

**CGIAR Research Program on  
Climate Change, Agriculture and Food Security (CCAFS)**

**Village Baseline Study:  
Site Analysis Report for Bihar - Vaishali,  
India (IN1640)**

**February 2014**

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The tools and guidelines used for implementation of the village baseline study across all CCAFS sites, as well as the mapping outputs at a higher resolution can be accessed on our website (<http://ccaafs.cgiar.org/resources/baseline-surveys>).

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## Abstract

This is the report of the village baseline study of Mukundpur village in the CCAFS benchmark site of Vaishali, India conducted from December 12-14, 2012 to compliment an earlier household baseline survey done in the same district. Vaishali is a district in Bihar state.

Mukundpur is located in a highly populated and resource poor area with small landholdings, largely dry natural ponds, and underdeveloped infrastructure. The population produces and markets predominantly rice, wheat and milk. Potatoes, oilseed, fruits and vegetables are also grown and sold to a lesser extent. Farmers have typically benefited from Mukundpur's good, flat, fertile land. However, not all portions of the population have food and livelihood security given a lack of resources and declining crop and dairy productivity. Some are receiving government food rations while others are seeing lower profits. Population pressures and climate change are seen as the drivers of increased vulnerability. The groups have a vision for their community in which productivity and income generation opportunities are improved, water availability for irrigation and drinking is expanded, and education and technology access grows.

Men and women identified 21 organizations supporting agriculture, livestock, microfinance, education, food distribution and community development. The majority of identified organizations are government entities or programs, while community and non-governmental ones are rarer. The groups complained of corruption, irregular service, performance dissatisfaction, and unequal allocation of resources. The main focus of food security related organizations is dairy production and marketing, access to inputs, crop production, food distribution and weather based crop insurance. There are essentially no permanent institutions working solely on food security, however those identified support all aspects of food security, with food availability the most common. No organizations are working specifically in NRM other than those working in livestock and agriculture. NRM related activities of those identified include provision of inputs, trainings and tree saplings in addition to climate change education by a Climate Smart Village program.

Men and women identified numerous sources for information on weather, agricultural production and marketing, seeds, fertilizers and pesticides. A total of 8 sources were reported, however the most popular were friends and relatives, followed by neighbours and observation. Though the population is facing production constraints for crops and dairy, very few sources were noted for agriculture and none for livestock, particularly for men.

Recommendations focus on addressing water availability and access, improving crop and dairy productivity, and mitigating climate change impacts to maintain food security and livelihoods. Ultimately, Mukundpur requires improved access to knowledge and resources. The population needs regular, targeted, equitable and timely assistance from local organizations that more directly address the area's food security and natural resource dynamics.

## Keywords

Baseline; India; village study; participatory mapping; organisations; access to information

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## Introduction

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic ten-year partnership between CGIAR and Future Earth to help the developing world overcome the threats posed by a changing climate, achieve food security, enhance livelihoods and improve environmental management. In 2010, CCAFS embarked on a major baseline effort at household, village and organisation levels across its three target regions, namely East Africa, West Africa and South Asia (more information about CCAFS sites is available on our website <http://ccafs.cgiar.org/where-we-work>). CCAFS trained survey teams from partner organisations in the three regions to conduct the baseline.

The baseline effort consists of three components – a household survey, village study and organisational survey. The household baseline survey, a quantitative questionnaire on basic indicators of welfare, information sources, livelihood/agriculture/natural resource management strategies, needs and uses of climate and agricultural-related information and current risk management, mitigation and adaptation practices, was implemented by CCAFS partners in 35 sites (245 villages) with nearly 5,000 households in 12 countries to date. CCAFS partners are implementing village baseline studies (VBS) and organisational surveys in one out of the seven villages within each CCAFS site where the household survey was implemented. The plan is to revisit these villages in roughly 5 years, and again in 10 years, to monitor what changes have occurred since the baseline was carried out. The goal is not to attribute these changes to the program, but to be able to assess what kinds of changes have occurred and whether these changes are helping villages adapt to, and mitigate, climate change.

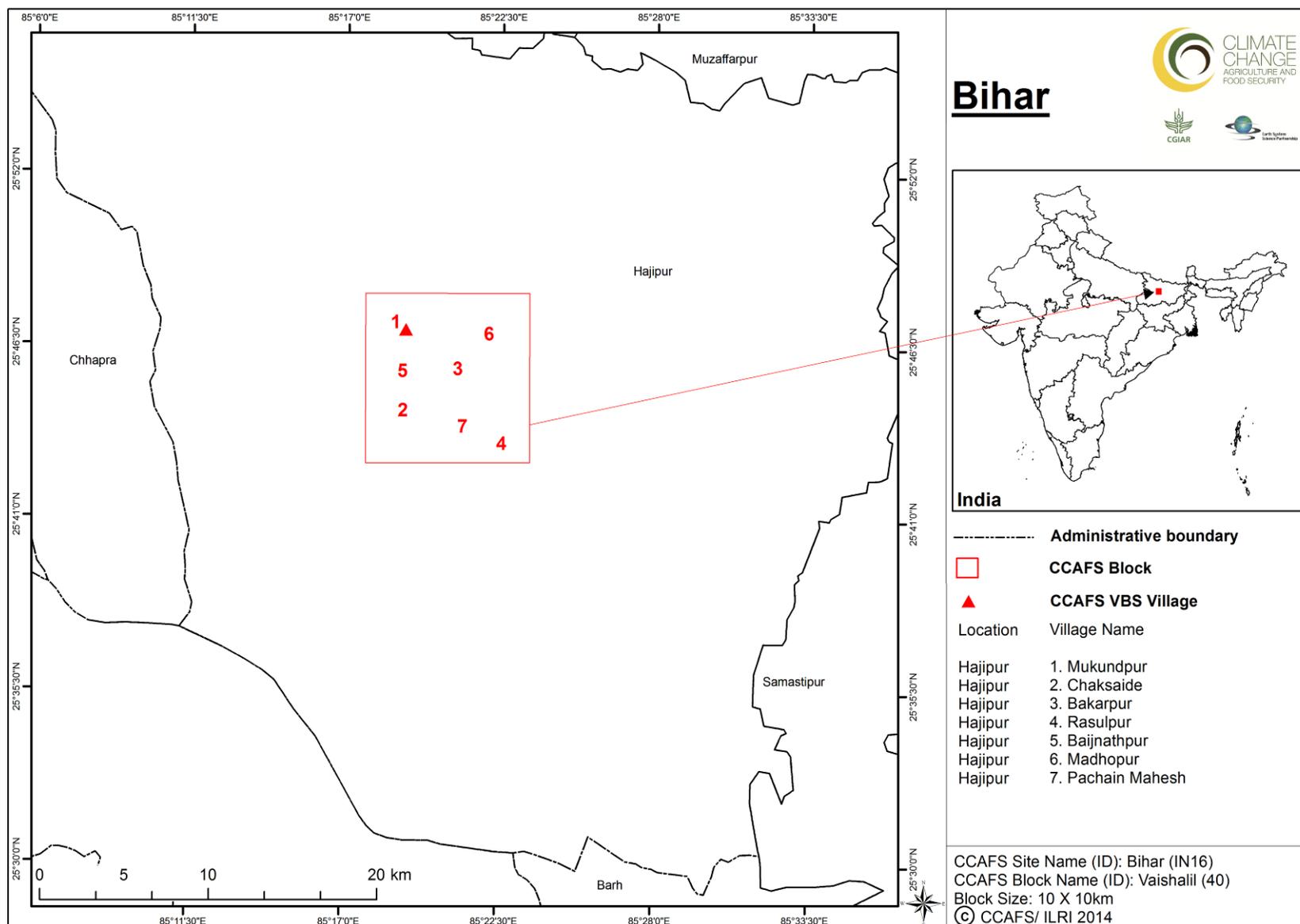
The focus of this site analysis report is the VBS. To date, seventeen VBS were conducted. The VBS aims to provide baseline information at the village level about some basic indicators of natural resource utilisation, organisational landscapes, information networks for weather and agricultural information, as well as mitigation baseline information, which can be compared across sites and monitored over time.

The objectives of the VBS are to:

- Provide indicators to allow us to monitor changes in these villages over time. In particular, changes that allow people to
  - Manage current climate risks,
  - Adapt to long-run climate change, and
  - Reduce/mitigate greenhouse gas emissions
- Understand the enabling environment that mediates certain practices and behaviours and creates constraints and opportunities (policies, institutions, infrastructure, information and services) for communities to respond to change
- Explore social differentiation:
  - Perceptions of women and men will be gathered separately to be able to present different gender perspectives.
  - Focus group participants will be selected to present perceptions of groups differentiated by age.

The detailed tools and guidelines used for the implementation of the VBS across all CCAFS sites, as well as the manuals, data and analysis reports can be accessed on our website (<http://ccafs.cgiar.org/resources/baseline-surveys>)

Map 1. Location of the Mukundpur village in the CCAFS benchmark Vaishali site, India



This report presents the results of the VBS conducted on December 12-14, 2012 in the village of Mukundpur, India (Vaishali site) (Map 1). Vaishali is a district in Bihar state, whose state capital is Patna. The Mukundpur location was selected for the village survey following completion of a household survey in the same district and because of its relative central location in the block. The survey team was composed of two facilitators, two note takers and two translators. Each pair was male and female. Consultations were made with the village authorities concerning time and place of meeting. They selected an appropriate venue in Mukundpur for the meeting.

Invitations were sent out by the site team leader to three sets of participants who were chosen using random sampling. Each group was composed of 15 men and 15 women. Three consecutive days were selected for the survey and on each day only one set of participants were expected to participate in the survey. The whole community was invited on the first day of the survey for an introductory session where this survey was explained to and results of an earlier household survey shared. After the introductory session the rest of the community was set free and only the invited group of 15 men and 15 women remained behind to carry on with the survey. This was repeated at the end of the third day when the survey was completed. The whole community was again invited to attend a debriefing session where summaries of the findings were shared.

The survey used participatory methods of data collection. Throughout the data collection process groups of male and female members of the community worked separately. This was to allow for collection of gender-differentiated information.

The task on day one was to introduce the community group to a satellite image of the block and work with each group to identify and map/sketch resources that are important to the community, their current state, their past state and what caused the changes. The outputs were maps and sketches. The process of working with the community to identify the resources that are important to them depended entirely on how well they were able to understand and interpret the image.

