Swanirbhar Gosthi. There are three self help groups, one fishery cooperative and one Farmers' Club (Alor Dishari) at the intervention site. The collective farming group was formed by the joint effort of the project partners (UBKV, CDHI and IWMI) based on primary and secondary information. Since the inception of the project, social mobilization at the primary and secondary implementation stage of the project was carried out at the site with the help of community meetings, issue based focus group discussions, community engagement programmes and gender awareness meetings. The predominance of rice based cropping system is observable at the site. Except rainfed paddy and winter potato in some patches, most of the lands used to remain fallow during the dry season. Mere existence or non existence of Irrigation infrastructure was the limiting factor in agricultural productivity. Direct pumping from a nearby river through very long flexible, highly inefficient and uneconomic delivery pipes was the only source of irrigation to grow winter potato.



The physical intervention of the project started with the installation of one shallow tube well and commissioning of one 4 HP diesel pump at the site, one drip irrigation system for protected cultivation and one solar irrigation system. With assured access of irrigation water, the group of farmers started growing crops even during the dry seasons. After careful consideration of soil, climate and season, the project scientists and farmers decided about the crops to be grown in the site throughout the year (three seasons) and prepared a crop calendar and layout of the plots for the specified crops in a

participatory mode. The farmers were technically backstopped by the trainings and practical demonstrations on different aspects of integrated crop management technologies for field crops and vegetable crops like Aman paddy, Zero tillage mustard, Boro paddy, wheat, maize, Jute, Onion, Garlic, Coriander, Chilli, Cabbage, Taro, Capsicum, Cauliflower, *Basella alba*, Elephant Foot yam. In the last dry season (winter of 2016-17) a total area of 10 bigha (1 ha = 7.5 bigha) were brought under rabi field crops and winter vegetables.

The water management aspects like reduction in the length of furrows for potato, and corrugation irrigation to vegetables, low water requirement crop cultivation were piloted successfully at the site. After harvesting of the winter vegetables, in the summer of 2017 the farmers cultivated irrigated summer rice using SRI method and jute before going for the monsoon

paddy. In this connection one protected structure was prepared to grow off season vegetable crops. The group has already grown Lady's finger, Capsicum, Spinach, Coriander leaves, cauliflower etc. in the protected structure. During this winter the farmers of this group are planning to grow the field crops like maize with the help of resource conservation technology. Also the group has exposed to other successful vegetable belts of north Bengal to get the first hand experience. This year the farmers are growing a variety of winter vegetables using furrow or corrugation irrigation method using solar pumps as well as diesel pumps.

Impact:

Inclusion of women landless member in the group is also empowered the women socially and economically. The woman landless group member Jharna Karjee is sharing the responsibility of cashier in this group which builds her capability of running a farmers group and sharing the benefits among the group members in an efficient manner. The cognitive capability of knowing



the scientific cultivation practices of dry season field crops and winter vegetables has also been enhanced and her able leadership reflects in the areas of crop productivity enhancement (Mustard 710 Kg/ha, Maize 3031kg/ha, Wheat 3151kg/ha, Boro paddy 1180kg/ha, Taro 10690 kg/ha, Chilli 2534kg/ha, Elephant foot yam 5988kg/ha, Coriander 2238kg/ha, Radish

32270kg/ha, Cabbage 46000kg/ha). The benefits of cooperative farming are also visible in case of increasing the confidence of the woman group members to uplift their livelihood status by improving the water use efficiency in agriculture. The risk taking ability of Jharna Karjee has also been increased in case of selecting and growing new crops and applying the more sustainable intensive cropping system in the dry season. Change in cropping intensity is also remarkable in this area which also contributes to the livelihood of Jharna Karjee. The assured access of irrigation water through newly created efficient irrigation infrastructure and better water management techniques, and improved practices of crop production has reduced the risk of crop failure, the overall cost of cultivation and has enhanced crop productivity. Due to the higher crop productivity, timely harvesting of the crops and appropriate market linkage, the market prices of the marketed agricultural surplus are more remunerative to the farmers. The farmers group has earned Rs. 5000 from the protected structure by cultivating and marketing off season vegetables and the women member Jharna Karjee herself has got the benefit of Rs. 625 from this project intervention.

Lessons for the project:



Access to land and irrigation affects agricultural success and agriculture underpins many livelihood strategies; thus the project has a critical influence over livelihood outcomes of the woman. The successful implementation of cooperative farming approach builds the confidence of women marginal and tenant group members in case of augmentation of their livelihood status through group cohesiveness, appropriate benefit sharing,

conflict management, and institutional enabling environment. The sustainability of project interventions for women empowerment through improved water use in dry season agriculture depends on the strengthening of collective farming group institutionally. The more emphasis should be given in case of value chain management for each and every agricultural produce so that the women farmers can get remunerative prices of their produce from the market in timely manner. Improved techniques in irrigation and water resource management can also be introduced to enhance crop productivity by using limited amount of water. Woman is the integral part of this project and special consideration for women related other livelihood options may be explored in the near future at the project site to raise the voice of woman through technical, economic and social empowerment.

2.5 Lalita Oran: Emerging leader setting examples from male-out migrant family

Context:

The DSI4MTF project is focusing on collective farming and crop intensification in dry season. The collectivization is always challenging and it has been noticed in the past that most of the time group farming failed in different countries due to lack of social capital. In this project community engagement approach towards adoption of new technologies is being practiced to achieve the success of collectivization. For the last 3 years this project is experiencing and capturing different learning. The overall outcomes from the research fields are being documented in the form of article, news bulletin, website, case study etc. To reach the common people and local level policy makers, case study is an important tool. Recently the case study is also considered as a good research method. Case studies are complex because they generally involve multiple sources of data, may include multiple cases within a study. Researchers and practitioners from many disciplines use the case study method to produce new theory or challenge the existing theory as well as apply solutions to situations.

Objectives:

The case is the real life situation and it is the analysis of the certain situation of certain period of time. In the context of DSI4MTF project, the prime objective of this case study is to capture the process and outcome of activities for sharing and reflection with farmers in the project location.

Approach:

There are two different types of approaches used to this case study –

- (1) Analytical approach: The case study is examined in order to try and understand what has happened and why. This is not always necessary to identify the problems or suggest probable solutions.
- (2) Problem oriented approach: The case study is analyzed to identify the major problems and to probable suggest solutions to the problems.

In both approaches transect walk, primary data collection, interview, peer group discussion etc are done in November 2017. The existing farmers meeting minutes also provided good data and information.

Discussion / Narratives:

Different events - orientation, peer group discussion, farmers training and exposure programmes were organized for the farmers' collective on institution building, participatory planning, decision making, crop choice, method of farming etc by CDHI-UBKV to promote collective farming at six sites (now seven) of two research villages.



Figure 21: Meeting at UC to explore the women potentialities

The community engagement and training programmes supported farmers learn some practical skills like conflict resolution, land preparation, crop selection, seedbed preparation, irrigation management, harvesting, linkage building, marketing etc. With the continuous support and guidance, the CFGs gained necessary basic skills on agriculture, improved their decision making

capacities and leadership qualities. The leaders are emerging from both villages. Here Lalita from UC site-III is representing other leaders like Rita, Tapan, Surendra, Kaliram, Dhukha, Rajoni, Jharna, Nirmal, Mrinal, Nonibala, Dhiman etc.



Figure 22: Lalita is busy in domestic activities

Lalita Oran is 29 years young married women. She is illiterate but managing domestic works, livestock and own agriculture land (1 hectors including mortgage). To manage her family and livelihood she has long been working as daily wage labour. Her husband Ramjesh Oran is a seasonal migrant labour and frequently visiting New Delhi, Haryana for additional income. Only one daughter Anushka is studying in class-II at local government primary school. Lalita is very much confident about the outcome agricultural and animal husbandry activities and it pushed her involved in collective initiatives to lead better live.



Figure 23: Lalita is equally managing irrigation water through solar system.

Lalita believes in collective initiatives and formed the Paroshmoni Self Help Groups (SHGs) in 2007. The positive attitude towards savings and working together is the ultimate outcome of this group so far. This is the 10 members homogeneous group which is depositing their own money to the local Garmeen bank and accessing loan. Initially each member contributed Rs. 20.00 per month and now they are contributing Rs. 50.00. Lalita received Rs. 10000.00 as a loan in 2011 and purchased one cow and 2 goats. In 2017 she has now 4 cows, 5 goats and 9 chickens. She said “ *The livestock along with farming is great support of my family in the crisis period as well as my daughter is getting good vitamin in drinking pure milk. We did not sell the milk and we used it for our family consumption. We are benefited from this group.*” The real collective work / business of the group is missing but individually each member like Lalita is getting benefits. This motivated her to do further collectively under collective farming groups (CFG -Sabuj Kalyan Krishak Gosthi, Bholarghat, UC site-III) initiated by CDHI-UBKV in 2015. Initially it was women led group of 16 members including 2 male farmers and now entirely women CFG of 9 members. They are collectively managing open field crops and poly house cultivation. During the last monsoon they successfully cultivated spinach and coriander first time in the history of UC. Lalita and other women members are satisfied that they can manage new crops and earn better price. This time they cultivated successfully early variety cauliflower also first time in the history of UC and sold Rs. 30 to 40 per kg which is 5 times more than normal price during the season. More than profit they gained confidence. Lalita is very happy that she and Rita are leading the group and showing the better result. One year back Male farmers like Ram, Tapan ... had doubt on female farmers’ skill but now they are appreciating them and telling – “*women in UC are capable to manage high return vegetable under poly house and open field crops like- potato, radish, mustard, wheat etc.*” Lalita is also very successfully operating the solar irrigation system and managing irrigation water scientifically. They are gaining knowledge on modern agriculture technologies. During this Rabi season they are in process to cultivate potato, broccoli, radish, mustard, wheat etc collectively in

more than 2 acre land at site-II. The farmers around collective group are also motivated to grow different crops during this Rabi season.



Figure 24: Lalita (second from right) along with male farmers and CDHI in the field of Radish.

Key findings:

- The knowledge and confidence of the farmers is growing up for collectivization. The farmers from non CFG-collective farming groups are following the leaders like Lalita and motivated to do some crops in Rabi and pre-kharif season in their individual land.
- New crops like potato, cauliflower, spinach, coriander etc introduced by farmers and the project. The vegetables are used for both purpose of own consumption and commercial.
- Farmers are slowly making their own decision and selecting the crops by their own choice for health and economical benefits.
- The farmers have enough confidence to grow high value vegetables during the off-season.
- Tenant and marginalized farmers like Lalita are managing and operating the technologies quite successfully. The irrigation systems- solar, STW, ridge/furrow, hose pipe etc are managing quite efficiently.
- The trust between farming community and practitioners / scientists is increasing and respecting to each others.
- The mobilization of UC people for ensuring their schedule tribe (ST) certificate worked very well. Poor households like Lalita are aware of their right and entitlement. Now they can access irrigation and other facilities from government.

Lessons for the project:

The collective farming / CFG is slowly and steadily creating a joyful environment for introducing new crops and new technologies. The capability of “risk taking and handling” among poor women can be created by promoting collectivization. The relationship built under collectivization has also led to a process of learning and sharing between landless and the landholding farmers or between success and failure. With increasing technical knowledge of the CFG leaders as well as social and scientific support, the farmers are more confident to go for a more intensive cropping system. The assured supply of irrigation water by solar and STW-shallow tube well at UC site-III

has also reduced the risk of crop failure. With timely transplanting and harvesting of the crops the market rates were more remunerative to the farmers. More leaders with more specific skills to be targeted. The engagement of farming households to access the caste certificated helped them to do more advocacy with government.

More specific comments on ways forward are listed below:

- There are challenges like the delays in monsoon, uneven rainfall and pest attacked. Also the soil of the collective land is low quality especially. It needs more organic inputs to regenerate the soil. They are confident that continuous application of bio inputs will help in improving the soil health which will result in better incomes in future. There is a need to organize more events like farmers to farmers' field visit / exposure. The aspiration level of the farmers still low and need to organize more event so that farmers can think big and achieve big.
 - Considering the high cost involved in purchasing of seeds, seed treatment or thresher machine , weed m/c, spray etc for their farming activities, the collective groups can plan to establish a Farmers Service Centre (FSC) in their respective village. The leaders like Lalita, Rita, Tapan, Bhagwati etc can lead the FSC. The groups can also access those facilities from government by creating convergence with government line department.
 - The leaders including Lalita played important role in accessing caste certificate. Now they are in process to get land right. The process of tube well installation from district authority, Alipurduar is going on. This kind of farmers engagement with local level policy makers to be continued.
-

2.6 Inclusion of landless household in mainstreaming development in Dhalaguri

Context:

The ACIAR supported DSI4MTF project is talking about community engagement, institution building, collectivization, crop intensification and adoption of innovative technologies. The project is targeting tenant, marginal and women farmers in two villages- Dhaloguri(DH) and Uttar Chakowakheti (UC) of Coochbehar and Alipurduar districts (West Bengal). Project partners- CDHI-UBKV is gathering different experiences from the field. Recently workshop on “Case study” conducted in Jalpaiguri for the project partners from Nepal, Bihar and West Bengal to capture the project outcomes. To advocacy with local level policy makers and service providers case study is an important tool.

