# Who gets the information?

## Gender, power and equity considerations in the design of climate services for farmers

Working Paper No. 89

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

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**Photos:**

# Abstract

Central to understanding the usefulness of climate and weather forecasts in support of agricultural decision-making is addressing the issue of who receives what information. Many contend that improved climate forecasts since the late 1990s have had limited impact on smallholder farming communities in Africa and across the developing world. However, power and privilege may determine who has access to appropriate climate and advisory services within those communities.

In 2011-2012, we tested this hypothesis in three climate-vulnerable farming communities in the CGIAR Research Program on Climate Change, Agriculture and Food Security semi-arid research site of Kaffrine, Senegal. Therein, we assessed gender-specific vulnerabilities to climate-related shocks, endogenous adaptation strategies, and coping mechanisms. From the gap between vulnerability and local capacity, we deduced farmers' climate service needs, and then assessed whether these systematically differed between distinct vulnerable sub-groups within the community – chiefly, between male and female farmers. In 2011 we introduced a seasonal climate forecast for the first time in the community, and explored perceptions of forecast access, usefulness and value, by both men and women.

We find that within vulnerable farming communities in Kaffrine, the impact of increasing climate risk is not equally distributed through the population. Moreover, within a community, patterns of unequal access to climate information and advisory services exist, differentiating between community sub-groups that can and cannot make use of incoming climate services to improve their management of climate risks and strengthen their resilience to a changing climate at farm-level. Gender-specific climate service needs exist, both in terms of type of climate information and advisory needed (women farmers for instance reported needing a forecast of rainfall cessation, not onset) and nature of communication channels required to reach the most vulnerable; and we found these differences to be mediated by place-specific socio-cultural realities.

Place- and gender-specific needs must inform the design of new climate services for farmers to ensure enhanced equity and effectiveness of such services at the local level. The gender 'blind spot' of current national adaptation policies must be replaced by gender-responsive adaptation policies. By reducing the vulnerability of women and other marginalized groups through strengthened resilience in the face of increasingly frequent and severe climate-related shocks, such changes will reduce the overall vulnerability of farmers in Kaffrine and other communities facing similar climate challenges.

## Keywords

Gender; agriculture; climate and weather information; climate services; Senegal; West Africa.

## About the authors

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## Acknowledgements

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We wish to acknowledge the Red Cross National Society of Senegal for facilitating fieldwork and data collection in the research site of Kaffrine. Methods development significantly benefited from inputs from Emma Visman, of the Humanitarian Futures Program, King's College London, and Pablo Suarez, of the Red Cross/Red Crescent Climate Centre. Finally, we are finally are indebted to Dr. Richard Jones of the UK Meteorological Office (UKMO) for his support with the analysis of rainfall logbooks from this Kaffrine project to determine and improve ANACIM's forecast skill.

# Contents

# Acronyms

| | |
|---|---|
| ANACIM | Agence Nationale de la Meteorologie du Senegal |
| CCAFS | Research Program on Climate Change, Agriculture, and Food Security |
| HMD | Hydro-Meteorological Disaster |
| IGA | Income Generating Activity |
| IPCC | Intergovernmental Panel on Climate Change |
| PAR | Participatory Action Research |
| VCA | Vulnerability and Capacity Assessment |
| AR5 | IPCC Assessment report 5 (Fifth Assessment Report) |

# Introduction

Climate forecasting holds the promise of improving the lives of vulnerable, resource-dependent farmers through delivery of seasonal and shorter-term weather and climate information and related advisory services directly into farmers' hands. Since the late 1990s, improved skill in modeling ocean-atmosphere teleconnections has led to an increased ability to forecast climate variability at seasonal to inter-annual timescales worldwide (Cane 1986, Stern et al. 1999). In livelihood systems that are highly dependent on specific rainfall or temperature patterns, improved forecasting can provide potentially life-saving information to communities at the frontline of climate change impacts. Through effective use of climate information, households and communities are able to better anticipate and prepare for climate-related shocks, leading to improved decisions under uncertainty and increased livelihood security.

Previous experiments with communicating climate and weather forecasts with farmers in Africa – ranging from seasonal forecasts to intra-seasonal outlooks and short-range weather advisories – have identified multiple bottlenecks that prevent forecasts from fulfilling their promise of supporting farmers in better managing climate-related risks and better anticipating and preparing for climatic hazards (O'Brien et al. 2000, Tall 2010, Hansen et al. 2011). Chief among these are: (i) the scientific jargon-filled language in which climate information is often disseminated, with no avenues for feedback on the usefulness of provided information (Tall 2010, Hansen et al. 2011); (ii) the lack of farmer trust in received scientific forecast information (Patt 2000); (iii) inadequate communication systems to relay knowledge to remote farmer communities, and from farmers back to forecasting hubs (Roncoli et al. 2002, DNM 2005); (iv) the limited financial capacity of communities to trigger preparedness actions once forecasted information is received; and finally (v) the incongruent nature of current forecasts and farmer decision timelines and geographic scales (e.g., forecasts remain aggregate whereas decisions are local) (Patt and Gwata 2002). Surprisingly enough, these bottlenecks are most tenacious in regions of the world where forecasts hold the highest potential for improving the quality of farmers' lives and livelihoods, such as Africa and South Asia.

Together, these challenges sustain a large gap between the potential of climate forecasts from the supply side and their realized usefulness on the user side, particularly for farmers making ahead-of-season farm management practice decisions under an increasingly uncertain climate. To realize the full potential of climate forecasts at the local level, research is beginning to demonstrate that an important first step to bridge the gap is the creation or engagement of iterative dialogue spaces where forecasters can come together with farmers from vulnerable communities to identify farmers' critical information needs for adaptation and co-produce relevant climate services (Roncoli et al. 2002, Tall et al 2013). Salience, credibility and legitimacy are key criteria for linking knowledge with action (Cash et al. 2003).

However, a key yet under-researched facet of the debate on the potential usefulness of forecasts to support agricultural decision-making is whether disparity in access to and utilization of climate information services *within* vulnerable communities could be driving their limited uptake in certain populations. Who actually receives climate information and related advisory services? Could the perceived limited usefulness of climate forecasts by smallholders in Africa be conditioned by the possibility that only a few elite farmers actually have access to transmitted climate services, i.e. the powerful and most privileged?

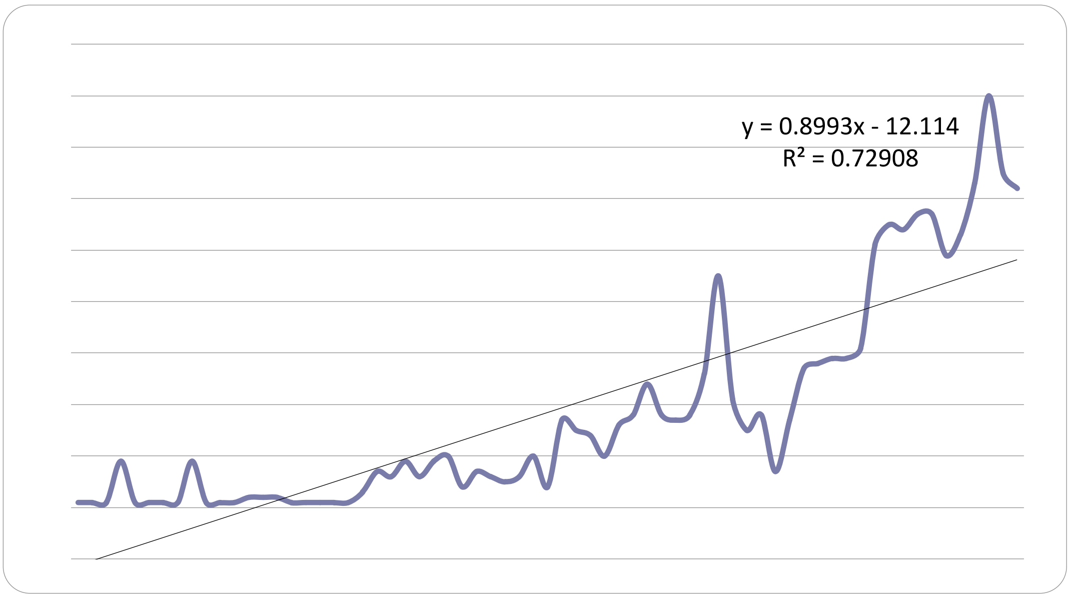
From 2011-2012, we tested this hypothesis in three communities within the CCAFS semi-arid research site of Kaffrine, Senegal. Therein, we followed a control group of women farmers from each target village over the study period and assessed gender-specific climate vulnerabilities, endogenous adaptation strategies, and resulting climate service needs. We assessed whether these were significantly different from those of men. We then introduced a climate forecast for the first time in the community, and we explored whether men and women farmers accessed forecast information in the same way, how useful women and men farmers found the forecast, and what operational use they made of the forecasts.

This paper summarizes the results from this investigation, and articulates how male and female rural farmers in Kaffrine are currently coping with climate stresses, and how these decisions impact their livelihoods and food security levels. These findings illustrate a nuanced understanding of gender-specific adaptation needs, providing valuable guidance for the design of policies that support local climate risk management and coping strategies. It is our hope that an improved understanding of the gender-specific nature of climate service needs will lead to development of adaptation plans and policies that more effectively engage women and other marginalized groups, and are inclusive of their specific adaptation needs.

## Background

The period of 1995 to 2005 in Africa was characterized by increasing climate variability and more frequent extreme weather events (Figure 1). This empirical finding serves as a possible early manifestation of projected climate change impacts in Africa. Findings of the Intergovernmental Panel on Climate Change (IPCC)'s Fifth Assessment Report (AR 5) indicate that climate change will lead to increases in extreme daily minimum and maximum temperatures, more frequent warm spells and heat waves, and changes in the frequency, intensity, spatial extent, duration, and timing of extreme weather and climate events in Africa. This is likely to result in unprecedented extreme weather and climate shocks, with impacts on all sectors of human activity, from agriculture to water resources, human health, industry and tourism. Though the attribution of single extreme events to anthropogenic climate change – versus natural climate variability – is challenging, impacts related to changes in patterns of extreme events, based on projections to the mid- to late 21st century, not-withstanding any changes or new developments in adaptive capacity, appear significant and non-negligible (IPCC 2012).

**Figure 1. Hydro-Meteorological Disasters in Africa**




Source: Tall et al., 2013, based on EM-DAT data

*Figure 1 depicts the sharp increase in hydro-meteorological disasters in Africa since 1990s and rising disaster trend. The following are classified as hydro-meteorological disasters: floods, pest infestations, droughts and storms/cyclones.*

Within this context, the question of whether women's specific vulnerability to climate shocks and related hazards can be mediated through increased use of salient, timely and accurate climate information and related advisory services is an important one to answer, with critical implications for climate research and development practice communities.

A review of the literature suggests that the different roles played by rural women and men within their communities, particularly in the economic production process, make women more vulnerable to climate change impacts. Due to women's limited access to, and control over, key assets, information and inputs for instance, they tend to be disadvantaged in terms of ability, flexibility and means to change their agricultural practices to adapt to a changing climate (1998, Patt et al. 2009, Bryan et al. 2012).

This study had three research objectives. The first was to examine how climate risk affects the livelihoods of men and women differently, if at all, including identification of gender specific vulnerabilities and adaptive capacity to hydro-meteorological disasters (HMDs) in Kaffrine. Next, the study aimed to examine the role and added value of climate information, as well as any differentiation that exists between men and women. Finally, the study investigated obstacles that inhibit rural women's access to and utilization of climate information services.

## Research Methods

To answer our research questions, we proceeded with a participatory action research (PAR) approach and undertook the following steps:

***Step 1: Site selection (June –August 2010).*** Desk-based literature review and interviews with national stakeholders in Senegal led us to identify three areas of acute physical and social vulnerability in Kaffrine, where HMDs have become recurrent. One community was selected in each of these three hotspot areas as a project site.

***Step 2: Pre-project needs assessment and baseline data collection/analysis (September – December 2010).*** We then proceeded to assess adaptation needs of both male and female farmers in Kaffrine and collect baseline data in each target project site. We utilized the Red Cross Vulnerability and Capacity Assessment (VCA) tool, adapted to climate and weather disasters, to gauge local adaptation needs.

***Step 3: Project implementation & Launch workshop (January – September 2011 & 2012).*** Based on the information gleaned from steps 1 and 2, and together with Senegal's National Meteorological Service (ANACIM), we then designed a suite of tailored downscaled climate and weather forecasts to address farmers' climate information needs identified and began delivering them to each of the three target communities. This was the first time formal climate/weather forecasts reached these communities. A project launch workshop held in June 2011 was instrumental to bring together all project stakeholders to agree on a process for delivering climate information services needed by farmers, which opened an important space for dialogue between forecasters and farmers. This dialogue was the first of its kind in Senegal between forecasters and farming communities, and was mediated through a series of participatory games and small group discussions, to build mutual understanding around the limitations/uses of climate information on the one hand, and farmers' information needs and tailoring requirements on the other, for climate information to serve farm-level decisions[1].

Actual project implementation began after the workshop. Over the ensuing twelve months, women farmers' access to delivered forecasts was monitored and assessed in particular.

***Step 4: Iterative Monitoring and Evaluation (October 2011 – October 2012).*** Following each rainy season, we carried out post-season participatory reviews in each target community to co-evaluate with the community the performance of climate forecasts delivered, collect community feedback on needed improvements to the project and its service delivery, and to assess evolving levels of climate information use in the community by male and female farmers. To facilitate community assessments of the performance of provided forecasts, we distributed rainfall logbooks and rain gages in each community**.** We entrusted keeping of the logbooks and rain gage readings to a member in each community who could read and write, with the charge to log every rainfall event in the community against received forecasts and materialized damages in the community. Finally, we conducted a final project impact assessment, in collaboration with the UK Met Office and King's College London, with funding from the CDKN.

