Timor-Leste

Integrated Actions for Resilience and Adaptation (IA4RA) to climate change in the Raumoco Watershed Project

Baseline Study Report

March 2017

Supported by:

EU-GIZ ACSE

ADAPTING TO CLIMATE CHANGE AND SUSTAINABLE ENERGY

MINISTERIO DA AGRICULTURA E PESCAS

EUROPEAN UNION

german cooperation

DEUTSCHE ZUSAMMENARBEIT

giz

Document Revision History

Rev	Date	Description	Issued	Checked	Approved
6	24-04-2017	Submission of Final Report Final Draft	Tristan Skinner	Vasco Lobato Leitão	Raul de la Rosa

Title: *Final Baseline Report for the IA4RA of the Raumoco Watershed*

Location: Dili, Timor-Leste

Prepared by: *OASIS* – Sustainable Projects

Consultants: Tristan Skinner – Team Leader

Vasco Leitão – Project Reviewer

Rowena Mempin - Baseline Survey Specialist

Date: March 2017

This publication has been produced with the assistance of the European Union and GIZ.
The contents of this publication are the sole responsibility of the authors and can in no way be taken to reflect the views of the European Union or GIZ.

Contents

EXECUTIVE SUMMARY

This study aimed to update existing baseline data of the IA4RA and make detailed recommendations on the project's monitoring and evaluation framework. It generated information needed for the evaluation of the project, particularly on:

- the current adoption of low-carbon and climate-resilient agricultural technologies
- the current use of rainwater and river solar powered drip irrigation for crop production
- the current use of tree plantation for fuel wood, living fencing, contour terracing and windbreaks
- the current use and source of fuelwood and improved wood-fired cooking stoves;
- local perceptions on climate change and food security
- young peoples' (<30 years) current engagement and employment in farming
- additional information to inform project implementation

The main findings of this study include:

- On average, approximately 35 percent of the respondents is under 30 years old and work (either part or full time) on their farm
- Average household size ifs 7.6 percent with highest concentrations in Suco Kotamuto and Luro (8.3 and 8.2, respectively)
- The highest level of education is university education (12 of females and 22 percent of males) and high school (17 percent of females and 29 of males)
- 40 percent of respondents have a farm size of 5,000-10,000 sq.m. located mainly in downstream villages of Afabubo and Daudere with the rest having less than 5,000 sq.m. Only 4 percent has more than 10,000 sq.m.
- 59 percent of farms are in sloping areas (particularly in the villages of Kotamuto, Luro and Lakawa. Farms in flat lands consist of 35 percent and along riverbanks, 5 percent.
- The average number of females and males working in farms is almost even at 1.8 females and 2 males
- Only 42 percent of farms yield cash income ranging from $50-$500 per year with the remaining $58 percent producing no income.
- 74 percent of respondents stated they have food shortages at least once every five years with 25 percent stating they rarely (5 percent) or never (20 percent) have food shortage issues
- Farmers reported shortage of Corn (63 percent), cassava (33 percent) and rice (28 percent) during periods of food shortages
- During food shortages, the main coping mechanism of households include the selling of animal stocks (51 percent), sseeking other sources of income in construction, crushed gravel selling, kiosk (18 percent) and making and selling *tais* and other handicrafts (10 percent)
- 89 percent of respondents stated that climate change has affected their farms in some way resulting in damage to crops, crop failure, pest attack, delay in planting crops, livestock death from strong winds, drought/delayed and irregular rain patterns
- Corn, cassava and banana are the three crops mainly impacted by climate change (79, 31, and 27 percent respectively). Cassava, banana and taro (54, 34, 24 percent respectively) are considered as the most resilient crops
- Some adaptation practices by farmers include planting of trees as windbreaks/living fences (40,percent) and crop diversification/intercropping of taro, cassava, rice, papaya, and pumpkin (20 percent)
- Corn and cassava (along with pumpkins) are the most widely grown crops in Raumoco Watershed, with 99 percent and 91 percent. Over 50 percent of households also grow other popular crops include bean, banana, sweet potato, papaya, taro and rice.
- 62 percent of households have access to 'good seeds', especially corn seeds (76 percent) provided by MAF
- Rainwater harvesting for vegetable/crop production is not practiced

- 94 percent of households reported having planted trees in their farms as living fences, terracing, and/or windbreaks. However, data on the number of trees planted and area of planted trees was not collected during the study.
- 63 percent of households stated that they did not get enough fuelwood from their own plantations, with the majority (43 percent) stating that they got additional fuelwood from the forest. Fuelwood used for daily cooking is at least 2 bunches per day
- 98 percent of households use 'three-stone' (traditional) stoves with only 2 percent of households using improved wood-fired cooking stoves. Only six percent of households are using rice cookers, electric and kerosene stoves.

Some issues for follow up:

- It was not clear from the baseline survey why people collect wood from the forest. Whether it is for sale or for use as fuel wood needs to be clarified to inform project implementation and evaluation. Additionally, the survey did not include the data on the extent of current tree plantations (number of trees planted/area planted).
- Additional information on what the current farm management plan includes and how farmers document them would help the project's evaluation..
- There was a low response rate to questions regarding crop production and the impact of different farming systems/practices. This data will need to be collected from records of the Ministry of Agriculture and Fisheries (MAF).
- Further detail on each of the farmer-led field trials needs to be added to the baseline through a Terms of Reference (TOR) or Statement of Work (SOW) for each identified Farmer-Led Field Trials (FLFT).
- The effectiveness of each Farmer-Led Field Trials (FLFTs) needs to be rigorously tested. This could be done using a 'randomised controlled' methodology.
- Why 20 percent of households have never had food security issues while the majority reports having experienced a shortage of food for at least once every 5 years can be further investigated.
- The baseline data shows that climate change has a wide range of impact on many aspects of farming, particularly crop yields. This demonstrates the importance of climate change adaptation methods such as crop diversification and the use of climate-resilient seeds. Questions could be asked on which aspects of farming are most impacted, by what aspect of climate change and the most effective methods of adaptation.
- The baseline data showed that there is a correlation between farms that have a low ability to adapt to climate change and low food security, as well as small farms on sloping land with low youth engagement in farming. This correlation and strength needs further study
- Why Lakawa village has a significantly lower number of young people who work on farms and the impact of this on food security could be further explored.

And recommendations:

Figure 4 below provides a logical framework for the IA4RA and is further elaborated under Section 4. Recommendations for Project Evaluation. It presents a results chain from output to outcomes to impact leading to the achievement of objectives. Some minor modifications from the original indicators and targets are presented with explanations and justifications.

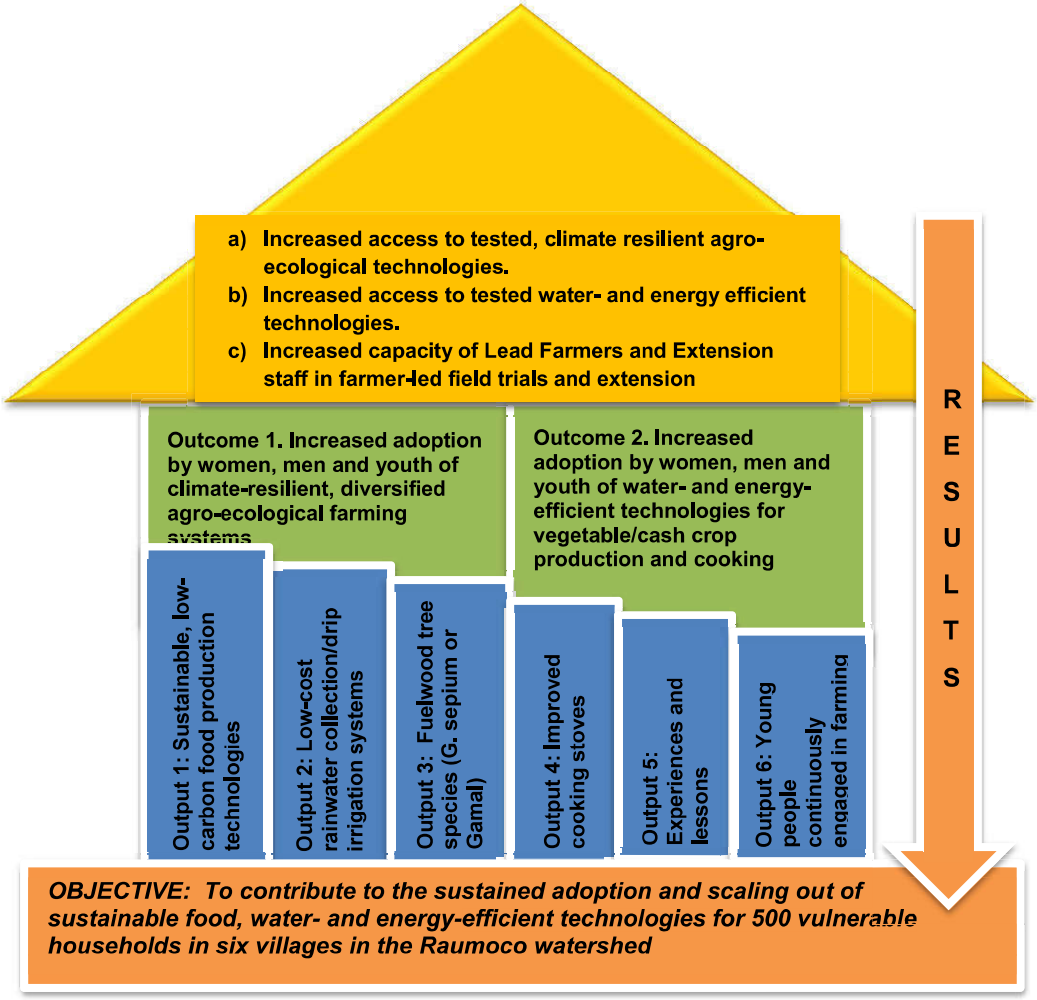


Figure 1: IA4RA Project logic

The key assumptions in this project include:

- If the project successfully contributes to the sustained adoption and scaling-up of tested, effective, climate-smart technologies, then communities will have greater adaptive capacity and resilience to weather the impact of climate change on food- water- and energy security. The pilot phases (farmer-led field trials) of each project activity will test and demonstrate the effectiveness of these technologies on the local context.
- Perception is reflective and representative of the actual situation. The results of this baseline are driven by what the community perceives rather than by an analysis of quantitative actual data such as crop yield or rainfall. For example, people's perception of food security may not relate to actual food security. Additionally we are assuming that answers, records and data entry are correct.
- If households can adapt and increase resilience to climate change, then those households will have an increased food, water and energy security. However, other influences on food, water and energy may be greater than climate change.
- If people are reporting reduced food security and increased ability to adapt to climate change, this is not only attributable to the project. There could be other factors that could have led to this.

