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CCAFS

# Midline Household Survey Results
## **Vaishali, Bihar State, India**

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# 1. Introduction

This midline study, carried out in Vaishali district of Bihar (northeastern part of the Indo-Gangetic Plains) of India, was accomplished under the CCAFS program of CGIAR and its partners. Bihar is one of the poorest states in India. It is surrounded by Jharkhand, Uttar Pradesh and West Bengal states in the south, west and east respectively, and it shares a border with Nepal in the northern part. Surrounded by river Ganga in the south and Gandak in the west, the Vaishali district is located at 25° to 30° north latitude and 84° to 85° east longitude.

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a major research partnership that works in five regions: South Asia, South-East Asia, East Africa, West Africa, and Latin America. When CCAFS began in 2011, baseline surveys were carried out in 21 research sites across 17 countries within these five regions. The surveys were conducted using standardized tools in each site, including a quantitative household survey, a qualitative village study, and an organizational survey.

In 2012, the baselines were conducted in South Asia, and now CCAFS has conducted the midterm evaluation surveys, which are compared with the baseline findings to track the performance of Climate Smart Village (CSV) sites and measure the impact on beneficiaries. With a few improvements, the same standardized tools were used again to carry out the midline evaluation and to ensure comparability with the data collected previously.

CCAFS conducted baseline surveys in India that include a household survey, qualitative village study, and organizational survey at two sites, i.e., Karnal district in Haryana and Vaishali district in Bihar. To measure the impact of the program, BISA-CIMMYT conducted a midline survey with three components, i.e. household midline surveys (HMS), village midline surveys (VMS), and organizational midline surveys (OMS).

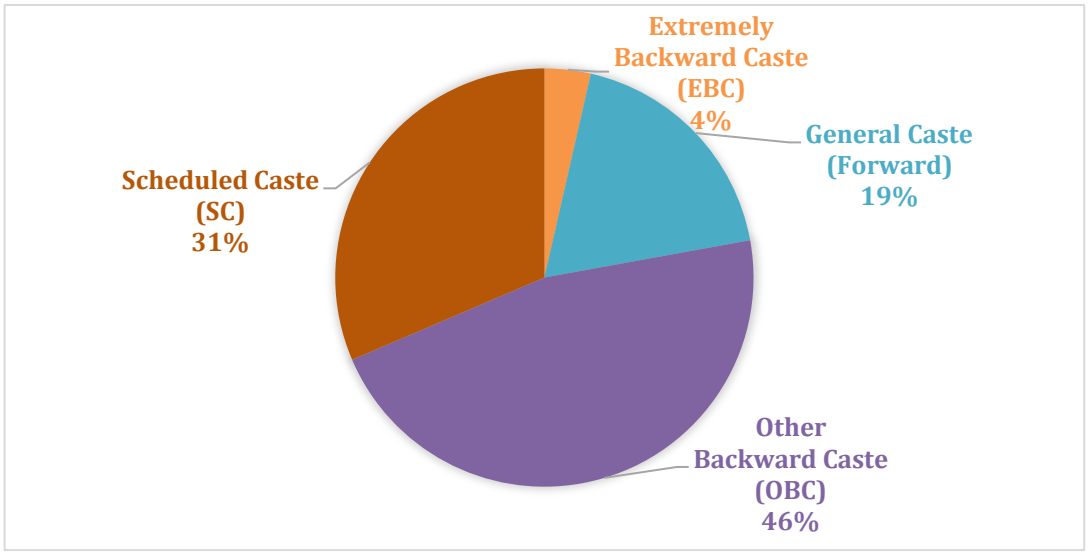
The household questionnaire was translated into the local language Hindi, and the survey was carried out by a group of enumerators using the Open Data Kit (ODK) on Android devices using smartphones/tablets. The questionnaire was pre-tested to assess the appropriateness of the language and develop the necessary skill of the enumerators. The Team leader Sanjay Prasad supervised the data collection as per the sampling design mutually developed and

agreed within CCAFS, thereby ensuring proper quality control of data in ODK, and conducted some initial processing/analysis of the data and report writing. The name of the study team members and the Field Enumerators are listed in the Appendix.

## 1.1. Household respondents and type

The survey revisited the original 140 households in Vaishali from the CCAFS baseline survey. All the households covered in the baseline were covered in the midline survey. Both male and female respondents were interviewed for the midline survey. Among the respondents, 32% are female and 68% of the surveyed respondents were males. Out of the 140 respondents, 85 were the household head, 26 were represented by the spouse of the household head, and 17 were either son or daughter in law. About 87% of the households are male headed compared to the 99% reported during the baseline and the rest (12.9%) are headed by women. In the midline survey the same caste groups defined during the baseline were followed, and as the sample was the same, there was no change in caste composition. Most of the inhabitants in the surveyed villages belonged to the Other Backward Caste OBC (46.4%), followed by SC (31.4%) and GC (18.6%) (Figure 1).

**Figure 1. Distribution of the surveyed households according to their castes**



# 2. Household demographics

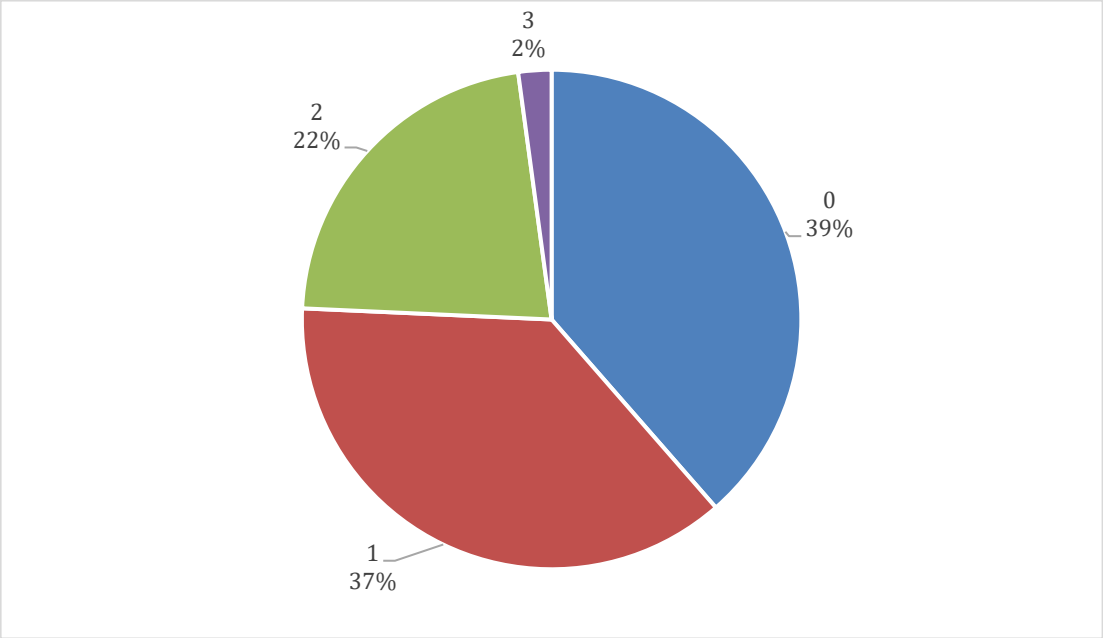
Vaishali district lies in Bihar, one of the most densely populated states in India. The population density in Vaishali district is also very high (1,335 person/km2). In the surveyed sample, 56.4% of households (79 HHs out of 140) do not have children below the age of 5 years, while 22.1% of households (31 households) have one young child. Another 21.4% (30 households) have 2 or more children under the age of 5 years (Table 1).

**Table 1. Number of children below the age of 5 years in a household**

| No. of children below the age of 5 years | Number of households | Percentage of households |
|---|---|---|
| None | 79 | 56.4 |
| One child | 31 | 22.1 |
| 2 or more children | 30 | 21.4 |

When the analysis is done for households with elderly people (over 60 years of age), we find that 38.6% of households (compared to the baseline of 51%) do not have any elderly member (i.e., over 60 years), while 37.14% of households (compared to the midline figure of 25%) have one elderly resident, and only 31 households (22.14%) have two elderly residents.

**Figure 2. Proportion of the number of working age members in a household.**



Another analysis was done to figure out the number of members in a household who are in the working-age group, who are neither child nor elderly. Figure 2. Proportion of the number of working age members in a household.among the surveyed households only 2% have more than three working-age members in a household, about 22% of households have 2 members in the working-age group, and about 37% households have one member in the working-age group.

## 2.1. Household size

The average household size in the surveyed area was 8.2, with a minimum of 1 member and a maximum of 21 members. According to the parameters set during the baseline, a family with up to 4 members is considered a small household; usually comprising of a husband, a wife, and their two children. During the midline survey, it was found that 17.9% of the respondents are from small households (1 to 4 family members). Following the parlance of the baseline survey, 57.9% of the households are medium-sized (5 to 8 family members). Also, there are 17.9% of the households that have 9 to 12 members in the household. Only nine households (6.4%) have more than 12 members (Table 2).

**Table 2. Distribution of households by size in Vaishali**

| Household size | Number of households | Percentage distribution |
|---|---|---|
| 1 to 4 (small family size) | 25 | 17.9 |
| 5 to 8 (medium family size) | 81 | 57.9 |
| 9 to 12 (large family size) | 25 | 17.9 |
| More than 12 (very large family size) | 9 | 6.4 |

## 2.2. Education levels

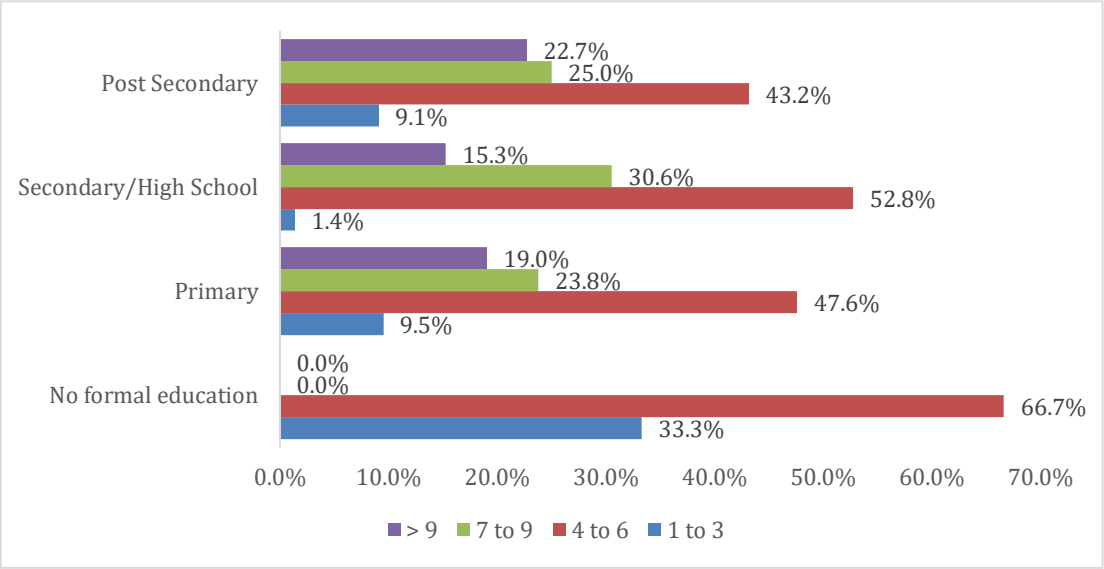
Among the surveyed households, it was found that 137 households (97.9%) have someone who obtained some level of education, while 2.2% do not have any member in the household with formal education. Among the educated households, 15% have a member with primary education, 51.4% with a secondary degree, and 31.4% with post-secondary education (

Table 3).