Objectives:

The core objective of this case study is to document the process and outcome of activities undertaken by the collective group. The other objective is to know how a tenant and tribal women is evolving as leader and supporting the family for better life.

Approach:

The case study is examined in order to try and understand what has happened and why. This is also analyzed to identify the major problems and to probable suggest solutions to the problems. The existing project reports and meeting minutes along with interview and group discussion helped to prepare the case study.

Discussion / Narratives:

The activities - orientation, peer group discussion, farmers training and exposure were organized for the farmers' collective on institution building, participatory planning, decision making, crop choice, method of farming etc by CDHI-UBKV to promote collective farming at six sites (now seven) of two research villages. The community engagement and training programmes supported farmers learn some practical skills like conflict resolution, land preparation, crop selection, seedbed preparation, irrigation management, harvesting, linkage building, marketing etc. With the continuous support and guidance, the CFGs gained necessary basic skills on agriculture, improved their decision making capacities and leadership qualities. The family of landless Nonibala Roy from Dhaloguri(DH) site-III is representing other households like Tuli Burman, Jharna Karjee, Lipika Adhikary, Shyamal Roy, Minuti Adhikary etc who are landless and struggling in managing three times food and child health.

Nonibala Roy, 39 years old woman is the second wife of the manual rickshaw puller Bhabendra Nath Roy, 62 years. Nonibala is living with her husband and two sons- Soumen (20yrs) and Bijon (18 years) who are migrant labours of construction company in Bangalore at the age of 15. The earning of sons helped them to renovate the house at DH. Nonibala has long been working very

hard in managing domestic work and agriculture field as a daily labour after her marriage in 1995. Now she is working harder and harder as income of her husband is rapidly slowing down due to availability of motorized rickshaw in this locality.



Figure 25: Working hard as daily agricultural labour

Nonibala is the member of two local institutions- women Self Help Group (SHG), Mahila Sanchay Swanirvoir Ghosti and Collective Farming Group (CFG), Krishi Unnayan Samity formed in 2009 and 2015 respectively. Like other SHGs, each member is contributing Rs. 50.00 per month and group is depositing to the bank to access loan and government supports. Nonibala received loan Rs. 5000.00 in 2012 for enterprise development but she used it to meet the basic need of drinking water and installed the hand tube well. She refunded it with interest and again recently received Rs. 10000.00 for enterprise development but again used it other purpose – land preparation for house. Most of the poor women like Nonibala is not having the training and skill resulted in lack of small business development. She is quite satisfied with SHG's performance but emphasizing on selling of her agricultural labour. According to Nonobala, she is working 230 to 240 days as a daily wage labour in a year. In 1995-96 the daily wage rate was Rs. 50.00 and now it is Rs. 200.00 excluding lunch. She was proudly telling us that her knowledge and skill on agriculture enhanced owing to CFGs. They collectively cultivated new crops -chili, elephant foot yam, taro, boro paddy etc and traditional crop potato. They are also managing the poly house cultivation of capsicum, coriander and cauliflower. The introduction of new crops and managing them successfully built the confidence of landless farmers like Nonibala beyond economical benefits. Nonibala said “ *I am landless agriculture labour and my family is still depending upon my own income. My sons are earning but this is very pathetic that both sons are staying far away from me. We should not use our sons' income to run our livelihood. I am happy that I am the member of CFG and my enhanced knowledge will support me to sell my daily labour more efficiently*”. The male farmers are pleased to see the involvement of landless families in collective farming groups. Rajoni Karjee and Nirmal Das, progressive farmers and members of CFGs said “ *We are helping each other, working together and we did not differentiate the rich, poor, landless and women. We are living in the same society and we have to do good in the farming sector to increase our income*”



Figure 26: Nonibala (third from left) is working with male counterpart in the field of collective farming.

Nonibala along with other 4 landless women are encouraged with collective farming and formed another group “Sabuj Sathi”. This collective women group planned to cultivate maize or potato in 2 bigha land during this Rabi season. Already they mobilized land from rich farmer and communicating with DSI4MTF team for social and technical supports.

Findings:

- The skill and confidence of the landless farmers is growing up due to collectivization. The deprived and landless family led by women is feeling good that landholders and rich farmers are respecting them. Also honouring their decisions as well as appreciating their participation.
- New crops like elephant foot yam, cauliflower, spinach, coriander, capsicum etc introduced by farmers and DSI4MTF project facilitated them. The vegetables are mainly used for economical purpose. No major conflicts in sharing the profits of crop.
- Landless households are slowly establishing themselves as an important member of CFG by their honest and hard work.
- Landless farmers like Nonibala is learning from progressive farmers and slowly managing and operating the technologies. But landless family is still hesitant to operate the solar or pump technology. They are still shy to sell their product in the local market and depending on male counterpart.
- Nonibala is very regular to attend the farmers meetings at different places. Also attended to the stakeholders’ workshop where engineers from Agri-Irrigation department also participated. The government officials appreciated the idea of collective farming especially inclusion of landless farmers and women.



Figure 27: Nonibala is in Farmers Planning meeting at CDHI (Fourth from left)



Figure 28 Nonibala (second from left) is checking the growth of early variety cauliflower under poly house.

Lessons for the project:

The capacity and skill among landless and male-out migrant households are more serious to learn and adopt the new technologies. The profit they are making from collectivization is not so much but they are appreciating the introduction of new crops. Their confidence and risk taking ability is growing up due to their active engagement towards technology.

The following recommendations can be made:

- The landless households are working hard under collectivization. But the profit they are gaining (equal share) is not so much due to land coverage of collective farming is very less. To sustain the collective farming the DSI4MTF project needs to emphasis to increase the land coverage.
- Record keeping is tough for women farmers like Nonibala but someone from the CFG needs to maintain the accounting system properly and sharing among all members to build strong social relationship.
- Considering the high cost involved in purchasing of seeds, seed treatment or thresher machine , weed m/c, spray etc for their farming activities, the collective groups can plan to establish a Farmers Service Centre (FSC) in their respective village. The groups can also

access those facilities from government by creating convergence with agriculture department.

- The farmers are mobilized to visit to the Agri-Irrigation department and sanctioned six irrigation system for Dhaloguri farmers after attending the workshop held in UBKV. This is expected that installation work will be completed within February 2018 and these six clusters will cover 60 poor farmers. Such initiatives to be continued.



Figure 29: : Wheat grown first time in Dhaloguri history under collective farming

3. Collective action case studies

3.1 Introduction

As well as understanding positive and negative stories relating to particular households or individuals, there are also important learnings concerning the groups themselves, and how they function. Important questions and learnings relate to decision making, conflict resolution, and innovative ways of working together. This set of questions is critical as the collectives, particularly the pure collectives, operate themselves as the core unit of production, and thus group failure can translate directly into lower productivity.

3.2 Strength in Adversity: A Collective Approach in the Face of Disaster in Kanakpatti

Introduction:

Well coordinated effort of a group alone does not guarantee success and prosperity. There could be unanticipated challenges with the potential to threaten good efforts. Although the fishery group at Kanakpatti village in Saptari district of Nepal are working well together, they learned early that the force of nature affects good intention and action. At such times, the realization hits

that the true test of collective action is during such uncertain times followed by how the groups organize themselves.

When the pond leased by the fishery group at Kanakpatti was threatened by continuous heavy rainfall, the group had two options. They could either feel sorry about the situation and do nothing or they could collectivize towards a solution. This case unfolds story of a fishery group from the above mentioned village, which demonstrated collective effort amidst unanticipated challenge. It sheds light on the sustainability question development expert often pose during discussion on collective action.

Start of the group:

Multiple uses of available water resource such as surface pond is essential especially in regions such as Saptari that falls in the Eastern Gangetic Plains. With the facilitation of ACIAR funded project “Improving Dry Season Irrigation for Marginal and Tenant Farmers in Eastern Gangetic Plains”, farmers decided to organize themselves in a fishery group aimed at starting fish farming in one of the surface pond of the village. In addition to the pond use as source of livestock and as a sacred water body for festivals, farmers decided to utilize the pond for fishery.

Farmers in the Kanakpatti village were already working in three groups formed with the support of the project. Among three groups, farmers from two groups (Group 1, Rajaji Krisak Samuha and Group 2, Mahila Utthan Krisak Samuha) showed interest to lease the local pond and diversify their livelihoods. Members from those two merged into one and now comprises a total of 15 members with 14 female and one male members.

The prospect of additional income through fishery was followed by formal and informal meetings. At the beginning two ponds in the village were assessed for leasing. Among the two, one is a community pond (made in collaboration with the government and GIZ) and another is pond owned by an individual. The government made pond was ruled out due to its distant location in comparison to the pond within village, which is much more accessible.

In the group, the members started taking coordinated steps. Negotiation with the landlord began early on to set suitable lease agreement. The negotiation and leadership skills acquired earlier as farmer groups under the project proved handy in the process. They were realizing the strength in togetherness. When annual pond lease amount was set to 1 lakh by the landlord, farmers together convinced him to bring down the amount. The project personnel also assisted in the process. They stated the obvious fact about the high investment cost for making pond suitable for fish farming. The cost to purchase fish hatchling, fish feed and manure would increase their initial capital investment. Having shed light on these aspects, the landlord agreed on lease agreement with NPR 17,000 per annum rent.

Training and linkage building with local bodies:

Not a single member had prior experience in fishery. The provision of necessary training and linkages with the local institutions built confidence among the farmers to pick on the opportunity

to diversify their livelihood. Through the facilitation of the project staffs, group bylaws were drafted. To acquaint farmers on the same, two rounds of information dissemination workshops were organized at the site. On the first phase, the fishery personnel from District Agricultural Development Office (DADO) of Saptari visited the pond in mid march of 2016. After assessment of the pond water level and water quality, he advised on appropriate species of fish and pond treatment techniques. He suggested to treat the pond with 150 kg lime. He recommended on putting a total of 15000 fingerlings with specification on species composition as silver carp(15%) bighead carp (15%), Common carp (20%), Rehu(15%), Grass carp (5%) and Naini(30%). Furthermore, he provided contacts of private and public fish farms at nearby areas: Lahan, Fattepur and Santnagar for fingerlings. Due to the complexity of filling the pond, he advised not to dry the pond for treatment.

On the second round, the DADO personnel provided inputs to farmers on fish feed, interval of feeding, fish disease and fish market for specific species. Gathering from the two interactions, farmers purchased fingerlings from government run fish farm at Lahan. Based on the species availability, they purchased finger sized Rehu, Naini, and Common carp. Additionally, they bought fry piece Common carp. They were assisted by the Junior Technical Assistant from the farm to unload fingerlings to the pond.

What went well?

The group identified a couple of situation they could face in the future. During the initial meetings, the group members identified one challenge of fish theft in the future. They figured the need to guard the pond at night, assistance from male members was considered necessary. They decided to keep husband of the members as the advisory members. They decided to construct a small bamboo house as a night guard space. They contributed self labour to make the bamboo house. Roofing was supported by iDE. They made a rule to schedule feeding the fishes every two days to each member.

The division of work among the members is working out well for them. for example, they have allotted fish feeding task every two days among each member. The turn of a member comes every next month. Each member invested Rs. 1000 to purchase fingerlings and fish feed. They contributed capital and labor to construct bamboo house to guard the pond.

Rocky Patch:

Despite the well coordinated work, the continuous and heavy monsoon of 2017 caused some damage to the towards the intake of the pond. The gully formation due to flood water caused soil erosion threatening the pond. Farmers gathered to divert the flood water to avoid further damage. The Pond Management Committee organized a meeting and carried out the urgent repair work. They added soil in the intake area combined with installation of two 6-inches diameter pipe.



Figure 30: Fishery group member explaining pond damage at the pond intake after rainfall

The coordination among farmer was supported by the project personnel, Department of Irrigation at Rajbiraj and the landlord. Farmers contributed labor and got material cost support from the program which was reimbursed by Department of Irrigation. Landlord provided soil to do the repair work. Farmers worked for two days and DOI supported with excavator and 6 inch polythene pipe worth Rs 25,000.



