



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

## A Compilation of Case Studies Volume 1

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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 in 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.

### **1.3 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.

#### 1.4 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.

**Table 1: overview of groups and key irrigation interventions in Kanakpatti**

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.

*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 perceives 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.

### **Documenting Engagement in Koiladi**

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. Table 2 below provides quick overview of groups and key irrigation interventions.

**Table 2: Group characteristics in Koiladi**

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 waning 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.

## **Documenting Engagement in Bhagwatipur, Madhubani**

### **Background of the Community**

Bhagwatipur is a village in Andhrathadi block of Madhubani district of Bihar, India. This village is just 7 km away towards north of Ease-West Corridor (Golden Quardilateral) nation highway no.- 57. Total 198 family or household residing in the village, community wise Yadav (OBC), Malah (OBC), Dalit (SC), and only one family Brahmin inhabiting the village. Main dominant cast or community population wise is Yadav followed by Dalit. Land holding wise major land holding belongs to Brahmin and Yadav. Majority of Dalits (SC) and Malah (OBC) are landless and depends of share cropping, wage labor income and remittance. Among Yadav except few family majority family is marginal (< 0.5ha land holding size) and they also depends on share cropping, dairy (marginal 1 or 2 milch animal), wage labor and remittance. Except few family majority of male

member who are healthy migrated to cities or metropolitan cities of India (Mostly Delhi followed by Kolkata) even as agriculture labor (seasonal labour) in other state of India like Punjab, Haryana and Uttar Pradesh for their livelihood. In village only women, old men and unhealthy persons left and entire agricultural activity done by this population only. Some male member return to village during cropping season and stay for 2-3 weeks and return back after planting of crop.

Agriculture is not entirely depends on monsoon in the village. During kharif season farmers from Bhagwatipur and around 20 more village farmer just close downstream side of rivulet to bring water for paddy transplanting even if there is drought. Other source of irrigation is STW and pond (for very limited irrigation). STW installed by only rich farmers from the village and total available STW for irrigation is 17 in the village. There is one government pond in the village that is lease out by government for fishery purpose to fisherman. Taking water from pond for irrigation by farmer depend at the will of fishermen. Fisherman allow very limited water for irrigation from pond. Farmer using STW during rabi season mainly for wheat irrigation.

### **Institutional Strengthening and Development**

Village level institution evolved just after the independence of India as Panchayati Raj Institution (PRI). This was the brain child of Mahatma Gandhi. The holistic development and inclusive growth of village was the mission and vision of PRI. But this mission was hijacked by very few and dominant person of the village and panchayat. Later government strengthen this institution by reserving the seat for women and dalit for more inclusive growth and development of panchayat and village. Another institution evolved for holistic development of farming system was primary agriculture co-operative society (PACS) at panchayat or village level. Earlier this PACS was providing the input (like seed & fertilizer and other input) as well as financial support to only the member of this society. Later this institution was grabbed by dominant class of the society and mission of this society diluted and remain for very few people of society. This institution become defunct and in dyeing stage. After 2005 again government revived this institution by change its mission instead of supplying input and financial support for agricultural development, now this institution purchase agricultural produce of farmers on minimum support price (MSP) better price realization of farmers produce. Both this institution working in this village but beneficiary are very few. In 90's self-help group evolved in the village as an institution with support from local level NGO. The main aim of SHG was to cater the micro-credit need of group member as well as other non-member person at some higher interest rate than the member. But in this village SHG only mobilize saving no other group activity like internal loaning and revolving of funds and lack of knowledge of institutional norm leads to failure of SHG movement.

With this background, the project started with community mobilization effort through a series of informal discussions and meetings. Four 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, local NGO partner (Sakhi) were given training on group management, formulating by-laws, mobilizing savings, record keeping to equip farmers with necessary skills for proper running of this collective groups. Another partner (India's apex agricultural research institute ICAR) were given training on cultivation practices for high value vegetable crops and other food grain crops cultivation practice as well as maintenance of irrigation infrastructure. Eventually, farmers agreed to work in 4 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 4 sites, in two sites (1 & 4) leased from landlords and rest two sites (2 & 3) on their own land. The area of intervention plots are 1.6 ha, 3.06 ha, 1.88 ha and 0.55 ha respectively for group 1, 2, 3 & 4. Group 1 & 4 have lease agreement with landlords in group. They have to pay 20 kg of paddy and 20 kg wheat per katha for one year as land rent. The key bio-physical intervention included installation of solar and diesel pumps and micro irrigation technologies such as drip and sprinkler irrigation system. Farmers follow specific crop rotations in the specific plots.

**Table 3: Overview of groups and key irrigation interventions in Bhagwatipur**

Groups	Year established	Membership		cultivated land (Ha)	# STW available for group irrigation	# pump-set in group	Type of pump	Other irrigation infrastructure	Water allocation mechanism	Pumping charge
		Female	Male							
Group 1	2015	6	2	1.6	1	2	Diesel and solar	Drip Irrigation in 6 plot	Water demand of the plot Using only Solar pump set	No charge
Group 2	2015	8	1	3.06	1	1	Diesel pump set	Drum kit drip Irrigation in two plot	First come first serve	Rs 40 per hour (diesel cost only)

Group 3	2015	5	2	1.88	1	1	Diesel pump set		First come first serve	Rs 40 per hour (Diesel cost only)
Group 4	2015	5	0	0.55	1	2	Diesel and Solar	Drip (3 plot) and Sprinkler (2 plots)	Water demand of the plot Using only Solar pump set	No charge

Following the institutional processes established, they developed cropping calendar through group meeting and discussion. In group 1 and 4, farmers followed pure collective models in two different sites. In pure collective both groups cultivated wheat, paddy and vegetable crop (more area under vegetable crop). While group 2 & 3 cultivated potatoes, onion, wheat and paddy in part collective model.

*On field training on use of plastic mulch and other agronomic practices in Bhagwatipur*



Crop management (use of plastic mulch and other agronomic practices) and plant protection trainings were provided focusing on rabi season crops. Farmers were especially excited about using solar, drip and sprinkler system for the first time. On field training were provided to farmer how to use these new irrigation infrastructure and its maintenance. But these technology 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. Project team has realized the need for regular and further trainings on agronomic, plant protection and water management.

#### Consolidating Participatory approaches:

Based on the farmers demand for on field training on uses of all the new technology project team mostly organized on field training this year on different agronomic and water management practices. Here farmers of group-1 comparing their group with group-4 and expressed their views that practicing pure collective could be successful if size of group smaller and smaller area under cultivation.

#### Spreading and consolidating Leadership Base:

Here in Bhagwatipur all group have changed their group leader. In group -1 male leadership changed with female leader (Sita Devi take the position of Jitan Ram), similarly in group-4 Ranju Devi take the position of Urmila Devi. This trend shows that some of the group members have shown encouraging leadership potentials – also conflicts were in some contexts addressed through changes in leadership. 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 vegetable cultivation. Group 1 is now 6 women and 2 men, however, in reality it is women run entirely, as the 2 men's wives are the de facto members, and also keep the produce.

Though initially, land agreement was done through the facilitation by project team, now farmers have started dealing with landlord. Selected group members have attended exposure visit to commercial vegetable production in Ranchi district of Jharkhand. Five farmer representatives from all the group participated in Collective Farmers meet organized at Sakhi, 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:

For establishing stakeholder network project team facilitated a series of meeting and consultation with the identified stakeholder both at local level as well as state level. Farmers from this village established very good linkages with stakeholder like input supplier, agro-service provider, vegetable trader and local government agriculture department. They make informal agreement with agro-service provider for timely service, input supplier for make available input on time, trader agreed to procure their produce directly from farm at higher price than Mandi. Local government agriculture department agreed to provide subsidies input and other service to farmers but due to land entitlement issue they are not able to serve these farmers. Another issue

is farmers are also not showing interest to get these scheme because government provide all the input and service after planting season/time over.

## **Documenting engagement in Mahuyahi**

### **Background**

Mauahi village is situated at 26°26'16" N latitude and 86°17'39" E longitude. Mauahi village comes under Dhamora panchayat of Babubarhi block of Madhubani district of Bihar state in India. This village is situated about 5 km away from Block headquarter (Babubarhi) and 45 km away from its district head quarter at Madhubani. Presently, a total of 580 families are residing in the village. Community wise or population wise distribution showed that Brahmin (General) has the largest population share, followed by Muslim, Paswan (SC), Ram (SC), Yadav (OBC), Teli (OBC), and Mallah (OBC).

Majority of land in the village belongs to Brahmin community while the other communities are either marginal farmers or landless labours. The main source of livelihood for the villagers is agriculture and remittance. Other minor sources of livelihood include non-farm activities, wage labour and seasonal agriculture labour. Male outmigration is very high. The migrated males mainly work as unskilled wage labourer and remittance is their main source of livelihood. Major destination of migration is metropolitan cities of India and rural part of other state like Punjab, Haryana, and Western Uttar Pradesh.

Access to ground water for agriculture is very poor. Although ground water is present in the shallow aquifer layer, its extraction using diesel or electric pump is a costly affair for marginal and poor landless farmers. Thus agriculture is entirely dependent on monsoon and water from unfinished canal that flows only seasonally. In kharif season transplanting of paddy takes place only after receiving good monsoon rainfall. The unfinished canal also supplements water only after mid-August. In rabi season farmers use water from tube wells that tap water from the shallow aquifer layers where water table remains at 2-3 m below ground level. Diesel engines of 3-5 hp capacity are used to pump the water from these tubewells. These tube wells are able to supply water for only two or three irrigation. During summer season sowing of crops depend on pre-monsoon rain. In the event that sufficient rainfall occurs in the months of Mar-Apr, farmers undertake the sowing of moong crop, otherwise entire agricultural land remains fallow during the summer season.

Institutional strengthening and development:

During the last decade some farmers of the Mauahi village could get the experience of institutional arrangements. One of the implementing partners of this project, 'Sakhi' did work with the fisherman community. They formed the self help group (SHG) of fisherman community

of the village wherein the group members were oriented towards fish farming in a collective and co-operative manner. These SHGs worked well only for two to three years. But these groups could not sustain due to governance issue in group. The farmers who were not part of these SHGs have no experience of group activity or any other formal institutional arrangements.

In view of the prevailing practices of agriculture and the water availability scenario in the region, it was important to bring-in the change in the manner in which farmers are undertaking their farming activities. The project team visualized that if farmer-to-famer linkages are strengthened to improve the co-operation in day-to-day agricultural activities, the agriculture scenario in the village could be transformed. This aimed at making farmers to work shoulder-to-shoulder and build synergy and co-operation in performing farming activities in a collective manner. This required a lot of social mobilization and convincing of the farmers to bring required social change that aimed at institutionalization of farming community. As an entry point to social mobilisation, we started a series of meeting with almost all the section of society and community. Some farmers (specially the early adopters) liked the concept and were ready to work in group to carry out the farming in collective mode. Some farmers did not like the idea and restrained from these groups. Initially, some groups were formed which started functioning as collective of farmers. Due to lack of understanding among the group members few groups broke within weeks of their formation. . It was observed that farmers of one hamlet could not agree to be in farmers group of another hamlet.

In the process of group formation farmers from Yadav and Muslim community from Lohapipar hamlet showed enthusiasm in group formation and even agreed to contribute Rs. 100 per member per month as group fund which can be used in the event of any emergency. They started group activity in 2015 with regular group meetings and with monthly saving (contribution towards group fund) as its first activity. Landlord raised the issue that why project will provide any input directly to his tenant. Their main viewpoint was that the project should provide the inputs to all the concerned landlords and they will distribute it to the tenants. This message reached to tenant and they started opposing this proposal put forth by their landlords. Later the project team discussed the matter with landlords and urged the landlords to develop a formal agreement with tenants that the project team can work with them. Landlord did not agree on this proposal. Landlord agreed that they can have a legal agreement with Sakhi (our local partner) that Sakhi can provide the land to tenant on yearly rental basis. Sakhi agreed to have a formal agreement for land rental with landlord and provided land to landless tenant farmers of the groups. This process of forming groups, developing formal agreements and finalizing group structures took two cropping seasons (one year). Finally, our interventions started from Kharif-2016 in Mauahi village with same group formed in 2015. This group decided to work in a part-collective (individual plot wise intervention) way of functioning.

After Kharif harvest young people from the village, Mr. Gagan Yadav and Mr. Sonu Paswan come forward to form one group of young farmers called 'youth group'. They formed the group and started as pure collective in one plot of our intervention area. From Rabi 2016-17 they worked in a collective manner and cultivated potato, pea, maize. They cultivated okra during summer season.

At the same time another group of women from *dalit* community of the Lohapipar hamlet came forward to work together as a pure collective. The project team, recognizing their enthusiasm and urge, formed a formal group these women farmers and completed the legal exercise of developing an agreement with landlords. This group was allocated two plot of land and started working from Rabi 2016-17. They grew wheat in rabi season and okra and moong in the summer season.