The following sections provide additional detail on the methods we used during each step of our methodological framework.

## Step 1: Site selection

Previous research on impacts of climate shocks in Senegal suggests that the main hotspots of climate-related disasters are concentrated around the peri-urban settlements of Dakar and Saint-Louis, corresponding to hubs of human exposure and socio-economic vulnerability (Thiam 2011, World Bank/GoS 2010). A review of the literature reveals however limited documentation of impacts of climate shocks in rural environments (Mertz et al., 2009). Given gaps in the literature, we conducted follow-up research to downscale national level disaster data to the sub-national level, in order to zoom in on local districts and rural communities most often impacted by climate-related shocks and hydro-meteorological disasters (HMDs).

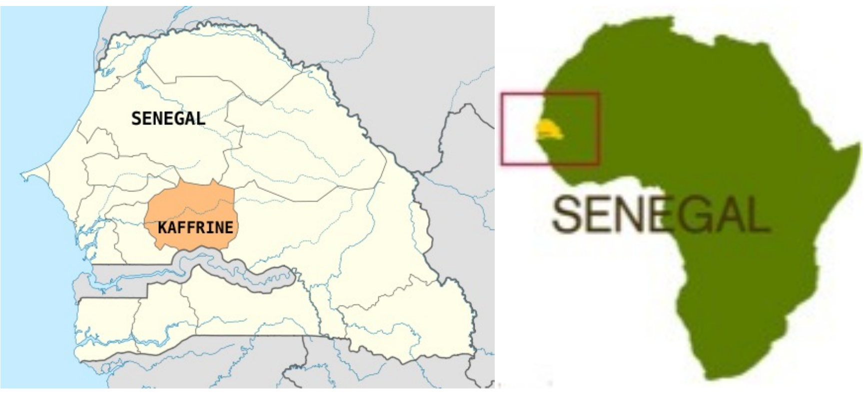
[1] Reference forthcoming Tall et al. article. Bridging the Gap between climate science and users in Africa: Learning from Practice through Early Warning > Early Action Workshops (BAMS).

Supplemental interviews with key informants at the National Meteorological Office of Senegal (l'*Agence Nationale de l'Aviation Civile et de la Météorologie du Sénégal-ANACIM*), helped identify the types, timing, and locations of extreme climate or weather related events that have occurred in Senegal during the past decade of increasingly frequent HMDs. Interviews with socio-economists within various ministries (including Planning, Agriculture, and Livestock), with national social science research institutes (including the University Cheikh Anta Diop and CODESRIA), as well as with the Senegalese Red Cross Society and other relevant stakeholders involved in disaster risk management and climate service provision were instrumental in determining geographic areas of acute vulnerability in the country. Based on data disaggregation and expert interview responses, it was confirmed that Kaffrine, located in Senegal's arid center and prone to rising yearly floods, was indeed an acutely climate-disaster prone and vulnerable site where our research would be relevant.

### The Kaffrine research site

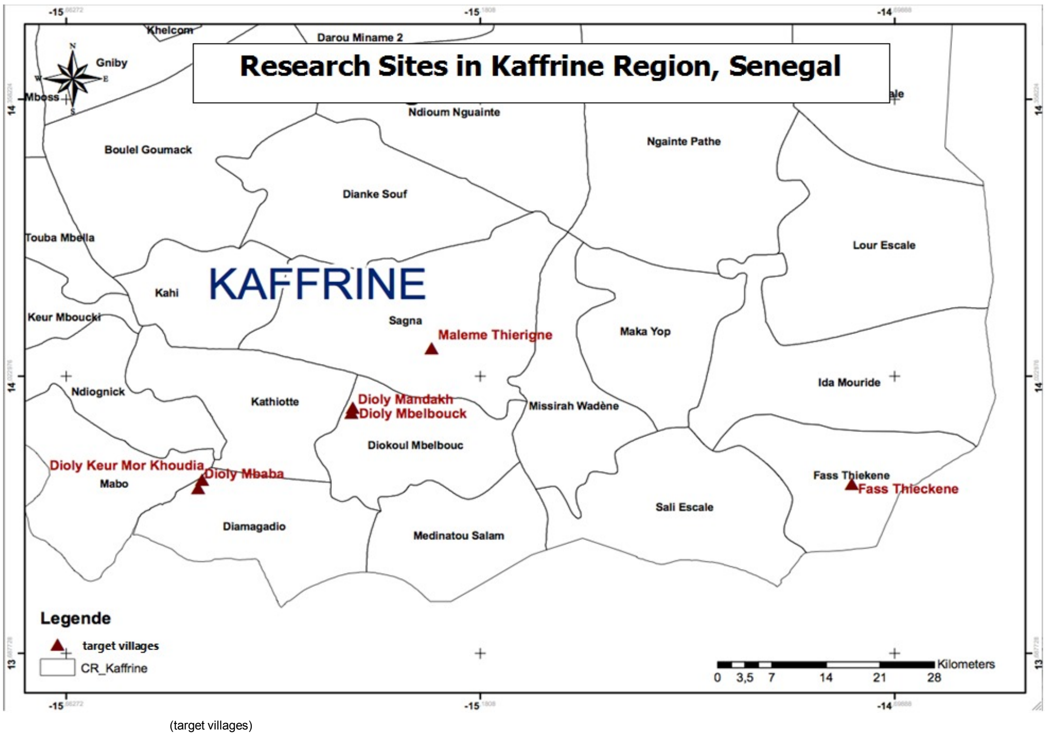
Senegal's newest and fourteenth region, Kaffrine is home to 500,000 inhabitants, 90% of whom are rural farmers (Kaffrine local government 2008). Kaffrine, a benchmark research site of CCAFS (Figure 2), has been hit by increasingly frequent floods and other extreme weather-related events, and rising climate variability in recent years (Goudou et al. 2012, Ndiaye et al. 2013). Kaffrine, like the rest of Senegal, is characterized by a unimodal rainfall regime, with most rainfall occurring in the July-August-September (JAS) rainy season, followed by a long dry season. Livelihoods of Kaffrine people are heavily dependent on rainfed agriculture. Because of significant decline in rainfall during rainy season since 1960, Kaffrine's vulnerability to climate-related shock is more evident (Ndiaye et al. 2013, Podestá et al. 2013, Mills 2014).

**Figure 2. Map of Kaffrine in Senegal**



Within Kaffrine, site selection was based on the following criteria: i) feasibility of study completion (from data collection to analysis) within the 12-month timeframe; ii) demonstrated vulnerability of local farmers (both men and women) to HMDs; and iii) good site accessibility during the rainy season. Despite it being the time of greatest climate and climate related risk in Senegal, we carried out research during the rainy season in order to observe and document first hand communities' vulnerability to HMDs.  On this basis, we selected three target communities across the region of Kaffrine: Malem Thierign (district of Malem Hoddar), Dioly-Mandakh (Kaffrine district) and Fass Thieken (Kounghel district) (Figure 3).

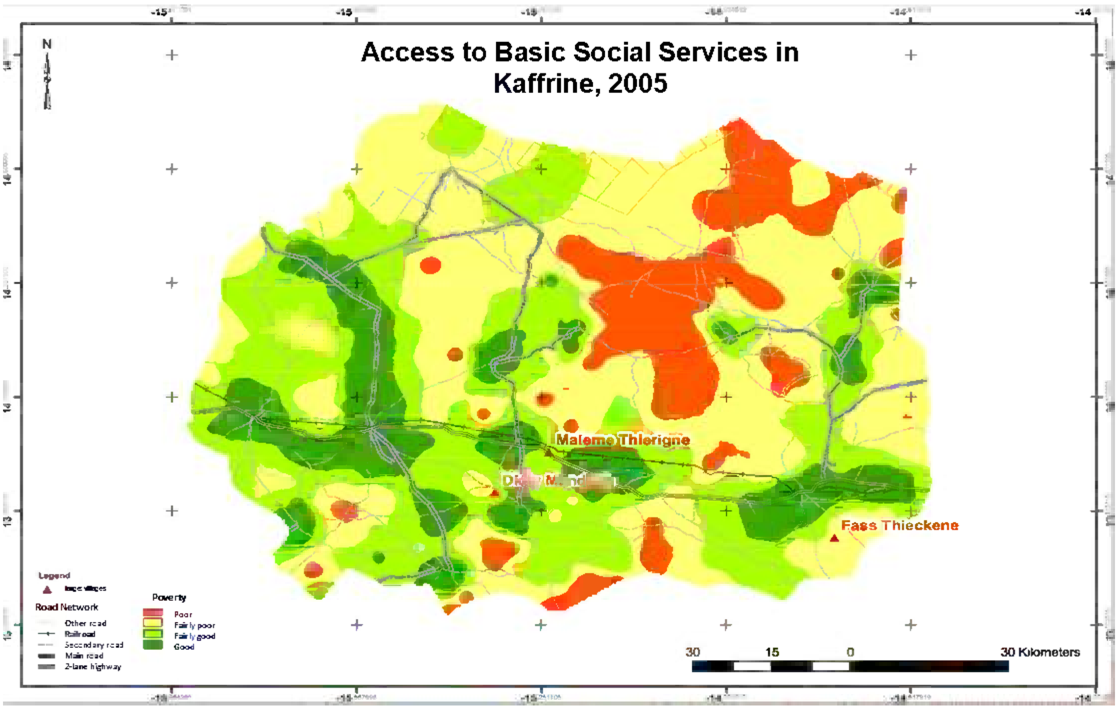
**Figure 3. Location of three target sites in Kaffrine Region, Senegal**




Source: CSE

A GIS-enabled assessment of each target community's distance from basic social services (health clinic, school, etc.) served as a proxy indicator for socio-economic vulnerability of the three selected target sites (Figure 4).

**Figure 4. Access to basic public services in three target research sites in Kaffrine Region, Senegal**




Source: CSE

*Figure 4 Quick Key: Green-good access; Yellow- average; Red- relatively poor)*

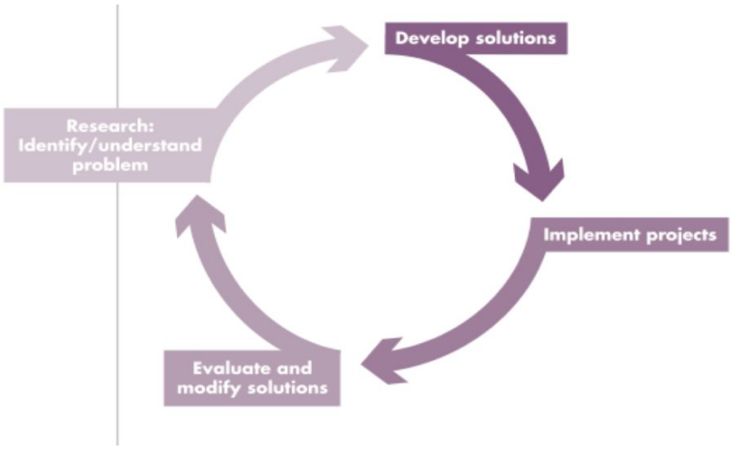
Pre-fieldwork visits in early June 2011 confirmed site accessibility, local vulnerability, and research feasibility in all three sites. Visits also enabled initial dialogue with local village authorities, to ensure their full engagement in the research.

Absence of rainfall data records in all three sites to support improvements in forecast downscaling was, however, notable.

## Step 2: Pre-project Needs Assessment

We adapted an existing tool to generate our gender-specific data on farmers' priority adaptation needs, devised by the Red Cross/Red Crescent for use by its community-level volunteers during community work programming: the ***Vulnerability and Capacity Assessment (VCA) tools*** (IFRC 2009). Drawing from the VCA's participatory methods toolbox, we developed a new Climate-VCA (C-VCA) tool for assessing communities' vulnerability and capacities to climate-related risks. The VCA toolbox offered us a range of relevant participatory rural appraisal tools for implementing PAR (Figure 5), which we adapted to our gender-specific data collection objectives, and utilized to generate the C-VCA surveys to obtain information on the specific vulnerabilities, and local capacities, of female and male farmers to cope with climate-related risks in Kaffrine (see Annex 1).

**Figure 5. The Participatory Action-Research (PAR) model in the VCA**




Source: IFRC 2009

The purpose of conducting the C-VCAs was to assess within each identified vulnerable sub-group (e.g., youth and women): 1) their particular vulnerability to HMDs; 2) endogenous local capacities to address these vulnerabilities; and 3) gaps between local vulnerabilities and capacities, community needs in excess of local capacity to cope (the adaptation gap), which external intervention was needed to close.

This approach is based on the conceptual framework that depicts the adaptation gap as the distance between vulnerability and capacity to cope. Thus adaptive capacity is defined as the quotient of hazard and vulnerability divided by capacity to cope:

$$\text{Adaptive Capacity} = \frac{\text{Hazard} * \text{Vulnerability}}{\text{Capacity to cope}}$$

In 2011, prior to the start of the July-August-September (JAS) rainy season in Kaffrine, we collected data in our three selected target sites of Kaffrine on localized, gender-specific vulnerabilities and capacities to cope with climate-related risks. A series of participatory rural appraisal exercises (including focus groups, participatory mapping, observation, etc.) and household surveys convened men and women separately, and efforts were made to be inclusive of participants across the adult age span. Each activity engaged men, women, young adults, and elders, and their perspectives and local knowledge were included at each step of the process. Annex 1 details the package of participatory rural appraisal tools that we used in Kaffrine as part of the C-VCA package. Focus-group discussions with male and female farmers centered on understanding gender-specific vulnerabilities to rising hydro-meteorological risks, community and household capacity to cope with these risks, and finally gender-differentiated need for climate services and delivery channels.

