Impact assessment on climate information services for community-based adaptation to climate change

Ghana Country Report

C4 EcoSolutions

CARBON I CONSERVATION I CLIMATE I COMMUNITY

Acknowledgements

Authors C4Eco

Dr Glwadys Gbetibouo,
Courtney Hill, Dr Abazaami
Joseph, Dr Anthony Mills,
Dirk Snyman and Onno Huyser

June 2017

Support by CARE International ALP Programme

Maurine Ambani

Table of contents

Acronyms and abbreviations

AAPs	Annual Action Plans
ALP	Adaptation Learning Programme
CBA	Community-based adaptation
CBEAs	Community-based extension agents
CBOs	Community-based organisations
CFTC	Canadian Feed the Children
CICs	Climate Information Centres
CIS	Climate Information Services
CMs	Community monitors
DAs	District Assemblies
DDF	District Development Facility
DfID	Department for International Development
DMTDPs	District Medium-Term Development Plans
DoA	District Departments of Agriculture
DPCU	District Planning Coordinating Unit
DRM	Disaster risk management
DRR	Disaster risk reduction
ENRACCA-WA	Enhancing Resilience and Adaptive Capacity to Climate Change through Sustainable Land, Water and Nutrient Strategies in West Africa
FBOs	Farmer-based organisations
FGDs	Focus-group discussions
FOAT	Ministry of Local Government's Functional Organisational Assessment Tool
FRI	Farm Radio International
GEPA	Ghana Environmental Protection Agency
GHS	Ghana Health Services
GMET	Ghana Meteorological Agency
GNFS	Ghana National Fire Service
HESP	Household Economic Security for Poor Women Smallholder Farmers Project
ISD	Information Services Department
KIIs	Key informant interviews
LAC	Local Adaptive Capacity
MIS	Management Information Systems
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MoFA	Ministry of Food and Agriculture
NADMO	National Disaster Management Organisation
NCAP	Netherlands Climate Assistance Programme
NGOs	Non-governmental organisations
PARED	Partners in Rural Development and Empowerment
PAS	Presbyterian Agricultural Station
PICSA	Participatory Integrated Climate Services for Agriculture
PSP	Participatory Scenario Planning
SARI	Savanna Agricultural Research Institute
UDS	University for Development Studies
UNU-EHS	United Nations University Institute for Environment and Human Security
USAID	United States Agency for International Development

UWR	Upper West Region
VSLAs	Village Savings and Loans Associations
WA-WASH	West Africa Water Supply, Sanitation Hygiene Programme

Impact assessment on climate information services for community-based adaptation to climate change

Ghana Country Report

Executive summary

Changes in annual rainfall amounts and seasonal rain and temperature patterns are experienced by many communities in north-eastern Ghana. These changes often create problems for vulnerable farmers and other land-users in securing their livelihoods. For this reason, effective strategies and plans for adaptation to both climate change and climate variability are central to the CARE Adaptation Learning Programme (ALP) in Ghana.

Based on early experiences of ALP in Kenya, CARE introduced the Participatory Scenario Planning (PSP) process in north-eastern Ghana in 2012. The PSP process is a community-based adaptation approach to climate information services (CIS). Through workshops, PSPs provide a platform for multi-level stakeholders where individuals with different expertise and knowledge collaborate to interpret short-term climate forecasts and develop potential scenarios and advisories based on forecasts for the coming rain season. Following the development of advisories, they are packaged and communicated to users through a variety of channels, including *inter alia* SMS, radio broadcasting, brochures and informal meetings.

Along with PSPs, rain gauges and Climate Information Centres (CICs) have been introduced as an integrated CIS approach in Ghana. Rain gauges are community-operated and provide localised weather data, which helps to contextualise the forecasts used in PSPs. The advisories generated through PSPs are then communicated through the CICs, along with other relevant information. By involving the community at every step of the information-creation cycle, this process fosters user confidence and familiarity with the resulting advisories.

The integration of the three CIS pathways was first implemented in East Mamprusi and Garu-Tempane Districts. Since 2012, the process has been upscaled to five other districts in the country, namely Nadowli-Kaleo, Tain, Kokoben, Asebu-Ekuful and Saviefe.

This country report forms part of a regional impact assessment by CARE Adaptation Learning Programme on CIS for community-based adaptation to climate change. The regional assessment was conducted across Ethiopia, Ghana, Kenya, Malawi and Niger. Specifically, the Ghana Country Report presents the results of the impact assessment on the introduction of CIS in three Northern Ghana districts. The Ghana Country Report presents an analysis of community feedback collected from face-to-face interviews and conclusions from

previous annual PSP reports to critically assess the successes and failures for each of the three CIS pathways and how they interlink.

The PSP process has been an overall success in Ghana. PSP workshops are now part of an integrated CIS approach that includes CICs and rain gauges to facilitate community-based climate adaptation. As a result of ALP partnering with a decentralised local government such as the Ghanaian District Assemblies (DAs), there has been a promotion of local ownership in the process. Communities have begun to show acceptance of the PSP process, with community members putting pressure on DAs to organise workshops. Local community members have demonstrated an awareness of the need for quality climate information. PSPs are an evolving practice and innovations and variations introduced into the PSP process in Ghana demonstrate a number of good practices and successes for the overall process.

Using information from PSP advisories, communities are implementing proactive measures into their rain season preparation, such as: i) planting early-maturing and climate-tolerant crop cultivars; and ii) implementing climate-smart agricultural practices[1]. The adoption of these proactive measures has helped to improve overall food security and income in communities, even throughout dry periods and droughts. At the district level, the multi-stakeholder process of the PSP workshops has provided strategic networking and collaborative opportunities for district departments to address their respective Disaster Risk Reduction (DRR) mandates. Before PSP implementation, the various district departments were insufficiently equipped with the necessary tools to enhance cross-sectoral collaboration and partnership for DRR responses.

The future success of the PSP process in the country will rely on a smooth and effective hand-over process from CARE to the Ghanaian DAs. This process should be informed by challenges identified, lessons learned and recommendations highlighted in this country report. Hand-over should maintain a flexible and locally-attuned PSP process that continues building the resilience of communities in Ghana.

[1] Including *inter alia* composting, staggered planting, fertiliser micro-dosing and minimum or zero tillage.

1. Introduction

1.1. Climate change risks and vulnerabilities in Ghana

Ghana is situated on the West African coast, with a population of ~24.6 million. [2] Administratively, the country is divided into ten regions that span a variety of agro-ecological zones from Sudan Savanna and Guinea Savanna in the north, to Transition Zone, Semi-deciduous Forest zone, Rain Forest Zone and Coastal Savanna Zone in the middle and southern parts of the country, respectively (Figure 1[3]).

Annual temperatures typically stay above 24°C [4] and rainfall patterns vary between agro-ecological zones with increasing aridity from the coastal zones to the northern zones. Mean annual rainfall ranges between 800 and 2,400–2,800 mm.[5] The Guinea and Sudan Savanna zones, which categorise the northern areas of Ghana, experience only one rain season whereas the other parts of the country experience a bi-modal system (Table 1).

Table 1. Climates of the agro-ecological zones, including rainfall and range[6].

Agro-ecological zone	Area (km^2)	Mean annual rainfall (mm)	Range (mm)	Major rain season months	Minor rain season months
Guinea Savanna	147,900	1,000	800–1,200	May–Sep	*Unknown*
Sudan Savanna	2,200	1,000	*Unknown*	May–Sep	*Unknown*
Transitional Zone	8,400	1,300	1,100–1,400	March–July	Sep–Oct
Deciduous Forest	66,000	1,500	1,200–1,600	March–July	Sep–Nov
Rainforest	9,500	2,200	800–2,800	March–July	Sep–Nov
Coastal Savanna	4,500	800	600–1,200	March–July	Sep–Oct

Agriculture is an essential contributor to the Ghanaian economy, providing employment to ~57% of its labour force and contributing ~44% to the Gross Domestic Product (GDP)[7]. The stable production of cash crops relies almost entirely on rain-fed agriculture. Consequently, the amount and pattern of rainfall play a determining role in agricultural productivity and agricultural production is sensitive to droughts and floods[8].

The degree of crop failure and community vulnerability is greatest in the three northern districts, namely Upper East, Upper West, and the Northern District (Figure 2 and 3[9]). These

[2] Ghana Statistical Service. 2010.
[3] Images available at: https://www.deboomfotografie.nl/map-of-africa-ghana.html [accessed 15.08.2016]; and sourced from Ghana Statistical Service 2010.
[4] Ghana Environmental Protection Agency (GEPA). 2001.
[5] Ghana Government. 2008. Ghana climate change impacts, vulnerability and adaptation assessment: under the Netherlands Climate Assistance Programme (NCAP), Accra, Ghana
[6] FAO. 2016. Fertiliser use by crop in Ghana. Natural Resources and Environment Department, Ghana. Available at: http://www.fao.org/docrep/008/a0013e/a0013e05.htm [accessed 25.08.2016].
[7] Ministry of Food and Agriculture (MoFA). 2007. Food and Agriculture Sector Development Policy. Ghana Government Policy Document. Accra, Ghana.
[8] MoFA 2007; Seini AW, Botchie G & Damnyag L. 2004. Environmental services provided by selected farming systems in Ghana. Technical Publication Series No. 65. Institute for Statistical, Social and Economic Research, University of Ghana, Legon, Accra, Ghana.
[9] Images sourced from Ghana Statistical Service 2010.

districts include ~453,000 individuals that are currently considered food insecure[10]. The Sudan and Guinea Savanna agro-ecological zones that characterise these regions experience a unimodal rainfall pattern and contain agro-ecosystems that become easily degraded in response to changing climate patterns. These areas experience dry conditions, poor soil fertility and increased desertification that impacts directly on the food insecurity of local communities, making them further vulnerable to climate change[11].

Similar to other African countries, Ghanaian communities are increasingly vulnerable to climate change because of *inter alia*: i) their dependence on rain-fed agriculture; ii) increasing poverty levels; iii) a lack of capacity of both human and capital resources; and iv) inadequate infrastructure.[12] Future climate change predictions in Ghana include annual mean temperature increases[13] and predicted decreases in mean annual rainfall for the same periods[14;15]. This predicted warming and drying will coincide with greater rainfall variability, leading to increased intensity and frequency of extreme drought and flood events[16]. The increase in temperature will result in greater evaporation; along with a decrease in rainfall, this will further reduce available water and result in a shortening of the crop-growing season in Ghana[17]. This shortening will impact crop yields and food security for communities, especially in the Guinea and Sudan Savanna agro-ecological zones which are exposed to increasing drought events[18].

[10] Rademacher-Schulz C, Schraven B & Mahama ES. 2012. Rainfall, Food Security and Human Mobility: "Where the rain falls" project. Case study: Ghana. Results from Nadowli District, Upper West Region. Report No. 3. United Nations University Institute for Environment and Human Security (UNU-EHS), Bonn.
[11] Antwi-Agyei P, Fraser EDG, Dougill AJ, Stringer LC & Simelton E. 2011. Mapping the vulnerability of crop production to drought in Ghana using rainfall, yield and socio-economic data. Centre for Climate Change Economics and Policy. Working Paper No. 55.
[12] Africa Partnership Forum. 2007. Climate Change and Africa. 8th Meeting of the Africa Partnership Forum. Berlin; Intergovernmental Panel on Climate Change. 2007. Summary for Policy-makers. In Parry ML et al. (eds.) "Climate Change 2007: Impacts, Adaptation and Vulnerability" Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge; Laux P, Jäckel G, Munang R & Kunstmann H. 2010. Impact of climate change on agricultural productivity under rain-fed conditions in Cameroon – a method to improve attainable crop yields by planting date adaptations. *Agricultural and Forest Meteorology* 1258–1271.
[13] Expected annual rainfall increases of 0.6°C6°C, 2.0°C0°C and 3.9°C9°C by 2020, 2050 and 2080, respectively.
[14] Rainfall amount is expected to decrease by 2.8%, 10.9% and 18.6% for 2020, 2050 and 2080, respectively.
[15] GEPA 2011.
[16] Reynolds RW, Smith TM, Liu C, Chelton DB, Casey KS & Schlax MG. 2007. Daily high-resolution blended analyses for sea surface temperature. *Journal of Climate* 20:5473–5496 in Reynolds RW (ed.) 2009 "What's New in Version 2" OISST Webpage.
[17] Lobell DB, Bänziger M, Magorokosho C & Vivek B. 2011. Non-linear heat effects on African maize as evidenced by historical yield trials. *Nature Climate Change* 1:1–4.
[18] Antwi-Agyei et al. 2011.

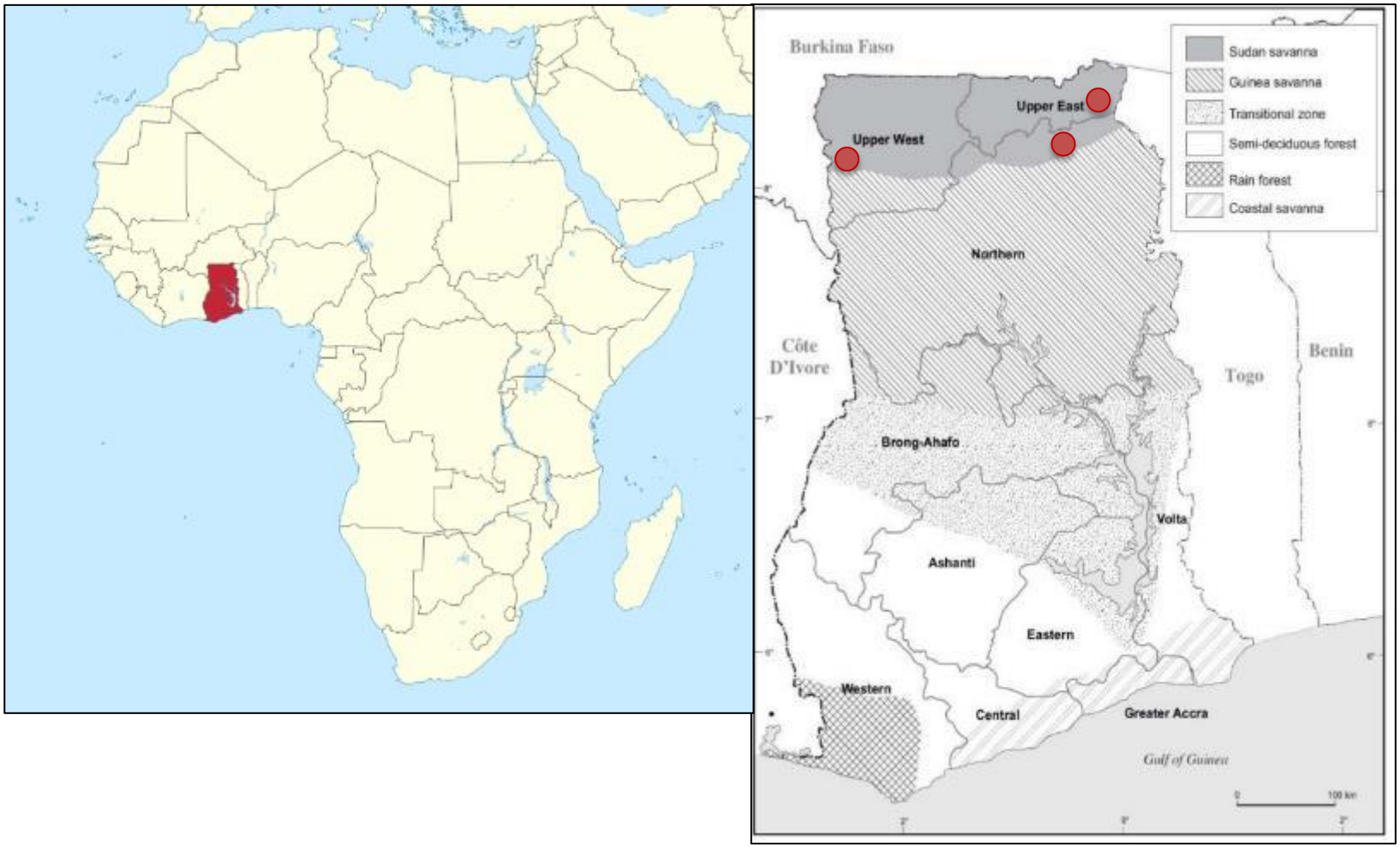

Figure 1. *Left:* Map of Africa indicating the location of Ghana in West Africa. *Right:* Administrative regions and agro-ecological zones of Ghana. The red dots indicate Nadowli-Kaleo District in the Upper West Region, Garu-Tempane District in the Upper East Region and East Mamprusi in the northern-most area of the Northern Region.