#### Consolidating Intervention:

After several rounds of field visit and series of meeting with farmers and after analysing the biophysical situation at each of the intervention site, the interventions of solar pumping system, drip and sprinkler system were finalized for implementation. Solar pumping systems were aimed at providing access to groundwater during dry season while drip and sprinkler irrigation was implemented with the major objective of water saving and improving crop productivity. Group of farmers did not agreed to take the responsibility of any equipment to be installed in their field that is 1 Km away from their home. Theft was the major concern that precluded the farmers from taking the responsibility of these systems. The project team further discussed this issue with the group members to finalize materialistic interventions at this site. The farmers agreed had a view point that the portable diesel engine so that they can carry it to field and bring back to home after work. The farmers also demanded construction of new shallow tube well at this site to meet the irrigation water requirements during rabi season.

Project personnel agreed on these two demand and constructed two shallow tube wells and provided one diesel engine to the groups. From this tube well and diesel engine they are able to save Rs. 70/- per hour on irrigation cost. The prevalent cost of irrigation per hour s in the range of Rs. 120-150 per hour, which includes the engine hiring charges and the diesel charges. With the provision of diesel operated pump, the farmers now have to pay only the diesel charges and maintenance cost of the pump. This resulted in savings of Rs.50 per hour of the irrigation.

Due to shallow aquifer layer and low discharge of ground water during dry season project considered for micro drip system of irrigation (Drum Kit). Project installed the drum-kit system in the project area. But farmers not maintaining and using it properly. The major reason for not using drum kit is the lack of water filling facility at the site. Due to major threat of theft, the farmer's are not keeping the pump set at the tube well. This pump set was supposed to be used for filling the drum. Absence of water in the drum is making farmers less interested in the system

and they are not looking after the system. The empty drum placed on the elevated platform is more prone to damage by regular storm. Farmers are also not willing to lay the laterals in the field because of the theft threat. Also, the farmers selected for in this area are not regular farmers. They were the youth group and out of the group of four, two farmers have already migrated from the village.

Keeping in view the water availability and the possible benefits, a plot wise cropping calendar was developed by the participating farmers of each group. Farmers started to cultivate the crops in accordance with the cropping calendars. They cultivated paddy during kharif season (2016), Wheat Potato, Pea and Lentil during Rabi (2016-17) and Okra and Moong in Summer (2017). Due to low discharge from tube well farmers were able to apply only one irrigation to wheat crop. This year area under wheat crop increased in our intervention area and the nearby agricultural lands as well. Earlier paddy totally depended on the monsoon rains, even for raising paddy nursery. Now, with the increased availability of water by the use of the diesel engine farmers are able to grow the nursery of paddy crop before the monsoon rains. This ensured timely sowing of the paddy crop. During Rabi 2016-17 we introduced potato, pea and maize in our intervention area. Earlier none of the farmers cultivated potato, pea and maize in that area. Potato was cultivated on ridge and furrow system of plantation and results were quite encouraging. After witnessing the results of the potato crop, other group farmers as well as outside farmers also showed interest to grow potato and pea.

As a part of the project farmers trainings and exposure visits were conducted for the participating farmers. One such exposure visit was held to visit the research farms of the ICAR-RCER, Research Centre Ranchi and one to the other project village Bhagwatipur. ICAR and Sakhi organised on-field as well classroom training to farmers on agronomic practices and water management before start of Rabi and summer season. During their one day visit to RC Ranchi, farmers were given 3 hours of classroom training on vegetable cultivation practices and plant protection measures. Here, farmers got an opportunity to acquaint and understand the better techniques of vegetable cultivation including drip, sprinkler, mulching, vermi composting and nursery production in shade net etc. During the visit to a field of progressive farmer at Ranchi, our project farmers could witness the state-of-art technologies of crop production like drip system of irrigation, bicolour polythene mulching, fertigation with ventury and better nutrient management.

Consolidating participatory approaches:

Our approach towards implementing the project is such that each and every member associated with this project feel that they are the partner in our research project, in particular our farmers feel that they are included in all the major intervention that project is implementing. Farmers, with the facilitation by local partners, are regularly conducting the monthly meeting of their respective group. In these meetings they decide the cropping calendar and pattern to be followed

for a year. They also develop the training need plan based on their experience and highlight the points they need to learn from expert. They also decide upon whether to visit the progressive farmers field. When we had informal discussion with the farmers on the Ranchi field visit and Bhagwatipur field visit. Their opinion was as follows

Md. Sakruddin said that” *Ranchi ke kisan ka toh sab suvidha uplabdha chhe kahiyo pani ke dikat ne hoye chhe, kiye toh wo apn kuan khodene chhe, apn okar jamin chhe, Hamara sab ke te dosrak khet bateya kare chhiye, aur monsoon ke samay me pani lagi jay chhe aur sukhil samay me pani ke subidha ne chhe, aa otba paisa kharch ham sab kat se aanbe, teye duware wohan te nahi ka sake chhi lekin tarahk kheti ka sake chhi*” He said that “Ranchi farmer having all the facility available in their farm, there is no dearth of water because they are having a dug well with sufficient water. They are having their own land and we are tenant farmers and working as a sharecropper. In monsoon season in our plot there is problem of water logging and in dry season there is dearth of water availability. We do not have the capital for investment in the farm. We can replicate some of the practices followed at Ranchi but not possible to implement all of them here”.

Md. Sabul said that “ *Ham sab toh bhumhin majdura aadmi aa je tarhak paristhiti aatuka chhe woye paristhisti mein Bhagwatipur janka aa Ranchi janka kheti kenaya Muskil chhe. Bhagwatipur mein boding badhiya pani de chhe aa atye toh 10 ghanta chala ke bad pani denay band ke de chhe, Apn jivika ke lele toh kam aa kheti toh kareye padate. Woye dunu jagah jaka te ne lekin keechh naya fasal toh jarur prayog karbe je hamar sab ke paristhiti sudhar sake*” He said “we are landless labourer and tenant farmers and the situation prevailing here is different than the Ranchi and Bhagwatipur. So difficult to do same practices here as practiced in Bhagwatipur and Ranchi. In Bhagwatipur there is sufficient water available but in our plot area if machine run for 10 hours then automatically stop delivering water. For our own livelihood we need to work and do agriculture. Not like Ranchi and Bhagwatipur, but we will try some new crops so that we can improve our condition”.

The project partner ICAR conducted a on-farm training program for Mauahi farmers in Bhagwatipur village before start of Rabi and summer season. Two individual farmers selected Okra crop for cultivation during summer season and new ‘youth group’ chosen to grow potato, pea, okra and maize in rabi and summer season. After getting experience of cultivating okra and other vegetable crops they gain the knowledge of how to control the insect pest and disease of these crops. Project team provide them the time to time hands on support for insect-pest and disease control. In the event of infestation of the crops by insect pest or disease, the project team sends a photo of the affected plant to ICAR experts through the use of Whatsapp and the experts at ICAR respond with the appropriate management option to control the insect pest or disease.

The project activities in the villages has imparted enough experience and confidence to the farming community that, now these groups are able to identify their needs and can develop their own cropping calendar and pattern. They are also in position to assess the aspects of crop cultivation on which they require a training and capacity building.

#### Spreading and Consolidating Leadership Base:

In Mauahi earlier only one two members were actively participating in the group meetings and rest member remained quite. Now the times have changed and so the confidence of the farming community. Now every group member speaks and raise his view in the meeting. Sakhi organised training on group management and book keeping. This training capacitates the group member to write their group meetings their own and also keep the record of saving amount in the group. They maintain the good governance in the group. Other member also able to conduct the group meeting & other group activity in absence of any group leader. These groups now regularly formulate the rules and regulation for their group.

In group 1, the project team has identified Md. Sabul and Ganga Yadav as the potential future leaders of the group. Because, in absence of any group leader they conduct the group meetings and any other group activity. In new youth group all the four having the potential of group leadership. In new women group almost all are outspoken and capable to carry the group activity.

In group 1, Md. Sabul and Ganga Yadav are entrusted with the task of organising meeting and group activity. In group 2, Youth group all the four member are equally capable and all discharge their duty properly. The group 3 new women group is quite new one we need to observe one more cropping season to identify the potential other member.

Project staff regularly attend their group meeting and tell the success story of other groups for encouragement. This resulted into formation of third self-motivated women group which started function as pure collective activity.

All group member had exposure visit to well established group of Bhagwatipur. During the visit to ICAR, Ranchi, the Mauahi group farmers also visited a progressive farmer's field located about 20 km from the institute. Group leaders of all the group also participated in one workshop organised at Sakhi centre in the month of Feb-17.

### Engaging farmers in data collection:

Both social and biophysical interventions have started in the village. For research we need regular data collection on both social as well as biophysical interventions. Initially, farmers were asking 'why you are collecting all this information or data? what are their need? what you will do with this data?' These were some of the frequently asked questions from farmer's side. The project team explained that this data is useful for the researchers in working out the best possible farming options for the farmers and is also useful for the farmers themselves to make decisions on farming practices. Consequently, upon understanding the utility of the data, they started supporting us in collecting data on social as well as biophysical aspects. Farmers maintain the minutes of the regular group meetings and keep the record of day-to-day activities. They also record expenses incurred on each and every farming activity and earnings from their activity. We use this record for entering the data into our economic data collection sheet. We also train them to keep the record of irrigation time/ machine run hour and even how to take flow rate. They help us in collecting the data wherever it is needed.

### Enhancing and consolidating stakeholder's network:

For establishing stakeholder network, the project team facilitated a series of meetings and consultations with the identified stakeholders both at local level as well as state level. Our project farmers established a very good linkage with stakeholders like input supplier, agro-service provider, vegetable trader and block agriculture officials. They had informal agreements with agro-service providers (for tractor & thresher) from the same village for timely service. Without these linkages, during peak time farmers faced problems. For agro input they identified some suppliers who are reliable for quality seed, fertilizer and pesticide in Mauahi, Bhupati and Babubarhi and developed good relationships with them. During the first summer season farmers faced the problem of selling their produce as the nearby vegetable traders were not aware about vegetable cultivation and production in the village. Initially, Sakhi and project personnel contacted traders for selling the vegetable produce. Some traders agreed to procure the vegetables directly from the farm at a higher price than local Mandi (Khutona). Traders could pay higher than market price because they said that procuring vegetables from this village reduced their transporting cost and that amount they could pay to farmers.

Earlier our project farmers were not aware about the various government subsidy schemes like subsidy on seed and other inputs. They came to know about these subsidies through their interaction with block level agriculture officials during stakeholder engagement meetings. Block level agriculture officials agreed to provide available subsidies to our farmers but due to land entitlement issues they are not able to serve these farmers.

## **Documenting engagement in Uttar Chaokakheti**

### **Background**

Uttar Chakwakheta, Alipurduar-I block of Alipurduar district, is characterized by extremely poor infrastructure, largely inaccessible and interwoven with river and forest. The population continues to be excluded from mainstream development, is underserved by weak governance and suffer the impact of poverty severely. Alipurduar district (also known as 'Dooars') was a subdivision of Jalpaiguri district before its emergence as the new 20th district of West Bengal on 25 June 2014. The district Jalpaiguri was originally named Baikunthapur. Before reorganizing the district boundary, Jalpaiguri was one of the largest districts in West Bengal and backward too according to a Report on Comparative Backwardness of North Bengal Region (2002). The people of Alipurduar subdivision had faced hardships in receiving government services and had to spend long hours travelling 110 kms to reach the district headquarter. Geographically, Uttar Chakwakheta falls under alluvial zone with humid tropical climate conditions. The monsoon hits in between mid-year to September/October, followed by a cooler dry season from November to February, and then summer season from March to mid- September.

The Kaljani River, which flows from the Himalayan foothills, runs along one side of Uttar Chakowakheta which joins Torsa River and flows through India to Bangladesh where it eventually flows into Bay of Bengal. Kaljani River is subject to river flooding following heavy rains. A major flood in 1993 deposited large amounts sand in Uttar Chakowakheta, resulting in large loss of cropland, however since then, sand mining has been an important source of livelihood for 10 % of its people. Uttar Chakowakheta is also unique, in itself which borders with Chilapatha forest on northern side lies under the Jaldapara Wild Life Sanctuary and tea estate, Mathura tea garden on the western side.