Figure 31: Fishery group member making bamboo shed to guard pond



Figure 32: Members contributing labor for mud work at the pond after damage caused by monsoon

Some other challenges perceived by the fishery group in the future are regarding the fish and infrastructure theft. Furthermore, up until now, the landlord is supportive but after the lease

period ends in three years, the landlord could create trouble to continue leasing or increase the lease amount.

Learning for the project and next steps:

Having tackled the challenges brought by monsoon, now farmers are drawing plan for the future. They want to install a pump nearby pond to refill water in dry season. To do so, they are planning to apply for pump related scheme under DOI and GWRDB, the government bodies. The prospect for collaboration has been positive as the Rajbiraj DOI personnel, Mr. Ashok has visited the pond to see the current work and promised to put the pond in priority list for upcoming financial year. With the completion of recent local election, farmers are looking for possibility to establish linkages with newly elected representatives of the local bodies.



Figure 33: One of the member observing the pond after the repair work

Landlord, tenants and power hierarchy: A tale of Koiladi village, Saptari

Introduction:

Saptari district of Nepal is characterized as the land of “*unequal land distribution*”. In a country where agriculture is the major source of livelihood for 68% of the population, unequal access to land brings in a lot of challenges especially for the marginal and tenant farmers. The access to unequal resources brings in power hierarchy placing landlords at the assertive and tenants at submissive positions. The experience of working with group 2 comprising of marginal and tenant farmers from Koiladi village at Saptari depicts a similar tale.

Community Context:

In Koiladi, a few landlords own large plots of land, while there are many tenant and marginal farmers who have no or small land holdings. These marginal and tenant farmers lease in land from the landlords under different rental arrangements. In Kanakpatti and Koiladi village, the two main kinds of rental arrangements are *thekka* and *bataiya*. *Thekka* is the one time rent paid to the landlord in a year and *bataiya* is sharecropping whereby 50% of the crop yield is distributed among the landlord and the tenant.

A Rocky Start:

As the intervention was in the process of rolling out in Koiladi group 2 comprising of 6 members, a formal land agreement was made between the landlord and the group members. The rental arrangement was fixed through *adhiya* system. However, soon after the electric pump was installed in the leased intervention land, the landlord Mr. Murari Singh started demanding for more rent from the group. He wanted to go for sharecropping. The project team and farmers negotiated with the landlord a new agreement whereby a portion of land was decided on *thekka* (leasing) and another portion on *adiya* (share cropping). This resulted in a reduced intervention area and delays in implementation of planned activities. Despite the initial hurdles, the group members started cropping all three season as opposed to traditional cropping pattern on monsoon, partially on winter and fallow on summer season. The farmers started commercially cultivating vegetables in summer and winter season by learning new agronomic skills. In the initial winter season of 2016, farmers cropped cauliflower and cabbage for the first time. However, the production did not turn up well and farmers could not make as much profit they expected. In the following summer season, some farmers were motivated due to the returns from cucurbits. As the prospect of vegetable farming was looking up, the intention of the landlord was not in tandem to their aspirations.

Recent Development:

In the recent months, during the meetings with landlord and his son, they expressed the lack of interest to continue leasing out the land to the farmer groups anymore after the contract ends. This is in response to the federal structure of government Nepal is moving into. The constitution of 2015 has provisioned federal and local system of government for Nepal. As of yet, the local

body election has been held and the provincial election is underway. The possibility of land reform to be brought in through the new system has crept in the reluctance to go for formal land lease agreement. Land reform in Nepal has not been progressive in the past but some of the steps taken while formulating Land Reform Act has shaped the landlord's perception in this manner.

The landlord's son mentioned, *"yo samuhako manchhe haru le jamin uniharu naam ma huncha aba vancha re"* (meaning this group members are heard saying our land will be transferred in their name). Through the negotiation led by iDE officers and farmers, it was assured that the farmer group will not capture his land. For the assurance, the farmers are willing to sign a formal document stating the same. After the intervention, although the landlord was somewhat positive towards continuing with the group, the situation is something to think about seriously.

Power hierarchy and land reform history:

The power hierarchy established among the landlord and the tenants gives the latter less confidence to negotiate the unsatisfactory land leasing terms. Likewise in this case of Koiladi group 2, the farmers were less likely to communicate the dissatisfaction over the landlord's stance.

Increasing discourse on land reform led to the promulgation of Land Reform Act on 1964 in Nepal. This act put land ceiling on the ownership of land in the terai (plain) and hilly regions of Nepal. The land ownership ceiling provisioned 25 Bigga land holding in the Terai plains and inner Terai. As for the hilly and mountain regions, the land holding ceiling was 80 ropani. The limit for Kathmandu was 50 ropani. Likewise the fourth amendment of 1964 Land Act provisioned the tenants to have ownership over 50% of land in the land they leased. Although materializing this policy required a formal agreement between the landlord and the tenant, this move was enough to withdraw land leasing to same tenant for a long time period. Either the land was leased in to different tenants or left fallow. The general practice of having a land leasing document is uncommon in Nepal. Likewise, working with the landlord in Saptari is a challenging venture in these terms.

Implication on Koiladi farmers and lesson learned:

The perception on the likelihood of land reform and the new form of government arrangement Nepal is moving into has heightened the fear among the landlord that the land will be redistributed. As a result, the landlord are trying measures to not let this happen. The losing side in all this are the marginal and tenant farmers like Koiladi group 2 farmers.

In the project level, having already made the investment on infrastructures at landlord's land, this situation threatens the sustainability of intervention. The access to the water pump is still a challenge despite the availability. Although, currently, the landlord Murari Singh has agreed to continue with the intervention, the situation is still a challenging one.

3.3 Change in marketing strategy by small and marginal farmers: A case of Bhagwatipur & Mauahi Village

Context:

Prior to the start of interventions under DSI4MTF project, the farmers of Bhagwatipur and Mauahi villages used to cultivate paddy during *kharif* season and wheat during *rabi* season. During summer season, farmers were growing moong crop, but limited water availability had forced its cultivation to a very small area. Vegetable crops were not an option in their cropping system. With the increased availability of water through water management interventions and the technical support and guidance by the DSI4MTF team, the farmers of both the villages adopted vegetable cultivation in their cropping system.

Given the large scale production of vegetables from the increased cultivation area, its marketing became a major concern for the vegetable growers. There is no formal market in the villages where agricultural produce can be sold by the farmers. As a general practice, farmers of these villages sold their grain produce (mainly paddy and wheat) to local trader at their doorstep, at a price lower than the market rate. Marketable surplus of grains is mainly sold by big and medium farmers and not by small and marginal farmers who produce to meet their domestic needs. Initially, both the villages started vegetable cultivation on the premise that they will sell the produce themselves. But given the good vegetable production from the experimental plots, the problem of marketing the vegetable produce became serious. This problem is either related to social constraint or technical issues like price fluctuation, knowledge of marketing etc.

There was a need to identify possible constraints in marketing of vegetables and to work out optimal solutions to the marketing problem. This case study was planned with the following broad objectives.

1. To study the constraint in marketing of vegetable produce by the farmers from both the villages.
2. To work out possible ways and mechanisms to improve the marketing of vegetable produce.

Process:

Realizing that the problem in selling vegetable produce had twin derivatives, one: there was rigid thinking in the farmers that a particular cast cannot go in to the market and sell their produce and the other was the fluctuation in the market price at the same time they were lacking the confidence to negotiate with the local vendors in the market. It is against the dignity or acceptability by the community at the large. After several discussions, the project team succeeded in convincing the farmers about the superiority of economic gains over the social concerns. Several counselling sessions were conducted to bring-in the attitudinal change in the thinking of the farmers. Also, the project team motivated the farmers to negotiate the price with the vendors. The transformation brought out by the project has changed the scenario. Now the marginal and tenant farmers are also generating marketable surplus of vegetable produce.

Farmers sale their produce in different market places like *haat* (weekly market) in nearby village, daily market in nearby village like Nanour Chowk for Bhagwatipur and Rampur chowk for Mauahi, market place at block head quarter (Andhrathadi and Babubarhi) and wholesale vegetable market at Khutona and Jhanjharpur.

Impact:

Change in attitude towards direct marketing of vegetable produce

In 2016, Mr. Bishundev Mukhiya member of group number 1 of Bhagwatipur village agreed to sale the vegetable produce of group number 1 after a several round of meeting with him. He started selling of the produce from Group-1. After two weeks he stopped selling the produce due to many reasons. Out of many reasons, one reason might be social constraint to stop selling vegetable produce directly to customers.

From Bhagwatipur village Mr. Ram Yadav (not project beneficiary farmer) also started vegetable cultivation in the year 2016. He used to harvest the produce and contact the 4-5 vegetable vendor in the nearby market, negotiate with them on price and who ever tell higher price, he goes there and sale their produce to them. We had discussion with him on the issue of social constraint for marketing of vegetable produce. "People passing comment on me that now you are perfect Kujra, this comment did not deviate me from doing this business. I gain higher return from vegetable cultivation and its marketing". Now people have stopped passing comments on me, they now understand the value of vegetable cultivation and its marketing.

From Bhagwatipur, another beneficiary farmer Mr. Jugut Yadav used his past customers, to whom he used to sell the milk, as potential customers for vegetable produce. He met his old milk customers in Nanour village and informed about the vegetable cultivation. He used to sell milk to 30-40 families in the village now they are the fixed customer for vegetable as well. He used to harvest the produce early morning and directly goes to Nanour village to sale the produce door-by door. We had discussion with him on the social constraint for marketing of vegetable produce. His reply was that this is true for some people but I am not afraid of this social perception. If I have money people recognise me and listen to me. So my perception differs from other people.

From Mauahi village Md. Sakruddin also tried to sale their produce at Rampur haat. Unfortunately, he was not able to sale even a kilogram of lady's finger (Okra) on that haat. When we asked about why you was not able to sale the produce?. He told that not a single customer even ask me the rate of vegetable, I spent time and return back with my vegetable produce and feed the cattle all the produce (he jokingly said even my buffalo not eat that Okra). That was his first frustrating experience of marketing vegetable produce. He paid the tax amount from his pocket to the haat in-charge.

Recently the team had discussions with individual farmers on the issues in vegetable marketing. Still there is mixed response on this topic. But some farmers nodded that they can do marketing

of vegetable produce to nearby village by making ferry in the village. One farmer Mr. Jitan Ram said that he will start to sale their produce directly to customers.

This trend shows that there is change in the attitude and perception of farming community in the study village towards direct selling of their vegetable produce.

Price fixation for their produce (Market data we have)

In 2016, farmers contacted the local vegetable trader and discussed with trader on rate of different vegetable produce. Farmers did informal agreement with trader that they will sale their produce to them at Rs.5/kg less than the market price. This was their first experience of fixing the price of their produce. But this is really very difficult for our farmers to fix the price of their vegetable produce without knowing the real time market rate. Now some of our farmer collect the market rate and then fix the price of their produce based on the market rate data. We also share with farmers the weekly market rate data and trend of commodity rate in the market. In 2017, they followed the same practice of fixing the price of their produce, but this year price of vegetable crashed in third week of April.

In 2016, farmers realised that significantly higher rate for early season vegetable crop in comparison to same period in 2017. In 2017, price of early season vegetable crashed in the month of April due to heavy supply of vegetable in the early season, whereas in 2016 price remained stable till Mid-June. This year low price persisted for longer duration and up to the end of the Jun. Price of vegetables increased from July onwards. This year due to low price and less market demand led to lower income from vegetable crops.

Comparative price of different commodity in two years

Commodity	Average Selling price/kg in 2016 (In INR)	Average Selling price Rs/kg in 2017
Lady finger (Okra)	22	12
Cucumber	25	10
Bitter gourd	20	14
Sponge gourd	15	8
Cowpea	20	12
Pea	NA	14
Potato	10	7
Brinjal	15	8

In the table average selling price consider price from April-June for summer season vegetable. Table data shows significant fall of price of all the commodities in 2017 in comparison to 2016.



Gain from doing direct selling:

Many farmers realised that they can earn more by selling directly to consumer instead of selling to vegetable vendor. Because vegetable vendor pays lower rate than the market price. Farmers also perceived this from their peer that those who sell their produce directly to customer are getting higher price than those selling to vendor.

In Bhagwatipur village Mr. Jugut Yadav earned INR 12000/- from 3 katha of land in 2016 where as our collective group earned significantly less amount from the same area of land in the same year because they sold the produce to vegetable vendor, instead taking it to market directly. Similarly, in 2017 in spite of declined prices of early vegetable crop, he earned INR 7344/- from 9 katha of land where as the collective group earned significantly less from the same land area.