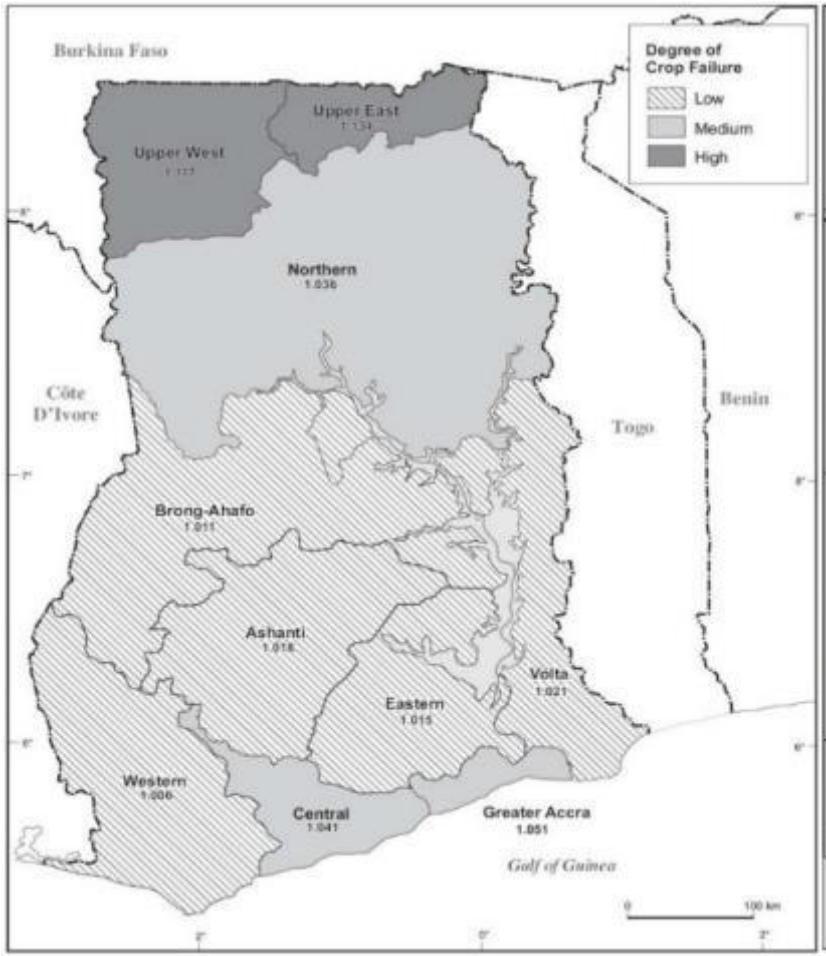

Figure 2. Degree of crop failure by district in Ghana. The greatest crop failure was experienced in the northern-most districts.

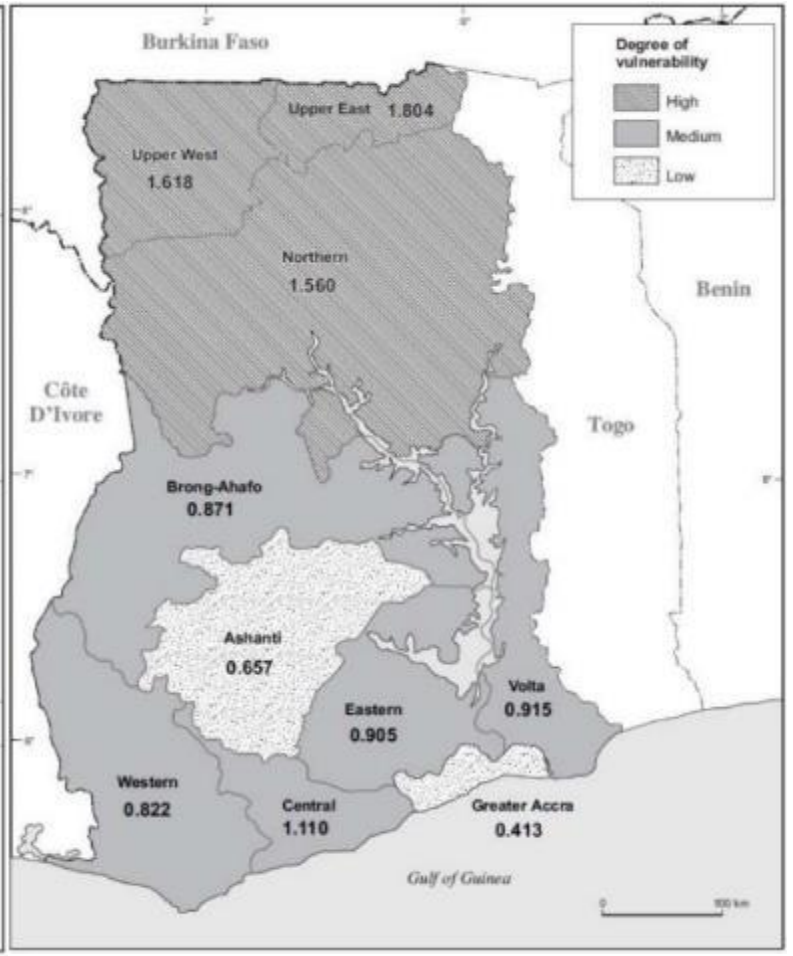

Figure 3. Degree of vulnerability to drought by district in Ghana. The greatest vulnerability is experienced by communities in the northern districts.

1.2. The Adaptation Learning Programme in Ghana

The Adaptation Learning Programme (ALP) is an initiative that was developed by CARE in 2010. This initiative was created in response to community-level research indicating that climate change had already impacted on the food and income security of many vulnerable African communities, particularly women and other marginalised groups. ALP is funded by the Department for International Development (DfID) in the United Kingdom, the Ministry of Foreign Affairs of Denmark, the Ministry of Foreign Affairs of Finland and the Austrian Development Cooperation. Originally scheduled to end in 2014, ALP was extended until 2017 in response to the positive impacts of the programme on local communities in the target countries[19].

The overarching goal of ALP is to increase the capacity of vulnerable households in sub-Saharan Africa to adapt to climate change and variability. Through ALP, local communities are given the opportunity to build their adaptive capacity using a number of innovative community-based adaptation (CBA) approaches. Participatory, community-based approaches have been created that aim to increase resilience and inform decision-making through the availability and distribution of climate information and forecasts. CARE's approach to CBA, together with the Local Adaptive Capacity (LAC) framework, provide the conceptual underpinning to ALP's work.

Climate information needs to be packaged in a manner that is easily accessible to communities. Information that is relevant to a community should encompass traditional and historical observations as well as more formal, science-based measurements. Together, these observations and measurements can be used by on-the-ground climate information systems (CIS) to inform communities. Access to climate information through CIS is critical where small-scale agriculture is an integral part of livelihoods and is threatened by climate change and climatic variability. CBA-based CIS assist small-holder farmers, amongst others, to improve their understanding of climate change and variability. This allows them to assess the impact of climatic factors on agricultural production and their livelihoods.

ALP has developed a form of CIS that is based on CBA, known as Participatory Scenario Planning (PSP). The aim of this CIS approach is to increase the capacity of local communities to better adapt to climate change and variability through a process of working together to generate advisories based on climate forecasts for the next rain season. ALP is working in Ghana in partnership with communities, local civil societies and government institutions to:

- develop and apply innovative approaches to CBA to generate best practice models;
- empower local communities and civil society organisations to have a voice in adaptation decision-making;
- promote good practice models for CBA among adaptation practitioners;
- influence national, regional and international adaptation policies and plans; and
- to contribute to the global knowledge base on CBA.

[19] The seven-year programme has a budget of US$13 million.

In Ghana, ALP was initially implemented in eight communities across Garu-Tempane and East Mamprusi Districts, but the programme has recently scaled up to include four additional communities in the Nadowli-Kaleo District of the Upper West Region. In Garu-Tempane District specifically, ALP is working with a local partner organisation, the Presbyterian Agricultural Station (PAS), in four communities, namely: i) Kugri; ii) Farfar; iii) Akara; and iv) Tariganga. In East Mamprusi District, ALP is working with the initiative, Partners in Rural Development and Empowerment (PARED), in four communities: i) Dimia; ii) Jawani; iii) Saamini; and iv) Zumbulgu.[20]

Stakeholders aimed to be included in the ALP initiative in Ghana include the ~14,000 vulnerable households in the eight targeted communities. ALP also intends to build the capacity of local civil society organisations, local planning authorities, government service providers and community-based organisations (CBOs) on the integration of CBA into their development plans. At the national level, ALP aims to establish relationships with national-level, non-governmental organisations (NGOs) to build the capacity of actors to advocate for appropriate policies, mechanisms and programmes for adaptation and to include climate information as a priority[21]. Finally, practitioners in the adaptation and development communities are targeted through practitioner networks, conferences and publications.

A few of the projects run by ALP Ghana are outlined below.

- The creation of Village Savings and Loan Associations (VSLAs) that increase and enhance poor communities' access to credit facilities for the purchase of climate-tolerant seeds in preparation for the coming rain season. Further to this, VSLAs provide support to the diversification of community livelihoods to reduce vulnerability to climate-related disaster risks.
- Developing conservation agricultural practice methodologies, including compost preparation and application, minimum and zero tillage practices and others aiming for improvements in, namely: i) soil fertility; ii) soil conservation; iii) farm management; and iv) crop production.
- Community seed multiplication initiatives of maize, soya, millet and early-bulking cassava trials, aiming to improve access to more climate-resilient crop varieties.
- Developing CISs that encompass *inter alia*: i) sharing and interpreting seasonal forecasts to develop advisories for the coming rain seasons through PSP workshops; ii) installing and establishing rain gauges in communities; and iii) establishing Climate Information Centres (CICs)[22].

[20] Population figures for the eight communities associated with ALP Ghana are included in Annex 1.
[21] ALP also targets various international institutions for collaboration at the national and regional levels across Africa.
[22] Climate Information Centres (CICs) are discussed in Section 1.3 (below) on the different CIS approaches in Ghana.

1.3. Climate information service approaches in Ghana

Changes in annual rainfall amounts and shifts in seasonal rainfall patterns are being experienced by many communities in north-eastern Ghana. These changes impact vulnerable farmers and other land users, who must adapt their practices to secure their livelihoods. For this reason, effective strategies and plans for adaptation to both climate change and climate variability are of central importance to ALP in Ghana. Effective adaptation to climate variability and climate change is dependent on timely access to climate information for the coming season; such information enables communities to make informed decisions for their livelihoods.

Flexible forward planning in the face of a continuously changing climate needs to be informed by climate forecasts. Such planning allows the effects of uncertainties and risks on different vulnerable groups and socio-economic sectors to be determined so as to identify a range of response options. Scenario development contributes to making livelihoods more climate resilient. It can also be a first step towards mitigating the effects of climate-related disasters on communities. The PSP process seeks to communicate climate projections and local observations to support agricultural decision-making, specifically for climate-resilient livelihoods and disaster risk reduction (DRR) actions.

ALP has been implemented in Ghana since 2012, specifically focusing on three forms of CBA-based CIS. These three approaches are described below.

- **Participatory Scenario Planning (PSP) workshops**. PSP workshops are a mechanism for the collective sharing and interpretation of climate forecasts. They are attended by a combination of community members and technical experts that co-create evidence-based and locally-attuned adaptation strategies. PSP workshops are conducted as soon as seasonal climate forecasts are made available from the Ghana Meteorological Agency (GMET). The PSP process seeks to communicate climate projections and local observations to support agricultural decision-making, specifically for climate-resilient livelihoods and disaster risk reduction (DRR) actions. Advisories are packaged and disseminated following the completion of the workshop, providing details for the start and end dates of the predicted rainfall. These dates assist farmers in making informed decisions including *inter alia*: i) when to plant; ii) the type of crops to plant; and iii) when to harvest. The workshops involve a multi-stakeholder platform with the aim to create trust between the different stakeholder levels and allowing for reviews and knowledge sharing to occur. The different stakeholder levels are arranged as follows:
    - users are those individuals and groups that use advisories and climate information to make informed decisions for the coming rain seasons. They include individual community members and farmers;
    - intermediaries include those institutions that are involved in organising or facilitating the PSP process, providing technical guidance and funding to the process or assistance in the dissemination of advisories, including *inter alia* local government planners, sector-based service providers and NGOs; and
    - climate information producers include all collectors and providers of climate data and weather forecasts, i.e. national meteorological services.

  PSPs have been implemented in the East Mamprusi and Garu-Tempane Districts located in the Upper East and Northern Regions, respectively, since the 2012 rainfall season. This implementation is through collaboration between ALP, local communities, the

GMET, District Assemblies (DAs), the Ministry of Food and Agriculture (MOFA), agricultural research organisations, the National Disaster Management Organisation (NADMO), local and international NGOs, and other local actors, with strong participation by the media. DAs and staff from MOFA have been trained on the PSP process, with DAs now taking the lead in implementing the approach in the two districts. PSPs have been upscaled to five other districts in the country, namely: i) Nadowli-Kaleo District (Upper West Region); ii) Tain District (Brong Ahafo Region); iii) Kokoben District (Eastern Region); iv) Asebu-Ekuful District (Central Region); and v) Saviefe District (Volta region).

- **Community rain gauges**. Rain gauges have been installed in communities where ALP is piloting the CBA approach. Through collaboration with national meteorological services, community monitors have been trained on taking rainfall records from the rain gauges and forwarding the information to national meteorological services. The collected information is helping to build historical rainfall data records for the specific locations, which can be used for downscaling seasonal forecasts and generating location-specific climate information products. Rain gauges were successfully installed in Garu-Tempane and East Mamprusi Districts in 2011, in six different communities with monitors that are trained by GMET on rainfall recording.

- **Climate Information Centres (CICs)**. CICs have been established through a joint initiative between the CARE International ALP and FARM Radio International[23]. The purpose of the CICs is to use the development of radio broadcasting in hard-to-reach, rural areas of Ghana so as to provide smallholder farmers with a range of climate information relevant to cultivation practices. Weather forecasts, farming best practices, tips on the appropriate period for cultivation and other information is broadcast to farmers, helping them reduce the vulnerability of their activities to adverse climate change conditions[24].Through collaboration between ALP, FARM Radio International, local FM radio stations and GMET, CICs have successfully been established in the Saamini community of the East Mampurusi District, and the Tariganga community of the Garu-Tempane District. CICs aim for gender-neutral access to information on climate forecasts, agro-meteorological advisories from PSP workshops, agricultural extension services and an array of market information to inform their livelihood activities. CICs are managed by the communities, with technical support from GMET and Farm Radio International. Community volunteers run the CICs by linking radio broadcasts to loudspeakers to enable information broadcasts to reach wide community audiences. In addition, CICs link broadcasts to mobile phones for call-in programmes as well as general weather information dissemination from GMET and other services (such as ESOKO). CICs receive transmissions from the FM stations and transmit to communities and also respond to climate information queries from community members.

ALP implementation of the PSP process in Ghana constitutes an innovative participatory approach to the delivery of climate information. Using three different CIS pathways that complement each other allows for a more efficient method of communicating climate information than if the advisories were disseminated stand-alone.

[23] FARM Radio International. 2014. Implementing Innovative Climate Communication Systems. Care International.
[24] FARM Radio International. 2014. Implementing Innovative Climate Communication Systems. Care International.

1.4. Objectives of the impact assessment

This country report is part of a CARE-commissioned regional impact assessment evaluating the impact of the ALP approaches to CIS in addressing climate change adaptation across five sub-Saharan African countries, namely Ethiopia, Ghana, Kenya, Malawi and Niger. The overall objective of the regional assessment is to explore the value and impacts of CIS approaches on CBA through evaluating the effectiveness of ALP and other adapted processes in each country. This Ghana Country Report serves to showcase the results of an assessment on the three ALP-developed CIS approaches currently underway in the country in order to contribute to the regional impact assessment.