The task on day two was to work with each group to understand the organisational landscape and the links that exist between the organisations in relation to food security in a normal year, in a year of crisis and in relation to natural resource management. The outputs were diagrams showing the organisational landscape. Information on each organisation was also captured cards. The links between the organisations were shown using lines and arrows on the diagrams.

There were two main tasks on day three. One was to work with each group on understanding information networks in relation to weather elements and farming activities. The outputs were diagrams. The second task was to bring the two groups together and generate a vision of what the community would like their village to be like in the future. The output was a map/sketch showing “the vision of the community.”

Information generated from the survey was captured on sketches, maps, flip charts, information cards and notes, which were brought together in an initial debriefing and ultimately this final report. Photographs were also taken of all the activities and information generated at each stage. The survey materials were then labelled and packed for off-site processing. The debriefing report was prepared in the field so that it could benefit from the presence of the site team. The photographed sketches and maps were inserted in the debriefing report. In this site analysis report proper maps and diagrams derived from the field outputs replaced them.

## Data analysis

### Topic 1: Community resources - participatory satellite imagery interpretation and visioning

Community infrastructure and resources and gender-differentiated access and utilisation of those resources have been analysed, based on a process of participatory visual interpretation of high resolution satellite imagery (RapidEye). The aim was to create a basic understanding of existing community resources, as well as of community dynamics in relation to its environment. The participants discussed the current state of those resources, in terms of quality, access, management, history and potential drivers of change. Later on, a mixed group developed an image of village resources and human well-being into 2030 to understand opportunities, constraints and aspirations for the future. The detailed approach to this exercise is outlined in the CCAFS Village Baseline Study Implementation Manual (follow the link to the baseline study from our website <http://ccafs.cgiar.org/resources/baseline-surveys>).

#### A. Current resources

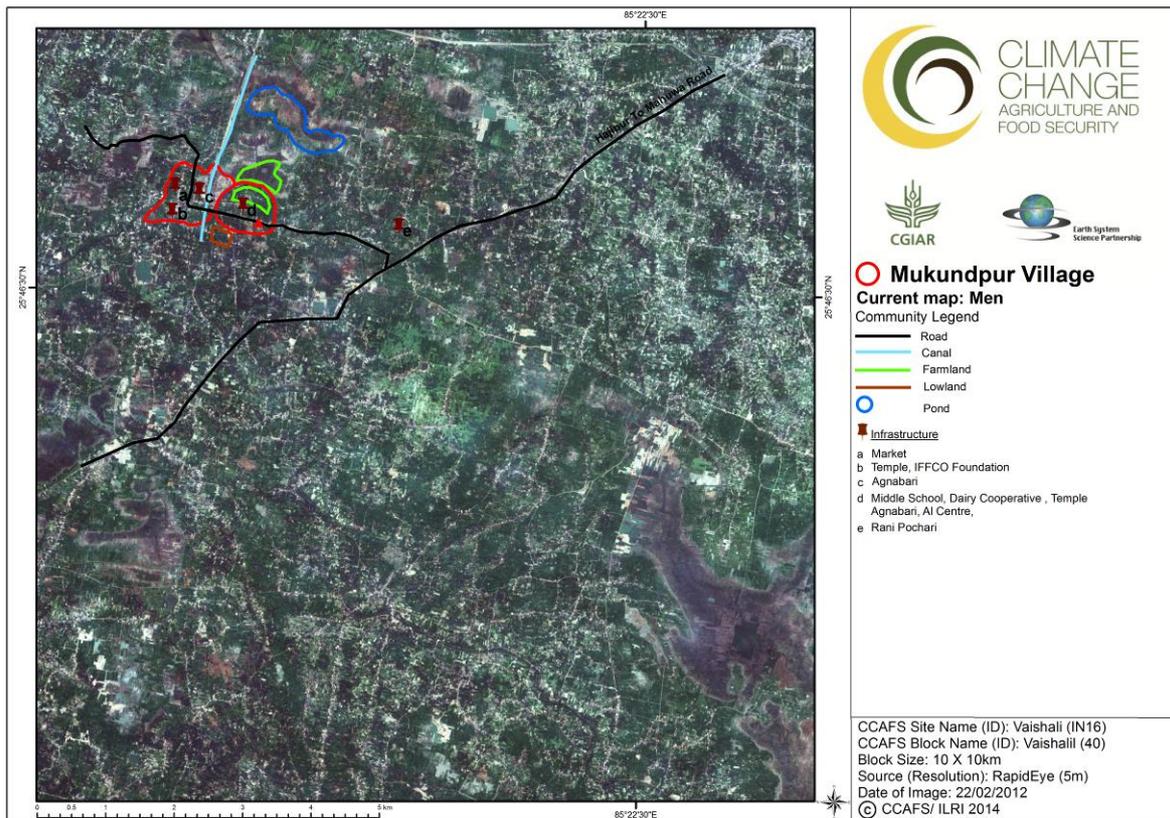
Separate meetings of male and female participants took place in Mukundpur. To begin the identification of community natural resources and infrastructure, groups generated initial diagrams on the floor as a basis for discussion and consensus before final versions were transferred to flipcharts by the research team (Photo 1). Following this activity groups were shown satellite imagery of their region to compare and confirm their maps. The appreciation of scale was important for participants to get their bearings. The exercise could not be rushed and took a few minutes, but both groups were ultimately able to identify key features from the images.

Photo 1. Current conditions mentioned by women regarding natural resources and infrastructure



Maps 2 and 3 represent the current conditions in the community regarding natural resources (water, forest, grazing, farmland, degraded land) and infrastructure (roads, markets, education, health) according to, respectively, male and female participants. The maps lay out information prepared by the community participants super-imposed on a satellite image.

Map 2. Men's map of current community resources



Map 3. Women's map of current community resources

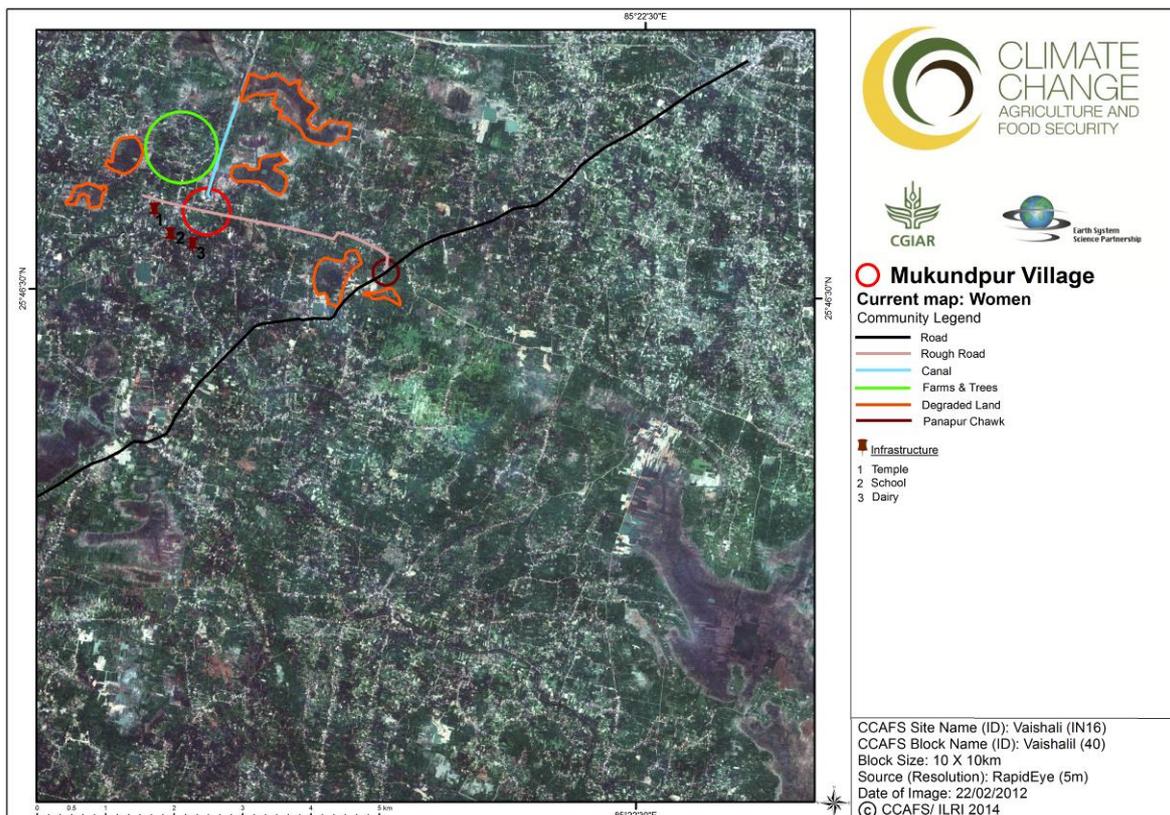


Table 1. Summary for Layer 1: current conditions, as perceived by men (M) and women (F)

Land cover class	Community determined land use	Location Names	Current state (quality)	Time to resource	Mgmt and ownership issues	Environmental Benefits	Opportunities	Limitations
Large Ponds – Over 50 acres (M)		Mukundpur	Water available for 2 months before ponds go dry	10 – 30 minutes	Private	Greenery due to some grass and weeds	Once ponds are dry farmers grow mung bean, winter wheat and sesame	No longer functioning as a pond. It's now a low area mostly full of silt and sand
Small Ponds – Under 50 acres (M)		Mukundpur	Water available for 2 months before ponds go dry	10 -3- minutes	Private	Greenery due to some grass and weeds	Once ponds are dry farmers grow mung bean, winter wheat and sesame	No longer functioning as a pond. It's now a low area mostly full of silt and sand
Ponds (F)		West of Mukundpur	Existing	30 – 40 minutes			Washing, bathing and other daily uses	Cannot be used for irrigation, fishery, or drinking purposes
Secondary School (M)	Education	Mukundpur	Medium	½ Km	Government	Access to education	Producing educated people	Poor resources
Secondary School (F)	Education	West of Mukundpur	Functional	10 – 30 minutes	Government and community			Not extended to higher education
Wells (M)	Irrigation water	Mukundpur	Now deeper than 100 - 120 feet	5 - 15 minutes	Private	Irrigation for growth and development of plants	Better production	Cost of production getting higher
Canal (F)		West of Mukundpur	Dysfunctional	20 – 30 minutes				Source of pond water and cannot be used given damage

Land cover class	Community determined land use	Location Names	Current state (quality)	Time to resource	Mgmt and ownership issues	Environmental Benefits	Opportunities	Limitations
Roads (M)	Transportation	Mahuwa and Mirpur Patad-Saray roads	Dirt	Passes through village	Government		Transporting crops to market	Not paved
Roads (F)		Mahua road	Functional	5 – 50 minutes				
Temple (M)		Mukundpur	Poor	5 – 20 minutes	Community	Trees around temple	Community support for CCAFS efforts	Only for religious purposes
Temple (F)		Mukundpur	Functional	10 – 30 minutes	Community		Faith based	
Farmland (M)	Crop production	Mukundpur	Good land quality	10 – 20 minutes	Private	Increasing greenery and improving soil organic mater	Can grow C4 crops and soil sequestration	Scarcity of irrigation water
Farmland (F)	Multiple	Scattered	Small but functional	1 – 40 minutes	Private		Access to food	Production for consumption not sale
Mukundpur Hat Baazar (M)	Crop marketing twice a week	Mukundpur	Poor	10 -20 minutes	Community		Improving infrastructure and market linkages	Resource constraints
Electricity Lines (M)	Electricity	Mukundpur	Wiring good but managment poor	In village	Government	Minimize use of firewood	Can be used for agroprocessing and value addition of farm products	Load shedding
Forest (M)	Mango, guava, litchi and bamboo	Mukundpur	Good	10 – 15 minutes	Private	Helps improve the environment	Upscaling and replicating elsewhere	Poor technology

Male and female participants provided the following information on their community's resources, including infrastructure (building on Table 1).