**Table 3. Highest levels of education within the households**

| Highest level of education of any resident household member | Number of households | Percentage distribution |
|---|---|---|
| No formal education | 3 | 2.2 |
| Primary | 21 | 15.0 |
| Secondary/High School | 72 | 51.4 |
| Post-Secondary | 44 | 31.4 |

**Figure 3. Number of family members and level of education**




In terms of the relationship between family size and education level of the household members, a large percentage of households with a member with a post-secondary degree (43.2%), come from households with 4 to 6 members (**Error! Reference source not found.**). There is not a single member in the smaller households who has no formal education.

# 3. Sources of livelihood

## 3.1. On-farm livelihood sources

Among the 140 surveyed households, 135 households (96.4%) produce agricultural products on-farm while the remaining five (3.6%) do not. As shown in Table 4, the majority (62.9%) of the households practice integrated agriculture (food crops and livestock rearing). Among the surveyed households, 21.4% cultivate food crops, fruits, and vegetables, whereas 10.7% of

the households only rear livestock (small and large ruminants). All of the households which produce on-farm also sell the products in the market.

**Table 4. Percentage of households producing agricultural products on-farm**

| Produced in the farm | % of households producing on farm | % of households selling |
|---|---|---|
| Food crops, fruits, vegetables | 21.4 | 21.4 |
| Livestock and crops | 62.9 | 62.9 |
| Livestock only | 10.7 | 10.7 |
| Other items (fuelwood, honey, manure, timber) | 0.7 | 0.7 |
| Fish and livestock | 0.7 | 0.7 |

The agricultural production in the area has been going down because of erratic rainfall and lack of irrigation. Another issue that is affecting agricultural production is stray cattle and wild animals (e.g. nilgai, a large Asian antelope). There is a lot of need for watch and ward. Therefore, most of these smallholders have been rearing livestock. Most of the people in the area sell milk in the local dairy centers. Fifteen households (10.7% of respondents) have been rearing livestock exclusively. One household is engaged in fisheries along with livestock. The milk collection center pays regularly and has been providing the farmers with regular income. Apart from livestock rearing, a new enterprise of quail farming and broiler farming is proving profitable for the respondents. Milk is sold commercially, and some part used for own consumption.

To further understand production and selling behavior, households were asked which specific products they produced and sold in the market last year. In the surveyed villages, 129 households produced food crops, with some doing some further processing of these crops at home, mainly for home consumption (*Table 5*). Fifteen households produced cash crops, 23.6% produced fruits and 60% of households produced vegetables. Key fruits grown in the area are mango, litchi, guava, and banana. The most common vegetables grown here are cauliflower, cabbage, brinjal, and okra. A majority of the households raised small livestock and poultry (mainly goats and chicken). Some also have large livestock such as cows and buffaloes, mainly for milk production and to obtain by-products such as manure and compost. Most of the households who have livestock species also produce fodder to supply feed to the livestock. About a quarter of the households produce fuelwood, mainly for household needs.

All of the on-farm production is consumed in the households. About 31% of the food crops and livestock is sold in the market, signifying the resource-poor condition of the area.

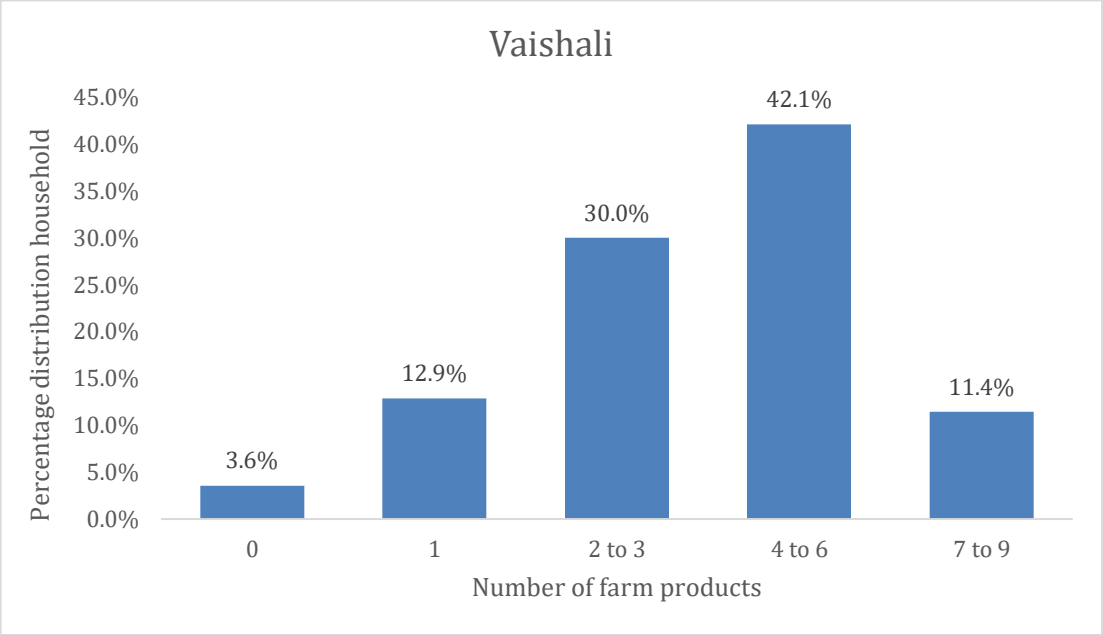
**Table 5 Percentage of households producing, consuming and selling various agricultural products on-farm**

| Products | % of households producing | % of households selling | % of households consuming |
|---|---|---|---|
| Charcoal | 0.7 | 0.0 | 0.7 |
| Fish and other aquatic animals | 1.4 | 1.4 | 1.4 |
| Fodder | 26.4 | 4.3 | 26.4 |
| Food crop (raw) | 82.1 | 31.4 | 82.1 |
| Fruit | 23.6 | 7.1 | 23.6 |
| Fuel wood | 25.7 | 0.7 | 25.7 |
| Large livestock (cattle, buffalo) | 52.1 | 30.7 | 52.1 |
| Livestock products (milk, eggs, etc.) | 15.7 | 13.6 | 15.7 |
| Manure/compost | 47.1 | 4.3 | 47.1 |
| Other/cash crop (Rubber, sugar cane, etc.) | 0.7 | 0.7 | 0.7 |
| Small livestock (sheep, goats, pigs, chickens, donkeys) | 36.4 | 30.7 | 36.4 |
| Timber | 2.9 | 1.4 | 2.9 |
| Vegetables | 60.0 | 26.4 | 60.0 |

As shown in

Figure 4, most of the households (59 households, 42.1%) produced several products on the farm (4 to 6 products). Out of the surveyed households, 3.6% did not produce any farm item. This is mainly because of resource-poor condition and lack of investment avenues. The figure of no production was same during the baseline. About 12.9% produced one product last year, and 30% produced 2 to 3 products. The product diversification observed in Vaishali is not related to commercialization or affluence. These avenues are various baskets of livelihoods used by the poor to avert risks and shocks.

**Figure 4. Percentage distribution of the households as per the number of farm products produced**




## 3.2. Off-farm livelihood sources

In Vaishali, due to crop failures and low productivity in agriculture, 53.6% of households collect food grains (this figure was only 43% during the baseline). Most of these food grains are procured through the Public Distribution System of the Government of Bihar. Approximately 17.1% collect fuelwood from the forest and community sources, while 14.3% of them collect fodder for their livestock from common property resources (35% during baseline). The fact that 53.6% of households are procuring food items from outside shows their food insecurity, and they do not get food throughout the year.

**Table 6. Agricultural products coming from off-farm sources**

| Products coming from off-farm sources | Number of households | % of households |
|---|---|---|
| Food crops | 75 | 53.6 |
| Fruits | 5 | 3.6 |
| Fodder | 20 | 14.3 |
| Fish | 1 | 0.7 |
| Timber | 2 | 1.4 |
| Fuelwood | 24 | 17.1 |
| Animal and animal products | 7 | 5.0 |
| Honey | 2 | 1.4 |
| Manure | 10 | 7.1 |

## 3.3. Diversification indices

A production diversification index was created during the baseline by adding up the total number of agricultural products produced on-farm:

1 = 1-4 product(s) (low production diversification)

2 = 5-8 products (intermediate production diversification)

3 = >8 products (high production diversification)

Similarly, the total numbers of agricultural products sold was added up to calculate a commercialization index:

0 = no products sold (no commercialization)

1 = 1-2 products sold (low commercialization)

2 = 3-5 products sold (intermediate commercialization)

3 = >5 products sold (high commercialization)

The results of these diversification indices for the 135 surveyed households in Vaishali that produce items on farm are shown in

Table 7. The data show that there is only one household which produces more than 8 items (high level of diversification); 34.3% of households produce 5-8 products (intermediate level of diversification) and 61.4% of households produce 1-4 products on-farm (low diversification). Five households (3.6%), however, did not produce any product in the last year.