Forests in this region are generally characterized as moist deciduous Sal forest interspersed with riverine forests. Before late 18th century during British reign in India the area was fully occupied by dense forest and some ethnic indigenous communities might settle around. But during early 19th century some ethnic tribes from Bihar (now Jharkhand) were forced by British to migrate in this region for cleaning of the forest and venture tea plantation. Since then this tribal community -Oraon, Chik Baraik etc settled around and Uttar Chakwakheta village evolved. Plenty of migratory bird like ruddy duck / shelduck used to visit the area during onset of winter season near the bank of Kaljani River and the place used to be white as snow. The local villagers were calling these migrant birds as "Chakowa bird". Hence due to this phenomenon the place used to be called as Chakowa – keti (agriculture) as days passed it named as Uttar Chakowakheta. Later during 1970-71 war between Pakistan and East Bengal / Bangladesh many more community comprise of Rajbanshi, Nepali, Rabha shifted and settled after the tribal.

Uttar Chakowakheti is divided into two parts – one part is on the east embankment of Kaljani River and the other is on the west embankment. There are 243 households in the western embankment, and falls under the DSI4MTF project includes 30 % Scheduled Castes, 63 % Scheduled Tribes, 4 % minority and 3 % general.

Livelihood depend on farming, work in sand mining and the remaining rely on forest resources. A few households in Uttar Chakowakheti also engage in fishing and animal husbandry as their secondary occupation which is a source of livelihood for a small proportion of its community as well as a source of wild animals that threaten lives, crops and housing. Seasonal migration to other state of India is also a part of income for the villagers.

#### Institutional Strengthening and Development:

The village has limited institutions due to remoteness, culture of silence and poor linkage between village community and service providers. The village has women self-help groups ( SHG) initiated by village PRI-Panchayat Raj Institution / Local governance; Forest protection committee ( FPC ) initiated by Forest department and farmers club as well as Collective farming groups ( CFGs) promoting by DSI4MTF project.

There are 24 number of women SHGs consists of 10 to 15 women with a president, secretary and treasurer as office bearer of group. The groups were limited to savings and credit. Weakly maintained rules and regulation of the groups with irregular meeting and the group members hardly refund the loan / interest in time. The groups also did not change their chief functionaries in a decade. The groups are formed heterogeneously. The group's members are belonging to both APL and BPL families. The landless, married, widows and farming women are included in the groups. The groups are irregularly contributing monthly membership varies Rs. 20/- to Rs. 30/- depending on what the members have agreed to contribute but membership is remained unchanged from the beginning. Members take loan for the various purposes that include agriculture, animal husbandry, house repairing, marriage of the family members, etc. It has been observed that those who take loan for investing in entrepreneurial activities their refund rate is better in comparison to those invest in house repairing or marriage etc.

The Uttar Chakowakheti Green Tribal Farmers Club is a project area based institution. This is newly formed institution and yet to get legal entity though NABARD- national agriculture bank for rural development is already involved. CDHI has also been facilitate to ensure legal entity as registration under co-operative act. The Farmers Club was established on 11th March 2015. The farmers club consists of 20 tribal farmers. They organize occasional meeting where attendance is almost 70%. Yet to start the activities under the club but will be planning soon. They just opened the bank account but monthly contribution from the members is quite irregular. They were oriented on farmers club and its role in the village. Exposer to Jalpaguri CDHI has been a good strengthening of collective and exposer to reflect their believe in inner strength.

There is one FPC-forest protection committee “Uttar Chakowakheti Kumarpara FPC” consists of 140 members and established in 1990 by forest department. The FPC was in functional condition till year 2000 but after that the no meeting organized. Again the Beat officer of the forest department is taking initiative to revive and very recently one meeting organized where 60 members participated and planning to take some developmental activities under the forest department. After selection of this village for LWR DSI4MTF project, the research team members are frequently visiting the site and already conducted few meeting with the community members. This message might be gone to the forest department and they are also planning to do something through FPC. Already key persons of farmers club initiated by LWR project are included in FPC. It seems that this emerging convergence is going to play vital role for accessing benefits related to agriculture and irrigation.

No special enterprise is visualized though many of households are doing small business like selling vegetables, running of small shops etc. The sand lifting and selling of it is a good enterprise in this village but this business is controlled by the outsider of Uttar Chakowakheti.

Socially and traditionally they are introvert and prefer to stay calm and rather they are nervous mingling with. They gossip among themselves and celebrate gaon puja, Karam puja for which they collectively ride the occasion.

With such narrow sphere of institution LWR project initiated developing concept of collective farming. A sense of together and to achieve a bigger goal unity is what matter. Taking the background of UBKVs intervention village as “Adopted village” the project started with understanding the community and generating community mobilization effort through a series of informal discussions and meetings conducted by CDHI. Three heterogeneous farmer collective groups were formed including the landless, land owner, male, female, and veteran farmer. Each group through series of meeting constructed its team member. Provided a name to each group. The working procedure was also prepared as how input, physical labour, monitoring and distribution of harvest segregated and collective management. Necessary awareness, community mobilization, crop management training and record keeping process also followed. But almost all the group develop collective model similar to each other.

However, there were many problems initially, during the 2015-16 rabi season. The farmers were very reluctant to participate in the project – the initial intervention was in lentil relay cropping – yet during the growth phase, it was left for grazing by the cows and goats, and productivity was limited. There were a number of root problems:

- The group members didn’t know their actual roles, and how to work collectively. The attendance of group members in meetings, and to take part in the collective farming, was poor. They didn’t come as they were not sure what their role was, and they prioritized other work.

- There were initially some natural leaders, who became active, yet they were expecting to receive some cash or quick benefits from the project – they had these short term motivations initially.
- They were naturally reluctant to engage in agriculture, as traditionally it was not an important component of their livelihoods, they would just plant paddy and that was all. They were mostly interested in crops which require little management, which they plant and then harvest at the end of the season. This also affected their motivation to participate in the project.
- They were mostly dependent upon daily wage work. Sand mining etc was an important income which provided regular income.

The team realized that there needed to be a change in the modality to engage with the community.

- The groups were reshuffled. For each group, in site 1 and 2, and older and more experienced farmer was placed in each group to take a leadership role and motivate the farmers.
- Community engagement strategy was changed to better align with existing institutions such as schools and SHGs, and to broaden the scope beyond just agriculture to mobilise the community.
  - The school teacher, students, were brought on board for a childrens’ program at the school, an art project related to agriculture, involving the family members also, where they were asked to reflect upon what their vision was for the village. This was to highlight that this project was not just for male farmers, but was for the benefit of the whole community including the younger generation. Many wanted the village to become ‘more green’ – through new cropping intensity.
  - The project mobilized the school teachers to mobilise farmers to receive Scheduled Tribe certificate, that many did not have. Teacher motivated the community to note that through this agricultural project, they can also be mobilized to claim other benefits, such as the ST certificate, which gives them many benefits and subsidies, for both agricultural and non-agricultural purposes. For example, the community is putting in a mass application now for shallow tubewells, and they get a priority as ST community. They made a strong case on the basis of the very limited cropping intensity. Many farmers also put in a joint application for land ownership certificates, which was preventing them from accessing Kisan Credit Card.
- Links were built with existing self help groups. More than 100 – 120 people was present in a meeting which was organized. A kind of SWOT analysis was organized, for female farmers. Some important points were extracted, and Mitali and team selected some key

leaders, and provided trainer of trainer meetings for groups, and for UC as a whole. This was on things such as SHG book maintenance, leadership training

- The leader of group three is the Pradan of this gram panchayat, and she is also the member of an SHG, and therefore she can bring some other facilities to the group aside from what is provided through the project, five of NRM (National Rural Livelihoods Mission – the apex body of government which looks after self help groups in India, micro-investment plans).
- UBKV supported the farmers to improve the crop management, also providing some motivation.
- For site three, the introduction of solar systems generated considerable interest.

Together, these activities were able to increase the motivation and confidence of the farmers from the rabi 2016-17 season. Another trigger was the success of site 4. They had the most experienced farmers, who have already taken agriculture as an enterprise, and they began to emerge as the most successful groups. This also triggered the other groups.

Through a structured norm-office bearers, group norms were developed. Roles and responsibility of each office bearers developed includes the group leader, secretary, cashier, knowledge farmer, and member.

#### Consolidating Interventions:

A farmer quotes “football khelate ball kakemarte hoy, kheloyar ken a hole ball to goal a jabena. Referee kajkhela take porichalonakora, khelanoi”- (in a football match players play with ball and unless it is being kicked by one of the player it do not get to goal. Referee only keep an eye of the match and ensure that the rules are adhered to and to arbitrate on matters arising from the play.)

Taking the farmers note from Uttar Chakwakheta role of external is made clear from all corner. And that lead to the foundation of any kind of intervention to the village. A farmer quotes “amraadivasibhutamraektukombuhjitabejakhanbujhiamaderthekebhhalokaunai” ( we are tribal and act as ghost and are generally ignorant and have less knowledge to any developing matter but its true once the matter is made understand we pick up then we are far better than other). Taking the nerve of the community various haphazard initiative have been take in the past and provided a lesson to the LWR project. Need of the community was assessed first and then as part of intervention as the collage of activities were undertaken. Broadly its was three sphere intervention

- a. Learning agriculture practice of the local population and intervene crop season wise
- b. Technology to intensify crop management
- c. Community engagement to garnish collective farming and community effort.

Traditionally the cropping practice was marua, tishi, paddy and winter leafy vegetables. But now farmers have introduced lentil, mustard, wheat, maize, pumpkin, paddy, jute, maize, potato, tea and winter vegetables. Major percentage of cropping season was June to September and the rest period the land used to be fallow.

**Table 4: the cropping pattern changed after intervention in the 5.25 hectare project site in Uttar Chakoakheti**

Season	Intervention area	Crops	Percentage of cultivable land
Monsoon ( June to Sep )	4.785 hectare	Paddy	91%
Winter (Oct to Feb )	2.10 hectare	Potato and other vegetables	40%
Summer (March to May )	1.345 hectare	Jute and Maize	25.61%

Though this change look mere but it's a change from zero to what it shows now.

Traditionally they never used to use any kind of fertilizer, manure except cow dung and used to depend on rainwater for irrigation. But there was intervention to the cropping pattern practice, pump set to deliver water for irrigation with other technical advice as crop management.

**Table 5: Changes introduced by interventions in Uttar Chakhoakheti**

Traditional practice	Intervention	Probable change
Only monsoon paddy	Dry season agriculture	Rabi and pre kharif crop initiated
Only rain fed irrigation	Diesel pump	Rabi and pre kharif crop get timely irrigation water
Only flood irrigation	Basin, furrow, drip irrigation	Application in crop like potato, brinjal, mustard, maize
Male run pump	Solar unit	Female also involve in irrigation process
Fuel cost unaffordable	Solar unit	Round the day can be used with spending any money
Individual cropping	Collective cropping	Initiatives for new crop taken, sharing of labour and other inputs, better management of crops, profit sharing with tenant farmers

Conventional technique of paddy	SRI	From 3 mon per bigha at least leap of 5.5 mon per bigha
Conventional technique of jute led to crop failure	Lime application	All the jute plant survived till end and would extract jute
Tribal have no knowledge	Cross learning of conventional agriculture	Improvising traditional practice with new technique
No weeding practice for any crop	Timely for weeding	More paddy seedling from bed to main bed, more jute production than usual, good maize production
Could not avail govt. scheme	Collective community effort	ST certificate
Individual farming	Collective effort	Collective farming
Traditional variety of paddy , long duration and low yield	High yielding variety and short duration crop	Better yield , early harvest and scope for early sowing of winter crop
Dare to intervene off season crop	Off season agriculture under poly house	

Consolidating Participatory approaches:

*“To stimulate or facilitate change, one has to begin where the community is”*. An important aspect of effective engagement is the *quality of participation* generated by engagement.

There are both practical and ethical goals of engaging with communities in the conduct of development initiatives. These are fundamentally interconnected. The more effective the engagement with communities, the more likely project goals will be met. Effective engagement demands participatory approaches where skills, attitudes and behaviors are acquired and practiced by highly skilled facilitators.

Farmers being an integral part of research was from very beginning was involved in the process.

Aspects:

- a. New site selection : the total process was indicated and settled by community
- b. Training on diesel pump operation was a need from the farmer taken into account and been provided
- c. Selection of crop season wise was selected by the group members and then projected to UBKV and according crop implemented. But this has evolved through good intervention by CDHI. Initially the crop was decided from UBKV.

- d. New agriculture technique like seed treatment, timely weeding, seed selection, planting technique, irrigation technique were not taken into account by the farmers. UBKV used to provide necessary support on the same but used to fail in most of case. As most of the technology transfer was done on lecture basis. Taking in account the farmers are aware of the basic of agriculture. It was however, felt that the training approach needed to change. CDHI led a session on what training means for them – the outcome was that they wanted hand holding, not just lecture style training. The farmers felt that they were not at that stage yet. CDHI changed that technique and were now involving line departments, and directly engaged in hands on training, demonstrating basic techniques such as bed preparation etc. As number of farmers were taken to Jalpaiguri for training – Central Plant and Crop Research Institute (under ICAR), and they took farmer to farmer training from more experienced farmers, particularly from the large scale commercial farmers. This was on protected cultivation, and the use of low cost protected structures.
- e. Spot selection for hand tube well was decided by the farmers from each site. Previously any kind of installation was decided from the department or funding authority. Community engagement in this process has provided a good base of ownership of the project.
- f. Group norms and office bearer were fully customized and decided by the farmers of each group.