To test project assumptions, and to truly understand the outcomes of the project, it is recommended that the project invest in a rigorous randomised controlled quantitative evaluation, outlined in Chapter 4.4. Although the baseline detailed in this report will allow for an understanding of the general trajectory of the project, it will not allow for a conclusive demonstration of project outcomes. This will be especially true if there is another drought. There will be no way to know if it is the drought (or other climate event such as high rainfall) and/or if the project is having an effect on the community.

1 INTRODUCTION

1.1 Project Background

The *Integrated Actions for Resilience and Adaptation (IA4RA) to climate change in the Raumoco Watershed* is a 28-month climate adaptation initiative. It is funded by the (EU-GIZ's *Adapting to Climate Change and Sustainable Energy (ACSE) Programme* for 14 Pacific Island countries and Timor-Leste.

The project aims to contribute to the sustained adoption and scaling-up of sustainable food, water and energy-efficient technologies for 500 vulnerable households in 12 Aldeias (sub-villages) of six Suco (villages) in the Raumoco watershed.

1.2 Objectives of the study

This study aimed to update existing baseline data, which was originally established during the development of the IA4RA Project Design Documents (PDD), and provide new information for the monitoring and evaluation of the project. In particular, it will generate baseline information on:

- the current adoption of low-carbon and climate-resilient agricultural technologies;
- the current use of rainwater and river solar powered drip irrigation for crop production;
- young peoples' (<30 year) current engagement and employment in farming;
- the current use of tree plantation for fuel wood, living fencing, contour terracing and windbreaks;
- the current use and source of fuelwood and improved wood-fired cooking stoves; and
- local perceptions on climate change and food security.

Additionally, the baseline survey collected information that will be used to inform project implementation.

1.3 How to read the report

Chapter 1: Introduction (this chapter) – briefly outlines the project and its intentions. This is designed to give the reader a very basic understanding of the context of the baseline survey results and recommendations.

Chapter 2: Method including the survey sampling – outlines how the project was undertaken, outlines the sampling methodology and stratification, and details any limitation in data collection. The aim of this chapter is to enable the survey to be repeated as accurately as possible.

Chapter 3: Results from the baseline survey – The baseline survey collected many data not only to develop the baseline survey, but to also inform project implementation. The key results from the survey are presented in this chapter.

Chapter 4: Recommendations for project evaluation – the Oasis team then provided recommended indicators and a baseline for each indicator (where possible) with corresponding explanation and justifications.

2 METHODOLOGY

2.1 Steps

The study followed seven steps - summarised in Figure 2: Summary of baseline study steps below.

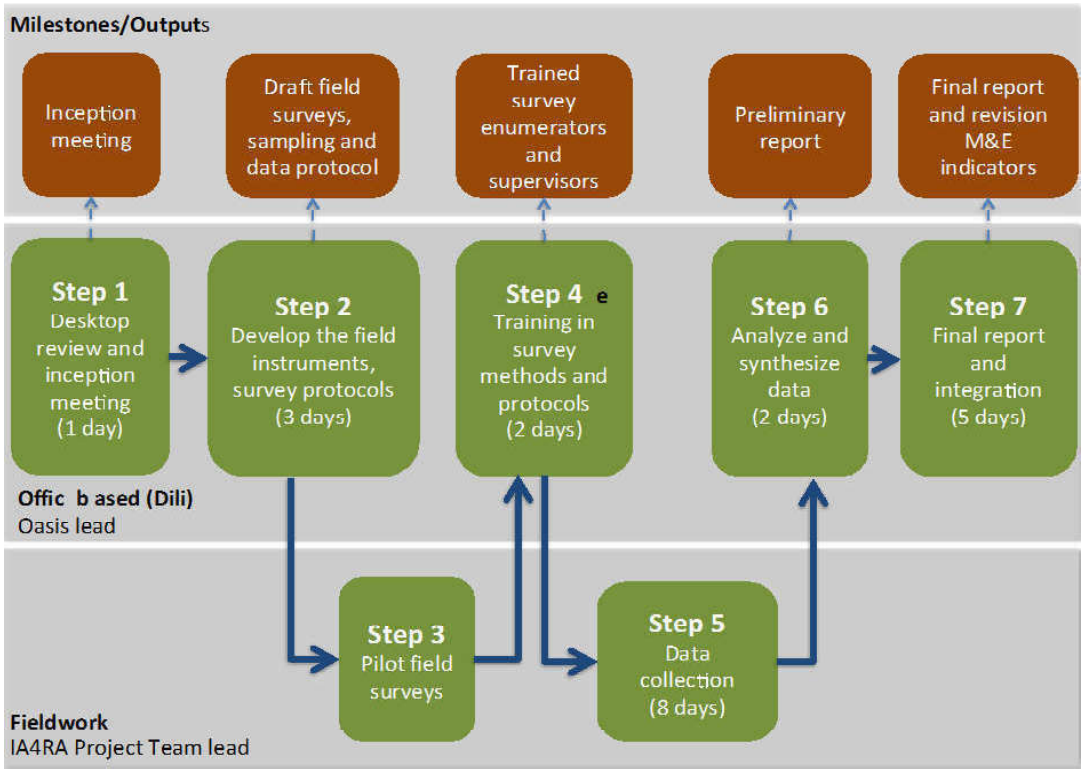


Figure 2: Summary of baseline study steps

Step 1: Desktop review and inception meeting

This included the review of: Project Design Document (PDD), project log-frame and the project monitoring and evaluation plan. Following this initial review, an inception meeting was held between Oasis and the Hivos IA4RA Project Team. This allowed time for both parties to ask questions and clarify roles and responsibilities as well as the project's outputs, objectives and methods.

Step 2: Development of field survey, sampling and training materials

Oasis developed the field surveys, sampling and data entry template and associated training material. The foundation of this was the field survey. Oasis worked with the Hivos team to finalize the field survey and training material.

Step 3: Training of survey enumerators and supervisors and pilot field surveys

Oasis developed and delivered training on the field instruments and data collection for field enumerators and supervisors (annex 3). The training included guidance regarding the handling of problems and questions that might arise during data collection. Training included a brief discussion of the IA4RA activities. The survey was then field-tested and Oasis incorporated the needed changes into the design of the field instruments.

Step 4: Data collection, data input and cleaning

Oasis with Hivos undertook the baseline survey as detailed in section 2.2, the training notes (Annex 3) and survey. This took one week and included nine enumerators. 100 interviews were completed. Oasis then entered the data into an Excel spreadsheet and worked with Hivos and the enumerators to clarify data where required. The following limitations were noted with regard to the field survey:

- Most respondents gave limited answers (yes or no). Most of the *how's* and *whys* were not answered - perhaps due to lack of understanding or difficulty in expressing their answers.
- It is unlikely that most households keep written record of crop production. Additionally, most respondents do not keep a written register of production or farm inventory. Most answers were based on respondents' memory.
- Limited technical interventions from outside the project areas may mean a lack of understanding of the farming systems/practices the project is implementing.
- Communities may have only come across clay/cement cooking stoves promoted by NGOs/MAF and have not tried other improved cooking stoves resulting to bias towards preferred cooking stoves.

Step 5: Analysis and synthesis of data and preparation of preliminary report

Oasis analyzed and synthesized the data based on the results of the surveys (see Annex 1 for details on analysis).

Step 6: Final report preparation: revision of monitoring and evaluation indicators and baseline report.

Oasis developed a final report (this report) which included a review of the evaluation logic and indicators of the project, and provided required information for project baseline.

2.2 Survey sampling

The baseline survey achieved a representative sample across the 6 villages and 500 households in the project area. An online automatic random generator was used to select respondents. The survey was deliberately biased towards the farming community in the project area. Therefore, the results will be skewed towards farming households and not represent the wider non-farming community in the project site.

2.2.1 Margin of error

The survey sampled 20 percent of all households (100 households out of 500 households). This achieved a margin of error of 9% with a confidence level of 95%. (Table 2-2, Table 2-3).. This margin of error means that 95% of the 500 project household (475 households) is within an 18 percent range of the average baseline. For example, 62 percent of the surveyed households have access to 'good seeds'. This means, the project team can be confident that between 53-71 percent of all 500 households in the project area had access to 'good seeds'.

This report has reported only the average results (e.g. 62 percent).
Another example: the study asked respondents to rank their current perception of food security in their village. The table below (Table 2-1) shows the average, maximum and minimum with a 95% confidence level. This means, the project team can be confident that between 12-30 percent (average of 21 percent) of the respondents believe that food security across the project areas is 'very low'.

Table 2-1: Example of margin of error for community's perception of food security

Community perception of food security	Average (Percent)	Margin Error (with 95 percent confidence)	
		Min (-9 percent)	Max (+9 percent)
Very High	2	0	11
High	16	7	25
Moderate	24	15	33
Low	37	28	46
Very Low	21	12	30

2.2.2 Sampling stratification

The study achieved the pre-sample stratification per 'village'. It also achieved mostly the pre-sample stratification for 'male/female'. Given the sampling size was 100 and the difference between the planned and actual sampling of 'male/female' was only nine samples, this will not have a significant impact on the results. However, the study did not achieve the pre-sampling stratification for age. This was because there were not enough 'young' farmers (less than 30 yrs.) to interview in each village. Not achieving the stratification for age will not significantly affect the results of the survey. However, the accuracy of these results should be considered when interpreting results regarding age.

Table 2-4Table 2-4 outlines how the sampling was planned and Table 2-5 shows the actual sampling.

Table 2-2: Population and sample size

Est. total population	2200
Total Households	500
No. of samples	**100**

Table 2-3 Margin of error and confidence levels

	Total population	Households
Percent of sampled	5	20
Margin of error	10	9
Confidence level	95	95

Table 2-4 Pre-sample (planned) stratification

Village	Approximate number of Households	Approxi-mate Population	Percent of total popula-tion	No. of respon dents/ village	Male	Female	Age 16-30	Above 30
Afabubo	114	502	23	20	10	10	10	10
Daudere	107	471	21	20	10	10	10	10
Lakawa	21	92	4	10	5	5	5	5
Luro	120	528	24	20	10	10	10	10
Kotamuto	107	471	21	20	10	10	10	10
Wairoke	30	132	6	10	5	5	5	5
Total	**499**	**2195.6**	**100**	**100**	**100**		**100**	

Table 2-5 Post-sample (actual) stratification.

