Institution: University of Reading

Unit of Assessment: 22, Anthropology and Development Studies

Title of case study: Participatory Integrated Climate Services for Agriculture – Empowering smallholder farmers to cope with and adapt to challenges associated with climate change and variability

Period when the underpinning research was undertaken: 2000 - present

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Peter Dorward	Lecturer; Associate Professor Professor	1989 - present
Graham Clarkson	Senior Research Fellow	2012 - present

Period when the claimed impact occurred: 2014–20

Is this case study continued from a case study submitted in 2014? No

1. **Summary of the impact**

The Participatory Integrated Climate Services for Agriculture (PICSA) approach has enabled hundreds of thousands of smallholder farmers to better adapt to and cope with climate challenges and has influenced the thinking and strategies of key UN and other international organisations. The approach has been used in 23 countries, and national governments have included it in their strategies and policies for agricultural extension and climate services. Developed by researchers at the University of Reading, PICSA is a novel approach which empowers farmers by facilitating locally specific, evidence-based planning and decision-making for their own contexts. Multiple evaluations have shown that more than 85% (and up to 98%) of farmers trained in the approach have made changes in their crop, livestock and/or other livelihood enterprises as a result of their use of PICSA. These changes have improved household food security and income and increased resilience to climate variability and change in the Majority World.

2. Underpinning research

A novel agricultural extension and climate services approach, PICSA, was developed by Dorward and Clarkson at the University of Reading to address two main challenges. Firstly, smallholder farmers are vital for food security across the Majority World, where millions of households depend upon small-scale, rain-fed farming. Helping farmers to adapt to and cope with climate change and variability is a major global challenge, as acknowledged in the 2015 Paris Agreement. Critical farming and household decisions depend upon the weather, including how much rain falls, the length and start of rainfall seasons, and the timing and extent of extreme events. Smallholder farmers have received very little, if any, locally relevant, climate and weather information, and little has been done to contextualise this information, relate it to farmers' experience and to make it useful for decision-making. Secondly, in the areas of both agricultural extension and climate services, top-down and technology-focused methods have continued to be widely applied and have been of limited use to smallholder farmers. Addressing these challenges required a bottom-up, scalable approach that can support individual smallholders with planning and decision-making in their own complex environments and farming systems.

PICSA was developed using an iterative and reflective process, working with smallholder farmers, government extension personnel, NGO field staff and meteorologists in Zimbabwe (2011–13; funded by Nuffield Africa) and Tanzania (2013–15; funded by the Research Program on Climate Change, Agriculture and Food Security of the Consultative Group on International Agricultural Research – CCAFS). The research aimed to develop a process that would support and empower farmers in their planning and decision-making processes for cropping, livestock and non-agricultural activities. Two principles were established to underpin the PICSA approach: (1) everything in the approach should support the farmer as the decision-maker, as farmers are the most able and best placed to make decisions on their farming practices; and (2) options-by-context – each farmer has their own unique context consisting of multiple aspects which need to be considered, including their economic context, their access to different resources, their aspirations and their attitudes to risk. Drawing on the experience of the University of Reading team in agricultural innovation, participatory extension [ref 1] and climate analysis, and following a series

of workshops with subject experts and representative stakeholders in Zimbabwe, a preliminary version of the PICSA approach was developed in 2011. In each of the next four years, the researchers undertook an iterative process involving cycles of *implementation, reflection, learning* and *adaptation*, using a combination of formal and informal approaches with farmers and government and NGO extension staff. Implementation included a series of five-day practice-based training workshops, run with groups of approximately 30 field extension staff (together with their managers), who each then facilitated the use of PICSA with groups of farmers ahead of and during the next agricultural season. The reflection and learning were also informed through (1) observation of the use of the approach by farmers and facilitators; (2) focus group discussions and individual interviews and discussions with farmers and extension field staff, both during and after their use of the approach; and (3) discussion with key institutions involved in agricultural innovation and climate services. The approach and training materials were adapted ahead of each cycle. In total, four cycles were used (two seasons in both Zimbabwe and Tanzania) in a range of locations and environments. This process involved approximately 1,400 farmers and 110 field staff. From this, the PICSA field guide [ref 2] that outlines the approach was produced in 2015.