### Focus Groups

Qualitative focus groups were conducted with men and women, separately, in each of the three communities of Kaffrine, for a total of six focus groups, with an average dozen participants in each. Focus group participants were randomly selected from the community and administered questions from a semi-structured focus group instrument. During focus groups, interactions were closely monitored and expertly facilitated to ensure equal participation from all members, and maintain inclusion of the voices of the most vulnerable, where relevant. Focus group findings were then triangulated with results from targeted interviews with key community informants.

### Household survey

We developed a detailed household questionnaire and surveyed male and female members separately within the household to allow for sex-disaggregated data analysis. The questionnaire also included general questions to which all members of the household were asked to respond jointly, once we obtained approval from the household head. This household survey, which covered topics including vulnerability, livelihood strategies, and adaptations, served as the backbone of our gender-specific analysis and was used to triangulate the information gleaned from focus groups.

The household survey was administered to 30 households in Malem-Thierign, 36 in Dioly-Mandakh, and 40 in Fass Thieken, for a total of 106 (n=106) households. Households were randomly selected for inclusion in the sample in the following manner: beginning in the center of the village, the research team tossed a coin to determine the direction of first house to be surveyed, then skipped a pre-calculated number of households between surveys until 30% of the community was included. This methodology ensured geographic coverage of the entire village. Thirty percent of all households in each community were surveyed to ensure high internal validity of collected household data results. Average time of each household survey was forty minutes, since men and women within the household were interviewed separately.

Annex 2 displays the household questionnaire administered in each target site. Gender-disaggregated quantitative data were then analyzed in conjunction with gender-disaggregated qualitative data from focus group to reveal gender-specific vulnerabilities and capacities to cope to HMDs in Kaffrine.

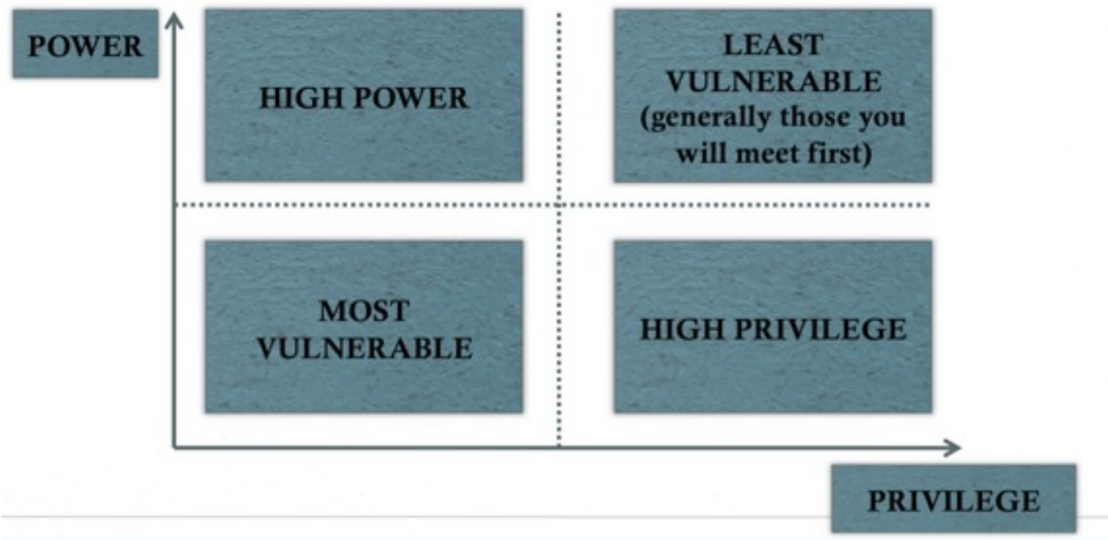
### Starting with livelihoods, not climate

An important note on methodology is that we did not engage the communities by initially speaking about climate risks, but rather by discussing each community's overall livelihood constraints and the stressors and drivers of these constraints, including climate variability (where identified by target communities as an important stressor). This temporal element is important to note, as we began with the assumption that rural farmers have been adjusting their entire lives to climatic changes. We tried to glean and understand the local adjustments they are making today in light of recent climate stresses, and how these endogenous adaptation strategies may be best supported. Adaptation is seen here as a *process* of adjustment to constant changes.

### Accessing the most vulnerable

Identifying and including the most vulnerable individuals in the community was a challenge. Our goal was to ensure their representation within focus group discussions. However as we entered our target communities, we were consistently directed to chiefs and the village elite. While an appropriate practice in establishing rapport and goodwill within prospective research communities, utilizing the village elite as the point of entry does make it difficult to reach vulnerable sub-groups of the population.  We addressed this constraint by using various rural appraisal tools and research methodologies, including participant observation, expert facilitation, culturally appropriate prompts during group discussions, and targeted follow-up interviews with marginalized members of the community. These practices were utilized throughout the length of the project to ensure inclusion of the voices of the most vulnerable. Conceptually, we considered power and privilege as the most important dimensions of vulnerability, thus targeted inclusion of individuals ranging from the least to the most vulnerable. Figure 6 illustrates how these parameters were used to conceptualize highly vulnerable groups in each community.

**Figure 6. Criteria for identifying and reaching the most vulnerable within a community**




Source: Authors

### Data analysis

Based on baseline data collected during focus groups, interviews and household surveys, we identified gaps between perceived vulnerabilities to climate shocks and current local capacities of male and female sub-groups within the community. These gaps provided insights into priority adaptation needs and the relevance of climate services for farmers, including women and other vulnerable populations. Based on this, we were able to identify specific needs for climate services that would support farmer decision-making, as well as the most salient channels to reach both male and female farmers in Kaffrine with climate information and agro-meteorological advisory support.

We then proceeded to rank and identify priority adaptation options with each target community, as well as salient policies needed to address outstanding gaps in adaptive capacity. If, and only if, climate information and early warning alerts were identified as priority adaptation needs and emerged as a need from the local population, we then proceed with the second part of our research method - the investigation of 1) whether there were differentiated needs for climate services among male and female farmers; 2) if so, were the differences in desired content (types of climate information needed), communication channels (how best to get information to male vs. female farmers), or otherwise; and 3) did any specific obstacles prevent rural women from accessing and utilizing climate services once these were introduced into the community?

### Community restitution of C-VCA findings

The final step in the C-VCA involved returning the results of focus group discussions and household surveys to the community. Immediately following the presentation of findings, each community developed an adaptation plan, which prioritized specific strategies aimed at transforming their vulnerabilities into capacities. This process of results restitution and the ensuing process of participatory development of local adaptation plans contributed to a clearer understanding by community participants of the pathways through which different sub-groups of the community are impacted by hydro-meteorological disasters (male, female, older, younger farmers), and specific areas in which interventions are needed to prevent or mitigate adverse impacts of climate change within the community.

## Step 3: Project implementation

Following identification of farmer adaptation needs at the pre-project stage, we designed a suite of tailored climate information products to responds to identified farmer needs in Kaffrine. Working in partnership with the UK Met Office and the Humanitarian Futures Program, ANACIM was able to develop new products to meet the demand expressed by farmers, opening a space for user-driven development of climate information services in the season 2011. In July 2011, a first suite of climate forecasts and advisories were introduced into our three climate communities. Based on feedback received from farmers following season 1, ANACIM revised its products and delivered a new suite for 2012.

In 2012, the format of communication chosen for the seasonal forecast information was still the default tercile seasonal forecast of likely rainfall totals for the season, which was produced by ANACIM, but complemented with a forecast of start date. The 2012 rainy season forecast from ANACIM was: 30% chance of below average rainfall, 45% chance of average rain and 25% chance of above average rains. The start of the rains was forecast as the 20th June (+/- 3 days). ANACIM recommended that communities contacted them as soon as the rains started so that they could initiate the 10 day forecast. ANACIM warned the community to beware of the possibility of a false onset (an isolated period of rain which does not signal the start of the larger period of principal rains). The second test season then began, lasting from July to October 2012.

### Step 4: Iterative, continual monitoring and evaluation

At the end of the 2011 rainy season and for each consecutive rainy season throughout the project, we carried out participatory post-season assessments to determine usefulness of transmitted products for male and female farmers and to capture farmer feedback on service delivery. We established a learning feedback loop between farmers and forecasters, within which farmers who received forecasts in Kaffrine could access climate forecasters at ANACIM directly on their cellular phones for additional clarification on the forecasts transmitted. This was critical to the success of forecasts, which were routinely tailored to meet farmer needs. Service delivery was adjusted as needed throughout the project, based on feedback from female farmers surveyed during the post-season assessments, whose suggested improvements to climate information content and delivery channels served to improve service delivery and became an integral piece of the monitoring and evaluation effort. Finally, to facilitate community assessments of the performance of provided forecasts, we distributed log books and rain gages in each community. Log books were organized in three columns (forecast received, whether the forecast event materialized or not, mm of rainfall and damages generated within community), and we entrusted keeping of the logbook and rain gage readings to a community member who could read and write. Results from analysis of the logbooks following two years of research are displayed in the Results section.

# Results

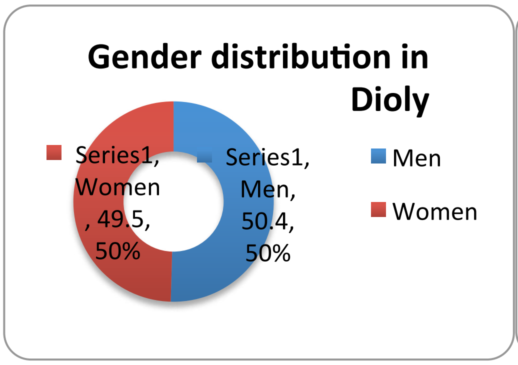
## Findings of pre-project C-VCAs

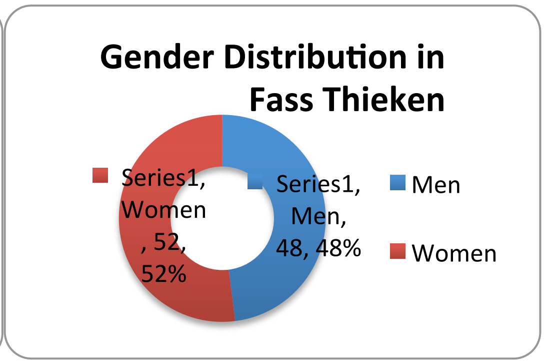
During the pre-project C-VCAs, we surveyed 106 households across the three communities in Kaffrine, within which we interviewed a total of 1550 farmers from different age groups.

#### Age and gender distribution, identification of vulnerable sub-groups

Across our sample, we generally found a homogeneous demographic gender distribution, with a ratio of up to 1:1 of women to men (fig. 7).

**Figure 7. Gender distribution in Dioly Mandakh and Fass Thieken villages**




There were other similarities across sample communities, including age distribution, gender of household heads, and percent of community members with disability. Table 1 summarizes key age characteristics of the respondents. Among age tranches present (see Table 1), the greatest percent of the population was in the age range of 16 to 49 years in all three communities. Surveyed households were predominantly male-headed, with 97% of households headed by males and only 3% of households headed by women. This finding was consistent across the 3 villages. Finally, roughly 3-4% of the population in each community are people living with disability; the lowest frequency was found in Malem Thierign. Given the very small portion of the population living with disability in each community, the research team determined that gender would remain the social determinant of marginalization of primary interest for this project.

**Table 1. Age distribution of sample population (total population of all sampled households) of three communities in Kaffrine, Senegal**

| | | | | |
|---|---|---|---|---|
| **Community #1: DIOLY** | | | | |
| Sample Population | | | **529** | |
| # HH sampled | | | **36** | |
| *Age tranches:* | ***0- 5 years*** | ***6- 15 years*** | ***16 – 49 years*** | ***50 years +*** |
| **Freq count** | 163 | 156 | 172 | 38 |
| **% of population** | 30% | 30% | **33%** | 7% |
| **Community #2: FASS THIEKEN** | | | | |
| Sample Population | | | **608** | |
| # HH sampled | | | **40** | |
| *Age tranches:* | ***0- 5 years*** | ***6- 15 years*** | ***16 – 49 years*** | ***50 years +*** |
| **Freq count** | 157 | 160 | 232 | 59 |
| **% of population** | 26% | 26% | **38%** | 10% |
| **Community #3: MALEM THIERIGN** | | | | |
| Sample Population | | | **413** | |
| # HH sampled | | | **30** | |
| *Age tranches:* | ***0- 5 years*** | ***6- 15 years*** | ***16 – 49 years*** | ***50 years +*** |
| **Freq count** | 120 | 98 | 156 | 39 |
| **% of population** | 29% | 24% | **37%** | 10% |

### Community socio-economic profiles

In terms of access to basic public services, the three communities, despite being located at various distances to the main road (see fig. 4), feature a similar lack of access to basic amenities (latrines, drinking water, literacy). In Dioly, for instance, all respondents interviewed reported living in thatch huts and mud houses (i.e. there were no concrete buildings). From observation in the other two villages, the same pattern of habitat types can be confirmed. In Dioly, about 90% of the sampled population reported not having access to electricity, and 56% did not have access to in-house drinkable water. In Malem Thierign village, only 27% of surveyed households had latrines, leaving 73% without access to in-house sanitation. Literacy rates were low across all three communities (19% in Malem Thierign, 19% in Fass Thieken, and 13% in Dioly), an indicator of relative homogeneity in socio-economic welfare.

Across all three target villages, agriculture emerged as the dominant source of income. In Dioly, agricultural production was the main source of income for 100% of households, with secondary income from pastoralism, vegetable gardening, petty trade, bread making, sewing, and peddling. In Fass Thieken, agriculture was the dominant income source for 95% of all households sampled and for 97% of sampled households in Malem Thierign. The remaining households engaged in pastoralism and petty trade, and to a lesser extent pottery. Across the board, agriculture remained the main source of income.