Village	No. of respondents per Village	Male	Female	Age 16-30	Above 30
Afabubo	20	15	5	1	19
Daudere	20	14	6	1	19
Lakawa	10	5	5	0	10
Luro	20	8	12	7	13
Kotamuto	20	11	9	2	18
Wairoke	10	6	4	4	6
Sub-totals	**100**	**59**	**41**	**15**	**85**
Total	**100**		**100**		**100**

3 RESULTS

3.1 Characteristics of respondents

3.1.1 Age

Age of the respondents was not representative of the age structure of the community. On average, approximately. 35 percent of the community is under 30 years old and work (either part or full time) on their farm. (This can be as low as 12 percent in some villages). Only 15 percent of the respondents, however, were under 30 years old (.Table 3-1)

Table 3-1: Age of the respondents in the project area

Age	Percent of respondents
Below 20	1
20-30	14
30-40	17
40-50	37
50-60	16
60-70	11
Above 70	4
Total	**100**

3.1.2 Occupation and farm income

The study focused deliberately towards the targeted farming communities of the project. Therefore, 96 percent of the respondents were farmers; one respondent was as student. The study included farmers who work as public servants, carpenters, 'housewives' and chief of the *aldeia* (sub-village) administration.

Respondents reported the following farm-generated income:

- 58 percent of farms yield no income.
  24 percent of farms yield between $1 - $50 per year.
- 9 percent of farms yield between $51-$500 per year.
- 1 percent of farms yield over $500 per year.

3.1.3 Education

Forty-six percent of respondents have finished high school with a further 34 percent having finished an undergraduate university degree. In the project site 12 percent more males have been to high school and 10 percent, more males have completed a university undergraduate degree (Table 3-2).

Table 3-2: Highest level of education of respondents in the project area

Highest level of education	Percent Female	Percent Male	Percent Difference
No schooling	5	2	-3
Primary school	2	4	2
High school	17	29	12
University/Undergraduate Degree	12	22	10
University/Masters or PhD	1	0	1
No response	5	1	5
Total	**41**	**59**	

3.1.4 Farm Size and population

Household size in the project area has an average of 7.6 people. The number of female and male in each household who work on farms is roughly even. In some villages, more females work on the farm than males. Sixty-seven percent of people under 30 years old work on farms. In Lakawa, however, this is significantly lower with 27 percent of young people working on farms (**Table 3-4**).

Table 3-3: Count of the number of respondents farms size and location

Size of farms	Afabubo	Daudere	Kotamuto	Lakawa	Luro	Wairoke	Grand Total
Very large (>10,0000 m^2)	0	2	1	0	0	1	4
Large (5,000-10,000 m^2)	14	12	6	2	4	2	40
Medium (1,000-4,999 m^2)	4	5	2	5	3	5	24
Small (100-999 m^2)	1	1	2	1	4	1	10
Very small (<100 m^2)	1	0	7	2	5	1	16
Location of farms	**Afabubo**	**Daudere**	**Kotamuto**	**Lakawa**	**Luro**	**Wairoke**	**Grand Total**
Flat land	12	13	2	0	2	6	35
Flat land/River bank	5	0	0	0	0	0	5
Sloping land	3	6	18	10	18	4	59
Sloping land/Flat land	0	1	0	0	0	0	1

Table 3-4: Average households male/female/youth breakdown

Village	Average number of people in HH	Average number of females in HH	Average number of males in HH	Average number of young people (<30yr) in HH
Afabubo	7.7	3.8	3.9	4.3
Daudere	6.9	3.2	3.7	3.3
Kotamuto	8.3	3.7	4.6	4.6
Lakawa	7.5	4.3	3.2	3.3
Luro	8.2	3.8	4.4	4.6

Wairoke	7.0	3.5	3.5	3.8
Total	**7.65**	**3.66**	**3.99**	**4.0**
Village	**Average number of females working on farms**		**Average number of males working on farms**	**Average number of young people (<30 yr) working on farms**
Afabubo	2.0		2.0	3.7
Daudere	2.2		1.8	2.9
Kotamuto	1.7		2.6	2.9
Lakawa	1.3		1.2	0.9
Luro	1.7		2.1	2.6
Wairoke	1.6		1.9	2.6
Total	**1.8**		**2**	**2.7**

3.2 Food security

Food security was highlighted as a major issue in the project area. Baseline results for food security impacts are summarised below. Food security relates to multiple project activities. Seventy-four percent of people stated they have food shortages at least once every five years. Conversely 25 percent of respondents stated that they rarely (greater than 5 years, 5 percent) or never (20 percent) have food shortage issues. Respondents identified shortages in the following crops:

- Corn, 63 percent
- Cassava, 33 percent
- Rice, 28 percent
- Beans, 13 percent
- Pumpkin, 12 percent
- Sweet potato, 10 percent
- Taro, 8 percent
- Banana, 6 percent
- Soya beans, 3 percent

Sixty-nine percent of respondents stated their community show signs of food security issues, which include:

- People/children getting sick (malnutrition, loss of weight, fainting, increase in illness), 51 percent
- Hunger (not enough food, reduced number of meals per day), 22 percent
- Selling farm assets (stock, grains, reduction in quality of food), 8 percent
- Anxiety, 5 percent
- Seeking other income/employment, 1 percent

Respondents identified the following 'coping mechanisms' when managing food shortages and food security issues:

- Selling animal stocks, 51 percent
- Seeking other employment (construction, crushed gravel selling, kiosk), 18 percent
- Making and selling *tais* and other handicrafts, 10 percent
- Selling fruits and vegetables 7 percent
- Looking for wild food (yams and other food sources), 4 percent
- Diversifying farm crops, 1 percent
- Fishing and selling fish, 1 percent
- Relying on government subsidies, 1 percent
- Using savings, 1 percent

3.3 Climate change

The study highlights 'climate change' as a significant issue in the project area. Climate change relates to multiple project outcomes and outputs (such as i.e.: 'food security').

It is important to note that these results are based on respondents' answers and perception of climate change. Whether the impacts discussed here are due to 'climate change' or 'climate variation' is of lesser relevance. It is important to highlight that the farmers' perceive they are impacted by a variable climate. This report has not verified if the perceived climate change impacts are within the natural variation or are due to long-term change in the climate. However, respondents' observations during the baseline survey are consistent with national predictions and observed impacts of climate change[1].

In total, 89 percent of people stated that climate change has affected their farms in some way. The impacts on their farm include:

- Reduced production (damage to crops, crop failure, pest attack, delay in planting crops, livestock death), 35 percent
- Increased storm intensity (high winds, increased erosion, flooding), 24 percent
- Reduced water availability (drought, spring drying up earlier than usual), 19 percent
- Delayed wet season, 17 percent
- Reduced human essential resources (food, malnutrition, hunger, fresh water), 14 percent
- Irregular rain patterns, 7 percent

Respondents identified eight of the 12 most climate change impacted crops as also the most resilient to climate change (Table 3-5). This shows climate change has a large range of impact on key farming crops. It demonstrates the importance of climate adaptation methods such as crop diversification and the use of climate resilient seeds.

Table 3-5: Most impacted and resilient crops

Crops most impacted by CC	Percent	Crops most resilient to CC	Percent
Corn	79	Cassava	54
Cassava	31	Banana	34
Banana	27	Taro	24
Pumpkin	21	Potato	16
Rice	9	Pumpkin	11
Coconut	8	Papaya	10
Bean	8	Corn	8
Potato	6	Arrowroot	7
Papaya	6	teak	4
Rice plant	5	Mango	8
Taro	4	Bean	3
Candlenut	2	Breadfruit	3

There was a low response rate to questions about *why* respondents observed the climate change impact and resilience of crops. Responses from Luro, Kotamuto, Wairoke villages show that:

- Corn was impacted by 'long dry seasons and irregular rainfall';
- Banana/Jackfruit was impacted by 'landslides and heavy rain'; and

[1] See, Timor-Leste's initial national communication under the UNFCCC 2014: http://unfccc.int/resource/docs/natc/tlsnc1.pdf

- Rice was impacted by 'flooding and prolonged inundation'.

Farms already presented some adaptation actions to respond to perceived climate change-related impacts. These are:

- Windbreak planting (living fences), 40 percent
- Crop diversification/intercropping (taro, cassava, mahogany, rice, papaya, pumpkin), 20 percent
- Planting trees, 15 percent
- Flood mitigation (flood barriers), 12 percent
- Building fences, 7 percent
- Changing seeds, 5 percent
- Erosion control, 4 percent
- Erosion control/flood mitigation (planting trees, flood barriers), 2 percent
- Using fertilizer, 2 percent
- Ridge planting, 2 percent
- Rodent control (clearing food and habitat), 1 percent

3.4 Village food security and climate change assessment

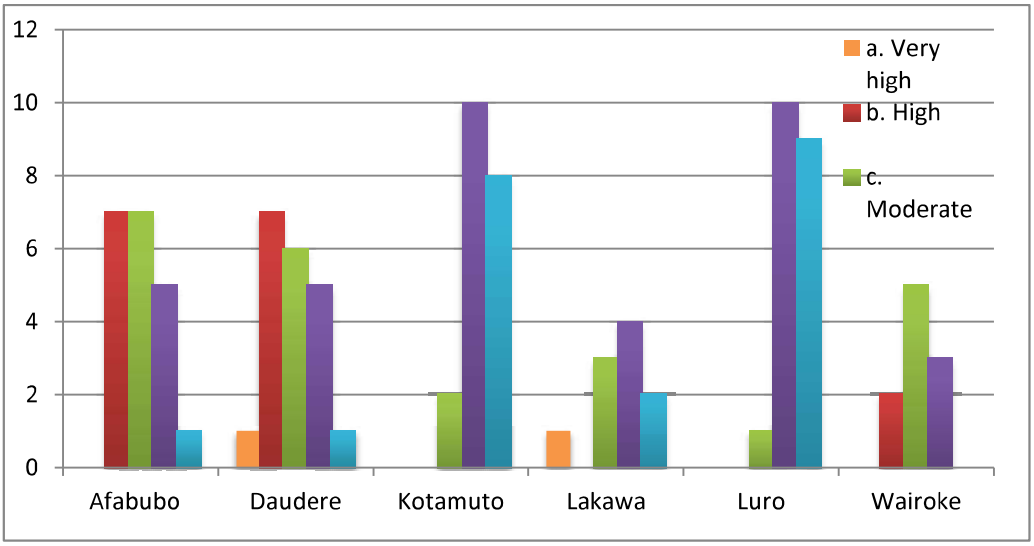
The Oasis team completed a brief analysis of what the common characteristics are of villages that have reported higher food security and climate change issues. This analysis is an added feature to the scope of work for this study. The data collected for the baseline survey, however, can be used in this manner to help inform project implementation.