**Natural Resources:** There are limited natural resources in Mukundpur. The community has no forest, river or grassland. Natural ponds exist but now only have water half the year.

**Water:** Agricultural production is predominantly rainfed with additional water coming from tube wells. There are some 15 wells in Mukundpur specifically for crop irrigation. An irrigation canal west of the village is not functional. Rainfall has been decreasing over the last 10 years, which has made farmers more reliant on wells. As a result, production costs have increased, crop productivity has declined and the water table has lowered. Well depth is increasing each year to reach water, which is now down to 100-120 feet. Large and small ponds are also prevalent in Mukundpur, however they are dry half the year and not used for irrigation. The pond water is used for household needs as well as drinking water for animals. Farmers tried fish farming but there was not sufficient water. Farmers do plant mung bean, winter wheat and sesame in the beds of ponds once the water dries up.

**Farming:** Farmers are mainly doing rice paddy and wheat farming using few high yielding varieties and chemical fertilizers. Mukundpur's other main agricultural products are potato and oilseeds. Some farmers grow mango, guava, litchi and bamboo around their homes. Most of the production is for household consumption, with surpluses being sold during high seasons. Some vegetable production is also undertaken and sold in the village market twice a week. Farmers with livestock may also grow fodder crops for feed as well. Farmers have typically benefited from Mukundpur's good, flat, and fertile land. Cow dung has some use as fertilizer but is also used as an energy source for cooking.

**Livestock:** Some farmers have cows and buffalos for milk production, which is used for home consumption and sale. The majority of the surplus milk is sold to the Sudha Diary Cooperative in the village. Farmers noted they are losing money since the milk production level is quite low. The government provides farmers with artificial insemination facilities but other services are limited.

**Land:** Bihar is the third most populous state in India with a population density of 1102 person/km<sup>2</sup>. The Vaishali district shares similar attributes and has a population density of 1335 person/km<sup>2</sup>. Land holdings are small given population pressures.

**Infrastructure:** Black topped roads are in good condition connecting the village with the highways leading to Patna and beyond. Roads inside the village are not paved and are in poor condition. Electricity is available in the village 2-4 hours a day. Diesel running grain mills are also located in the village but are expensive.

**Schools:** There is a secondary school in the village, however the education provided is sub standard. Colleges are far away which limits availability of higher education for youth. The colleges are reported to be unsafe for girls.

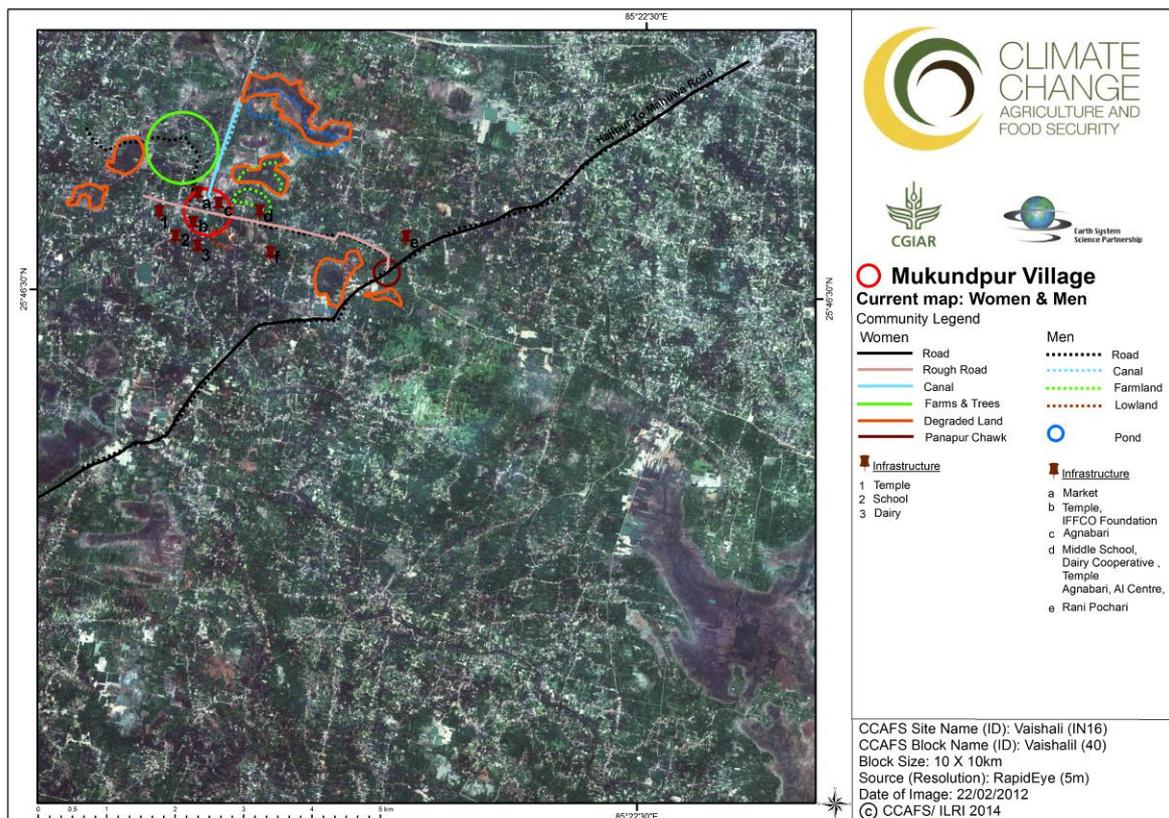
## **B. Gender-differentiated comparison of current conditions**

As seen in the table above, the views of male and female village members regarding present resources are similar except for a few differences. Men and women both noted ponds as sources of water, but men also mentioned wells while women mentioned the canal. Both groups listed farmland, roads, schools and temples. Men and women discussed issues with milk production. Men also noted the local market, electricity lines and trees used for fruit production. Education seems key to the future success for the men and women of Mukundpur and was discussed by both groups. Limited health services and electricity were also important issues highlighted by men and women.

Women in the village work within the home but do some activities such as rice transplanting and grain cleaning as well as cow dung collection and preparation. Men are largely concerned with field preparations, marketing and local or regional official business. Women have limited mobility and do not travel far from the village for education or markets due to security concerns. Most of the older women in Mukundpur are illiterate whereas most men are literate. Given these dynamics, women are more interested in education opportunities for children while men are more concerned about roads and transport. During interviews, women were shy unlike the men and had less confidence within group

settings. Women were particularly not talkative in front of men, however they made their opinions clear.

Map 4. Overlay of current conditions, comparing men's and women's maps

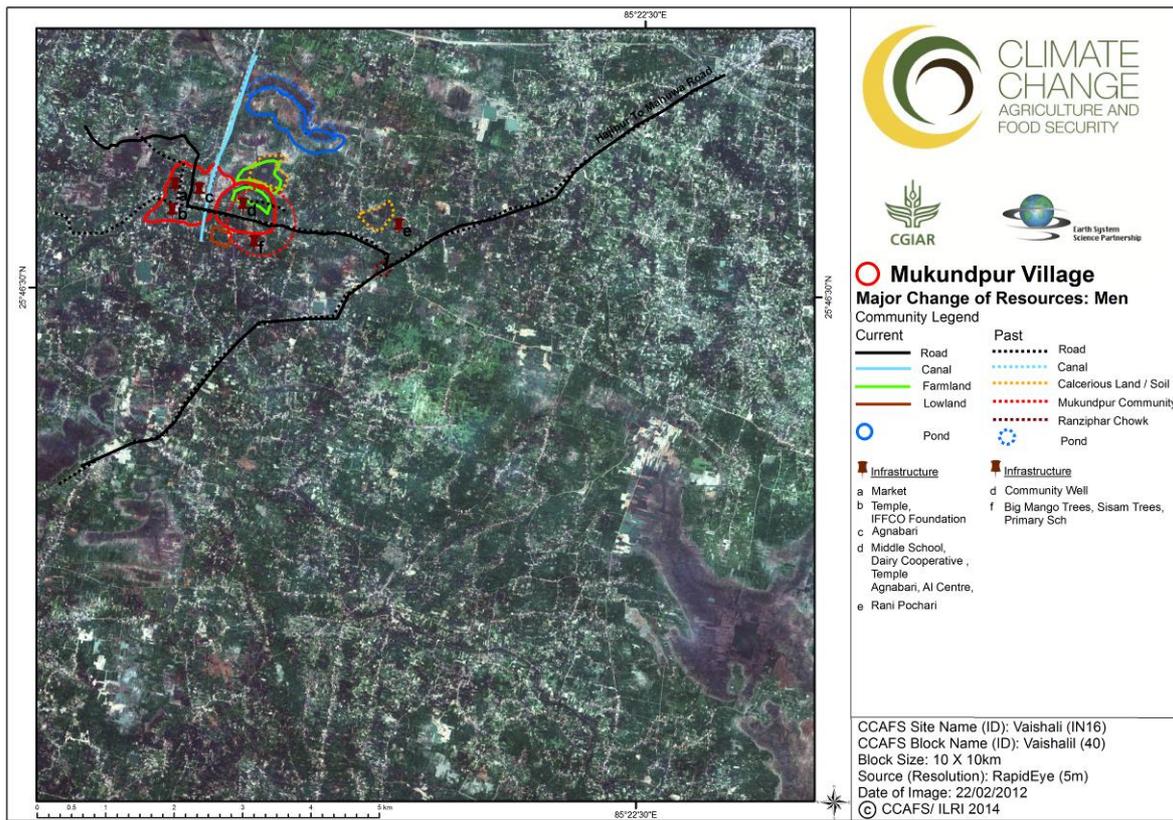


### C. Major changes of resource conditions

Maps 5 and 6, and Table 2, show the most relevant changes in community resources as expressed by male and female participants.

