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ENHANCING SMALLHOLDERS' CAPACITY TO COPE WITH CLIMATE CHANGE

Use of Seasonal Climate Forecasts

This document is one of a series of factsheets that aim to share practical experience of how Participatory Action Research (PAR) can be used to trigger technological, social and institutional innovation in Africa to enhance smallholders' adaptive capacity in the face of climate change and increased climate variability. The uniqueness of this approach is the integration of the "what" (the technologies) with the "how" (PAR) and the "why" (increased capacity of smallholders to cope with climate change).

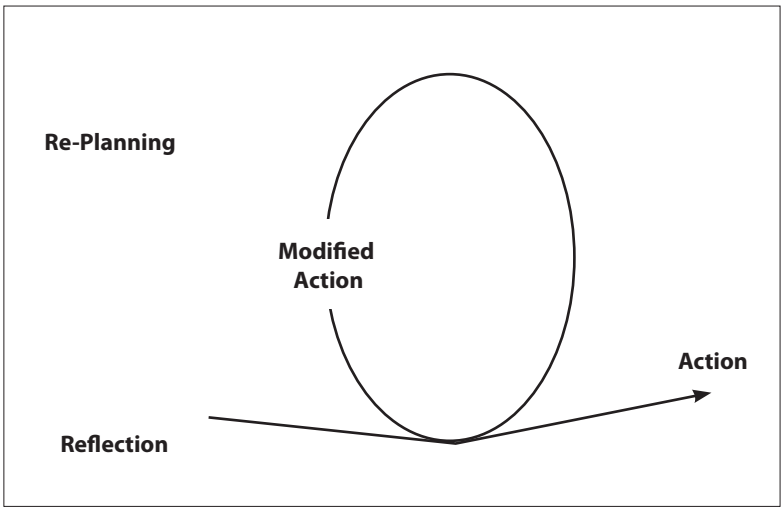
In Africa, widespread poverty, fragile ecosystems, weak institutions, and other issues compound the effects of climate change. For millions of people, food and water security, livelihoods, shelter and health are all at risk. There is a clear need to better understand the determinants of vulnerability, the adaptive capacity needed to cope with new challenges, and the learning process these imply — recognizing also the need to address considerable uncertainty and accommodate nonlinear processes.

Increasingly, Participatory Action Research is seen to offer significant advantages over the conventional research model whereby research products are passively transferred to smallholders via extension workers. The PAR approach enables smallholders, extension agents, researchers, the private sector, policy makers and other stakeholders to jointly identify problems and then select, test and refine options. This greatly increases the likelihood of reaching appropriate and sustainable solutions.

The factsheets draw upon practical experience and lessons learnt from 26 projects undertaken between 2007 and 2011 in 17 countries. These projects were supported by the Climate Change Adaptation in Africa (CCAA) research and capacity development program.

> CCAA is a joint program of the International Development Research Centre (IDRC), Canada, and the Department for International Development (DFID), UK. It aimed to improve the capacity of African countries to adapt to climate change in ways that benefit the most vulnerable. Building on existing initiatives and past experience, the CCAA program worked to establish a self-sustained and skilled body of expertise in Africa.

This factsheet aims to share the CCAA projects' experience of and lessons from PAR focused on use of Seasonal Climate Forecasts (SCFs) with a wider audience. This includes rural development practitioners, non-governmental organizations (NGOs), civil society organizations, farmers' organizations and extension services. The purpose is also to inform policy and decision makers, donors and researchers. Other factsheets in this series cover Integrated Soil Fertility Management and Water Resource Management.



Action Learning / Research Loop

What is Participatory Action Research?

Within the CCAA project PAR has been defined as a process of social learning and change carried out by local development actors themselves (including villagers, extensionists, local leaders and policy makers, the private sector and researchers), which is operationalized through an iterative process of planning, action, reflection and re-planning (see diagram).

PAR relies heavily on skilled facilitation to enable a process that involves:

Getting started: team building, partnership, mobilization

Understanding the starting points and aims: participatory action planning, action research planning

Understanding the starting points and aims: participatory action planning, action research planning

Managing change: supporting the implementation of planned actions, monitoring, evaluation and adjustment

Including empirical research inputs: deeper analysis of the system, impact assessment

PAR does not operate in isolation. it builds on results of *empirical research* (e.g. technology development; characterizing past, present and future situations) and complements researcher-led *action research*, which helps to develop and share broader lessons. These can be from local impact assessments, between site comparisons and process documentation, and be used to facilitate scaling up and mainstreaming results into policies.