Similarly, non-project beneficiary farmer from Bhagwatipur Mr. Ram Yadav earned INR 42000/- from 10 katha of land by direct selling the produce to trader after negotiating price in 2016. But in 2017, he earns only INR 12000/- from same piece of land due to low price and crop failure due to insect pest and diseases.

This trend also validates the view that those selling directly to customer fetch higher price than those selling to vegetable vendor in the village without negotiation on price.

Critical factors that contributed to the impact:

After the intervention of the project team the farmers started to sale their product directly in to the market. Direct sale of the produce in the market improved the farmer's income by avoiding the middle man. Also, motivation of the farmers that economic gains and personal prosperity is important than the social compulsions of cast and creed liberated the farmers from all such social bindings and empowered them to sale the produce directly in to the market or by doing ferry.

Identified Constraint:

During discussion with farmer the following problems in marketing of vegetable produce were identified.

Knowledge of marketing

Knowledge about markets and marketing strategies is key to fetch good returns from the agricultural produce. Traditionally, farmers are selling their grain produce (rice and wheat) to the traders who visit the farms and houses of the farmers. Entire grain produce was sold from the village itself. At the time of sell farmers are not aware about the prevailing market rates and the traders take undue advantage of this. Farmers are not able to bargain with trader the price of commodity. This is due to the lack of information on prevailing market prices. This calls for updating of the farmers about the market rate on daily or at least on weekly basis such that they are able to make decision of selling of their produce (both grain and vegetable) and can have the capacity to even bargain with the trader. Information on rate of a commodity in different markets will enable farmers to work out the economics of product sale in different markets ultimately leading to selection of better and remunerative market for their agricultural produce.

Our farmers, at present, are targeting only the rural customers. In order to sale the produce for urban customer's, the farmers should know how to do sorting, grading and arranging the produce in the basket that gives attractive look. Urban customers are attracted towards the well-arranged and clean vegetables in the market. At present our farmers are not so mature to correctly judge the customer behaviour. We will do another stakeholder meet and conduct an interaction of farmers with the vegetable trader and vendor. Through this interaction farmer should learn how to attract the urban and semi urban customers.

Social status as a seller/vendor

Traditionally, vegetable cultivation and marketing is done by a particular community called "Kujra" (a Muslim community). Now, vegetable cultivation activity also taken up by "Koiry" (a Hindu sub caste belonging to kushwaha community) community on a large scale. Now a days, other communities have also started vegetable cultivation on a smaller scale. But still there is dominance of "Kujra" community in marketing of vegetable produce. The social and economic status of this community is very poor.

Our project beneficiary have also adopted vegetable cultivation practices on small scale. In both villages farmers have no exposure of vegetable cultivation and its marketing. Project team organised a farm training on vegetable cultivation. Farmers from Bhagwatipur village started cultivation of vegetable from summer 2016 and 2 farmer from Mauahi village started cultivation of vegetable crop from summer 2017. Initially, these farmers depended on project personnel for

marketing of vegetable produce through local vegetable vendor (mostly Kujra and others). To make farmers self-reliant for searching a reliable market and negotiating with traders, the project personnel organised one stakeholder meeting in which most of the local vendors participated. Farmers actively interacted with the vendors and started negotiation on marketing of vegetable produce. These local vendors agreed to pay lower price to the farmers than the market rate but little bit higher than the mandi rate to compensate for the transportation cost of produce.

We had discussions with the farmers on why they are not selling their produce directly in the market or to nearby village. The view of majority of farmers was that we do not belong to Kujra community to sale vegetable produce in market. If we start doing this practice then people of our society and relative will call us Kujra. Being called Kujra was not acceptable for many of the farmers which precluded them from selling the vegetable directly in the market or to the customer in the nearby village. They are thinking that their social status goes down in the society if they sell vegetables directly in the market. This discussion was held in both the villages and more or less their views were similar.

Lessons for project:

In general marketing of agricultural produce is more or less a complex phenomenon. Our farmer doesn't know much about marketing of their produce. Unavailability of the daily market rate data to the farmers leads to price lower income from their produce. Farmer need to collect daily market rate data from different market and other sources to decide where to sale and at what price.

The change in attitude and perception of farmers towards the direct marketing of vegetable produce. Project personnel facilitated other farmers to interact with farmers who are engaged in direct selling of vegetable produce to shed off their hesitation and to promote direct marketing of their produce.

It is evident that the farmers selling their produce directly to customers and traders after negotiation on price, are getting significantly higher income than those selling to local vendor without negotiation on the price. Small and marginal farmer should learn from their peers the method of marketing of their produce.

4. Technology case studies

4.1 Introduction

It is important that the analysis of the group functioning and the economic benefits of the project interventions do not overlook the human-technology interface. This interface is a key link which must be bridged if the project is to successfully integrate its technological and institutional innovations. This section outlines some of the technologies which have been introduced and explores how their success or failure has been mediated by social factors.

Their mustard must have wilted, their spirit kept flowering! UC's farmers' response to impending vulnerabilities

Background:

Should misfortune, such as crop failure, befall poor communities, what possibly could happen? If this is a collective experimental initiative how the response would be different? These and related others may be possible questions. In a normal Indian social milieu the immediate post failure scenario may begin and end with 'blame' –finding for some scapegoats and explanations –it was all due to factors I am not responsible for –'they' did not do it, they should have done it' –are the usual refrain'. Scientists would mine more data and pie-diagrams, social activists some more consultations and administrators would pass some orders suggesting not to repeat such mistakes. The matter would end with farmers ruining their fate and government officers closing their files till such catastrophe befall again.

In Uttar Chakuakheti, a tribal village of Alipurduar, West Bengal nothing of the above sort happened. When their mustard failed to germinate this year, which had a better performance last year, the farmers lost no time. Immediately contacted the social and bio-physical scientists, who in turn, rather than waiting for an explanation ran to the field, stood behind them, listened to them, shared their insights and agreed to do something urgently. As the term of events unfolded there was an environment of pro-action and an alternative possibility emerged. Rather than waiting for cost sharing arrangements the collaborators readily worked out something which was agreeable to all. The visit of an international scientist, during the period, helped confidence building and within a manageable time the plots of land which had turned sour got agog with activities. Mustard has been replaced with maize and summer paddy. The scientists and the farmers are hopeful of a better crop.

The story from UC is important to listen to and considered. The story suggests that technological failures can be compensated not with financial and physical compensation, lot of data mining and analysis. The situation has to be dealt with empathy and solidarity. Failures do not make farmers redundant. At times of crisis they need to be more intensely listened to and their views more deftly understood. This failure may help better solution next.

A very thought provoking perspective on livelihoods, the sustainable livelihoods framework (SLF), considers social capital as an important endowment to depend upon and institutional and policy support essential to help the poor negotiate with and come out of the multiple stifling vulnerabilities. While the social capital is gradually dwindling institutional and policy support proving elusive and all too incongruent and incompatible to the needs of the poor-thanks to the ever growing pace of globalization and global economic order! Challenging such vulnerabilities and addressing policy and institutional inadequacies, however, are the only options poor are left with if they have to come out of the poverty trap by asserting their entitlement, developing and strengthening resilience and restoring their well being and dignity.

The tribal communities of Uttar Chakuakheti (UC), Alipurduwar (West Bengal) have been taking on their existing vulnerabilities of livelihoods with resolve. Supported under the twin international research initiatives-DSI4MTF and SIAGI (sponsored by the Australian Centre for International Agriculture Research-ACIAR), the community- is collaborating in the research initiatives to promote socially inclusive sustainable agriculture intensification especially involving the small, marginal and tenant farmers during adverse climatic conditions –dry season.

Beginning of innovations:

Over period the tribal communities of UC witnessed a number of innovations in the village. Shallow tube wells, solar pumps and protected farming attracted them which they soon saw as something offering green potentials. Last couple of cropping seasons brought new and diverse vegetables and crops. The family savoured new vegetables and also earned some savings out of cultivation of mustard and wheat. The community realized the power of being together-social capital- and being proactive for a better market.

While the writings on the wall were clear it also helped the communities add additional wings to help them unleash their aspirations. The facilitating organizations –UBKV and CDHI-with team of scientists and social scientists hand held the community and walked with them on their new providing the necessary support where ever and whenever needed. Reflective interactions, exposure visits and imparting of scientific knowledge by the scientists from the University and government departments helped the community with the necessary technical and managerial expertise and skills.

To be able to move systematically, last season witnessed added emphasis over and effort at planning. The community was able to plan a yearly calendar of detailed activities with sequence of activities, responsibilities and possible linkages. End of September, 2017 could see a clear plan to be unveiled soon after the end of Kharif season. The planning process reflected experience of the last year and confidence gained.

Planting of a dream- the technology crop mix:

Not to miss on the season the community, under the guidance of the scientists and specialists, made no delay in sowing mustard using zero tillage technology. Last season mustard worked better using traditional methods while the wheat and maize performed better using zero tillage. The building on the last season's success scientists and the community decided to try zero tillage for both the crops. UC witnessed a never before feat of planting these two crops just on time-not a day delay. The confidence of working closely with the scientists and based on their own experience the community was all enthusiastic with new hope of a bumper harvest!

When Biplab Mitra⁴ and his scientific fraternity from UBKV invited the fellow scientists and participants to the annual meeting of the project (DSI4MTF) to witness the new crop and technology they must have had a feeling of pride –a farmer friendly approach has worked -let it spread! The community felt equally agog –they could showcase their achievement! Zero-tillage in mustard remained talk of rest of the conference –it was a major agronomic breakthrough! For Erik⁵ and Ram⁶ this must not have been a surprise for they attended the planning sessions in the village earlier (May, 2017,) and were aware of how things were evolving.

Wilting of mustard: A hope gets disrupted:

Two weeks after the zero-tillage (for mustard and wheat) was tried had opportunity to exchange notes with Tapan⁷. Hoping of the great enthusiastic response I asked him –‘ how the crops were doing’? He was polite but subdued –‘ sir the mustard in the neighbouring plot is doing better than the zero-tillage’. Was surprised and, in a consoling tone, asked if he has contacted the UBKV scientists to which he informed -Biplab Babu did visit and had asked to wait few more days. I was rattled –immediately contacted Joy and Subrata⁸ who subsequently contacted Biplab and Rupak⁹ with a next morning plan of visit to UC. Called back Tapan and Souren¹⁰. Subsequent, calls and discussions with them seemed to have created some soothing impact. They would observe in unison –‘ scientists are with us and have been visiting us. No worry –they can suggest better. Life is experiment –things can go wrong but that should not stop us from experimenting! These were quite reassuring and positive to begin with further.

The visit of scientists from UBKV and CDHI, the next morning, had a warm healing touch. Plot to plot visits were organized, rows and depths were examined and questions discussed. The germination was different for the different plots and also within the same plot. The density of plants differed as well. The field level examination and analysis worked better as the farmers and the scientists were able to make appropriate judgements. Incidentally, Christian Roth, CSIRO,

⁴ Biplab Mitra and the team –Rupak Sarkar, Ranjeet Chatterjee, Soumendra and others are part of the scientific team from UBKV offering professional support in agronomy, agriculture technology and water management.

⁵ Erik is the team leader of the DSI4MTF, University of South Queensland (USQ), Toowoomba, Australia. Erik has been quite persistent in the annual crop planning, working closely with the UBKV-CDHI team. Earlier last year (2017) Erik spent quite good time immersing with the UC, community and understanding the engagement process.

⁶ Ram is the economist with IWMI who spent time in UC together with Erik understanding the engagement process. Both Erik and Ram attended planning sessions.

⁷ Tapan is one of the key farmers from UC and a great enthusiast so far new experiments are going on. He is also the de-facto link between the community and the outside world.

⁸ Subrata Majumdar and Dhanajay Ray are the coordinators for SIAGI and DSI4MTF, respectively, with CDHI. These two are key players in community mobilization and pleasant link between UBKV, the community and the outside service providers. But for their dedicated involvement much of the goals would not have been accomplished. They are technology persons, they are community mobilizers and ‘ready to act any moment souls’ acceptable to all.

⁹ Rupak is a hydrologist with UBKV and leads the project. His leadership has galvanized the team of scientists willing to work and deliver something concrete.

¹⁰ Souren, another farmer whose plot had suffered the most. There was virtually no germination of mustard in his plot who was sounded too morosed to be consoled. A long discussion about the consequences of experiments seemed to work better who agreed to have further discussion with the visiting scientists the next day.

Australia has been on an immersion visit to the village who, being a soil scientist, made some on the spot examination and analysis. The UBKV scientists and Christian exchanged their insights and agreed on certain examinations and analysis. Having analyzed the situation, however, there was an agreement to replace the plots with the cultivation of maize and summer paddy.