The men reported there used to be some forest consisting of big mango trees in and around Mukundpur. The forest used to provide for firewood, animal forage, timely rainfall, and soil fertility. Most of the older women knew about the previous forest resource whereas most young women came to the village after marriage and were unaware. Women did, however, report there used to be more trees around the fields and in the village. Both groups noted there have never been grazing lands or rivers in or near the village. There was a local irrigation canal working before but it is no longer functional. Given these earlier conditions, farmers enjoyed higher food production. Men said that rice and wheat have always been their main crop. Both groups reported the school has stayed in the same location but its condition has improved and it was upgraded to include secondary education. The main drivers of change among men and women are population growth and climate change. Deforestation occurred due to increased demand for farmland and conversion of land into housing. Climate change was also blamed for decreasing and untimely rainfall as well as temperature increases.

Map 5. Major changes in resources (comparing past and present) for men



Map 6. Major changes in resources (comparing past and present) for women

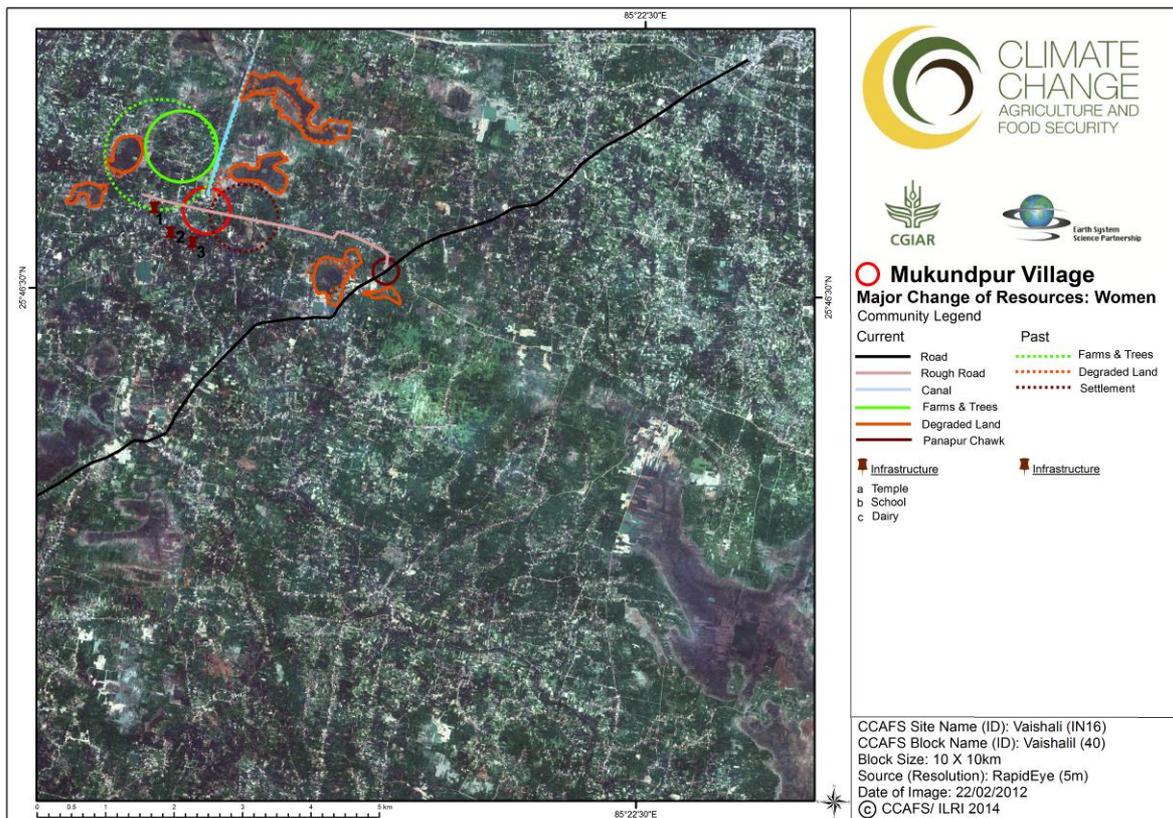


Table 2. Major changes and drivers of change in the last 10 years, as perceived by men (M) and women (F)

<b>Land cover class</b>	<b>Past state (quality)</b>	<b>Drivers of change</b>	<b>Management and ownership issues</b>	<b>Environmental Benefits</b>
Canal (M)	Built 55 years ago but now in poor condition	Population pressure and farming needs	Government	Improves growth and development of plants
Ponds (M)	Was deeper before but now full of silt and sand	Population pressure	Private	Greenery
Farmland (F)	The size of the village farmland remains the same, but individual farmlands have become smaller	Families have moved from extended to nuclear structures	Private	
Calcareous Soil (M)	Not fertile	Population pressure and natural process	Private	
Trees (M)	Never forests but area had big trees such as mango and sesame	Cut down for furniture making		
Trees (F)	Never forests but area in and around community and many more trees	Population growth	Private	
Roads (M)	35 years ago the road that passed through the village went from dirt to paved	Population pressure and farming needs	Government	
Roads (F)	Mahua road existed, but it was a dirt road			
Primary School (M)	Poor state, low quality and lack of infrastructure	Needs and requirement of increasing population	Government	Awareness through education
Primary School (F)	The school existed where it is today, but it was only to the primary level			

## D. Vision of the future

With a mixed group of men and women, the goal was to develop an image of village resources and human wellbeing into 2030 to understand the opportunities and constraints, as well as aspirations for the future. This exercise built upon all the work completed in the previous sessions. In addition, the exercise took into account the photographs of the landscape, including things they are proud of and things that need to be improved upon in the future, that a group of young people had produced following instructions given on day 1. In the section below we include the map that encapsulates Mukundpur village's vision of the future (Map 7). We also include a few of the photographs taken by the youth. These images operationalize the collective vision of the future.

The group's vision focused on improving access to water, alternative fuel sources and electricity. Expanding opportunities and income generating potential through improved schools, expanded market access, and increased crop and milk production were also important. Villagers noted the desire for improved technology and mechanization, such as tractors, solar panels and alternative energy sources. Such improvements open the potential for sustainable livelihoods, agro-processing, and sources of employment. Expansion of the local market will also allow for improved collection and sale of agriculture and livestock products. Several constraints to achieving the community vision were identified for men, women, youth and the community at large. A lack of funds, human resources and improved technologies constrains their capacity to improve the village and their conditions. In addition, with most of the available land in and around Mukundpur used as farmland, the potential for livestock and industry expansion as envisioned is limited. The weak education system also limits the villagers' opportunities. Little or no access to education is a big constraint for women in particular. Women are also hampered by poor economic empowerment and a lack of decision-making capacity. This was particularly evident during the mixed group discussion regarding the community's future; women stood up, covered their heads and stopped talking in front of male family members. Men are largely constrained by a lack of economic opportunity to fully use their potential. Such a limitation is also an issue for the youth, who are impacted by poor access to quality school and health services as well as employment. Young people are tasked with making dung cakes, household chores, farming, and selling goods in distant markets which also encroaches on their time available for school.

