

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

Summary of Baseline Household Survey Results:

**Ek Phnum district
Battambang province
Cambodia**

May 2015

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RESEARCH PROGRAM ON
**Climate Change,
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Food Security**



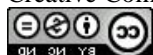
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The tools and guidelines used for implementation of the household baseline study across all CCAFS sites can be accessed on our website (<http://ccafts.cgiar.org/resources/baseline-surveys>).

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Abstract

The household baseline survey conducted from December 2014 to January 2015 collected data from 140 households in seven villages, including Rohal Suong village, in the Ek Phnum district, Battambang province, Cambodia. This is part of the baseline data collection activities in Rohal Suong Climate Smart Village of CGIAR Research Program on Climate Change, Agriculture and Food Security. The objective is to collect household baseline data where the data to be collected five and 10 years after on the same households will be compared to capture changes that may occur over time. Results showed that the households were highly dependent on farming and small livestock raising for food and income and had access to small landholdings. Households also diversified income sources by engaging in off-farm work, and experienced hunger, especially in the months of October to December. Farming was characterized by low crop and commercialization index. Climate change-related factors, particularly drought and flooding, were the main factors identified to influence farming decisions. Adaptation and mitigation measures need to be enhanced. Information on extreme weather events were commonly available, but not weather forecasts. Providing the farmers with correct information can help them make good farming decisions.

Keywords

Cambodia, baseline, household survey, livelihoods, agriculture products

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TABLE OF CONTENTS

1. INTRODUCTION.....	6
2. RESULTS.....	9
2.1. Household types and survey participants.....	9
2.2. Demography.....	9
2.2.1. Household size and composition	9
2.2.2. Education levels.....	10
2.3. Sources of livelihood	10
2.3.1. On-farm livelihood sources	10
2.3.2. Off-farm livelihood sources.....	12
2.3.3. Diversification index	13
2.3.4. Commercialization index.....	13
2.3.5. Division of labor on- and off-farms.....	13
2.3.6. Sources of off-farm cash income.....	15
2.4. Changes in farming practices and resources	16
2.4.1. Crop-related changes	16
2.4.2. Changes in farming practices	17
Cropping-related changes	17
Soil management-related changes.....	17
2.4.3. Livestock-related changes	18
2.4.4. Adaptability/Innovation index	19
2.4.5. Mitigation indices	20
2.5. Food security.....	20
2.5.1. Food security index	20
2.5.2. Climate related crisis	20
2.6. Land and Water.....	21
2.6.1. Water for agriculture	21
2.6.2. Land use.....	22
2.6.3. Communal Land	22
2.6.4. Rental of machinery or hiring of labor	22
2.7. Input and credit	23
2.8. Climate and weather information	24
2.8.1. Forecast for extreme events	24
2.8.2. Forecast for pest or disease outbreak	25
2.8.3. Forecast for the start of the rains	25
2.8.4. Weather forecast for the next two to three days	26
2.8.5. Weather forecast for the next two to three months	27
2.9. Community groups	28
2.10. Assets	28
3. CONCLUSIONS	30
Acknowledgements.....	31
Appendix A: Survey process and implementation	32
Appendix B: Sampling Frame – List of Villages	33

LIST OF TABLES

Table 1. Demographic characteristics of the households.....	9
Table 2. Highest level of education obtained by any household member.....	10
Table 3. Number of products produced in own farm	11
Table 4. Production, consumption, and sale of own farm produce (%)	11
Table 5. Production, consumption, and sale of off-farm produce (%)	12
Table 6. Diversification index.....	13
Table 7. Number of products produced on-farm and sold in the last 12 months.....	13
Table 8. Sources of off-farm cash income	15
Table 9. Number of crops to which changes were made over the last 10 years	16
Table 10. Reasons for changing cropping practices	17
Table 11. Changes in farming practices over the last 10 years	17
Table 12. Number of animals types reported.....	18
Table 13. Changes related to livestock over the last 10 years	18
Table 14. Reasons for the changes related to livestock over the last 10 years	19
Table 15. Adaptability/innovation index	19
Table 16. Mitigation indices	20
Table 17. Climate-related crisis experienced by the households in the last 5 years	21
Table 18. Water sources for on-farm agriculture	21
Table 19. Total land size and land use	22
Table 20. Rental of farm machinery and hiring of labor.....	22
Table 21. Farm inputs.....	23
Table 22. Forecast for extreme events	24
Table 23. Forecast for pest or disease outbreak	25
Table 24. Forecast for the start of rains	26
Table 25. Weather forecast for the next two to three days	26
Table 26. Weather forecast for the next two to three months.....	27
Table 27. Membership in community groups	28
Table 28. Asset Index.....	28
Table 29. Specific assets owned.....	29

LIST OF FIGURES

Figure 1. Research site map and location of sampled villages.....	8
Figure 2. Households' members aged between 5 and 60 years old	10
Figure 3. On-farm diversity in the product produced, consumed and sold.....	12
Figure 4. Agricultural workload on-farm by gender/sex	14
Figure 5. Agricultural workload off-farm by gender/sex.....	15

1. INTRODUCTION

This is the report of the household baseline survey (HBS) conducted in the research site in Rohal Suong, province of Battambang, Cambodia of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). The HBS is part of the baseline data collection activities in Rohal Suong Climate Smart Village (CSV) of CCAFS as initial activities toward local engagement in participatory action research.

The objective of the HBS was to gather household level data that include basic indicators of welfare, information sources, livelihood/agriculture/natural resource management strategies, needs and uses of climate and agriculture-related information and current risk management, mitigation and adaptation practices. The main aim was to capture some of the diversity in the landscape, across communities and households, with sufficient precision in some of the indicators to capture changes that may occur over time. The same households covered by the household baseline survey will be revisited in five to 10 years for another survey.

The Rohal Suong CSV is a village in a block of 10km x 10km in the Prek Norinn commune, Ek Phnum District, Battambang province, Cambodia. Located along Stung Sangkee river, Rohal Suong is flooded from September to November each year. It has 347 households with 1,347 population (670 women). The main livelihood activities are rice farming, vegetable farming, and fishing during the rainy season. It has two pronounced seasons – dry and wet. The main climate change challenges include the seasonal flood and drought. Changes in flooding patterns such as the level of water, timing, and duration of floods have been observed in recent years.

The household baseline survey was conducted in January 2015 in seven (out of 22) villages, including Rohal Suong, and covered 140 households. Figure 1 shows the location of the surveyed villages. The survey followed standard steps given in the HBS guideline. Seven villages including Rohal Suong CSV within the 10km x 10km block were randomly selected. For each selected village, 20 households were randomly selected for the survey. Several meetings with the commune and village authorities were conducted to inform about the purpose, scope, and procedure of the survey. The questionnaire was divided into 10 sections, as follows: household respondent and type; demography; sources of livelihood, crop, farm animals/fish, tree, soil, land and water management changes; food security; land and water; input and credits; climate and weather information; community groups and assets. Questionnaires were translated into Khmer to facilitate communication with farmers. Training for data collection and refining the questionnaire were done before implementing the actual survey.

This report provides a summary of the main findings of the analysis of the household survey data. The three main sections are Introduction, Results and Conclusions. The Results section is divided into 10 sub-sections, corresponding to the 10 parts of the questionnaire.

For the full details of the survey team members and villages surveyed, see Appendices A and B. The questionnaire and training materials use, including data entry and management guidelines can be found at www.ccafs.cgiar.org/resources/baseline-surveys.