Specifically, the assessment was designed to assist the ALP team and ALP stakeholders with the tasks outlined below.

- Developing a better understanding of the situations in which the ALP approach to CIS worked well, and those where it did not, in order to progress understanding of what works, where it works, for whom and why.
- Assessing the overall value and impacts of CIS approaches developed by ALP.
- Drawing on this understanding and assessment to progress and strengthen the continuing upscaling and outscaling of the ALP approach to CIS.
- Reconstructing the theory underlying the ALP and CIS programme, and assessing its underlying assumptions, as a means to identifying which mechanisms were in operation, in what contexts and why.

This country report contributes to the overall regional impact assessment objective by assessing the following in Ghana.

- The level of PSP adoption/uptake and major changes or innovations of the PSP process in Ghana.
- The level and effectiveness of communication sharing and the use of different tools.
- The value and impact of PSPs, CICs and rain gauges in Ghana, with a focus on PSPs. Particularly, on how the approaches have strengthened adaptive capacity and community climate resilience.
- The role and effectiveness of CICs in translating and disseminating climate information over and above other dissemination channels.
- The links between PSPs, CICs and rain gauges implemented by ALP.
- The factors hindering or enabling the transition of the three approaches from a pilot phase to a country-wide adoption as an effective approach for delivering CIS that responds to community needs.
- Potential linkages between long-term adaptation/resilience programming, disaster preparedness and early action through PSPs.

2. Analytical framework

The analytical framework for this impact assessment is based on a social learning methodology and practice[25]. The impact assessment is directed by the following underlying

[25] Ensor E & Harvey H. 2015. Social learning and climate change adaptation: evidence for international development practice. *WIREs Climate Change* 6:509–522.

conceptual approaches: i) the CARE CBA approach; and ii) the subsequent LAC [26] framework. ALP understands learning to be a:

> *"…social process, bringing people together for meaningful conversations that lead to action and using practical innovation as a learning process… as ALP's learning on climate change impacts and CBA evolve, new reasons for putting learning at the centre of adaptation have emerged."*[27]

Overall, successful adaptation is measured in terms of the learning and decision-making processes that are *inter alia*: i) capable of drawing on knowledge about risks and uncertainties; ii) evaluating the response options planned and implemented; and iii) creating the conditions for adaptation actions [28]. Adaptation and the enabling decision-making processes are consequently not static, but dynamic in nature. These processes constantly evolve and improve with newly emerging information and understanding.

The ALP theory of change involves two main components that feed into the PSP process outlined below.

- **Knowledge and information**. The first component consists of seasonal forecasts, local knowledge and other relevant scientific and technical knowledge.
- **Institutions and entitlements**. The second component involves multiple and multi-level stakeholder participation, including *inter alia* meteorology services, government representatives, local-level governing bodies, communities, extension officers and NGOs.

Social learning occurs at the level of processes between actors. This level allows for trust-building, learning and empowerment to make informed decisions. There are several key assumptions that underpin the multi-stakeholder social learning praxis and design. These assumptions shape the PSP process and are outlined below[29].

- Enable communicating, sharing, understanding and interpretation of climate information.
- Through the development of scenarios, PSPs enable the assessment of risks and uncertainties, linking climate information to decisions concerning livelihood activities in preparation for the coming year.
- Provide opportunities for dialogue on local adaptation challenges and options[30]. These processes, in turn, promote: i) flexible and forward-looking decision-making and governance at both community and government level; ii) an enabling policy environment; and iii) innovation.
- Through trust and relationship-building designed into the workshop process, the PSP process provides opportunities for dialogue on local adaptation challenges and options, and agreement of ways forward.

---

[26] Jones L, Ludi E & Levine S. 2010. Towards a characterisation of adaptive capacity: a framework for analysing adaptive capacity at the local level. *Overseas Development Institute* 50.
[27] CARE. 2015. Adaptation Learning Programme: ALP Results, Outcomes and Impacts Report. January 2010 to June 2015.
[28] Leary N, Adejuwon J, Barros V, Burton I, Kulkarni J & Lasco R. 2008. Climate change and adaptation. Earthscan, London, United Kingdom; Osbahr 2007.
[29] Ambani M & Percy F. 2014. Facing uncertainty: the value of climate information for adaptation, risk reduction and resilience in Africa. CARE International, Adaptation Learning Programme. Available at: http://careclimatechange.org/wpcontent/uploads/2014/08/C_Comms_Brief.pdf
[30] Ambani & Percy 2014. Facing uncertainty.

3. Investigations and methods

3.1. Data collection

Data was collected using multiple methods, including focus-group discussions (FGDs), key informant interviews (KIIs), participation at selected 2016 PSP workshops, field visits to selected CICs and rain gauge locations, and a review of available literature and previous reports. Further to this data collection, field observations and photographs informed the analysis. The use of these varied methods ensured comprehensiveness and triangulation for better reliability and accuracy of the collected data. The five data collection methods are detailed below:

- **Focus-group discussions (FGDs)**. The PSP impact assessment was undertaken at the local community level using FGD session guides. The FGDs were conducted in Tariganga and Kugri communities of Garu-Tempane District and Chaang and Nadowli-Dambaa communities of Nadowli-Kaleo District. Tariganga, Kugri and Chaang are ALP communities whereas Nadowli-Dambaa was selected as a control community to identify any differences between beneficiary and non-beneficiary communities. Three groups were targeted for the FGDs, including beneficiaries and non-beneficiaries of ALP as well as community representatives participating in PSPs.
- **Key informant interviews (KIIs)**. In Garu-Tempane and Nadowli-Kaleo Districts, 15 face-to-face interviews were undertaken with various stakeholders who were involved in the implementation of ALP. The purpose of the KIIs was to: i) assess participants' perspectives on the CIS approaches, the steps, communication tools and impacts; and ii) generate evidence of CIS learning in the planning process, as well as sustainability and upscaling of the three ALP approaches. Details of those interviewed during KIIs are included in Annex 2.
- **Participation at selected 2016 PSP workshops**. During the in-country field mission, selected PSP workshops were attended in Garu-Tempane and Nadowli-Kaleo Districts to assess: i) the quality of PSPs; ii) participation during the workshops; iii) the overall social learning process; iv) products developed from the workshops; and v) the dissemination and communication of climate information in the different districts. Additionally, baseline information necessary for identifying participants for further assessment interviews and FGDs was collected. Stakeholders from similar initiatives that do not fall under the ALP umbrella were also consulted.
- **Field visits to selected CICs and rain gauge locations**. During the in-country field mission, two communities were visited to evaluate the impact and effectiveness of rain gauges and CICs. The selected villages were Taringaga and Akara in the Garu-Tempane District.
- **Review of literature and previous reports**. Extensive desktop reviews were undertaken to compare the objective and expected outcomes of the ALP initiative with its achievements. The review concentrated particularly on the seasonal PSP reports produced by districts where PSPs were held. Information from these PSP reports was used to answer the three lines of investigations of the impact assessment, namely the implementation process, communication, and use and impact.

3.2. Lines of investigation

Four main aspects were investigated during the impact assessment. These are described below.

- **Implementation process** (method): assessment of the practice of PSP principles implemented and the way in which it is carried out between counties.
- **Communication**: assessment of the reach, content and quality of advisories and assessment of the communication channels used to disseminate such advisories.
- **Use and impact**: assessment of the use and impact of the advisories on the users, i.e. whether they implemented the advisories in practice and whether they trust the information source.
- **Sustainability**: assessment of the potential for the process to be long-lasting beyond the lifespan of ALP in Ghana.

3.2.1. Line 1: implementation process

The first stage of the impact assessment focussed on the following criteria in Ghana.

- Analysing the PSP process and considering improvements and innovations in design and implementation.
- Analysing interactions between the different stakeholders, namely the users, intermediaries and climate information producers, on the process of:
    - integrating local and scientific knowledge to develop a common understanding for all stakeholders;
    - producing plans and actions for seasonal decision-making and providing the opportunity for long-term planning; and
    - interpreting seasonal forecasts and the level of uncertainty in delivering user-responsive CIS.
- Analysing the ability of the PSP process to integrate feedback for specific climate information needs.

3.2.2. Line 2: communication

The effectiveness of climate information in supporting informed decision-making and planning for all stakeholders is largely dependent on the reach and appropriateness of communication.

Assessing communication involved the following criteria.

- Evaluating how seasonal forecasts and uncertainty is communicated through the various channels of communication.
- Analysing the differential reach of communication of advisories to the different user groups, taking into account livelihoods, gender, age and sectors. This meant assessing by: i) cross-tabulating information on content and different users at the community and local levels; and ii) evaluating the range of channels of communication and their access by the different user groups.

3.2.3. Line 3: use and impact

The assessment of use and impact provides evidence of the impacts PSPs have had on i) users, such as *inter alia* farmers and agro-pastoralists; ii) climate information producers; and iii) intermediaries. Further to this, the assessment takes into account gender, context, sectors and levels, as outlined below.

- Capturing any change in knowledge, attitude and practices, considering any changes specifically for: i) users, e.g. decision-making processes or changing information needs; ii) intermediaries, e.g. provision of climate-informed agriculture methods, DRR and other

sectoral services; and iii) climate information producers, e.g. understanding different user information needs and developing more user-responsive climate information products and services.
- Analysing the resulting livelihoods, poverty reduction, DRR and sectoral development measures adopted by the different users.
- Demonstrating productivity gains in agriculture and other relevant sectors, where possible.
- Investigating the resulting effects on planning processes and decision-making at the community and local levels in terms of promoting and integrating CIS in adaptation, DRR, agriculture and development.

3.2.4. Sustainability of the Participatory Scenario Planning process, communication and impact

The sustainability of the PSP process is an overarching theme that spans the three lines of investigation measured above. This is assessed separately, analysing the previous and current success of the PSP process and the likelihood of continued successes in the future. Analysing sustainability involves gauging how PSPs can continue to contribute to user-based CIS for on-going adaptation and climate-informed decision-making.

This report analyses the various levels of evidence of sustainability in different regions and districts of Ghana. The sustainability analysis assists with identifying the enabling, challenging and failure factors that influence the integration of PSPs into: i) sectoral and development planning processes; ii) sustainable CIS systems; and iii) appropriate institutions.

4. Results and analysis

This section summarises the findings from the FGDs, KIIs, short case studies and the data taken from the review of past PSP reports. Using these findings, this section is focused on addressing the lines of investigations identified in Section 3.2.

The analyses are qualitative, focusing on the content of the questionnaires. Information extracted from the interview data and literature review was categorised for classification, summarisation and tabulation to outline descriptive as well as interpretative results. Descriptive results are what the data shows (i.e. evidence), whilst interpretative results are what the data means. Short case studies have been illustrated to assist with assessing the findings and drawing lessons. From these, recommendations have been made to improve the on-going ALP approach to CIS and inform broader development and support for user-based CIS in Ghana.

4.1. Implementation process

Under this section, the following divisions are used to guide and illustrate the discussion points: i) analysing the PSP process and considering improvements and innovations in design and implementation; ii) assessing the value of PSP workshops, rain gauges, CICs and the synergies between them for informing decision-making; and iii) assessing the PSP

principles upheld in the process for delivering user-responsive CIS. Each sub-section is further divided into observations and analysis to illustrate the description and interpretive results.

4.1.1. Participatory Scenario Process: adaptation, changes and innovation in design and implementation

Observations

The original principles and steps of conducting PSP workshops have been generally maintained in Ghana since its introduction. PSPs in Ghana are facilitated similarly to those in Kenya, with an agricultural focus. However, Kenyan PSPs are conducted at the national level, under the leadership of the Agriculture Sector Development Support Programme (ASDSP) of the Ministry of Agriculture. Ghanaian PSPs fall under the leadership of District Assemblies (DAs), a local government entity. DAs are the administrative and developmental decision-making entity in the districts and form the basic unit of government administration at the local level. In addition, DAs are the highest political, administrative, planning, development, budgeting and rating authorities in the districts and as such are effective partners for CARE in the facilitation of development initiatives such as ALP. In districts such as Garu-Tempane and Nadowli-Kaleo, DAs form a mobiliser role for organising PSP stakeholders, also providing funding and necessary human and material resources. Over the years that PSPs have been run in Ghana, the following changes have been observed in the implementation process.

- **Shift in the organisation and facilitation of PSPs over time.** The range of stakeholders supporting the PSP process has widened since its first introduction to Ghana in 2012 when ALP was the only sponsor and facilitator. Currently, however, the DAs are responsible for organising the workshops, from the mobilisation of stakeholders to the dissemination of advisories, including workshop facilitation. In addition to a shift in facilitation structure, in 2014, an increase became evident in the range of stakeholders supporting the PSP process. Subsequently, the PSP process has evolved in Ghana to include representatives from ongoing projects as stakeholders and workshop participants. This increase and broadening of the reach of stakeholders has resulted in partnerships being developed with various institutions, namely:
    - ‘West Africa Water Supply, Sanitation Hygiene Programme’ (WA-WASH), run by the United States Agency for International Development (USAID), which has the objective to increase community access to potable water to improve sanitation;
    - Pathways Programme, run by CARE, which aims to empower women in agriculture;
    - ‘Household Economic Security for Poor Women Smallholder Farmers Project’ (HESP), an International Fund for Agricultural Development (IFAD) initiative that develops strategies for the economic advancement of rural women; and
    - Oxfam, a charitable organisation that works in partnership with CARE on numerous initiatives.

  The addition of these stakeholders and partnerships has enabled additional sponsoring and facilitating of the PSP process.
- **Increased number of community-level participants.** Over the years, the number of participants from communities in PSP workshops has increased because of improved trust in the process as well as funding provided by other projects and NGOs. For example, in Garu-Tempane District, the interest in workshops has grown to include more than 250 participants at the 2016 PSP workshops. To cater for this increased number of

participants, two back-to-back workshops were organised in Garu-Tempane to ensure that every interested participant was able to partake and contribute in the process.

- **Increased diversity of participants over time.** Facilitators of the PSP process have been responsive to local priorities and community needs by ensuring the involvement of all relevant stakeholders, gender groups and forms of media. Further to this, the PSP process in Ghana is increasingly recognising the roles of various stakeholder groups and utilising their specific knowledge and capacities to enable a participatory process in coordinating outcomes. Stakeholders who were previously not involved in PSPs are now participating and guiding the development of advisories to recognise the full range of their livelihood needs in terms of CIS. For example, livestock producers and marketers, produce-buying companies, district-level female farmers and differently-abled groups, as well as the Department of Health Services were all previously not involved in the PSP process, but now play integral parts throughout the process, including providing historical and local advice to the development of advisories.
- **PSP workshop scope expanded.** The PSP workshops have broadened the scope of the process to include the following:
    - seed fairs to improve farmers' access to a diverse mix of certified climate-tolerant seeds to operationalise advisories effectively;
    - agro-chemical use exhibitions to improve farmers' cautionary hazard management relative to the handling and use of agro-chemicals; and
    - crop-water requirement sessions, where agricultural officers provide technical information to farmers on the amount of water needed specific to the various crops for optimal growth. This session provides them with information on the best time for sowing crops based on the forecast and seasonal rain patterns.

Analysis

The observations from PSPs in Ghana have revealed innovations and variations that have been introduced into the PSP process. These modifications demonstrate a number of good practices that are described below.

- **Shift in the organisation and facilitation of PSPs over time.** As a result of ALP partnering with decentralised local governments such as the DAs, there has been a promotion of local ownership in the process. This involvement of decentralised local governments in PSP workshops over recent years has resulted in the PSP concept being institutionalised within them. Through organising annual PSP workshops specifically to plan for early warning and weather forecasts, the PSP process has now been included in the District Medium-Term Development Plans (DMTDPs). This illustrates that PSPs have become a regular, annual and well-known event for the respective departments. A brief review of the Garu-Tempane District DMTDP reveals a total of GHS148,000 (~US$37,559) being earmarked for PSPs for the planned four-year period (2014–2017)[31]. This demonstrates the potential for the sustainability of the PSP process following CARE, ALP or any other facilitator's exit from the process[32]. In addition, the funding and facilitation of PSPs by other NGOs and CARE projects demonstrates that the adoption of the PSP process goes beyond CARE and that it has become an accepted tool for CIS among development practitioners. There is a synergising collaboration between ALP, related CARE projects (i.e. WA-WASH; Pathways programme) and other NGOs (i.e. the Oxfam ELCAP/CRAFTS project) to support PSP implementation. This has

[31] Garu-Tempane District Medium Term Development Plan (DMTDP) 2014–2017.
[32] See further discussions on sustainability in Section 4.4 below.

led to upscaling of the approach in an additional district (i.e. Nadowli-Kaleo) in the Upper West Region.