Map 7. Future map of the community

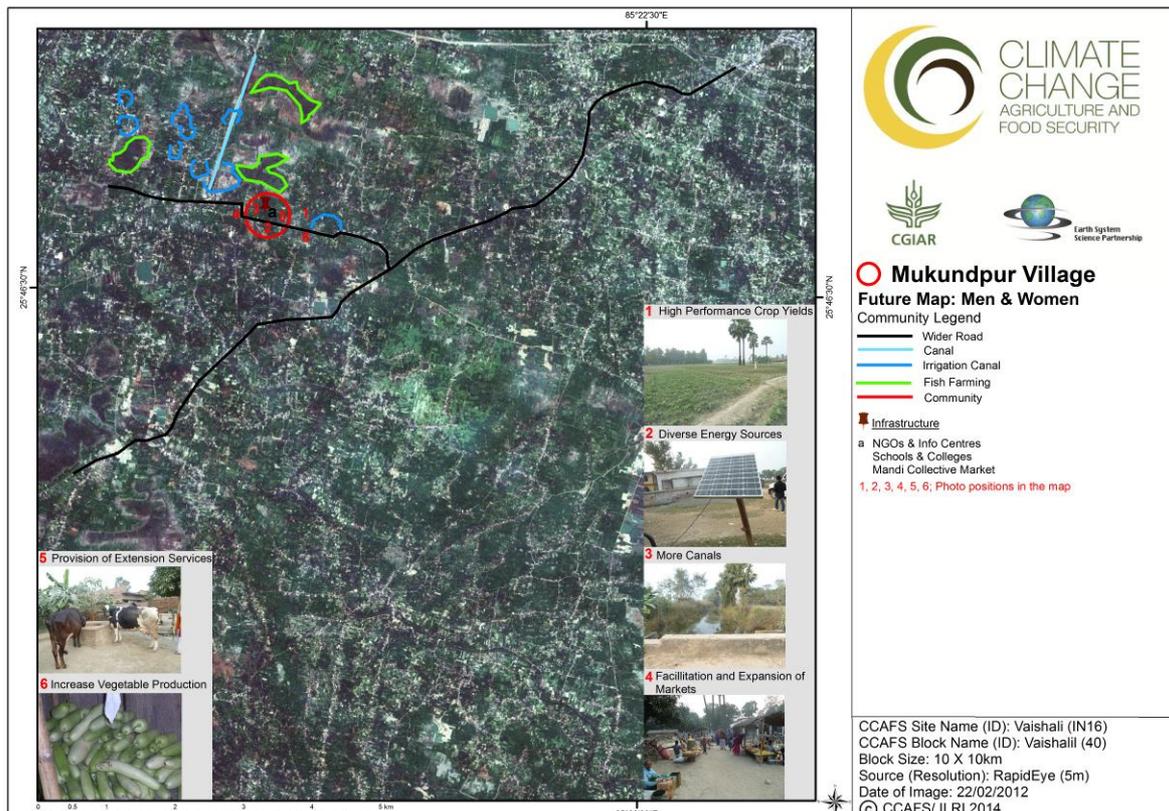


Table 3. Vision of the future

<b>Resources</b>	<b>Preferred condition for 2030</b>	<b>Opportunities</b>	<b>Constraints</b>	<b>Organisations to involve</b>
Trees	Exist in more quantities	Seen as good for the environment and fruit bearing ones provide for better nutrition	Lack of space for something like a community forest	IFFCO has provided some saplings in the past
Plough and Oxen	Be replaced by tractors		Lack of funds	
Dairy	Continue to provide milk to local dairies	Allows for income generation and provides nutritious milk		
Solar Panels	Promoted but provisions for electricity also needed	Allows for light which makes it safer to get about and enables children to study at the night	Lack of funds and access	
Unused Well	Disused as it is hazardous	Should be barricaded as it is dangerous given location next to school		
Cow Dung	Continued usage but people should have access to gas and other sources of fuel	Can be used as a source of fuel for cooking and is also a good fertilizer		
School	Expanded to include higher education and a playground	Enables children to study within the community itself and gives them a chance at higher education		
Canal	Usable and possibly for irrigation		Lack of funding for repairs	
Boreholes	Continued	Alternative kinds of pumps, such as electric or solar should be explored		
Market	Closer, bigger and better	Enables members of the community to buy food items they do not grow and other basic commodities	No space locally to hold market	
Cattle	Rear cattle, particular high yielding ones	Provides for milk and cow dung		
Vermi compost	Expanded practice	Feasible option to increase production	Most villagers know little about it	
Vegetables	Increased production and sales	Improved nutrition and income	Lack of land and market access	

## Topic 2: Organisational landscapes

This topic aims to show evidence of organisational capacities that help address food security and manage resources. This will inform CCAFS about how prepared the village is to respond to the challenges envisaged as a consequence of climate change or other future challenges and to engage with CCAFS partners at a collective level.

Specifically, this section presents the different formal and informal organisations involved in the community in general terms, as well as with respect to food security in different situations (i.e. average and crisis conditions), and natural resources management (NRM). It also elaborates on what types of activities the organisations are engaged in, who their members are, whether the organisations are useful, etc.

### A. Basic spheres of operation

Participants were asked to draw three large concentric circles on the ground. The inner circle would represent the community, the middle circle the locality and the outer circle beyond the locality. Participants were then asked to name organisations working in the area, whose names were written on cards, and place the cards in the appropriate circle. Thus, the group placed in the inner circle the cards of organisations that worked in the community, in the middle circle the cards of organisations operating in the locality, and in the outer circle those that operated beyond the locality. See Photo 2 for an example of the activity as carried out with the study participants. The results are shown in the diagrams that follow.

Based on this structure, the men identified 14 organisations in the village while women identified 11. Four of the identified organizations were the same among men and women. The foci of the organizations operating in and around Mukundpur include agriculture, livestock, microfinance, education, food distribution and community development. Most of the identified organizations are operating within the village or the locality. The majority are government organizations or programs, while community groups are present to a lesser extent. Local and international non-governmental organizations are rarer in and around Mukundpur.

The men's top ranking organization was by far the Sudha Dairy Cooperative, followed by the IFFCO Foundation, secondary school and Gram Panchayat. These organizations provide dairy, agriculture, education, and community development support. Gram Panchayat is the lowest level government legal body and is concerned with all developmental activities in the community. The women's top ranking organizations were the Central Bank, Below and Above the Poverty Line (BPL/APL) rations program, Anganwadi, secondary school and Raja Pakar Community Development Block. These organizations provide for credit, food access, education and women's empowerment. Overall, women had very little information about what is going on in the community but were able to provide some details about identified organizations. It was observed during the exercise that those organizations working well in Mukundpur were easy to remember quickly by all. In Tables 4 and 5, more detailed information is provided on the five most important organisations as they were ranked by the men's and women's groups.

There were other organisations in the village that were not mentioned by either groups or were ranked very low mainly due to their poor performance and corruptions. Even among identified organizations the groups complained of corruption, irregular service, and high levels of performance dissatisfaction. Women expressed particular concern about the unequal allocation of resources by village leaders. Groups reported most of the institutions are working independently and there is insufficient coordination on planning and implementation of activities. Some linkages were identified, with the government being a key link among agencies and programs for funding as well as Gram Panchayat coordinating all development activities within Mukundpur. Linkages in training and capacity building were noted between government and Agriculture Science Centre (ASC), Anganwadi, Department of Agriculture, Department of Irrigation, Department of Forest, and Department of Livestock and Fishery. Linkage were also found between Gram Panchayat and Sudha Dairy Cooperative, Department of Agriculture, Public Distribution System (PDS), Anganwadi and secondary school given their similar mandates.

Photo 2. The organisational landscape activity in progress



Figure 1. Organisational landscape of the men's group

Legend	
1	Sudha Dairy Cooperative
2	Department of Agriculture
3	Department of Livestock and Fishery
4	Anganwadi
5	Primary Agricultural Credit Cooperative Society
6	IFFCO Foundation
7	IFFCO Tokyo
8	Secondary School
9	Public Distribution System
10	Gram Panchayat
11	Department of Forest
12	Agriculture Science Centre
13	Department of Irrigation
14	Poorest Areas Civil Society

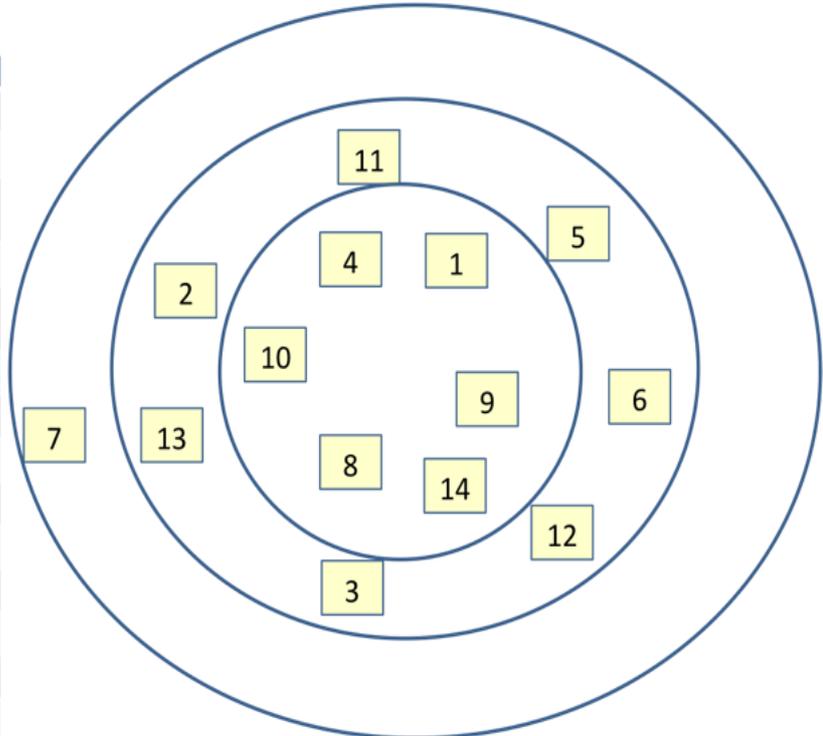


Figure 2. Organisational landscape of the women's group

Legend	
1	Sudha Dairy Cooperative
2	Central Bank
3	Indira Yavash Jojana Program
4	Secondary School
5	Raja Pakar Community Development Block
6	Anganwadi
7	Women's Group
8	BPL/APL Ration Program
9	IFFCO Foundation
10	Government
11	Non Governmental Organizations

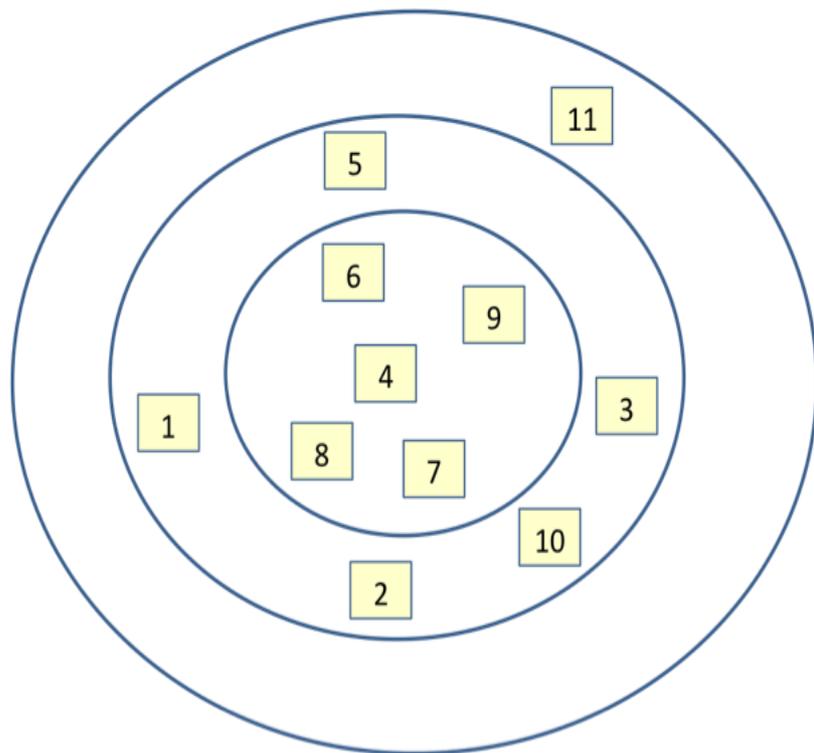


Table 4. Information on the first five organisations ranked by the men

Organisation name	Main activities	Number of members (estimate)	Access (open or restricted to...)	Origin (indigenous, state, NGO, project)	Sphere of operation: community, local, beyond local	For community groups		
						Sources of funding (members, external, both)	Existed how long (less than 1 yr, 1-5, longer)	Formal or informal
1 Sudha Dairy Cooperative	Provides feed and fodder seed, conducts artificial insemination and dairy trainings, and purchases milk	3 Staff	Open	Indigenous	Beyond Local	External	Longer – since 1983	Formal
2 IFFCO Foundation	Provides seeds, saplings, technology, and agriculture trainings. Running climate smart village program	1 Staff	Open	Foundation	Beyond Local	External	1 -5 years	Formal
3 Secondary School	Education of children	3 Teachers	Open	State	Community	External	Longer – upgraded 3 years ago	Formal
4 Gram Panchayat	Village development activities, such as hand pump installation, tree planting, and road maintenance	3 Staff / 30 Members	Open	State	Beyond Local	External	Longer	Formal
5 Anganwadi	Food and medicine to children	2 Staff	Open	State	Beyond Local	External	Longer – since 1980	Formal