This section requires further statistical analysis of individual responses. This section presents an example, and limited analysis of the whole data set. It only presents a village level analysis of observed characteristics. Note that each village only had 10 or 20 surveys completed (samples) and it is, therefore, difficult to compare between villages.

The baseline data collected shows a link between food security and climate change adaptability (). Villages such as Kotamuto and Luro who reported low to very low food security also reported low to very low climate change adaptability. Similarly, Afabubo and Daudere reported moderate to high food security and moderate to high climate change adaptability (Figure 3).

Additionally, villages dominated by larger farms (>5000m^2), which had a flat and/or riverside aspect and higher perceived youth engagement in farming reported a high food security and adaptability to climate change (Figure 4, Figure 5, Figure 6), Conversely, villages dominated by farms smaller than 100 m^2, on sloping land and had a low perception of youth engagement reported higher food security issues and lower ability to adapt to climate change.

a.



b.

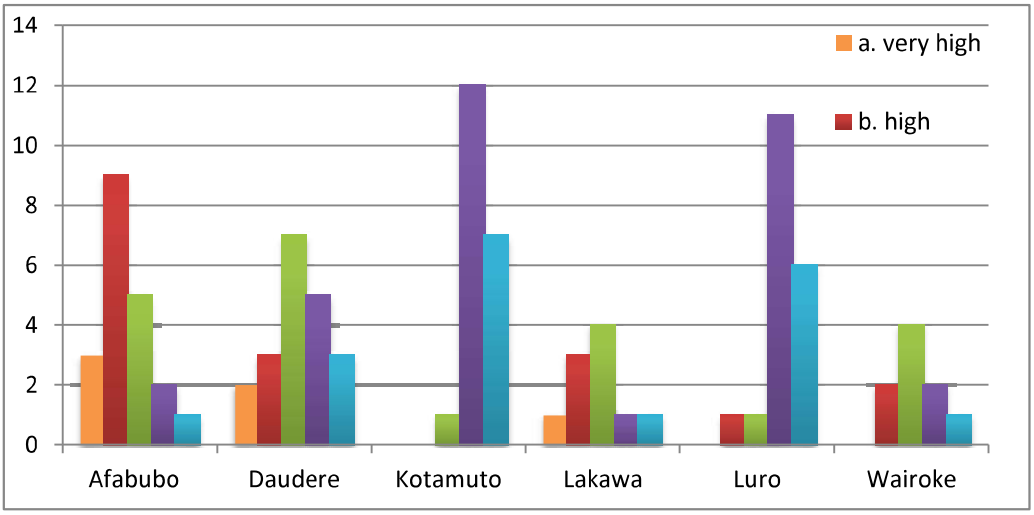


Figure 3: Count of perception of village a) food security and b) farm adaptability

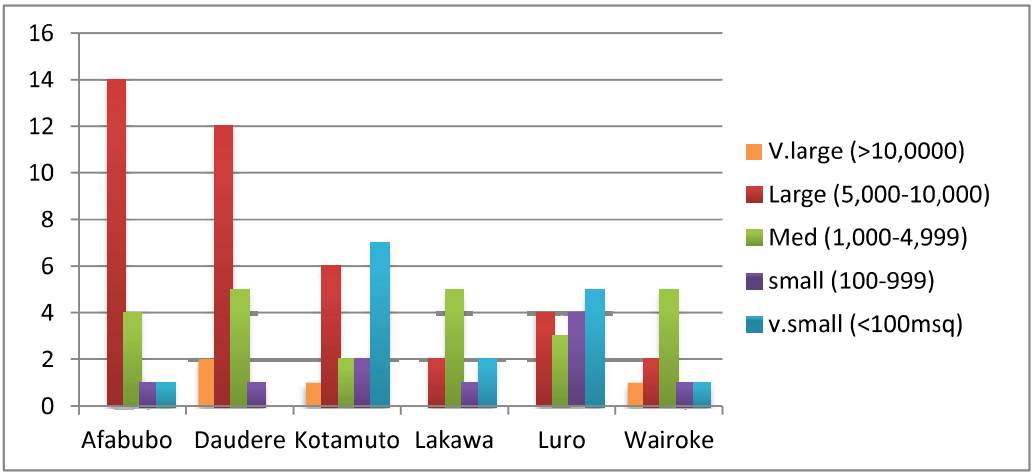


Figure 4: Count of farm size

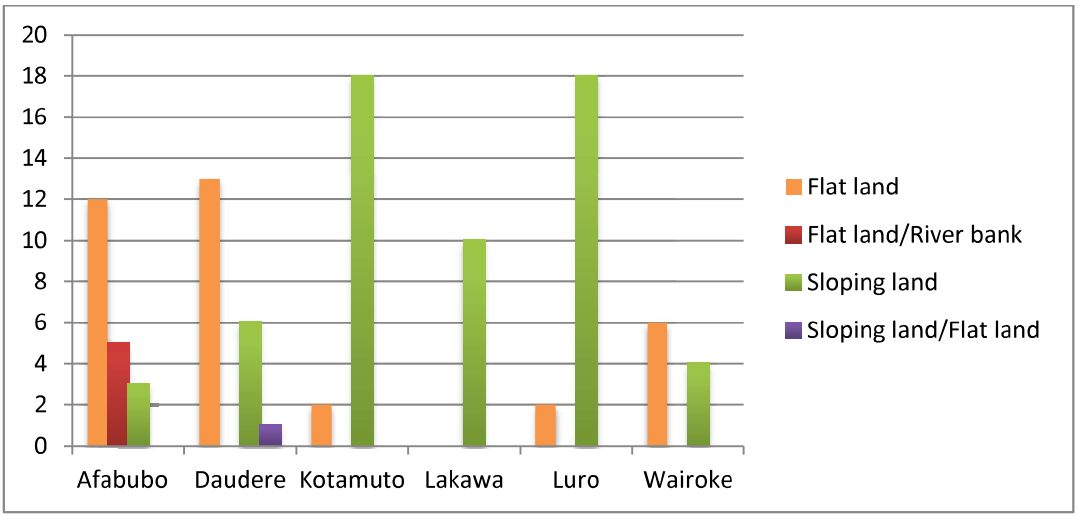


Figure 5: Count of farm location

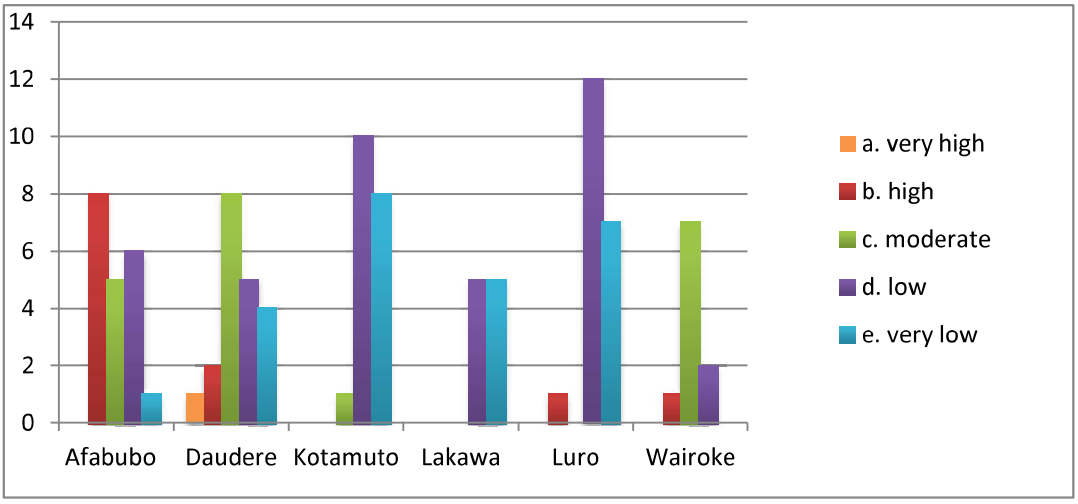


Figure 6: Count of perceived youth (<30yr old) engagement in farms

3.5 Climate-resilient and sustainable food production systems

The baseline survey showed that corn and cassava (along with pumpkins) are the most widely grown crops in Raumoco Watershed, with 99 percent and 91 percent households in the project areas growing them respectively. However, over 50 percent of households also grow four or more crops. Other popular crops include bean, banana, sweet potato, papaya, taro and rice.

Furthermore, 62 percent of households have access to 'good seeds'. Seventy-six percent of households who have access to 'good seeds' have access to good corn seeds. 13 percent have access to good seeds for other crops (cassava, sweet potato, hybrids, rice, taro, banana, pumpkins).

Respondents preferred to use the seeds they currently have because:

- Good quality seed, 24 percent
- Increase production/income, 20 percent
- They're available at the right time, 12 percent
- Good results, 10 percent
- Do not have access to other seeds, 3 percent

- Drought resilient/withstand climate variations/requires less water, 4 percent
- Easy to access and cheaper, 3 percent

Seventy-eight percent of households are already using three or more low-carbon technologies (22 percent reported using less than three). The most popular are reduced/no tillage, crop diversification, intercropping, companion cropping and seed saving/conservation.

Sixty-four percent reported that the technologies were working as expected and 73 percent said they plan to continue to use the technologies. Conversely, 19% reported issues with the technologies with 11 percent that said they would not continue to use the technologies. Respondents stated the following reasons for not wanting to continue to use the technologies:

- Prefers to use the old system/practices, 3 percent
- Farm is not suited to the system/practice (sloping/narrow land), 2 percent
- No capacity to continue/needs further technical support, 1 percent
- Not currently farming, 1 percent
- Too time consuming, 1 percent
- Does not improve production, 1 percent

Most respondents (64 percent) received technical support from MAF and NGOs in the adoption of these technologies.