#### Spreading and consolidating Leadership Base:

As notned above, building the capacity of leaders was critical for the success of the groups and to maintain motivation. Leader is one with good understanding and skill, teach the commune to lead and evoke the inner initiative of the community to march forward for development. Groundbreaker are evolving from community members who are morally motivated and encouraged to do welfare works for others people. Social institutions like women SHGs, farmers club, forest protection committee (FPC) are led by same community members. The leaders evolved from the community members have sound knowledge and skills on agriculture, communication and innate to look forward.

Women in this tribal based village are introverted though they are supporting and working in the agriculture field especially their involvement is much more than male farmers during the period of planting and harvesting.

The leaders in Uttar Chakoakheti village are literate and holds qualification till Bachelor of Arts. The leaders are bashful and having shy smile. They are always extending their helping hands to the needy people and resolving the critical and social conflicts locally. They are also good farmers and involved in farmers club as well as looking after the women SHGs.

Therefore there are no formal and informal arrangements of incentives as well as leaders are also not working for any kind of incentives. They are just getting / expecting respects for their good works and villagers are always showing their good respect to them.

There are no significant growths in the last 10 years but now leaders have more voice and bargaining capacity with outsiders as well as more about their rights. We have not also seen financial growths among the emerging leaders.

The collective agriculture has revealed many new leaders who literally changed the dimension of agriculture scenario of the village among the tribal. Veteran like Dukha Oraon, Niro Oraon, Youth like Kaliram Oraon, Birash Oraon, Tapan chick Baraik and female like Lalita Oraon, Rita Bhagat have created a vibration in with in the society.

A leading role was played by the primary school teacher to generate power in children and among the youth to negotiate with line department and evolve demand. Kishore Kindo, Rabi Orao lead and initiative have awarded the tribe their identity, license to receive any entitlement from government – the cast certificate.

An encouraging leadership and collective effort of farmers like Niro Oraon, Kaliram Oraon, Tapan Chick Baraik, Birsha Oraon, Birash Oraon, Dukha Oraon of site 2 have produced good production of wheat, maize and pumpkin.

Bhagabati Oraon a leader from SHG is also providing significant effort for development of female though group effort. She provide voluntary training to the group members in maintaining book keeping and meeting resolution book. Leading the other female look forward.

The interested and progressive along with new farmer, male and female were given exposer to Dhaloguri for learning and developing agriculture technique, process and practice. Allied agriculture activities like fishing, azola cultivation, female SHG and initiative were a good exposer for tribal farmers.

Enhancing and consolidating stakeholder's network:

From the beginning of the project, DSI4MTF team members visited the office of the stakeholders including service providers, local governance, market actors and line departments as well as organized the stakeholders meeting to orient and aware them about the project goals, objectives, activities and expected outcome. The leaflets on project in local language also circulated to the community members including farming community. Based on initial results documents prepared by CDHI-IWMI-UBKV and shared with different stakeholders to create strong linkage and ownership among the different agencies. Regular visit by CDHI to relevant government line departments especially office of the District Magistrate, District Rural Development Cell, agriculture department ( office of the Deputy director agriculture ), irrigation

department, Agri-Marketing department, Central Plant and Research Institute ( an wing of ICAR) etc. created a good impact resulted in better relationship between community and service providers and accessing government facilities. The exposure of collective farming groups and women self-help groups to different department also created enabling environment among the stakeholders. Now farming community and local level institutions preparing and implementing issue based plan by themselves. DSI4MTF project team members are guiding and facilitating them to explore their initiatives for ensuring better livelihood through agriculture and allied activities.

Extension officers from agriculture department have extended hand hold training along with crop planning meeting with the farmers. Senior officers from ICAR wing have visited and provided training and training proposal on beetle nut and black pepper. Further extended training will be provided to the farmer.

Engaging farmers in data collection:

DSI4MTF projects' research for development. Development is aimed for community being searched by scientist, academican, and development practitioners. To attain effective development being developed – the farmers also need to be part of research process. Their lies how ethically farmers being engaged in the project to justify- research for development.

In the process the farmers were taken been part of project from very beginning. Site selection, member's selection with group, crop selection were the areas where farmers directly intervene. Research has component of data collection both for social and bio physical intervention.

Especially in respect to social intervention farmers site specific keep note of farmers involve in collective farming, meeting minutes are maintained, participation of community members. Self-capacity building of individual farmer and group. The female tenant farmer say being note in meeting minutes, any say is valued that provide them a raise in social strata.

On other hand tribal farmers who always kept themselves on shy mode have silently created database of non-tribal certificate holder and that finally led to attainment of cast certificate to the tribal farmers. This has provided a platform to believe in them self and explore potentiality of the tribal. They used to endeavor being tribal but now proud to tribal.

On bio physical aspect the farmers were made believe in collecting some important note relevance for research. The rain data collection is entirely done by a farmer of village which is well maintained. They can relate how much rain have occur in their area and they feel proud that the data collected by them is used by the scientist and researcher.

Agriculture input data is maintained group wise along with note of irrigation water flow to crop field. Has increased self-efficacy and confidence among the farmers.

Overall this self-confidence has lead them to venture new crop during dry season.

## **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 interative 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.

### **New skills, new crops and reclamation of uncultivated land in Kanakpatti**

Background of Household:

Sundari Devi Chaudhary is a member of Rajaji Krisak Samhuha from Kanakpatti, Saptari. There are 6 members in her family: her husband, Durga Chaudhary who is the household head, her mother in law and 3 children. She is a small holder farmer with 4 kathha owned land. She is cultivating in 14 kathha rented land. No one in her family have migrated outside either seasonally or permanently recently.

How she benefited from the project:

Prior to the intervention, during monsoon, she cultivated paddy. During winter, she cultivated seasonal vegetables such as wheat, onion, tomato and eggplant. During summer, she cultivated

pumpkin and bottle gourd. She cultivates seasonal vegetables, but this was for self-consumption. Table below provides an overview of her cultivation practices prior to being part of intervention. Sundari had some exposure to vegetable farming for commercial purpose.

**Table 6: Cultivated areas and yield by crops in Kanakpatti**

Season	Crops	Cultivated Area (kathha)	Yield	Sale	Remarks
Monsoon	Paddy	12	2360	No	
Winter	Wheat	1.5	300	No	
Winter	Onion	4	50	No	
Winter	Tomato	4	1200	Yes	
Winter	Egg Plant	2	1600	Yes	
Summer	Pumpkin	3	1200	Yes	
Summer	Bottle Gourd	0.5	250	Yes	Unit in Pieces

She used to irrigate both owned and rented land using Shallow Tube Well. She owns one STW in her land and irrigates using her own electric pump. In case of rented land, STW belongs to the landlord.

In the 2015-16 season she joined the one of the new farming groups. Sundari Devi Chaudhary is part of all women group comprising of 8 members. The name of the group is Rajaji Krisak Samuha. As the project started, this is the first time that she is working in farmer group. She is practicing pure and part collective farming leasing the land from the local landlord.

As part of pure collective model, the group started cultivating paddy in 6 kathha of land in the monsoon of 2016. Recently in winter season of 2016/17, they cultivated wheat in the same land. After discussion with her group, she has been contributing labor and input since the beginning of the season.

Under part collective, she cultivates vegetables in 2.2038 kathha of land out of 17 kathha of jointly-leased land. In the group, they have jointly leased the land, share water infrastructure: 1 electric and solar pump and sprayer occasionally they hire tractor together for land preparation.

Sundari anticipated that working in group would help the members procure input in low cost on one hand and get work done in less time. Though, she farmed commercially before joining the group, mode of farming was traditional. At present, she has been trained to prepare nursery beds for tomato and eggplant, compost manure and use of drip kit for irrigation. As anticipated, she notes working collectively has brought couple of direct economic benefits.

Paddy yield from pure collective land has helped Sundari and group members to pay for land rent to landlord. She is happy to have rest of the crops produce: wheat and vegetables all to herself. She has both been consuming and selling the crops.

In part collective land, Sundari decided to cultivate tomato and eggplant instead of paddy in monsoon 2016. In her previous experience, she had fetched more profit from these vegetables. She bought local tomato seed from Agrovat at Traffic Chowk, local market located 1.5 km from the village. Since, she planted tomato early in comparison to other farmers, she expected to receive high return from tomato. She sold first batch of tomato, altogether 4-5 kg. Had it been sold on season, she would merely make NPRs 10 for a kg of tomato. She happily shared that she made up to NPRs 50/kg.

Her first intervention crop, zucchini alone fetched her an income of NPRs. 12,000 to NPRs 13,000. "I am very pleased with the income I made from zucchini. I work hard, so I was able to make this much money." She adds "I was aware of the fact that the first season could fetch me less money. However, I am excited about the return". Using the profit received from eggplant Sundari was able to repay the loan that she took from the group fund. She had taken a loan of NPRs. 5000 to pay for her daughter's school's expenses at Rajbiraj, a town, 10 km far from Kanakpatti.

*Sundari Devi Chaudary selling vegetables at Traffic Chowk, weekly market*



The land Sundari's group are currently leasing was a virgin land. During the initial discussion with project team, the idea of farming in virgin was not welcomed by her mother in law. She had said, "*maughi vyake baanj khet kar sakbe? Kyut lagto*". This means "Can women farm in previously fallow land? You will have to pay rent to landlord" assuming cultivation in such land would only incur loss. On the other hand, her husband was supportive of the idea. Sundari adds, "I was not scared. I work hard and I was confident that I would get good produce". Looking at the economic benefits received, now her mother in law does not oppose her involvement in the group.

In addition to the direct economic benefits, she is happy with other skill sets she gained after joining the group. Sundari is excited about learning new agricultural skills after being part of the group. This was one major motivation for her

to work collectively. She adds availability of STW and electric pump was another reason to join the group. Sundari shares her experience of using drip irrigation kit for the first time. There is one

drip system installed on her tomato field. She finds it easy to use and less time consuming. She notes that conventional methods to irrigate tomato took more time and weed growth was another problem. *“Thopa sichai se jair mai jaische, dyang se kono thina besi jaische pani kono bela kaam, besi pani se tamatar mair jaiche”*, she shares meaning “drip irrigation gets water in the roots. In furrow irrigation, some plants receive more and others receive less water. Excess water leads tomato plants to die”. The kit needs regular cleaning, she checks whether drip pipes are clogged to ensure smooth water discharge. Though she understands the merit of drip system and would like to use it in personal farm as well, she realizes it would be expensive to install.

#### Perceived social benefits:

After being part of the group, Sundari has started participating in project activities such as trainings, exposure visit and monthly. Her confidence did not come about in an instant. She says “Now everyone speaks in meetings, so I don’t feel shy anymore”. Her exposure through trainings and visits outside the village has given her confidence to speak her mind. She gives an example of how talking to landlord was a scary thought for her. This was primarily due to two reasons:

firstly, he is rich and secondly, a man. Her husband was engaged in dialogues with landlord like most other men in the village. As she became part of the group, women were part of discussion with the landlord and subsequent negotiations relating to land rent.

#### Learnings and roots of success:

Even though she is fetching higher returns from different vegetable crops, unexpected fluctuations in market price of the produce is always a risk. The better strategy would be to adopt off-season cultivation so that she can get good as well as reliable price without much fluctuations. She is considering to start cultivating the winter vegetables a bit early so that she can produce in off-season. She is selling the produce in nearby haat bazar as well as in a nearby market at the distance of 4 km from the farm. While she thinks marketing would be easy if the buyers can collect vegetables directly from the farm, the price they receive would be lower than the ones she can get in weekly markets. She is not sure yet, but she wonders whether farmers can try new crops that have higher market value.



*Sundari Devi Chaudary in discussion with farmers from Bhagwatipur India during Farmer's Meet*

## Koiladi chairperson: Successful diversification, yet cautionary tales for the group approach

Background of the Household:



Ram Mangal Mandal is the chairman of Ma Durga Krisak Samuha from Koiladi, Saptari. He lives in a nuclear family comprising of 4 members: 1 wife and 2 sons. He is the household and makes major household decisions. Ram Mangal is a small holder farmer with 5 khatha owned land. He is cultivating 30 khatta rented land. No one in his family has migrated outside either seasonally or permanently.