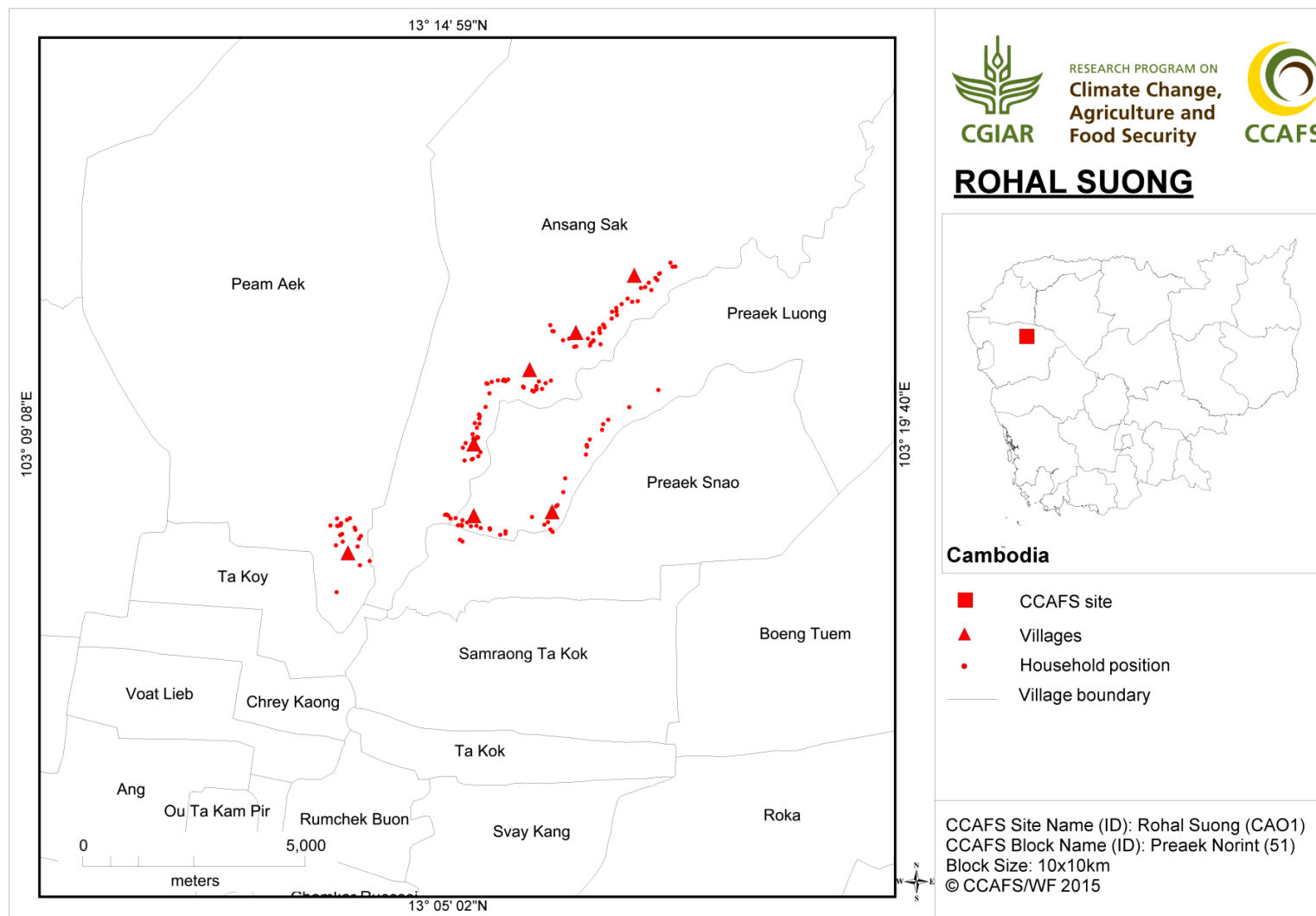


Figure 1. Research site map and location of sampled villages

2. RESULTS

2.1. Household types and survey participants

Among the 140 surveyed households, 36% of respondents were males and 64% were females. They were all Khmer people. In terms of household headship, however, eight in every 10 households were identified to be headed by a male. The likely reason of having more female respondents in the survey was that the women were at home and had time to answer the interview.

2.2. Demography

2.2.1. Household size and composition

Household size ranged between one and 12 members or, on average, five members (5.4) (Table 1). This included the household members who were away from home, but return regularly and/or sending support and not yet having a separate family.¹ The inclusion of these household members could likely account for the bigger household size compared to the typical households in the province of Batambang (4.9), the rural area (4.6) of the country, and in Cambodia (4.6)².

In terms of distribution of the households by number of members, one-third had one to four members, more than half had five to eight members, while few (7%) had nine to 12 members. One-third of the households had children aged less than five years old, while half of the households had members older than 60 years old.

Table 1. Demographic characteristics of the households

Characteristics	% of households (N=140)
Household size (mean)	5.4
Household with (%)	
1– 4 members	34.3
5 - 8 members	58.6
9- 12 members	7.1
With household members <5 years old (%)	35.7
With household members >60 years old (%)	50.7

In terms of having household members aged between 5 and 60 years old, the distribution of the households were near half (47%) had between 80% and 100%, one-third (34% between 60% to 80%, one household had between 40% and 60%, and few had at most 40% (Figure 2). This implies a large pool of members in working age in these households.

¹ It was agreed during the training on HBS to include the household members as described.

² Source: Cambodia Inter-Censal Population Survey 2013

www.stat.go.jp/info/meetings/cambodia/pdf/ci_pr02.pdf

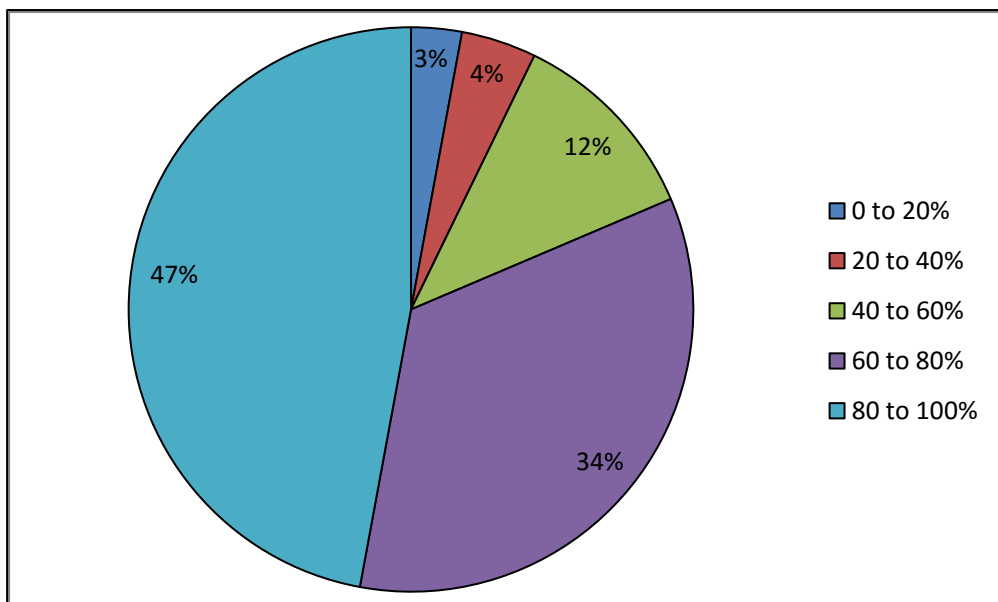


Figure 2. Households' members aged between 5 and 60 years old

2.2.2 Education levels

For every 10 households, three had a household member who attained post-secondary education and four had a household member who attained secondary education (Table 2). About one-fourth of the households had a member who finished at most primary education.