### Sensitivity of livelihoods to climate-related hazards

Household surveys revealed an interesting picture of the degree of sensitivity of household livelihoods to climate-related shocks. Households were first asked about their main sources of livelihood and then asked to self-rank their perception of the degree to which each of their livelihood activities is affected by climate-related hazards, on a scale of 1 to 5 (1 relating to low vulnerability of income source to climate hazards and 5 signifying high). Vulnerability of income sources were assessed on a scale of 1 to 5, then standardized to reach a % (see Annex 1 for detail of questionnaire used to assess vulnerability of income sources to climate-related hazards). For instance, male farmers interviewed in Dioly perceived their main livelihood source (agriculture) to have a 15% degree of sensitivity to Strong rains, but only 5% sensitivity to Flooding. This perception is higher among female farmers of the same village who perceived their agricultural income to be 17% sensitive to Strong rains, and 6.9% to Flooding.

Overall, farmers across the three communities displayed a low risk perception of the vulnerability of their main income sources to climate risks (in Dioly and Malem), with a medium vulnerability of income sources perceived in Fass Thieken. Across the 3 communities, men and women perceived their income sources as vulnerable to climate hazards at comparable levels, with an average to low vulnerability of income sources to climate and weather shocks. Climate hazards to which main livelihood sources are perceived to be most vulnerable are: 1) strong rains, 2) downstream rainwater flooding, 3) storms, 4) wild fires, and 5) out of season rains.

In Malem Thierign, flash floods were also mentioned as a threat by some farmers.  Of all three targeted communities, Dioly displayed the least livelihood vulnerability to climate-related hazards. Though sensitivity to strong rains was non-negligible in Dioly (an average 15.6% for the community), vulnerability of income sources to climate-related hazards remained low overall. It is important to note, however, that Dioly residents also report access to the widest range of secondary livelihoods outside of agriculture, with a thriving market operating weekly in the community giving farmers access to trade and barter opportunities.

## Gender differentials in degree of vulnerability, capacities and adaptation needs

A detailed household questionnaire focusing on individual responses to climate-related shocks within the household revealed important gender differentials in vulnerabilities, capacities, and adaptation needs across the 3 surveyed communities in Kaffrine (see Table 2).

**Table 2. Gender disaggregated vulnerabilities, local capacities to cope and priority adaptation needs that emerged in Dioly, Fass Thieken, and Malem Thierign**

| Community #1 - DIOLY<br>Summary of Vulnerabilities, Capacities & Adaptation Needs | | | | | |
|---|---|---|---|---|---|
| Climate Hazard | Asset Affected (vulnerability) | Current Response Strategies (local capacities) | | Priority Interventions Needed to Support Community Resilience (gap between local vulnerabilities and capacities) | |
| | | *Men* | *Women* | *Men* | *Women* |
| Strong Rains | Fields destroyed | • Migration to cities<br>• Soil rotation | • Water evacuation system<br>• Solidarity<br>• Loan<br>• Migration<br>• Sale of machinery | • Construction of dikes<br>• IGAs | • Distribution of food items<br>• Canals<br>• Make machines available |
| | Houses destroyed | • Roofs<br>• Hold hut with piques<br>• Relocation<br>• Promiscuity | • Relocation<br>• Place piques<br>• Promiscuity | • Construction in concrete<br>• Canals | Concrete homes |
| | Harvest destroyed | Sale of agricultural equipment | Solidarity | Canals | Storage house |
| | Loss of cattle | Social action | • Sale of cattle<br>• Reduction in food intake | Canals | Canals |
| | Low income | • Family solidarity<br>• Reduction in food intake | Family solidarity | • Dig modern dikes<br>• IGAs | • Canals<br>• IGAs |
| | Destroyed lands | Construction of artisanal dikes | Construction of artisanal dikes | Canal system | Canals |
| | Loss of lives | Dig traditional drainage canals | - | Canals | - |
| | Difficult access to fields | - | Canals | - | Water drainage |
| Flood (down streaming water) | Houses destroyed | • Family solidarity<br>• Resignation | Family solidarity | Construction of a dike | Concrete homes |
| | Harvest destroyed | • Family solidarity<br>• Drainage system | - | Construction of a dam | - |
| | Loss of lives | Keep children indoors | • Keep children indoors<br>• Dig holes/drainage holes/dikes | Canals | • Canals<br>• Concrete houses |
| | Loss of cattle | • Keep animals indoors<br>• NGOs | Solidarity | • Canals<br>• IGAs | Concrete cattle enclosures |

**Community #1 - DIOLY**
**Summary of Vulnerabilities, Capacities & Adaptation Needs**

| Climate Hazard | Asset Affected (vulnerability) | Current Response Strategies (local capacities) | | Priority Interventions Needed to Support Community Resilience (gap between local vulnerabilities and capacities) | |
|---|---|---|---|---|---|
| | | ***Men*** | ***Women*** | ***Men*** | ***Women*** |
| | Low income | • Family solidarity<br>• Loan club<br>• Sale of material | • Depletion of cash stock<br>• Sale of necklaces | • Dikes<br>• IGAs | • Dikes in concrete<br>• NGOs<br>• IGAs |
| **Storms / Fire** | Houses destroyed | Solidarity | • Strengthen houses<br>• Extinguish fire with water from emergency hoses | Storm **Early Warnings** | Construction of concrete homes |
| | Harvest destroyed | - | Resignation | - | Tree replanting |
| | Seeds, merchandise destroyed | - | • Community solidarity<br>• Emergency support | - | Concrete houses |
| | Low income | Solidarity | Sale of equipment | IGAs | IGAs |
| | Missing persons | - | Search for the missing | - | **Early warnings on hazard** |

Community #3 - MALEM THIERIGN

Summary of Vulnerabilities, Capacities & Adaptation Needs

| Climate Hazard | Asset Affected (vulnerability) | Current Response Strategies (local capacities) | | Priority Interventions Needed to Support Community Resilience (gap between local vulnerabilities and capacities) | |
|---|---|---|---|---|---|
| | | *Men* | *Women* | *Men* | *Women* |
| Strong Rains | Loss of fields (flooding/erosion) | • Family solidarity<br>• Leasing in of land to farm | • Family solidarity<br>• Look for new farming land further away - walk longer distances to farm (more drudgery) | - | - |
| | Collapse/abandoning of homes | Relocation | Relocation of stricken families | Build concrete homes | Build concrete homes |
| | Loss of cattle | - | - | - | Build cattle enclosures in concrete |
| | Low income/slowing down in IGAs | Dig out traditional canals to evacuate waters | Dig out traditional canals to evacuate waters | Modern canals, water retention basin | - |
| Storms | Collapse of homes | • Family solidarity<br>• Relocation<br>• Reconstruction of homes | Relocation | • Construction in concrete<br>• Tree replanting | • Better construction material<br>• Tree replanting |
| | Destruction of crops | - | Family solidarity | - | Adequate construction material for homes (concrete, not thatch) |
| | Loss of cattle | - | - | - | - |
| Flooding (from upstream rain water runoff) | Loss of farmland | • Family solidarity<br>• Leasing in of farming land | Family solidarity | - | - |
| | Destruction/abandonment of homes | • Relocation<br>• Rural exodus (migration to city) | - | Construction in concrete | - |
| | Unusable access ways/roads | - | Dig artisanal canals | Modern canals | • Enlarge Northern dam<br>• Modern canals |
| Drought | Loss of cattle | - | Family solidarity | - | Resignation to divine will |
| | Destruction of farming land | - | Rural exodus (migration to city) | - | - |

| Community #3 - MALEM THIERIGN<br>Summary of Vulnerabilities, Capacities & Adaptation Needs | | | | | |
|---|---|---|---|---|---|
| **Climate Hazard** | **Asset Affected (vulnerability)** | **Current Response Strategies (local capacities)** | | **Priority Interventions Needed to Support Community Resilience (gap between local vulnerabilities and capacities)** | |
| | | ***Men*** | ***Women*** | ***Men*** | ***Women*** |
| Strong Rains | Loss of fields (flooding/erosion) | • Family solidarity<br>• Leasing in of land to farm | • Family solidarity<br>• Look for new farming land further away - walk longer distances to farm (more drudgery) | - | - |
| | Collapse/abandoning of homes | Relocation | Relocation of stricken families | Build concrete homes | Build concrete homes |
| | Loss of cattle | - | - | - | Build cattle enclosures in concrete |
| | Low income/slowing down in IGAs | Dig out traditional canals to evacuate waters | Dig out traditional canals to evacuate waters | Modern canals, water retention basin | - |
| Storms | Collapse of homes | • Family solidarity<br>• Relocation<br>• Reconstruction of homes | Relocation | • Construction in concrete<br>• Tree replanting | • Better construction material<br>• Tree replanting |
| | Destruction of crops | - | Family solidarity | - | Adequate construction material for homes (concrete, not thatch) |
| | Loss of cattle | - | - | - | - |
| Flooding (from upstream rain water runoff) | Loss of farmland | • Family solidarity<br>• Leasing in of farming land | Family solidarity | - | - |
| | Destruction/abandonment of homes | • Relocation<br>• Rural exodus (migration to city) | - | Construction in concrete | - |
| | Unusable access ways/roads | - | Dig artisanal canals | Modern canals | • Enlarge Northern dam<br>• Modern canals |
| Drought | Loss of cattle | - | Family solidarity | - | Resignation to divine will |

| | | | | | |
|---|---|---|---|---|---|
| | Destruction of farming land | - | Rural exodus (migration to city) | - | - |

| Community #2 - FASS THIEKEN<br>Summary of Vulnerabilities, Capacities & Adaptation Needs | | | | | |
|---|---|---|---|---|---|
| **Climate Hazard** | **Asset Affected (vulnerability)** | **Current Response Strategies (local capacities)** | | **Priority Interventions Needed to Support Community Resilience (gap between local vulnerabilities and capacities)** | |
| | | ***Men*** | ***Women*** | ***Men*** | ***Women*** |
| Strong Rains | Loss of cattle | • Credit<br>• Loans | Liquidate remainder of cattle at minimal price so as not to lose the whole herd | Build cattle enclosures in concrete | Build high-quality cattle enclosures |
| | Destroyed harvest/ storage silos | - | • Hiatus in trading activities<br>• Revert back to agriculture | - | Access to finance to restock destroyed items/ purchase items for trade |
| | Destruction of pottery equipment and finished products | - | Revert back to agriculture when pottery income is destroyed | - | Storage house for pottery safekeeping during strong rains |
| Storms | Soil erosion | • Credit<br>• Loans | - | Family solidarity | - |
| | Loss of cattle | - | Localization of lost cattle among households | - | Construction of high quality cattle enclosures |

**Table 3. Indigenous Knowledge and Outstanding Climate Information Needs that emerged in Dioly, Fass Thieken, and Malem Thierign**

| Community / Variables | DIOLY | | FASS THIEKEN | | MALEME THIERIGN | |
|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female |
| ***Local Forecasting Techniques*** | -Early rain = rainfall deficit overall<br>-Late rain = quick + rainy winters<br>-Baobab tree begins to bloom when rain arrives<br>-Irres tree ripens in winters | -Tree observations (flowering Dimb, Baobab leaves appear) | -Reference date from 25 may<br>-Certain provisions of the stars in sky<br>-Reference date beyond first rain of the year<br>-Cry of frogs<br>-Rumblings of thunder-Darkening sky<br>-Occurrence of lightning in the sky for a month | -Strong heat<br>-Chirping of certain birds (Goutoute)<br>-Cry of frogs<br>-Flowering of certain trees<br>-Strong presence of flies<br>-Stink of very small insects<br>-Occurrence of lightning in the sky for a month<br>-Rumblings of thunder-Darkening sky | -Strong winds overnight<br>-Mystical knowledge<br>-Gradual-onset 7 star called "deleugn"<br>-Wind direction from South to North | -Wind direction from East to West<br>-The prediction of saltigués (Priets)<br>-When the fruit of the tree called "dimb" ripes<br>-Presence of a bird named "Kadio" |
| ***Limitations of Local Techniques*** | Fails to provide info on:<br>-Quantity of rain water<br>-Rainy days<br>-Frequency of rains<br>-Beginning of the rainy season (first rains) | Techniques have evolved disappearance lately and are not reliable enough | -These techniques are no longer sufficient<br>-It lag from the date of 25 May<br>-Scarcity of frogs<br>-These techniques do not allow us to detect correctly and make decisions in advance of the rainy season / hazards | -Imprecision and uncertainty of information<br>-Disappearance of trees that are used for information<br>-Rarefaction-birds (Goutoute)<br>-Disappearance of Insects<br>-Disappearance of flies | -Lack of information on length and rainfall amounts<br>-Difficulties-distant forecast | -Imprecise information on the amount of rain<br>-Lack of information on the period of precipitation |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Local Information Sources*** | -Nature<br>-Word of mouth<br>-Radio (Weather) | -Word of mouth<br>-Radio | -Radio (Weather)<br>-TV | | -Radio<br>-Telephone<br>-Mosque | -Radio<br>-Telephone<br>-Mosque |
| ***Outstanding Climate Information Needs*** | -With the arrival of rainy season<br>-Through radios (Walf, South RFM), newspaper or by phone | Women did not express any need | Information should be sent to the village chief who will spread it in the village as soon as he/she receives it | Information needs:<br>-First rains<br>-Entry of large tornadoes<br>-Arrival of high winds<br>-Duration of the rainy season<br>-Sending the information to the wells, so that all women can receive | Be informed in time Information channels: radio, telephone, mosque | Be informed in time Information channels: radio, telephone, mosque |
| ***Thresholds to Communicate Information*** | When information is sure and certain | When info. is sure & certain | Information should be provided as soon as it is known | Information should be provided as soon as it is known | | |

**Dioly.** In Dioly, in order to face the main climate hazards encountered (strong rains, downstream rainwater flooding, and storms/fires), both men and women rely heavily on family and community collective action, which is often focused on digging traditional trenches and canals to divert the water away from homes and fields. A significant number of assets are negatively impacted by climate hazards, including fields, homes, harvests, and seeds. Many assets are forfeited in order to cope with the impacts of the climate hazards. Examples include: 1) sale of agricultural equipment, 2) sale of livestock, and 3) sale of jewelry. A reduction in food intake was also mentioned as a coping mechanism by both males and females following strong rains that destroy herds and harvests. It is noteworthy, however, that women mentioned more often than men the depletion of all their assets occurring when a climate hazard hit.