Among the 135 households, slightly less than half sell 3 to 5 products (intermediate commercialization), whereas 23.6% sell more than 5 products. Only 27.1% of households sell 1 to 2 products in the market. This implies that most of the farm production has commercial diversification and intent. Also, higher production diversification has higher commercialization diversification.

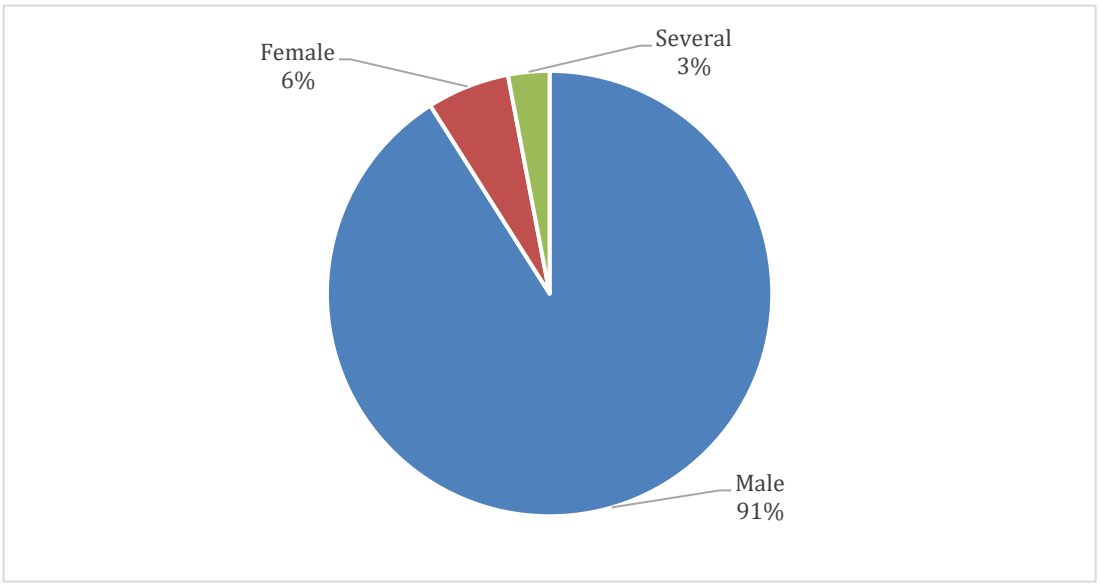
**Table 7. Production and Commercialization Diversification Indices**

| Vaishali | No. of households | % of households |
|---|---|---|
| **Production Diversification** | | |
| 1-4 products (low production diversification) | 86 | 61.4 |
| 5-8 products (intermediate production diversification) | 48 | 34.3 |
| >8 products (high production diversification) | 1 | 0.7 |
| **Selling/Commercialization Diversification** | | |
| No products sold (no commercialization) | 5 | 3.6 |
| 1-2 products sold (low commercialization) | 38 | 27.14 |
| 3-5 products sold (intermediate commercialization) | 63 | 45.0 |
| >5 products sold (high commercialization) | 33 | 23.6 |

## 3.4. Participation in on-farm and off-farm activities in the households

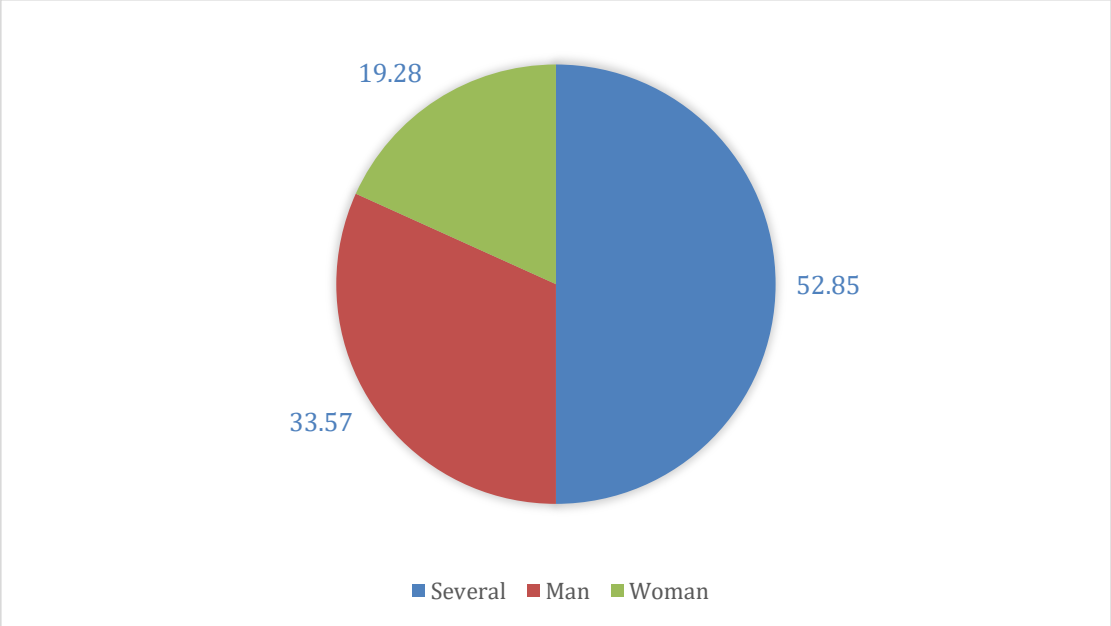
There is a marked improvement in the socioeconomic status of the women with the advent of the National Rural Livelihood Mission (NRLM) through Self Help Groups and related institutions. The livelihood activities (both on-farm and off-farm) are shared among the family members, including grownup children. For the on-farm activities, in 91% of the surveyed households males are responsible for farm activity work while only 6% of women are responsible for the farm work. In about 3% of the houses, the workload is shared by several family members (Figure 5).

**Figure 5. Agricultural workload on farm by gender**



In case of off- farm activities, a large portion of the off-farm activities are being done by men (53%), whereas involvement of women in the off-farm activities is 19.3% (Figure 6).

**Figure 6. Agricultural workload off-farm by gender**




## 3.5. Sources of cash in the households

The survey found that 64.3% of households earn cash from employment on someone else's farm, as contractual workers in nearby cities and in government and non-government jobs. Sixty-two percent of the households derive income from remittances or gifts. Small business and trade are also the source of income for 15% of households in the study villages. Renting out their own land accounts for 10% of the cash income.

The cash income sources are diversified in the study villages, which include: employment in off-farm activities, other paid employment, business, remittances, and renting out farm equipment and land. Of households that earn from employment on someone else's farm, these members are mostly agricultural laborers or wage laborers. Some migrate to Patna, Hajipur, or Muzaffarpur for employment. Some work in nearby villages or in litchi plantations. Earlier, during the baseline, only 35.7% of the households were engaged on someone else's farm. The reasons for engaging in labor on someone else's farm include erratic rainfall, decreasing yield in agriculture and fragmentation of land. Forty-six percent of the households derive income from government or other projects. Small business and trade are also major sources of income for a third of households in the study villages. Renting out agricultural machinery like

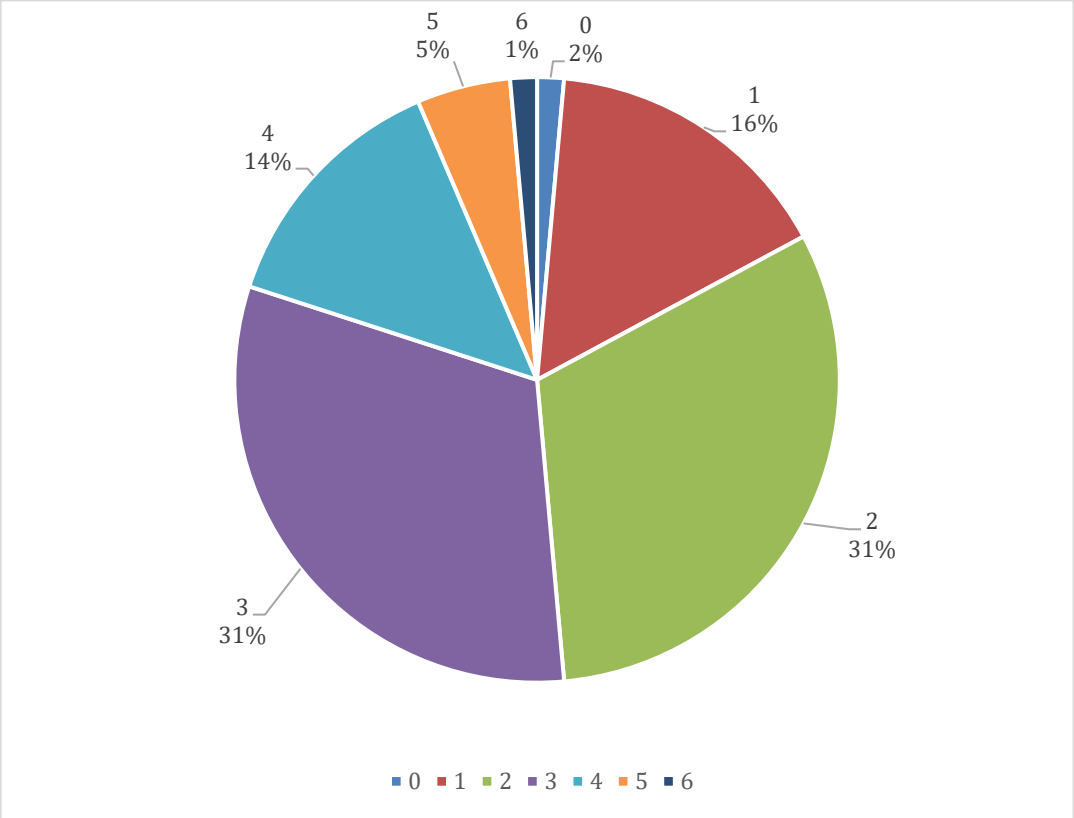
tractors, water pumps, combine harvesters and threshers is lower than during the baseline as there has been increased acquisition of agricultural machineries, which had been a major source of income earlier. Remittances are the most important source of income for 54% of households, as there has been increased migration out of the country or to major cities within India. The credit seeking pattern has changed from 84.3% during the baseline to 29.5%. Access to formal credit sources is now 27.3% (an increase from 11.4% during the baseline). This is because of the work of the National Rural Livelihood Mission and access to microfinance institutions. There is decreased access to government programs; during the baseline 118 households had access to government program payments but this has reduced to 64. It is because of reduced work in Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS). MGNREGS has a very high potential in providing off-farm employment and improving the natural resources of the area such as creation of water bodies for water storage and rain water harvesting.