*Ram Mangal Mandal, the chairman of Ma Durga Krisak Samuha, Koiladi Saptari*

Before the project intervention, Ram Mangal used to cultivate paddy in 30 khatta of land. During winter, he cultivated wheat and some vegetables such as onion and lady finger. He cultivated these vegetables for self-consumption and well as sale. Table below provides an overview of his cultivation practices prior to being part of intervention. Ram Mangal has some exposure to vegetable farming for commercial purpose.

**Table 7: Cropping pattern on land of Ram Mangal Mandal prior to project**

Season(Reference year-2014)	Crops	Cultivated Area (Khatta)	Yield (kg)	Yield sold (kg)
Monsoon	Paddy	30	4800	3200
Winter	Wheat	15	450	375
Winter	Onion	5	400	160
Summer	Lady Finger	5	170	150

(Note: 1 khatta= 0.0338 hectare)

He used to irrigate the cultivated land using Shallow Tube Well. He owns an electric pump and the STW belongs to the landlord.

Joining the Group and being part of the intervention:

Ram Mangal Mandal is part of Ma Durga Krisak Samuha. It comprises of 6 members: 2 women and 4 men. Before the project, Ram Mangal has experience working in groups, he is a member of local market committee and informal water committee. At present, he 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 0.507 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, Ram Mangal 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:



*Ram Mangal has cultivated sponge gourd and bitter gourd for summer 2017*

Ram Mangal has always realized the need for irrigation infrastructure for successful vegetable farming. However, due to poor financial condition, he was not able to make adequate investment. Although he farmed vegetables such as onion and ladyfinger commercially, he did it in limited land. So, when he learned water infrastructure support and agronomic skill transfer were components of the project, he was happy

to be part of the group. The idea of working in the group together sharing input and output was intriguing for him. Cultivating vegetables was equally tempting as he could learn agricultural skills, cultivate and sell the produce in weekly Koiladi market.

Having cultivated paddy in the monsoon season of 2016, Ram Mangal like other farmers of his group opted for cauliflower and cabbage for Rabi 2016-17. Although he irrigated the crops and applied fertilizers, he did not get a good yield. On the contrary to his expectations, pest attack damaged the vegetable. He could only make an income of Rs. 3000 from cauliflower and Rs. 3500 from cabbage. He received Rs .10 per kg for cauliflower in local weekly market at Koiladi. Despite the poor yield in last season, Ram Mangal wants to do better in upcoming season. For the summer of 2017, he has planted bitter gourd and sponge gourd in his field.

Conflict and challenges:

The aspiration to enhance his livelihood was disrupted when Ram Mangal and the group came in land rent related conflict with the landlord. After the installation of STW and electric pump, the landlord started bargaining for more rent than what was agreed for. Although, Ram Mangal is

the land manager<sup>1</sup> and is comfortable to approach the landlord, he could not do much in this situation<sup>2</sup>.

Despite the initial issue with landlord, Ram Mangal and the group started with paddy cultivation in the monsoon of 2016 in pure collective model. Under pure collective approach, Ram Mangal had hoped individual farmer's input cost contribution and labor hours would be alleviated. Nevertheless, he found himself doing majority of the group tasks. *"Most of the members say they are busy with work at other fields and did not show up on time. I could not let the crops without care. So, I went to Hanuman nagar to buy fertilizers and pesticides"*. He adds *"I and other male farmers sprayed the pesticides and applied fertilizer in the field."* Due to difficulty for group members to contribute time and labor at the same time, they decided to convert to part collective from Rabi 2017.

As the chairman of the group, Ram Mangal soon realized, with power come responsibilities, more so in his case. Even operating as part collective, along with leasing land and sharing water infrastructure together, his group purchased input and hired machinery together sometimes. As the chairman of the group, he was expected to take a lead on other activities too. Other farmers look up to him due to his previous experience with vegetable farming. *"I support other farmers because not all members have experience with vegetable farming."* He shares *"I feel overburdened with work occasionally"*. He has to call for tractor, go to buy fertilizer at Hanuman nagar. *"Everyone thought since I have the contacts of tractor, I should call for it. It was not a big task, so I did it."* To pay for the tractor hire charge, money is collected among the members. Not everyone is able to give money at same time since not everyone has money in hand. During such time, he makes personal contribution. He believes he will receive contributed money back but does not want to continue doing so. Some of the women members expect him to irrigate their plots.

Lessons for the project:

Ram Mangal is a progressive farmer. He has been utilizing his previous knowledge and adopting new agronomic skills in the intervention farm. On the crop and vegetable production side, Ram Mangal is doing well and is motivated to continue supporting fellow members. Nevertheless, for the group to function well, the responsibilities he is carrying out should be shared by other members. One man taking up all the responsibilities puts question mark on strength and longevity of the group. There is potential for conflict if the labor division for procuring inputs and

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<sup>1</sup> Ram Mangal is the land manager for the landlord. This means he suggests which farmer gets the land tenure on the village of the particular landlord.

<sup>2</sup> The initial agreed rental was 30 maan paddy for one bigga land in a year (1 maan paddy= 40 kg paddy; 1 bigga= 0.16055846 hectare). Landlord started demanding to go for sharecropping the entire year. If the members gave in to the demand, they had to share yield of each crop the entire year. This was not acceptable to the group members. So, they negotiated to increase the paddy amount up to 35 maan and pay half of hay as well.

operation of pump is not shared. Other group members need to be equipped with agronomic skills and share the burden. Only then, others can perform the agricultural activities without any hindrance even in ram Mangal's absence.

## **2.2 Market knowledge and a vegetable production success story from Bhagwatipur**

### **Background of the household**

Jugat Yadav and Kaushaliya Devi both reside in Bhagwatipur of Madhubani. They own a small plot of land which they cultivate themselves, but on the initiation of the project, they joined group 2, which is a part collective, formed by a group of small holders with their own individual plots.

How they benefitted from the project:

Before the project, the couple were not cultivating vegetables, only paddy, wheat and local potato – without any irrigation. After initiation of the project, they started irrigating and shifted from flat bed to ridge and furrow cultivation. They started individually doing vegetable farming, then shifted to collective farming. However, unfortunately the collectives didn't work out due to unresolved conflict within the group relating to labour time contributions.

Now they are farming individually again – they have been getting a particularly good profit, much better than the other group members. They have been diligent in the sowing and weeding and other key tasks. The couple have developed a sound knowledge and network as to where there is demand for vegetables. Jugat knows where there are rich farmers, or service men who can buy them. Especially in Nanour Brahmin tola. There are many wealthy farmers there who purchase the vegetables. Many are government employees. He sells them higher than the market rate as he sells door to door. He is good at convincing the farmers to buy his vegetables.

Jugat is the actual member, although he gets support from Kaushaliya devi. As they are producing vegetables, they are also consuming vegetables, improving the nutritional intake of the household. They have been able to convince other farmers of the benefits of vegetable farming, and have taken on a leadership role in the community.

Learnings and roots of success:

The success of this family emerges from the fact that they are both good learners and leaders. It is important to harness the leadership potential of these farmers as role models for other group members, allowing cross-fertilization of knowledge and skills.

### **Moving towards food security in Mahuyahi**

Background of family

Md. Sakruddin is a member of kisan samuh of Mauahi (Lohapipar tola) village of Dhamora Panchyat of Babubarhi block of Madhubani district of Bihar, India. There are 13 member in their family. He is the head of his family. He is a landless tenant farmer and also seasonal migrant worker. He is cultivating 1.5 bigha of land on sharecropping basis. As is common in this region, the land owner is not providing any input support to him and take 50% of the total produce from him.

Farming and Irrigation practices before intervention:

Prior to the project, in the Kharif season he cultivated only paddy and in Rabi just a small area under wheat and more area under lentil paira (relay) crop. This is due to high cost and not easy access to ground water. The lentil crop was sown on standing paddy crop to use residual moisture. In the wheat season he managed to apply only one irrigation. If there was any rain in the month of March-April than they would be able to cultivate moong crop otherwise the land remained fallow during the summer season. After paying land rent he barely had sufficient food to feed his family for the year, so he would work as a wage labourer or seasonal migrant to earn cash and meet the food shortfalls.

Joining the group:

He is now a member of a group of 5 farmers. This is the first time that he is a member of any group and doing group activity such as this. He is the member of a group that works as a part-collective i.e joint leasing of land and input procurement. Land rental is on a fixed cash basis i.e. Rs. 600/- per annum. For irrigation he has installed a new shallow tube well and has given a diesel pump set to the group. The group manage the maintenance of the diesel engine and the tube well. After this intervention their irrigation cost has reduced to Rs 50 per hour from 120-150 per hour, as they no longer need to pay the rental fee to use the pump set of other farmers.

After the project intervention he has taken 0.9788 hectare of land and cultivated paddy during kharif 2016 and wheat during rabi 2016-17 and Okra and Moong during summer 2017.

Perceived economic and livelihood benefit:

Before intervention there was not sufficient food grain left with him after paying land rent to feed his family throughout the year. To feed the family and meet other household expense they had to work as a wage labourer and as a migrant worker. After joining the group he is able to food secure food for his family and even sell some produce to meet his family's cash needs, as illustrated in Table 8.

**Table 8: Mr Sakruddin's crop yield and grain surplus**

Season	Crop	Area (Ha)	Yield (Kg)	Value in Rs.	Half yearly land rent amount	Remaining grain amount

						with farmer (Kg)
Kharif (2016)	Paddy	0.9788	3240	32400	16200	1620
Rabi (2016-17)	Wheat	0.8158	1575	23625	16200	495
Summer (2017)	Okra	0.1630			No rent	
Summer (2017)	Moong	0.3090			No rent	

Cost of production reduced in irrigation earlier they paid Rs.120 per hour but now only diesel and maintenance cost require for diesel engine. Thus he gains some income in the form annual food security and meet some of their household need.

#### Perceived social benefit

Md. Sakruddin not an outspoken person but after joining group he speaks up in the group. He shares his view with group member and has also developed his bargaining power with traders and input suppliers. In addition to that now he understands the different types of crop which could fetch him more income.

#### Learnings and roots of success

A key learning here is that once incentive systems are in place, productivity can improve significantly. The shift to a cash contract means that a greater share of the produce stays now with the family after improving the irrigation. This is also facilitated by access to the group tubewell and pump set which considerably lowers the cost of irrigation, reducing the unproductive rent payments which had to be made earlier.

### **2.3 The development of a leader in Uttar Chakhoakheti**

#### Background to the household/individual:

Dukha Oraon the son of Uttar Chakoakheti who belonged from a hand to mouth family. Century ago his forefather was uprooted from his native village and settled here in Uttar Chakoakheti. He resides in a kuccha house with wife two son two daughter in law and three grandchildren. He is head of the family. From his child hood he used to accompany his father to field for agriculture where he learned the art of cultivation following his father and supporting him with physical labour. He continued since then. But after his father death he was left with mere one acre of land. Only agriculture could not support him enough money to serve his family so parallel he started cutting wood from forest and sell it as firewood to nearby market and occasionally work as unskilled labour in road construction. He never migrated for alternate livelihood.

#### How he benefited from the project

The story line of Dukha Oraon started from a plot with Tobacco. The only farmer to grow (out of three site) tobacco but the plant looked unnourished and not at per. But the plot was without any weed. It was 23rd Feb 2016 when he participated in meeting of farmer discussing over crop selection at 2nd site. Aged man with white hair drunk but was in full enthusiasm. He is father in law of Sabita and Sujita. He was well aware of what went wrong with the tobacco plant but was optimistic next year he would do it right. He used to grow many vegetable, green leafy, Marua. He never had facility of irrigation water and only depended on rain water. In case of watering the field used to irrigate by tin bucket, water collected from nearby open dug well.

His elder son Raju, once became mad and used to run away from home at any point of time. Dukha owner of around 3 and half bigha land had to lease out 2 bigha of his land for son treatment.

As on 1<sup>st</sup> September 2016 while in a meeting with this group sujita was unattended hence his husband Raju was present. While discussing on crop management of jute, tobacco followed by the farmer in the plots. Raju though was answering my question but was hesitant and hence he revealed that he was not involved in the farming fully the know how could be extracted from his father. So he called his father Dukha. He provided all the detail management of crop in the field managed by him. He termed himself as tractor "I am tractor, with bull to plough the field, I am very fast". He described what other crop he grows. He added, he used to compete with some other farmer that how much better he can produce. A healthy competition prevails in his mind over agriculture. Someone proposed to the group if this group has someone like him as speedy, as enthusiast, as experience, as focused, as competitive with in. Tapan, Subhash promptly accepted and they proposed him directly if he want to involve in this group.

The person then urged to learn what this group all about and what his role would be in this group. He proposed if the group is collective then we all have to contribute. We all have to plan prior before what we have to plant and how we can manage the crop. All planning and management if carried well he would be ready to include in the group. Hence on the day with every one consent Dukha Oraon was included in the group.