PICSA integrates locally specific climate information with participatory decision-making tools to support farmer decision-making. The approach incorporates experiential and anticipatory action learning and emphasises the importance of farmers' existing knowledge, iterative questioning and reflection. Trained agricultural field staff facilitate the approach through a set of participatory, active learning sessions with groups of farmers. These sessions involve participatory tools and activities [refs 3 & 4] that are suitable for farmers regardless of their level of literacy. Firstly, individual farmers consider their own resources, existing activities and farm contexts and think about how timing and weather affect these. As the farmers progress through the sessions, they analyse locally specific historical climate graphs alongside their individual and collective experiences. These climate graphs include information on seasonal rainfall amounts, season start and end dates, extreme events and temperatures. Commonly the graphs present information for each past season over a 30-50 year period and help farmers to explore how the climate is changing and the range of climate variability in their location. Farmers also use the graphs to assess risks and relate them to decision-making; for example, the probability they will receive enough rainfall for a specific variety of crop within the season. Drawing on these climate analyses and their collective experiences, farmers then identify a range of potential options for coping and adaptation. Using options matrices, farmers explore the viability of different options for their individual contexts. Individual farmers then construct participatory budgets to explore the feasibility of their preferred options and plan their implementation. Ahead of the season, using a transparent process, farmers are introduced to the seasonal forecast and, depending on the strength and nature of the forecast, may adapt plans they have developed. During the season short-term forecasts are shared to inform more immediate decision-making and after the season both farmers and agricultural field staff compare and reflect on their experiences in order to improve the process in future seasons.

As detailed in Section 4, the overall PICSA approach is a novel process that has resulted in major improvements in climate services for agriculture and has been instrumental in empowering farmers and improving their livelihoods in 23 countries across four continents.

3. References to the research

1. Dorward, P., Galpin, M. and Shepherd, D. (2003) Participatory Farm Management methods for assessing the suitability of potential innovations. A case study on green manuring options for tomato producers in Ghana. *Agricultural Systems*, 75 (1). pp. 97-117. ISSN 0308-521X doi: https://doi.org/10.1016/S0308-521X(02)00034-3
2. Dorward, P., Clarkson, G. and Stern, R. (2015) *Participatory Integrated Climate Services for Agriculture (PICSA): Field manual. A Step-by-Step Guide to Using PICSA with Farmers.* Walker Institute, University of Reading.
3. Clarkson, G., Dorward, P., Osbahr, H., Torgbor, F. and Kankam-Boadu, I. (2019) 'An investigation of the effects of PICSA on smallholder farmers' decision-making and livelihoods when implemented at large scale – The case of Northern Ghana'. *Climate Services*, 14. pp. 1–14. doi: https://doi.org/10.1016/j.cliser.2019.02.002
4. Staub, C. G. and Clarkson, G. (2021) Farmer-led participatory extension leads Haitian farmers to anticipate climate-related risks and adjust livelihood strategies. *Journal of Rural*

Studies, 81. pp. 235-245. doi: https://doi.org/10.1016/j.jrurstud.2020.10.029 [available online 19th November 2020]

The research team are confident that the research meets at least the 2* quality level for originality, significance and rigour. It demonstrates the characteristics of: *providing important knowledge and the application of that knowledge*; *contributing to incremental and cumulative advances in knowledge*; and *thorough and professional application of appropriate research design and techniques of investigation and analysis*. The research was funded through a number of highly competitive, peer-reviewed funding applications. It has influenced researchers, policy makers and practitioners understanding of and approaches to climate services in smallholder farming systems. The journal articles listed are published in well-established, peer-reviewed, international journals. Refs 3 and 4 explain the novel and original PICSA approach and investigate how its use at scale has influenced farmer behaviour. Ref 2 provides further details of the approach and was developed for practical use by field staff.