**Table 8. Sources of cash income other than from own farm**

| Source of Income | Number of households | % of households |
|---|---|---|
| Employment on someone else's farm | 67 | 48.2 |
| Other paid employment (e.g. Salary) | 51 | 36.7 |
| Business (other than farm products) | 46 | 33.1 |
| Remittances or gifts | 75 | 54.0 |
| Payments for environmental services | 1 | 0.7 |
| Other payment from projects/government, including benefits in kind | 64 | 46.0 |
| Loan/credit from a bank or other formal institution (microfinance, projects/programs, registered group) | 38 | 27.3 |
| Loan/credit from an informal source (moneylender, relative, etc.) | 41 | 29.5 |
| Renting out your farm machinery (e.g. tractor, thresher, pump, etc.) | 6 | 4.3 |
| Renting out your own land | 28 | 20.1 |

In terms of the number of off-farm income sources, 2% of the households reported having none, 16% reported one source, 31% reported two, 31% reported three, and 14% had four different off-farm income sources (Figure 7).

**Figure 7. Percentage distribution of household according to number of off-farm income sources**




## 3.6. Discussion

There have been issues of erratic and low rainfall in the Vaishali area, leading to low crop productivity. Most of the households are resource-poor. The Public Distribution System has been contributing to overall household food security. In recent years, the households have diversified into other activities like quail farming, plantation crops, and livestock rearing. The reliance on food crops is still there, however only 31.4% of the households have been selling the crops.

The households are rearing cows, buffaloes, goats, and chickens for augmenting the farm income. The milk is sold commercially and some partially used for own consumption. The manure is put in the fields. Some fields which have bushes are used as fuel in domestic cooking as well as feed for the livestock. The production and commercialization diversification indices indicate that there is intermediate commercialization in the area, where households produce 3 to 5 crops (including income from selling milk) and have good access to markets. As on-farm production is diversified, results also show that there is substantial

income from remittances and employment outside the farm. There has been an increase in the number of households accessing both formal and informal credit sources since the baseline was carried out.

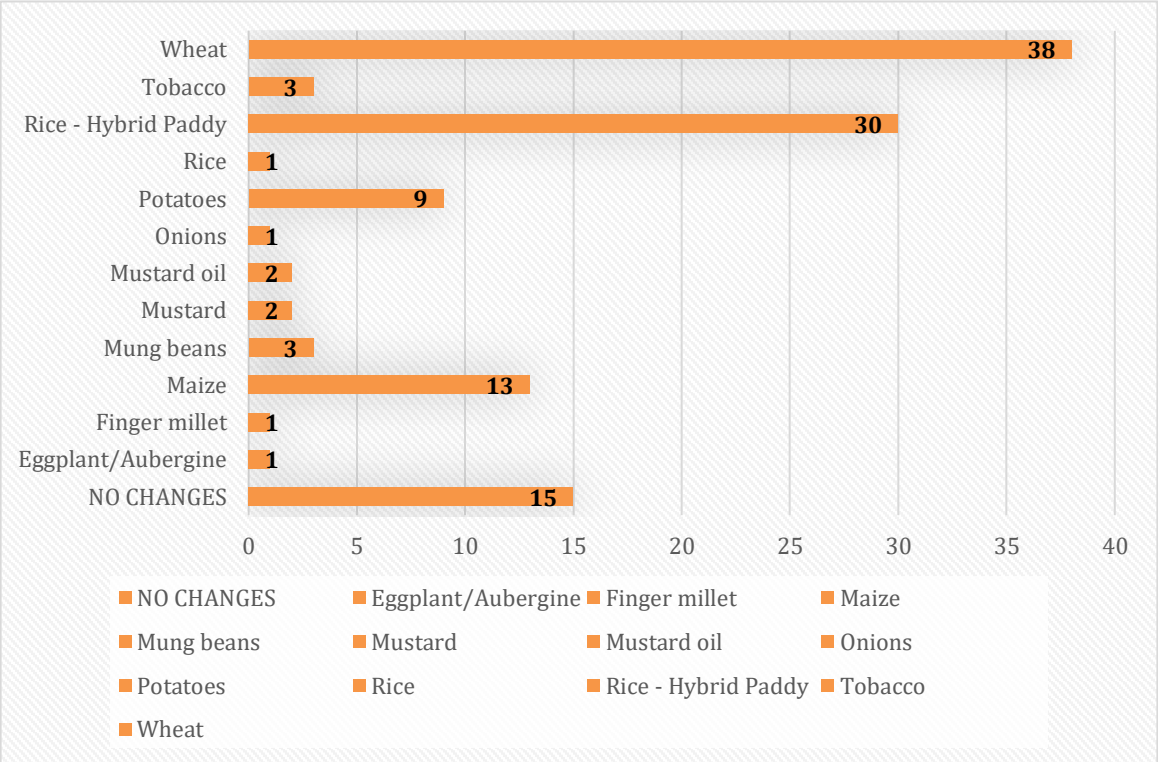
# 4. Crop, livestock, land and water management changes

The major crops are rice in Kharif followed by wheat in winter. Some farmers cultivate vegetables, however due to the high cost of manual labor they feel discouraged to bring more land under vegetables. In Vaishali, the majority of farm households have small landholdings. While most of the farmers are keen on adopting modern crop and livestock technologies, they do not easily access these technologies

## 4.1. Crop-related changes

In the surveyed households, identification of the three most important crops based on an overall livelihood perspective are wheat, paddy, and maize apart from various vegetables cultivated in the area.

**Figure 8 Changes to main crops as per percentage of households cultivating them**



As shown in

Figure 8, the main crops identified as per the number of households growing them are wheat and rice, which is the same as seven years ago.

### Adopters of new crops/ varieties

Households were asked about the changes they made to their farming practices over the last seven years and for which crop, and whether they introduced new crops or not. The result from the analysis shows that 67.63% of the surveyed households showed no introduction of any new crop, whereas the maximum percentage of households (20%) introduced wheat as a new crop followed by rice as their new crop. All the new crops that were introduced within the surveyed households are mentioned in Table 9.

**Table 9. Introduction of new crops within the surveyed households**

| Introduction of any new crop | Number of households | % of households |
|---|---|---|
| No change | 94 | 67.63 |
| Banana | 1 | 0.72 |
| Beans | 2 | 1.44 |
| Betel leaf | 1 | 0.72 |
| Cauliflower | 2 | 1.44 |
| Cucumber | 1 | 0.72 |
| Eggplant | 1 | 0.72 |
| Fodder (crop) | 2 | 1.44 |
| Garlic | 2 | 1.44 |
| Maize | 21 | 15.11 |
| Mango | 1 | 0.72 |
| Mung beans | 4 | 2.88 |
| Mustard | 1 | 0.72 |
| Mustard oil | 4 | 2.88 |
| Okra | 2 | 1.44 |
| Onions | 7 | 5.04 |
| Potatoes | 20 | 14.39 |
| Pumpkin/Squash/Gourd | 2 | 1.44 |
| Rice - Hybrid Paddy | 25 | 17.99 |
| Tobacco | 2 | 1.44 |
| Wheat | 28 | 20.14 |

A majority of households (84%) are not testing any new crops, but the a few households are testing cauliflower, chickpeas, and rice (2% of households for each) as a new crop in the field (Table 10).

**Table 10. Number of new crop testing in the surveyed households**

| New crop testing | Number of households | % of households |
|---|---|---|
| No change | 118 | 84.29 |
| Beans | 1 | 0.71 |
| Cauliflower | 3 | 2.14 |
| Chickpeas | 3 | 2.14 |
| Eggplant/Aubergine | 3 | 2.14 |
| Finger millet | 1 | 0.71 |
| Guava | 1 | 0.71 |
| Herbs/Spices | 1 | 0.71 |
| Lentils | 1 | 0.71 |
| Maize | 2 | 1.43 |
| Mung beans | 2 | 1.43 |
| Onions | 1 | 0.71 |
| Pumpkin/Squash/Gourd | 1 | 0.71 |
| Rice - Hybrid Paddy | 3 | 2.14 |
| Tobacco | 1 | 0.71 |

In contrast to the baseline survey, 84.28% of the households have entirely stopped growing a few crops in the last seven years. Some of the crops that are not being cultivated any longer are pulses, sugarcane, and millets.

A majority of the households have not stopped growing of any crops completely, although a few households have stopped growing maize (15.7%), and a tiny percentage of households have stopped growing mung beans, eggplant, and cauliflower, among others (Table 11).

**Table 11. Crops that surveyed households have stopped growing**

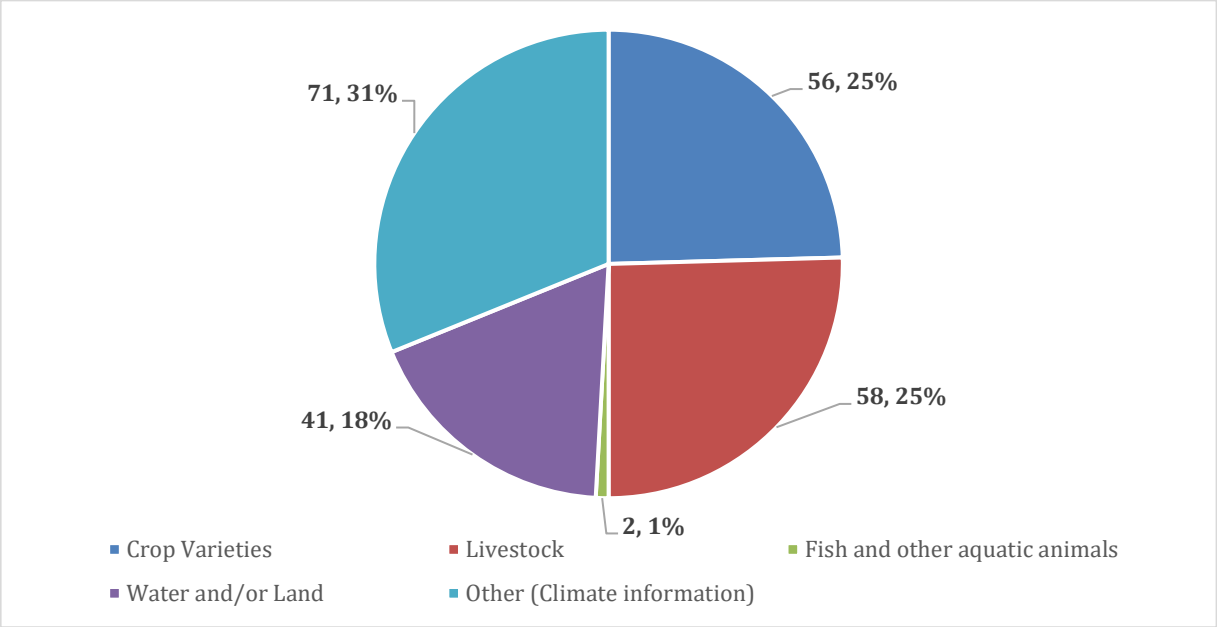
| Stopped growing the following crops (completely) | Number of households | % of households |
|---|---|---|
| No change | 63 | 45.00 |
| Beans | 1 | 0.71 |
| Cauliflower | 4 | 2.86 |
| Chickpeas | 1 | 0.71 |
| Eggplant/Aubergine | 8 | 5.71 |
| Finger millet | 1 | 0.71 |
| Maize | 22 | 15.71 |