Ninety-seven percent of households have reported to have a 'farm management plan'. However, it was not clear if they maintain written farm management plans and/or if this includes climate information, seed resistance and tolerance qualities, and yield potential in decision-making. It appears very unlikely that they document their farm plans.

Forty-six percent of farms in the project area are on 'sloping land'. Some farmers stated that some farming systems are not appropriate for their farms because of this land feature. Only 2 percent of farmers use inorganic fertilisers.

3.6 Rainwater collection and river solar-power drip irrigation systems.

From the 100 households surveyed only three households reported irrigating their crops. These were in Daudere and Wairoke. The two irrigators from Daudere irrigate in both the dry season and wet season. The irrigator from Wairoke only irrigates in the wet season. Springs used for water resources dry up between the months of August and November (with a maximum range from July to December). The three households that irrigate reported spending between 2-5 hours per day irrigating their crops.

3.7 Tree planting and fuelwood

Ninety-four percent of households have planted trees as living fences, terracing, and/or windbreaks. 84 percent of respondents stated their relative success with this activity. The respondents said the main issues with around it have been drought, irregular rainfall as well as infertile land. When asked about the main reason for planting trees they responded:

- Wind protection, 81 percent
- Animal protection, 81 percent (participants were asked to identify more than one main reason)
- Fuel, 14 percent
- Composting/mulching, 5 percent
- Animal feed, 7 percent

The most common tree species currently used are:

- Madre de cacao (Gamal)
- Ironwood
- White gum
- Makassar oil tree
- Candlenut tree
- Coconut tree
- Mango tree
- Bamboo
- Mahogany
- Kapok tree
- Tamarind tree
- Teak
- Banana

Sixty-three percent of households stated that they did not get enough fuelwood from their own plantations, with the majority (43 percent) stating that they got additional fuelwood from native forests. Only 23 percent of respondents stated that they got fuelwood from their planted trees. Fifty percent of Lakawa villagers stated that they did not have enough fuelwood; while 25 percent of Afabubo villagers reported a surplus of fuelwood.

Additionally, some respondents from Afabubo and Daudere villages report collecting up to 30 bunches of wood from nearby forests per day. The study could not verify what this additional fuelwood was for but assumes that it is for sale and/or for use during household/village traditional ceremonies/events. On average, the total fuel wood use per household is as follows:

- 20 percent of households use <2 bunches per day
- 13 percent use 2 bunches per day.
- 15 percent use 3 bunches per day
- 10 percent use 4 bunches per day
- 4 percent use 5-6 bunches per day
- 2 percent use 6-8 bunches per day

3.8 Improved cooking stoves

Ninety-eight percent of households in the project area use 'three-stone' (traditional) stoves with only 2 percent of households using improved wood-fired cooking stoves. Six percent of households are using rice cookers, electric and kerosene stoves. The majority of household accessed improved stoves from their local market (including electric, rice cookers and kerosene stoves), while two households accessed their improved wood-fire stoves from the NGOs Fraterna and Prospek.

Ninety-four percent of households have planted trees but only 14 percent of households reported that fuel was the major reason for planting them. This indicates that households may be using other sources of wood for fuel (i.e. forest) and/or are saving the trees they planted to function as windbreaks and animal protection and/or selling their wood as a source of income. This also may suggest there is a limited knowledge on the use of specific tree species for firewood. Additionally, the survey did not include the extent of these tree-planting activities (number of trees planted/area planted). Therefore, exclusively increasing fuelwood planting without raising awareness on their fuelwood value may not increase the use of fuelwood from their plantations.

Villages in the project area are well aware of the advantages of improved wood-fueled cooking stoves. They reported seeing advertising as well as family and friends with improved stoves. The benefits they reported are:

- Reduced firewood, 61 percent
- Reduced smoke, 17 percent
- Liked having/using them, 14 percent

- Reduced illness (from indoor air pollution), 12 percent
- Requires less time and effort, 5 percent
- Not dependent on electricity, 2 percent
- Better quality stove, 1 percent
- Faster cooking, 1 percent

3.9 Engagement of young people in farming

Approximately 50 percent of the population in the project area are under 30 years old (young people). Across the project area, 68 percent of young people work (either part-time or full time) on farms. Lakawa has a significantly lower number of young people who work on farms (27 percent). 87 percent of households perceive youth engagement in farms as 'moderate' to 'very low'. The main reason for this perception was because the youth:

- Go to school
- Prefer other non-farm employment (Kiosk, construction, public service, other services)
- Move to cities to work (England, Korea, Dili, Los Palos)

The respondents stated that they would like to encourage young people to choose farming as an employment by way of the following:

- Improving community and youth attitudes around the value of farming
- Building a better understanding of how farming will improve living standards (reduce hunger, 'have to work to live', helping their parents/family have a better life)
- Including young people in farming activities and empowering youth with knowledge
- Improving/providing income and incentives for youth and family

4 RECOMMENDATIONS FOR PROJECT EVALUATION

This section details the recommended application of the baseline survey results to the IA4RA project evaluation and was developed following discussion of the baseline survey results with the IA4RA team. The original indicators and targets are presented, followed by recommended modifications and justifications. A summary table of recommended indicators and targets and corresponding baseline is presented after each outcome/output. Comments are also provided where applicable.

4.1 Recommendation 1: Impact indicators and targets

4.1.1 Project objective

To contribute to the sustained adoption and scaling out of sustainable food, water- and energy-efficient technologies for 500 vulnerable households in six villages in the Raumoco watershed

4.1.2 Original Indicators and targets

Indicator 1*:* Number and percentage of households that report increase in sustainable food, water and energy security.
Target*:* By end of the 2.5-year period, at least 350 or 70% of target population (total household coverage is projected at 500) are reporting decreases in localized food security in Lautem

Indicator 2*:* Number and percentage of target households that report increased use of fuelwood from their own plantations.
Target*:* At least 350 or 70% of target population

Indicator 3: Climate change adaptation research and extension methodology for MAF.
Target: Climate Field School-cum Farmer-led Field Trials and Climate Field Day

4.1.3 Recommended modifications

Indicator 1: Number and percentage of households that report increased access to tested climate resilient technologies that contribute to localized food security
Target: At least 70 percent of households (350 households) are reporting increased access to tested climate-resilient technologies.

Indicator 2: Number and percentage of target households that report increased access to tested efficient technologies that contribute to water and energy security
Target: At least 70 percent of households (350 households) are reporting increased access to tested water- and energy-efficient technologies

Indicator 3: Number and percentage of Lead Farmers and MAF Extension staff that report increased capacity in conducting farmer-led climate field trials and extension of climate-resilient and low-carbon technologies
Target*:* At least 70 percent of Lead Farmers (35 LFs) and MAF Extension (6) have increased capacity in farmer-led field trials and extension of climate resilient, water- and energy-efficient technologies

4.1.4 *Explanation/Justification*

Indicators 1 & 2: Considering the short duration of the project, increases in food, water and energy security are deemed unachievable by end of September 2018. With a focus on the trial and dissemination of climate-resilient technologies, the project's contribution to the food-water-energy nexus would be technologies that have been tested and proven resilient to the local climatic condition of the Raumoco Watershed. Hence, the recommendations points to increased access to the technologies tested by farmers and extensionists. Access to these technologies will enable

farmers to easily adopt them in their own farms that could eventually lead to increases in food, water and energy security beyond the project's short time frame. This is an important contribution to sustained resilience and adaptation to climate change for watershed inhabitants.

Indicator 3: The role of Lead Farmers and MAF extensionists is key to the on-farm field trials of resilience and adaptation technologies. The scaling out of these climate resilient technologies are contingent on the increased capacity of these actors in the conduct of these trials and the sharing of their results of these trials with other farmers within Raumoco and other watersheds.

Table 4-1 Impact targets and baseline

Indicators	Target	Updated Baseline[2]	Comments
Indicator 1: Number and percentage of households that report increased access to tested, climate resilient agro-ecological technologies that contribute to localized food security	*By end of the project, at least 50% (250HH) of households are reporting* A. Increased access to tested, climate resilient agro-ecological technologies.	The community ranks their current (Feb 2017) perception of food security as: Very High: 2% High: 16% Moderate: 24% Low: 37% Very Low: 21% Based on the above, it could be subsumed that access could range from Very Low (21%) to low (37%).	The total shift of percentages will be used to assess change. For example: if in 2019 the perception of food security reaches: Very High: 40% (+38%) High: 30% (+14%) Moderate: 15% (-9%) Low: 10% (-27%) Very Low: 5% (-16%) Then, this would mean 52% HH are reporting an increase in access to tested climate resilient technologies that contribute to localised food security.
Indicator 2: Number and percentage of target households that report increased access to tested and efficient technologies that contribute to water and energy security)	*By end of the project, at least 50% (250HH) of households are reporting* B. Increased access to tested water- and energy efficient technologies.	The community ranks their current (Feb 2017) resiliency and adaptation to climate change as: Very High: 6% High: 18% Moderate: 22% Low: 33% Very Low: 19% No answer: 2% Based on the above, it could be subsumed that access to tested efficient technologies could range from Very Low (19%) to Low (33%)	The total shift of percentages will be used to assess change. For example: if in 2018 the perception of resiliency and adaptation reaches: Very High: 20% (+14%) High: 50% (+32%) Moderate: 22% (0%) Low: 7% (-26%) Very Low: 1% (-18%) Then, this would mean 46% HH are reporting an increase in their access to tested and efficient technologies
Indicator 3: Number and percentage of Lead Farmers and Extension staff that report increased capacity in conducting farmer-led climate field trials and extension of tested, climate-resilient and agro-ecological technologies	*By end of the project, at least 70% of Lead Farmers (35 of 50 LFs) and MAF Extension staff (6 of 8) are reporting* C. Increased capacity in conducting farmer-led field trials and extension of tested, climate-resilient and agro-ecological, water- and energy efficient technologies.	TBD	This outcome will be evaluated during the training and skill sharing activities. A "before and after" assessment should be completed with questions aimed at evaluating success of the project's field trials and scaling out/extension activities.