Table 2. Highest level of education obtained by any household member

Level of education	% of households (N=140)
No formal education	1.4
Primary (Grades 1- 6)	24.3
Secondary (Grades 7-9)	42.9
Post-secondary*	31.4

* Grades 10-12, vocational training school and college/university

Educational attainment is important in the design of interventions such as information, education and communication activities. Although one-third of the households were identified to have a family member with post-secondary education, this may mean only grades 10-12 or vocational education.

2.3. Sources of livelihood

2.3.1. On-farm livelihood sources

Generally, the households engaged in on-farm production for consumption and for sale. Nineteen (14%) was identified to be subsistence households (i.e., they produce but do not sell crops and livestock).

The number of products produced by the households ranged between one and 10 (Table 3). Near half of the households were producing two or three products, while more than one-third of the households was producing four to six products. This low number of products

produced could be attributed to access to land and the size of land available. Most of the households had less than a hectare of land, while a few had access to land of two hectares in size.

Table 3. Number of products produced in own farm

Number of products	% of households (N=140)
One product	13.6
2 or 3 products	47.9
4 to 6 products	37.1
7 to 10 products	1.4

For households that produced and sold their produce from own farms, their products could be one or several combinations of the following: food crops (raw and processed), fruits, vegetables, other cash crops, fish, livestock (large and small), fodder, livestock products, manure, compost, timber and wood for fuel (Table 4).

Given the size of the land area available to the households for farming, most of the produce from own farm was for consumption. Most (88%) produced raw food crops for consumption (87%), while more than the majority (57%) also sold these products. Similarly, the majority (54%) of households produced (54%) vegetable for consumption (52%), and also for sale (40%). Near one fourth of the households produced fruits for consumption (24%) and for sale (22%). Few were fishers (9%).

Table 4. Production, consumption, and sale of own farm produce (%)

Products	Producing (N=140)	Consuming (N=140)	Selling (N=140)
Food crop (raw)	87.9	86.4	58.6
Food crop (processed)	1.4	1.4	1.4
Vegetables	53.6	52.1	40.0
Fruit	24.3	23.6	22.1
Other cash crops	10.0	8.6	9.3
Fish	9.3	7.1	7.9
Large livestock	30.7	8.6	25.0
Small livestock	65.0	56.4	43.6
Livestock products	0.7	0.0	0.0
Manure/compost	3.6	3.6	0.7
Fodder	0.7	0.7	0.0
Fuel wood	18.6	18.6	0.7
Timber	1.4	1.4	0.0
Others	1.4	1.4	0.0

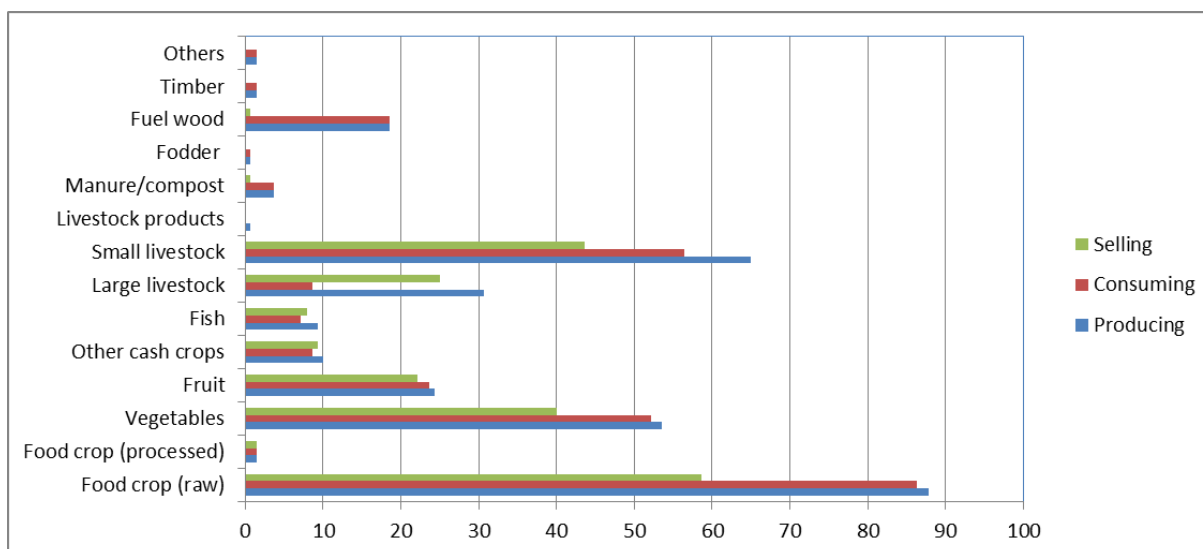


Figure 3. On-farm diversity in the product produced, consumed and sold

Two-thirds of the households (65%) raised small livestock for consumption (56%) and for sale (44%). One-third of the households raised large livestock, mainly for sale (25%) and a few raised large livestock for consumption (9%).

The volume of production was expected to be low because most were household level production. Large-scale production in terms of volume was not observed in the selected villages. However, wide land areas were found in nearby areas. The province of Batambang has been known as the “rice bowl” with rice product being exported abroad.

2.3.2. Off-farm livelihood sources

Near two-thirds (60%) of the households had one to three off-farm products harvested (Table 5). Fish was the most common off-farm product (45%) reported, followed by fuel wood (43%). While fish were for consumption (32%) and for sale (32%), fuel wood was mainly for consumption (41%).

Table 5. Production, consumption, and sale of off-farm produce (%)

Products	Producing (N=140)	Consuming (N=140)	Selling (N=140)
Food crop	11.9	7.1	2.9
Fodder	2.4	1.4	0.0
Fish	72.6	43.6	32.9
Animal or animal products	3.6	2.1	1.4
Timber	1.2	0.7	0.0
Fuel wood	69.0	41.4	2.1
Honey	1.2	0.7	0.7

The off-farm products reported were wild products collected or harvested from communal lands such as the river, ponds, Tonle Sap lake, paddy fields, and flooded forest. Fishing was active during the rainy season or flooding season during the months of September to November. On the other hand, wood for fuel were manually collected from flooded forest, during rainy and dry season and transported to the village using a cart.

2.3.3. Diversification index

A production diversification index was created by adding up the total number of products produced/harvested on-farm: 1 = 1 to 4 products (low production diversification); 2 = 5 to 8 products (intermediate production diversification); 3 = 9 or more products (high production diversification). Most households scored as low production diversification (86%) (Table 6). This was consistent with the results shown in Section 2.3.1 where six in every 10 households had between one and three products produced. The main reason was likely to be the small farmlands of the households. The rest of the household (14%) scored intermediate production diversification.

Table 6. Diversification index

Diversification Index	% (N=140)
1-4 (low production diversification)	85.7
5-8 (intermediate production diversification)	14.3

2.3.4. Commercialization index

In terms of commercialization index based on the number of products sold, half of the households belonged to low commercialization index and one-third belonged to intermediate commercialization (Table 7). As shown in Section 3.2.1, most of the produce by the households were for home consumption. This was likely because of the small amount of production that households would prioritize consumption over selling their produce.