How he contributed to the dynamics of the larger group

Positive energy and thinking with serious endeavor collected the group in a new form and encourage for a healthy completion of agriculture evoke after Dhuka's presence in group. The group was completely reshuffled. The group which was never taking initiative prior season

started taking new initiative.



*Dukha with SRI production 2016 monsoon*

A positive vibe rolled as he ventured last in monsoon 2016, cultivated only 1 bigha 5 katha with Kartiksali variety paddy the seed was his own staked in house and the pratikha variety paddy under SRI technique. Subhash Oraon through KPS of Chakwakheti gram panchayat collected the variety and as per know how of KPS regarding SRI learning transferred to Subhash and he disseminate to Dhukha. And the result is only plot with SRI standing still on field with Dukha Orao's management and monitoring.

None of the plot in the vicinity looked as develop as his. He received around 8 and half mon paddy compared to 3 mon previous year. This achievement has lifted his moral and the team member also generate confidence. Next rabi (2016 – 2017) season he ventured wheat in collective mode in his plot from site 2.

A time slot was prepared by him and accordingly all the plot with in collective was plough by all the member. So was his plot. All input cost, labour input, management, monitoring, harvesting, threshing and selling was done together by all member. Apart from elephant attack a keen eye was always on field so that no cattel can graze on field. Dukha was the leader on this matter. Any cattle that would enter the field was taken into custody and when the owner used to come in search of pet he on behalf of group used to charge fine. The fine depend on type of destruction done to field charged up Rs.100 per day. He roar "it's my field and I am growing crop on it hence no one has right to intrude in my territory, I can even kill it"

Apart from his part of land 2 bigha more was under wheat with in group. So the total production of wheat at 4.5 bigha was 580 kg. Out of which the group sold 460 kg at Rs. 16 per kg. The rest 120 kg was divided equally among 5 member i.e 12 kg each. The production seems to be low if we consider the total land due to crop damaged by elephant. The income rendered out of sale will be kept as saving which will be used for next Rabi season.

Dukha does not stop his energy only to collective he choose a protected area within his village 100 meter from his house. He works as daily wage security and care taker of that area against

which he receives Rs. 200 per day. He have planted all kind of vegetable like chilli of various variety, leamon, tomato, radish, cucumber, rid gourd, bitter gourd, and pumpkin. Moreover some fruit plant like pomelo, mango, litchi added plant like mehogini, shal, gamar, Arjun, eucalyptus and few many.

During a farmer meeting Dukha Oran said “I have lost my father many years back but now realizing father is coming back to me in cultivating different crops under DSI4MTF as my father was a farmer and wanted to grow all sorts of crops in UC. Earlier there was barren land for animal grazing “.

#### Perceived bargaining power and social benefits

His proactive energy has impressed the property owner for whom he work as care taker. Dukha on other hand felt confidence in his ability to grow crop in land of Uttar Chakwakheti and taste of earning from produce crop rather than only paddy. A loan of Rs. 8000 was approved by the property owner with which Dukha has retaken the ownership of his leased land.



*Dukha ploughing the settled lease land*



*Dukha participating in planning meeting*

Now he plans to bring under the additional plot under cultivation. Hence he has planned to go for “Payjam” midterm variety paddy during this monsoon 2017. Next target is to catch early season for potato in coming rabi 2017 – 2018. HE believes this collective syndicate will provide a big support to his initiative.

He not only perceives for self but also generate sense of unity and too with evidence for tackling against elephant attack

Learnings, roots of success:

Ethical community engagement with deeper insight and time lead to discover leader and creator like Dukha Oraon. Despite all challenges one can stick to agriculture in Uttar Chakwakheti and collective effort lead to new venture of crop selection in bigger area.

#### **2.4 Overdependence on one leader: A lesson from Uttar Chakhoakheti**

In one group, there was a graduate who was a member of the group. He has more land than other farmers, but he himself never farms himself. He was very active in the collective group initially, as he had expectation that he would get some kind of contract (e.g. for pond excavation, pump installation etc) through the group, as he is a MNREGA supervisor, and he will receive wages as a semi-skilled labourer. In meetings he was very active – some farmers felt he was a very good leader, and this motivated other farmers. He showed a lot of goodwill – for example, when well digger came, he stayed in his house.

However, as he felt he was not getting the benefits he had anticipated, he started to withdraw from meetings, and directly getting involved in farming activities. This attitude also misguided some of the other farmers, who took him as a role model. He would encourage other boys to come up with requests for off-farm opportunities.

He was a group member for the mustard cultivation this year. Initial investment was from him for the power tiller etc during the sowing. When the mustard seed was sown however, he showed very little interest in managing the crop, yet other farmers thought he was managing it and taking a lead. During the day of harvest, it was difficult to find a day, as the group were expecting the decision of that member, yet he was not available. By the time it was harvested, already it had been damaged by rain. Even after harvesting, there was no plastic available to protect the crop. Final threshing led to a very poor quality mustard. Although he was not the formal leader, as an educated member, he used to take frequent initiative, and members became very dependent upon him. He is still involved in the group, yet after observing the success of site 2, he has become a bit more active in the group. Farmers still look to him for support.

Lessons learned:

It is risky if a collective is dependent upon a particular leader. In this case even though he was not actual the formal leader, he was taking on a de facto leadership role in the group, and the other farmers followed his decisions and insights. This shows how there is a need for continual awareness of the group dynamics, to ensure the groups do not become dominated by one individual, or that group members do not become over dependent upon a single farmer.

### 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.

#### **Collective mobilisation not sufficient to shake off entrenched power relations: Learnings from Koiladi**

##### Background

What does it take to be a successful farmer? The first things that come in mind are fertile land, water infrastructure access and agronomic skills. Viewing at it technically, these elements check all the boxes. As we transcend beyond the obvious elements of farming, complex social dynamics uncover which are equally important. These affect “how one farms”, more importantly “who farms” The case of Shree Jeeta Krisak Samuha, Chattitole, Koiladi shows how despite the availability of resources such as land, pond and water infrastructure, the access and utilization can be hampered from power hierarchy between the “powerful landlord” and “powerless tenants”.

Koiladi is one of the two intervention village in Saptari, Nepal under “Improving Dry Season Agriculture for marginal and Tenant Farmers in Eastern Gangetic Plains”. When the project intervention started, one of the group comprising 8 women members from Dalit community was formed.

Koiladi is a village in Saptari district, Terai, Nepal. Koiladi 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<sup>3</sup> communities, the major source of livelihood of the region are agriculture, wage labour and remittance. In Koiladi, the majority of land is owned by few households from the Singh community. They own large plots of land, while there are many tenant and marginal farmers who have no or small land holdings. Many of them are cultivating as tenants, mainly as sharecroppers of the landlords. They depended on monsoon for irrigation to farm paddy. Canal could assist in irrigating wheat for some farmers. Water was not sufficient to irrigate adequately and purchasing water renting a pump was an expensive option.

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<sup>3</sup> Dalit community are the member of lower caste according to the Hindu Caste System in Nepal. As a result, they are socially, culturally, politically and economically marginalized.

## Community mobilization:



*Members of Shree Jeeta Krisak Samuha discussing during Participatory Gender training*

The project started with community mobilization effort through a series of informal discussions and meetings. As the project officers approached the community, 8 interested farmers were selected to form Shree Jeeta Farmers Group. Group members 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 them with necessary skills for high value vegetable and

crops cultivation. Eventually, farmers agreed to work in groups following pure collective model. The project team provided training on saving and credits. They were all set to start farming and so the land was leased. Plans were also drawn to start fishery at the community pond tying up with conjunctive use i.e. for fishery and irrigation. As we started engaging more, the more we learned the group would be dissolved due to the pre-existing conflict between the Dalit community and the landlord.

### The issue, and the failure to find a solution

Dalit group members wanted to lease the land nearby their residence (Chattitole) so that they could work on the land and look after it well. The nearby land belonged to the very landlord the group members were in conflict with. The conflict was regarding Chattitole pond ownership: Dalit community claimed the pond was in an “*aailani land*” meaning, it was unregistered and did not belong to the landlord. The landlord contested to their claim, presented document proving the land indeed belonged to him. After, he decided to withdraw from leasing the land as well as pond to the group.



*Proposed intervention School Pond at Koiladi*

With the assistance from the project personnel, another land parcel and pond were identified for intervention in close proximity to Chattitole. The pond belonged to the community school but the land belonged to the same landlord. Through negotiation with the help of project officers, the landlord decided to rent out the land to Dalit group initially.

With the group members and School Management Committee (SMC) on board, the project officials carried out feasibility study of the pond. A three

year leasing agreement was made with the School Management Committee (SMC). The members in the committee comprised of the school principle and the village elite including “the kamtiya in conflict” According to the feasibility study report, the plan to install solar panel to pump water to fill the pond and sell water to nearby fields for irrigation purpose was drawn. Solar panel installation would be done at the community school. School would be given electricity and water demand of 200 students be fulfilled. So, the design of a 2.94kWp solar water pumping system was proposed to deliver water of 214.5 m<sup>3</sup> /day at 6m head. The estimated costs of the electromechanical systems of the solar water pumping system was NRs. 820,293.

However, the mistrust among both parties was still brewing. There was an instance of physical violence between the group members and the landlord’s “kamtiya”- land manager who is appointed by landlord to look after his land, pick farmers to rent it out and collect the rent. Yet again, the second identified plot of land proposed for use was withdrawn by the landlord.



*Proposed intervention land at Koiladi*

Initially, the group members had anticipated to create new livelihood opportunities through improved farming practices in the land and fishery on the pond. Now, only left with pond, other concerns were raising. Firstly, due to unavailability of land, the group members were hesitant to go ahead with only fishery. They were also unsure about the availability of the pond for long run. The influence of school committee could mean termination of agreement after

three years. They assumed the return from initial years would just help cover for pond rental fees and fishery related expenses. Discontinuance after would only incur them loss. The group members had doubts if they would be able to sell pond water to others. The reason being, the elite potentially would not pay for the water sold. The possibility of fish being stolen was another important concern. Finally, the group members did not want to take risks assuming a lot could go wrong. Hence the work with Dalit group from Koiladi was unfortunately withdrawn.

#### Lesson learned:

The complex social dynamics of the society can make project intervention challenging. Even with extensive community engagement processes, it can be challenging to manage interests of multiple stakeholders, particularly in the context of deeply inequitable agrarian formations such as Koiladi. Understanding the background of the Dalit community and their relationship with landlords, kamtiya and members of SMC is important. Site specific stakeholder meeting at the onset of project activities and continuous separate discussions with each would have helped to understand the pre-existing conflict. This would have led to the selection of landlord with no conflicting history. Therefore, while conducting the feasibility study, along with assessment on water requirement, the social and cultural aspects should have been explored as well.

The conflict between Dalit community and the landlord of Koiladi reflects age old structural inequality between landlord and tenant in Terai plains of Nepal. Such power hierarchy puts landlord at the powerful position affecting livelihood of tenants. A shift in the relationship is visible as the Dalit community are challenging and contradicting the landlords – and this can be viewed positively. However, in the end, although Dalit community questioned the landlord's ownership of the pond, they ended up losing the intervention land. The availability of resources

alone does not guarantee success in farming. The hesitation of the group to move forward emerged from the possibility of landlord's power play in the future putting them in the losing end. Such complex realities of a society should always be factored in by the project to avoid future conflicts. Engaging with the community and continuous discussion with all the stakeholders is a must from project side.

### **3.2 Overcoming adversity to work together in Bhagwatipur**

#### **Background**

It was the intention of the project team to set up several groups in Bihar of farmers who were totally landless, and one of our groups in Bhagwatipur met this criteria. Most of them were just receiving cash from their husbands in cities. Only one was working as a sharecropper. Several of the members had not even been engaged in agriculture at all and had limited interest in farming. This was the fourth group to be set up, and Sakhi led the negotiations for the land. There was strong hand holding by Sakhi to ensure cultivation and group mobilization were initiated.

#### The issue and its resolution

In spite of this the motivation amongst the women was not high. They bore a loss initially and there was frequent squabbling within the group, over the labour contributions and time management. There was mistrust over the financial management and use of the funds also. The group members who had been leading the group before was one of the leaders from within that community, yet she was not transparent, and wanted total control over the group – both financial and management – there was high dissatisfaction. The group was about to collapse. However, a new leader came forward and agreed to take charge of the finances in the group and was motivated for the group to carry on cultivation regardless. Two members wanted to leave the group and didn't come to the field for one month in September 2016, but they returned to the group after seeing it continuing successfully. For the second rabi season, they were much more engaged independently, and didn't need so much support from Sakhi. She mobilized the other two members of the group to come back. She is a very strong leader.