Table 5. Information on the first five organisations ranked by the women

<b>Organisation name</b>	<b>Main activities</b>	<b>Number of members (estimate)</b>	<b>Access (open or restricted to...)</b>	<b>Origin (indigenous, state, NGO, project)</b>	<b>Sphere of operation: community, local, beyond local</b>	<b>Sources of funding (members, external, both)</b>	<b>Existed how long (less than 1 yr, 1-5, longer)</b>	<b>Formal or informal</b>
1 Central Bank	Savings and loan options	Half the community	Open	State	Beyond local	External	Longer	Formal
2 Below and Above the Poverty Line (BPL/APL) Ration Program	Provides torches, kerosene, and food rations at subsidized rate	Most of the community	Open	State	Beyond local	External	Longer	Formal
3 Anganwadi	Provides pre-primary students with midday meals and schooling, inoculations when necessary, and iron supplements for pregnant women	Only those with young children	Open	State	Beyond local	External	Longer	Formal
4 Secondary School	Education of children	Community children	Open	State	Community	External	Longer	Formal
5 Raja Parker Community Development Block	Assembly constituency. Provides food rations	Entire community	Open	State	Local	External	Longer	Formal

## **B. Organisational landscape of food security**

The goal of this exercise was to get an improved understanding of how the organisational landscape contributes to the food security of the group. Food security is mostly measured at the household level. Nonetheless, community-level organisations and interactions influence the food security of different groups within the community differently. Male and female participants were asked to discuss the concepts of food availability, access and utilization, and then review each organisation they had previously identified by asking which of them had activities that fell under these categories. Organizations identified by men and women are shown in Figures 3 and 4.

The men identified 14 organizations working in food security and the women identified 10. The main focus of food security related organizations is dairy production and marketing, access to inputs, crop production, food distribution and weather based crop insurance. Most of the Mukundpur population is food secure and are able to produce enough food and earn sufficient income to cover their needs. However, this capacity varies greatly depending on class and portions of the population are regularly food insecure. Nutrition is also a widespread challenge given a lack of production and diet diversity. There are essentially no permanent institutions working solely on food security, however those identified do support all aspects of food security, with food availability the most common. Anganwadi and the Public Distribution System (PDS) are doing direct feeding to vulnerable populations. The Sudha Dairy Cooperative, IFFCO Foundation, and Poorest Areas Civil Society (PACS) provide agricultural inputs to increase and diversify crop production. The Sudha Dairy Cooperative is also the main source of income for villagers, serving as a single milk marketing system for over 50% of Mukundpur farmers. The Central Bank and Primary Agricultural Credit Cooperative Society are the source of farming and enterprise development loans. In addition, for the last two years IFFCO Tokyo has been providing weather based crop insurance to rice and wheat farmers to help mitigate their production risks. The government has set up three mega programs which are expected to address food security issues and reach the community level but have not yet gotten underway: National Food Security, National Agricultural Development Plan and Horticulture Mission. Of the organizations currently supporting food security their availability and performance has been variable. Several of the identified organizations have come and gone from Mukundpur. PACS closed and reopened following mismanagement of funds, while BPL/APL reinstated services five years ago after having stopped following years of active community engagement, and the Central Bank moved from Dumri to Hajipur after a robbery. Some, such as the ASC, Department of Livestock and Fisheries, and Department of Irrigation, are not effective or active in the community.

The community has not experienced a food crisis since 1983 when the Gandak River flooded Mukundpur. Given the groups' unfamiliarity with food crises, they hypothesized which groups were likely to engage if a future situation arose. The men believed the PDS, Gram Panchayat and Anganwadi would engage during a crisis, while the women foresaw the government, Raja Parker Community Development Block and the Central Bank. Some dissatisfaction with the standard government support during a crisis was expressed, as it is drawn from a relief fund and allocates an insufficient 110kg of wheat and rice per family.

Figure 3. Organisational lanscape of food security – men

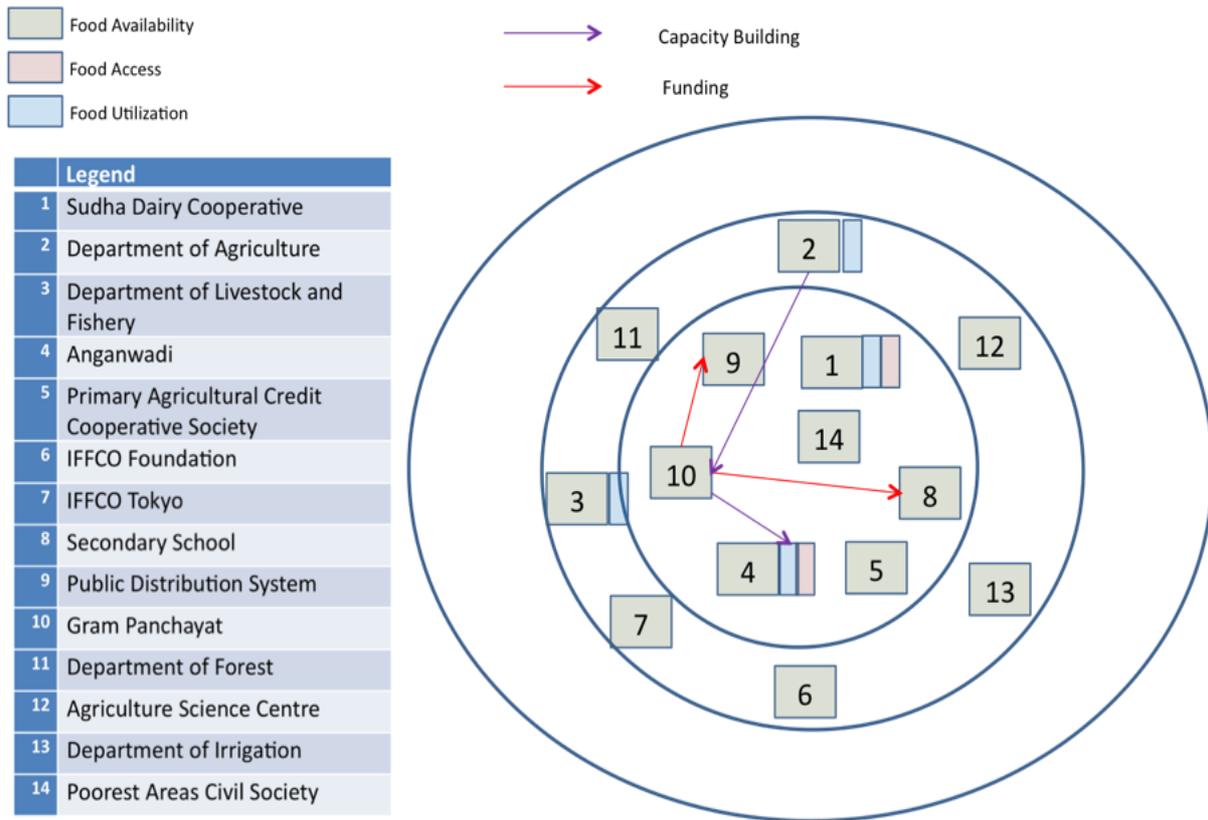
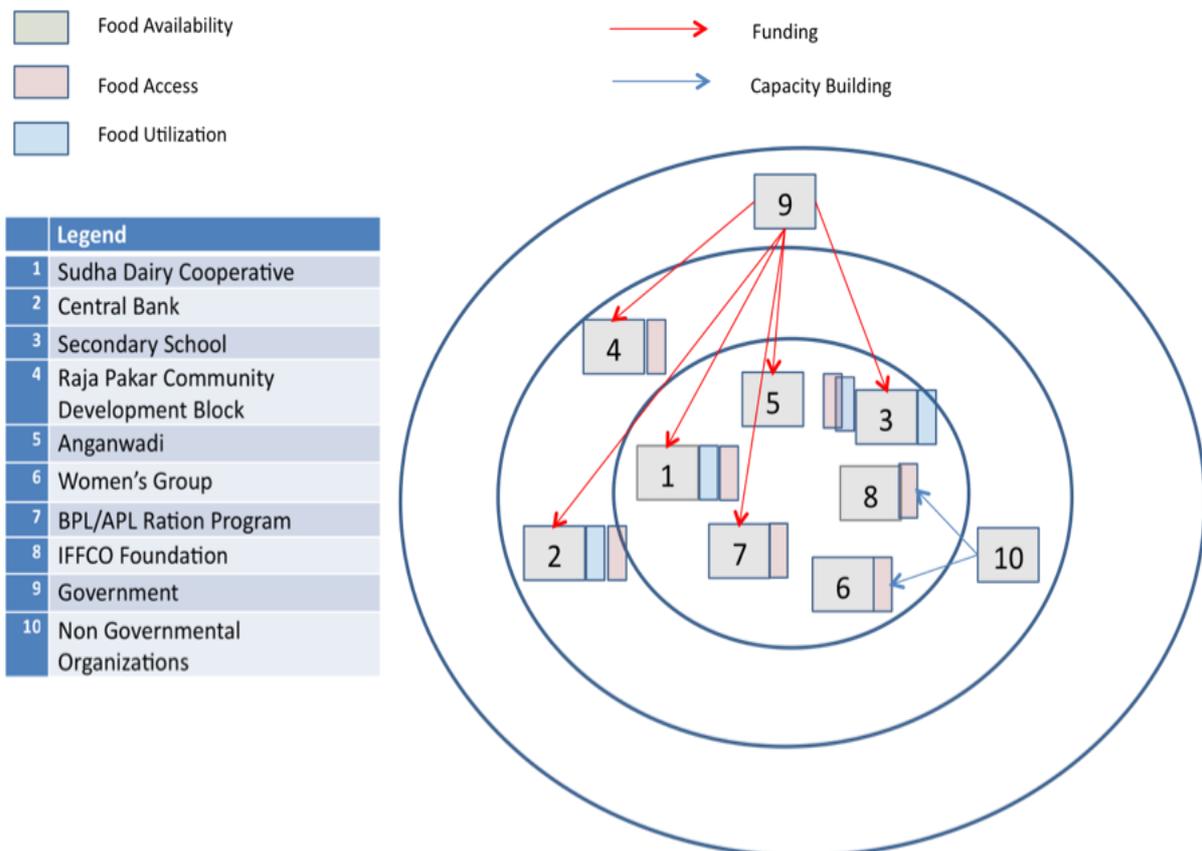


Figure 4. Organisational landscape of food security – women



### C. Organisational landscape of natural resource management

In this section, the organisational landscape in relation to NRM is discussed. Specifically, what organisations were actively working to protect the environment, manage natural resources, etc.? The process entailed asking the group to highlight what organisations are involved in the management of natural resources in the community; developing a list of natural resources important to the livelihoods of the community; and asking the group to decide on a symbol for each type of natural resource listed.