[2] The target for these outcomes will need to be determined with the results from of the mid-project and final review. Exact target cannot be quantified at this time. The accompanying spreadsheet will allow for the evaluation.

4.2 Recommendation 2: Outcome Indicators and Targets

4.2.1 Outcome 1. Increased adoption by women, men and youth of climate-resilient, diversified agro-ecological farming systems

4.2.1.1 Original Indicators and targets: *By end of the project*
Indicator 1.1*:* Number and percentage of households that have developed their climate resilient farm management plans based on their specific agro-ecosystems and using low-carbon technologies
Target*:* At least 250 or 70% of target farming households are using farm management plans that adopt climate information, seed resistance and tolerance qualities, yield potential in decision-making

Indicator 1.2: Number and percentage of target households continuously applying integrated, climate-resilient farming systems to increase production outputs
Target*:* At least two of three are operational

Indicator 1.3 Type of implemented systems that are operational and yielding expected production outputs
Target*:* At least two of three are operational

4.2.1.2 Recommended modifications:
Indicator 1.1: Number and percentage of households that have developed their climate resilient farm management plans based on their specific agro-ecological systems
Target: At least 250 or 70% of target farming households are using farm management plans that adopt tested, climate-resilient agro-ecological practices

Indicator 1.2*:* Number and percentage of target households continuously applying diversified agro-ecological farming systems to increase production outputs
Target*:* At least 95% (475) of target households are adopting at least two agro-ecological technologies and working as expected

Indicator 1.3 *(Integrated into Indicator 1.2)*
Target*: (Integrated into Target for Indicator 1.2 above.)*

4.2.1.3 Explanation/Justification
As articulated in the IA4RA PDD, the climate-resilient and low-carbon technologies that will be trialled and disseminated refer to agro-ecological practices, hence, the use of the term in the modified indicators and targets. Agro-ecology's contribution to climate change adaptation is through "building up the farm's natural defences through improved water management, enhanced nutrient management, better soil management and diversified production system". Specific agro-ecological practices that are included in the PDD are: reduced/zero tillage, intercropping, companion planting, composting and the application of manure, mulching, and diversified farming, among others.

Table 4-2: Outcome 1 indicators/targets and baseline.

	Indicators	Target	Updated Baseline	Comments
1.1	Number and percentage of households that have developed their climate resilient farm management plans based on their specific agro-ecological systems	At least 250 or 70% of target farming households are using farm management plans that adopt tested, climate-resilient agro-ecological practices	0 farmers have no written farm management plan.	97% of households have reported to have a 'farm management plan'. However, it was not clear if this has been written down and/or if this includes climate information, seed resistance and tolerance qualities, yield potential in decision-making. It very unlikely that any farm plans are written down. A follow up survey is required to clarify the baseline for this indicator.

1.2	Number and percentage of target households continuously applying diversified agro-ecological farming systems to increase production outputs	At least 95% (475) of target households are adopting at least two agro-ecological technologies and working as expected	78% of households are using three or more agro-ecological technologies in some form. 64% reported that the technologies were working as expected.	73% said they plan to continue to use the technologies.

4.2.2 Outcome 2. Increased adoption by women, men and youth of water- and energy-efficient technologies for vegetable/cash crop production and cooking

4.2.2.1 Original Indicators and targets:

Indicator 2.1 Number and percentage of women and men having access to harvested/stored rainwater during dry periods for their vegetable/cash crop production
Target*:* At least 50 women and 50 men are implementing as groups

Indicator 2.2 Area (sq.m.) of vegetable gardens/cash crops serviced by facilities
Target*:* At least 100 sq.m. of vegetable/cash crop gardens are served per participating household

Indicator 2.3 Number and percentage of households that are using improved cooking stoves (ICS) with fuelwood from their own fuelwood plantation
Target*:* At least 350 households or 70% of 500 target households that received improved cooking stoves are continuously using them

4.2.2.2 Recommended modifications:

Indicator 2.1 Number and percentage of households having access to irrigation water during dry periods for their vegetable/cash crop production
Target: At least 200 households (40%) have access to rain/spring water for irrigation.

Indicator 2.2 Number and percentage of households and area of gardens having access to solar-powered drip irrigation system
Target*:* At least 25 households with at least 500 m^2 of vegetable/cash crop gardens each are using solar-powered drip irrigation.

Indicator 2.3: Number and percentage of households that are using improved cooking stoves (ICS) with decreased fuelwood consumption
Target*:* a) At least 350 households or 70% of 500 target households that received improved cooking stoves are continuously using them
Target: b) At least 250 or 70% of households that are continuously using them are getting fuelwood from their own plantation
Target: c) At least 250 of households that received improved cooking stoves (70%) are reporting decreased use of fuelwood

4.2.2.3 Explanation/Justification

Indicator 2.1: In addition to having access to stored rainwater during dry periods, which may not last the whole production cycle, tapping water from nearby springs could increase the availability of water for irrigation. Target households were increased to 200, which translates to at least 15 households for each water tank organized into groups of women, men and young people.

Indicator 2.2: A new indicator and target was included for the project's solar-powered drip irrigation.

Indicator 2.3: Two new targets were added on the sourcing of fuelwood and decrease in fuelwood use

Table 4-3 Outcome 2 indicators/target and baseline

	Indicators	Target	Updated Baseline[3]	Comments
2.1	Number and percentage of households having access to irrigation water during dry periods for their vegetable/cash crop production	At least 200 households (40%) have access to rain/spring water for irrigation.	0% households reported using rain/spring water irrigation. 3 households (3% of survey respondents) are using solar powered irrigation	I pre-project trial has been undertaken in Daudere Village.
2.2	Number and percentage of households and area of gardens having access to solar-powered drip irrigation system	At least 25 households with at least 500 m^2 of vegetable/cash crop gardens each are using solar-powered drip irrigation.	100% of households who are irrigating (3% of HH) are irrigating >100m^2 of crops with solar-powered drip irrigation system.	So far, the project as installed three 600L water tanks which service 5 HH each in Daudere village. The 600 L tanks are fed from one 60,000 L tank that the project also installed. The 60,000 L tank is filled using solar power from the Daudere river.
2.3	Number and percentage of households that are using improved cooking stoves (ICS) with decreased fuelwood consumption	At least 350 households or 70% of 500 target households that received improved cooking stoves are continuously using them	0 households (0%) are using improved cooking stoves	Activity not started
		At least 250 or 70% of households that are continuously using them are getting fuelwood from their own plantation	23% of households are using plantation trees for fuelwood	
		At least 70% of households that received improved cooking stoves are reporting decreased use of fuelwood	20% use <2 bunches per day 13% use 2 bunches per day 15% use 3 bunches per day 10% use 4 bunches per day 4% use 5-6 bunches per day 2% use 6-8 bunches per day	28% did not respond This baseline is for all households. With only 2% of households with improved cooking stoves, it was not possible to see any trend between household with and without improved cooking stoves

[3] This data is limited given the low number of responded (3) who currently irrigate (either with rainwater or river water).

4.3 Recommendation 3: Output Indicators and Targets

4.3.1 Output 1: Sustainable, low-carbon food production technologies are implemented by vulnerable farming households

4.3.1.1 Original indicators and Targets

Indicator 1.1 Number and percentage of vulnerable households implementing climate-resilient food production systems
Target: At least 350 or 70% of vulnerable target population

Indicator 1.2 Number of sustainable, low-carbon technologies implemented
Target: At least three low-carbon technologies are implemented
Target: Number of women and men provided access to good seeds
100 percent of women and men are provided access to good seeds (high-yielding, drought-resistant and tolerant seeds)

4.3.1.2 Recommended modifications

Indicator 1.1 Number and percentage of Lead Farmers trained on diversified agro-ecological farming systems through climate/farmer field schools
Target: At least 50 Lead Farmers have completed Climate/Farmer Field Schools

Indicator 1.2: Number of sustainable agro-ecological technologies tested in on-farm field trials with Lead Farmers
Target: At least three agro-ecological technologies are tested in on-farm trials

Indicator 1.3 Number of women and men provided access to good seeds and tools
Target: 100 percent of women and men are provided access to good seeds (high-yielding, drought-resistant and tolerant seeds) and tools

4.3.1.3 Explanation/Justification

Indicator 1.1 The original indicator on the number and percentage of households implementing climate resilient technologies is already subsumed under Outcome 2. A new indicator relating to the training of Lead Farmers replaced this indicator.

Indicator 1.2. This output now refers to tested technologies (in on-farm field trials by Lead Farmers). Use of these tested technologies is included under Outcome 1 indicators and targets.

Indicator 1.3 The provision of tools was added to this indicator.

Table 4-4: Output 1 indicators/targets and baseline

	Indicator	Target	Updated Baseline	Comments
1.1	Number and percentage of Lead Farmers trained on diversified agro-ecological farming systems through climate/farmer field schools	Target: At least 50 Lead Farmers have completed Climate/Farmer Field Schools	0	50 Lead Farmers have been selected but have yet to undergo training
1.2	Number of sustainable agro-ecological technologies tested in on-farm field trials with Lead Farmers	At least 3 agro-ecological technologies are tested in on-farm trials	0	Testing of block planting corn, ridge planting of cassava and companion planting on-going
1.3	Number of women and men provided access to good seeds and tools	Target: 100% of women and men are provided access to good seeds (high-yielding, drought-resistant and tolerant seeds) and tools	62% of Households have access to 'good seeds'.	Good seeds are high-yielding, drought-resistant and flood-tolerant seeds.