Priority interventions that would support adaptation and that are desired by both male and female farmers in this community included:

- Modern drainage canals / dikes /dam to stop the water from destroying homes and fields;
- Sturdier homes built of concrete;
- Alternative climate-resilient Income Generating Activities (IGAs); and
- Meteorological early warnings for storms.

**Fass Thieken.** In Fass Thieken, the main climate hazards impacting the community were strong rains, storms, and thunder. These hazards destroy homes, fields, and herds, and slow down economic activities for both and female respondents. As in Dioly, the priority coping strategy was reliance on family solidarity. Of note, female farmers in Fass Thieken reported that during storms and strong rains economic and agricultural activities often stop until the weather becomes more clement. One solution identified by the women was the provision of advance information on weather conditions, as well as warnings on thunder, to help them plan economic activities better.

**Malem Thierign.** In Malem Thierign, the main climate-related shocks were similar to the other two sites (strong rains, storms and thunder), but also included severe flooding caused by upstream rainfall runoff and drought. Collectively these hazards cause severe damage in Malem Thierign annually: homes collapse, fields flood, cattle go stray, and lives are lost. The torrential flooding from upstream runoff carves massive crevasses in the landscape, breaking off main access roads and literally severing the village in two. Again, family solidarity and social networks were found here to be the most prevalent coping mechanism. In Malem Thierign, however, female farmers also mentioned rural exodus (immigration) as a coping strategy; this strategy was only mentioned by male farmers elsewhere. Women farmers surveyed also indicated that they cope with the loss of farming land by walking longer distances to find farming land, leading to more drudgery for them.

Of all three communities, Malem was the only one where climate services were not explicitly mentioned as a priority adaptation intervention need. For both male and female farmers from Malem Thierign, priority adaptation needs were (from Table 2) access to sturdy construction material to build more resilient homes (in zinc, not mud/thatch) and dig trenches, as well as resorting to divine will.

### Climate information emerges as a priority vulnerability-reduction strategy in Dioly and Fass Thieken, not in Malem

Climate information was identified as a priority strategy needed to reduce vulnerability to climate-related shocks by both men and women farmers in Dioly and Fass Thieken. Despite the fact that the two villages faced different climate hazards, they both mentioned provision of climate information as an important potential resilience-building intervention. Specifically, sampled respondents across gender groups in these 2 communities prioritized short-range early warnings for climate-related shocks, as well as forecasts of overall rainfall conditions (e.g., predicted start of rains, duration of rains, etc.) to help plan agricultural activities. No significant gender differences in climate information needs emerged. This could be possibly due to the novelty of climate information for our target communities, as no climate information had ever been disseminated in the three communities before project onset.

Farmers in Malem Thierign did not identify a specific need for climate information; from an analysis of the CVCA data (Table 2), their outstanding adaptation needs focused on getting access to construction material to construct sturdier homes, and resigning to divine will.

## Findings from post season 1 monitoring & evaluation

Although information began to flow into the community from June 2011, our post-season 1 review visit at the end of the growing season in October 2011 revealed that gender disaggregated needs did indeed exist in the demand for climate services. These findings served to improve service delivery by the national meteorological service –ANACIM. The most surprising findings related to lead time, information types and communication channels most relevant to reach vulnerable-sub groups.

## Lead time

When asked what time they would like to receive information products requested above, all male and female farmers interviewed requested that the information be communicated to them **as soon as it was known**. They also expressed that the confirmation of uncertainty associated with the forecasts evolving throughout the season should be communicated to them.

## Innovative communication channels needed to reach farmers & overcome gender-specific obstacles to climate information access

Focus group discussions with farmers during the post-season review mission also revealed across all 3 communities that climate information delivery channels needed to be better targeted. Surveyed male respondents requested that information be communicated to them via the following specific mediums:

- SMS messages to their cell phones (in the local language Alpha or Arabic),
- Written on meteorological blackboards placed at strategic outposts in the village with assigned neighborhood relays,
- As well as shared on the mosque loudspeaker each morning following the call to prayer (for Dioly and Malem villages only).

A similar request emerged from female farmer respondents, who requested that early warning messages be communicated to them through channels that are appropriate for reaching them. These include word of mouth (oral source), radio, mosque, etc.

There were some geographic variations in what were considered as appropriate channels across villages, however. For instance in the more conservative religious village of Fass Thieken, the mosque was not allowed as an appropriate space to share forecasts, whereas in Dioly and Malem Thierign they were the prime information sharing space identified by men and women.

Finally, across all villages, community radio was identified as the most efficient medium to reach all community members simultaneously, provided the information was communicated at a time when they were not in the fields (during the evening or early morning news, broadcast at 8am and 8pm).

In addition to the channels mentioned above, female farmers specifically requested that early warnings also be communicated at the water borehole, where they draw water every morning. This is a strategic outpost to reach them. They suggested that identified 'chatterboxes' in the villages could also be drafted to serve as information relays through the village.

## Different types of climate information requested by male and female farmers

Most interesting among our findings was that female farmers requested different **types of climate information**, relative to men. The specific forecast products most frequently requested by farmers in all 3 communities across gender groups were information on seasonal onset, length of rainy season, distribution of rainfall within the season and warnings on the arrival of rainfall events and hazards (storms, strong rains, and strong winds). In addition to this general list, female farmers specifically requested information on dry spells (which they defined as no rain for a period of 20 consecutive days), as well as information on the likely seasonal rainfall cessation date. This last information request on seasonal cessation was a major finding for climate science colleagues who participated in the post-season 1 review mission, as climate research hitherto had mainly focused on forecasting seasonal onset. We revisit the possible reasons behind female farmers' need for seasonal cessation information in the Discussion section.

Based on these direct insights about reaching the most vulnerable people in the three studied communities in Kaffrine and together with a few targeted female stakeholders, we jointly designed guidelines for the meteorological services that would improve salience of weather/climate information for women, in terms of content, timeliness, and delivery channels. These served as the basis for improving tailoring of climate information with the National Meteorological Service of Senegal to provide targeted early warning advisories and continued hazard surveillance for Kaffrine, with the aim of improved decision making and more resilient livelihoods.

Table 4 below highlights issues revealed from our post-season review of the first season 2011, and how they were addressed in the second test season or considered for the future.

**Table 4. Issues highlighted in the first season 2011, and how they were addressed in the second test season or considered for the future**

| Village | Issues highlighted in review of 2011 season | How was the issue resolved for the 2012 season or considered for the future? |
|---|---|---|
| Malem Thierign | • SMS was found to be acceptable for transmitting warnings but some issues were highlighted. Sometimes SMS were read too late. Cell phones often did not have any power, due to there being no electricity in the village and the members having to rely on recharging their cell phones in neighbouring villages. Also, in using SMS to disseminate warnings, no confirmation of receipt exists, unlike other communication methods.<br>• Alerts received by the village chief and his son were efficiently and successfully relayed to the entire community by announcements made at the mosque.<br>• Community recognised the value of receiving probabilistic information, 'God is the one who provides, but YOUR knowledge contributes to it.' | • Investigate solar rechargers to be provided to community members, whilst recognising that the cost might be an obstacle.<br>• Send alert messages with delivery report. If delivery report not received, call the people from whom confirmation not received.<br>• Increased dissemination through community radio.<br>• Train 5 village youth as Red Cross volunteers to serve as additional agents for EW-EA |
| Fass Thieken | • Information had been received, but not transmitted throughout the whole community: third of community members reported not having received a single forecast.<br>• SMS sent only to 3 relays in community; not enough for the large communities.<br>• SMS sent in French; not all understood.<br>• Messages from radio Kunghel effectively reach everyone, men and women alike. | • Train 5 village youth as Red Cross volunteers to serve as additional agents for EW-EA.<br>• Send alert messages with delivery report. If delivery report not received, call the people who have not received.<br>• Identified consensually 8 additional community members, covering all neighbourhoods. These 8 relays to cover all parts of the village, and spread the alerts at fountains, mosques and other central places in the community.<br>• From now onwards send messages both in French and WOLOF.<br>• Met with director of community radio and deputy Mayor of Kunghel to discuss ways to provide further support to community radio. |
| Dioly | • Many, mostly youth, reported not having received a single forecast. It was noted the best place to reach youth were at the meeting points (miradors) or under the talking trees spread all across the village.<br>• SMS sent only to 3 relays in community, not enough for Dioly, a very large hub composed of 2 villages in reality: Dioly Mandakh and Dioly Melbouck.<br>• The mosque was a good dissemination location for men but not for women, who would need door to door dissemination or | • Consensually designated 8 additional community members to serve as information relays, some receiving the information directly (the school headmaster, 2 village chiefs, women's association head, and rain gauge holder), and others to serve as aides to the relays (including the Imam of the mosque and women selling breakfast and water at water fountains).<br>• Blackboards installed in three central locations across the village, where received forecasts can be written out in French, Wolof |

| | | |
|---|---|---|
| | the designation of women to spread the forecasts at women's central meeting points (e.g. the water fountain).<br>• SMS sent in French; not all understood.<br>• Planting after men, women are particularly prone to the impact of dry periods in the rainy season. | and Arabic for all to read.<br>• From now onwards send messages in both French and Wolof.<br>• Consideration of gender-differentiated weather and climate information needs noted within technical consultations. |

Source: Emma Visman, ODI

## Final project impact assessment results

Finally, in October 2012 we conducted a final project impact assessment, in collaboration with the UK Met Office and King's College London, with funding from CDKN. A qualitative survey displayed in Annex 3 served to collect farmer perspectives on the usefulness and reliability of climate information and forecasts delivered over the past two years.

This final visit revealed that across farmers interviewed, all had received a forecast in the past two years, revealing a 100% increase in forecast access between the time the project started in 2011 to 2012. Farmers surveyed furthermore reported demonstrated usefulness of the received forecasts, relative to traditional sources of forecast information. By the end of our Kaffrine Participatory Action research project, following two years of receiving climate information products, surveyed community members across the three villages requested new additional products: an interpretation of the seasonal rainfall forecast with agricultural advisories, giving farmers guidance on what seed varieties to plant, when to spray pesticide and fertilizers, and so forth, based on the seasonal forecast.

This opened the door for a new collaboration with Kaffrine's extension service department, which is today still ongoing.

## Forecast skill: Findings from community log books

A mining of the community rainfall logbooks revealed useful findings on forecast skill and actual occurrence of wet/dry days in each community throughout the season. These logbooks were distributed to each target community at the end of season 1 in order to monitor the performance of received forecasts against realized rainfall/extreme weather events, actual rainfall received from rain gage readings and materialized damage in the community generated in the community.

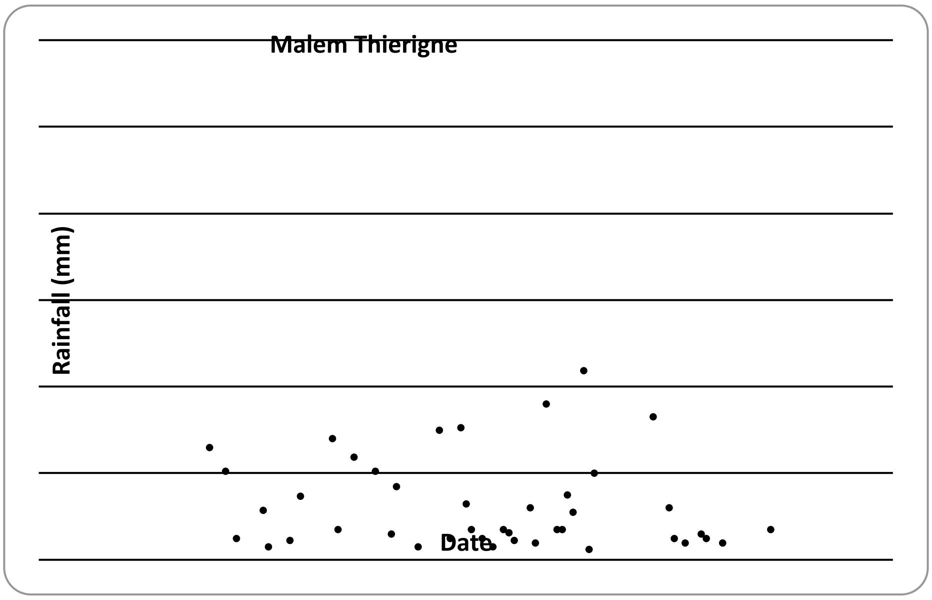
## Malem Thierign

In Malem Thierign the reliability of the forecasts overall was 81% and the hit rate for wet forecasts was 99%, showing that surveyed farmers in Malem Thierign can be almost certain of rainfall if it is predicted. However, 47% of rain fell that was not foreseen, i.e, if the weather forecast predicted a dry day communities could only be 53% sure that there would be no rain. Overall this shows that though the hit rain for rainfall is exceptionally good in Malem (99%) the miss rate for rainfall is almost at 50%, which surely cannot allow communities to rely on the forecasts. It would appear that the forecasts could be being cautious; avoiding forecasting rainfall that was less certain – hence preserving a good hit rate (they only predict rain that is close to certain to fall) but also maintaining a high miss rate (rainfall that is less certain is not forecast, while some of that rain still fell).