The men’s group identified 9 organizations working in NRM related areas while the women identified 2 organizations. These organizations focus on inputs, technology, weather based crop insurance and climate change awareness. One of the biggest gaps found among identified organizations was that there were none working specifically in NRM as such other than those working in livestock and agriculture. Women had less awareness about NRM, climate change, and related organizations than men. As a result, the women were unable to recall the names of many organizations or detail their activities. Both men and women cited more agriculture related support in relation to NRM, such as provision of inputs, trainings and tree saplings by the IFFCO Foundation, PACS and Departments of Agriculture, Livestock and Fisheries, Forest and Irrigation. Farmers were familiar with some soil management concepts such as cow manure application and the use of legumes for nitrogen fixation. Irrigation and forestry support were found to be nonexistent for several years. The IFFCO Foundation does have a Climate Smart Village project operating in Mukundpur, which has been educating the community about climate change. NRM linkages were found between the ASC and Department of Agriculture to IFFCO Foundation and PACS for technology provision. The IFFCO Foundation and IFFCO Tokyo have also worked together and shared necessary information. The groups did report that identified NRM related organizations undertook the planning and implementation of activities in coordination with the community.

Figure 7. Organisational landscape of natural resource management – men

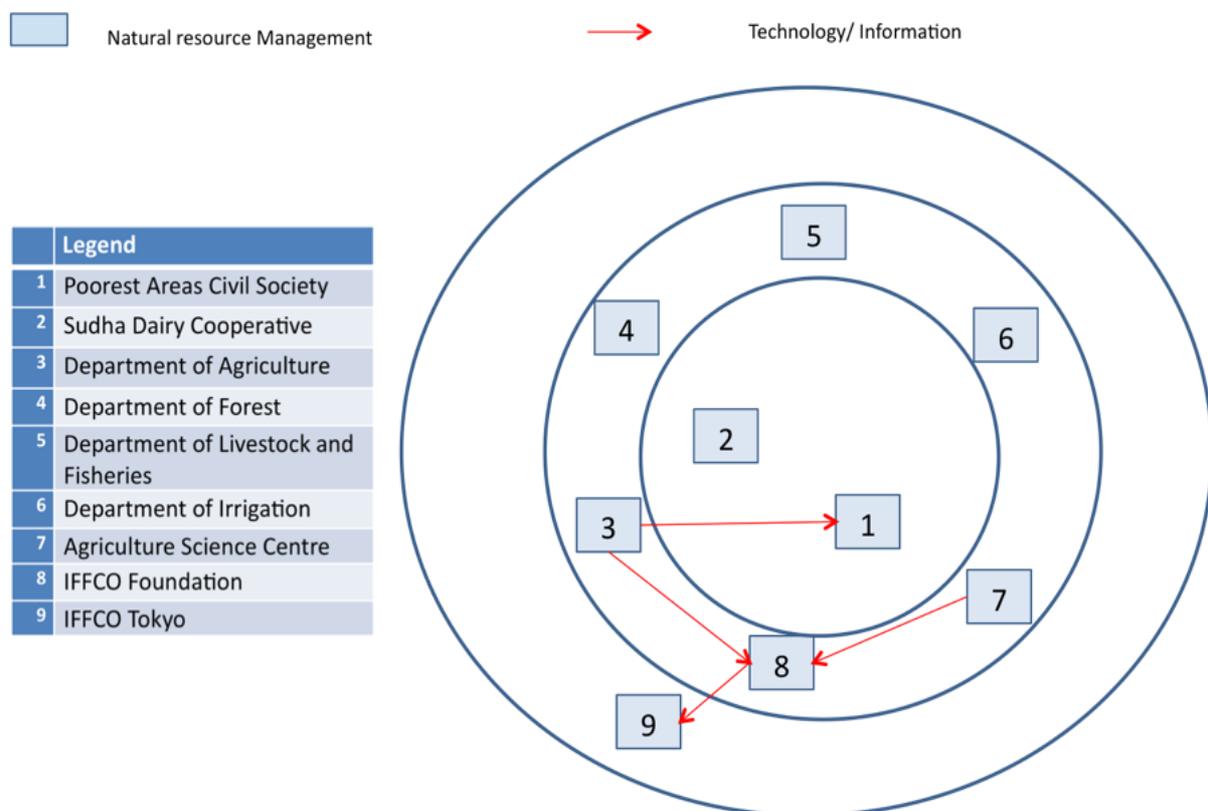


Figure 8. Organisational landscape of natural resource management – women

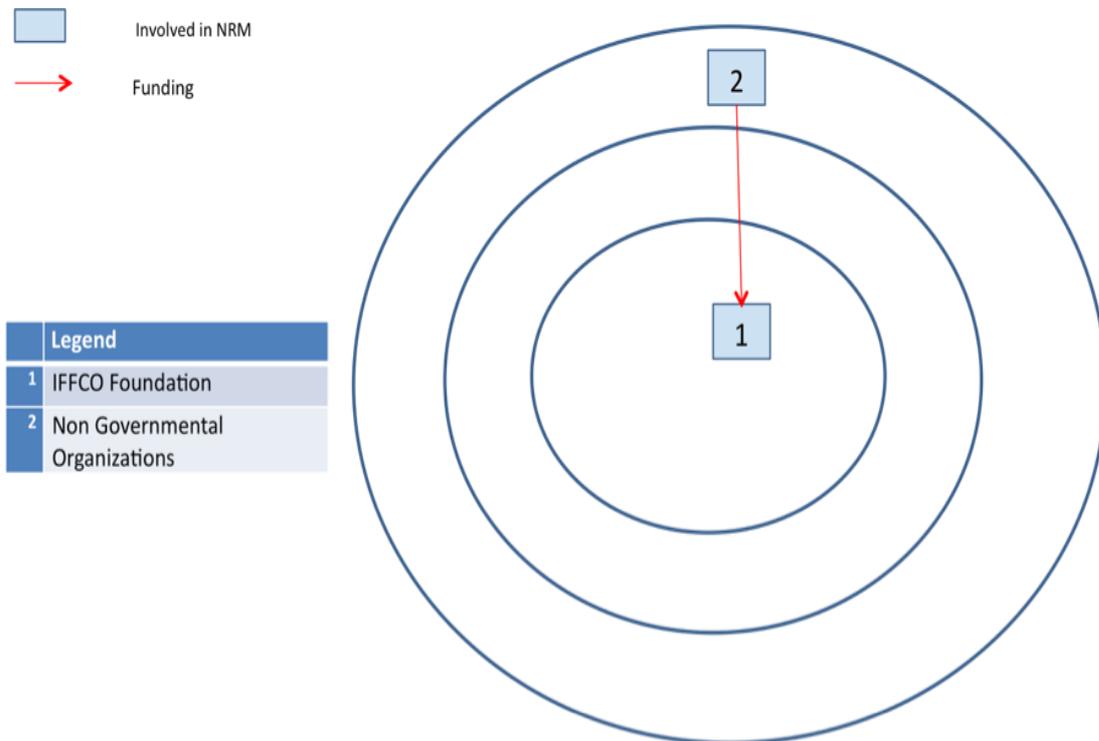


Table 6 summarizes information on all the organisations identified separately by male and female participants. The organisations are classified according to their role in supporting food availability, access and/or utilization, as well as the provision of relief in times of food crisis, and NRM.

Table 6. Information on highlighted organisations of men and women (1=yes, 0=no)

Organisational Landscape Name of organisation	Men					Women				
	Org. ID by men	Sphere 1=Village 2=Locality 3=Beyond locality	Food security	Food crisis	NRM	Org. ID by women	Sphere 1=Village 2=Locality 3=Beyond locality	Food security	Food crisis	NRM
1. Sudha Dairy Cooperative	1	1	1	0	1	1	1	1	0	0
2. Public Distribution System	1	1	1	1	0					
3. Gram Panchayat	1	1	1	1	0					
4. Department of Agriculture	1	2	1	0	1					
5. Department of Livestock and Fisheries	1	2	1	0	1					
6. Anganwadi	1	1	1	1	0	1	1	1	0	0
7. Primary Agricultural Credit Cooperative Society	1	1	1	0	0					
8. IFFCO Foundation	1	2	1	0	1	1	1	1	0	1
9. IFFCO Tokyo	1	2	1	0	1					
10. Secondary School	1	1	1	0	0	1	1	1	0	0
11. Department of Forest	1	2	1	0	1					
12. Agriculture Science Centre	1	2	1	0	1					
13. Department of Irrigation	1	2	1	0	1					
14. Poorest Areas Civil Society	1	1	1	0	1					
15. Indira Yavash Joiana Program						1	2	0	0	0
16. Raja Parker Community Development Block						1	2	1	1	0
17. Women's Group						1	1	1	0	0
18. Central Bank						1	1	1	1	0
19. Non Governmental Organizations						1	2	1	0	1
20. Government						1	3	1	1	0
21. BPL/APL Ration Program						1	1	1	0	0
TOTALS	14	Village=7 Locality=7 Beyond locality=0	14	3	9	11	Village=7 Locality=3 Beyond locality=1	10	3	2

### Topic 3: Information networks

The aim of this exercise was to understand the diversity of options people use for accessing information on agriculture and weather; how people take advantage of sources of information available, and if some sources are not used and why. We want to describe networks of how people access and share information within the community.