| | | |
|---|---|---|
| **Mung beans** | 9 | 6.43 |
| **Mustard** | 2 | 1.43 |
| **Okra** | 3 | 2.14 |
| **Onions** | 14 | 10.00 |
| **Peppers** | 1 | 0.71 |
| **Potatoes** | 7 | 5.00 |
| **Pumpkin/Squash/Gourd** | 1 | 0.71 |
| **Radish** | 1 | 0.71 |
| **Rice** | 2 | 1.43 |
| **Rice - Hybrid Paddy** | 14 | 10.00 |
| **Tobacco** | 21 | 15.00 |
| **Tomatoes** | 2 | 1.43 |
| **Wheat** | 2 | 1.43 |

## Changes made in the past 7 years

The surveyed households were queried regarding the changes they have made to crop varieties, livestock, water and land, and other climatic information. Figure 9 depicts the changes made by the surveyed households. The analysis shows that one quarter of the changes related to crop varieties, another quarter of the changes have been made to livestock practices, 18% of the changes were related to land and water and 31% of changes were other changes (Figure 9).

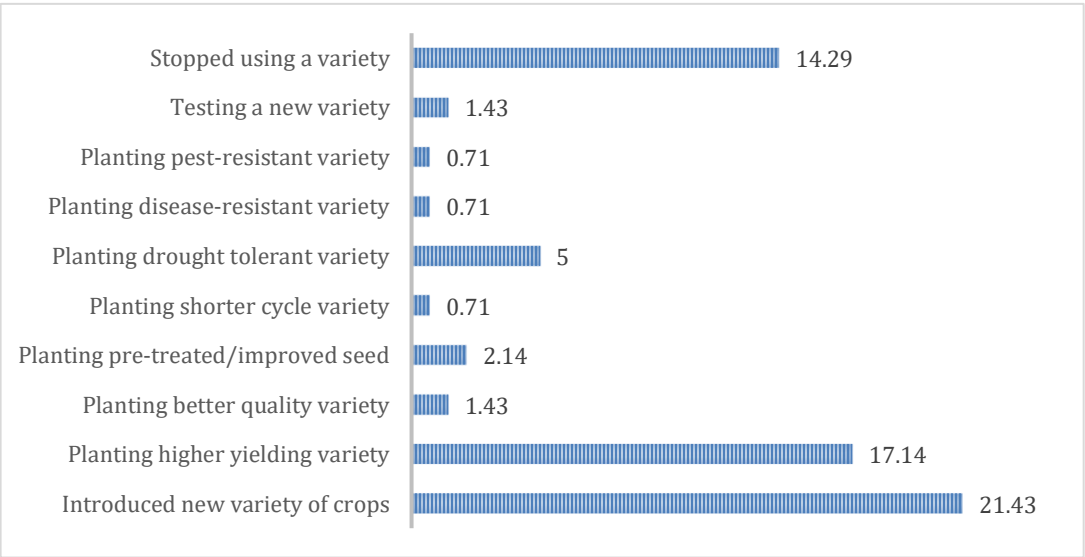
**Figure 9. Changes made in past 7 years within the surveyed households**




## Cropping-related changes

The cropping-related changes over the last 7 years were analyzed. The results showed that most of the households had made cropping-related changes such as planting new varieties of crops and planting high yield variety crops (Figure 10). Cropping-related changes took place mainly in rice, wheat, and fodder crops.

**Figure 10. Cropping related changes within surveyed households**



### Market related changes

When probed further about market-related changes it was found that only three factors are considered by the farmers to change farming practices (Table 12). These factors are getting better yield, better price, and a new opportunity to sell.

**Table 12. Market related reasons for changes in farming of principal practices crops**

| Market related changes | Number of respondent households | % of respondents |
|---|---|---|
| Better yield | 26 | 74.29 |
| Better price | 6 | 17.14 |
| New opportunity to sell | 6 | 17.14 |

About three-quarters of households making changes for market-related reasons are motivated by better yield, while 17.14% made changes due to better prices. There are also new opportunities to sell as mentioned by 17.14% of households as their reason for making changes in farming practices.

### Climate-related reasons

The study considered the climatic factors that could be the potential reason for the household to change farming practices. Six climate-related reasons for changing farming practices were highlighted: less overall rainfall, more frequent droughts, later start of rains, more cold spells or foggy days, rains stopped too early, and lastly the declining groundwater table. Many of the respondents mentioned climate-related reasons that influenced changes in farm-related practices over the past seven years (Table 13).

**Table 13. Weather/Climate-related reasons for changes in farming practices in surveyed villages**

| Climate-related reasons | Number of households | % of households |
|---|---|---|
| Less overall rainfall | 62 | 44.29 |
| More frequent droughts | 46 | 32.86 |
| Later start of rains | 13 | 9.29 |
| More cold spells or foggy days | 9 | 6.43 |
| Rains stopped too early | 3 | 2.14 |
| Lower groundwater table | 100 | 71.43 |

The result from the climate-related reasons reveals that the majority of the households (71.4%) are impacted due to the lower groundwater table, followed by less overall rain with

about 45% of households affected, and the least concerning climatic factors amongst the surveyed household was rain stopping too early. The water table declined by about 50 feet during the last 40 years, and the decline was particularly rapid during the previous seven years. The decrease in the groundwater table is caused by low rainfall along with the absence of water harvesting and aquifer recharging arrangements in the area under study.

## 4.2. Livestock-related changes

Livestock is an important component of the livelihood, economy generation and complementary resource for crop production. The households were surveyed to gather the information regarding changes with respect to livestock.

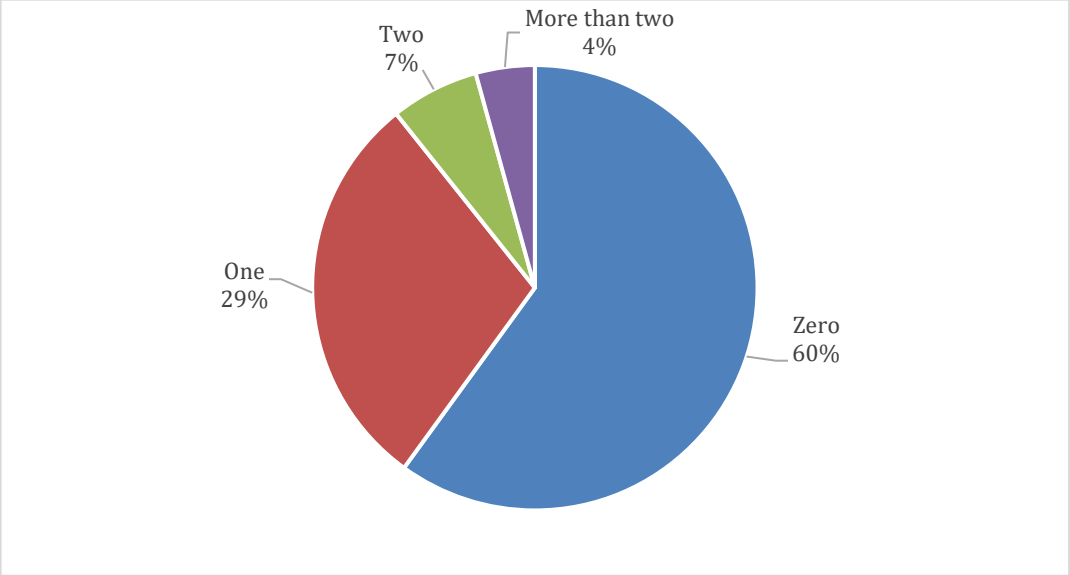
Sixty-two percent of the respondents made changes in terms of introduction of new farm animals while 20.7% of the respondents stopped keeping one or more farm animals. A few respondents made changes in terms of change in fencing and cut and carry introduction (Table 14).

**Table 14. Changes made in relation to livestock within each household**

| Changes made in relation to livestock | Number of households responded | % of respondents |
|---|---|---|
| New farm animals introduced | 36 | 62.07 |
| Stopped keeping one or more types of farm animal | 12 | 20.69 |
| Fencing introduced | 1 | 1.72 |
| Cut and carry introduced | 9 | 15.52 |

Among 140 households, 56 of the households made changes in their livestock keeping practices. Twenty-nine percent of the households made changes in the practices of one animal, 7% in two animals and 4% in more than two animals (Figure 11).

**Figure 11. Number of households making changes in number of livestock**




The maximum number of changes in dairy cow keeping is noted to be three. The results suggest that all households introduced new types of animal and/or new breeds and made associated changes in herd size and care and management of livestock.

### Reason for making the changes

The analysis was done to understand the reasons for making particular changes to crop, livestock, land, and water. The results are shown in Table 14.

**Table 15. Reasons for making the changes**

| Reasons for the changes | Number of households | % of households |
|---|---|---|
| Market | 32 | 23.02 |
| Climate | 118 | 84.89 |
| Land | 14 | 10.07 |
| Labor | 12 | 8.63 |
| Pest and Diseases | 11 | 7.91 |
| Projects | 1 | 0.72 |

The majority of households reported climate as the main reason for the changes they made within past seven years, followed by market-related reasons. Land and water contributed to 10% of the reasons for the changes made, while the least important reason for making the changes was due to projects.