Table 7. Number of products produced on-farm and sold in the last 12 months

Commercialization index	% (N=140)
No products sold (no commercialization)	13.6
1 to 2 products sold (low commercialization)	50.7
3 to 5 products sold (intermediate commercialization)	35.0
6 or more products sold (high commercialization)	0.7

2.3.5. Division of labor on- and off-farms

Farm work appeared to be equally shared by men and women. The proportion of households that reported that most of the work was done by men (30%) was not much higher than the households who reported the work was done by women (22.1%), shared by men and women (20%), or “several persons”. Notable was the citation for “female-

child” to be responsible for farm work, albeit the figure was low (1.4%) (Figure 4). No household reported that “male-child is responsible for own farm work.

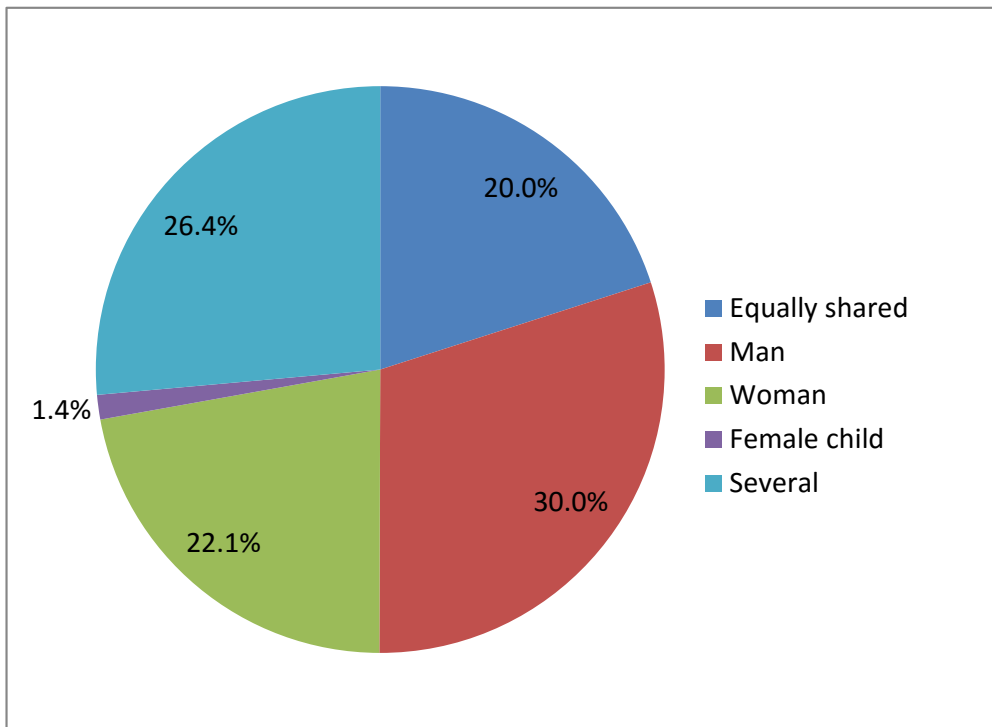


Figure 4. Agricultural workload on-farm by gender/sex

One-fourth of the household reported that women were responsible for taking care of small livestock (26%) and in growing vegetables (24%). For the other products from own farm, women’s participation in the production was reported by less than 20% of the households. Almost half of the households (47%) reported that women were not responsible for any project. Similarly, children were reported by 91% of the households to be not responsible for any product. Few (8%) reported that children were responsible for large and small livestock.

In contrast, the production off-farm was predominantly shared by the men and women (47.1%) and by the men alone (Figure 5). Still, there were products where the responsibility rested on the women alone (3.6%) or the male-child (2.1%).

All households reported access to land for farming. Men and women were involved in farming. More than a shared activity between men and women, farming can even be viewed as a family activity. Probably this was likely a result of the shortage of labor in the rural area that everyone was engaged in farming activities or by the difficulty of hiring labor outside the family. Recruiting family labor was the usual economic response of households facing labor shortage or wanting to ensure all produce (given small amount) goes to the family and not shared with others.

On the other hand, in some households, the men were out and earning a living elsewhere. The women in these households were left to engage in farming activities.

In a typical farming activity, the men performed the heavy work such as plowing the fields, pumping of water, spraying of chemicals, fertilizer, hauling and transporting the produce. The women do less physically-demanding tasks but requires managerial and negotiation skills such as farm management and maintenance, negotiating in the renting of

farm machines, and in the marketing of the products. As shown in Section 2.10 (Assets), most of the households did not own farm machineries.

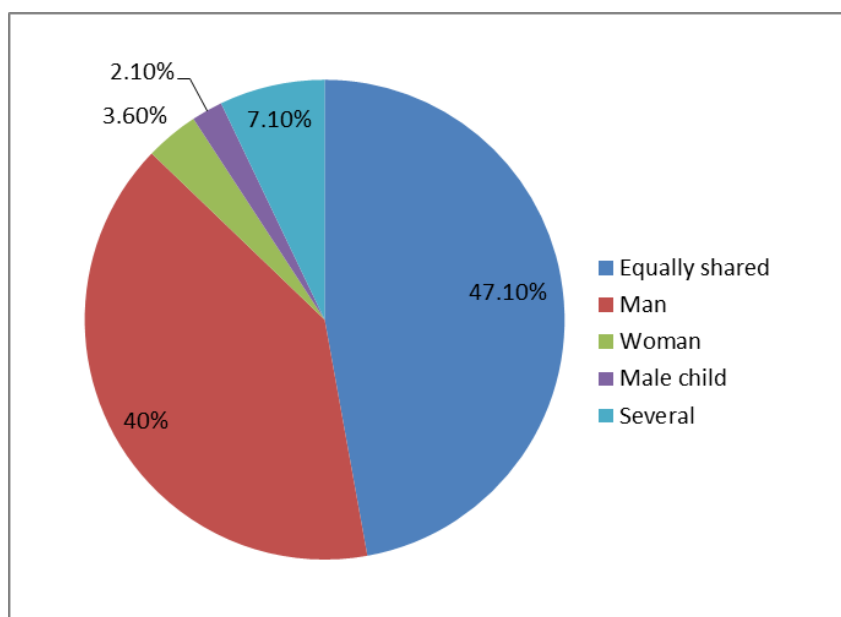


Figure 5. Agricultural workload off-farm by gender/sex

2.3.6. Sources of off-farm cash income

About 93% of the households reported to have a source of off-farm cash income (Table 8). The majority of the households had one or two sources of off-farm cash income. One-fifth of the households had at least five sources of cash income. All households reported not having new source or have lost off-farm cash income source for the past 12 months.

Table 8. Sources of off-farm cash income

Sources	% of the households (N=140)
Business	62.9
Other paid employment	44.3
Formal loan/credit	32.9
Remittances or gifts	23.6
Employment on someone else's farm	22.1
Informal loan/credit	12.9
Renting out land	7.1
Other payments from projects/government	1.4
Renting out farm machinery	1.4
No other source of cash	7.1

The top sources of off-farm cash income reported by the households include business (63%) (e.g. motor taxi, delivery vehicles, food stalls/vending, buy and sell business), other paid employment (44%) (e.g., work somewhere else during off-farm season, construction work, wage labor, government employment), formal loan or credit (33%) (microfinance sources), remittances (24%), and employed in someone else’s farm (22%). The other sources of income were cited by less than 15% of the households. Few households reported not having a source of off-farm cash income (7%).