This factsheet draws on experience from West Africa (Benin and Senegal), East Africa (Kenya and Ethiopia) and Southern Africa (Zambia and Zimbabwe). It demonstrates how participatory action research (PAR) has been used to ensure sustainable crop and livestock production in the face of climate change and increasing climate variability, specifically by introducing the use of Seasonal Climate Forecasts, among other adaptation and mitigation strategies.

THE PROBLEM: The effects of climate change and increased climate variability mean that farmers and pastoralists have to make crucial management decisions based on available climate information. However, they are hampered by their lack of access to science-based forecasts of the coming season, and also their lack of knowledge about the full range of crop and livestock management options that could help minimize rainfall-related risks.

Climate change and increasing climate variability are causing rainfall to become more erratic in semiarid areas of sub-Saharan Africa. This means that precipitation patterns are changing, both in timing and spatial distribution of rainfall, and droughts are becoming more frequent. This has negatively impacted farmers and pastoralists; crop failures have been more frequent and there has been largescale mortality of livestock. To deal with the uncertainty, farmers and livestock keepers have to take crucial crop, livestock, land and water management decisions before and during growing seasons. Their decisions should be based on indigenous climate knowledge, but as precipitation patterns change there is a growing need for science-based climate information. But farmers and pastoralists lack of access to reliable forecasts on probable rainfall patterns in coming rainy seasons, and knowledge about the full range of technologies that they could use to stabilize production under increasingly challenging conditions, so it is difficult for them to make effective decisions. The result is increasing food insecurity and vulnerability, and persistent or even increased poverty.

THE SOLUTION: Making available timely Seasonal Climate Forecasts, which offer crucial information ahead of the next growing season, providing guidance on how the SCFs should be interpreted, and working with farmers and livestock keepers to facilitate their field experimentation to test and compare different responses to the forecasts.

The research teams made Seasonal Climate Forecasts for the forthcoming growing season available to their farmer and pastoralist partners, and provided them with guidance on how to interpret the SCF information. This helped the farmers and livestock keepers make informed decisions on which crops and varieties to sow, which soil and water management technologies to utilize, and when to migrate with livestock, de-stock and restock. This is an approach sometimes called “response farming”. Ideally, forecasts are made available before the onset of the growing season and again early in the season, so that the most appropriate crop and livestock management decisions and any necessary adjustments can be made. So, for example, the initial Forecast guides choices of crop and cultivars/varieties, which are based on the time required by each to reach maturation. It also informs decisions about initial seed sowing and fertilizer application rates, and the most appropriate conservation tillage options to use. When the crops are thinned, these initial decisions are revisited, based on the amount of rain that has fallen to that date. If rainfall has been good, fertilizer applications can be increased in anticipation of a good harvest. If, however, rainfall has been poor, plants may be thinned more drastically, leaving fewer plants so that limited water available can sustain the growing crops. In these ways, farmers and pastoralists can achieve the best possible productivity outcomes under increasingly erratic and challenging climatic conditions.

In these case studies, Participatory Action Research was used to introduce farmers and livestock keepers to the concept of using Seasonal Climate Forecasts to inform response farming. In Ethiopia, for example, research teams supported farmers’ experiments to compare traditional practices with response farming packages of choices based on SCFs and research-based recommendations. In this way, they were able to see for themselves which ones performed the best in their own fields.

A wide range of technologies was used in conjunction with SCFs. They included: drip irrigation; various water harvesting technologies (tied ridges, infiltration pits, fanya juus — a type of terracing in which the excavated soil is thrown uphill to form an embankment — pot holes, and zaï – water retaining pits in which seeds are sown); mulching with crop residues; application of green manures, such as the cover-crop legume “mucuna”; compost or animal manure; carefully calculated amounts and timing of fertilizer application; optimum sowing time; choice of drought-tolerant crops and fast-maturing varieties; and adoption of livestock breeds that are more productive and thus result in smaller herds requiring fewer resources

THE STEPS TAKEN: The approach used in these CCAA projects involved mobilization, diagnosis, conceptualization of change, participatory action planning, planning of research actions, implementation and participatory monitoring and evaluation. For the final step, impact evaluation, the project timeframe proved too short.