#### Lessons learned

A key learning was that the transfer of leadership was possible because all the farmers were from a similar socio-economic status. Had the leader been economically powerful as well, it would have been difficult for the two group members to swap leadership roles, as it would have been difficult for a poorer less powerful farmer to challenge the leadership. If it was led by a wealthy farmer, it was felt by the project team on the ground that nobody would have dared to try to challenge their leadership.

### **3.3 Greater trust of tenants by Mahuyahi landlords**

## Background

Setting up new group leased land in Mahuyahi prove to be extremely challenging. Landlords didn't want to have any formal agreement with the tenants in Mahuyahi and were suspicious as to the outcomes. Anoj and the team intervened and the landlords agreed to have an agreement with Sakhi. One group was established using the part collective model beginning. Another women's group came into operation in the Kharif of 2016 – yet this faced even more significant challenges due to deeply entrenched caste politics.

### What happened

The group of women actually came together on their own initiation, and they shared the vision of Sakhi, after watching what the other farmers had done – they were also opting for a full collective, unlike the part collective already established. They wanted to learn new things, and mobilizing this group prove to be a golden opportunity given the high level of self motivation. Sakhi supported them in agricultural production planning and technical guidance, and gave some support with seeds, but took a hands off approach.

However, most of the memebtrs were from the Dalit Paswan community, and the landlords initially were reluctant to give them land when most tenants until then had been Muslim or Yadav. They were afraid that the Dalits would encourage them to encroach their land, and there was a history of Dalits support for the Communist Party of India (CPI). In the past in nearby villages, they have planted red flags in the land and claimed it as theirs.

However, Sakhi took a facilitating role, and the landlords agreed to give land, realizing that they would actually get a better income from leasing out to the tenants through groups. Now there is a shift towards fixed rent tenancy in Bhagwatipur, as landlords realise it is more productive, and for the tenants there are clear benefits in terms of how much profit they can take home. Landlords from Nanour, a nearby village, are now asking Sakhi if they can lease out some land.

### Lessons learned

It is very important to gain the full confidence of all parties, including the landowners, so they can put aside suspicions and see the mutual benefits of working with the groups. In this case, a highly self motivated group may not have been able to get off the ground had it not been for continued efforts at dialogue with land owners with the role of Sakhi as a mediating body. It is important to consider other parties who could mediate in providing land for tenants for future collective formation after the project.

### **3.4 Poor market information for French Beans in Uttar Chakoakheti**

What happened:

What In site no 1 in Uttar Chakoakheti, French bean was introduced. This was one among several high value vegetables which was produced after irrigation facilities were expanded in what was one of the project's more successful farmer groups from West Bengal.

What happened:

As the beans matured, nobody was interested in harvesting the crop. The market rate was 20-30 per kilo, yet one of the group members took it into his own hands, and sold it, but for a meagre Rs 4 per kilo, far below the market rate. This was mainly due to lack of awareness. The group felt that they didn't have time to harvest and sell the crop – nobody took initiative.

Lessons learned:

Learnings are that we should be careful not to give crops which require too much management. It is also really important that farmers are sensitized about market rates, or at least one member of the group keeps track of market trends, so they are not cheated, as happened here.

## **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.

#### **Background**

It is always a challenge to introduce new technology in a new community. The chances of gaining a success seems threatening and a rare possibility to begin with. However engaging with the stakeholders constantly and learning from experience can make the possibility a reality. In Kanakpatti village of Saptari, similar case was witnessed among the 8 member Rajaji Krisak Samuha farmer's group when micro irrigation technology, drip system was introduced.



*Drip kit installed at the intervention plot of Rajaji Krisak Samuha, group 1, Kanakpatti, Photo by: Andrew Reckers*

Prior to the project intervention, farmers from Rajaji Krisak Samuha from Kanakpatti, Saptari practiced conventional mode of farming. For irrigation, they depended on monsoon water. They had limited knowledge on micro irrigation technology and irrigation efficient techniques. Few of the group members had access to tube well and pumps. However, their limited knowledge on efficient water usage constrained them to fulfill crop water requirement and irrigate efficiently.

Similar to the other farmers in the village, the common techniques used was flood and basin irrigation. The indicator of whether the crop has been irrigated adequately was determined through visual measures. For example, if the water applied was visible in soil that too towards the higher end, this was taken as an indicator to sufficient crop water requirement. Farmers believed that the crops would grow well if they can irrigate in abundance. So, they ended up over-irrigating the crops. For few crops such as onion, potato and wheat, furrow irrigation technique was used.

As the project began, under the technological intervention, drip system was introduced in group 1 in small scale. The size of small drip kit was 50 meter square with the capacity of 50 liter drum. One such system suffices for 80 plants. One of the farmer, Janaki Devi Chaudary has planted vegetables such as bottle gourd, cucumber, tomato under small drip system in Rabi 2016/17. For the summer season of 2017, her family has invested in bigger drip system. She has planted cow pea in the field. The size of bigger drip kit is 500 meter square with 1000 liter drum capacity. Under small drip system, she has continued to plant bitter gourd for the summer season.

What went well, and why?

As one of the major objective of DSI4MTF, farmers were introduced with micro irrigation technology such drip kits. Farmers were much to learn as they began using the technology themselves. As the technology was introduced, some members were excited as this was the first time they were ever using drip. While others considered the small drip size, a concern primarily attributing to limited land coverage.

With the purpose of familiarizing farmers with new technology, the initial anticipation of farmers regarding drip system use was substantiated with on-farm demonstration. Installation of drip

system was done in a participatory way. Farmers were guided by the project personnel on the drip system installation. They were advised to use 80 watt solar pump with drip system together.

The initial small drip system usage to irrigate tomato, bottle gourd and cucumber assisted farmers in learning a few things. In the dry season, drip system ensured less water requirement. Sundari Chaudary says *“It requires less effort and saves time. Since water is directly applied in the plant roots not elsewhere, weed growth was controlled”*. Farmers were especially happy with the fact the drip system ensured direct water application to the plant roots. In addition, this eliminated extra labor of farmers on weeding.

Farmers were more aware as they participated in water use efficiency test carried out by project team (which showed water efficiency to 90%). The idea that drip system needs to be regularly cleaned was reinforced for smooth water discharge. Furthermore, women farmers reported drip system is easy to use. Sundari Chaudary says *“I fill the water tank/drum connecting with solar and engage in other work while field is being irrigated. I can either do another work or take rest”*.

Some farmers such as Janaki Devi Chaudary mix fertilizer i.e. urea with water in the drum. Doing this saves her time of manual urea fertilizer application. Fertilizer requirement is also reduced through this method. Janaki shares *“ Instead of 3 kg, 700 gram urea is sufficient for 1 khatta of plot when I use with drip system”*.

Realizing the benefits of drip irrigation, farmers have installed bigger drip system for the summer of 2017. One of the farmer from group 1 Kanakpatti, Sundari devi Chaudary has installed bigger drip and planted chilli crop.



*Drip Kit drum being filled using Sunflower pump, Photo by: Andrew Reckers*

## Challenges faced:



Drip system set at Janaki Devi Chaudary's Cowpea field

Drip irrigation did not catch attention of all the farmers of Rajaji Krisak Samuha at once. Some farmers were not interested initially because of its small size. Drip system of 50 meter square (12\*4) size would suffice only 80 plants. While they anticipated the benefits of drip, size of the drip was considered as a constraint. The small coverage area of drip was an issue put forward since it could not cover the entire plot. With the smaller drip drums, it becomes tedious for farmers to refill the table continuously. This is experienced in the context where solar delivery pipe is short to reach

the drums.

Occasionally, farmers are guided by the conventional visual whim to determine water requirement in the field. Although, drip system is in place, some farmers do not find water application visually convincing. So, along the furrow, they end up using flooding technique instead. Installation of drip is a labor intensive task. Male members from the women household assisted in the process. It is vital for the drum to be placed at appropriate height so the water flow is smooth.

One more issue identified was cost related. Initial cost to purchase drip is high. So, investment in drip by farmers themselves can be an issue. This raises concern for technology adoption in long run. Another issue is that when farmers are out of the sight, village children drink water from the pipe connected to the water tank. This disrupts the water application and flow to the field.

## Lessons for the project:

Experience is the biggest teacher. This is rightly reflected among group 1 farmers of Kanakpatti. Farmers who were initially not willing to go for drip, having seen benefits of the system in other farmers' field have started using it. Having realized that small size drip can perform better when upgraded to a bigger system, some farmers such as Janaki and Sundari have replaced with the bigger drip systems. The need to use appropriate size of drip is realized. Doing so addresses two

issues: more land coverage and reduction in labor to refill the tank. In the upcoming summer season, other farmers are also showing interest to co-invest in bigger size pumps.

The initial cost of drip system is high. Hence the adoption of drip system by farmers purchasing themselves can be difficult. However, upon discussion on the possibility of financing drip system, by farmers, some were positive while others are not interested.

For technologies such as drip system to be successful, engagement of primary stakeholder i.e., farmers is vital. It helps in assessing the suitability of the technology and ultimately the continuity of technology usage. Farmers should be engaged more on the activities such as uniformity test of the drip system. Such practice helps to boost the confidence of the farmers through practical technology usage and effectiveness of the system.

Human and technology aspects should be taken side by side for new technology adoption a success. Although success is not a final destination we arrive at. It is a work in progress and a continuous process. For the farmers of Rajaji Krishak Samuha from Kanakpatti, day to day drip system usage is helping them ease irrigation process. At the same time, they are learning as they use the system day by day.

#### **4.2 Establishing mains electric pumping in Koiladi**

##### **Background**

Availability of water technology alone does not guarantee successful agricultural production. Both technical and socio-cultural dimensions should be considered for the technology to be adequately accessed and utilized by all. When we look at one of the intervention group, Shiv Parvati Krishak Samuha at Koiladi, similar observation can be made.

Shiv Parvati Krishak Samuha comprises of 6 members in total with 4 women and 2 men. Before the project, poor financial condition of the group members prevented them from purchasing water pump for irrigation. So, the farmers used to cultivate paddy in the monsoon season followed by wheat and potato. Monsoon water helped the farmers irrigate paddy. Canal had water for a few months following monsoon and a few farmers could use it. During Rabi and summer, renting the pump for Rs. 150 to Rs. 250 for an hour was expensive and unaffordable to most of the group members. As a result, vegetable was planted in the kitchen garden merely for consumption purpose.

What went well, and why?



*One of the group member demonstrating pump use at site 1, Koiladi, Saptari*

With the project intervention, an area of 0.8112 hectare was leased by the members of Shiv Parbati Krishak Samuha. Group members were excited to receive 1 tube well and 1 electric pump in the intervention plot. Farmers have started cultivating vegetable for the first time in Koiladi. Availability of the pump did not only ensure access to water in dry season but extended the prospect of enhancing their livelihood through commercial vegetable farming. Both men and women farmers were trained on electric pump and delivery pipe usage. In Rabi 2016, they cultivated cauliflower, cabbage, onion and garlic.

To systematize irrigation usage among the members, the group made irrigation schedule with the support from the project personnel. Initially 1 day was allocated to 1 member for irrigating respective plot. As the farmers started following the schedule, they realized that more than 1 farmer could easily irrigate

their crops in a day. Hence they have modified the water allocation schedule accommodating two farmers in a day. The schedule is still flexible to accommodate more farmers than 2.

Which technologies have faced problems? Why? Were challenges technical or social?

Despite the expectation of the group members from the pump, the installation of the pump had a rocky start. Before the pump installation, an application had to be submitted to Electricity office at Hanumannagar for electric meter. Despite fulfilling all the procedures and regularly visiting the Electricity Office, there was 2 month delay to get the permission. Finally with the support from the project personnel, 1 phase electricity meter was connected. An electric pump of 3.5 hp was installed.



*Pump at siye 1 Koiladi, Saptari used to irrigate the intervention field*

Anticipation of the group members that everything would go smooth after the pump installation was challenged when the pump broke down in two instances. The first time, there was an issue with the pump's washer shield. It was broken in the monsoon of 2016. It was repaired at Rajbiraj, the district headquarter.

In Rabi 2016, there was again another issue with the pump check valve. A mechanic from Rajbiraj was called in the village through the support of project personnel. When the pump required repair, the group members were reluctant to call for mechanic and depended on field officers to do so. The initial repair cost was borne by the project but some members still expect to receive financial support if such issues arise in future. However, some women members are willing to collect money or contribute from the monthly saving fund.