Households were likely to diversify income sources given that income from farming was likely to be low. As shown earlier, crop diversification and commercialization were low, which translates to low income.

2.4. Changes in farming practices and resources

2.4.1. Crop-related changes

Almost all households (94%) made changes to one or more of their most important crops (Table 9). On average, the number of crops to which changes were made was two, or a range of 0 to 6. One-third of the households had one or at least three crops changed; one-fourth of the households had two crops changed. The changes were mostly with rice and vegetables, which were common farm products.

Table 9. Number of crops to which changes were made over the last 10 years

Number of crops	% of the households (N=140)
None	6.4
One	37.1
Two	24.3
Three or more	32.1

Multiple reasons of changes were provided by 94% of the households for the changes they have made. These reasons can be grouped into weather (73%), land (55%), markets (50%), labor (49%), pest/diseases (31%), and project (3%) (Table 10).

Almost all households (98%) made changes to their most important crops because of climate-related reasons (mostly rice and vegetables). Among the climate-related reasons, “more frequent droughts” was cited by eight in every 10 households. The other reasons cited by at least half of the households support drought as a common reason. These included “less overall rainfall” (71%), “more erratic rainfall” (62%), and “higher temperatures” (51%).

Among the land-related reasons provided, “land is less productive” (83%) was common. “Less land” was also cited by 18% of those who cited land-related reasons. Very few cited “land is more productive” and “more land”.

The market reasons provided included better price (73%), better yield (70%), and new opportunities to see (68%), (%). With regard to land-related reasons, eight in every 10 households cited the land becoming less productive.

As shown, crop-related changes were driven mostly by weather-related factors. Specifically, it was the experience with drought when they see the plants wilting and not just water shortage. It was reported that water shortage is experienced during the months of

December to April. Rivers were reported to have low levels of water and rains not coming during the months of March to April. The rice planting season was reported to usually start in the month of May.

Table 10. Reasons for changing cropping practices

Categories	% of the households
Changed cropping practices: (N=132)	
<i>Weather/climate</i>	72.7
<i>Land</i>	54.5
<i>Markets</i>	50.0
<i>Labor</i>	48.5
<i>Pests/diseases</i>	31.1
<i>Projects</i>	3.8
Market-related reasons (N=66)	
<i>Better price</i>	72.7
<i>Better yield</i>	69.7
<i>New opportunities to sell</i>	68.2
Land-related reasons (N=72)	
<i>Land is less productive</i>	83.3
<i>Land is more productive</i>	6.9
<i>Less land</i>	18.1
<i>More land</i>	4.2
Made changes due to climate reasons (N=140)	97.9
Weather/Climate-related reason (N=96)	
<i>More frequent droughts</i>	83.3
<i>Less overall rainfall</i>	70.8
<i>More erratic rainfall</i>	61.5
<i>Higher temperatures</i>	51.0
<i>More cold spells or foggy days</i>	22.9
<i>Strong winds</i>	18.8
<i>The rains stopped too early</i>	16.7
<i>More frequent floods</i>	14.6
<i>Longer canicula (dry period during rainy season)-</i>	4.2
<i>Later start of the rains</i>	2.1
<i>Earlier start of the rains</i>	2.1
<i>More overall rainfall</i>	1.0

2.4.2. Changes in farming practices

For every 10 households, six introduced at least one crop or variety (Table 11). Three-fourths of the households made cropping-related changes, which include one or more of the following: introduced intercropping; earlier land preparation; earlier planting; later planting; expanded area; reduced area; started using pesticides/herbicides; integrated pest management; integrated crop management, growing fodder crops; and started to use greenhouse or poly-tunnel.

Table 11. Changes in farming practices over the last 10 years

Changes	% of the households (N=131)
Cropping-related changes	78.7
Introduced new varieties	61.1
Soil management-related changes	57.3
Tree/agro-forestry management-related changes	45.8
Water management-related changes	18.3

In terms of other changes in farm practices over the last 10 year, more than half (57%) of the households introduced soil management changes that include one or more of the following: stopped burning; introduce intercropping, cover crop, ridges or bunds, and rotation; and started using more mineral/chemical fertilizers or manure/composite. Near the majority (46%) of the households reported changes related to trees or Agroforestry. This means they have planted or protected trees within the year. Changes related to water management were reported by 18% of the households. This means they introduced one or more of the following: started irrigation, improved irrigation, mulching, and improved drainage.

2.4.3. Livestock-related changes

For every 10 households, eight reported raising at least one animal type (Table 12). The distribution was as follows: one type, 41%; two, 34%; and 3 or more, 8%.

Table 12. Number of animal types reported

Number of animal types	% of the households (N=140)
None	17.9
One	40.7
Two	33.6
Three and more	7.9

Among the households who reported raising animals, three-fourths made changes in their type of animals raised in the last 10 years (Table 13). Changes were made by 30% of the households to one animal type, 37% to two animal types, and 26% to at least three animal types.

Table 13. Changes related to livestock over the last 10 years

Type of change	% of the households (N=115)
Changed one or more most important farm animals	77.4
Herd related changes	67.0
Animal management related changes	13.9
Adopted a new animal types/breeds	8.7
Animal feed related changes	0.9

Among the households who reported raising animals, two-thirds introduced herd-related changes that included increases in size and change in composition. Animal management-related changes were introduced by 14% of the households, which included stall keeping, fencing, and cut and carry. Very few households (7%) introduced feed-related changes such as growing fodder crops, improved pastures, and fodder storage. Households' adoption of new animal types/breeds was low (8%).

As shown in Section 2.3.1, two-thirds of the households reported having small livestock. These were chickens, ducks, goats and pigs, that the households can easily dispose when they need cash income or for food. They were not "herds" as can be seen in Africa or in Latin American countries.

Regarding reasons for changes in livestock rearing practices, eight in every 10 households (81%) provided multiple reasons for the changes in livestock rearing practices they have adopted. These were categorized into weather/climate-related (61%), labor-related (57%), market-related (47%), and pest/diseases-related (23%) (Table 14). Three-fourths of the households indicated that the reasons were not limited to climate and markets.

Table 14. Reasons for the changes related to livestock over the last 10 years

Reasons	% of the households
Changed in livestock practices (n=113)	
<i>Weather/climate</i>	61.1
<i>Labor</i>	56.6
<i>Markets</i>	46.9
<i>Pests/diseases</i>	23.0
Weather/Climate-related reason (n=69)	
<i>More frequent droughts</i>	78.3
<i>Less overall rainfall</i>	68.1
<i>More erratic rainfall</i>	53.6
<i>Higher temperatures</i>	52.2
<i>More frequent floods</i>	17.4
<i>More cold spells or foggy days</i>	13.0
<i>The rains stopped too early</i>	11.6
<i>Strong winds</i>	7.2
<i>Longer dry period during rainy season</i>	4.3
<i>More overall rainfall</i>	2.9
<i>Later start of the rains</i>	1.4
Market –related reasons (n=53)	
<i>New opportunities to sell</i>	36.8
<i>Better price</i>	33.0
<i>More productive</i>	30.2

The common weather/climate-related reasons cited included “more frequent droughts” (78%), “less overall rainfall” (68%), more erratic rainfall (54%), and higher temperatures (52%). For market reasons, the 53 households that identified market-related reasons were almost equally divided between “new opportunities to sell” (37%), “better price” (33%), and “more productive” (30%).