1. **Mobilization:** *securing the active participation of stakeholders*

A key priority during the mobilization phase was to bring together those responsible for generating the Seasonal Climate Forecasts, those with expertise in their interpretation and those who could use the SCF information to inform practical farming decisions This meant for a broad and diverse group of stakeholders involved in the PAR process, including research institutes, universities, extension personnel, meteorological department staff, NGOs, development workers from the Ministry of Agriculture, and of course the all-important farmers and herders.

In some cases, Benin for example, national committees were formed to establish the links between the authorities responsible for producing the Seasonal Climate Forecasts and those who could interpret and make them available to farmers. In Benin the forecasts were initially produced by the Agence pour la Sécurité de la Navigation Aérienne en Afrique et à Madagascar *(Agency for Aerial Navigation Safety in Africa and Madagascar or ASECNA)* and they were not intended for the agricultural sector. The national committees then obtained the SCFs from ASECNA, and put these together with information they got from the Benin Meteorological Service and from field observations, and used all of this climate and weather information to produce agro-meteorological bulletins throughout the growing season.

In Zimbabwe and Zambia, workshops were held at the district level with representative farmers and extension workers. These workshops were the venues for explaining the concept and benefits of using SCFs.

In Senegal, multi-stakeholder platforms convened by the CCAA-supported InfoClim Project created the opportunity for stakeholders to come together and exchange and share information. Fora held at the local level enabled the project's technical team to provide information to farmers on the likely quality and characteristics of the coming growing season. These fora also enabled elder farmers to share their experience and know-how on the local indicators they traditionally used for weather forecast and farming systems during extreme weather events, including droughts and floods. Following these initial fora in Senegal, some farmers took the initiative to seek out improved seeds, such as cowpea and millet, and try them out for themselves. The following year they then shared the results of their initiatives during similar meetings.

2. **Diagnosis:** *identifying the problem*

During inception workshops or meetings, researchers guided farmers and pastoralists in a process to identify their major problems. For pastoralists, these included increased frequency of drought that led to food insecurity and conflict. For all farmers, the major challenge was the increasing variability and unpredictability of rainfall, which prevented them making effective decisions about which crops and varieties to grow and which complementary soil and water management technologies to employ.

Although farmers and pastoralists were using indigenous climate forecasts and knowledge, these were proving to be inadequate to cope with the increasing variability of rainfall patterns with which they were confronted. The researchers introduced the farmers and pastoralists to the idea of supplementing their indigenous coping strategies with science-based SCFs and expert research-based knowledge of new and improved technologies.

3. **Conceptualization of change:** *envisioning the future*

Having identified the problem, researchers worked with farmers and pastoralists to identify possible solutions. In some cases the desired vision of change had to be adapted to make it realistic. In Kenya, for example, pastoralists initially wanted to have "more rainfall" and hence more good pasture to enable them to enjoy healthy animals, food security, and fewer conflicts with neighbouring tribes. In other cases, Ethiopia for example, a participatory exercise identified current farmers' practices and these were then subjected to simulation models to establish and validate their effectiveness in the current climate. These results were shared with farmers, which informed the selection of which technologies and strategies they chose to test.

4. **Participatory action planning:** *who will do what?*

At the national level, committees were formed to make the Seasonal Climate Forecasts available to farmers, and to synthesize and adapt them so that the farmers could access and use the information.

At the district level, extension workers identified the farmers that were interested in implementing comparative trials in their own fields. They also gave them guidance on how field experimentation should be done and how it could provide answers to the problems that they had identified. Researchers worked closely with farmers and herders in the implementation, recording, analysis and interpretation of the trials.

5. **Planning of research activities:** *designing comparative experiments in farmers' fields*

Based on suggestions made by the farmers, researchers worked with them to design appropriate field experiments. The trials tested the effects of decisions farmers had made about crop and variety selection, tillage methods and

fertilizer treatments informed by the SCFs. The trials they selected were informed by a ranking of farmers' problems in order of importance. In Zimbabwe and Zambia, larger-scale trials were managed by researchers at the district level to address prioritized problems of the districts, and farmers undertook smaller-scale trials at the ward level.

In Benin, farmer field schools were found to be an effective approach that enabled farmers to adopt selected adaptation options and gain experience in their application through learning-by-doing.

In Ethiopia, the various treatments that were compared included: traditional farmers' practices, response farming practices, and use of Seasonal Climate Forecasts and research-based recommendations.