## 4.3. Adaptibility/innovation index

An adaptability/innovation index was defined as the following:

0 = 0 or 1 change made in farming practices over last seven years (low level)

1 = 2-10 changes made in farming practices (intermediate level)

2 = 11 or more changes made in farming practices (high level)

The result from the study shows that the adaptability index in Vaishali is low, as 66.43% of the surveyed households has made zero to one changes in both crops and livestock species.

**Table 16. Adaptability/Innovative index**

| Number of changes made in last 7 years | Number of households | % of household |
|---|---|---|
| Zero to one (low) | 93 | 66.43 |
| Two to Ten (intermediate) | 47 | 33.57 |
| More than eleven (high) | 0 | 0 |

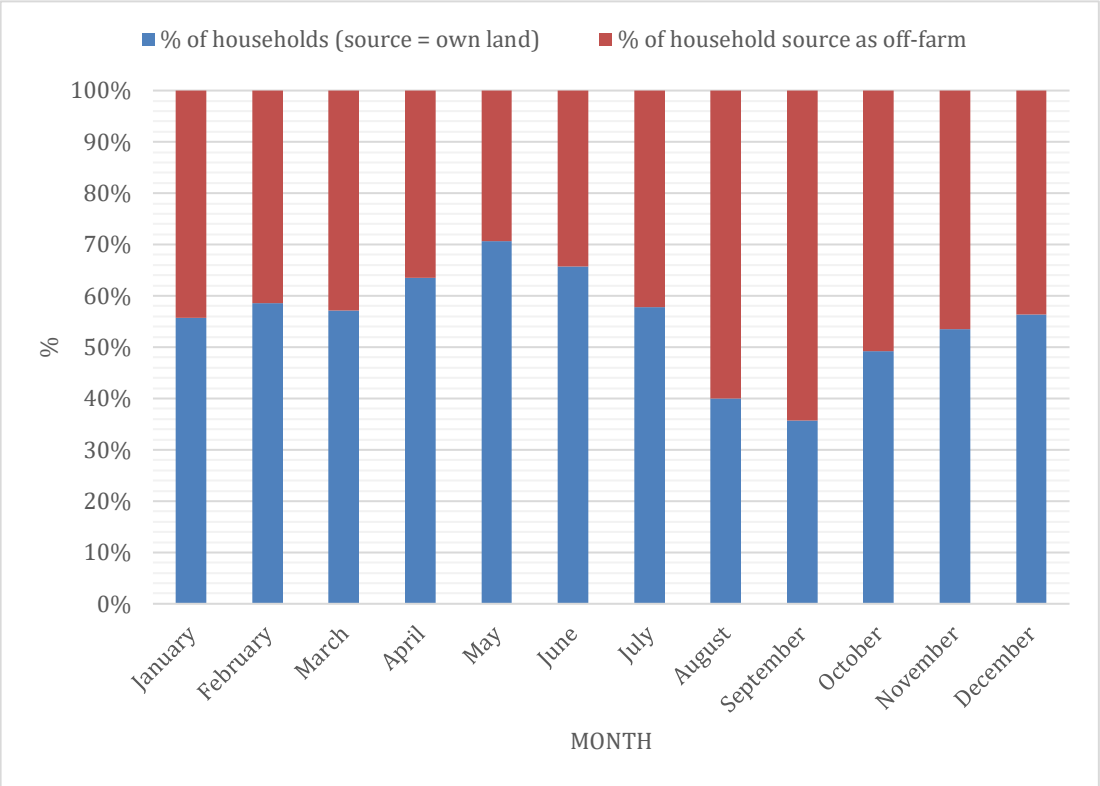
## 4.4. Discussion

The area is witnessing a major shift in rainfall. In the last five years there has not been rainfall at the optimum level. The farmers are still sticking with the rice and wheat crops. The major diversification has been in terms of livestock rearing for diversification of livelihoods.

# 5. Food security

We asked households about their ability to access enough food for their family and whether the food came from their own farm or elsewhere (off-farm) for each month of the year. The results from the survey show that out of 115 respondents, 55.5% of the surveyed households acquired food from their own farmland, while 44.5% of the surveyed households obtain food from off-farm land throughout the year from January to December. The variation in the graph in Figure 12 shows the primary source of food by month.

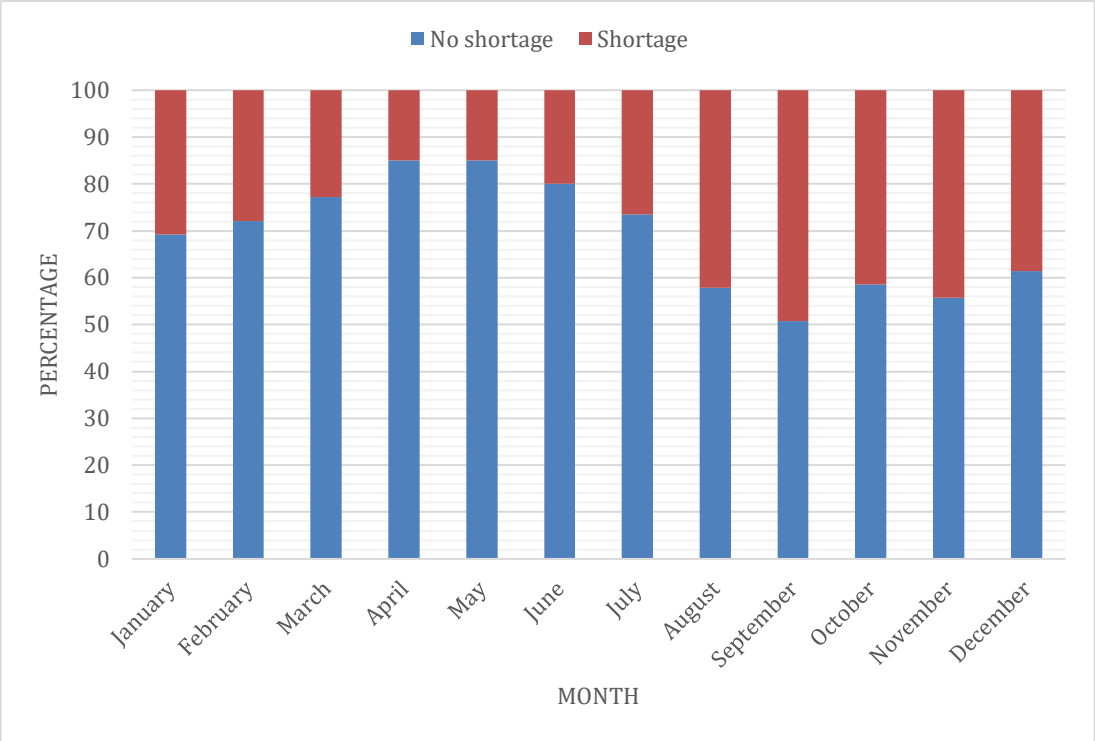
**Figure 12. Main source of food by month (from own farm and off-farm)**




The surveyed households were also queried about the duration of the year when they struggled to have an adequate amount of food from any source. A total of 108 households faced food shortages in at least one month of the year, and on average each household faces food shortage at least three times in a year. The highest number faces food shortage during September.

Figure 13 shows the time of the year in which a particular household faces difficulty to feed the family.

**Figure 13. Hunger/Food shortage months**




## 5.1. Food Security Index

The food security index was created based on the number of months that the household has difficulty in getting food from any source (i.e. from their own farm or stores, gifts, purchases or transfers). Households in Vaishali face a relatively high amount of food security: 60% of households have three months or more of food insecurity throughout the year.

**Table 17. Food Security Index**

| Hunger months | More than 6 months of food deficit | 5-6 food deficit months | 3-4 food deficit months | 1-2 food deficit months | Food all year round |
|---|---|---|---|---|---|
| % of households | 21.6 | 14.2 | 25 | 21.4 | 17.8 |

## 5.2. Discussion

The result obtained from the midline survey noted a sharp increase in hunger amongst the surveyed households by as compared to the baseline survey conducted 7 years ago. During the baseline survey, 55% of households reported having sufficient food all year, but only 17.8% of households reported the same during this midline survey. The percentage of households

experiencing more than 6 months of food deficit during the year more than doubled from the baseline to the midline, from 10% to 21.6%.

# 6. Land and water

## 6.1. Water for agriculture

In Vaishali, agriculture is mostly rainfed, which in the last 7 years has been changing into tube well/ bore well-based irrigation. The survey area is in the valley of the Ganges and Gandak. There are some canals, which mostly run dry. As reported below in the asset section, very few households have pump sets, signifying the resource-poor condition. CIMMYT has been active in teaching the farmers water saving techniques and better agronomic practices. The results are better now. The low rainfall in the last few years has forced farmers to take up livestock cultivation as a supplementary livelihood source. Most of the water requirement is for the cultivation of wheat and paddy.

About 40% of households have access to an irrigation source, either owned or hired. The bore well (submersible) is the predominant source of water with 82.71% of surveyed households having access, and many of the respondents have fitted hand pumps. However, resource-poor farmers are constrained by not having their own pump, and therefore cannot invest in water for irrigation.

**Table 18. Water sources for agriculture on-farm**

| On-farm agricultural water source | Number of households | % of households |
|---|---|---|
| Irrigation | 53 | 39.85 |
| Tanks/infrastructure for water harvesting | 1 | 0.75 |
| Boreholes | 110 | 82.71 |
| Wind water pumps | 2 | 1.50 |
| Water pumps (other type) | 20 | 15.04 |

## 6.2. Land use

The majority of the households are poor, both in terms of land ownership and income. Table 19 shows that 82.85% of them access less than one hectare of land (i.e. owned and/or rented). The highest landholding among the respondents is 2.21 ha, and 11 households (7.86%) are landless. None of the respondents have more than five hectares of land, and 9.29% of

households have between 1-5 hectares. Most of the land owned is used for growing cereals. None of the respondents use communal land. All categories of households used almost all land for crop production. Less than a hectare land is unproductive and degraded.