2.4.4. Adaptability/Innovation index

An adaptability/innovation index was defined as the number of changes made in farming practices over last 10 years, as follows: low level= 0 to 1 change; intermediate level = 2 to 10 changes; and high level= 11 or more changes. Results show that most households (88%) belonged to the intermediate level (Table 15).

Table 15. Adaptability/innovation index

Index	% of the households (N=140)
0-1 (low)	7.9
2 to 10 (intermediate)	87.9
11 or more (high)	4.3

2.4.5. Mitigation indices

Several climate mitigation-related behavioral changes were used to create the mitigation indices (Table 16). These included soil amendments (73%), tree management (50%), low input intensification (60%), high input intensification (24%), and increase in productivity (35%).

Table 16. Mitigation indices

Index	% of the households (N=140)
With soil amendments	72.9
With tree management	50.0
With input intensification	
<i>Low input</i>	60.0
<i>High input</i>	24.3
Increase in productivity Index	35.0

2.5. Food security

2.5.1 Food security index

For every 10 households, four depended on their own farm as a source of food throughout the year, four sourced foods from own farm of the period between 7 and 11 months, and two for less than seven months. All households reported securing food off-farm for less than 7 months in a year.

Forty percent of the households reported not to have experienced hunger throughout the year, while six reported having experienced hunger at least one month in a year. One in every five households reported experiencing more than six months of hunger. Relatively more households experienced hunger in the months of October to December.

Hunger here means “not having enough food from own farm” or supply from own farm was low relative to what was needed. When this happens, households bought food from outside or other sources. Food supply crisis happened during big floods that regularly occur every five years. However, there were households, albeit very few, who were not able to produce enough and could not buy supplies for consumption. October to December were lean months (food supply running low), or the months when “hunger” or “food shortage months” were experienced. Hunger was more pronounced when there was late flooding that affected the start of the new planting season.

2.5.2. Climate related crisis

Eight out of 10 households reported having experienced a climate-related crisis in the last 5 years (Table 17). Among them, three-fourths received assistance. Most of them received assistance from the government agencies (82%), followed by NGOs/CBOs (19%).

Table 17. Climate-related crisis experienced by the households in the last 5 years

	% of the households
Experienced climate-related crisis in the last 5 years (N=140)	81.4
Received assistance for climate related crises (N=114)	73.7
Source of assistance (N=20)	
<i>Government agencies</i>	82.0
<i>NGOs/CBOs</i>	19.3
<i>Politicians</i>	9.6
<i>Religious organizations</i>	9.6
<i>Local community group</i>	4.8
<i>Friends/relatives/neighbors</i>	1.2

2.6. Land and Water

2.6.1. Water for agriculture

Almost half of the households reported no water source for farming (Table 18). Other households identified water sources, which included “inlet/water gate” (34%), water pumps (19%), irrigation (16%). Other water sources were reported by less than 10% of the households. Near half reported not having any water source for farming.

Table 18. Water sources for on-farm agriculture

Availability of on-farm water sources	% of the households (N=140)
Irrigation	49.3
Water pumps (other type)	18.6
Dams or water ponds	7.9
Tanks/infrastructure for water harvesting	2.9
Boreholes	0.7
None of the above	46.4

The results imply that water was a major challenge in farming. Near half of the households relied on irrigation as a water source. The farmers reported paying water fee (at 5USD/rai³) for a share of water from the irrigation canal. Pumping water from the river into the irrigation canal, a responsibility of Dry Rice Committee in the village, entailed cost in terms of fuel for the water pumping machine.

On the other hand, flooding was reported to be commonly experienced in the area in the months of September to October (“normal flood”). This flooding was regular that it was no longer considered a problem by the households. The exception was the floods that came early or late. Early floods (before September) were big floods that may destroy the rice about to be harvested; late flooding (after October) affected the start of the next cropping season, which usually starts in November.

³ 1ha is equal 6.25 rai

2.6.2. Land use

Generally, land holdings were small, with more than half of the households having access to land of less than one hectare (55%) (Table 19). Only 40% of the households had access to land with an area between 1 and 5 hectares. Few households (4%) had access to land of more than 5 hectares.

Table 19. Total land size and land use

Area	% of households (N=140)		
	Has access to land	Has land available for crops	Has land currently dedicated to crops
Less than one hectare	55.0	57.9	62.1
Between 1 and 5 hectares	40.7	37.9	34.3
More than 5 hectares	4.3	4.3	3.6

Few households with access to land area between 1 and 5 hectares made less than a hectare available for crops and currently have dedicated to crop farming. According to 59% of the households, there is no more land for expansion, while 38% reported that only less than a hectare is available for expansion. Few households (3%) indicated that the land available for expansion is more than a hectare.

2.6.3. Communal Land

Almost all households did not use the communal lands (99%). The 1% of the households who reported using the communal land also mentioned using the land for growing crops, under tree cover, and the land is degraded or unproductive.

It should be noted, however, that these findings conflict with the results in Section 2.3.2 showing the results when the households were asked if they have off-farm produce. Here, most of the households reported that they were not using communal lands and yet reported gathering fuel wood and catching fish. It was highly probable that the concept of “commons” was not clear to the households. It was also possible that “communal” was understood in the context of land area for farming. In this case, the flooded forest where they collect wood for fuel and the water bodies where they catch fish will be excluded.

2.6.4. Rental of machinery or hiring of labor

Rental of farm machinery was common to 81% of the households (96%) (Table 20). Almost half of the households also hired farm labor (46%). Few (16%) households did not hire labor or rent machines.

Table 20. Rental of farm machinery and hiring of labor

Items	% of households (N=140)
Animal-drawn plough	2.1
Rental tractor or other farm machinery	81.4
Hire farm labor	46.4
Do not rent/hire machinery or labor	15.7

2.7. Input and credit

In the last 12 months, the households purchased farm inputs (Table 21). These included seed (70%), fertilizer (67%), pesticides (83%), and veterinary medicine (35%). One-third of the households reported to have received credit to fund their agricultural activities.

Table 21. Farm inputs

Inputs	% of households (N=140)
Purchased seed	70.0
Purchased fertilizer	67.1
Purchased pesticides	82.9
Purchase veterinary medicine	35.0
Received credit for agricultural activities	36.4
None of the above	7.1

In the last 10 years, farmers changed the rice variety they grew from rainy season rice (“floating rice”, which was low yielding) to dry season rice (modern high yielding varieties). The latter was high yielding but required high use of fertilizer, pesticides, and farm machineries. Recently, farmers have experienced new pests and diseases with their plants. All these may account for the high proportion of the households purchasing pesticides.

2.8. Climate and weather information

Almost all households received a weather/climate-related information in the last 12 months (97%). The different types of weather-related information that households were using, the recipient, and the use of the information were examined.

2.8.1. Forecast for extreme events

Almost all households reported receiving information on extreme weather events (Table 2.21). The mass media, specifically television (87%) and radio (63%), were their main sources of information, followed by friends/relatives/neighbors (56%). Few households received information from technical experts and other sources. The information was reported by half of the households to be received by both men and women (57%).

More than half of the households who received extreme weather information reported that the information included advice on what to do (68%) and they were able to use the advice (60%). The main actions taken by the households varied: changes in crop variety (68%), crop type (22%), feed management (21%), and inputs (16%).