6. Implementation and participatory monitoring-evaluation: *who did what and what happened?*

A simple and highly effective approach was used to enable farmers to see the impact of their management choices. At harvest, examples of the produce, maize cobs for example, were laid out next to the plots in which they were grown. Farmers were then able to see for themselves the different results of different technologies that were used in each plot, and asked to choose which treatments they would have adopted for that season. The researchers then led discussions with the farmers to explore how the different treatments responded to the Seasonal Climate Forecasts.

7. Impact evaluation: *objective assessments of change*

The project cycle was too short to enable formal impact evaluations to be undertaken.

WHAT HAPPENED? PAR enabled farmers to access and use Seasonal Climate Forecasts. Participatory trials enabled them to see for themselves the relative merits and disadvantages of the different technology options that could be used in response to the forecasts.

Using the PAR approach proved to be an effective way of linking up the various actors — those who produced Seasonal Climate Forecasts, but not necessarily for the agricultural sector, with those who could interpret the SCFs and make them available to extension workers and farmers. By working with farmers to facilitate farmer-led experimental trials of different technologies in their own fields, researchers were able to enable farmers to see for themselves which options worked best in which situations and share these results with neighbours.

In Ethiopia, following the completion of field trials, a computer program for a decision support tool was developed.

WHAT WORKED WELL? Feedback from farmers made the SCFs more user-friendly. Farmers increased their capacity to develop solutions to their own problems. Researchers gained better insights into farmers' problems and practices.

Feedback from farmers' experiences using the Seasonal Climate Forecasts helped those responsible for synthesizing the information and making it accessible to and useable by the farmers improve their skills. In this way, it was possible to better adapt the climate information to meet the farmers' needs.

One practical example of an adaptation strategy that worked well with SCF was the adjustment of fertilizer use in response to the Forecast. When the forecast for precipitation in 2008–09 was good, farmers chose to apply a high rate of fertilizer (59 kg per hectare of nitrogen). The SCF proved accurate and rainfall was sufficient at between 800 and 1100 mm. The combination of good rainfall and high fertilizer usage resulted in good yields and a good return on that investment. In contrast, when the forecast was for poor rainfall, lower rates of fertilizer (24 kg N per hectare) and more rigorous weeding proved the best choice.

The PAR approach enabled researchers to work closely with farmers and pastoralists and to carefully document and analyze their farming practices. This afforded the researchers deeper understanding of farmers' problems and practices. By documenting these findings, the researchers can share them more widely. Their exposure to the PAR approach has improved the capacities of farmers and pastoralists to identify problems and to select and test solutions; they are now empowered to deal with their own problems that relate to climate change and variability.

WHAT WERE THE CHALLENGES?

A major challenge is to ensure that Seasonal Climate Forecasts are made available in a timely manner so that farmers can use them to make appropriate management decisions ahead of the coming growing season.

More generally, PAR was found to be very time-consuming and it required a lot of resources. This means that relatively few farmers can benefit directly and it may be difficult to scale-up these initiatives so that more farmers can benefit.

KEY LESSONS:

Using PAR to investigate management responses of farmers, including initial mobilization, jointly designing and implementing field experiments and reviewing the results, proved to be an effective way of adding value to Seasonal Climate Forecasts within a project setting. However, as the direct impact is limited to a relatively few participating farmers, this approach is perhaps best suited to test options and then develop information packages and messages that can be disseminated far more widely. In this way, many more farmers can benefit from timely access to advice based on SCFs and build the resilience of their farms — or herds, in the case of pastoralists — to climate change, developing dynamic response farming systems. In Benin, dissemination of the synthesized SCFs together with practical guidance for farmers using the medium of radio in local languages was one approach designed to achieve this wider impact.

A key lesson from these CCAA projects is that adequate time and resources need to be budgeted for in any future proposals based on Participatory Action Research.

This factsheet draw on experience gained through the implementation of the following CCAA projects:

- Building Adaptive Capacity to Cope with Increasing Vulnerability Due to Climate change (Zimbabwe and Zambia)
- Managing Risk, Reducing Vulnerability and Enhancing Agricultural Productivity under a Changing Climate (Tanzania, Kenya, Ethiopia, Sudan)
- InfoClim : Platform for Helping Vulnerable Communities Adapt to Climate Change (Senegal)
- Enhancing Adaptive Capacity of Pastoralists to Climate Change Induced Vulnerability in Northern Kenya
- Projet de Renforcement des capacités d'adaptation des acteurs ruraux béninois face aux changements climatiques (Benin)

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