The farmers had contributed, out of their last years' saving, to the sowing of mustard and there was economic difficulty to make fresh investment. This, however, was not an easy decision to make. After a series of discussions cost sharing arrangement was agreed upon which the farmers and the project agreed upon and respected.

The flowering of the spirit:

During a field visit Biplab proposed the final arrangements for the summer paddy. According to the arrangement the farmers had to attend a training program anchored by UBKV and hand held by a local farmers club. Tapan and Joy/Subrata coordinated the visit of the farmers and finally the training was organized. This was return of 'celebration time' in UC. Farmers started preparing for the visit and farmer to farmer contacts made to ensure that no farmer is left behind and there is timeliness in reaching the venue.

As one can feel the festive mood of the farmers in the field, during the training, this was an opportunity for the UBKV scientists to prove that they meant business which necessarily meant that they wished to restore the confidence that the farmers were about to lose. For CDHI it was a reconfirmation of their conviction that the farmers could make all the difference with their confidence and elan.

Back from the training the farmers did not lose time to transplant. The project team was there in the field to celebrate the sowing of summer paddy. This time the local government official (ADA)¹¹ made it to the field to personally see and read the new script that the tribal farmers were writing. For him this was an occasion to savour and celebrate. The story could be inspiring for others with the ADA and the UBKV scientists acting story tellers.

Lessons for the project:

Where does this story lead us to? Does it look like driving euphoria emphasizing impossible conditions –solidarity, empathy, network... Are we undermining and discounting the inevitable role of technology in ensuring livelihoods and in dealing with vulnerabilities? We cannot be naive enough to ignore technology and scientific formulations. Neither can we be too simplistic to consider a formulation for empathy and solidarity as sine qua non. Science and scientific facts need to be considered in a given time and space. The science and scientific data must begin and end with the community as originator and interpreter of scientific realities. This is what empathy

¹¹ Additional Director of Agriculture, Alipurduar. Our effort at having network with the Government Officers has always been positive. Earlier the District Magistrate and the Sub-Divisional officer proved instrumental in arranging for the caste certificate of the tribal communities. Subsequently, irrigation pumps are being arranged under another government program. Visit of the ADA signifies a major shift toward out-scaling.

is all about so far as science and scientific knowledge is concerned. Considering scientists and common people as two distinct categories –one who possess the scientific knowledge and the other as recipient

Our understanding is that human have the indomitable potential to deal with their miseries and crises. These virtues need to be acknowledged and made sincere use of. There is a tendency to hierarchically arrange and see those virtues –poor considered as some body at the lower echelon incapable of carrying out feats that is possible by specially endowed individuals. This perspective is fallacious and goes against the ethos of human development which suggests that humans are reflective, proactive and self-efficacious –they can restructure their environment and change their world and adversities surrounding them. We need to, proactively, work around to create conditions in which humans can have level playing games. Our work with the tribal communities in UC and exposure to similar situations lead us to reemphasize our conviction in the self-efficacy of the poor and they ways this can be created.

4.2 Farmer's perspectives on Drip irrigation technology in Kanakpatti

There are couples of technologies demonstrated in the Kanakpatti of Saptari. Majority of the technologies provide crop protection services and irrigation facilities including drip kits. Prior to the project, most of the farmers were unknown about the drip kits and its benefits for vegetable production. In the beginning of the project, iDE provided micro-irrigation training to the farmer groups. The trainings were complemented by the demonstration of drip kits in the farmer's plots suitable for vegetable. These efforts enabled the farmers to use technology for irrigating vegetables. We also trained them to couple the drip with the sunflower pump to improve the water use efficiency.



Figure 34. Budhai Ram's daughter in field (November 2017)

In an interaction with Sundari Devi Chaudhary, member of the Rajajee farmers group about her experiences using drip kits, she said, "I was not familiar about the drip system. I used to irrigate crops from cannel. After I attended training on drip, I knew about it. It was the first time I heard about the technology in the training. A drip video shown in the training attracted my attention and I immediately got interested to see how it works in my field. In the mean time, I was thinking if it might just be a waste of money to invest in as I saw it as a complicated system with several pipes and fittings. When I used the drip kit, it worked well. The soil was already moist enough up to the root zone".

Initially, the project installed 6 small drip kits in different plots of the farmer's fields as a demonstration. Each system has four lateral lines with 80 emitters (i.e 80 plants) irrigating 50 m² area of land, and water supplied by 50 liters tank. We conducted a quick survey with 23 users to understand their perception on the performance of drip technologies. An assessment (Pie-chart : Figure 2) shows that a vast majority of the farmers were happy on the drip performance, however they still hesitated to use the technology for mainly two reasons: I) extra cost needed for the drip kit (that replaced the furrow irrigation in the selected area) and II) small systems that irrigate only 50 sq. m. To overcome the limitations, project provided 40% funds to buy systems up to 500 sq.m. Now, out of twenty three farmers of the Kanakpatti, nine farmers are using different sized drip kits (100 - 500 m²) irrigating a total of 1400 m² land in the area.

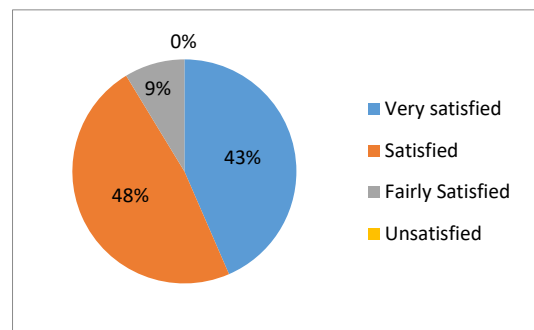


Figure 35 farmer satisfaction chart

We spoke to Janaki Devi Chaudary, one of the farmers in Kanakpatti. She was excited to talk about her experiences using the drip. She reported, "Initially, I purchased small drip with 50 Liter tank that required frequent filling up of the tank just to irrigate 50 sq.m of land. Now, I have a large drip kit (500 m² with 1000 ltr tank) that irrigates my field in less than 30 minutes with a full 1000 liters tank. It is a tremendous benefit that I can irrigate more lands with less water. Similarly, Shusila Devi Chaudahry and Budhai Ram appreciated that the technology is easy to operate and is instrumental to control weeds and apply fertilizers. An estimate based on the data from the project area shows that the technology saves nearly 63 % of water as compared to furrow system.

We also interacted with other three farmers, who are not in the group, but have closely observed the use of the technology. "I saw that the technology offers multiple benefits. It irrigates large number of plants in less time and drops water in plant root zone without any losses", said Pulkit Chaudhary, a neighbor farmer of Kanakpatti.

Lessons for project:

We found that farmers have become aware of this technology and gradually understand its benefits. To enable them to take a full advantage of the technology, we have trained them to use plastic/straw mulching, improved seeds and fertilizers, IPM and Trichoderma in the plot. Our experiences working in the areas shows that the technology is potential for the water scare area like Kanakpatti where access of surface water and availability of groundwater are limited as compared to other areas of Terai. Positive responses from the farmers indicate that the technology has a potential to scale up. However, it requires more research to understand an appropriate model for the wider promotion and scale up of the technology for the tenet and marginal farmers.

Improved vegetable production through adoption of seedling trays, plastic mulch and ridge and furrow system of planting in Madhubani

Context:

Rice-wheat is the major cropping system in the Bhagwatipur and Mahuai villages of Madhubani district. High dependence of farmers on one or two major cereals crops like wheat and rice makes the farming community vulnerable to vagaries of the climate. This type of systems is also susceptible to the fluctuations in the market price. Under such circumstances, diversifying the cropping system with vegetable crops can be a better option that can tolerate variability in climate as well as market prices. But vegetable production requires a lot of care like proper insect pest management, weed management and better irrigation practices. Various factors affecting the yield and quality of vegetable are water stress, weeds, insect pest and diseases. Since, both the villages depend upon surface tube wells for irrigating rabi crops which is not enough for vegetable production as vegetables are high water requiring crops. Water deficit is one of the most environmental stresses affecting vegetable productivity which may result in considerable growth and yield reductions. Under such conditions, conservation of soil moisture and ensuring its availability to vegetable crops is of vital importance. It was also observed that most of the male members of the family migrate out for their livelihood hence, there is a labour scarcity for carrying out intercultural operations like weeding which is also one of the major problem in vegetable production. Hence, plastic mulching plays a major role in combating both the problems.

Kharif season paddy takes longer time to harvest because the longer duration of the paddy varieties grown by the farmers are of long duration. The paddy is generally harvested during second fortnight of the November. Since, farmers are occupied by the paddy, raising nursery for rabi season vegetables gets delayed. Such delays may have adverse impact on the crop yields. Moreover, due to excess soil water in the field after harvest paddy makes it difficult for the farmers to conduct nursery raising operations in the field. Even if farmers succeed in sowing the vegetable seed in the wetter soil conditions, it encounters difficulty in germination and causes more mortality of the seedlings due to damping off. To overcome these issues in nursery raising the project team planned to demonstrate the use of improved nursery raising technique that uses seedling trays.

The potato cultivation in the Bhagwatipur village was solely for the household consumption and not for the commercial purpose. They used to use flat bed system of planting for potato without applying irrigation as they have the conception that if they irrigate the field it will result in early rotting during storage and low shelf life of the tubers after harvest. Farmers think that the residual moisture in the field after paddy cultivation was enough for the potato production but it was not sufficient for producing higher yield as the yield obtained by them using flatbed system of planting was less than 6 t/ha. Problem of rotting of potatoes was a serious concern to the farmers. A better alternative to the flat bed system is the ridge and furrow systems of plantation. This method precludes the direct contact of water with the tubers and prevents the rotting. Also,

the ridges do not get compacted that leads to increased size of the tubers. This intervention was required in the villages to improve the potato production which will add to the income of the farmers.

The major objectives of taking up these interventions were:

1. To demonstrate the farmers about potential benefits of the plastic mulching. The aim was that the farmers should understand the potential benefits of plastic mulching like soil water conservation, weed control and increased yield etc.
2. To achieve timely planting of vegetables and production of healthy and disease free seedlings for improving vegetable yields.
3. To introduce ridge and furrow method in the village was to increase the yield of potato by utilizing the irrigation water effectively.

Process:

A sensitization workshop was conducted at the beginning of the Rabi 2015-16 to make the farmers aware about these technologies. Farmers were made aware about the types of plastic mulches and the potential benefits it can offer. The practical field training was conducted to have an hands-on-experience to the farmers. Use of seedling trays was demonstrated to the farmers through interactive sessions. The process of forming ridge and furrows for vegetable cultivation was also demonstrated in the fields. Farmers raised several questions during the interactive sessions and the field practical, which were answered to their best satisfying levels. Farmers agreed to take up the polythene mulching in vegetables from rabi 2016. Raising of nursery in the polythene trays was also agreed upon. Growing of potato on ridge and furrow system of plantation was also agreed by many famers of the four different collective groups in the Bhagwatipur. In our intervention we have used black polythene mulch of 25μ thickness for cultivating vegetables during rabi season 2015-16. In site no 1, 18 katha area was under mulch while in site no 4, 8 Katha was under the mulch. The vegetables crop grown was brinjal, tomato, pointed gourd during rabi season and okra during summer. The use of plastic mulch in the village was new and was introduced for the first time by ICAR.

Plug tray nursery trays was used in two sites i.e. Site no 1 and Site No 2 of Bhagwatipur village. According to the respondents, they had no idea regarding the plastic trays and were very new technology to them.

Impact:

According to the farmers, use of plastic mulch resulted in good vegetative growth and early maturity. It saved labor as there was no weed problem. They said that there was full of weeds in the open area and no weed at all in the area where plastic mulch was used. Hence, weeding was not required. They also mentioned that the soil under the mulch conserved moisture for longer time and may be that was the reason for good yield because crop was getting water continuously. One of the major impacts of the technology was awareness. They could see themselves that it

really does conserve water, controls weeds which ultimately saves labor and give higher yield. More than 50 farmers also visited the field and as per their opinion, they are ready to adopt the same technology if provided to them by the government.

Farmers are happy to use the trays as the mortality of the seedlings reduced to great extent. They even said that they can easily see in each cell that whether the seed has been germinated or not and if suppose one or two seed did not germinate then they could easily notice it and re-sow the seed immediately in the empty cell. Transportation of seedlings is easy as they could easily carry the whole tray in the field itself and transplant the required seedling. As for this technology is concerned there was no problems identified.

Ridge and furrow system also showed very positive impact on potato production. At first, farmers were hesitating to adopt the new planting system because they thought that this system will not give good yield as most of the land remained unutilized and moreover the plant population also reduced. But finally, when the crop was harvested they could see the good harvest (yield upto 11t/ha). Even those farmers who were against the technology have accepted the fact that the yield can be higher with this type of planting system and with good irrigation.