Water access and utilization is not only determined by technical factors, social aspects take a center stage. The question of "who accesses the pump" is surrounded by beliefs shaped by traditional gender roles. Everyone in the group is allowed to operate the pump but the perception of "irrigation activity as the domain of men" still reflects in some of the group members. Shiv Kimar Mandal, one of the group member holds such reservations. He is an experienced farmer in comparison to others and has some knowledge on repair and maintenance of the pump. However, he is not convinced that women in the group can operate the pump well. According to him, the knowledge of merely switching the pump on is not enough. He says, "*How can women operate the pumps? Women may damage the motor ("motor jalaila sakbi"). If motor does not draw water after the switch is turned on, they will not know what to do.*" He adds, "*I know what to do. If the motor does not draw water after I switch it on, I check the motor fan, I use a stick to rotate the fan and switch the machine back on*". Uprooting such culturally produced belief is a gradual process. Through the irrigation related training to both the sexes, women have started challenging such opinion. One of the women member, Jaja Devi responded to Shiv Kumar's remark as, "*Women are operating pumps by themselves now, how can you say we cannot do it?*" She adds, "*As we learn more, we will be able to do it*". Triggering such thought process is a start to move beyond water availability towards equitable access and fair utilization of the pump.

Lessons for the project:

For the groups to be self-sufficient and ensure smooth functioning in long run, farmers have to assume the ownership of water infrastructures. From project perspective, it is vital to manage expectation of the farmers. The group fund should be mobilized to carry out repair and maintenance work. It is also important to develop skills among the group members to do such tasks. In days to come, training plan has to incorporate pump operation as well as repair and maintenance.

Implication of traditional gender role can be observed when it comes to carrying out irrigation related activities. Although, the group is part collective where they share water infrastructure, inputs contribution and lease land collectively, they farm individual plots. Farming individually means the task of irrigation is done by individual farmer. In this context, the lack of trust in part of male farmers on women can be problematic. Through continuous community engagement, cultural and traditional gender stereotypes can be eroded. Meanwhile we have to understand, it is a gradual process. A women starting to challenge traditional irrigation role is definitely a start.

#### **4.3 Drip and sprinkler irrigation is changing gender roles in Bhatwatipur**

##### **Background**

Farming is considered as men's activity and whenever we ask who the farmers are, 100% answer is the name of male members from the family. With the initiation of the project of DSI4MTF in Village Bhagwatipur of Andhrathari block. Two groups started as cooperative farming group. In the first year both the groups is dependent on the male members for the activity of land preparation, fertilizer management & irrigation. Male members used to give time as per their convenience which delays their activity and sometimes memebtrs have to suffer from loss.

What went well and why?

With the introduction of the drip, sprinkler and solar operated irrigation equipment now the women farmers of the group number 4 is doing all the farming activity on their own. Previously, the men were required to start the diesel pumps and lay the pipes – very physical work which requires practice. Now with the drip system which is solar based, it can be started by pressing a button.

Fertilizer application is also easier. Because it is a drip and sprinkler system, fertilizer can be added to the drum, and they do not need to apply by hand – this saves a considerable amount of time and labour. In the initial period of installation of the equipment they have hesitation regarding use, operation and management of the equipment but after their capacity built on operation, management of the irrigation equipment they started all activity of farming on their own.

During this dry season all the agriculture activity at the field level as well as off the field level is done by the 5 women's of the group and within last 5 months these members distributed profit of Rs 3000 each and they have 8000 in their box for this year agriculture activity.

Lessons for the project:

A key lesson for this project is that there are complex constraints which can hinder the success of particular technologies for women farmers – these include the dependence of women on men for certain activities relating to a system. Drip fortunately addresses some of these concerns, but constant monitoring is necessary.

#### **4.4 Technology case study 2: Ridge and furrow**

##### **Background**

In Bhagwatipur village, farmers are cultivating potato as a major vegetable crop which was mainly for their own consumption. They use the local (landraces of potato) varieties of potato having small sized tuber but with high keeping quality (shelf life) without refrigeration. Potato was cultivated on flat bed without applying irrigation water. Residual soil moisture was the major source of water for potato. Farmers purposefully skipped the irrigation to avoid stagnation of irrigation water in the field. Water stagnation on the flat surface was responsible for reduced shelf life and early rotting of potato. This practice of less or no application water resulted in significantly lesser yields of potato (<11000 kg/ha). Convincing the farmers to apply irrigation to potato crop was a major challenge. There was a need to address this issue to improve the yield and profitability of the potato cultivation in the region.

DSI4MTF project team decide to provide the complete agronomic guidance to the farmers and demonstrate the effect of better planting practices in potato cultivation. At many locations in India potato is being cultivated on the ridge and furrow method of plantation with water application in the small furrows formed in between these ridges. The ridges are typically about 15-20 cm wide and raised to a height of about 20 cm, while the furrow is 10-15 cm wide meant for water application. This intervention on this ridge and furrow cultivation of potato started from the Rabi season (Oct-Feb) 2015-16 in Bhagwatipur. The project team informed the farmers about this technique of potato plantation. The process of land preparation and techniques of potato plantation were explained to the farmers highlighting the potential benefits of ridge and furrow technology. Farmers were sceptical about this technology because ridge and furrow left more space unutilised. They were of the opinion that reduced plant population will reduce the yield and will incur economic loss. After so many farmers' meetings and rounds of discussions, the project team could succeed in convincing the farmers about adoption this technology. Farmers started cultivation of potato with ridge and furrow method of plantation. Many other farmers who were not part of this intervention, commented like you people harvest handsome amount of potato crop. But the change in technology on potato plantation, provision of improved

seed and application of irrigation water led to good harvest of potato. The potato yields of up to 11000 kg/ha were observed from the intervention plots. Those who commented (negatively) on the ridge and furrow technology have now started appreciating it. Farmers realized the potential of ridge and furrow system and this positive message spread among the farmers. This led to an overwhelming response from the farmers as during the Rabi season of 2016-17, the entire potato in the village was cultivated using the raised bed technology.

Given the installation of drip irrigation systems, farmers believe that if potato is grown on raised beds with drip irrigation system can further improve potato yield. Farmers of site-1, site-2 and site-4 are ready to take up this option and will grow potato on ridge and furrow with drip system in the next Rabi season 2017-18.



*Figure 1 Potato on ridge and furrow*

What went well, and why?

We cannot say that this is new technology demonstrated to farmers. Only changed their mind set that, although it appears that there is more unused land in case of ridge and furrow, the changes in the soil micro-climate due to improved aeration under ridges led to better potato yields. Adoption of improved varieties also contributed increased potato yields. This went well because farmer compared their own technology with the improved technology simultaneously, and could visualize the impact.

Which technologies have faced problems? Why? Were challenges technical or social?

Right now ridge and furrow technology have no major problem. Only problem is that scientifically designed ridge maker is not available in local market or with service provider. Ridges and furrows are made manually with the help of spade. This leads to slightly oversized furrows. But this increased furrow width had little impact on potato yield. Earlier villager challenged our technology but later same farmers adopted our technology.

Lessons for the project:

On-site demonstration of appropriate technologies and showcasing its potential benefits on their own field leads to large scale adoption. This particular case study highlighted that even small technology change can bring big change in the society. So our focus should be on the need based and farmer friendly technologies which will be adopted easily.

#### **4.5 Expanding groundwater access in Mahuyahi**

##### **Background**

In Mauahi village farmers cultivated paddy during Kharif season and Rabi season crops like wheat, lentil, lathyrus and linseed after paddy crop. Except wheat, other rabi season crops were not provided with irrigation as the residual soil moisture after the harvest of paddy was sufficient to meet their water requirement. Lentil, lathyrus and linseed were cultivated as relay crop (paira crop) i.e. these crop were sown before the harvest of paddy crop, however their spatial extent was very small. During summer season, the extent and sowing time of moong bean depends on the pre-monsoon rains in the month of Mar-Apr. Absence of rains during these months precludes the sowing of moong bean. Kharif paddy cover 95% of the cultivated area, during rabi season approximately 50-60% area is covered with wheat and pulse crop and in summer season approximately 20-30% area gets covered under pulse crop. Sowing of wheat is by broadcasting method likewise row-row and plant-plant spacing was also no maintained in case of paddy crop. For paddy they are totally depend on rain and surface water from unfinished canal. Because of dependency on monsoon, delay in paddy sowing often leads to delay in the overall crop cycle. Due to delay in transplanting of paddy leads to a delay of 25 days in the sowing of wheat crop. In the event of delayed wheat sowing the groundwater level goes down such that only one irrigation is possible for the wheat. Under such conditions, farmers could apply only one irrigation after germination of wheat. They use check-basin for wheat crop irrigation. Improper root and canopy development leads to drastic reduction in wheat yield.

##### **Intervention of DSI4MTF project**

From Project one diesel engine provided for both the group and installation of two shallow tube well for improving the irrigation facility to farmers of both the group. Earlier they hire the diesel engine at the rate of Rs.120/- per hour. But now they pay only diesel, oil and maintenance cost

that comes around Rs.50/- per hour. This reduce the cost of production. Farmers also given training on maintenance of diesel engine i.e. in how many hour of machine run they will change the engine oil and how to increase or decrease of RPM will affect the fuel consumption rate.

Our intervention started from Kharif 2016 in this village, we intervene in line sowing/transplanting of paddy and farmers compare the result of line transplanting and their conventional method of transplanting and found that yield is better in line sowing as compared to their traditional method of transplanting.

In rabi season we intervene in line sowing of wheat, line sowing of lentil in paddy as paira crop. We also introduce potato crop on ridge and furrow. Line sowing of table pea and maize crop was also introduced in our intervention area. Potato crop on ridge and furrow and pea crop in line sowing perform well while maize also perform well up to cob initiation stage later there was insect attack on maize crop leads to no proper grain filling.

We also introduce drum-kit drip irrigation system in our intervention site. But farmer not maintaining it properly. The major reason for not using the drum-kit is the lack of water filling facility at the site. Due to the major threat of theft, the concerned farmers are not keeping his pump set at the nearby tube well which was supposed to be used for filling of the drum. Absence of water in the drums is making farmer less interested in this system and not looking after. The empty drum placed on the elevated platform is more prone to damage by regular storm. Farmers are also not willing to lay the laterals in the field because of the theft threat. Also, the farmers selected for in this area are not regular farmers. They were the youth group and out of group of four, two have already migrated from the village.



*Transplanting of paddy crop*

What went well, and why?

Line sowing/transplanting of paddy and wheat, growing potato on ridge and furrow and line sowing of pea went well. Because this gives better yield as compared to their own traditional method of agronomical practices

Which technologies have faced problems? Why? Were challenges technical or social?

Initially farmers criticise about the agronomical and irrigation practices advice or practices by us. But after seeing the overall results, some other farmers come forward and asked for similar interventions and advice. Farmers face problems in maintaining the drum-kit drip system, because of distance of water source from the drum-kit plot and lack of interest due to less use during wheat crop in the system. The site selection for the location of the drum-kit was not appropriate. All the plots at this site get wheat as the second crop after rice or moong. All the crops like, rice, moong and wheat have limited applicability of the drum kit irrigation system. This led to lack of interest from the farmers in this particular technology at Mauahi village. The challenge is social to retain the members of the farming group and also technical, to train the newly inducted members about this technology and suitable cropping systems.

Lessons for the project:

We need to provide field training to farmers on regular basis. We need to install the equipment as per the required season where the farmers could find the use. Selections of the sites for intervention should consider the cropping sequence to be practiced in the area.

#### **4.6 Solar pump installation in Uttar Chakhoakheti**

##### **Background, what went well and why**

Solar installation and shallow tubewells we installed in 2016. There was no irrigation facility available before and land used to be fallow in the winter. Now potato has been planted for the first time, and mustard planted as well and it turned out well. Solar does not incur an additional operating cost, although the upfront costs are high. Solar is easy to operate and there is no hassle. It also saves considerable time, as farmers operating the pump and can be involved other activities while land is being irrigated. Now farmers are able to start farming early: for example paddy land preparation was done in advance- for next season, they can start early vegetable and get good price- for nearby farmers this is not possible. Another benefit is that water used from the solar systems can be used for drinking as well.

Challenges which were faced:

There were however challenges upscaling the systems in Uttar Chakoakheti. It is an expensive system and thus it will be difficult for other farmers to take it up without a significant drop in the price. Farmers also found it challenging sometimes to irrigate given that water can only be extracted during the sunlght period, and even with cloud, discharge can be low. Repair maintenance can be difficult if any problem arises as there is no manpower in the village who know how to repair solar systems.

Lessons for the project:

Solar has considerable potential, and can be utilized most effectively with proper crop planning, and if it can be used to irrigate a larger area – at present it is not being used to its full capacity in terms of command area, and thus they are not receiving an optimal return. One option is to sell water to nearby farmers to raise funds for the group, and this is taking place in group 3 of Uttar Chakoakheti, with a group of affiliate members who are not part of the production group who also use the water. Storage tanks could also be made to use water for irrigation when there is no sun, it is also important to look into options to supplement the solar with another energy option such as mains ppower, during periods of low sunlight. More efficient water usage should still be promoted because farmers may use more water because it is free.