4.3.2 Output 2: Low-cost rainwater collection/drip irrigation systems are implemented by vulnerable groups of women and men

4.3.2.1 Original Indicators and Targets

Indicator 2.1 Number of women and men implementing rainwater collection/drip irrigation system for vegetable/cash crop production
Target: At least 50 women and 50 men are implementing in groups

Indicator 2.2 Number of villages that are implementing low-cost rainwater collection/drip irrigation system
Target: All six target villages will be provided two units each of 10,000 sq.m. rainwater collection tanks

Indicator 2.3 Percentage of women and men involved in a solar powered drip irrigation
Target: At least one solar-powered drip irrigation project for cash crop production in a 3-hectare area

4.3.2.2 Recommended modifications

Indicator 2.1 Number of solar powered drip irrigation systems
Target: At least one solar-powered drip irrigation project for vegetable/cash crop production in a 1-hectare area established

Indicator 2.2 Number of low-cost rainwater collection/drip irrigation systems for vegetable/cash crop production
Target: At least 12 units of 10,000 sq.m. rain/spring water collection tanks for vegetable/cash crop production established

Indicator 2.3 3.1 Number of women, men and young people organized and involved in rain/spring water collection/solar-powered drip irrigation system for vegetable/cash crop production
Target: At least 12 groups of 100 women, 50 men and 50 young people are organized and involved

4.3.2.3 Explanation/Justification

Indicator 2.1 This indicator focuses on the establishment of a solar-powered irrigation system. The original indicator was combined with original Indicator 2.3 to constitute modified Indicator 2.3

Indicator 2.2 Instead of counting villages, this modified indicator now refers to the number of water tanks to be installed

Indicator 2.3 (See explanation for 2.1 above)

Table 4-5 Output 2 indicators/target and baseline

	Indicators	Target	Updated baseline	Comments
2.1	Number of solar powered drip irrigation systems	At least one solar-powered drip irrigation project for vegetable/cash crop production in a 1-hectare area established	A solar pump system has been installed by Hivos, pumping water from the Raumoco River to a 60,000-liter tank.	The system is currently involving a group of farmers (14 households) involved in cash crop production.
2.2	Number of low-cost rainwater collection/drip irrigation systems for vegetable/cash crop production	At least 12 units of 10,000 sq.m. rain/spring water collection tanks for vegetable/cash crop production established	0	

2.3	Number of groups of women, men and young people organized and involved in rain/spring water collection/solar-powered drip irrigation system for vegetable/cash crop production	At least 12 groups of 100 women, 50 men and 50 young people are organized and involved	One group is involved in solar powered drip irrigation	

4.3.3 Output 3: Fuelwood tree species (G. sepium or Gamal) planting are established as living fence, contour hedgerows and windbreaks for farmlands under cultivation

4.3.3.1 Original indicators (No modifications)

Indicator 3.1 Number and percentage of target households that have established fuelwood plantation as living fence, contour hedgerows and windbreaks
Target: At least 400 or 80 percent of households

Indicator 3.2 Number of gamal tree species planted per vulnerable household as living fence, contour hedgerows and windbreaks
Target: At least 100 trees are planted per vulnerable household each year or 200 during IA4RA for 200,000 trees

Table 4-6 Output 3 indicators/targets and baseline

	Indicators	Targets	Updated baseline	Comments
3.1	Number and percentage of target households that have established fuelwood plantation as living fence, contour hedgerows and windbreaks	At least 400 or 80% of households	0	
3.2	Number of gamal tree species planted per vulnerable household as living fence, contour hedgerows and windbreaks	At least 100 trees are planted per vulnerable household are planted each year or 200 during IA4RA for a total of 200,000 trees	0	

4.3.4 Output 4: Improved cooking stoves are distributed to vulnerable women and men

4.3.4.1 Original indicators:

Indicator 4.1 Number of vulnerable households that received improved cooking stoves
Target: 500 or 100% of target households

4.3.4.2 Recommended modifications

Indicator 4.1 Number of vulnerable households that received improved cooking stoves
Target: 500 or 100 percent of target households

Indicator 4.2 Number of cooking stoves trialed among vulnerable households
Target: At least three types of improved cooking stoves (portable clay/concrete ICS, fixed clay two burner, concrete rocket stove.

4.3.4.2 Explanation/Justification

A new indicator has been added on the distribution of three types of improved cooking stove (portable clay/concrete, fixed clay stove with 2 burners and portable concrete rocket stove)

Table 4-7 Output 4 indicators/targets and baseline

	Indicator	Target	Updated baseline	Comments
4.1	Number of vulnerable households that received improved cooking stoves	500 or 100 percent of target households	2 percent of households use improved cooking stoves	Project will distribute 400 improved cooking stoves (portable clay, 50 fixed and 50 rocket stoves
4.2	Number of cooking stoves trialed among vulnerable households	At least three types of improved cooking stoves (portable clay/concrete ICS, fixed clay two burner, concrete rocket stove	0	Project will trial ICS, rocket stove and fixed stoves

4.3.5 Output 5: Experiences and lessons learned are collected and shared

4.3.5.1 Original indicators

Indicator 5.1 Key lessons learned inform decision-making processes on implemented/proposed activities contribute to building capacities at local, municipal and national levels.
Target: Two FCFD (one in 2016 and the other in 2017) are facilitated

Indicator 5.2 Print/video documentation distributed to a wider stakeholder audience
Target: One print & one video documentation of successful technologies

4.3.5.1 Recommended modifications (Not applicable)

Table 4-8 Output 5 indicators/targets and baseline

	Indicators	Targets	Updated baseline	Comments
5.1	Key lessons learned inform decision-making processes on implemented/proposed activities contribute to building capacities at local, municipal and national levels.	Two FCFD (one in 2017 and the other in 2018) are facilitated	NA	This output will be evaluated during the training and skills sharing activities. A before and after assessment should be completed with questions aimed at evaluating success of the project's technologies capacity building
5.2	Print/video documentation distributed to a wider stakeholder audience	Print/video documentation distributed to a wider stakeholder audience	NA	This output to be evaluated after the production of communication materials

4.3.6 New Output 6: Young people continuously engaged in farming

4.3.6.1 Explanation/Justification

The lack of young people engaged in farming is seen as an issue for future primary production and sustainable farming in Lautem. Through continuous exposure to various field trials that show good results, young people could be motivated to sustain farming activities or go back to the farm after completing their studies. This output is an additional benefit - there are no direct project activities that aim to increase engagement of youth in farming. However, through improved access to climate-resilient, low-carbon technologies and involvement of young farmers and the youth in the project activities it is expected to increase youth engagement in farming.

Table 4-9 Activity 6 indicators/targets and baseline

	Indicator	Target	Baseline	Comments
6.1	Young people continuously engaged in farming	At least 50% of project beneficiaries (250 households) are young people working full-time as farmers	The villages reported the follow % of young people working on farms: Afabubo, 86% Daudere, 88% Kotamuto, 63% Lakawa, 27% Luro, 57% Wairoke, 68% Average across all villages 68%	Need to focus on Lakawa. The baseline survey has defined engagement in farms as either 'part-time or full time work on farms'. The survey did not ask if farmers are full time or part-time in their farming activities.

4.4 Recommendation 4: Baseline survey limitations and opportunities

During the analysis of the baseline survey, the following limitations and opportunities were identified:

Quantitative evaluation: To test project assumptions, and to truly understand the impact of the project, it is recommend that the project invest in a rigorous quantitative 'outcomes conceptual model evaluation', outlined in section 4.4. Although the baseline detailed in this report will allow for understanding the trajectory of the project, it will not allow a conclusive demonstration of project outcomes. This will be especially true if another drought hits the project site. There will be no way to know if it is the drought or the project that is having a greater effect on the community.

Monitoring capacity building: Monitoring the 'Build capacity and disseminating skills and lessons learned' activities (Famer field days and communication material) will need to be assessed outside of this evaluation framework. It is best to evaluate these outputs before and after the field day activities.

Add pilot projects detail: Pilot and tests of each technology is a large part of this project, and still need to be defined. Details of each trial need to be added to this baselines report, i.e., Terms of Reference, Statement of Work, etc.

People collecting fuelwood from the forest. Detail on 'why' wood is collected from forest particularly by households that have planted trees, was not collected during the baseline survey. This has since been identified as important information to inform the fuelwood plantation project activities (Activity 4). It is now believed that much of the fuelwood collected by the project community is sold or used during traditional ceremonies and community events. This has implications on the implementation of tree planting activities.

Additionally, the survey did not assess the current extent of villages and farms tree plantations (number of trees planted/area planted).

Impact of low youth engagement in Lakawa village. This baseline survey could not determine the impact of low youth engagement in Lakawa. This could be a focus of an addition study.

Farm management plans. 97% of households have reported to have a 'farm management plan'. However it was not clear if this has been written down and/or developed considering climate information, seed resistance and tolerance qualities, and yield potential. It is thought to be very unlikely that any farm plans are written down. Prior to the implementation of farm planning activities, the project can verify this with lead farmers.

Additional data analysis: There are a number of additional data analyses that would be interesting to pursue not only for this project but also for other similar projects. For example, it would be

interesting to investigate the difference between households that have no food security issues (20%) and the majority of households that have very high food security issues. Please see the 'correlation' tab in the spreadsheet for more detail. This type of analysis was not part of the baseline survey scope.

Crop production and the impact of different farming systems: Due to a very low rate of response and a combination of unclear measurement units the data for farm crop production and the influence of different farming systems/practices was not sufficient to complete the analysis. District production data could be used to assess the change in production due to the project activities.

4.5 Recommendation 5: Looking forward

4.5.1 Mid-project (and final-project) evaluation

When implementing the mid-project (and final-project) evaluation the following points should be considered:

Output biased sampling strategy: the structure of the mid-project evaluation sampling should be biased to capture all parts of the project to ensure that results can be compared before and after project implementation. In addition, control samples are required to understand what has changed without the project interventions. The sampling does not necessarily need to follow the baseline sampling strategy.

Additionally, where possible use the same enumerators to ensure consistency across the baseline and mid-year surveys.

Ask the same questions using the same categories: The same questions with the same wording should be asked. This ensures the answers are comparable to the baseline.

Moreover, use the same answer categories as developed during the baseline survey. This is essential and will ensure that the mid-project results can be compared to the baseline (e.g. farm size categories and definition of very small to very large).

Ask about average years: the survey should reflect the average of the years since the baseline has been completed. For example, if two years have elapsed since the baseline, the answers should be an average of those two years. This will limit the impact of very dry or very wet individual years that would give a better understanding of the impact trajectory of the project.

Assess level of intervention: It may be reasonable to include questions related to type and level of interventions received by respondents. The respondents' level of understanding on the issues at hand and new methods affects how they would answer the questions. It is difficult to conclude from the gathered data alone whether the respondent's answers are based on objective perception. It may also be helpful in determining relationships to variations in growth/development between different villages, age, gender etc.

Use consistent units (kg and m^2): Quantities are given in kilogram unit, with other undefined units of measurement like sack, box, bunch, and drums. This makes it difficult to obtain a standard measure for further quantitative analysis. In the mid-project survey, it would be helpful if an equivalent unit can be defined for crops. An example is provided below. Equivalent unit in kilogram was provided by Hivos:

1 bunch of cassava (newly harvested, one stem)	2.5kg
1 sack of cassava	24 kg
1 sack of corn (ears)	12 kg

It can be easier to apply a defined unit in the questionnaire, However known standard units of measurements are not commonly used in districts where crop produce are not intended for

commercial purposes or for profit, rather for subsistence. It is important to consider the respondents' capacity to answer the questions.