- **Increased number of community-level participants.** The collaborative support between CARE and other NGOs has increased the number of community representatives at PSP workshops. In Garu-Tempane District, for example, the community member participation has increased from ~38% in 2013 to ~60% at the 2016 PSP workshop. This increased participation of community representatives demonstrates the community focus of the Ghanaian PSP process. During the FGDs, communities showed strong ownership of the process. There is evidence of trust and confidence in the PSP process by the community. Each year following the PSPs, community members would follow-up with the DAs on the dates for next workshop. According to the District Planning Officer (DPO) from Garu-Tempane, there is a sense of pressure from the communities to organise the workshop before the rain season. This indicates that PSPs have now become a demand-driven process within the communities.
- **Increased diversity of participants over time.** The inclusion of more categories of stakeholders in the PSP process is likely to evolve the workshop from farming-based to a more multi-disciplinary approach. Examples of stakeholders for inclusion include representatives from the livestock, veterinary and health sectors. Within the farming sector, the inclusion of inputs dealers helps to promote the inclusion of all relevant value chain actors.
- **PSP workshop scope expanded.** The broader scope and inclusion of new information sessions within workshops has promoted improved learning and increased interest by participants. This broader scope includes *inter alia* practical learning on crop water requirements, as well as new seeds and available inputs (such as fertilisers and agro-chemicals). These innovations can be framed as good practices as they contribute to the continued improvement of the PSP workshop and overall process through a learning platform where new knowledge is shared. Particularly those participants who had attended PSP workshops more than three times since the inception of the process in-country found that the workshops were improving and evolving with additional knowledge.

4.1.2. Multi-stakeholder participation and interaction

Observations

- **Involvement of all relevant stakeholders enabling a responsive and participatory process.** Since the introduction of PSP workshops to Ghana in 2012, the process has involved a diverse group of participants in the stakeholder groupings. These participants include representatives such as *inter alia*: i) GMET; ii) DA members and central administration; iii) sectoral departments (including agriculture, health, community development, social welfare, information services, forestry); iv) National Disaster Management Organisation (NADMO); v) traditional authorities (e.g. chiefs, queen mothers); vi) traditional forecasters; vii) community data collectors; viii) schools and other education facilities; ix) NGOs (e.g. ALP, Oxfam, World Vision); x) women, youth and physically-challenged groups; xi) Savanna Agriculture Research Institute (SARI); and xii) other relevant organisations and representatives (e.g. farmers, media, agro-dealers, Ghana Police). Over time, the number of participants involved in PSP workshops has increased. Examples of this increase include:
  - in Garu-Tempane District, participant numbers increased from 49 in 2012, to 284 in 2016; and
  - in East Mamprusi District, participant numbers have increased from 64 in 2013, to 112 in 2015.

At the onset of PSP implementation in the country, women represented ~35% of the participants in East Mamprusi District and ~17% in Garu-Tempane District. For the 2016 workshops, representatives had expanded to include other vulnerable and previously marginalised groupings, such as differently-abled groups. Additionally, the workshops integrated the naming of 'achievers' during proceedings, including for 'Best or outstanding male and female farmers' in the district.

- **Multi-stakeholder interactions during workshops.**
  - **For communities and other users.** According to communities involved in FGDs, there is improved access to national-level officials of GMET and National Disaster Management Organisation (NADMO). Barriers to interaction between communities and GMET, NADMO, the Ministry of Food and Agriculture (MoFA) and other NGOs have been eliminated because of the communication platforms PSPs have created. There is now a direct line available to the institutions and technical personnel for all climate information users. This improved level of communication has allowed for a deeper understanding of CIS, climate forecasts, advisories and the benefit thereof.
  - **For climate information producers (e.g. GMET).** PSPs have provided a platform for GMET to interact with climate information users. This improved interaction is illustrated by the following quotes:
    - Regional Meteorological Officer for the Northern Region:

> *"We feel a lot more relevant now – instead of simply generating climate information, we are now actively working with and through communities to generate the information, reflect on the information together and share knowledge about possible adaptation measures to deploy in view of the seasonal outlook. This is giving us the opportunity to explain to communities [the] reasons accounting for variations in seasonal forecasts. This way, we are able to build and sustain their interest and confidence in the forecasts we provide. Moreover, it is also a channel to positively shape communities' [sic] understanding of the dynamics involved in generating and using climate information."*[33]

    - Head of Research for GMET:

> "*Our encounter with PSPs makes us to [sic] understanding users (farmers) needs and therefore does some extra work to cover their needs. We now provide them with: onset/dry-spell/cessation date (before we were not too much focused on these) and daily information to dictate [the] time for fertiliser application. Further, PSPs give us a platform to be directly in contact with farmers. Before PSPs, we sent seasonal forecasts to [the] Agricultural Ministry and had no direct contact with farmers."*[34]

    Further to the above quotes, KII participants acknowledged that PSP workshops have enhanced interaction and collaboration between NADMO and GMET specifically in disaster response.

  - **For intermediaries.**
    - **Governments institutions.** PSP workshops have increased collaboration among technical departments at the district level and strengthened their link to

[33] Quote taken from the KII with the Regional Meteorological Officer for the Northern Region.
[34] Quote taken from KII with the Head of Research for GMET during KII discussions held on 15 June 2016.

communities. For example, the Community Development and Social Welfare Department representative shared, that by getting involved in the dissemination of PSP advisories, the working relationship between the department and community monitors (CMs) as well as community-based extension agents (CBEAs), was strengthened for the implementation of other projects. The department is using the enhanced relationship to mobilise communities for development action. Additionally, PSPs have been instrumental in complementing the efforts of MoFA in bringing CIS to farmers. As a result, CIS are becoming vital inputs for farmers during the pre-rain season.

- **Media and NGOs.** PSPs have provided opportunities for intermediaries to engage more efficiently amongst themselves, which has increased productivity. For example, Radio Progress has broadened its scope of operations to include other stations (e.g. RADFORD FM in Tumu) to share daily and seasonal forecast updates as they are received from GMET. The ability of Radio Progress to access information directly from GMET was as a direct result of the station's participation in PSP workshops, as well as taking advantage of the linkages created. PSPs have improved the station's interactions with agro-input dealers who are using their platform for marketing various different kinds of inputs for implementing advisories. Specifically, FARM Radio International (FRI) was a key stakeholder that facilitated the process of setting up the CICs and providing technical support for the radio stations broadcasting the advisories. The introduction of PSPs has created a platform to reach out to organisations such as *inter alia* Oxfam, GIZ and CFTC with a common interest in the development, dissemination and communication of climate information. Several partnerships between FRI and these organisations have since emerged, which is helping to expand the reach of CIS to various categories of users in northern Ghana. Similarly, there have been improved interactions between the MoFA, SARI, GMET and many DAs in northern Ghana in response to the common objective of reaching out to farmers with CIS. Furthermore, there has been increased collaboration between CARE and NGOs such as Oxfam, which has contributed to upscaling the PSP processes in further districts.

Analysis

In the northern regions of Ghana, various stakeholders are now participating in PSPs, including relevant representatives from rural development. This multi-stakeholder approach has resulted in the creation of a cooperative and enabling environment for building community climate resilience. In addition, it has resulted in the transformation, creation and redesign of both old and new relationships. Communities' growing confidence in the PSP is also attributed to the interactive and participatory nature of the PSP process in including communities' knowledge, experiences and opinions.

The PSP process integrated into Northern Ghana focuses on achieving broad community (i.e. user) representation within the workshops. This increased number of participants has largely been in response to this focus[35]. The focus on community indicates a bias towards users, with the result that PSPs provide direct user benefits such as: i) increasing community ownership of the PSP process; and ii) ensuring timely and efficient

[35] I.e. more than 100 participants in attendance at a single workshop.

communication of advisories among communities[36]. These benefits are likely to increase the adoption of advisories and result in adaptive behavioural changes[37]. However, having a large number of community participants often leads to challenges related to workshop facilitation. These challenges are identified below.

- 'Invisible' participants. Some workshop attendants may not participate and engage effectively in workshop proceedings.
- Running overtime. It is difficult to stay on schedule with workshop proceedings as discussions often go on longer than expected.
- Participant willingness for group feedback. Often, there are many groups to report their feedback from group discussions[38], which leads to lengthy sessions. As a result, participants often lose focus and lack concentration.
- Logistics. Organising and catering for a large number of people often becomes a challenge.

Furthermore, when a workshop has an overrepresentation of community members compared to technical expertise, this influences the quality of advisories as the levels of stakeholder expertise shape the content and quality. Ensuring that all technical departments are represented provides a safeguard for the production of quality advisories in each relevant area. Some KII participants questioned the effectiveness of this approach to the workshops, for example:

> *"…striking a good balance between the number of technical stakeholders needed for the PSP workshops and the number of other stakeholders is very important looking forward. With a good dissemination strategy for the advisories, it may be worthwhile to focus on providing ample time for a core group of technical stakeholders to discuss the outlook and proffer best-practice or best-fit options for each of the scenarios rather than dealing with unwieldy numbers of stakeholders whose input in many instances is not informed…"*[39]

A successful PSP workshop should be attended by a well-balanced mix of technical experts and local community members to ensure the production of a scientifically accurate advisory, shaped by local knowledge and communicated through appropriate community channels.

4.1.3. Feedback: interpretation of uncertainty and probability, and advisory development in the PSP process

Observations

- **Feedback process**. In Ghana, feedback on PSP workshops are conducted is received through the following three mechanisms:
  - Workshop review session. PSP workshops create a platform for discussion and review of previous rain seasons and the associated predictions and outcomes.

[36] This means of dissemination was found to be both cost- and time-effective relative to other means.
[37] This ownership assists with overcoming the cultural norms and practices that are entrenched in various socio-cultural African settings that can influence farmers' perceptions and their adoption of new technologies and practices.
[38] At the 2016 PSP workshop in Garu-Tempane District, the large number of people meant that men and women were further sub-divided, totalling seven sub-groups.
[39] Taken from KII interviews held on 9 June 2016 with the Director of Regional SARI Director.

Workshop participants are encouraged to share their experiences on receiving, interpreting and implementing advisories as well as how they perceived their outcomes and results. During PSP workshops in 2016, feedback discussions were in-depth and lengthy. Traditional forecasters and Community Monitors bring their rain gauge recordings to engage in discussions and debates to showcase their observations. During the 2016 PSP workshop in Garu-Tempane District, ~8 people provided their feedback on the 2015 seasonal forecasts. The general report from participants was that the seasonal prediction for the previous year was accurate (see Annex 4[40]). During the Nadowli-Kaleo District 2016 PSP workshop, the review of 2015 forecasts highlighted that the predictions were accurate. However, because it was the first year of PSP implementation, a large number of people distrusted the forecasts and did not follow the advisories. As a result, many of them suffered produce losses. One of the participants stated the following:

> *"…we did not believe the forecasts for 2015, so we failed to get [a] good harvest. But surely, we have learnt our lessons. It was forecasted that we will have early cessation of rain but some of us were still ploughing rice in September hoping God still bring[s] enough rain."*[41]

- PSP planning meeting. Through a pre-workshop PSP planning meeting – usually involving the DPCU members and other relevant stakeholders – reviews and evaluations of previous PSP sessions are conducted to establish good practices for upcoming PSP workshops.
- Media. Feedback is also sometimes assessed through the media, over SMS and by phone call. Through collaboration with local radio stations[42], a 12-week radio campaign programme is run that focuses on disseminating seasonal forecasts and agricultural advisories. In addition, the programmes provide a platform for receiving feedback through call-in sessions where farmers are able to share their experiences dealing with advisories. This platform provides an opportunity to address user concerns and advocating for the use and implementation of advisories.

- **Interpretation of probability and uncertainty.** The structure of the PSP workshops caters for the uncertainty and probability elements of weather forecasting. These aspects are integrated into the workshops to assist all participants – particularly intermediaries and users – in understanding that there is still risk involved in these forecasting methods. GMET technicians provide three different potential scenarios of seasonal weather forecasts, namely 'below normal', 'normal', and 'above normal', specifically indicating the variation from what is perceived to be a 'normal' or expected amount of rainfall for a region.

  Intermediaries including *inter alia* NGO representatives, sectoral departments and the media have demonstrated a good understanding of uncertainty and probability related to weather forecasts. For example, the following statements demonstrate the increase in the level of understanding surrounding uncertainty and probability through PSP participation.

[40] See Annex 4 on the raw KII data.
[41] Taken from discussions during a PSP workshop review session of the 2016 PSP workshop in Nadowli-Kaleo District.
[42] For e.g., Quality FM in Garu-Tempane District and Radio Progress in Nadowli-Kaleo District.

> *"Probability tells us how likely an outcome will [be], especially in relation to rain, drought or severe sunshine or windstorm. Understanding of these weather events has changed over time because the initial impression was that these events were predetermined and could not be predicted with some degree of accuracy. The seasonal outlooks shared by GMET over time through the PSPs have helped to improve our understanding of the models upon which predictions are based and the factors determining the likely occurrence of a particular outcome. This has, in essence, awakened our consciousness to the fact that within the context of probability, there is measurable uncertainty as opposed to immeasurable uncertainty (i.e. risk). PSPs have helped to downscale knowledge of weather predictions to the understanding of media personnel such as us."*[43]

> *"Probability is the chances [sic] of occurrence of a phenomenon. Uncertainty is a measure of the degree of reliability that an occurrence will take place."*[44]

> *"Probability is a likelihood we are able to measure, and uncertainty is a surprise. We can anticipate but [it] cannot be measured."*[45]

After the first advisories were issued following the first implementation of the PSP process in Ghana, farmers reported varied experiences relative to their compliance to advisories. Some farmers were satisfied with their results while others expressed dissatisfaction and that they felt they had been led astray by the advisories[46]. In light of this, intermediaries are making conscious efforts to further explain the uncertainties and probabilities in seasonal forecasts to users, particularly farmers. Presently, attention is being paid to communicate to farmers that the 'most-likely' scenario may or may not happen in any given rain season[47]. An innovative means of explaining probability and uncertainty was illustrated to farmers using the following analogy: a person with 10 stones aiming to hit a target has the probability of $\frac{x}{10}$ of hitting the target, where x equals the number of stones that actually hit the target out of a total of 10 throws[48].

During FGDs and field visits, communities have demonstrated a fairly positive understanding of the uncertainty surrounding weather forecasts. Communities are aware of the three potential scenarios that may occur in a given rain season. However, the majority of users are more interested in the most-likely scenario – i.e. above, below or normal rainfall – rather than the degree of probability or uncertainty linked to each scenario. The user understanding of the level of 'uncertainty' in weather forecasting is demonstrated in the following statement recorded during an FGD in Kugri village of Garu-Tempane District:

> *"With PSPs, we got [sic] knowledge about what it [sic] is going to happen this season. We know this is not 100% accurate. This is what is called uncertainty. We should always have in mind this uncertainty."*[49]

[43] Quote taken from a KII held on 6 June 2016 with the Country Director from Farm Radio International.
[44] Quote taken from a KII held on 10 June 2016 with the Project Facilitator for PATHWAYS from CARE International.
[45] Quote taken from a KII held on 10 June 2016 with the Project Facilitator from PAS-G.
[46] Quote taken from a KII held on 6 June 2016 with the Country Director from Farm Radio International.
[47] Quote taken from a KII held on 10 June 2016 with the Project Facilitator from PAS-G.
[48] Quote taken from a KII held on 13 June 2016 with the District Crops Officer from the District Department of Agriculture for Nadowli-Kaleo District.
[49] Quote taken from an FGD held in Kugri village of Garu-Tempane District.