**Table 19. Total land size accessed by households**

| Number of hectares of land owned and rented in | % of households |
|---|---|
| Landless | 7.86 |
| Less than 1 hectare | 82.85 |
| 1 to 5 hectares | 9.29 |
| More than 5 hectares | 0.00 |

# 7. Inputs and credits

The surveyed households reported using a variety of agricultural inputs, including improved certified seeds, chemical fertilizers, pesticides and veterinary medicines, and a few also purchase crop and livestock insurance. The results from the survey as shown in Table 17 reveal that about 90% of farmers buy seeds and fertilizers from markets. Sometimes such inputs are sought from the local government as the government distributes high yielding varieties of the seeds to a few farmers for testing them in the farmers' fields. Similarly, about 90% buy and use pesticides because they are engaged in intensive cultivation of food crops and a few of them started commercial vegetable cultivation. Livestock is also an important enterprise in the area, hence 75.7% of farm households purchased and used veterinary medicines to maintain good health of their dairy animals. The self-help groups groups promoted by the NRLM and the microfinance institutions (MFIs) provide necessary credit for the farmers. Access to a formal credit system and Kisan credit cards is weak in this area. About 51% of the farmers make use of credit for agricultural activities. Only 5 households have taken insurance for crop or livestock. The extension and delivery mechanism for insurance still leaves a lot to be desired. However, two households have purchased weather-based insurance.

**Table 20. Purchased input use**

| In the last year, did you purchase | Number of households | % of households |
|---|---|---|
| Improved seed? | 122 | 87.14 |
| Inorganic mineral fertilizer? | 126 | 90.00 |
| Pesticides/herbicides? | 126 | 90.00 |
| Organic fertilizer? | 59 | 42.14 |
| Veterinary medicines? | 106 | 75.71 |
| Credit for agricultural activities? | 71 | 50.71 |
| Crop or livestock insurance? | 5 | 3.57 |
| Was the insurance weather-based? | 2 | 1.43 |

# 8. Climate and weather information

The survey data show that 75.71% of respondents get climate and weather-related information from various sources, including radio, television, government department (agricultural extension), private organizations and community members. Households receive information on extreme events, pest or disease outbreak, the start of the rains and extended periods of weather information.

## 8.1. Information recipients in the households

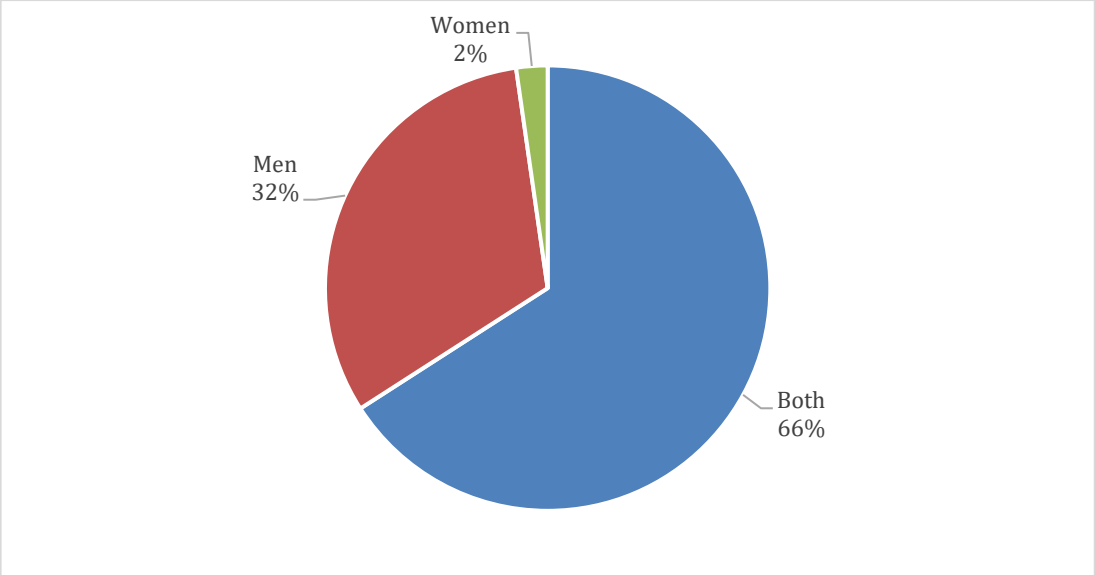
About three-quarters of surveyed households reported receiving information on weather/climate over the past 12 months. Almost 55% of the households access information about the start of rain. Among the households, 31.43% receive information about an extreme event such as floods. About 14% households have information about the weather for the following 2-3 months. About 6% of households have information about the weather for the coming 24 hours to 3 days. Very few households, i.e. 4%, have information about pest and disease outbreaks.

**Table 21. Type of weather-related information received by the surveyed households**

| Type of weather-related information | Number of households | % of households |
|---|---|---|
| Extreme event | 44 | 31.43 |
| Pest or disease outbreak | 6 | 4.29 |
| Start of the rains | 76 | 54.29 |
| Weather for the following 2-3 months | 19 | 13.57 |
| Weather for today, 24 hours and/or next 2-3 days | 9 | 6.43 |

Both male and female members of the surveyed households get information on weather. However, in most cases, males are the primary recipient of the information from the external sources. In Vaishali, 66% of households reported that the forecast information is received by both men and women. However, only 2% of the women receive the information alone. One-third of households reported that the weather-related information is received only by men.

**Figure 14. Gender breakdown of different kinds of weather-related information**




## 8.2. Types of weather-related information

Respondents reported receiving weather-related information from various sources, including radio, television, agricultural extension, friends, relatives, neighbors, newspaper, cell phone and internet.

### Extreme events

Out of the 140 households surveyed, 44 households (31.43%) receive information from some source or the other on extreme events. Television emerged as the most important source of information about extreme events amongst the surveyed households. About 63% of surveyed households that receive information related to extreme events receive it through television. This is followed by newspaper, where 47.73% of the 44 households get information on extreme events. About 45.5% of the surveyed households receiving information on extreme events get it through friends, relatives or neighbors. About 36.4% of the surveyed households

access the related information through cellphone. Those who have smartphones get information through the internet, which is 20.5% (Table 22).

**Table 22. Sources of information about extreme events**

| Source of information on extreme events | Number of responses | % of respondents |
|---|---|---|
| Radio | 3 | 6.82 |
| Television | 28 | 63.64 |
| Government agricultural extension or veterinary officers | 1 | 2.27 |
| Friends, relatives or neighbours | 20 | 45.45 |
| Newspaper | 21 | 47.73 |
| Your own observations | 8 | 18.18 |
| Cell phones | 16 | 36.36 |
| Internet | 9 | 20.45 |

With the information, 15 households reported that they make adjustments in their agricultural practices, most commonly through changes in inputs (five households) and irrigation (three households).

### Pest and disease outbreaks

Only six households reported that they get information about pest and disease outbreaks. The information source for all the households is television. Apart from it, they get the information from radio, newspaper, Government extension Officers, Veterinarians, own observations, cell phones, internet, and through friends and neighbors. The information is received by men in three households and in the other three households the information is received by both men and women. The information is mostly helpful in aiding livestock in vaccination and treatment.

### Forecasts of the start of the rains

The farmers and community people sometimes get predictions about the timing of rain, which is very important for planning agricultural activities. About 54.3% of the households get the information regarding the forecast about rains. In Vaishali, television is the main source for the rainfall information (71.05%) followed by cell phones (59.2%) and Internet (42.11%). TV channels generally get such forecasts through the government meteorological department and

local met office. Newspapers and friends and relatives are important sources of information which were accessed by 52.63% and 22.37% households, respectively.

Both male and female members of the surveyed households get an information forecast of rain. However, in most cases, both men and women (50 households out of 76) are the primary recipients of the information from the external sources. Yet only one woman responded that she receives the information alone.

**Table 23. Sources of information on the predicted timing of the start of the rains**

| Source of information on start of the rains | Number of households | % of household |
|---|---|---|
| Television | 54 | 71.05 |
| Friends, relatives or neighbours | 17 | 22.37 |
| Newspaper | 40 | 52.63 |
| Cell phones | 45 | 59.21 |
| Internet | 32 | 42.11 |

## Change in the farming aspect as a result of the information about the start of the rains

About 24% of surveyed households reported changing the timing of their farming activities and crop type as a result of the information about the start of the rains, followed by changes in irrigation (19%) and land management (19%).

**Table 24. Change in farming aspects due to information about the start of the rains**

| Changed aspects of farming | Number of households | % of households |
|---|---|---|
| None | 2 | 9.52 |
| Land management | 4 | 19.05 |
| Crop type | 5 | 23.81 |
| Crop variety | 3 | 14.29 |
| Change in inputs (seed, fertilizer, pesticides) | 3 | 14.29 |
| Use of manure/compost/mulch | 1 | 4.76 |
| Change in timing of farming activities | 5 | 23.81 |
| Irrigation | 4 | 19.05 |

## Weather forecasts for the next 2-3 months and 2-3 days

Among the surveyed households in Vaishali, only 13.6% received weather forecasts for the next 2-3 months, and 6.4% of households obtained weather forecasts for the next 2-3 days.

For the information about the 2-3 months' advance prediction, the most important source of information in providing weather forecasts of the given periods is internet at 57.9%. Television was the second most common source of information with 52.63%. This is followed by friends and relatives with 47.37%. About 42.11% of the information on 2-3 months advanced prediction was acquired with the help of newspapers (Table 25).

**Table 25. Sources of information on 2-3 months advance prediction**

| Source of information | Number of households | % of responses 2-3 months |
|---|---|---|
| Radio | 3 | 15.79 |
| Television | 10 | 52.63 |
| Friends, relatives or neighbours | 9 | 47.37 |
| Newspaper | 8 | 42.11 |
| Your own observations | 1 | 5.26 |
| Cell phones | 1 | 5.26 |
| Internet | 11 | 57.89 |

For the information about the 2-3 days' advance prediction, the most important source of information in providing weather forecasts of the given periods is television, followed by radio and friends and relatives (Table 26).