Critical factors that contributed to impact:

1. Effective capacity building of the farmers led to large scale adoption of mulching in vegetables and ridge and furrow system for potato cultivation.
2. Earliness of growing seedlings and health of the seedling were the two characteristics of the seedling rays that appealed the farmers a lot.

Constraints faced:





- Laying and removing of plastic was labor intensive
- Residuals of plastic in the field after the cropping season
- Plastic film is prone to wear and tear
- At present there is no facility of mechanical ridge and furrow making and also of laying of the polythene film on beds. Also, the rotting of potato tubers during storage was higher.
- There were no constraints for plug tray nursery raising technology but the trays can be made easily available in the local market for adoption by the farmers of larger group. It can be done by discussing with the local traders or organizing stakeholders meetings.
- Social constraints (harvesting of tomato and brinjal was delayed due to some problem in the collectives of farmers which has resulted in yield loss to some extent)

Learnings for project:

Farmers are ready to accept or adopt new technologies provided the new technology gives good return than traditional method. With the adoption of plastic mulching higher yield was obtained but the major problem with the farmers was its laying of mulch, easy wear and tear and removal after the crop period. So instead of using 25 micron thickness plastic we can use 50 micron which

last longer and is also easy to remove or organic mulches like paddy straw can be adopted which is easily available and biodegradable. However, for laying of the mulch, as there is no infrastructure facilities available like tractors for laying of mulch so one have to go with manual method which is labour intensive.

Similarly, for the ridge and furrow method of planting, though labour intensive higher yield was obtained but rotting of tuber during storage was also higher than the traditional variety. As such farmers do not store the potatoes because they sell it immediately after the harvest but some of the farmers store their produce. So, to reduce the rotting of tubers, storage can be improved with proper ventilation and proper room temperature suitable for the tuber storage. Also, good variety with better storage life can be adopted.

	
<i>Demonstration of mulch laying</i>	<i>Laying of mulch by the farmers</i>
	
<i>Sowing of vegetable seeds in plug trays</i>	

4.3 Role of irrigation system in adoption of new crops in the cropping systems in Madhubani

The context:

Governments, NGOs, aid agencies and extension workers have long known that the success of any project depends, in part, on whether farmers adopt the offered technologies. In agriculture, adoption of a particular technology often leads to many other meaningful changes in the farming practices. When the benefits emanated from the adopted technology outweigh the expected benefit from it, farmers tend to adopt more and more better technologies that can earn profit to them. Although better technologies leads to adoption of new technologies, there are certain technologies (say Tech A) that needs adoption of some other technologies (say Tech B) for its functioning. These additional technologies are not at the farmers will and farmers may not adopt the Tech 'A' itself. Under such circumstances it is a challenge for the project workers to convince the farmer that Tech 'B' is also going to give additional benefit. This case study particularly highlights the later scenario of the technology adoption. It explains how replacement of traditional irrigation systems with advanced ones called for modified cropping sequence and how farmers reacted to it. The objective of this case study is to demonstrate that if offered technology is good, farmers can adopt other related changes in to the farming system.

Prevalent crop options and cropping sequences:

Paddy is the only kharif crop in both the villages. During rabi season farmers opt for wheat and lentil as rabi season crops. Moong was the major summer crop in both the villages. In Mauahi and also in Bhagwatipur farmers used to grow lentil during rabi season on residual soil moisture. There is common practice in both the village that farmers broadcast lentil seed in standing paddy crop just 15 days before harvest. This practice is called 'utera' cropping. The lentil crop does not require irrigation. Some farmers also grow linseed on residual soil moisture in both the village during rabi season.

In summer season farmers grow moong on a very small scale in both the village. This crop not require irrigation but prior to sowing require good soil moisture. For sowing of moong crop farmer dependent on rain, in Mar-Apr month if there is rain than farmers start sowing moong crop in both the village. During this season, large area remains fallow and serve as grazing ground for animal till paddy transplanting start.

Traditional irrigation practices:

Irrigation is a major concern during the for wheat crop during rabi season (dry season). During summer season farmer leave most of their land fallow due to lack of water as the water table drops below the suction head of the surface operated diesel pumps. Those who have access to

irrigation water and can afford one or two irrigations grow moong crop on a very limited area. In kharif season (Monsoon season) farmers depends on stream water (canal) and rain water. None of the farmer applies irrigation to paddy crop. During summer season farmers grow only moong crop, which is either grown on residual soil moisture or rain water. No irrigation water is applied to moong crop.

Irrigation during the dry season (rabi and summer) is mainly from the use of diesel engine for extracting shallow ground water. No other source of energy is used to extract ground water. Groundwater is the major source of irrigation irrigating almost 95% of the irrigated area during dry season, only few pockets of land are irrigated from pond water irrigation.

Most of the farmers apply one irrigation to wheat crop at the crown root initiation (CRI) stage, by default they know that irrigation water should be applied to wheat crop after 21 days after sowing. Some farmers even two irrigations to wheat crop based on their own judgement. Most of the farmers fear of applying second irrigation because at this time wind speed increase so their might be lodging problem. Second reason of not applying more irrigation water to wheat crop is due to higher cost of irrigation water. Mostly farmers follow check basin method of irrigation to irrigate the wheat crop. The size of the check basins range from 200 sq m to 900 sq m. The watering is done using flexible pipes that convey water from pump to the point of application.

Conventional irrigation equipment:

Diesel engine and a tube well is the main irrigation infrastructure of the village. Earlier, diesel engines of capacity 5-8hp with high fuel consumption and heavy weight were used by the farmers. Major drawback of this engine was transportation or movement of engine from one site to another site and high fuel consumption rate. Nowadays, farmers used small size and higher fuel efficient diesel engine. Many farmers prefer china made diesel pumps mainly because of its low cost.

Mostly irrigation infrastructure like bore well, diesel engine, water delivery pipe and any other irrigation equipment is available with big and medium farmers. Small, marginal and tenant farmers were not able to buy and install the irrigation equipment due to higher cost involved in it. More than 85% of the tube wells and about 70% of the pumps in the villages are with small and big farmers. Earlier, big farmers did not allow other farmers to use their borewell or diesel pump on custom hiring basis. Later small farmers also installed the borewell and purchased diesel engine and delivery pipe for irrigation purpose. Small farmers act as a service provider of marginal and tenant farmers.

Water conveyance was another aspect that required attention. Farmers used earthen channel for conveyance of irrigation water to field. Big farmer kept this earthen channel permanently in their field while small land holder made temporary earthen channel in their plot. Digging earthen channel is labour intensive and cumbersome so big farmer allocates some land permanently for

the earthen channel. Conveyance efficiency of earthen channel was very less but no option was available at that time so farmers used this earthen channel for conveyance of irrigation water. Now farmers have option for conveyance of irrigation water i.e. plastic delivery pipe available in the market. Farmers start using the plastic delivery pipe for conveyance of irrigation water.

Irrigation water market:

While looking at the distribution pattern of irrigation equipment and the social aspect prevailing in the village the irrigation water market seems to be a monopolistic. There is great impact of irrigation water market on crop production in both the study village. In Mauahi village there are only two water sellers and number of buyers are more. The sellers charge Rs.120-150 per hour for diesel engine. During peak irrigation water demand time these two water sellers serve the farmers on first come first serve basis. During rabi season area under wheat crop is less as compared with Bhagwatipur because of limited water availability. Whereas, in Bhagwatipur village 7-8 farmers sell irrigation water. Water availability is significantly high in comparison to Mauahi village. So the area under wheat crop during rabi season is high in comparison to Mauahi village. The rate of irrigation charged by service providers range from Rs. 120-150 per hour.

Increasing diesel price and cost of irrigation water have a greater impact on crop production in general in Bihar. Another problem that existing in the water market is that service providers run the pump at low rpm to save diesel and increase the run time to make disproportionate profit from pump custom hiring.

Process:

During the biophysical surveys in the villages it was observed that dry season irrigation is mainly limited due to access to irrigation water. Therefore, the project team thought of implementing some interventions that can provide year round water availability to the farmers. The major problem was in tapping the deeper aquifer layers which are the good natural source and are presently being underutilized.

Improved irrigation system and equipment introduced:

In view of the pathetic situation of the irrigation in the project villages, the DSI4MTF team decided to introduce improved irrigation equipment to the farmers. Several sensitization sessions were held with the farmers and their proper management among the farmers of these two villages. First, project personnel brought up the institutional arrangement for proper management of irrigation infrastructure and equipment. Under institutional arrangement, farmers groups were formed with 5 to 10 number of farmers. These groups were entrusted the responsibility of management of irrigation equipment. They were trained on the management of irrigation equipment by ICAR scientist. The following irrigation equipment introduced to the group.

1. **Diesel engine group wise:** After formation of groups, 4 group in Bhagwatipur and 2 group in Mauahi 3 diesel engine given to these six group. For two group one diesel engine. For maintenance of diesel engine group member collect Rs 10 per hour of machine run. This amount covered the cost of operator as well as the cost of small repairing. If any heavy repairing required than group either collect from each member or use the corpus money for repairing of diesel engine. The motive behind diesel engine to save the farmers from exorbitant rising price of irrigation water.
2. **Solar Pump:** Two solar pump of 3 hp capacity introduced in Bhagwatipur village. Solar pump is used to directly irrigate the field and also used to pump water through drip and sprinkler system. Both pump during peak sunshine hour through 5.5 litre water per second. Farmers sharing their experience with us that for diesel engine they need to either purchase diesel or pay Rs120-150 per hour. Now this amount is saved through solar pump. Second no need to pull handle to start it so now even women come to field and start the pump and irrigate the field.
3. **Drip Irrigation system:** In Bhagwatipur village drip system was introduced at two intervention site. Total 9 plot covered under drip irrigation system. During summer-17 farmers grow Brinjal, Okra and Tomato on drip with plastic mulch. Farmers compared the plant growth as well as yield of crop with without drip and mulch. They share their experience with us that with the adoption of drip and plastic mulch yield is increased significantly.
4. **Sprinkler System:** In Bhagwatipur village two plot covered under the sprinkler irrigation system. During rabi 2016-17 farmers grow wheat and potato under sprinkler irrigation. Farmers compared the yield of both the crop with basin irrigation in wheat and ridge and furrow based potato and found that the even applying less water there is no impact on the yield.
5. **Drum Kit irrigation system:** Drum irrigation system installed in both village Mauahi and Bhagwatipur. But the problem of filling the water in tank leads to the no use by farmers. Farmer is sceptical of using this irrigation system.

Impact of improved irrigation system on adoption of new crop:

After installation of improved irrigation system in the village and training given to farmer on various techniques of crop production and water management led to adoption of summer season vegetable crop in their cropping system. After two seasons of cultivation of vegetable crop farmers realise that vegetable crop requires frequent irrigation but less water as compared to other crop. Farmers also experienced that the vegetable yield also increased with the adoption of better water management equipment. This realisation of fact become a motivating factor for adoption of entire new crop in the cropping system. The following vegetable crop adopted by farmers of both the village.

1. **Brinjal:** In Bhagwatipur village farmers of intervention site-1 and intervention site-4 planted brinjal in two season. Farmers of both interventions site earn a modest income from Summer season 2016 brinjal crop. In the season one non beneficiary farmers Katimlal Yadav also planted brinjal on 2 katha (0.0364 ha) of land and earn around Rs.36000/-. They also adopted

the same technique with our help. Katimlal land is elevated than our intervention site land that was an added advantage for him that's why they earn higher than our intervention site farmer. Another non beneficiary farmers Pramod Yadav also cultivated brinjal crop in the same season, he also earns modest amount from this intervention. But rabi season (2016-17) brinjal crop experience was not good due to low price. Brinjal crop is not tried in Mauahi village due to their low land area and water logging problem.

2. **Okra:** This crop is highly adopted by both project beneficiary and non-beneficiary farmers of Bhagwatipur village during summer season only. During Summer-17 farmers of Mauahi also adopted this crop. In summer-16 farmers earn modest income from this income but in summer-17 due to low price income level goes down in both the village.
3. **Cucumber:** The cucumber crop is also adopted by and new crop on commercial scale in two intervention site in Bhagwatipur village. Two-three non-beneficiary also adopted this crop. Earnings from this crop was modest in 2016 as compared to summer 2017.
4. **Bitter gourd:** This crop also cultivated by both beneficiary and non-beneficiary's farmers of Bhagwatipur village for last two years. In summer 2016 farmers earn modest income from this crop.
5. **Sponge & Ridge gourd:** Farmers also started cultivation of this crop for last two years and also earn a modest amount from this crop.
6. **Potato:** This crop is widely grown by farmers of Bhagwatipur but here project bring change in the irrigation practices of this crop by ridge and furrow method.
7. **Pea:** This crop introduced in the village during rabi 2016-17, the yield and market of this crop is very good. This factor motivates farmers for large scale adoption of this crop.
8. **Pointed gourd:** Pointed gourd introduced during rabi 2016-17 but plant not survive. This year again farmer bring pointed gourd planting materials from the farmers of Pagadih of Muzaffarpur district. This shows the farmers interest in adoption of new crop.