- **Advisory development.** Following the presentation of seasonal forecasts during the PSP workshops[50], advisories are developed by participants. Advisories are based on hazards, risks, opportunities, impacts and plans for the identified sectors and/or livelihoods for each of the three scenarios[51]. To develop these advisories, discussion groups were formed based on the geographical origin of the different community representatives. Stakeholders such as those from technical departments, as well as other intermediaries, were asked to distribute themselves amongst the groups. Feedback from participants informed that this approach to grouping discussions did not encourage equal participation from all participants. Consequently, the division of groups is now based on intermediaries and their involvement by the community. These groupings are then further sub-divided by gender and age (i.e. women and men, youth and elders).

  Some PSP workshops divide discussion groups according to institutions, others by sectors and some by different levels of user groups. For example, Nadowli-Kaleo, Garu-Tempane and East Mamprusi Districts each demonstrated different approaches to dividing discussion groups and the subsequent development of advisories. In Nadowli-Kaleo District, the development of advisories is targeted to communities, government departments and the general public. For communities, two types of livelihoods are considered, namely agriculture and livestock. For each sub-group, advisories are developed for the three proposed scenarios, specific to the following sectors: i) agriculture; ii) commerce; and iii) water and sanitation. In Garu-Tempane District, advisories are developed that target four sectors, namely: i) crop farming; ii) agro-processing; iii) livestock and poultry farming; and iv) dry season farming. Further to this, the advisories are developed with consideration for development priorities, such as water and sanitation, health facilities and services, educational infrastructure, energy and electricity, infrastructure (i.e. roads), peace and security, and market sheds/infrastructure. In East Mamprusi, advisories are developed specifically for communities, considering four sectors and/or livelihoods as well as three development priorities. The four sectors include livestock and poultry farming, crop farming, petty trading (i.e. in livestock, grains and foodstuffs, and agro-processing. The development priorities focus on: i) crafting and soap making; ii) housing; and iii) water. Furthermore, East Mamprusi advisories integrate all three proposed scenarios into their development and communication (Table 2).

Table 2. East Mamprusi crop farming advisories developed during the 2013 PSP workshop.

District	2013 crop farming advisories
East Mamprusi	• During periods of 'normal' rainfall, plant indigenous crop breeds such as leguminous plants to avoid uprooting of plants by strong winds • For 'above normal' rainfall, plant in soils that are not at risk of being water logged to avoid loss of produce • Farmers should plant short-duration varieties of crops • Farmers to avoid planting and farming close to river banks • Use of pesticides • For 'below normal' rainfall, farmers should plant drought-resistant crop

Analysis

The analyses illustrated below are related to the feedback process, interpretation of probability and uncertainty, and advisory development during the PSP workshop.

[50] Generally, on the second day of the workshop.
[51] I.e. 'normal', 'above normal' and 'below normal' rainfall scenarios.

- **Feedback process.** One of the principles guiding participation in the PSP process and workshops is the importance of integrating a positive feedback process. Incorporating feedback encourages producers of climate data and initial weather forecasts to improve data presentation and to adapt it to the changing needs of local users[41]. There is currently no established feedback mechanism in the Ghanaian PSP process except for a brief sharing of farmer experiences dealing with advisories and/or traditional forecaster predictions. It is not evident how this shared information feeds into the development of advisories nor how it informs planning for subsequent workshops. Furthermore, feedback received through the media has an advantage as it is regarded as spontaneous and independent, and is not controlled by the PSP local committee organisers. However, it is not clear how this information is recorded for integration into the process going forward.

  Overall, a more structured and organised review process needs to be integrated into the PSP process. This will result in building trust, cooperation and ownership of the process, and therefore ensuring sustainability for the process as a whole.

- **Interpretation of probability and uncertainty.** The PSP process has demonstrated good practice in communicating climate information through communicating all three potential weather forecast scenarios and subsequent advisories to users. The observations illustrated above highlight that communities are able to understand the concept of uncertainty. Communities are making use of their improved understanding to inform their decisions in dealing with future challenges and adapting socio-economic activities to an evolving environment. Further efforts are needed to improve communication of probability and uncertainty during PSP workshops to ensure users are up to date with the continuously evolving nature of providing forecasts.

- **Advisory development.** The process of developing advisories is shaped by *inter alia*: i) the expertise and knowledge of PSP workshop participants; and ii) the approach used to divide participants for discussion groups. The current practice of separating technical intermediaries from communities and users in Ghana results in advisories capturing community-specific views and knowledge as well as technical insights. Therefore, when the local organising committee is collating the developed advisories, any and all similarities between technical insights and traditional knowledge are given preference. This preference promotes the integration of community and local knowledge into advisories as well as providing a platform for assessing the current state of community knowledge on climate and associated information. The participatory process of developing advisories has resulted in an increase in the uptake and adoption of advisories among users.

4.1.4. Rain gauges

Observations

- **Purpose.** Rain gauges were installed to give community members the opportunity to contribute to the collection of up-to-date rainfall data under the ALP programme. The idea followed that by linking community members to GMET, the contact would improve their understanding of how forecasts are generated and the ways in which CIS contribute to improved livelihoods. Furthermore, through this contact, community members are exposed to the different levels of interpreting climate information and how it is adopted into the decision-making process.

- **Process.** Setting up rain gauges involves identifying and appointing community monitors (CMs) to record the rainfall data on a regular basis[52]. Each CM is responsible for recording the: i) amount of rainfall for each day it occurs; ii) monthly rainfall; iii) number of rainfall days per month; iv) annual rainfall, and v) the number of rainfall days per year and their distribution across the land. The CMs are responsible for forwarding the collected data to the relevant district DoA for further delivery to the regional GMET offices.
- **Dissemination.** At the community level, CMs share the recorded data with their respective community during scheduled village meetings such as VSLAs, as well as through a more informal approach such as when CMs are asked by fellow community members. Additionally, the recorded data is shared with neighbouring villages and communities. This has been done in Saamini village[53], which has resulted in children from neighbouring villages now being sent to Saamini to receive information of planting time[54].
- **Use.** Communities use rain gauge data to determine rainfall levels and the moisture content in the soil. As a result, communities are able to inform their decision-making for crop farming including when and what species to plant. ALP staff engaged with the CMs to develop a graph illustrating the 2015 monthly rain gauge data and highlighting trends and patterns at both the intra- and inter-community level.

Analysis

The transfer and integration of data collected from community rain gauges into the national GMET database have not been as successful as was initially anticipated. Collected data is housed in the Management Information Systems (MIS) units of district DoAs, where it does not always reach the relevant GMET for processing and dissemination. In some areas, improper management of rain gauges by CMs has resulted in incomplete data collection making the data unusable. It is currently unclear to what extent the collected data is used for downscaling seasonal forecasts or any other purpose other than local-level discussions at community, CICs and ALP-organised meetings.

Notwithstanding the challenges identified above, the introduction of rain gauges has facilitated discussion of rainfall data among communities. The graphical representation of data has encouraged discussions and improved understanding within communities on various rainfall concerns, including: i) occurrence (i.e. daily, monthly or annual); ii) intensity and length of rainfall period; and iii) expectation dates for the next rainfall. Reported cases in Akara and Kugri villages in the Garu-Tempane District indicated that CMs were using previous years' rainfall data to make predictions for rainfall probabilities in their communities for the 2016 rain season (Box 1). The accuracy of the predictions may have been a coincidence for that specific rain season, however, the accuracy has nonetheless created a growing interest among communities in the provision of rainfall and climate data. This interest has encouraged an improved willingness amongst community members in accepting and making use of forecasts in decision-making for their livelihoods.

Box 1. Rain gauge data and use.

[52] Rainfall data is recorded manually by the CMs.
[53] Saamni is one of the Ghanaian villages that has been fitted with a rain gauge.
[54] Notes of the field visit to Saami village and community, 16 April 2016.

The example of Kugri village in Garu-Tempane District

Jacob, a 38-year-old male, is a community monitor (CM) in the village of Kugri in the Garu-Tempane District of Ghana. As a CM, Jacob is responsible for recording daily data readings from the rain gauge in his village. He uses this data to inform his fellow community members about the quantity of received rainfall through events such as *inter alia* village and VSLA meetings, funerals, school and social gatherings. Using the information, Jacob was able to inform his farming decisions, particularly the planting and sowing date. Because of his efficient collection and communication of rainfall information, Jacob has become a known source for reliable data in his village. Jacob stated the following:

> *"…if as a monitor I started preparing my land or planting my crops, the villagers follow me."*

Jacob's statement echoes that communities are becoming increasingly interested in rainfall data, information and receiving forecasts.

Through his experiences, Jacob has learned that rainfall is localised, and data collection is specific to certain areas. For example, on the 28 May 2015, 15 mm of rain was recorded in Kugri, while in the neighbouring Taringaga and Farfar villages, 50 mm and 15 mm was recorded respectively.

Through training with ALP, Jacob has developed mechanisms to predict and analyse rainfall seasons using previously recorded data. He highlights similarities of rainfall patterns between the current and previous year to predict the onset of the coming rain season[55].

4.1.5. Climate Information Centres

Observations

- **Purpose.** In 2014, Climate Information Centres (CICs) were established by ALP in two communities in the Upper East and Northern Regions of Ghana in Tariganga and Saamini communities respectively. These were set up to be used as sources of climate data, information and knowledge for decision-makers and other users at the local level for effective adaptation. The CICs help to build community climate archives and provide access to essential climate information that is required to manage uncertainties associated with climate change and variability. Through this process, CICs assist in addressing the climate change impacts on various livelihoods. This is achieved through storage and the provision of timely information – both forecasts and analysis – for users to mitigate the negative impacts of climatic change on communities.
- **Process.** CICs are run by a committee of five community members known as CIC operators. Local FM radio stations – Quality and Eagle FM – have been developing climate programmes for before and during the rain season in northern Ghana, running from April to October. CIC operators record the radio programmes and replay them at strategic times when community members are able to listen to the information. To reach all audiences, loudspeakers are installed in popular meeting places such as markets and village centres.
- **Dissemination.** The information communicated through CICs includes: i) climate forecasts; ii) advice on agricultural techniques and inputs for each climate scenario;

[55] For example, knowing that the previous rain season started on 15 May, and that both seasons prior to that had similar patterns of onset, Jacob was able to predict that for the current year onset would be around 12 May with two days' grace either side. Following this prediction, Jacob prepared and sowed his seeds on 11 May, with the rain starting on 13 May.

iii) rainfall requirements and timing for the range of crop activities; and iv) market information. CICs also broadcast early warning information such as information on disease outbreaks and prevention measures, which provides response teams with sufficient time to mobilise. In addition, CICs promote community mobilisation through encouraging the sharing of information from meetings to the wider community. Communication is also through social announcements such as from the 'queen mother' or chief [56], Maagazia (the women's organiser), who uses it to mobilise women, communicate information from VSLA apex bodies and announce social events as well as the women's meetings where they process shea butter together[57].

Analysis

CICs are an effective communication channel that have resulted in improving access to climate- and agricultural-related information. The provision of open and regular broadcasting through loudspeakers means that CICs as a dissemination channel reach a wide audience and provide a common platform for communication. This platform is accessible to community members regardless of gender, age or social status[58].

4.1.6. Synergies between the three climate information service approaches for informing decision-making

The value of PSP workshops, CICs and rain gauges within the ALP initiative in Ghana is evident in the way activities are coordinated.

PSP workshops promote discussions on seasonal outlooks. These discussions contribute to the development of advisories communicated to users through different channels[59]. Upon receiving advisories, CIC volunteers integrate the collected local rainfall data from rain gauges for dissemination to users. By involving local communities through the implementation of rain gauges, as well as CIC involvement, a platform has been created for communities to discuss climate information. PSP workshops complement these activities by presenting opportunities for communities to reach a broader range of duty bearers to address climate change livelihood challenges. Therefore, a mutually advantageous relationship exists between PSPs, CICs and rain gauges. This relationship has been established through the two-way communication that has been created by, namely: i) rain gauges contributing to data generation for CIS; ii) CICs providing a platform for community engagement and discussion on CIS[60]; and iii) PSP workshops providing an opportunity for communities to discuss CIS with a broad range of stakeholders who are well-equipped to assist them in making informed decisions.

[56] I.e. the traditional authority.
[57] Women gather to process their shea harvest together to make shea butter.
[58] Further analysis on CIC as an effective and efficient communication channel is discussed in Section 4.2 on communication.
[59] Including through CICs.
[60] Both inter- and intra-community discussion and communication.

FGDs have shown a relative increase in the awareness and knowledge of climate change risks and adaptation options in communities who are making use of the three interlinked CIS pathways. This increase is greater than in those communities which only partake in PSP workshops. For example, in Tariganga community of Garu-Tempane District, the provision of the three CIS pathways provided a greater diversify of adaptation interventions than in the Dambaa community of Nadowli District. In Tariganga community, aside from implementing reactive responses such as meal reduction, the community has adopted climate-smart agricultural practices to build resilience to climate change and variability (Table 3).

Table 3. Adaptation measures observed in a community with three CIS pathways compared to a community with only PSP workshops being implemented as a CIS approach.

	Tariganga, Garu-Tempane District	**Dambaa, Nadowli District**
CIS approach implemented in community	• Participation at PSP workshops • Implementation of rain gauges • Presence of CIC	• Participation at PSP workshops
Reactive adaptation options (short-term)	• Rationing of number of meal through staggered feeding	• Migration to areas with small-scale mining opportunities • Reduce quantity and/or skip meals • Reliance on wild fruits and berries • Selling of livestock • Manually mill grains to save costs • Reduce consumption of local alcohol[61]
Proactive adaptation options (long-term)	• VSLAs have helped to strengthen cooperative setups for improved food security and incomes • Adoption of early-maturing and climate-tolerant crop cultivars • Adoption of improved livestock management practices • Adoption of climate-smart agricultural practices (i.e. composting, staggered planting, fertiliser micro-dosing, minimum or zero tillage)	*No response*

4.2. Communication

The PSP model is designed to communicate climate projections and local observations that support agricultural decision-making for climate-resilient livelihoods and DRR actions.

This section addresses the range of channels used to communicate PSP advisories in Northern Ghana. Further analyses are provided on the quality of advisories, barriers and opportunities in communicating climate information. Each sub-section is further divided into observations and analysis to illustrate the description and interpretive results.

[61] During FGDs, this was a strong discussion point. Participants stated that they are obligated to reduce their alcohol consumption during times of drought.

4.2.1. Range of communication channels and their accessibility

Observations

Advisories are communicated to users following PSP workshops through various channels including: i) radio broadcasts; ii) religious leaders; iv) chiefs; v) government departments; vi) local groups, including farmer-based organisations (FBOs) and women's groups; vii) community-based extension agents (CBEAs); vii) CMs; and viii) NGOs and CBOs.

The range of channels for communicating advisories identified by respondents is indicated below.

- For literate users: i) SMS text; ii) emails; iii) fax; iv) TV; and v) radio.
- For illiterate users: i) local radio; ii) CICs; iii) durbars[62]; iv) funerals and festivals; v) local markets; vi) farmer-to-farmer extension; vii) farmer field schools; viii) CBEAs; x) CMs; xi) VSLAs; and xii) FBOs.

Women advisory users identified VSLAs and CBEAs/CMs as their preferred channels for climate information, while men preferred farmer-to-farmer extension services, CBEAs/CMs and radio broadcasts. For both groupings, CBEAs and CMs stand out as the main channels for advisory dissemination, which are those that are readily available to users at little to no cost. CBEAs and CMs are also closer to, and more accessible for users, since the representatives who communicate the information live and work within the communities. This positive outcome is as a result of CARE and the respective implementing partners continuing to strengthen community systems and institutions for extension delivery. Further to this, CARE focused on introducing sustainable and local ownership of knowledge and ideas.

Local participating radio stations[63] have been instrumental in disseminating advisories through CICs. In addition, through the technical facilitation of Farm Radio International (FRI), local participating radio stations are trained on how to develop and produce short programmes for broadcasting advisories.

Dissemination of advisories is typically through a 12-week campaign programme, where local radio stations support farmers with advisories relating to activities from the pre-season through to the off-season. These programmes are transmitted at the community level through CICs that pick up the signals and retransmit them community-wide. Additionally, CICs collect and display rainfall data on notice boards for local communities to examine and discuss matters including variations, patterns, distributions and intensities.