Our analysis displays multiple problems with the forecast accuracy rate, chief among them being that the forecast predicted certain rainfall days accurately (99% accurate rate), but less certain rainfall days and dry days very poorly (53% accuracy rate). As such if people in Malem Thierign needed to rely on a day being almost certainly wet they could rely on the forecast, but if they needed a dry day they could not look to the forecast to be sure. We wonder whether direct observation by farmers and indigenous forecasting techniques could not deliver similarly good success rates of forecasting certain rainfall days. However no data collected enables us to make this comparison.

Furthermore, the forecasts for Malem Thierign appear less advanced as they only detail the forecast of that day as opposed to predictions in advance. Finally, Malem Thierign appears to have less heavy rain than Dioly Mandakh as medium to heavy rain was forecast only twice and the largest amount of rain was 43.7mm.

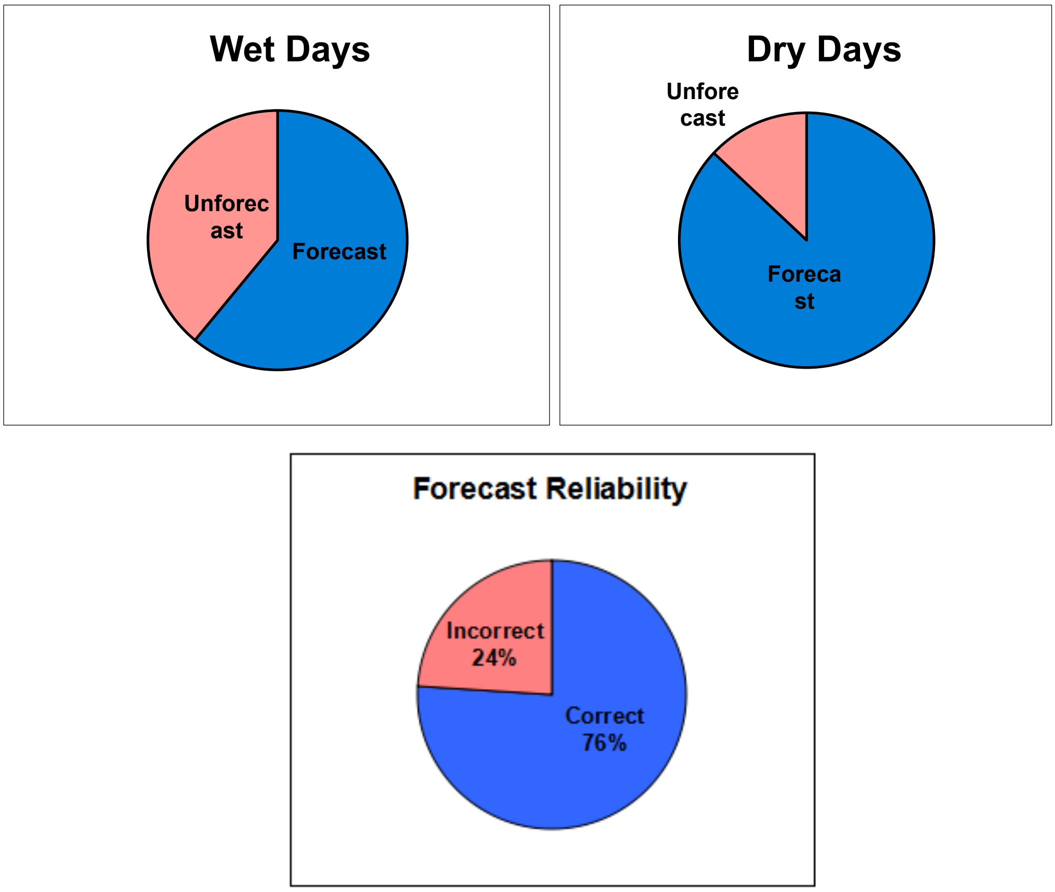
**Figure 8. Rainfall occurrence in Malem Thierign, Kaffrine between May and November 2012. Analysis courtesy of Richard Jones (UKMO).**




## Dioly Mandakh

In Dioly Mandakh the forecasts appear to have been more advanced since they detailed weather conditions in advance, i.e. 18-Sep 'Rainfall expected for the next three days' and were more precise in their use of words like 'intermittent' and 'strong'. The overall reliability of forecasts provided in Dioly Mandakh was 76% with the hit rate for rain (61%) being much lower than that of Malem Thierign and the miss rate being much higher, at 39%. This shows that the people of Dioly Mandakh could still be pretty sure it was going to rain when they were told it would do – in Malem Thierign for instance they wrongly predicted rain once whereas in Dioly Mandakh this happened 8 times. But they could also be more certain than the people of Malem Thierign that it would be dry if they were told so as the Malem Thierign miss rate was 47% whilst the miss rate of Dioly Mandakh was only 13%. Finally, Dioly Mandakh appeared to have more heavy rain than Malem Thierign with heavy rain predicted 18 times and the largest amount of rainfall was 100.3mm.

**Figure 9. Rainfall occurrence and reliability of forecasts in Dioly Mandakh, Kaffrine between May and November 2012. Analysis courtesy of Richard Jones (UKMO).**




Unfortunately, the data from the logbook from the third community, Fass Thieken, could not be recovered at the end of the project.

## Vagaries and interpretations

There are also noteworthy potential errors in Dioly Mandakh forecasts due to detail that was not all 100% comprehendible from reading the logbooks, often transcribed in Alphanumeric and Arabic. The following rainfall events recorded were notably problematic:

- (11-Aug) 'Medium to heavy rain' is predicted and 1.3mm falls. Over the next seven days there are no predictions yet 64.9mm falls including (12-Aug) 23.5mm and (18-Aug) 23.2mm. We thus assumed that there was either a recording error or translation error and that the rainfall was predicted, as it is hard to believe that so much rain could have been missed in the forecasts.
- (23-Aug) 'Rainfall (rest of meaning is unclear)' and 3mm falls. Then, (25 to 28-Aug) 142.3mm falls including (25-Aug) 39.3mm and (28-Aug) 100.3mm. We assumed here

that there was either a recording error or translation error and that the rainfall was predicted as it is here again hard to believe that so much rain could all have been un-forecast. This error is more likely to be a translation error as there was more to the prediction that we could not decipher from the log book.

These errors occurred in Dioly Mandakh forecasts but not Malem Thierign forecasts as the greater level of sophistication in the recording of the Dioly logbook made translation of original recording harder in Dioly, making for errors.

# Discussion

Climate change is having a perceivable impact on the Kaffrine region of Senegal, with increasing frequency and severity of extreme events. We found that farming communities in Kaffrine are already adapting to the rising frequency of climate hazards, including more intensive rainfall events, flooding from downstream water runoff and thunderstorms, each of which has contributed to rising mortality in Kaffrine since 2007. A diverse set of endogenous response strategies are being pursued by both men and women farmers, helping them to cope with the adverse impacts of weather-related events. Adaptation is indeed a process, not an event, and our results show gender differentials in vulnerability, capacity to cope, and needs for adaptation intervention in Kaffrine. This information is essential to guide the design of policy makers and project development staff's interventions who aim to improve the adaptive capacity of farmers in the region.

## Gendered nature of vulnerability and coping mechanisms

Table 2 clearly shows that sex-differentiated vulnerabilities to climate variability exist. Differential capacities to respond to climate shocks also appear to be influenced by gender. Different abilities to cope with climate shocks in turn determine gender-specific adaptation and agricultural support needs.

In Kaffrine, as in many other rural African settings, women are primarily responsible for family care. This includes cooking and house chores, caring for the young, collecting water, fodder, and firewood. Women are also responsible for farming on their own plots, land a part from their husband's land, to which traditional property rights entitle them, and which produces crops from which revenue is kept by the woman herself.

Men, however, control most factors of production (cart, horse/donkeys, government seeds and cash from sales of crops from family land). Traditional property rights do sanctify male and female plots. However we found that means of production to farm these plots are controlled, by and large, by men.

These different gender roles in the production process and in society largely explain the differential impacts of climate change, and gender differentiated capacities to cope with specific adaptation needs. Our evidence, from focus group discussions as well as in-depth household interviews, supports the findings of others in the literature, that the different roles that men and women play in their communities and in agriculture make women more vulnerable to the impact of climate change (Patt et al., 2009). Although the level of women's vulnerability compared to men varies from place to place, female farmers in Kaffrine consistently emerge as the most vulnerable sub-segment of the community, before people with disability, or youth and children. This confirms the contention that "gender intersects with economic, ethnic and other factors, creating hazardous social conditions that can place groups of women at greater risk when disasters unfold" (Wisner et al. 2004).

## Gender-specific needs exist for type of climate services and delivery channels

A major finding of this study is that male and female farmers have different needs with respect to climate services, both in terms of content (type of climate service required) and delivery channels required to reach them.

**Type of climate service products required.** All farmers expressed the need for information on seasonal onset of the rains, length of rainy season, distribution of rainfall within the season, and warnings on the arrival of rainfall-related events and hazards (storms, strong rains, strong winds, etc.).

In addition to this general list, female farmers specifically required information on rainfall deficit/dry spell forecasts (which they define as no rain for a period of 20 consecutive days), as well as information on the likely rainy season cessation period. This is linked to our finding that in Kaffrine, means of production to farm plots are controlled, by and large, by men. As such, men plant and farm on their plots first before they proceed to lend a hand on women's plots. This explains for instance why in Kaffrine, women plant their millet and maize plots a month later than do their husbands, as this is when men can spare the cart and donkey (means of production) to come plough women's fields. As a result, women farmers are ready for harvest later into the rainy season (in September). A dry spell or early seasonal rainfall cessation during this key period of crop blooming is devastating for most women in Kaffrine. This explains their request for early cessation and dry spell forecasts, relative to male farmers who focused on seasonal onset and rainfall distribution across the season. Gender-differences exist in types of information needed. This finding was consistent across the three sites.

**Lead time.** When asked about what time they would like to receive this information, all male and female farmers interviewed requested that the information be communicated to them as soon as it was known. They also expressed that the confirmation of uncertainty associated with the forecasts evolving throughout the season should also be communicated to them. This specifically expressed need for weather-related information that opens the door for co-production of knowledge – a space that fosters feedback between famers and forecasters. Weather forecasters at the National Meteorological Agency of Senegal (ANACIM) are readily able to provide this information. However, often climate scientists and professionals may feel that farmers will not understand the information they have regarding uncertainties and probabilities, and, thus, they hold back from communicating key information.

**Information delivery channels required to reach male and female farmers.**

The focus group discussions with women revealed the need for better targeted climate information delivery channels in order to effectively reach them. Sampled female respondents, both in focus groups and household interviews, requested that early warning messages be delivered to them through the following channels:

- via SMS messages to their own cell phones, or those of their children (in the local language of the area, Wolof, transcribed in Alphanumeric or Arabic);
- written on meteorological blackboards placed at strategic outposts in the village with assigned neighborhood relays;
- through the rural radios that reach the community, at a time when they are not out in the fields (during the early morning and late afternoon);
- at the borehole, where they draw water every morning; and

- finally, through the notorious ‘chatterboxes’ in the village, who serve as information relays through the village.

These gender-specific needs ought to inform the design of climate services to ensure that salient climate services must reach female farmers (and other sub-strata within the community found to be most vulnerable) in order to effectively support their farm-level decision-making under an increasingly variable climate.

## Gender vulnerability is place-specific

Gender vulnerability, capacity to cope and resulting adaptation need is place-specific due to cultural norms that vary from village to village. We found wide differences in women’s local capacities and adaptation needs, anchored in differing degrees of access to opportunities and social constraints limiting empowerment. As one might deduce based on these differences, we found the needs of women farmers in information services to be different from those of other women only a few dozen kilometers away.

Though all women interviewed shared the experience of limited access to opportunities and limited control of the critical means of production in agriculture (donkey, cart, seeds, inputs) compared to men, wide variations were noted from one village to another. For instance, in Dioly, women are more outspoken and forthcoming than women in the other communities. They publicly decried their men’s late sowing of their fields as the main cause for their bad cropping seasons in recent years of early rainfall cessation. By contrast, in the more rigid and hierarchical society of Fass Thieken, women who faced the issue of late sowing of their fields by men had less voice to advocate for change.

The place-specific nature of gender empowerment and vulnerability suggests that generalizations in the literature about women being more vulnerable to climate change impacts than men may be misleading. It suggests that researchers need to be more sensitive to subtle variations in the experience of women and men across different locations, even within one geographic area, and calls for deeper analyses of place-specific baseline data and identification of women farmers’ needs prior to project design. Such findings also suggest that access to and use of climate information will need to be differentiated among women depending social context and cultural norms, thereby designing climate information needs that are locally and culturally appropriate.

## Gender, a cross-cutting factor: the Gender Trap Hypothesis

So we see gender emerging as a crosscutting factor that interacts with all other factors of vulnerability within a community, mediating female farmers' specific vulnerability to increasing climate variability (Figure 10).

**Figure 10. Gender, a crosscutting, interactive factor of vulnerability that mediates female farmers' vulnerability to climate change impacts**


This finding leads us to ask: does a 'gender trap' exist, entrenching women's vulnerability to a changing climate relative to their male counterparts? What we see happening in Kaffrine is that female farmers, in order to cope with a heavier burden and more drudgery in times of a climate shock, often forfeit basic assets and investments safeguarded for their personal and family welfare, which then traps them further in a cycle (or trap) of vulnerability, very difficult to escape from, which in turn further raises their vulnerability to future climate-related shocks and erodes their adaptive capacity.