Table 22. Forecast for extreme events

	% of households
Received extreme weather information (N=140)	95.7
Sources of information (N=134)	
<i>Television</i>	86.6
<i>Radio</i>	63.4
<i>Friends/relatives/neighbors</i>	56.0
<i>Own observations</i>	5.2
<i>Local group/gathering/meetings</i>	2.2
<i>Traditional forecaster/indigenous knowledge</i>	1.5
<i>NGO project officers</i>	0.7
<i>Government agricultural extension or veterinary officers</i>	0.7
<i>Cell phones</i>	0.7
Recipient of information on extreme weather events (N=134)	
<i>Men</i>	24.6
<i>Women</i>	18.7
<i>Both</i>	56.7
Forecast for extreme event provided with advice (N=134)	67.9
Action taken as response to forecast for extreme events (N=81)	
<i>Crop variety</i>	67.5
<i>Crop type</i>	22.1
<i>Feed management</i>	20.8
<i>Change in inputs (seed, fertilizer, pesticide)</i>	15.6
<i>Land management</i>	14.3
<i>Water management</i>	14.3
<i>Livestock type</i>	14.3
<i>Timing of farming activities</i>	14.3
<i>Field location</i>	10.4
<i>Others</i>	2.6
<i>Use of manure/compost/mulch</i>	1.3
<i>Land area</i>	1.3
<i>Soil & water conservation</i>	1.3
<i>None</i>	1.3

2.8.2. Forecast for pest or disease outbreak

Only one-fourth of the households reported receiving information on pest or disease outbreak (Table 23). The main sources of information were television (81%), radio (50%), and friends/relatives/neighbors (47%). Three-fourths of the households reported that both the men and women received the information.

Table 23. Forecast for pest or disease outbreak

	% of households
Received pest or disease outbreak information (N=140)	25.7
Sources of information about pest or disease outbreak (N=36)	
<i>Television</i>	80.6
<i>Radio</i>	50.0
<i>Friends/relatives/neighbors</i>	47.2
<i>Govt. agricultural extension or veterinary officers</i>	2.8
<i>NGO project officers</i>	2.8
<i>Traditional forecaster/indigenous knowledge</i>	2.8
<i>Own observations</i>	5.6
<i>Local group/gathering/meetings</i>	5.6
Recipient of information on pest or disease outbreak (N=36)	
<i>Men</i>	13.9
<i>Women</i>	11.1
<i>Both</i>	75.0
Forecast for pest or disease outbreak provided with advice (N=36)	66.7
Actions taken in response to forecast for pest or disease outbreak (N=24)	
<i>Change in inputs (seed, fertilizer, pesticide)</i>	81.0
<i>Crop variety</i>	28.6
<i>Crop type</i>	23.8
<i>Livestock type</i>	19.0
<i>Land management</i>	4.8
<i>Feed management</i>	9.5

Among those who received the information, 67% reported that advice was included in the information received and all of them reported that they have used the advice given. Their main actions included changes in inputs (81%), crop variety (29%), and crop type (24%).

2.8.3. Forecast for the start of the rains

Four in every 10 households reported receiving information about the start of the rain. Almost all of them received the information from the television (95%) (Table 24). Other common sources include the radio (60%) and friends/relatives/neighbors (54%). Among those who received the information, 70% reported that both the men and women received the information. Advice was included in the information according to 67% of those who received the information. Their main responses were to change crop variety (81%). Other common responses were changed in land management (28%) and crop type (22%).

Table 24. Forecast for the start of rains

	% of households
Received information about the start of the rains (N=140)	41.4
Sources of information (N=58)	
<i>Radio</i>	56.9
<i>Television</i>	94.8
<i>Friends/relatives/neighbors</i>	53.4
<i>Traditional forecaster/indigenous knowledge</i>	6.9
<i>Own observations</i>	3.4
<i>Local group/gathering/meetings</i>	1.7
Recipient of information on start of the rains (N=58)	
<i>Men</i>	15.5
<i>Women</i>	13.8
<i>Both</i>	70.7
The forecast for the start of the rains included advice (N=58)	67.2
Actions taken in response to forecast for the start of the rains (N=39)	
<i>None</i>	5.6
<i>Land management</i>	27.8
<i>Crop type</i>	22.2
<i>Crop variety</i>	80.6
<i>Change in inputs (seed, fertilizer, pesticide)</i>	8.3
<i>Use of manure/compost/mulch</i>	2.8
<i>Land area</i>	2.8

2.8.4. Weather forecast for the next two to three days

Weather forecast information was not common. Only 13% of the households reported to have received weather forecast for the next 2 to 3 days (Table 25). Almost all of them cited the television as the source of information (94%). The other sources were radio (67%) and friends/relatives/neighbors (39%). The information was reported to be received by both men and women (78%) or the men alone (22%).

Table 25. Weather forecast for the next two to three days

	% of households
Received information (N=140)	12.9
Sources of information (N=18)	
<i>Radio</i>	66.7
<i>Television</i>	94.4
<i>Friends/relatives/neighbors</i>	38.9
<i>Own observations</i>	11.1
<i>Local group/gathering/meetings</i>	5.6
Recipient of information of weather for next 2-3 days (N=18)	
<i>Men</i>	22.2
<i>Both</i>	77.8
The forecast for the weather for next 2-3 days provided include advice (N=18)	83.3
Action taken in response to forecast for weather for next 2-3 days (N=15)	
<i>Land management</i>	7.7
<i>Crop type</i>	23.1
<i>Crop variety</i>	76.9
<i>Change in inputs (seed, fertilizer, pesticide)</i>	7.7
<i>Water management</i>	38.5
<i>Tree planting</i>	7.7
<i>Livestock type</i>	30.8
<i>Feed management</i>	30.8

Among those who received information, 83% reported that advice was included. Those who have used the advice reported that they changed crop variety (77%), resorted to water management (39%), feed management (31%), or changed livestock type.

2.8.5. Weather forecast for the next two to three months

Only 12% of the 140 households reported having received weather forecast for the next 2 to 3 months (Table 26). They received the information from multiple sources: television (77%), radio (71%), and friends/relatives/neighbors (71%). Both men and women received the information (77%). Near half of those who received the information reported that advices were included. Their main action as response to the information was to make changes in crop variety.

Table 26. Weather forecast for the next two to three months.

	% of households
Receive information (N=140)	12.1
Television as main source of weather information about the next 2-3 months (N=12)	
Sources of information (N=17)	
Radio	70.6
Television	76.5
Friends/relatives/neighbors	70.6
Own observations	5.9
Local group/gathering/meetings	
Recipient of weather information about the next 2-3 months (N=17)	
Men	5.9
Women	17.6
Both	76.5
Information on weather about the next 2-3 months included advice (N=17)	47.1
Actions taken in response to forecast for weather information about the next 2-3 months (N=8)	
Land management	25.0
Crop type	25.0
Crop variety	62.5
Change in inputs (seed, fertilizer, pesticide)	12.5
Land area	12.5
Water management	25.0
Livestock type	12.5
Feed management	37.5

Although the mass media, particularly television and radio, were important sources of information, the kind of information received by many households was limited to information on extreme events (drought, strong winds and big flood). Information on the start of rain, short term and long term weather forecasts were not common. Informal source, particularly friends/neighbors and relatives, was another major source of information. Technical people and other formal sources of information were not common sources of information to the households.