For communities where CICs are not currently established, beneficiaries are organised into 'listener groups' comprising 10 to 15 farmers, with male, female and mixed groups. The 'listener groups' are provided with radio sets with guidance to tune in at specific times of the day to listen to the broadcasted advisories, as well as to participate in discussions with each other as well as through call-in sessions. Users are able to call the station to share their

[62] Ghanaian traditional rulers sit in state and meet their people at events called durbars, which is an English word that comes from an Indo-Persian term for 'ruler's court'.
[63] Such as Eagle FM, Radio Progress, Quality FM and Farm Radio International (FRI).

experiences that relate to their interpretation and use of the advisories. This platform provides opportunities for climate information producers and intermediaries to address concerns of the users while correcting any false impressions surrounding advisories.

Analysis

The current communication process makes use of various dissemination techniques through both rural and modern technologies. The rationale is to ensure timely communication of advisories to empower communities, local governments and partners to take appropriate actions. These actions should ensure effective linkages between government and community actors to enable a positive response and to empower communities by creating and strengthening relationships with stakeholders and decisions makers.

CBEAs and CMs continue to play vital roles in the dissemination of advisories. The confidence of community members in the ability of extension agents and monitors to deliver effective services is growing continually. This growth explains why CBEAs and CMs were identified as the first point of contact for advisories from all visited communities. By supporting farmers to refine and strengthen community-based mechanisms and systems for CIS acquisition and delivery, the CBEAs and CMs will not only be supporting the long-term sustainability of people's livelihoods but will also offer a model that promotes empowerment of rural communities.

One of the enabling factors that make CBEAs and CMs effective channels for the dissemination of advisories is their ability to break down messages enough to be understood by users in local languages. Differences in languages coupled with varying literacy levels constrain learning and effectiveness of the process. At the local level, literacy levels are particularly low and communication is more verbal than written. This is not always taken into consideration when developing advisories for communities. Prevailing low literacy levels where people value verbal and illustrated messages more than written are not given suitable consideration during the development of advisories. Intensifying efforts in developing advisories in local languages and using more illustrated forms of communication would be beneficial moving forward.

Local participating radio stations[64] have been instrumental in disseminating advisories through CICs. This is an effective channel because there is direct involvement of communities in a participatory and engaging manner. Broadcasts are received by 'listener groups', where community members collectively listen to radio communications. The local participating radio stations, therefore, provide a cost-effective platform for communicating advisories to a wider audience, while the CBEAs and CMs are in the communities reinforcing the messages delivered via radio broadcasting. Even though this approach is innovative, it has not been successful in covering as many beneficiaries as initially planned. Radio broadcasting offers an efficient and affordable channel to reach a wide audience, however, it is currently limited because only those households that have radios benefit.

[64] Such as Eagle FM, Radio Progress and Quality FM, and FRI.

Using radio to communicate advisories appears to be working well because of the presence of ALP and FRI to fund and facilitate the process. It is, however, not evident how the method will continue following the exit of ALP from the PSP process. Prominent challenges in the process include the following:

- The likelihood of the 12-week radio programme being discontinued because of a lack of funding to pay the local participating radio stations. Currently, there is no guarantee that the DAs will be willing to take up this cost.
- 'Listener groups' are not likely to meet in the absence of FRI or ALP facilitators organising and supporting their functionality.
- CIC operators are not adequately motivated with incentive packages.

Furthermore, the anonymity and one-way nature of radio communications do not promote community trust of the channel. This may explain why CBEAs and CMs continue to be the preferred and trusted sources for receiving advisories by the majority of community-level users.

FBOs were identified as another important channel of communication. These are preferred by many users, as the group setting allows for efficient dissemination of information. Furthermore, they have a large multiplier effect that results in a wider reach of information than for example radio broadcasting. The FBOs also create a potential pathway for feedback as there are weekly, monthly and quarterly meetings. The advantage of this approach is the direct communication between experts (i.e. climate information producers) and users which reduces the tendency for information dilution when intermediaries are involved. Similarly, users have confidence accepting advisories when information is shared through a trusted colleague rather than an unknown source. This observation should be viewed from the angle that up to this point in the PSP process, feedback has been limited to occasional field visits to farmers. During reflection workshops and community question and answer sessions, users (including farmers) are able to provide feedback on CIS. These processes have helped to highlight specific GMET personnel that farmers have responded well to and, as a result, have the most confidence in. Similarly, communities have provided indications through this process about duty-bearers who are more cooperative in their service delivery. This information has helped to shape the focus of engagement with relevant stakeholders for PSP organisation.

4.2.2. Timing of information delivery

In Ghana, the unimodal rainfall regime results in a rain season between April and mid-May. Consequently, PSPs are planned for the period from March to April[65] so that farmers can begin to act on advisories approximately one month before the onset of the rain season.

During FGDs, farmers acknowledged receiving the advisory information in a timely manner. Generally, information on advisories and seasonal forecasts is disseminated and

[65] Workshops have generally been held in this period, with the exception of the 2015 workshop. During this year, the workshop was only held at the end of May (Table 4).

communicated amongst the communities on the same day as the release of the advisories thanks to live radio broadcasting that occurs while the workshops are taking place. PSP participants reported that they delivered their acquired information to their fellow community members within 1–2 days of the workshop. The following statements were recorded during the FGDs by various community members: *"…There is no problem with the timeliness of the information…"*[66]; and *"…The timing is improving with time…"*[67].

[66] Extracted from an FGD held with a mixed group in Tariganga, Garu-Tempane District, 8 June 2016.
[67] Extracted from an FGD held with a mixed group in Kugri, Garu-Tempane District, 9 June 2016.

Table 4. Timing of PSP workshops in Northern Ghana from 2012 to 2016 in relation to the expected onset of rains.

Year	Date of PSP workshop	Expected onset of rains	Rain period (window length) (days)
East Mamprusi District, Northern region			
2013	9–10 April	15–25 April	5–15
2014	16–17 April	7–17 April	Up to 7
2015	2–3 June	15–25 May	Up to 15
2016	18–19 April	*Data unavailable*	*Data unavailable*
Garu-Tempane District, Upper East			
2012	22–23 March	*Data unavailable*	*Data unavailable*
2013	11–12 April	24 May–3 June	36–46
2014	14–15 April	28 April–8 May	13–21
2015	28–29 April	20–30 May	21–30
2016	20–21 April	*Data unavailable*	*Data unavailable*
Nadowli-Kaleo District, Upper West			
2014	3–4 April	8–18 April	4–10
2015	*Data unavailable*	5–15 May	*Data unavailable*
2016	25–26 April	*Data unavailable*	*Data unavailable*

4.3. Use and impact

The introduction of three CIS forms[68] through ALP into Northern Ghana has had a positive impact at the different user levels, namely household, community and district.

4.3.1. Impacts of climate information services on communities

Change in knowledge, attitude and practices

Rain gauges, PSPs and CICs empower communities with knowledge on seasonal forecasts, climate change and variability, climate-smart agricultural practices, flexible planning and risk management. During FGDs, communities have demonstrated extensive knowledge on the importance of climate information and seasonal forecasts for agricultural planning. During FGDs, users (particularly farmers) reported that the knowledge gained from PSPs improved their disaster preparedness and decision-making ability on planting times as a community[69]. Users also reported that they began to integrate certified seeds based on their improved knowledge of the differences between seeds and grains[70]. For example, in Taringaga village, villagers demonstrated their knowledge on dealing with climate variability and change, highlighting that the villagers are now more equipped to deal with climate variability. Instead of relying on reactive measures such as rationing meals during dry periods, villagers are investing in proactive measures. With improved information from their participation in PSPs, they are implementing proactive measures into their rain and off-season preparation such as: i) planting early-maturing and climate-tolerant crop cultivars; and ii) implementing climate-smart agricultural practices, including *inter alia* composting, staggered planting, fertiliser

[68] i.e. rain gauges, PSPs and CICs.
[69] Taken from FGDs held on 12 June 2016, Chaang community, Nadowli District.
[70] Taken from FGDs held on 12 June 2016, Chaang community, Nadowli District.

micro-dosing and minimum or zero tillage. The adoption of these proactive measures has helped to improved overall food security and income in the community even through dry periods and droughts[71].

PSPs present communities with an opportunity to interact with technical personnel and increased knowledge. There is improved access to national-level officials of GMET and National Disaster Management Organisation (NADMO) for CIS. Barriers to interaction between communities and GMET, NADMO, Ministry of Food and Agriculture (MoFA) and other NGOs have been eliminated because of the communication platforms PSPs have created. There is now a direct line (via telephone) available to the institutions and technical personnel that all users have access to. This improved communication allows for further understanding of CIS, climate forecasts and advisories, which is of specific relevance to the improvement of their livelihoods. Furthermore, this improved access is facilitating support for adaptation and DRR. During FGDs, communities[72] expressed satisfaction with the platform provided by PSPs to easily communicate with technical departments and personnel. As a result, communities have more confidence in the advisories and in their decision-making and have taken ownership of the PSP process. Community members that participated in the workshops were ready and willing to share, disseminate and discuss seasonal forecasts and advisories amongst their fellow community members.

The three CIS forms introduced in rural Northern Ghana have transformed communication channels, specifically for farming decisions. Previously in the villages, elders were the principal source of CIS and farming decisions[73]. Currently, however, CMs are becoming the go-to source for information concerning farming decisions. This shift is illustrated by the following statement of CMs in Akara village, Garu-Tempane District:

> *"We are very proud to be community monitors [CMs]. We share information to individuals as well [as] VSLA and village general meetings. Now the villagers are looking at us. If as a monitor we start sowing, then the whole village follows…"*[74]

Furthermore, certain types of information were previously not distributed to all communities. Those community members that did not receive information would often include women. With the introduction of CICs, women in Taringanga village indicated receiving information directly rather than having to ask someone else[75] to get the information, which often would create conflict. This barrier of information is illustrated in the following statement from a woman in Taringaga village:

> *"…I would ask [my] neighbour for information they got from a meeting or find people discussing information from a meeting, but they would tell me: 'Go away, it does not*

[71] Taken from FGDs held on 8 June 2016, Taringanga community, Garu-Tempane District.
[72] Namely, Chaang, Kpatia, Kugri and Taringaga communities.
[73] Elders are regarded in communities as knowledgeable of traditional indicators for weather predictions as wells as traditional agricultural practices.
[74] Quote taken from a visit to Akara village, Garu-Tempane District, on 22 April 2016.
[75] The reference person for women to ask for information would often be a man.

> *concern you, old lady'. Now with the CIC, we are all getting the same information at the same time."*[76]

Communities reported the use of climate information and advisories, indicating the adoption of various climate-smart agricultural practices including *inter alia*: i) shifting of planting dates; ii) changing of seed varieties and/or crops; iii) integrating soil conservation techniques; and iv) implementing water harvesting methods. The following examples taken from village field visits illustrate the above statement.

- Jacob Adakudu, a 41-year-old married man with two children[77]: before the integration of PSPs, he was planting millet[78], and was yielding just enough for his household consumption. Now, following information received through the PSP process, he has shifted crops from millet to maize, cowpea and soya beans. Following this shift, he has produced enough to provide for his household consumption as well as being able to sell the surplus yield for extra income.
- Akuka Appian, a 57-year-old widow with eight children[79]: she is the women representative for the Aloko communities. Originally, she was farming millet and groundnut for pitto[80] and shea butter production. Following PSP introduction and the delivery of advisories, Akuka shifted to crop production to maize, cowpea, soya bean, and then moved on to livestock. She was able to sell her soya bean yield and subsequently able to clothe and send her children to school.
- Farmers in Kpatia village reported:

> *"Now since PSPs, we plant early-maturity varieties. We used to expose fertiliser, now since PSPs, we do [dig them into the ground] deeper and/or cover [the fertiliser]. We also make our own compost now. We do not build/or farm anymore near the stream."*[81]

Change in productivity gains and resulting effects

During KIIs and FGDs, many users (namely, farmers) reported that they were better-equipped to plan and make necessary preparations for the ensuing rain season because of the advisories they received. Some users felt that their overall farming activities had improved. Generally, users confirmed that they had all experienced increased yields[82]. For example, in the Chaang village of Nadowli District, users reported that injuries related to extreme weather events such as lightning and wind storms greatly decreased following

[76] Quote taken from a visit to Taringaga village, Garu-Tempane District, on 19 April 2016.
[77] Taken from discussion notes in Kugri village, Gari-Tempane District, on 9 June 2016.
[78] Millets are a variable group of small-seeded grasses. They are grown across the globe as cereal crops and grains for fodder.
[79] Taken from discussion notes in Kugri village, Gari-Tempane District, on 9 June 2016.
[80] Pito or pitto is a sour beer produced from fermenting millet grains.
[81] Quote taken from an FGD in Kpatia village, Garu-Tempane District, on 9 June 2016.
[82] During the FGDs conducted in Northern Ghana villages, four out of five villages reported a large adoption of the PSP advisories and that they received benefits and positive results from the implementation of the advisories. However, in Dambaa village of Nadowli District, farmers reported that although they received the advisories they did not implement them. The four adopting villages are supported by existing climate change adaptation projects run by either CARE ALP or other NGOs such as Oxfam. However, in Dambaa village, there are no previous or ongoing climate change projects underway as well as having only one village representative attending the PSP workshop. According to the Dambaa villagers, they felt they could not rely on their one representative as a trustworthy person in weather predictions.

advisories [83] . Furthermore, according to KII and FGD participants in Kpatia village, Garu-Tempane District, applying PSP advisories helped them become food secure for the duration of the entire year, instead of from season to season. This, in turn, allowed them to not have to rely on aid from NGOs. This is illustrated in the following statement taken from an FGD in Kpatia village:

> "*Before PSPs, food finish[ed] before [the] new season and we were not used to crop soya bean. Also, women in the village used to receive money for food from NGOs. Now that we received PSP advisories, we are planting early-maturing crops and we are able to have food security all year round. We plant soya bean and now are able to use as feed for children and sell the surplus. We can now take care of school fees and hospital costs. Our women are able to feed the family by themselves and do not receive any more handouts.*"[84]

Along with users in Kpatia village, KII and FGD participants from Kugri village, also in Garu-Tempane District, reported that they were satisfied with the provisions of PSP advisories. During the previous agricultural season, following the PSP advisories, they planted groundnuts and subsequently yielded large quantities for both subsistence and sale[85].

Further examples of the interpretation, use and implementation of PSP advisories as well as the resulting benefits as reported from PSP participants are outlined in the case studies illustrated in Box 2[86], 3[87] and 4[88].

Box 2. Benefits of PSPs illustrated through a Case Study in Taringaga village

Celestina Akudugu, a 32-year-old married woman with one child from Tariganga village, Garu-Tempane District

Celestina plants and harvests a subsistence garden of onion and vegetables.

She has attended three PSP workshops and noted the following: i) she always received new information on different crop varieties and their benefits as well as rainfall patterns for the coming rain season; ii) the format of the PSPs allowed people to participate through group work and discussions; iii) PSPs involve various people from many different authority and expertise levels (i.e. chiefs, assemblies, other villages and districts). Celestina further noted that these observations helped to learn and shape the experiences of the participants as well as encourage sharing of the knowledge.

Celestina did note however that the large number of participants often resulted in the workshop becoming overcrowded and therefore difficult for facilitators to control as well as encourage expression and engagement for all participants. Furthermore, she reported some disappointments about the information provided by traditional forecasters. She feels that traditional forecasters are often too general in their seasonal predictions instead of providing relevant examples for the coming season.

[83] Granted the advisories were adopted and implemented. Taken from FGDs in Chaang village, Nadowli District, on 12 June 2016.
[84] Quote taken from FGDs in Kpatia village, Garu-Tempane District, on 9 June 2016.
[85] Taken from FGDs in Kugri village, Garu-Tempane District, on 9 June 2016.
[86] Noted during discussions in Taringaga village, Garu-Tempane District, on 8 June 2016.
[87] Noted during discussions in Akara village, Garu-Tempane District, on 19 June 2016.
[88] Noted during discussions in Tariganga village, Garu-Tempane District, on 19 June 2016.

Using the advisories, Celestina developed a composting system for her garden which has enabled her to stop practising tillage[89]. She now also uses early-maturing seeds in her planting and has since observed a great improvement in her vegetable yield. For example, prior to the introduction of PSPs in her village, she used to produce one bag of 80 kg from her garden. Now following the implementation of the PSP advisories and her improved knowledge from participating in the workshops, her compost has contributed to her production of four to five bags of 80 kg, rather than just one.