Patt, Dazé and Suarez allude to this hypothesis, mentioning that during drought, women in charge of caring for the young have to contend with a heavier work burden than do men. With no other subsistence options, many resort to the following coping mechanisms (Patt et al. 2009)):

- Early marriage of girls to older men (many of whom are HIV positive)
- Turning to prostitution or provision of sexual favors in exchange for money to pay the bills
- Dropping out of school (many girls more likely to leave school than boys) to save on school fees/have more time to devote to wood/water collection for the household.

As mentioned earlier, we found that when faced with frequent adverse climate events, female farmers tend to forfeit crucial assets such as cattle and jewelry, more so than their male counterparts (Table 2). However, our findings from Kaffrine do not enable us to make a definitive statement on the "gender trap" hypothesis. Must women facing a heavier burden during times of climate shocks always sell off their assets? This hypothesis will have to be tested across a range of different settings to assess its validity, especially since women may be concurrently vulnerable in other ways besides being victims of the impact of climate variability.

## Women as powerful local agents of climate change adaptation?

A critical question arising in the Kaffrine fieldwork was whether women farmers, empowered with climate information services to anticipate and confront climate-related risks, can become lead agents for improved climate risk management at the local level. Will they be empowered by their access to the early warnings they requested, if delivered through the specific salient delivery channels they requested? Will access to one input (climate information services) contribute to women's empowerment to such an extent that it facilitates access or control over other agricultural inputs (the essential means of production in agriculture of a cart, horse/donkey, agricultural equipment, etc.)? Will putting climate services in the hands of women farmers lead to any behavioral changes in the long run? Can we verify that, with early warnings, women make better decisions that increase their adaptive capacity, relative to men?

Answers to all of these questions will have to be investigated through another Participatory Action Research in Kaffrine. As of now, provision of tailored climate services that respond to pre-identified female farmers' needs in Kaffrine is still underway. A full assessment of the value of climate services for both men and women farmers across our three target communities in Kaffrine is planned for 2015, following five full years of climate service delivery in Kaffrine.

Nonetheless, our study underscores a need for additional applied research on gender-specific adaptation support services needed for resource-dependent vulnerable farmers that make up the vast majority of communities across Africa. Without such research, the case cannot be made for effective gender mainstreaming into climate change national adaptation policies. Most national policies still adopt an impervious blind spot to the specific adaptation needs of women farmers in the agenda to build the resilience of the agricultural sector to climate change. As illustrated by Senegal's National Adaptation Plan of Action (NAPA), an 84-page document that identifies the country's most urgent needs for adaptation and evaluates key vulnerable sectors to climate change, there is a notable lack of discussion concerning either community needs or the gendered nature of effective adaptation.

As our study demonstrates, women farmers make up half of the population yet remain a vulnerable sub-group at the community level. Attention needs to be paid to their specific adaptation needs, and gender responsive policies must be developed to address these needs, if we are to be successful in our collective agenda to build community resilience to rising climate-related shocks and variability.

## Improvements needed to forecast skill

Our findings from community logbooks in two of the three target sites demonstrate further work is also needed on the climate science and research end, before climate information can be made fully useable by local farmers, across gender groups. For one, improvements in the geographical scale and reliability of forecasts (forecasting all rain events and not just certain rain events) are needed. Secondly, climate information needs to be coupled with appropriate advisory services. By the end of our Kaffrine Participatory Action research project, following two years of receiving climate information products, surveyed community members across the three villages requested new additional products: an interpretation of the seasonal rainfall forecast with agricultural advisories, giving farmers guidance on what seed varieties to plant, when to spray pesticide and fertilizers, and so forth, based on the seasonal forecast.

This opened the door for a new collaboration with Kaffrine's extension service department, which is today still ongoing.

Whilst clearly demonstrating a number of positive impacts, amongst those issues that could be addressed or furthered to improve climate service delivery activities in Kaffrine:

- The need to address intra-seasonal statistics, including the intensity and pattern of rain, and dry periods, within the rainy season (i.e. not just rainfall totals).
- The benefits of monitoring outside of the season for out-of-season hazards, such as periods of rain outside the main rainy season.
- The importance of addressing spatial variability to enable higher resolution forecasts.
- A greater study on risk perception and how risk and uncertainty are addressed in different sectors in the context of preparedness actions.

## Conclusions

This study sought to generate information on the relevance and potential impacts of providing gender-responsive climate services to women rural producers in three climate-vulnerable communities of Senegal. Key findings include that:

- There exist significant gender differentials in CC vulnerabilities, local capacities to cope, and resulting adaptation support needs for male and female farmers;
- Climate information services are identified as a useful resilience-building strategy by both men and women farmers. In two of the three target communities (Dioly and Fass Thieken), access to advance information on likely hazards (strong rains, storms, thunder) and overall weather conditions to guide agricultural activities was identified as one of the priority adaptation needs of the community.

Information on seasonal onset, intra-seasonal rainfall distribution, seasonal cessation (particularly important for women farmers), and rainy season length, as well as early warnings on rainfall events and hazards, are particularly useful. Communities displayed a genuine ability to deal with uncertain information, and requested that information be sent to them as soon as available, with confirmation/retraction of the forecast as information becomes more certain.

- Male and female farmers require different types of climate services to support their decision-making needs. In addition to a general demand, women farmers specifically require information on rainfall deficit / dry spell forecasts, as well as information on the likely season cessation period. Women farmers in Kaffrine, due to their lack of control over means of production, plant later than men. As such information on seasonal cessation was found to be more critical to them than information on seasonal onset.

- Innovative communication channels are needed to reach the most vulnerable and overcome gender-specific obstacles to access of climate information. Examples of salient delivery channels identified by women farmers of Kaffrine to reach them include: SMS messages in the local language, forecasting blackboards, information broadcasting at public places where women gather such as boreholes, and at the mosque where their husbands meet every day, as well as through community radio and chatterboxes.
- Vulnerability is place-specific**.** Variations in gender-disaggregated climate vulnerabilities, capacities to cope, and adaptation support needs are significant from one village to another, and need to be heeded in the design of climate services for farmers.

This study supports the conclusion that place-specific, gender disaggregated understanding of farmers' priority adaptation needs should be driving national climate adaptation efforts. Changing the current approach national adaptation plans (NAPs), from one which is entirely insensitive to the significance of gender on the impact of climate change to one that clearly targets gender as an important determinant in the experience of climate related events, is an urgent priority. This requires more applied research on gender-specific adaptation support services for resource-dependent vulnerable farmers.

If we are to be successful in supporting ongoing community adaptation efforts and strengthening community resilience to climate change, community needs will now have to come first. The needs of the most vulnerable sub-segments, in this instance, women, will have to be addressed.

# Appendix I: Participatory Research Plan

## Kaffrine (Senegal) Research Project:
## "Are there gender-specific climate service needs?"

## The Climate Vulnerability & Capacity Assessments (VCAs) Methodology

The tools we will be employing to generate our community vulnerability data are derived from a participatory methods toolbox for assessing communities' vulnerability and capacities to climate hazards, devised by the Red Cross/Red Crescent movement for use by its community-level volunteers for community work programming: the ***Vulnerability and Capacity Assessment (VCA) tools*** (IFRC 2009).

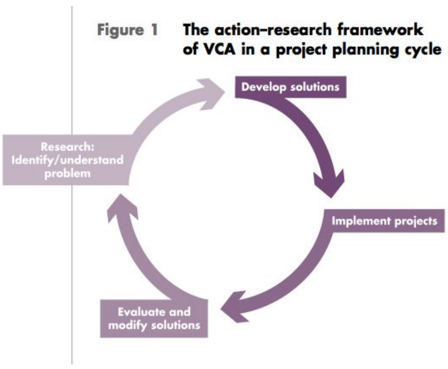
The ***Vulnerability and Capacity Assessment (VCA) toolbox*** uses a range of different tools, which like the hammer, scaffold and measuring meter that one uses to construct a house, are the aides we have used to access data across different segments of the community studied and build a complete picture of the community's vulnerabilities to and capacities to address climate changes.

All the data generated across groups using the VCA tools were then triangulated to draw to a complete picture as close to the local reality as possible.

The main attractions of this methodology are its ability to access the most vulnerable groups (women, youth, elders) and give them a voice within the process of collective solution design, as well as its emphasis on local capacities to address local vulnerabilities, before recourse to external interventions is considered. Additionally is the belief at the center of the VCA methodology that vulnerability is the product of multiple stressors, historically derived from the socio-economic characteristics of the community; climate variability under this understanding is thus solely one factor of vulnerability, out of many others. The output is data on climate vulnerability in the context of the community's wider vulnerability.

The VCA serves first and foremost as a planning tool, at the very beginning of the project cycle, a useful method to identify/understand the problem before devising solutions/policy interventions, and to involve communities from the very outset: in the design of the project's activities, for their future ownership of these (see Annex Figure 1).

**Annex Figure 1. The action-research framework of VCA**




More on the specific Vulnerability and Capacities Assessment (VCA) tools we will be using for the community assessments can be found in Table 1 below.

Note: All the activities detailed in Table 1 below were conducted within focus groups (men, women, elders and youth as relevant), save for the final community data validation meeting that will bring the entire community together. For those who have never conducted focus groups in the past, please refer to p. 66 in VCA manual).

Highlighted in **yellow** in Table 1 are exercises specifically designed to access gender-specific data.

In **red** are exercises specifically aimed at collecting information on climate variability & change.

**Table 1. Vulnerability and Capacity Assessment (VCA) Tools that will be employed to assess vulnerability in each target community (climate-vulnerable communities in Kaffrine, Senegal)**

| Exercise<br>(references in VCA manual) | Target community sub-segment to participate in exercise | Purpose of Exercise |
|---|---|---|
| Community introduction | Village authorities (Mix, all) | Introduction of Research team and of purpose of research |
| Transect walk<br>(pp. 86-92 in Manual) | Mix (Woman, Man, Youth) | Research team to walk through community scoping and taking note on its most salient features of vulnerability and capacities, accompanied by 3 guides (one woman, man and youth). |
| Community Mapping:<br>1) Spatial map<br>2) Hazard/Risk map<br>3) Vulnerability maps (places and people)<br>4) Capacities map<br>(pp. 75-86 in Manual) | Women – Men – Youth & Elders | Mapping exercises will serve to bring to the surface men, women, and age groups' perspectives on their community, as they see it. Results from these mapping exercises will be confronted across focus groups, towards a more complete picture of vulnerabilities and capacities in the community. |
| Seasonal calendar: past & present trends<br>(p. 92-97 in Manual) | Women – Men | Exercise to reveal the seasonality of women's vulnerabilities relative to those of men- during which times of the year are climate impacts felt at their peak? |
| Historical profile<br>(pp. 98-105 in Manual) | Elders & Youth groups of:<br>- MEN<br>- WOMEN | To get a sense of the community's history, cultural identity and environmental profile. Essential to put data in context.<br>In this exercise, we ask the group: 1) General historical markers of the community; 2) History of hazards in community; 3) How have you coped with hazards in the past? |
| Institutions and Social network Analysis (Venn diagram) + Assessing the capacity of key community Organizations<br>(see pp. 119-125 and pp. 128-132 in Manual)<br>*Refer to data collection Sheet 6* | Women – Men | During the focus group for this exercise, men and women are separated into two different groups and list the institutions and social networks that frame their lives in their community. Following this initial scoping, the capacity of the main local organizations and social networks identified is assessed (see data collection sheet 6), in order to gauge their ability to address and reduce the vulnerabilities of women producers.<br>A comparison of the different diagrams drawn by men and women will show differences in the way men and women perceive the patterns of relationships within the community. |
| Climate/weather information needs | Women – Men | This newly introduced exercise to the VCA package is a discussion in two distinct groups of men and women, where they are asked separately: 1) What local forecasting techniques do you currently use to make decisions; 2) What do these techniques not tell you? how are they not functioning? WHAT INFORMATION COULD YOU USE MORE OF? Discussion of thresholds<br>2 focus groups: women-men<br>Uses: BUILDS COMMON UNDERSTANDING OF WHAT FORECASTING IS (whether done using local traditional/modern techniques).<br>PROVIDES INSIGHTS ON THE SHORTAGES OF CURRENT LOCAL KNOWLEDGE TECHNIQUES |

| | | |
|---|---|---|
| | | For each identified information need, identify THRESHOLDS for transmission of information. |
| Direct observation<br>(p. 71 in manual) | Men – Women – Youth - Elders | This activity will be most critical to the understanding and generation of reliable data on the particular climate-related vulnerabilities that people face at the community-level. The purpose of this exercise is to "soak" in the community and bear eyewitness to the vulnerabilities/capacities highlighted by the women and other sub-communities, following the anthropological participant-observant method.<br><br>All observations from this exercise will be duly noted every day and will serve as qualitative input to contextualize the quantitative gender-disaggregated community-level data generated. |
| **DAY TWO: Household Data sampling**<br>Household & Village Vulnerability Assessment<br>(p. 107 in Manual)<br>*Refer to Data Collection sheets 1, 2 and 5* | Household Head (Women – Men) & members (surveyed separately by gender) | This exercise will serve to generate data on how households and their assets are vulnerable to climate risks.<br>This exercise also makes apparent inter vs. intra-household differences in access to resources. |
| **DAY TWO (Household Data sampling cont'd)**<br>Livelihoods and coping strategies analysis<br>(see pp. 109-119 in Manual)<br>*Refer to Data Collection sheets 1 through 4* | Household Head (Women – Men) & members (surveyed separately by gender) | How do women specifically cope with climate risks when these occur? Which particular institutional and social mechanisms are triggered in response? What are the pathways of cause and effect?<br>This specific exercise gets us to the heart of understanding the ways in which different members of the household are specifically affected by climate related disasters, which assets they sacrifice in order to cope, and which safety nets they resort to in order cope. |
| Final Community meeting:<br>- Problem tree (pp. 153-159)<br>- Validation of Vulnerabilities, Capacities, Gaps (summary of data collected), with breakout session with Women<br>- Identification of relevant resilience-building interventions<br>- Prioritization of interventions: Ranking matrix (see Data collection sheet 7) | All | The final community meeting at the end of the study reveals all the vulnerabilities, capacities and gaps that emerged by vulnerable sub-segment in the community and brings them to the surface in front of the entire community, for final validation of Capacity Gaps & relevant vulnerability-reducing/capacity-building strategies by the community.<br>At the end of this meeting, community members identify/validate relevant resilience-building interventions and prioritize these using the Ranking matrix (refer to data collection sheet 7).<br>*Refreshments/light food need to be organized for this meeting.*<br>*Include a breakout session to give space for women to express themselves.* |

## Appendix II: Household Survey Instrument

***Household data collection sheets administered to sample households in each of three our target communities.***

| FICHE D'ENQUETE MENAGE D'EVALUATION DES VULNERABILITES ET CAPACITES D'ADAPTATION FACE A L'ALEA CLIMATIQUE | |
|---|---|
| Numéro du questionnaire | /__/__/__/ |
| Nom du volontaire de la CR | |
| Nom du superviseur | |
| Date de l'entretien | |
| Lieu | |

Bonjour, Mon nom est ________________________. Je suis un volontaire de la Croix-Rouge. Nous sommes ici pour vous poser quelques questions sur votre communauté. Vos réponses seront confidentielles. Vous disposez d'un droit d'accepter ou non de participer. Voulez-vous aider à répondre à ces questions ? Je vous remercie.