This implies an area where improvement and intervention should be introduced. As shown in Section 10 (Assets), almost all households own mobile phone. However, the function of the mobile phone, which is a means to send and receive information, is not maximized as a possible source of information on farming related matters. Its use was confined to communicating with others; turned off when not in use to save on power and on load.

2.9. Community groups

Membership in community groups was low. Only one-third of the total number of households reported membership in any community groups (Table 2.26). The common community group was on savings and/or credit.

Table 27. Membership in community groups

Community groups	% of households (N=140)
Tree nursery/tree planting	1.4
Fish/shrimp ponds	1.4
Forest product collection	0.7
Soil improvement activities	0.7
Irrigation	1.4
Savings and/or credit	27.1
Vegetable production	2.9
Not a member of any group	67.1

The low membership in community organization can be likely explained by the understanding of the people on the membership. People's understanding was that if they are not officers or member of a committee, or are not active members, then they do not recognize themselves as members of the organization.

2.10. Assets

The assets the households likely owned were divided into five categories: energy (generator, solar panel, biogas digester, battery); information (radio, television, cell phone, internet access, and computer); production means (tractor, mechanical plough, thresher, and mill); transport (bicycle, motorbike, car or truck); and luxury (refrigerator, air conditioning, fan, bank account, improved stove). Results showed that that 91% of the households belonged to high level in the Asset Index (Table 28). The number of assets per category owned by the households is shown in Table 29. Relatively more households owned information and transportation assets. The common transportation assets category included the bicycle (78%) and motorcycle (73%). For production assets, half of the households were identified not to own any asset. Common production assets included boat (42%) and fishing net (43%). Similarly, ownership of energy assets was low (14%). Only half of the households indicated ownership of luxury assets, but most electric fan.

Table 28. Asset Index

Asset index	% of households (N=140)
0 no assets (basic level)	0.7
1-3 assets (Intermediate Level)	7.9
4 or more assets (High Level)	91.4

Table 29. Specific assets owned

Asset	% of households (N=140)
Transportation assets	
<i>Bicycle</i>	77.9
<i>Motorcycle</i>	72.9
<i>Car or truck</i>	2.9
Production assets	
<i>Mechanical plough</i>	9.3
<i>Water pump/treadle pump</i>	21.4
<i>Petrol trimmer</i>	0.7
<i>Motor powered spraying tank</i>	14.3
<i>Floating fish cage</i>	5.0
<i>Sewing machine</i>	18.6
<i>Handy tractor</i>	2.9
<i>Thresher</i>	0.7
<i>Boat</i>	42.1
<i>Fishing nets</i>	42.9
Energy Assets	
<i>Generator</i>	2.1
<i>Battery (large - e.g. car battery)</i>	10.0
<i>Liquid pressurized gas</i>	2.9
Information Assets	
<i>Radio</i>	58.6
<i>Television</i>	86.4
<i>Cell phone</i>	83.6
<i>Computer</i>	2.9
<i>Internet access</i>	0.7
Luxury items	
<i>Refrigerator</i>	4.3
<i>Electrical fan</i>	55.7
<i>Bank account</i>	1.4

3. CONCLUSIONS

A typical household was characterized by male-headship, relatively bigger in size than the provincial and national average, and low education among family members. Farming, particularly rice and vegetable farming from own land, and small livestock raising were the main sources of food and income. Farming, however, was characterized by low crop and commercialization index. Households diversified income sources by engaging in off-farm work.

Farmers made changes related to crop and livestock practices primarily in response to climate change-related factors, specifically drought and flooding, and land becoming less productive. The small land size, low crop diversification, small volume of produce, and the challenges of drought and flooding likely to contribute to the problem of hunger experienced by more than half of the households almost every month and becoming more acute during the months of October to December.

The adaptability and mitigation measures of the households need an enhancement from land intensification. Farmers need information on more than extreme weather events; weather forecasts that would guide them to make short-term farming decisions were not available. Providing farmers with correct and timely information will benefit them in making decisions about their farming activities. TV remained as the common medium by which farmers access information, but mobile phone, which were commonly owned by the households, can also be explored as another venue to disseminate information to the farmers and their households. Helping farmers form farmers' group can also enhance the sharing of knowledge and good practices.

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Appendix A: Survey process and implementation

The household survey was conducted following steps below:

1. Identify list of villages within the 10km x 10km block.
2. Randomly select seven villages within the 10km x 10km block including Rohal Suong village
3. Collect information on all households in the seven villages selected.
4. Randomly select 20 households in each selected village.
5. Select a village for pilot testing of the questionnaire.
6. Conduct pilot testing of questionnaire with 20 households.
7. Revise the questionnaire and train the data collectors on the use of the questionnaire.
8. Conduct household baseline survey of 140 selected households in seven selected villages
9. Replacement of households who refused interview or were unable to answer the interview. The process strictly followed the sequence of survey participants resulting from random sampling.

The survey used the digital tablet-based method. The questionnaire was divided into 10 sections, as follows: Household respondent and type; Demography; Sources of livelihood, Crop, farm animals/fish, tree, soil, land and water management changes; Food security; Land and water; Input and credits; Climate and weather information; Community groups; and Assets.

Questionnaires were translated into Khmer to facilitate communication with farmers. Training for data collection and refining the questionnaire were done before implementing the actual survey. Some questions and answer lists were modified based on consultations with senior researchers of WorldFish Center and experts from the survey team and local community groups.

Pre-testing questionnaires was conducted by all survey team members to ensure the questionnaires reflect reality in the field and for the survey team to get familiar with the tablet-based approach.

Before the questionnaire was administered, several meetings were convened with the commune and village authorities to inform about the purposes, scope, and procedure of the survey. The authorities then informed the villagers of the forthcoming household survey by the team to avoid suspicions or conflicts.

During the actual survey, before every interview the enumerator had to explain the purpose and contents of the survey to household member(s) and also asked for consent for picture and GPS location recording, from each household. For the cases that selected households could not participate, the team made substitution using the reserve list of households that were randomized selected in the same village.

The survey team was composed of five enumerators and a supervisor, who were selected from local partners. The supervisor went along with the enumerators during household interviews and provided support as needed. Another important role of supervisor was to check all survey questionnaires for completeness at the end of survey each day. In cases some errors were found, he talked directly to the individual enumerator for correction. If the mistakes could not be easily corrected, the enumerator had to go back to their interviewed household and ask for the missing information.

Appendix B: Sampling Frame – List of Villages

No.	Village name	Commune	Surveyed
1	Duong Mea	Praek Norint	
2	Sdei	Praek Norint	X
3	Preaek Norint	Praek Norint	
4	Svay Chrum	Praek Norint	
5	Preaek Krouch	Praek Norint	
6	Preaek Ta Chraeng	Praek Norint	
7	Ansang Sak	Praek Norint	X
8	Reach Doun Kaev	Praek Norint	X
9	Suos Ei	Peam Aek	X
10	Peam Aek	Peam Aek	
11	Kong Tum	Peam Aek	
12	Preaek Chdaor	Peam Aek	
13	Preaek Luong	Praek Luong	
14	Sdei Leu	Praek Luong	
15	Sdei Kraom	Praek Luong	
16	Rohal Suong	Praek Luong	X
17	Bak Amraek	Praek Luong	
18	Preaek Snao	Praek Khpob	
19	Preaek Khpob	Praek Khpob	X
20	Sna Pi Mukh	Praek Khpob	
21	Ou Kambot	Praek Khpob	X
22	Kampong Sambuo	Samrong Khnong	

X: Villages have been visited for household baseline survey