In addition to composting, Celestina adopted soya bean cropping following the advisories. Her soya bean is now providing her with good yields, enabling her to use them in many forms including nutrition for her child, as well as improving the protein intake of the entire family, adding it to the intake of milk, soup and *daddawa*[90].

Box 3. Benefits of PSPs illustrated through a Case Study in Akara village

Issiaka Kwame Yssouf, a married man in his mid-fourties from Akara village Garu-Tempane District

Issiaka has participated in three PSP workshops and notes the main change he observed as that the presentation of weather predictions from GMET for the coming season was too scientific when he compared to previous seasons which meant he was unable to understand.

Before his participation in PSP workshops, he planted a late-maturing variety of crops. Because he had no weather information for the coming rain seasons, he would make his agricultural decisions and plant on a trial and error basis from his own experiences.

Now following his participation in the PSP workshops, he reported that he has gained knowledge on the potential weather scenarios as well as the concept of probability. He further noted that the entire village listens to Quality FM for PSP advisories. Issiaka highlighted that what he learned for normal rainfall is to plant early-maturing ground beans and soya beans, and when there are severe storms, he should reinforce his roof. Because Issiaka and his village farm on valleys that are far from water bodies, they use compost to encourage tree growth at the onset of the rain season.

Issiaka explained that when the 2015 PSP advisories predicted that the rains would end in October instead of November, he decided to not plant a second harvest. Furthermore, Issiaka recalled that those in his village that did not follow the advisories lost their entire second harvest. Issiaka gained a competitive advantage relative to his peers who did not make use of the PSP advisories.

Box 4. Benefits of PSPs as illustrated by a Case Study in Tariganga village

Georges Alem, a married man in his early-thirties from Tariganga village, Garu-Tempane District

Georges has participated in four PSP workshops. According to him, relying on traditional indicators like trees, flowers, insects and the hatching of birds to predict the end of the rain season, you should expect losses in your harvest as they are not reliable.

He acknowledges that he relies more on the scientific projections provided through the PSP process. Because of his attendance at the workshops and his increased knowledge, Georges

[89] Tillage is the practice of clearing your land for planting in preparation of the rain season.
[90] *Daddawa* or *iru* is a condiment derived from processing the seeds of the African locust bean tree (*Parkia biglobosa*). It acts as a flavourant in soups and stews and provides an important protein source for many communities.

combined the two sources of knowledge (i.e. traditional and scientific) so that he broadened his opportunity for success during and following the rain season. He deduced that the main advisories suggested that he should provide protection against wind and storms by building roofs, include the use of bullocks[91], plant trees and use improved seeds.

Georges indicated that he realised significant benefits from implementing advisories, including better yields from using drought-resistant seeds during the below normal rain season as well as a high-yielding variety during the normal to above normal rainfall scenario. In addition, he used the crop water requirement knowledge gained from his attendance at the PSP workshops to inform his planting decisions.

He recommended that efforts be made each year to provide more relevant information to avoid boredom for those that attended the previous year's PSP workshop. Georges also encourages a practical demonstration of the different advisory fields.

4.3.2. Impacts of climate information services on district-level intermediaries

At the district level, the ALP CIS approaches have demonstrated impacts on intermediaries in various ways. These impacts can be grouped as: i) promoting the coordination of services; ii) contributing to improving districts; iii) supporting district-level early warning systems; and iv) improving stakeholder relationships and interactions.

Promoting service coordination

ALP has encouraged partnerships through promoting coordination amongst vulnerable communities. In addition to strengthening the capacity of local government services[92], ALP has engaged with new service providers including radio stations and other CSOs and NGOs in learning and disseminating knowledge on CIS.

In both regions selected for the KIIs and FGDs, ALP has been accepted into the communities and is considered a coach in the PSP process. This is as a result of the learning events and various trainings ALP hosted with local institutions.

The multi-stakeholder process of the PSP workshops has provided strategic networking and opportunities to district departments to work with each other in addressing their respective DRR mandates. Before PSP implementation, the various district departments were insufficiently equipped with the necessary tools to enhance cross-sectoral collaboration and partnership for DRR responses. A brief review of the District Medium-term Development Plans (DMTDP) of the Garu-Tempane District revealed a total of GHS148,000 (~US$37,559) being earmarked for PSPs for the four-year planned period (2014–2017). Funding is allocated from separate plans for NADMO, DoA, Ghana Health Services (GHS), Information Services Department (ISD), Ghana National Fire Service (GNFS) and the District Planning Coordinating Unit (DPCU) to carry out PSPs and disseminate advisories to a wide range of

[91] Bullocks are male bovines that have been castrated. They are raised specifically for beef production.
[92] For example, the GMET, NADMO and agricultural extension staff

targeted beneficiaries. These developments highlight that the involvement of decentralised departments in PSP workshops in the last couple of years has resulted in institutionalising the PSP concept. Organising annual PSP workshops specifically to plan for early warning and weather forecasts has been included in DMTDPs. This illustrates that PSPs have become a regular and annual event for relevant departments.

Contribute to the improvement of districts

The multi-stakeholder process of PSP workshops has helped to enrich the content of Annual Action Plans (AAPs) for the participating districts. This enrichment translates into better scores for the districts in the Ministry of Local Government and Rural Development (MLGRD) Functional Organisational Assessment Tool (FOAT) exercise. FOAT scores assist the MLGRD in determining fund allocation to districts from the District Development Facility (DDF). The integration of PSPs into DMTDPs is increasing district scores, which in turn results in more funding for development activities. This development is attributable to the Ministry of Finance and Economic Planning, which continues to emphasise the need for all Metropolitan, Municipal and District Assemblies (MMDAs) to make their plans and budgets both climate-sensitive and compliant. Various incentive packages are in development for this purpose. The FOAT exercise is an integral element in supporting allocations from the DDF.

Support to district-level early warning systems

The impact of the PSP process at the institutional level in Ghana is most evident through NADMO. PSP has assisted NADMO in appreciating that early warning systems should be comprehensive in covering risk assessment, technical monitoring, warning, dissemination and local preparedness. The history of disaster events in Garu-Tempane District suggests that three hazards, namely floods, wildfires and droughts, are the main precursors of disasters. While floods and wildfires are more visible and attract the attention of mainstream media, slow-onset disasters, such as droughts and desertification, have their own negative effects on the environment and impacts on the communities. Through ALP, NADMO is increasingly able to address these concerns by bringing relevant stakeholders together under the umbrella of PSPs to deliberate on and issue advisories. With these efforts, ALP is supporting NADMO in the development of credible early warning systems, embedded within a DRR system from the district to community levels, which have been critical for saving lives and protecting livelihood assets.

Improved stakeholder relationship and interaction

ALP has changed the relationship between GMET and users such as farmers. Previously, GMET did not include engaging with farmers as an important activity contributing to the development of climate information. GMET focus has traditionally been to generate climate information. Even though dissemination falls within GMET mandate, it was not included in regular activities[93]. Users who were previously uninterested in using scientific climate

[93] It is important to note that GMET was established to provide efficient and reliable meteorological information by collecting, processing, archiving, analysing and disseminating findings and meteorological information to users.

information to plan their pre-season activities are now blending traditional climate knowledge with scientific sources because of their increasing exposure to PSPs. This shift in practice, to blending traditional knowledge and scientific information – that GMET should have championed but was unable to because of resource and technical capacity constraints – has now been included in the ALP agenda. This is illustrated by the Regional Meteorological Officer for the Northern Region in the following statement:

> *"We feel a lot more relevant now – instead of simply generating climate information, we are now actively working with and through communities to generate the information, reflect on the information together and share knowledge about possible adaptation measures to deploy in view of the seasonal outlook. This is giving us the opportunity to explain to communities [the] reasons accounting for variations in seasonal forecasts. This way, we are able to build and sustain their interest and confidence in the forecasts we provide. Moreover, it is also a channel to positively shape communities' understanding of the dynamics involved in generating and using climate information."*[94]

Facilitating community processes to better enable farmers to use climate information to support their farming activities is a lesson SARI has learned through being a part of the PSP workshops[95]. SARI had previously been involved with disseminating climate information but did not have experience in including farmers in the process of data generation and analysis. PSPs have introduced a participatory dimension to climate information generation and dissemination. SARI, as part of its CORAF-funded Enhancing Resilience and Adaptive Capacity to Climate Change through Sustainable Land, Water and Nutrient Strategies in West Africa (ENRACCA-WA) project, is replicating PSPs with farmers in Dimabi, Kpalsobu and Wantugu in the Tolon District of the Northern Region. In addition, SARI is implementing PSPs in the yam-based cropping systems of Nanumba North District of the Northern Region and the maize-based cropping systems of the Sisalla West District of the UWR. This broad range of sites will enable SARI to determine how farmers are responding to PSPs across various ecological and spatial scales in the north. This, in turn, allows SARI to determine any differences in adoption rates to better inform policy and practice.

PSPs have also been introduced into SARI's Innovation Platform Concept, where farmers are brought together to brainstorm and prioritise problems, offer solutions and explore possibilities for developing strategies in response to climate change. The introduction of PSPs has helped farmers to structure their planning processes while building appreciation for climate information. Through these processes, SARI is able to tailor advisory services to farmers for deciding whether early or late crop cultivars – and exactly how early or late – will be best to plant, given the outlook for any particular year.

[94] Quote taken from Mr Jacob Lambon, the Regional Meteorological Officer for the Northern Region, during KII discussions in the region.
[95] Taken from KII discussions with Abdulai Lansah, an Agrometeorological Scientist from SARI Nyanpalla.

4.3.3. Impacts of Climate Information Centres on communities and users

CICs have improved community access to climate information as well as providing them with access to innovative technology for the implementation of climate-smart practices. This exposure helps users better manage the various climate change and variability challenges in innovative and informed ways. The existence of CICs is also encouraging a feedback process from users to improve the technical aspects of advisory development and dissemination.

An unanticipated outcome of the development of CICs is that they have become integral channels for mobilising support for rescue missions for both humans and livestock following disasters. Once announcements are made, rescue teams are quickly assembled and mobilised. Similarly, CICs have become strategic venues for hosting meetings with various stakeholders on the effects and impacts of climate change on communities and the opportunities presented by climate-smart agriculture[96]. This facilitation has helped in making CICs become known as trusted climate information sources among districts.

4.4. Sustainability of the Participatory Scenario Planning process

Observations

The following enabling factors for the PSP process were identified during KIIs, FGDs and workshop participation.

- Willingness of government sectors to support the process – the DAs have provided support for the PSP process, which has resulted in positive reinforcement of the process.
- Availability of donor projects with interest in CIS to replicate the PSP process.
- Agriculture – as the backbone of districts economies – necessitating and supporting the need for CIS.
- Visible negative impacts of climate change on livelihoods (e.g. long dry periods and droughts, desertification, flooding and windstorms) necessitating the need for more scientific, forward-looking decision making through CIS.
- Availability of key research institutions and professionals from *inter alia* GMET, SARI, the University for Development Studies (UDS) and DAs to facilitate the process.
- Availability of community forecasts for the onset of rains, which is a good entry point for scientific forecasting.
- Users' level of interest and continuous demand for PSPs.
- Support for the integration of PSPs into DMTDPs.

As previously mentioned, the PSP process has evolved from ALP being the sole sponsor to involving other organisations in sponsorship and facilitating the process in non-ALP districts – for example, Lambussie-Karni and Sissala East Districts in the Upper West Region (UWR).

[96] Climate-smart agriculture is an integrated approach to agriculture developed to address the interlinked challenges of food security and climate change. The approach has four objectives, namely: i) sustainably increasing agricultural productivity; ii) equitable increases in farm incomes, food security and development; iii) adapting and building resilience of agricultural and food security systems to climate change at multiple levels; and iv) reducing greenhouse gas emissions from agriculture. CSA prescribes that the three objectives be considered together at different scales, levels and over different time periods, with specific national and local priorities in mind.

This shift is attributable to demands by both ALP and non-ALP communities for PSP workshops. This demand has arisen as communities have recognised the benefits of the process to their livelihoods.

Various barriers were identified during the impact assessment that hinders the continuation and sustainability of the PSP process in districts and regions. These barriers are included below and expanded on under the analysis sub-section.

- Unreliable political commitment to PSPs because of preference for physical (visible and tangible) aspects of development, as opposed to the soft (intangible) knowledge-centred nature of PSPs.
- Evidence of donor fatigue – unwillingness of donors to provide further support for PSPs because of a less-than-satisfactory readiness for donor recipients to assume responsibility for initiatives set in motion.
- Poor attitude of people to projects centred on knowledge acquisition (i.e. PSPs) as opposed to projects providing handouts (tangibles).
- Following the exit of ALP, there is inadequate financial commitment and an increase in the untimeliness of organising PSPs, especially if the DAs are to independently organise the workshops going forward.
- Financial resources required by most small-scale farmers to operationalise advisories (i.e. cost of critical inputs such as improved seeds, fertiliser and agro-chemicals) are unavailable because of the poverty status of many areas and are beyond the economic means of most farmers.
- The accuracy of forecasts has in some instances been less than satisfactory, often weakening community confidence in them.

Analysis

The partnership approach that CARE has taken in the implementation of ALP has resulted in community capacities strengthened to shape initiatives that influence their livelihoods to bring about positive changes in their livelihoods, such as PSPs. These positive changes include the provision of information that promotes new thinking and climate-resilient decision-making. This bottom-up approach to sustainability is critical to the continuous development and improvement of the process.

Additionally, the process has shifted the facilitating role of PSP workshops from ALP representatives to DA staff and local district and community members. This shift has resulted in districts and communities taking ownership of the process as they are essentially required to run workshops independently, including preparation and planning. Ownership of the process began between 2015 and 2016 when all DA representatives joined PSPs. However, the frequent transfers of DA staff with the necessary capacity for facilitating PSPs – i.e. erosion of institutional memory for running PSPs – may become a barrier to the continuation of PSPs. Attention also needs to be focused on how to generate political support to commit time and resources for PSPs in the districts and regions.

The long-term sustainability of PSPs would be strengthened if the existing capacity of regional-level GMET staff was improved. Training to staff should be formalised to conduct and undertake research, particularly in the fields of agrometeorology, climatology and hydrology. Building capacity in regional GMET offices would support the process in

downscaling forecasts that are usually at a regional scale and do not consider local-scale variability.

Feedback is imperative to the PSP process to determine relevance, added value and to gauge to what extent confidence is growing in the provision and implementation of advisories. The lack of tracer studies to receive feedback on advisory relevance to end users has become a central barrier that was insufficiently planned for at the outset of the PSP process. Sustainability of the PSP process can be achieved if end users demonstrate continued and further interest. This user interest can be encouraged through appropriate feedback mechanisms that report on response, acceptance, adoption, implementation and replication of advisories by users. Examples of existing feedback mechanisms that could be implemented into the PSP process efficiently include tracer studies, farmer report cards, question and answer forums and farmer field days.

A particular challenge to CIC sustainability is access to local and appropriate repair and servicing centres. All repair works are currently being handled by experts from Accra[97] which is inefficient for the long-term sustainability of CICs. Operational problems also involve the lack of technical capacity to operate CIC equipment. This lack of capacity is also attributed to the voluntary nature of the work and the operational teams running CICs. It was reported during community meetings and discussions that there is limited capacity available when services are needed because of inadequate or a lack of motivational packages and incentives for volunteers.

Multi-stakeholder interactions have increasingly demonstrated that upscaling the PSP process is achievable at the regional and national levels. Replication of the process at these levels could help influence policies and secure investment for the process. A challenge, however, is that presently no PSP costing has been done at the district level to campaign for the integration, commitment to and support for the process. The budget for conducting PSPs needs to be finalised in order to promote further uptake and replication of the process.

Additionally, sustainability could be better guaranteed if climate-smart agricultural research were made a complementary component of the PSP process. This research component would provide the evidence needed to convince end users about compliance to advisories and to build a network of adaptation evidence for improving farmers' uptake of CIS. Users respond better through visual demonstration than verbal presentation. Presently, there is an absence of demonstration sites and adaptation trials to showcase to farmers the value addition of adopting advisories.