Merci de poser la question et attendre la réponse. <u>Ne pas donner des réponses possibles !</u>

Il peut y avoir plus d'une réponse correcte !

| 1. AGREGATS / DEMOGRAPHIE | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-1 | Nom de la communauté : | | | | | | | | | | | | |
| 1-2 | Répartition du ménage par sexe | MASCULIN | | | | FEMININS | | | | TOTAL | | | |
| 1-3 | Classes d'âge : | 0-5 ans | 6-15 ans | 16-49 ans | + 50 ans | 0-5 ans | 6-15 ans | 16-49 ans | + 50 ans | 0-5 ans | 6-15 ans | 16-49 ans | + 50 ans |
| 1-4 | Chef de famille (homme ou femme) | Femme /__/ Homme /__/ | | | | | | | | | | | |
| 1-5 | Nombre de personnes handicapées ou souffrant d'une maladie chronique | /__/ /__/ | | | | | | | | | | | |

| | | |
|---|---|---|
| 1-5 | Combien de personnes de votre famille peuvent lire et écrire ? | /__/ /__/ |
| 1-6 | Quelle est la principale source de revenu du ménage | |

| **2. DEGRE DE VULNERABILITE DU MENAGE** | | | |
|---|---|---|---|
| **2-A : DEGRE DE VULNERABILITE GENERALE** | | | |
| | Items | Oui =**1** | Non=**0** |
| 2-A1 | Le chef de ménage exerce t-il une activité génératrice de revenu ? | | |
| 2-A2 | Le type d'habitat de votre concession est-il en dur / zinc? | | |
| 2-A3 | Au moins un membre de votre ménage sait-il lire et écrire ? | | |
| 2-A4 | Avez-vous accès à l'électricité dans votre ménage? | | |
| 2-A5 | Avez-vous accès à l'eau potable ? | | |
| 2-A6 | Est-ce qu'il existe au moins une latrine dans votre concession ? | | |
| 2-A7 | Avez-vous un système de collecte des ordures ? | | |
| 2-A8 | Avez-vous un système d'évacuation des eaux usées ? | | |
| 2-A9 | Existe –t-il une structure de santé à proximité (moins de 5 km) de votre domicile ? | | |
| 2-A10 | Des membres du ménage adhérent –ils à des organisations communautaires de base ou d'autres réseaux de solidarité locaux | | |
| **Total** | | / | |

| **Résumé** : Degré de vulnérabilité | 1-3 | 4-6 | 7-10 |
|---|---|---|---|
| | **Forte** | **Moyenne** | **Faible** |
| | | | |

| | **2-B : EVALUATION DE LA VULNERABILITE DES SOURCES DE REVENUS FACE AUX ALEAS** | | |
|---|---|---|---|
| | **2-B1 : IDENTIFICATION DES ALEAS QUI TOUCHENT LE FOYER** | | |
| Quels sont les aléas auxquels vous êtes exposés pouvant menacer vos moyens subsistence ? | | **Oui** | **Non** |
| 3-1 | Fortes pluies | | |
| 3-2 | Eaux de ruissellement (*Yoolé / Waale*) | | |
| 3-3 | Feux de brousse | | |
| 3-4 | Déficit de pluies | | |
| 3-5 | Sécheresse | | |
| 3-6 | Pluies irrégulières | | |
| 3-7 | Tempêtes | | |
| 3-8 | Pluies hors-saisons | | |
| … | | | |
| … | | | |
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| | | | |
| | **2-B2 : IDENTIFICATION DES MOYENS DE SUBSISTENCE AU SEIN DU MENAGE** | | |
| | Quels sont toutes les sources de revenus au sein du ménage ? (hommes / femmes) | **Oui** | **Non** |

| | | | |
|---|---|---|---|
| 4-1 | Agriculture | | |
| 4-2 | Pastoralisme | | |
| 4-3 | Petit commerce | | |
| … | | | |
| … | | | |
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| **2-B3 : SENSIBILITE DES MOYENS DE SUBSISTENCE A L'ALEA** | | | | | | |
|---|---|---|---|---|---|---|
| **Moyens de subsistance dans le ménage** **(s'entretenir avec chaque membre de la famille exerçant cette source de revenus)** | **Degré de vulnérabilité des moyens de subsistance aux aléas** **TABLEAU : *FEMMES / HOMMES / SYNTHESE MENAGE*** | | | | | |
| | Fortes pluies | | | | | |
| **Agriculture** | | | | | | |
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| **TOTAL Vulnérabilité (TV) pour l'aléa** | | | | | | |
| **Degré de vulnérabilité standardisé (%) = TV/Total possible *100** | | | | | | |
| **Résumé** : Degré de vulnérabilité | | | 100-50 % | 49-25 % | 24-0 % | |
| | | | **Forte** | **Moyenne** | **Faible** | |
| | | | | | | |

Notes:

NB : Pour les tableaux suivants, obtenir  la permission au chef de famille et s'entretenir avec hommes et femmes séparément.

| **3. EVALUATION DES CAPACITES D'ADAPTATION : ABILITES A FAIRE FACE AUX ALEAS CLIMATIQUES** | | | | | | |
|---|---|---|---|---|---|---|
| **3.A- IDENTIFICATION DES ACTIFS TOUCHES EN CAS DE CATASTROPHE** | | | | | | |
| **Aléa/Catastrophe** | **Actifs touchés** | | | | | **Impacts sur les actifs?** |
| | *Naturel* | *Physique* | *Financier* | *Humain* | *Social* | |
| Fortes pluies | - | | | | | |
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| **3.B- IDENTIFICATION DES STRATEGIES DE REPONSE ET CAPACITES D'ADAPTATION** | | | | | | |
|---|---|---|---|---|---|---|
| **Aléas** | **Actifs du ménage touches (identifiés par Femmes + Hommes)** | | | | **Stratégie de réponse courante**<br>(Quels actifs sont réduits/sacrifiés pour assurer la survie? Quels stratégies adoptez- vous pour pouvoir survivre? Quelles sont les stratégies spécifiquement identifiées par les femmes ? Comment répondent-elles lorsqu'il y-a aléa ?<br>*Quelles sont les stratégies des jeunes?* | Mesures ou mécanismes à adopter pour réduire ou annuler l'impact sur les actifs ?<br><br>QUEL EST LE GAP A RESORBER POUR ASSURER UNE PARFAITE RESILIENCE DU MENAGE /UNE PARFAITE APTITUDE A FAIRE FACE A L'ALEA SANS AIDE EXTERNE (Solutions identifiées par les femmes –les hommes) |
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N’oubliez pas de remercier les personnes interrogées de leur temps.

# Appendix III: Kaffrine Exit Survey – Qualitative Survey

## Kaffrine Final Project evaluation (October 2012)

### Individual Questionnaire (to be administered to 50% men and 50% women respondents in each community)

***I. Respondent Personal Information***

1) Village Name:

| |
|---|
| |

2) Respondent Name: ________________________________________

3) Gender: ________________________________________

4) Farm size (specify individually owned:

| | |
|---|---|
| Very small (1-5 acres) | |
| Small (5-10 acres) | |
| Average (10-15 acres) | |
| Large (15-20 acres) | |
| Very large (+20 acres) | |

***II. Use of scientific climate information***

5) During this last season (May-Sep 2012), what types of information have you received about weather and climate?

| | Forecast | |
|---|---|---|
| i) | Forecasts for the next 3 hours. | |

| | | |
|---|---|---|
| ii) | Forecasts for the next day. | |
| iii) | Forecasts for the next 3 days. | |
| iv) | A forecast for the coming season | |
| v) | An update of the forecast for the coming season. | |
| vii) | Any other type of forecast (please describe) | |

6) How often have you received climate information during the season?

*Season 2 (2012):*

Always/very often ☐ Sometimes ☐ Never ☐

*Season 1 (2011):*

Always/very often ☐ Sometimes ☐ Never ☐

7) Has your access to information improved from 2011 to 2012? Y/N

8) How did you receive this information for the 2012 season? Which of these communication methods works best for you?

| Communication channel | Type of forecast | Rank |
|---|---|---|
| Through the radio | | |
| Saw it on TV | | |
| Read it in the newspaper | | |
| From your mobile phone (SMS, etc.) | | |
| Heard it from a neighbor | | |
| From another farmer/farmer group | | |
| From the mosque | | |
| From the forecast blackboard | | |
| Directly from a climate scientist or local ANACIM station | | |
| Any other type of communication (please describe) | | |

9) Is this different from before you joined the project (i.e. before 2011)? If it is, what has changed about how you receive the information?

10) What forecast information did you receive in the seasonal forecast?

| Type of information | No of group members |
|---|---|
| The expected average rainfall for this area for the season, how confident the forecast is | |
| Specific information about whether the rains are expected to be average, above average or below the average | |
| Advice on planting (what, when, how) | |
| Confidence of the forecast | |
| A forecast map showing the situation for this area | |
| The expected start date for the rains | |
| The expected end date for the rains | |
| Information about expected dry spells or heavy rainfall within the season | |
| Other: | |

11) Were the forecasts accurate? Did the rainfall arrive as forecast?

*During Season 2 (2012):*

Always accurate ☐ Sometimes right, sometimes wrong ☐ Always inaccurate ☐

*During Season 1 (2011):*

Always accurate ☐ Sometimes right, sometimes wrong ☐ Always inaccurate ☐

12) Overall, how do you assess the performance of received forecasts: How well did the forecasts you have received compare to what happened? What was forecast well and what was obviously wrong?

| |
|---|
| |

13) Has the weather/climate information you have received been useful to you? Y/N

a. If not, please tell us why. What was missing? What is needed in addition?

b. If so, please tell us, by order of importance, which weather/climate information is most useful to you? Which uses do you make of each weather/climate information when you receive it?

| Information | Rank | Uses of information |
|---|---|---|
| | | |
| | | |
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| | | |

14) Please give practical examples of early actions you triggered, if any, in response to a received weather/climate information this year and last.

15) Has there been any change in your daily activities or farming practices as a result of the forecasts you have received this year and last year? Y/N

a. If so, please give practical examples of how you have changed? [**here pay particular attention to stories of transformative behavioral change through Early Warning >Early Action**]

b. If not, why is that? What is missing? What is needed in addition?

***III. Use of local indicators of weather and climate***

16) Which local indicators did you use specifically for the 2012 rainy season? What did you use them to forecast? Did they all work?

| | Type of indicator | Description | When did you use it? | What did it specifically predict? | Was it useful? |
|---|---|---|---|---|---|
| i) | | | | | |
| ii) | | | | | |
| iii) | | | | | |
| iv) | | | | | |
| v) | | | | | |

Also assign a number in the final column indicating – 1 the most useful, 2 the second most useful, etc. If it did not work, put an X in the final column.

17) In general, are local indicators better, the same or not as good as forecasting the weather as the scientific forecast?

| Rating | No. of group members |
|---|---|
| Better | |
| About the same | |
| Not as good | |

17) Did you mix local indicators and the scientific forecast to get a local forecast? If you did, how did you do this?

| |
|---|
| |

***IV. Impacts on Crop output and yield***

18) For the 2012 rainy season, when thinking about the decisions the forecast helped you make (see question 13), how do you think this has affected the yield or output of your crops?

| Effect | No. of farmers |
|---|---|
| No effect at all | |
| A small effect, up to about a 5% increase | |
| A significant effect, between 5 and 15% increase | |
| A very noticeable effect, 15 – 50% | |
| A big impact, over 50% | |
| Using forecasts meant I lost output and my yields declined | |

19) Was the impact of using forecasts higher for some crops than others? If so, which crops benefited most? Why was this?

| Crop | Benefit and reason why |
|---|---|
| | |
| | |
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***V. Future use of climate information***

20) If you could design a "climate forecasting service" for farmers, what specific recommendations do you have for the information that it should contain?

| | |
|---|---|
| Before planting | |
| During cultivation and harvesting | |
| In the longer term | |

21) How should this forecasting service for farmers communicate this information with you?

| | |
|---|---|
| Before planting | |
| During cultivation and harvesting | |
| In the longer term | |

22) What other advice and/or service is needed for you to use forecasts effectively and increase your yields and profits (for example, soil testing, seed supply, more training on forecasts, etc.)?

| Advice | Importance |
|---|---|
| | |
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| | |

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