**Table 26. Sources of information on 2-3 day advance prediction**

| Source of information | Number of households | % of responses, 2-3 days' forecast |
|---|---|---|
| Radio | 3 | 33.3 |
| Television | 5 | 55.6 |
| Friends, relatives or neighbours | 3 | 33.3 |
| Newspaper | 2 | 22.2 |
| Cell phones | 1 | 11.1 |

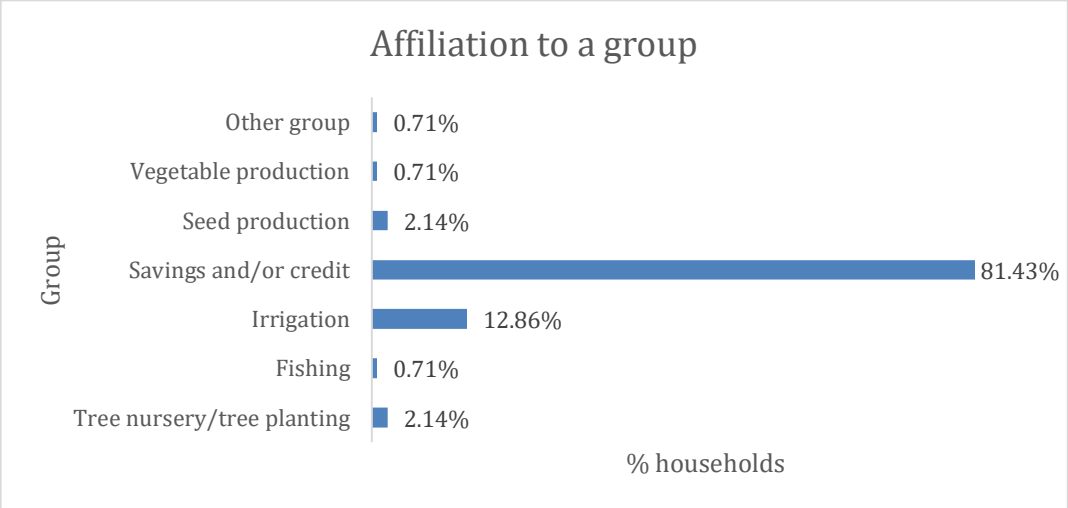
## 8.3. Discussion

From the results of the survey, it may be inferred that the majority of the households get climate and weather-related information from various sources. Television, cell phones, newspapers, internet, and friends and relatives have emerged as the most important sources of information about extreme events amongst the surveyed households.

# 9. Community groups

Community groups are affinity groups, which are formed to perform functions and efforts related to production, marketing, savings and credit, and water use. The few functional and vibrant groups are an Agricultural Cooperative Credit Society, a Dairy Cooperative Society, and a Productivity Enhancement Group. The Dairy Cooperative is one of the few successful rural institutions found within Bihar State. In the villages, a lot of work has been done the civil societies and the Bihar State Rural Livelihood Mission (Jeevika), which has formed Self Help Groups among women. Further, there are various microfinance institutions that are operating in the area. These organizations have mobilized women under the financial inclusion program. Among the 140 respondents, 114 (81.43%) are members of savings and credit groups, up from the baseline of 24%. Most of these beneficiaries are women, while the baseline suggested that mostly males were members of community groups. Under the programs of CIMMYT and other international organizations, farmers have organized themselves into irrigation user's groups.

**Figure 15. Membership in Community Groups**

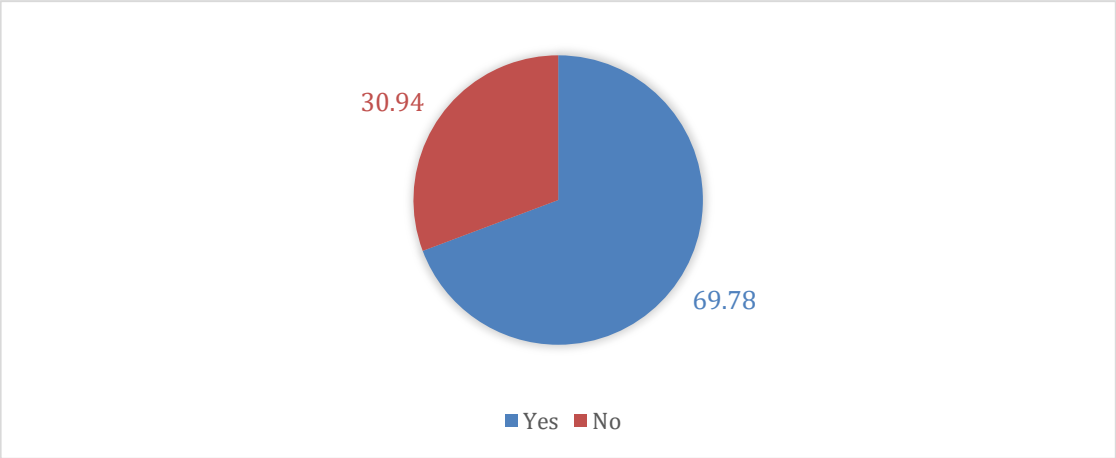



## 9.1. Climate-related crises

We looked at whether households have faced a climate-related crisis in the last 5 years and whether or not they received help to deal with the impacts of such a crisis. For those who received help we inquired as to the source of this help. Of the surveyed households, 69.78% reported facing a climate-related crisis in the last 5 years. Only 31% of the households convey

that they have not felt any climate related crisis in the last 5 years (Figure 16). About 14% of households sought help from one source or another. The source of help was from friends, relatives and neighbours (6.4%) and Government agencies (6.4%). One household sought assistance from a politician.

**Figure 16. Climate-related crisis in the last 5 years**




## 9.2. Discussion

The national flagship program of the National Rural Livelihood Mission and microfinance institutions have been working on financial inclusion in the area. It has brought prosperity and increased social security among the people of the area. There has been low rainfall over the past 4-5 years, and therefore the productivity of the agricultural crops has declined. The effect of climate change is evident, and the groundwater table is depleting at a faster rate. Some areas in Vaishali are flood prone, and therefore the people have to take shelter or assistance from somewhere.

# 10. Assets

Households were asked about ownership of different types of assets such as:

- Transport: Bicycle, motorcycle, car, truck
- Energy: solar panel, generator (electric or diesel), battery, biogas digester, LPG
- Production assets: tractor, plough, mill, thresher, treadle pump, fishing net
- Information assets: radio, TV, cell phone, computer, internet access
- Luxury items: refrigerator, air conditioning, electric fan, bank account, stove.

The Vaishali site is home to an impoverished population, and the majority of households are asset-poor.

About 81 percent of the households use a bicycle as the primary means of transport. Motorcycles are still a common mode of transport, owned by 38% of the households. Only 5 households among the 140 surveyed own a four-wheeler or a truck (Table 27).

**Table 27. Ownership of transport assets**

| Transportation assets | Number of households | % of households |
|---|---|---|
| Bicycle | 114 | 81.43 |
| Motorcycle | 53 | 37.86 |
| Car or truck | 5 | 3.57 |

Among the surveyed households, not a single household owns a tractor or mechanical plough. Only 21.4% of the households own a pump. There are only four mills for minor processing of the harvested crops, and there is only one thresher owned amongst the surveyed households (Table 28).

**Table 28. Ownership of various production assets**

| Production assets | Number of households | % of households |
|---|---|---|
| Water pump/Treadle pump | 30 | 21.43 |
| Mechanical plough | 0 | 0 |
| Mill (for grinding cereals or oilseeds) | 4 | 2.86 |
| Thresher | 1 | 0.71 |
| motor powered spraying tank | 0 | 0 |

In spite of the poverty and because of the recently launched Pradhan Mantri Ujjwala Yojana (aimed at providing Liquid Petroleum Gas (LPG) to all the households), LPG is used for cooking fuel, and 88% of surveyed households use it. Solar panels (2.14%), generators (2.14%), and biogas digesters (only one household) are not common energy assets in the study area (Table 29).

**Table 29. Ownership of various energy assets**

| Energy assets | Number of households | % of households |
|---|---|---|
| Solar panel | 3 | 2.14 |
| Generator (electric or diesel) | 3 | 2.14 |
| Battery (large, e.g. car battery for power) | 0 | 0.00 |
| Biogas digester | 1 | 0.71 |
| LPG | 123 | 87.86 |

Information assets include radio, television, cell phone, computer and internet. Among these, the cell phone is most common and is owned by about 91% of surveyed households, followed by television, which is owned by about 57% of the households. Radio is owned by 7.14% of the households. Computers are owned by only three households. Because of cheaper internet data charges in India, 41 households (29.29%) have internet access (Table 30).

**Table 30. Ownership of information assets**

| Information assets | Number of households | % of household |
|---|---|---|
| Radio | 10 | 7.14 |
| Television | 80 | 57.14 |
| Cell phone | 127 | 90.71 |
| Computer | 3 | 2.14 |
| Internet access | 41 | 29.29 |

Luxury assets included in the survey were refrigerator, air conditioner, electric fan, and bank account. Electric fans and bank accounts can now be considered necessary assets in the area. None of the households owns an air conditioner. Electric fans are owned by 89% of households, whereas about 95% of households have a bank account. A refrigerator is owned by only 13 households (9.3%) (Table 31).

**Table 31. Ownership of luxury assets**

| Luxury Assets | Number of households | % of households |
|---|---|---|
| Refrigerator | 13 | 9.29 |
| Air conditioning | 0 | 0.00 |
| Electric fan | 124 | 88.57 |
| Bank account | 133 | 95.00 |

## 10.1. Asset index

The total numbers of assets in all categories were added up and the following asset index created:

- 0 = no assets (basic level)
- 1 = 1-3 assets (intermediate level)
- 2 = 4 or more assets (high level

Almost all households possess various assets in the surveyed villages. The majority of households (91%) belong to the high asset level category, and about 9% of households are in the intermediate asset category. None of the surveyed households belong to the basic level asset category (Table 32).

**Table 32. Asset index of the surveyed households in Vaishali**

| Number of queried assets | Number of households | % of households |
|---|---|---|
| None (basic level) | 0 | 0.00 |
| 1-3(intermediate level) | 13 | 9.29 |
| 4 or more (high level) | 127 | 90.71 |

## 10.2. Discussion

More than 91 percent of households own four or more assets; this is because of the basic social welfare schemes of providing cooking gas and opening of bank accounts. The level of mechanization in agriculture is low. Overall prosperity in terms of owning luxury assets is extremely low.

# Appendix

## Appendix 1. Study Team Members

List of enumerators and survey team members:

- Anand Keshri
- Dhananjay Kumar
- Dhananjay Kumar Singh
- Kanchan Kargwal (Ms.)
- Rahul Ranjan Puri

All enumerators:

- Sanjay Prasad (Team Leader)

## Appendix 2.

List of villages covered in the midline

- Mukundpur
- Panchain Mahesh
- Baijnathpur
- Madhopur
- Bakarpur
- Chaksaide
- Rasulpur