4. Details of the impact

How to cope with and adapt to climate change and variability are key challenges for farmers, particularly smallholder farmers in the Majority World. Smallholder farmers play an essential role in contributing to food security and reducing poverty. The output of the underpinning research outlined in Section 2 (the PICSA approach) has been used in four continents by smallholder farmers and the national and international organisations that support them. PICSA has empowered farmers to identify and make beneficial changes in both their farming practices and their other livelihoods. This has resulted in increased agency to deal with climate-related challenges, as well as improved household food security and income.

Scale and reach of the PICSA approach

To date PICSA has been implemented in 23 countries (see Figure 1), ranging from initial smaller scale pilots (for example, in Guyana and Senegal) to national implementation across countries by government ministries. For example, all 30 districts of Rwanda [Section 5, source 4] and more than half of all districts in Malawi to date [sources 2 and 3] have implemented the approach. Implementation in each new country involves (1) contextualised planning with institutions and preparation of local materials and climate information to reflect local farming systems and farmers' priorities; and (2) practical training for agricultural facilitators (government and NGO extension workers and community volunteers) ahead of them working with groups of farmers.

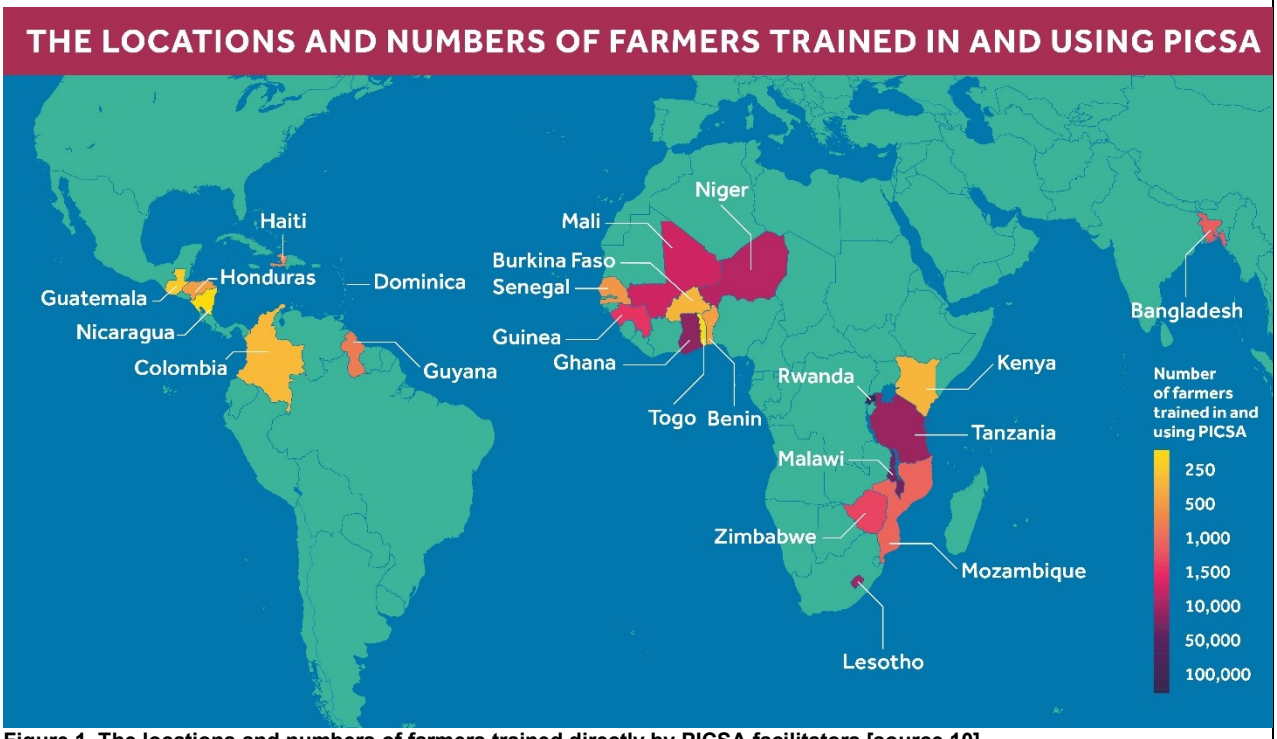

Figure 1. The locations and numbers of farmers trained directly by PICSA facilitators [source 10]