Men and women identified 8 sources of information. Men reported their main interests were on weather, agricultural production, and agricultural marketing. Women were interested in weather, seeds, fertilizers and pesticides, and market related information. Agricultural marketing was the most sought after type of information by men, followed by weather and agricultural production. Women reported sourcing the most information about fertilizers and pesticides, followed by weather, seeds and markets. Though the community is active in livestock and dairy activities neither men nor women noted any sources of related information. Among men and women the most popular sources of information were friends and relatives. Neighbours and observation were also common sources. Limited formal sources of weather related information are available for men or women, so they rely on friends, relatives, neighbours and observation. Women reported receiving weather information from television and radio, while the men did not. Many sources were different among men and women for similar types of information.

Table 7. Sources of information for men and women (1=yes, 0=no)

Source	Topic (women)				Topic (men)				Total
	Weather	Seeds	Pesticides and Fertilizers	Markets	Weather	Agricultural Marketing	Agriculture	Livestock	
<b>Individuals</b>									
Friends/relatives	1	1	1	1	1	1	0	0	<b>6</b>
Neighbour	0	0	1	1	1	0	0	0	<b>3</b>
Middleman	0	0	0	0	0	1	0	0	<b>1</b>
<b>Organizations</b>									
Agriculture Dev. Office	0	0	1	0	0	0	0	0	<b>1</b>
Block/State	0	0	0	0	0	0	1	0	<b>1</b>
IFFCO Foundation	0	0	0	0	0	1	0	0	<b>1</b>
<b>Media</b>									
Radio/TV	1	1	0	0	0	0	0	0	<b>2</b>
<b>Other</b>									
Observation	1	1	1	0	0	0	0	0	<b>3</b>
<b>Total</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>0</b>	

## Conclusion and recommendations

Mukundpur is located in the Vaishali district of Bihar state in a densely populated environment with limited natural resources. The village has never benefited from rivers or grasslands but used to have forests and natural ponds. Mukundpur is connected regionally via paved roads, however the roads within the village are unpaved. In addition, while the village is electrified, electricity is only available 2-4 hours a day. Population pressures have resulted in small landholdings and the conversion of available land into farms or homes for villagers. Water resources are strained as ponds are dry for most of the year, the local irrigation canal is not functioning, and irrigation wells continue to lower the water table. Mukundpur is largely food secure and many households are able to meet their needs through the production and sale of rice, wheat, potato, oilseed and milk. Some farmers also grow mango, guava, litchi and bamboo around their homes as well as some vegetables. Farmers have typically benefited from Mukundpur's good, flat, and fertile land. There is a small local market and farmers also sell surpluses at regional markets. Not all households are food secure, however, and the government provides food rations.

Farmers are experiencing climate change effects as rainfall is less timely and sufficient and temperatures are increasing. Crop and dairy productivity is declining which is starting to show impacts on household incomes and could potentially impact food security. Mukundpur is further constrained given the low quality of available education, lack of higher education access, security constraints for women outside the home, household burdens for youth and women, and limited income generating opportunities. The vision of the future among men and women is centred around 1) improving the productivity and sale of crops and dairy; 2) increasing agro-processing, market access and employment opportunities; 3) expanding the availability of water for irrigation and drinking; 4) improving access to improved and alternative technologies; and 5) upgrading the quality and levels of local education.

There are several organizations working in and around Mukundpur, of which the men's group identified 14 and women 11. These organizations focus on agriculture, livestock, microfinance, education, food distribution and community development. Men identified more dairy, agriculture, education, and community development support organizations while women cited those focused on credit, food access, education and women's empowerment. Overall, women had very little information about what is going on in the community and struggled with the names of organizations. The majority of identified organizations are government entities or programs, while community and non-governmental ones are rarer. Among identified organizations the groups complained of corruption, irregular service, performance dissatisfaction, and unequal allocation of resources. Some training, funding and coordination linkages with government were identified, largely given the dominance of government related organizations and services in Mukundpur.

The main focus of food security related organizations is dairy production and marketing, access to inputs, crop production, food distribution and weather based crop insurance. There are essentially no permanent institutions working solely on food security, however those identified do support all aspects of food security, with food availability the most common. As with the broader set of identified organizations, the availability and performance of food security related organizations was reported as highly variable. The community has not experience a food crisis since the Gandak River flooded in 1983, however they noted several government organizations would likely step-in if needed but that the standard amounts of crisis support would not realistically meet their needs if one occurred. No organizations are working specifically in NRM other than those working in livestock and agriculture. Women had less awareness about NRM, climate change, and related organizations than men. NRM related agriculture was reported in the provision of inputs, trainings and tree saplings. Farmers were familiar with some soil management concepts, however irrigation and forestry support was nonexistent. The population is, however, benefiting from increased climate change awareness through a Climate Smart Village program.

Men and women identified numerous sources for information on weather, agricultural production and marketing, seeds, fertilizers and pesticides. A total of 8 sources were reported, however the most popular were friends and relatives, followed by neighbours and observation. Formal sources were limited or not used by men and women. Many sources were different among both groups for similar types of information. Though the population is facing production constraints for crops and dairy, very few sources were noted for agriculture and none for livestock, particularly among men.

## Implications for CCAFS

Future CCAFS work and that of other organizations will need to address water availability and access, crop and dairy productivity, and climate change to maintain food security and livelihoods in Mukundpur.

The village has good, flat, and fertile land with good potential to increase crop productivity. Mukundpur is also well connected to paved roads and markets, which offers good transport and marketing options. The key climate related issues are frequent droughts, water logging and flooding, and decreasing annual rainfall. Farmers are starting to see climate change impacts, which are exacerbated by productivity constraints from population pressures and land scarcity. The shortage of crop irrigation water is a significant issue that needs to be promptly addressed. Improved technologies and practices can be introduced to facilitate access, such as treadle pumps, sprinklers, drip irrigation, water harvesting, and plastic ponds. Fixing the village irrigation canal will also benefit farmers.

Mukundpur has high potential to further improve food production by using improved crop varieties that are more resilient to local conditions. Farmers were not aware about the efforts in India to address crop resilience to climate change. Verification, demonstration and scaling up of climate friendly resilient varieties of locally important crops such as rice, wheat, fodder, oilseed and vegetables are important. There are a number of high yielding and resilient crop varieties that could be used to sustain crop production. Opening a seed collection store in Mukundpur will allow for self-sufficiency in terms of assuring timely access to high quality and low cost inputs. Upgrading the village market will further help generate income as production increases. In addition, given the huge potential and importance of livestock as a source of income from milk sales for area farmers, productivity needs to be managed. Attention should be given to building awareness and access to high yielding livestock breeds, good fodder varieties, and improved animal health and sanitation.

Crop diversification also offers opportunities for farmers in support of food security, nutrition, income generation and climate change mitigation. Farmers are very keen to grow sugarcane so that they can benefit from income generation, as it is a cash crop. Sugarcane is also a C4 crop and is good from a climate change perspective, however farmers will need support to expand into this market. Opportunities also exist for expanding fruit and vegetable production, which allows for improved nutrition and income generating potential. Few farmers are growing these crops and increased awareness is needed. Those farmers undertaking fruit and vegetable production are often doing it through mixed farming systems with livestock. Efforts are needed to strengthen these systems.

There is some level of awareness about climate change through the Climate Smart Village project, however further support is needed as well as research detailing local conditions and impacts. Farmers lack knowledge about resource conservation technologies and organic agriculture practices that can mitigate impacts. Expanding awareness on how efforts such as adding organic matter to soil, using green manure, managing farmyard manure, establishing biogas and limiting the use of chemical inputs can improve soil fertility, crop productivity and sustain resources will benefit farmers. Tree planting can also be encouraged, which supports fruit production, soil conservation, and access to firewood. The reliance on cow dung for cooking deprives the soil of potential nutrients and poses health risks; alternative fuel sources need to be expanded.

Ultimately, improving Mukundpur's food security and natural resources will depend on improved access to knowledge and resources. Expanding formal and higher-level education opportunities for women and youth while addressing their access issues should be supported. In addition, encouraging a broader range of local organizations with improved capacity to meet the population's productivity and water resource constraints will benefit Mukundpur. The village is in need of regular, targeted,

equitable and timely assistance from local organizations that more directly address the area's food security and natural resource dynamics.

Among the organizations noted by the groups, those presented in Table 8 are of particular interest for CCAFS. Given the implications for CCAFS and the identified challenges for Mukundpur, Table 9 provides a summary of targeted recommendations based on opportunities.

Table 8. Potential CCAFS partners

Organisation	Sphere Of Operation	Activities	Strength
IFFCO Foundation		Works in development activities	Running Climate Smart Village program
IFFCO Tokyo		Weather based crop insurance	Rice and wheat insurance in Mukundpur for two years
Department of Agriculture		Agriculture	Technical help in agriculture and running vermicompost program with the National Bank for Agriculture and Rural Development
Gram Panchayat	Locality	Governance	Development activities and coordination

## Recommendations for major opportunities

Table 9. Recommendations for major opportunities

Gaps in knowledge/ current constraints that could provide opportunities/niches for CCAFS and partners	Opportunities for research (CCAFS)	Opportunities for Action Research (CCAFS partners)	Development Interventions (Partners)
1. Carbon sequestration activities	X		
2. Collecting and modelling weather information	X		
3. Weather index based insurance	X		
4. Verification/research on resilient crop varieties	X		
5. Furthering research on resource conservation technologies	X		
6. Supporting climate friendly agricultural practices	X		
7. Technology transfer	X		
8. Develop/upgrade and continue/broaden present initiatives	X		X
9. Help farmers in agriculture and natural resource management		X	X
10. Capacity development and action research for male and female farmers		X	X
11. Verification and up scaling of available technologies such as Climate Smart Village		X	X
12. Crop intensification using organic and other climate friendly farming methods		X	X

<b>Gaps in knowledge/ current constraints that could provide opportunities/niches for CCAFS and partners</b>	<b>Opportunities for research (CCAFS)</b>	<b>Opportunities for Action Research (CCAFS partners)</b>	<b>Development Interventions (Partners)</b>
13. Promoting soil management (composting, green and farmyard manure, etc.) and resource conservation technology (minimum and zero tillage, etc.)		X	X
14. Improve livestock keeping system		X	X
15. Tree plantation including agro-forestry		X	X
16. Support processing and value addition in agriculture and livestock sectors		X	X
17. Support agricultural marketing		X	X
18. Develop sanitation and hygiene facilities			X
19. Upgrade secondary school			X
20. Upgrade and/or equip existing health facilities			X
21. Upgrade/repair seasonal irrigation canal			X
22. Support boring in fields for irrigation			X
23. Promote market system and infrastructure			X
24. Develop seed collection system and storage			X