Critical Factors that contributed to impact:

1. Farmers realised the system is useful for irrigation of vegetable crops as per the crops water needs and that it requires less water
2. The water saving achieved under the technologies impressed the farmers
3. Ease of operation of the system was important factor that led to change the present cropping system
4. Increased profit with adoption of new cropping systems (inclusion of vegetables)
5. Proper knowledge and training about the adopted technology led to the adoption of better crop options

Constraints encountered and resolved:

Farmers were not aware on cultivation practices of several vegetables. To overcome this constraint a range of trainings were required to be conducted. In view of this the project team conducted several trainings on operation of drip, sprinkler and solar systems. The trainings were also conducted on the aspects of improve nursery production, application of polythene mulching

and water management. With these trainings farmers got the confidence that they can grow vegetables on their own. This confidence build-up led to adoption of other remunerable vegetable crops like Okra, cucumber, bitter gourd and pointed gourd.

Other major constraint was faced in management of pest and disease of the solanaceous crops like tomato and brinjal. To resolve this issue the project staff at the site sent the photographs of the affected parts of the plants to experts at Ranchi through Whatsapp and the experts replied with the control measures to control that pest or disease. This approach was very quick and satisfying to the farmers.

Another major constraint was marketing of the newly adopted vegetables by the farmers. This problem was taken care by the collective farming approach. As one person has been identified for the sale of produce in each group, he took the responsibility of the sale of the produce in the local market. This solved the marketing issue of the produce.

Learnings for project:

Adoption of new technology was viewed by the farmers as an opportunity to learn new and better techniques of vegetable cultivation. With the improved knowledge on irrigation practices they are now in position to cultivate and sale vegetables. Earlier, where only three crops were there in their cropping systems, now the scenario has been changed. Farmers are cultivating several other vegetable crops which is providing an additional income to the farmers. The development of proper irrigation technique has a greater impact on adoption of new crop. Important learning from this case study was that for wider acceptability and adoption of any technology proper training and confidence building in the farmers is the activity of prime importance. Once this is achieved the farmers will willingly adopt other changes or technologies that support the earlier adopted technologies. In our case change in cropping system was adopted as a consequence of better irrigation equipment in the field.

4.4 Perception of the farmers about the drip and sprinkler irrigation systems

Context:

Rice-wheat cropping system dominates the agriculture in the Gangetic Plains of the North Bihar. Rice is cultivated during the *kharif* (monsoon) season with transplanting dates matching with onset of monsoon. Sufficient monsoon rainfall generally precludes the need of irrigation for this crop, except in the event of dry spell. Wheat, which is the main *rabi* (winter) crop of the region, requires at least three irrigations during the critical stages of the plant growth to make wheat cultivation profitable. The cultivated area under wheat is relatively very less and considerable part of the land remained fallow during the dry season. There was need to provide the round the year access to irrigation water and use the accessed water efficiently. Solar operated deep submersible pumps was the only solution in the electricity deprived areas to tap the unutilized groundwater. Also, to improve the water use efficiency in the fields there was need to have some efficient water application systems that can save water. To this effect, the technologies on drip and sprinkler irrigation were demonstrated in the farmer's field. All these technologies were new

and previously unseen by the farmers. Prior to demonstration in the farmers' fields, several trainings and field visits to other farms having drip systems were conducted to make the farmers aware about these technologies. The drip, sprinkler and solar systems were installed in the farmers' fields with participation from the farmers to make them aware about the handling of these systems. These systems were installed in the field during the rabi season of 2015-16. Farmers have used the system for the three consecutive cropping seasons and it the time to get the feedback of the farmers about these technologies. This will help the project team in assessing the future plans on training and capacity building.

Process:

Interviews of the farmers were conducted to assess the feedback of the farmers about drip and sprinkler irrigation systems. A questionnaire was designed to record the farmers' feedback about the social and technical aspects of the technologies. Response of ten farmers was recorded for each of the technology. The information was analysed and presented in this case study.

Impact:

The drip and sprinkler systems have led to many positive impacts on the farmers and farming systems. It has reduced the drudgery involved in irrigation to the greatest extent. There was overall increase in the yields of vegetables by the adoption of drip irrigation with polythene mulch. Sprinkler irrigation systems reduced the water use for wheat and potato significantly but produced the wheat yields at par with the surface flooding. These systems have also motivated farmers to adopt better crop options in their cropping systems. Overall there had been positive perceptions of the farmers about these two improved water application methods.

Farmers perceptions:

Feedback of the farmers as collected during the interviews through the pre-designed questionnaire are analysed and presented below.

What was good about these systems?

When asked about 'what was good about the system?' all the farmers said that the systems are really very good as it saves time and labour involved in irrigation. This has led to save the cost on irrigation to greater extent.

Which operation is more difficult to do?

Different operations like cleaning of emitters and filters, folding of pipes, fertigation with ventury were listed in the questionnaire. All the farmers (100%) said that none of the tasks listed here are difficult to undertake.

Can you operate the systems on your own? (Without assistance of project team)

This was little tough to them. Only 80 % of the farmers replied that they can start the system on their own. Starting of the drip and sprinkler system required to monitor the flow and pressure in the irrigation pipes, which was bit difficult for the farmers. Operation of the valves to maintain

proper pressure was the major concern raised by the farmers. Many farmers said they cannot read the pressure gauge. This was the major issue in starting the system on their own.

Is it difficult to fold pipes during rainy season?

The task of folding the pipes in proper loop was not at all a difficulty for the farmers. They responded that the lateral pipes are light in weight one can easily fold them in to circular loops.

What was the major maintenance related problem?

Farmers said that there is no any maintenance related problem till date. But it would be good have an interactive session on cleaning of filters and joining of laterals in the event of leakage.

Does the system applied water uniformly over the field?

Regarding uniformity of water application farmers claimed that the do not have the knowledge about what is uniformity. When explained in details, they said wheat crop looked fairly uniform as compared to the basin system of water application. Growth of other vegetable crops was also uniform throughout the field.

Does these systems reduced weed problem?

All farmers agreed that weed problem was reduced significantly when drip irrigation was applied in polythene mulched plots. They believed that there was no difference in the weed intensity observed in sprinkler irrigated plots and flood irrigated plots.

Is it difficulty to do inter-cultivation when these irrigation system exists?

Undertaking inter-culturing operations was not a problem with drip or sprinkler irrigation system. But they said that they have to be extra careful while operating the tools in the field so that the lateral don't get damaged. At the time of land preparation, they said, laterals needs to be folded and kept on one side of the field. But that is not a difficult task.

Is it labour intensive as compared to traditional furrow system?

Hundred percent of the respondents believed that this system is not at all labour intensive. In fact it reduced the irrigation time to great extent consequently reducing the labour requirement on irrigation.

Does the operation of system requires skilled man power?

All the farmers agreed in one voice that only skilled man power can run these system. But they further added that if training given, even a less educated person can operate these systems.

Drip/sprinkler irrigation saves time, when compared to surface irrigation methods?

All the farmers agreed that the drip irrigation system reduce the irrigation time as compared to furrow irrigation. They do not have stay in the field with the spade for the entire duration of the

irrigation. Application of fertilizer took just 20 minutes saving time and labour to the tune of 50 %.

Was irrigation easy with the adoption of the systems?

“Irrigation is just at a button push” said a farmer when asked this question. All the farmers of the opinion that irrigation of the vegetable and wheat crops is very easy with these systems.

Do you know from where to buy the components of drip/sprinkler in the market?

Drip or sprinkler irrigation vendors are very rare in the Madhubani district. Farmers have not seen any vendor till date who can supply these systems. They don’t have any idea about the suppliers of these systems. Farmers are also not aware about the after sales service providers for these systems. The spare parts are also not available even in district headquarters.

What is the major problem in its adoption?

For this particular question there were following options provided to the farmers.

- ☐ Lack of technical knowledge
- ☐ High initial cost
- ☐ Not suitable for my crops
- ☐ Difficult to operate
- ☐ Labour intensive

High initial cost of the system was reported as major problem in its adoption by 100 % of the farmers. Lack of technical knowledge as another major constraint was reported by 60% of the interviewed farmers. Difficulty to operate or labour intensiveness was not cited as major problem its adoption.

What would you like to know/learn about the system?

Farmers are willing to learn about the fertigation aspects of various crops and operation of the ventury system. Although clogging of emitters has not been reported from any of the sites, the farmers expressed their interest in getting trained on topic of ‘emitter cleaning’. Farmers also expressed the desire the project staff should tell them when the system is to be started and for how much duration it should be run. This was really a matter of concern for the project srtaff as well.

Will you recommend this to other farmers? Why?

All the farmers said that these systems are really beneficial and that they are recommending it to the other farmers whoever is enquiring about the system. Farmers of other villages are also being advised to take-up the sprinkler system for wheat irrigation.

In future, will you install it on landlords’ piece of land that you have rented from him?

There was a big NO to this question. None of the farmer wanted to install these systems on the landlords land. When asked about why they can't do that, they replied that their tenancy with a particular landlord is not permanent. If they install a system on a piece of land and their tenancy is terminated then they may have to bear huge monetary loss.

Critical factors that contributed to impact:

There were many factors that contributed to the upbringing of positive attitude about these systems in the farmers. As reported by many farmers labour saving in fertigation and irrigation was the major advantage of the system. Apart from that the improved yields and water saving were also the driving factors that developed liking of the farmers towards these systems. Effective training programs on operation and maintenance of the drip systems was critical to build the confidence among the farmers about these systems.

	
<p><i>Sprinkler irrigation in the wheat crop</i></p>	<p><i>Training farmers on operation and maintenance of drip and sprinkler system</i></p>
	
<p><i>Brinjal cultivated on drip irrigation</i></p>	<p><i>System installation with farmers participation</i></p>

Constraints encountered and resolved:

Complete absence of knowledge about these systems to the farmers was a major challenge. All of the farmers saw these systems for the first time in their life. Building the confidence that these

systems are really useful for them was really challengeable. On-farm training and involvement of the farmers in installation of these system was the effective step that could convince the farmers about the utility of these systems. Initially, farmers believed that the drip irrigation system may not apply water in sufficient quantity and the plants may remain wilted. But as the cropping season progressed farmers started realizing the benefits of the technology, water saving and better crop growth. Maintenance of these systems was another important constraint that farmers had to face. To overcome this issue an on-farm training on the maintenance of the drip laterals, sub-mains, filters and sprinkler heads was conducted. This kind of practical experience led to proper maintenance of the systems during the off-season.

Strategy to build through the learning from the case:

This case study was mainly aimed at the assessing the farmers perceptions about drip and sprinkler irrigation systems. The responses recorded by the farmers have highlighted certain very important issues. Learning from this case study was that farmers need further training on the aspects of fertigation and cleaning practices for emitters. A training event on these aspects needs to be conducted. Since the farmers raised a question that they do not know when to start the systems and for how much time it should run, there is dire need to develop farmer friendly irrigation practices for drip as well as sprinkler irrigation systems.

The first issue was regarding their knowledge about the vendors who could install the drip or sprinkler system and can provide them the after sales service. Actually there are no service providers for drip or sprinkler systems in the villages or even at the district headquarters. Unless some companies come forward and establish their sales in these regions it's practically impossible to have a large scale adoption of these systems. Also there are limited advertisements about these systems on television or any other public media. There is an urgent need to have large scale program to create mass awareness about these technologies. This calls for a policy change.