At least 5,836 agricultural extension workers and community volunteers globally have undertaken the detailed and practical PICSA training to become PICSA facilitators, and they have gone on to train at least 207,956 farmers to date (Figure 1; source 10). In addition, evaluation studies have shown that the majority of trained farmers have shared PICSA information and tools with those who did not attend the training. For example, each trained farmer in Malawi and Tanzania shared with an average of 16 and 26 other farmers respectively (source 1).

Smallholder farmers – improved food security, income and agency

Evaluations reveal that more than 85% (and up to 98%) of farmers trained in the approach have made changes in their crop, livestock and/or other livelihood enterprises as a result of their use of PICSA [sources 1, 2, 3 and 4]. Examples of changes include investing in new crops or planting a different variety of crop, changing the management of crops (timing of planting, soil or water management, etc.) and/or livestock enterprises (increasing scale, changing feed and veterinary practices, etc.), starting a new livestock enterprise and adapting wider livelihood strategies.

A combination of in-depth case studies and large scale quantitative surveys have provided detailed evidence of behaviour change and impact at the household level, with the large majority of trained farmers reporting improvements in food security, income and resilience [sources 1, 2, 3 and 4]. PICSA has had important personal and social impacts for farmers, including increased confidence in decision-making, greater agency and improved status in the community [source 1]. The United Nations Development Programme (UNDP) reports that the feedback from farmers has been unequivocally positive and that "89% reported that decisions had improved their household food security; 68% reported that they had improved household income; 86% were clear that the training had made them able to better cope with climate related risks" [source 3].

Scaling through uptake of PICSA by global institutions

Several international organisations have brought PICSA into their core approaches to work with smallholder farmers. UN organisations, including the World Food Programme (WFP) in Malawi and Tanzania [source 2] and the International Fund for Agricultural Development (IFAD) in Lesotho, have incorporated PICSA into their large-scale projects [source 7]. The adoption of PICSA within the UNDP has had significant reach: the approach has been implemented in Malawi, Guyana and Dominica, with a further Green Climate Fund project for Zimbabwe recently approved. In summary, the UNDP "intend to use the process whenever there is a need to improve the uptake and use of climate information in an agricultural context" [source 3]. Similarly, the WFP reports PICSA as "a crucial component for WFP's integrated climate risk management approach and… a key innovation for WFP work on last mile climate services" [source 2]. 'Last mile' is defined by WFP as reaching members of society who are physically, socially, economically and politically isolated. Building on this experience, WFP plans further implementation of the PICSA approach in Tajikistan, Kyrgyzstan, Zimbabwe, Sri Lanka, India, Afghanistan, Laos and Pakistan [source 2].

Further international organisations that have implemented PICSA include the International Center for Tropical Agriculture (CIAT) in Central America (Guatemala, Honduras, Nicaragua, Colombia) [source 6], with PICSA providing "the perfect bridge to close the gap between climate information, knowledge, and its use by farmers in Latin America working with farmers in a participatory way to support planning and decision-making" [source 6]. In Sub-Saharan Africa, further engagement with the University of Reading has facilitated CIAT's adoption of the PICSA approach in its USAID-funded project 'Rwanda Climate Services for Agriculture'. The approach has been instrumental in that project receiving international recognition in 2018 [source 5], and 112,000 farmers have been trained in PICSA and have incorporated it into their farm and livelihood planning [sources 5, 10]. As a result, PICSA "has been transformational for climate information and related services in Rwanda", and CIAT plans to extend its use of the approach in Africa beyond Rwanda [source 4]. In Francophone West Africa, the World Agroforestry Centre have supported national partners to implement PICSA in seven countries [source 8]. National and international organisations have also started to use PICSA in Asia. As part of the Global Climate Services for Resilient Development Partnership, the International Maize and Wheat Improvement Centre have supported government extension in their implementation of PICSA in Bangladesh [source 9].