It is advised that the field test of questionnaire be conducted based on random selection or a pool of respondents that ensures consideration to those located in the most rural and isolated places, from little to no technical intervention.

***Clarify answers**:* The quality of data obtained will also depend on the enumerator's capacity to go beyond the actual questions in order to come up with the intended answer, as well as how questions or complex terms are explained. It is useful to designate adequate time for questionnaire review and attending to the enumerators' concerns after the field test.

4.6 Recommendation 6: Quantitative impact monitoring (Conceptual Models)

To help conceptualise the monitoring framework required to effectively evaluate the project's **impact** the Oasis project team developed a series of conceptual models. The conceptual models are considered outside the scope of this baseline surveys. However due to the importance to the project, this brief summary has been included.

Conceptual models were developed for food security impact, climate change impact and fuelwood impact. These are presented below.

The conceptual models attempt to visualise the expected project impact (e.g. increased food security) with the project outputs (e.g. rainwater tank and solar drip irrigation (Figure 7: Food security conceptual model: Production with/without rainwater harvesting/drip irrigation). The conceptual models link the outputs to impact and highlight the evaluation assumptions. For example: The assumptions made for models related to rainwater harvesting and drip irrigation are:

- It will enable production through the dry season
- It will allow resilience in failed wet seasons
- It will allow production extension beyond current limits (i.e. start irrigation earlier, Irrigate for longer), and
- Thereby achieving the outcomes of improving food security.

The project can quantitatively evaluate the success in achieving the long-term impacts by testing these conceptual models. This will allow the project to definitively evaluate if it has been successful in achieving its desired objectives, not just outputs. Additional data and analysis, however, will be required, which is not included in this baseline. For food security (Figure 7: Food security conceptual model: Production with/without rainwater harvesting/drip irrigation) this includes:

- Rainfall data
- Irrigation rates
- Crop production per cycle
- Randomised and control sites

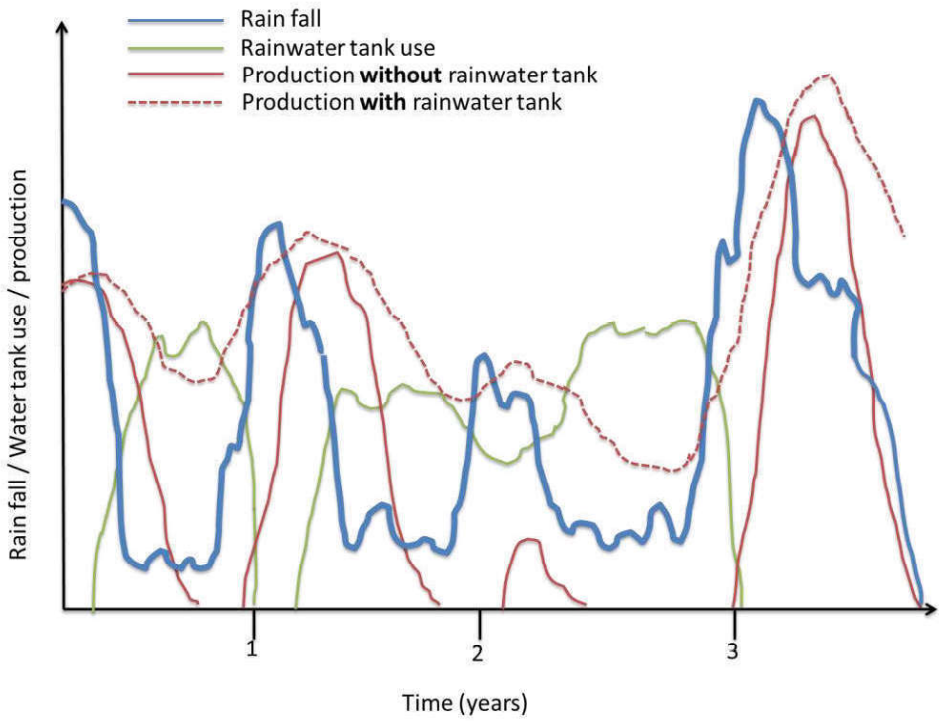


Figure 7: Food security conceptual model: Production with/without rainwater harvesting/drip irrigation

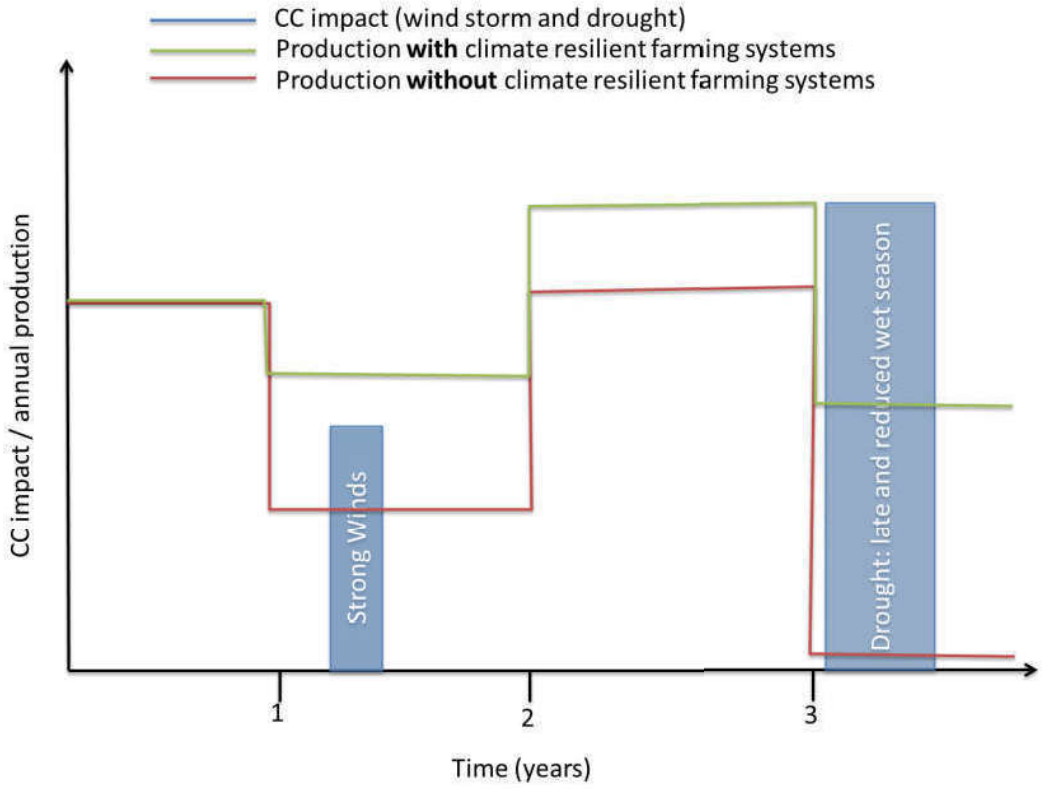


Figure 8: Climate change conceptual model: Resilience with/without climate resilient farming systems

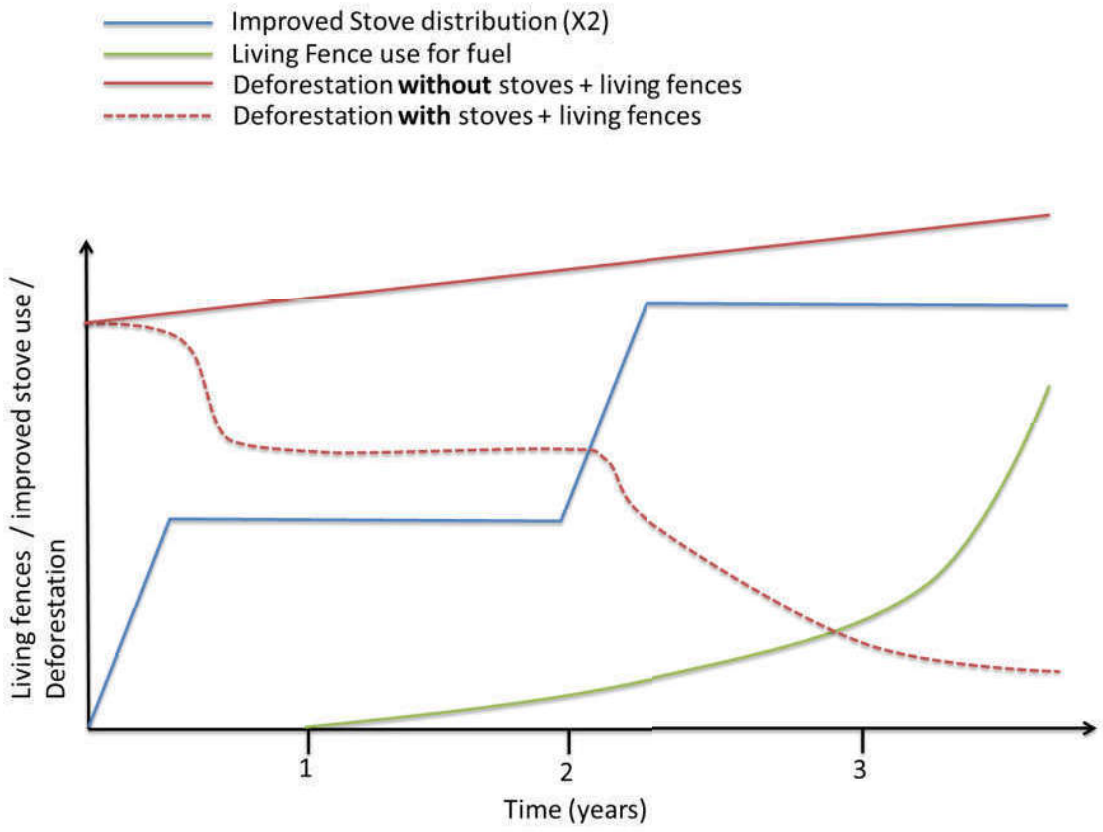


Figure 9: Deforestation conceptual model: Wood fuel use with/without improved cooking stoves and tree plantations