4.5 Introduction of vegetable crops for crop diversification, profitability and stability in agricultural production in Dhaloguri village

Introduction:

The terai agro climatic zone of West Bengal is blessed with favourable climate for cultivation of wide range of agricultural crops. High rainfall (above 3000 mm), moderate temperature, prolonged winter are the unique features of terai zone that encourages cultivation of different types of crops throughout the year. Agriculture is the primary source of livelihood for the village people and rice is the major crop cultivated during rainy/*kharif* season. In the project site of Dhaulagiri village the average size of land holding is low and mainly dominated by high proportion of marginal and tenant farmers. Irrigation infrastructure was almost negligible. Direct pumping from a nearby river was the only source of irrigation to grow potato during dry winter season. As a result most of the land remains unutilized and farmers forced to work as labour in the non

agriculture sector and sometimes migrated to other states in search of livelihood. Access to year-round water for irrigation particularly during dry season was the primary need to bring more area under cultivation and to improve the productivity and profitability of the production system. Intervention of the ACIAR funded project (Australian Centre for International Agricultural Research) in collaboration with project partners (UBKV, CDHI and IWMI) helped to install one shallow tube well and provided with one 4 HP diesel pump. The farmers were motivated and given technical exposure for cultivation of different vegetable crops during dry season. A collective farming group was formed by the joint effort of the project partners.

Village:

The village Dhologuri is located in the Ambari GP, Block II of the Cooch Behar district of West Bengal, India. The village is located in the sub-himalayan *terai* region of West Bengal. The region is characterized by high monsoonal rainfall and comparatively dry winter months. The village community is mainly dominated by the lower caste population. The average size of land holding is low and comprising of marginal and tenant farmers. Agriculture is the main source of livelihood for the village people. Most of the tenant farmers work as agricultural labourer. The migration of youth to other states in search of alternate livelihoods has left many families to be led by women. The village is rich in both surface and subsurface water resources. There is one perennial river called Ghargharia flowing through the village. However, most of the ponds are seasonal and only 20-25 ponds retain water throughout the year. The groundwater table is available at about 1.5 to 4.5 m below ground level. The quality of groundwater resources is good.

Project intervention: Introduction of vegetable cultivation:

In the project site, apart from rice in the monsoon season, traditionally potato was grown in some pockets during dry winter months. Traditional practice of cultivation of potato during winter months was associated with lot of risk factors such as high initial investments for seed, manures and fertilizers as well as pesticide which enhanced the total production cost. Again, sudden attack of disease like late blight in the crop maturity stage sometimes damaged the entire production; and fluctuations of price drastically reduced the profit margin. Introduction of vegetable crops brought diversity in the cropping system. Assured irrigation facility encouraged cultivation of multiple crops round the year. In the initial phase, vegetable crops which are easy to cultivate and have good demand in the local markets were purposely selected to create long term interest in vegetable cultivation. Accordingly Elephant foot yam, colocasia, chilli, cabbage, cauliflower, radish and some leafy vegetable were encouraged for cultivation. After getting success and better remuneration, farmers showed interest for cultivation of high value crops and off-season vegetables for higher profitability and better economic return. Subsequently crops like capsicum, french bean, broccoli were promoted for cultivation. Emphasis were also given for off-season crops like pumpkin and bitter gourd cultivation during winter months and palak and radish leaves production during rainy season. The uncultivated and unutilized lands were converted into a lush green field.

Impact:

Promotion of vegetable crops in place of potato increased the choice of crops that subsequently reduced the risk of market glut and assured better return from crop. Adoption of vegetable cultivation helps them developing cultivation skill through hands on learning. Scope of consultation with the subject matter specialist helped them to grow more interest in crop production, proper crop planning, better judgement of disease and pest attack as well as their management and market intelligence. As a result the family income from farm activities increased subsequently. Women farmers are also showing interest in vegetable cultivation and effectively utilizing their leisure time in some purposeful work. The assured supply of irrigation water has also reduced the risk of crop failure. With the increase in the irrigated area, the cropping intensity of the project area has increased subsequently. The migration of farmers from the project site to other state in search of job reduced considerably.



(a) Cabbage field

(b) Hoeing in Colocasia

(c) Tomato with straw mulch

Figure 36(a-c) Different crop scenarios at Dhaloguri village

Lessons for project:

Future emphasis will be given on awareness generation for larger area coverage under vegetable crops. More farmers groups will be formed to strengthen the collective farming. More skill development training will be organised for better management of the crops, development of suitable crop calendar considering the available resources. Local youth and women will be encouraged to undertake protected cultivation for large scale production of high value vegetables and off-season vegetables. More emphasis will be given on improvement of irrigation system and better management of irrigation water to ensure more harvest per drop of water.



(a) Radish in the field



(b) Seed sowing in nursery bed



(c) Nursery bed covered with polythene sheet

Figure 37(a-c) Field view of different vegetable crop scenarios at Dhaloguri village

4.6 Farmer's perspectives on Drip irrigation technology in Kankapatti

Introduction of drip technology:

There are couples of technologies demonstrated in the Kanakpatti of Saptari. Majority of the technologies provide crop protection services and irrigation facilities including drip kits. Prior to the project, most of the farmers were unknown about the drip kits and its benefits for vegetable production. In the beginning of the project, iDE provided micro-irrigation training to the farmer groups. The trainings were complemented by the demonstration of drip kits in the farmer's plots suitable for vegetable. These efforts enabled the farmers to use technology for irrigating vegetables. We also trained them to couple the drip with the sunflower pump to improve the water use efficiency.



Figure 38. Budhai Ram's daughter in field (November 2017)

In an interaction with Sundari Devi Chaudhary, member of the Rajajee farmers group about her experiences using drip kits, she said, "I was not familiar about the drip system. I used to irrigate crops from cannel. After I attended training on drip, I knew about it. It was the first time I heard about the technology in the training. A drip video shown in the training attracted my attention and I immediately got interested to see how it works in my field. In the mean time, I was thinking if it might just be a waste of money to invest in as I saw it as a complicated system with several

pipes and fittings. When I used the drip kit, it worked well. The soil was already moist enough up to the root zone".

Initially, the project installed 6 small drip kits in different plots of the farmer's fields as a demonstration. Each system has four lateral lines with 80 emitters (i.e 80 plants) irrigating 50 m² area of land, and water supplied by 50 liters tank. We conducted a quick survey with 23 users to understand their perception on the performance of drip technologies. An assessment (Pie-chart : Figure 2) shows that a vast majority of the farmers were happy on the drip performance, however they still hesitated to use the technology for mainly two reasons: I) extra cost needed for the drip kit (that replaced the furrow irrigation in the selected area) and II) small systems that irrigate only 50 sq. m. To overcome the limitations, project provided 40% funds to buy systems up to 500 sq.m. Now, out of twenty three farmers of the Kanakpatti, nine farmers are using different sized drip kits (100 - 500 m²) irrigating a total of 1400 m² land in the area.

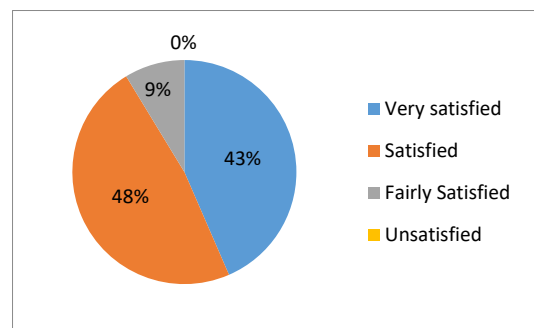


Figure 39 farmer satisfaction chart

We spoke to Janaki Devi Chaudary, one of the farmers in Kanakpatti. She was exited to talk about her experiences using the drip. She reported, "Initially, I purchased small drip with 50 Liter tank that required frequent filling up of the tank just to irrigate 50 sq.m of land. Now, I have a large drip kit (500 m² with 1000 ltr tank) that irrigates my field in less than 30 minutes with a full 1000 liters tank. It is a tremendous benefit that I can irrigate more lands with less water. Similarly, Shusila Devi Chaudahry and Budhai Ram appreciated that the technology is easy to operate and is instrumental to control weeds and apply fertilizers. An estimate based on the data from the project area shows that the technology saves nearly 63 % of water as compared to furrow system.

We also interacted with other three farmers, who are not in the group, but have closely observed the use of the technology. "I saw that the technology offers multiple benefits. It irrigates large number of plants in less time and drops water in plant root zone without any losses", said Pulkit Chaudhary, a neighbor farmer of Kanakpatti.

Lessons for the project:

We found that farmers have become aware of this technology and gradually understand its benefits. To enable them to take a full advantage of the technology, we have trained them to use plastic/straw mulching, improved seeds and fertilizers, IPM and Trichoderma in the plot. Our experiences working in the areas shows that the technology is potential for the water scare area like Kanakpati where access of surface water and availability of groundwater are limited as compared to other areas of Terai. Positive responses from the farmers indicate that the technology has a potential to scale up. However, it requires more research to understand an

appropriate model for the wider promotion and scale up of the technology for the tenet and marginal farmers.

4.7 Introduction of Dry Season Crops in Uttar Chakowakheti: A Story of Positive Changes in Farming Practice

Background:

Uttar Chakoakheti is a village which is dominated by small and marginal tribal farmers. Though farming is the major sources of livelihoods for the villagers, the agricultural scenario of this village is very poor as most of the lands remain fallow during dry season due to lack of irrigation facilities and farmers' lack of awareness about the dry season crops. The average size of land holding is low with a high proportion of marginal and tenant farmers. During the dry seasons, a significant proportion of the tenant farmers work as labour. The farmers and farm women are engaged in collecting forest produce and a good number is also engaged in sand mining during dry months. The migration of youth to other states in search of alternate livelihoods has left many families to be led by women.

Paddy is the only crop which is grown during monsoon season; again due to use of traditional long duration varieties with casual agro-techniques the productivity of the crop is very poor. Some of the farmers are growing potato or maize in a very limited scale. But the productivity of these crops is also very poor due to late sowing, use of local varieties, inadequate nutritional management, etc. Except ploughing, most of the agricultural operations are performed by the farm women.

The introduction of ACIAR funded DSI4MTF project is proving to be a timely step in the right direction. The project envisages testing the efficacy of bio-physical, technological and institutional aspects in augmenting the farm productivity of small and marginal farmers in a dry season scenario. Initially, collective farming group was formed by the collaborative efforts of the project partners (UBKV, CDHI and IWMI) and as a part of the project activities social mobilization was done at the sites through a series of community meetings, focus group discussions, community engagement programmes and gender awareness meetings.

Considering this situation, UBKV scientists took initiative under the DSI4MTF project to introduce rapeseed-mustard, wheat and maize cultivation in Uttar Chakoakheti during *rabi*, 2016-17 season as the basic irrigation infrastructure in the form of shallow tubewells (STWs) with diesel pumps in all three intervention sites of the village along with a solar pumping unit were already established under this project. During *rabi* 2016-17, altogether 5, 13 and 18 demonstrations covering an area of 12459, 5666 and 7189 square metre of rapeseed-mustard, wheat and maize, respectively were carried out to show the potentiality of these crops in this village. A number of training programmes on various aspects of crop production emphasizing sowing attributes, seed treatment, fertilizer management, water management, weed management, etc of these three crops were organized at the village. Based on land situation, these crops were sown after

harvesting of monsoon paddy. Each and every step in the packages was monitored by the scientists.

Results and impact:

Firstly, the farmers were excited to see a good stand of these crops in their own field. It was unbelievable for them that the lands which used to remain fallow every year during the winter months were put under great stand of dry season crops (Figs. a to d). Due to high residual moisture in the soil even after harvesting of paddy, most of the crops were planted late in season after conventional land preparation. Even though some crops were sown late, the yields of the crops were encouraging. This injected great enthusiasm in the farmers' mindset that by practicing timely agricultural operations they can further increase crop yield and thus agriculture can be a remunerative livelihood option for them as well. Simultaneously, assured supply of irrigation water has reduced the chances of crop failure and farmers are confident enough to grow these crops in the existing crop rotation. Through social mobilization and strengthening of the collective farming group the farmers have started to realize the benefits of collective farming. The results indicated the feasibility of the piloted technologies in farmers' field (Table 1). Moreover, the crops were raised with appropriate water management strategies for which the irrigation water requirement was also lower for all the crops. This year the farmers are keen to further expand the intervention area under different crops. Moreover, they have been provided with more crop options for better crop planning. This year new technology on zero tillage wheat and mustard sowing has been introduced and the farmers are able to avoid late sowing of crops instead of late departure of monsoon. The cost of conventional land preparation could also be avoided.

Table 7: Performance of the crops in Uttar Chakoakheta village in the year 2016-17

Crop	Variety	Yield(kg/ha)	Irrigation water use(mm)	Market value of the crop (INR/ha)	B:C ratio
Rapeseed-mustard	B 9	933	46.2 to 117.7	32655.00	1.17
Wheat	HD 2967	2498	103.6 to 156.9	34972.00	1.18
Maize	Allrounder	8813	59.5 to 63.6	61691.00	1.94



(a) Maize grown under ridge-furrow



(b) Excellent stand of maize crop



(c) Wheat crop ready for harvest



(d) Mustard at pod development stage

Figure 40: Dry season crop in Uttar Chakhoakheta