This adoption of PICSA by major global institutions in their strategies for climate adaptation is significant. Importantly, in moving away from the previous top-down and technology focused

approach in agricultural extension and climate services, it is fundamentally changing the way they conceptualise and approach supporting small-scale farmers in adapting to climate change. UNDP reports that the PICSA approach has led to a "paradigm shift in the way of thinking about climate services and its provision, as well as the treatment and understanding of farmers as users of those services" [source 3]. It also acknowledges that the PICSA approach has been designed so that it enables capacity-building and rapid scale-up, and facilitates an "exit strategy which does not rely on large amounts of external support from donors in the future".

Building sustainability through national institutions

A major achievement of PICSA has been to build the capacity of national institutions in multiple countries through its incorporation into government policies [sources 2 and 4]. The role of the University of Reading in building the skills and capacity of field and management staff in national agricultural extension organisations, has been widely recognised as a key contribution by national and international organisations [sources 2 and 4]. In Malawi, "the Department of Agricultural Extension Services (DAES) has recently included the use of PICSA in its extension strategy and PICSA has been integrated into the curricula for undergraduate and postgraduate training taken by potential government extension staff at the University of Agriculture and Natural Resources (LUANAR) in Lilongwe" [source 2]. Likewise, in Rwanda, the government body responsible for agricultural extension (Rwanda Agriculture Board) "have included PICSA in performance targets for staff" [source 4], and in Latin America, "PICSA is allowing many of the 350+ organisations in the MTAs [Local Technical Agro-Climatic Committees] to do the 'last-mile' delivery of agro-climatic information" [source 6].

In addition to institutions that focus on agriculture and food security, PICSA requires substantial input from National and Regional Meteorological Services (NRMS). In countries where PICSA has been implemented, the University of Reading has built the capacity of NRMS staff to rescue, clean and analyse climate data in order to produce relevant products for farmers and facilitators. Through their involvement in PICSA, NRMS have become more aware of farmers' requirements, and the challenges they face, which has enabled them to carry out key functions of their service more effectively. For example, "PICSA has helped the National Meteorological Services of Colombia, Honduras and Guatemala be better linked with the farming communities' demands" [source 6].

In summary, the impact of the PICSA approach is highly significant in the context of coping with and adapting to climate change in the Majority World. It has resulted in the increased agency and resilience of smallholder farmers, leading to greater food security and improved livelihoods. Moreover, national governments and international organisations have changed their approaches to extension and climate services by embracing PICSA and the principles that underpin it.

5. Sources to corroborate the impact

[S1] Steinmüller, S. and Cramer, L. (2017) *Evaluation of Climate Services Interventions in the GFCS Adaptation Programme for Africa: Beneficiary Assessment Final Evaluation Summary Report.* Statistics for Sustainable Development.

[S2] Letter from Senior Climate Services and DRR Advisor at World Food Programme HQ.

[S3] Letter from UNDP Climate Information and Early Warning Systems Advisor.

[S4] Letter from CIAT Rwanda Country Coordinator.

[S5] CCAFS. 2018. Rwanda Climate Services for Agriculture project awarded the first ever Climate Smart Agriculture Project of the Year 2018. [Online] [accessed 27th November 2020].

[S6] Letter from Senior Scientist on Climate Impacts: Climate Action Alliance of Bioversity International and CIAT.

[S7] IFAD Wool and Mohair Production Project: Supervision Report. August 2020.

[S8] Letter from World Agroforestry Centre (ICRAF) Tree Scientist and PICSA coordinator.

[S9] Khan, M. S. H. 2018. Accelerating Smallholder Farmers' Access to Climate Services in Bangladesh. Agrilinks. [Online] [accessed 27th November 2020].

[S10] Documents from sources providing evidence of the number of farmers trained in and using PICSA in each country.