Efforts to secure the involvement of private sector CIS providers (such as ESOKO, IGNITIA and TOTO AGRIC) in the PSP workshops could help leverage a demand-driven approach to CIS. Sustainability is better guaranteed when farmers appreciate and understand the value

[97] Accra is the national capital of Ghana which is far from the remote communities where CICs are situated.

addition of CIS to their livelihoods. Support for CIS in communities is demonstrated by their willingness to pay for the service.

5. Conclusions, lessons learned and recommendations

This assessment evaluated the value and impacts of the PSP process in delivering user-responsive CIS to communities and users in Ghana. Initially, GMET was only responsible for producing weather forecasts, downscaling them to meet community needs and disseminating to stakeholders. These disseminated weather forecasts were a general guide and often too technical for users to interpret, particularly users in rural communities. PSP introduction has seen the development of generalised forecasts to advisories that are simplified, detailed on adaptation and mitigation measures and well-tailored to specific regions and needs of farming communities. This provision of advisories is through a multi-stakeholder participation process, including climate information producers (e.g. GMET), government departments (e.g. agriculture, water and disaster management authorities), intermediaries (e.g. NGOs, community leaders and the media) as well as users (e.g. farmers, communities and pastoralists). GMET is now integrally involved in the process of producing and communicating advisories as well as forecasts.

The PSP process has been an overall success in Ghana. As a result of ALP partnering with decentralised local governments such as the District Assemblies (DAs), there has been a promotion of local ownership in the process. Community acceptance of the process and recognition of the need for improved CIS is a promising indication for the future of PSPs, with communities putting pressure on DAs to organise future workshops. Innovations and variations introduced into the PSP process in Ghana demonstrate a number of good practices and successes for the overall process. In selected locations in Ghana, PSPs are part of an integrated CIS approach that includes CICs and rain gauges to facilitate community-based climate adaptation through the provision of climate information. Some challenges have been identified that need to be addressed in order to facilitate a smooth and effective hand-over process from CARE ALP to the DAs. Addressing these challenges will also promote the upscaling of PSPs across the country.

The main findings from this impact assessment are summarised and integrated here as lessons learned and recommendations, which are grouped under: i) the implementation process; ii) communication; and iii) the use and impact; and iv) sustainability.

From these conclusions, further research questions have been identified that have been highlighted as pertinent to the PSP process[98].

5.1. On the implementation process

PSP workshop scope expanded. One innovative good practice of the PSP workshops in Ghana is the inclusion of new information sessions within workshops. This broader scope

[98] These research questions are discussed in Section 5.5.

includes practical learning on crop water requirement, as well as exhibitions on new seeds and available inputs (such as fertilisers and agro-chemicals). This innovation has contributed to the continued improvement of the PSP workshops and overall process through a learning platform where new knowledge is shared. This has improved learning and increased interest by participants.

Community-focused PSPs. The PSP process implemented in Northern Ghana focuses on achieving broad community representation within the workshops[99]. The focus on community indicates a bias towards users, with the result that PSPs provide direct user benefits such as: i) increasing community ownership of the PSP process; and ii) ensuring timely and efficient communication of advisories among communities. These benefits are likely to increase adoption and change in practices following the advisories. However, having a large number of community participants often leads to challenges related to workshop facilitation. Ideally, a successful PSP would see a balance between technicians (climate information producers/intermediaries) and communities (users), which would result in high-quality, scientific-based advisory production influenced and shaped through local knowledge and the extensive reach of advisory communication.

Broadening the diversity of sectors as stakeholders. The PSP process in Ghana has been effective for agricultural users, particularly those engaged in crop farming. However, there is no evidence of broadening the scope of PSPs to include sectors other than agriculture, such as water, sanitation or transport. This bias towards agriculture resulted in advisories that were too specific for use in the majority of economic sectors. To further the interest in the PSP process, more sectors need to be included to create a multi-sectoral stakeholder platform. This would embed CIS into wider development planning and contribute towards an overarching climate adaptation goal at the district level.

Need for practical explanations on uncertainty and probability. The PSP process has demonstrated good practice in communicating climate information through all three potential weather forecast scenarios and subsequent advisories to users. An innovative means of explaining probability and uncertainty was illustrated to farmers using the following analogy: a person with 10 stones aiming to hit a target where probability equals the number of stones that actually hit the target out of a total of 10 throws[100]. However, field investigations have revealed that a large number of users are still more interested in the developed advisories – i.e. for 'above normal', 'normal' and 'below normal' rainfall scenarios – rather than the degree of probability or uncertainty linked to the forecasts. Probability and uncertainty need more emphasis in subsequent PSPs to improve the accuracy of user understanding of the PSP process as well as how to interpret the advisories and practically use the information in their farming operations.

[99] i.e. more than 100 participants in attendance at a single workshop
[100] See Section 4.1.3 on the interpretation of uncertainty and probability.

Including feedback and lessons learned. There is currently no established feedback mechanism in the Ghanaian PSP process except for a brief sharing of farmer experiences dealing with advisories and/or traditional forecaster predictions during workshops and special radio broadcasting. It is not evident how this shared information feeds into the development of advisories nor how it informs planning for subsequent workshops. A more structured and organised review process is necessary to be integrated into the PSP process. This will result in building trust, cooperation and ownership of the process, and therefore ensuring sustainability for the process as a whole.

Installing more rain gauges to improve localising of forecasts. The transfer and integration of data collected from community rain gauges into the national GMET database have not been as successful as was initially anticipated. It is currently unclear to what extent the collected data is used for downscaling seasonal forecasts or any other purpose other than local-level discussions at community, CICs and ALP-organised meetings. Notwithstanding the challenges identified above, the introduction of rain gauges has facilitated discussion of rainfall data among communities. The graphical representation of data has encouraged discussions and improved understanding within communities on various rainfall concerns, including: i) occurrence (i.e. daily, monthly or annual); ii) intensity and length of rainfall period; and iii) expectation dates for the next rainfall. Further training of the rain gauge monitors or installation of automated weather stations is needed. Data collected from these can be used in producing reliable and downscaled forecasts that are applicable to the district- and/or community-level users.

5.2. On the communication process

Efficient timing of advisories for planning. The timing for PSP workshops and the subsequent dissemination of advisories has been successful thus far in the ALP-implemented regions in the country. This has resulted in advisories that are relevant to farmers for planning for the ensuing rain season. Farmers now have adequate time to make educated decisions before the onset of the rain season.

Reception and preference for different communication channels. The communication process makes use of various communication channels through both rural and modern technologies including: i) radio broadcasts; ii) religious leaders; iv) chiefs; v) government departments; vi) local groups, including farmer-based organisations and women's groups; vii) community-based extension agents (CBEAs); vii) CMs; and viii) NGOs and CBOs. Women advisory users identified VSLAs and CBEAs/CMs as their preferred channels for climate information, while men preferred farmer to farmer extension services, CBEAs/CMs and radio broadcasts. For both groupings, CBEAs and CMs stand out as the main channels preferred for advisory communication from all visited communities. One of the enabling factors that make CBEAs and CMs effective channels for the dissemination of advisories is their ability to break down messages enough to be understood by users in local languages. By supporting farmers to refine and strengthen community-based mechanisms and systems for CIS acquisition and delivery, the CBEAs and CMs will not only be supporting the long-term sustainability of people's livelihoods but will also offer a model that promotes empowerment of rural communities.

Climate Information Centres as an innovative communication channel. CICs are an effective communication channel that has resulted in improving access to climate- and agriculture-related information. The provision of open and regular broadcasting through loudspeakers means that CICs as a dissemination channel reach a wide audience as well as provide a common platform for communication, including for all community members (i.e. men and women, young and old, rich and poor). However, this method of communicating advisories appears to be working well because of the presence of ALP and FRI to fund and facilitate the process. Although it not currently evident how the method will continue following the exit of ALP from the PSP process.

Integration of the three CIS pathways. Rain gauges, PSPs and CICs are three interacting pathways contributing to the provision of CIS. They interact by: i) rain gauges contributing to data generation for CIS; ii) CICs providing a platform for community engagement and discussion on CIS; and iii) PSP workshops providing an opportunity for communities to discuss CIS with a broad range of stakeholders who are well-equipped to assist them in making informed decisions. FGDs have shown a relative increase in the awareness and knowledge of climate change risks and adaptation options in communities who are making use of the three interlinked CIS pathways. This increase is greater than in those communities which only partake in PSP workshops. Further emphasis needs to be placed on this integration of pathways in other districts and regions. Taking advantage of the momentum that PSPs currently have will help with further developing them into a user-responsive communication process.

5.3. On the use and impact

Community change in knowledge, attitude and practices. Rain gauges, PSPs and CICs empower communities with knowledge on seasonal forecasts, climate change and variability, climate-smart agricultural practices, flexible planning and risk management. Instead of relying on reactive measures such as rationing meals during dry periods, they are better prepared as they are investing in proactive measures. With improved information from their participation in PSPs, they are implementing proactive measures into their rain season preparation such as: i) planting early-maturing and climate-tolerant crop cultivars; and ii) implementing climate-smart agricultural practices, including *inter alia* composting, staggered planting, fertiliser micro-dosing and minimum or zero tillage. The adoption of these proactive measures has helped to improve overall food security and income in the community even through dry periods and droughts.

Enabling discussions with communities. PSPs present communities with an opportunity to interact with technical personnel and increased knowledge. There is improved access to national-level officials of GMET and National Disaster Management Organisation (NADMO) for CIS. Barriers to interaction between communities and GMET, NADMO and the Ministry of Food and Agriculture have been eliminated because of the communication platforms PSPs have created. There is now a direct line (via telephone) available to the institutions and technical personnel that all users have access to. This improved communication allows for further understanding of CIS, climate forecasts and advisories, which is of specific relevance

to the improvement of their livelihoods. Furthermore, this improved access is facilitating support for adaptation and DRR.

Diversity and increased collaboration with stakeholders. The multi-stakeholder process of the PSP workshops has provided strategic networking and opportunities to district departments to work with each other in addressing their respective DRR mandates. Before PSP implementation, the various district departments were insufficiently equipped with the necessary tools to enhance cross-sectoral collaboration and partnership for DRR responses.

5.4. Sustainability

The future success of the PSP process will rely to a large extent on a smooth and effective hand-over process from CARE and ALP representatives to the DAs. This hand-over should be informed by the lessons learned and recommendations made in this impact assessment. This will help to maintain a flexible and locally-relevant process that continues to build the resilience of communities in Ghana.

Improving coordination between relevant institutions. Currently, collaboration and partnerships between institutions are not developed enough to enhance the PSP process. Improving these relationships has the potential to build PSPs into stand-alone processes that no longer require the ALP as a facilitator. Furthermore, intensifying collaboration with agricultural research institutions will improve innovations in seed fairs and agro-input exhibitions during PSP workshops. These innovations will assist users in understanding the concepts demonstrated during the workshops.

Encouraging a strong multiplier effect in workshop participants. To effectively ensure that provision for sustainability of the PSP process is being established, participants of PSP workshops need to be capable of disseminating advisories to as many relevant users as possible. One such method of ensuring this sustainability is to have a selection process for participants within their representative sectors or institutions. This would ensure that each participant has a strong multiplier potential for disseminating the acquired information within their community.

Indicating advisories for all potential rainfall scenarios. There is a need to reconfigure the advisories to focus on the potential of all rainfall scenarios instead of the current focus solely on the most-likely scenario. This would help to widen the scope for users – specifically farmers – to diversify their options. Further to this, users need a more detailed explanation on the probabilities and uncertainties of the scenarios and predictions than what is currently being given during PSP workshops. Although these explanations are incorporated during the workshops, practical examples need to be shared during group discussions and included in the advisories. Participants need to be encouraged to discuss the concepts of uncertainty and probability in the context of the advisories and explain them to one another. This will broaden the understanding and assist with interpreting the scenarios individually for adopting and implementing advisories.

Improving the administration and value of CICs. The translation of forecasts and advisories into local languages will improve communication of climate information within communities. Thus far, the integration of the three CIS pathways has been innovative and loosely regarded as a 'breakthrough' for efficient climate information dissemination in Ghana, especially with the establishment of CICs. However, for further growth, more detailed and accessible local translations are necessary than what is currently available. Where CICs are run as voluntary services to the community, they require funding to translate advisories and information at the necessary levels. Suggestions for CICs to generate this funding include charging a small base fee to producers for the transmission and dissemination of all information and services that are not a part of CIS. This is feasible as CICs are an established system that can be used for fields other than CIS dissemination during dry seasons. Charging a small fee for this would assist with generating funds to employ local dialect-specific translators.

Ensuring sustainability of the PSP process. Incorporating video illustrations of rainfall scenarios and advisories could help improve the user's understanding, uptake, sharing and adoption in their preparations for the ensuing rain season. There needs to be a balance between technical stakeholders participating in PSP workshops and representatives from relevant sectors. This balance is important for the sustainability of PSPs going forward, specifically following the exit of ALP from the process. Along with a clear advisory dissemination strategy, it will be worthwhile to focus on providing time during preparation meetings for a core group of technical stakeholders to discuss the outlook and develop good practices for each of the developed rainfall scenarios.

Determining costing for the PSP process. Effective scaling of the PSP process is dependent on a more coherent understanding of the costing and budgeting processes for conducting PSPs. The costing of PSPs needs to be established prior to its implementation to plan for wider uptake and replication at the regional and national levels. The ALP has begun the necessary costing process for the implementation of PSPs, however, it will need to be refined before further scaling of the PSP process takes place.

5.5. Further research questions emerging from this impact assessment

Studies on feedback loops and processes. One notable finding that prompted a further research question is would a feedback process work if implemented through the CICs as they are currently run? With the volunteer nature of the CICs, would the feedback be accurately documented and fed back to the intermediaries and climate information producers?

Community understanding of uncertainty and probability. Observations revealed that the majority of users are more interested in the developed advisories – i.e. 'above normal', 'normal' and 'below normal' rainfall – rather than the degrees of probability or uncertainty linked to the forecasts. Probability and uncertainty need more emphasis in subsequent PSPs to bring users up to speed with the realities of forecasts. Although this has been a major focus during many PSP workshops and is integrated into discussions, participants do not

relay the information further. This suggests that these concepts are not sufficiently understood for participants to relay them.

Contextualising advisories using past seasons. When explaining advisories, a method that has proved particularly useful is the analogue year. This involves asking participants to recall a particular year where conditions were similar to the those detailed in the forecast. Detailed information from past forecasts and advisories will help in explaining future advisories to community members by relating scientific forecasts to their experiences. Furthermore, careful monitoring and evaluation of the on-the-ground use and users' interpretations of advisories will assist in shaping future PSPs. Such adaptive management of the PSP process will ensure that advisories remain relevant, understandable and impactful.

List of Annexes

Annex 1. Population figures for the eight communities that ALP Ghana is associated with
Annex 2. List of KII participants
Annex 3. List of FGD participants
Annex 4. Collaborated answers from all KIIs
Annex 5. Collaborated answers from FGDs

Available on request from alp@careclimatechange.org

The Adaptation Learning Program (ALP) for Africa aims to increase the capacity of vulnerable households in sub-Saharan Africa to adapt to climate change and climate variability. Since 2010, ALP has been working with communities, government institutions and civil society organisations in Ghana, Kenya, Mozambique and Niger to ensure that community-based adaptation approaches and actions are integrated in development policies and programmes. This is achieved through the demonstration and dissemination of innovative approaches for CBA, supported by practical tools, methodologies and evidence of impact. ALP is also working to create an enabling environment for CBA by working with civil society groups to influence national and international policy frameworks and financing mechanisms for adaptation.

The programme is implemented by CARE International. Financial support to ALP has been sourced from: UK Aid from the Department for International Development, the Ministry of Foreign Affairs of Denmark, the Ministry of Foreign Affairs of Finland and the Austrian Development Cooperation.

Contact us:

Adaptation Learning Programme
CARE International
P.O Box 2039 - 00202 KNH, Nairobi, Kenya
Tel: +254 2807000 /730 113 000
alp@careclimatechange.org

www.careclimatechange.org/our-work/alp/

ALP is supported by

UKaid from the Department for International Development

MINISTRY FOR FOREIGN AFFAIRS OF FINLAND

Austrian Development Cooperation

Danida