Institution: University of Reading

Unit of Assessment: 17b Geography

Title of case study: Improving the provision of climate and weather information to smallholders in Africa and south Asia.

1. Summary of the impact

Reading research has led to changes in policies and activities of national and international organisations that support the development of smallholder agriculture, particularly those who focus on provision of climate and weather information. Over the 2008-2013 period, the research has resulted in improved understanding of farmers' perceptions and information needs together with the design and implementation of methods for providing climate information services that better reflect smallholders' requirements. The research has to date had impact on the policies and activities of organisations responsible for design and delivery of climate information and services in at least 10 countries in Africa and South Asia and benefited thousands of farmers.

2. Underpinning research

In 2009 Drs Dorward (Lecturer September 1989 - 2008, then Associate Professor since October 2008), Osbahr (Lecturer September 2007-2013, then Associate Professor since October 2013), and Stern (Chief Biometrician, appointed September 1997-) of Reading University undertook work in semi-arid locations in Uganda and Sudan (funded by the Association for strengthening Agricultural Research in Eastern and Central Africa ASARECA and the International Crops Research Institute for the Semi Arid Tropics ICRISAT) which investigated farmers' perceptions of climate variability and change and how these influence their short and medium term planning and decision making. This involved comparison of farmers' perceptions with detailed historical rainfall and temperature data (more than 30 years of daily records), investigation of farmers' practices, information use and decision making, and identification of what types of information are needed by farmers and how this information can best be communicated to them [1].

Rainfall and its variability is a major factor determining agricultural yields across Sub-Saharan Africa and thus greatly affect food availability, livelihoods and the sustainability of local economies. However, the quality of climate and weather information for farmers has been poor and communicated inappropriately. Prior to the capacity building undertaken by this group of researchers (Stern), meteorological services in Sub-Saharan Africa had undertaken very limited historical analyses of climate data. Improving the provision of appropriate climate information is a priority for governments in Africa and for international organisations such as Climate Change Agriculture and Food Security (CCAFS), World Meteorological Organization (WMO), International Fund for Agricultural Development (IFAD) and Department for International Development (DFID).

Reading research addressed important research and development needs through: 1) improving understanding of what informs farmers' current perceptions of climate and weather and how this influences their planning, decision making and information requirements; 2) developing the use of analysed historical weather data with farmers which provides baseline information for them on climate, how it is changing, along with simple probabilities of rainfall characteristics for future years; 3) developing an approach, together with participatory tools, for service providers, such as government advisory services and NGOs, to provide information to large numbers of farmers and support them to interpret and use the information in their farm planning.

The Nuffield Foundation funded Reading research in Zimbabwe (Dorward, Stern 2011-13) that enabled development of the approach through an iterative process working with farmers, meteorological services, the national agricultural extension service (Agritex) and the NGO Practical Action [2, 3, 4]. The approach is mainly implemented by trained agricultural extension advisers (who already routinely offer agricultural advice to large numbers of farmers) and involves communicating with farmers about climate and weather information, providing additional technical information on cropping and livelihood practices and, through the use of a novel set of participatory planning methods, facilitating farmers to interpret the information and plan ahead for their own farm circumstances.

The approach consists of several stages. First, analysed historical climate information from local meteorological stations is provided to farmers in the form of clear graphs. The graphs are used to establish with farmers the basic characteristics of the local climate, whether they are changing, and then, together with information on local crop requirements, what crops and management are best

suited for different strategies. High variability between seasons in many semi-arid areas of Sub-Saharan Africa is addressed through the use of simple probabilities presented visually to farmers. Next, the Seasonal Climate Forecast (produced regionally in Africa and then interpreted by each country) is introduced and explained to farmers. Following this, farmers are trained in the use of participatory planning methods (resource allocation maps and participatory budgets) that enable them to take into account the weather, climate and crop information received. Farmers, supported by extension staff, use these to explore weather scenarios and determine the combinations of livelihood activities, individual enterprises and how they can be managed, to best suit their individual farms and circumstances. At the start of the rain season, and at 5-10 day intervals during it, short term weather forecasts (together with the updated seasonal forecast) are communicated directly to farmers by the meteorological service through mobile phones, thereby supporting farmers in their short term planning and in making adjustments to plans developed earlier. This overall approach can be implemented with large numbers of farmers using existing extension and meteorological staff. Following success early in the project in Zimbabwe, the international program on Climate Change, Agriculture and Food Security (CCAFS) funded further research by the team on the approach in Tanzania (2012 -2013).

3. References to the research

The first of these references is the main reference for this research and has been assessed internally as of at least 2* in quality.

1. Osbahr, H, Dorward, P, Stern, R and Cooper, S. (2011) Supporting agricultural innovation in Uganda to climate risk: linking climate change and variability with farmer perceptions. Experimental Agriculture, 47,293-316 (doi: 10.1017/S0014479710000785)

2. Muchedzi, H, Van den Ende, P, Dorward, P, Stern, R, Marovanidze, K, Nhongonhema, R, Mupuro, J, Unganai, L (2012) Mainstreaming climate change adaptation in agricultural extension: A training manual on use of climate information, and vulnerability and capacity assessment, for agricultural extension staff in Zimbabwe. University of Reading, Practical Action, Agritex

3. Dorward, P, Stern, R. (2012) Developing approaches to support smallholder decision making and planning through the use of: historical climate information; forecasts; and participatory planning methods. Synopsis presented at workshop on Scaling Up Climate Services for Farmers in Africa and South Asia December 10-12, 2012, Saly, Senegal, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

4. Van den Ende, P, Dorward, P, Muchedzi, K (2013) Mainstreaming Climate Change Adaptation in Zimbabwe's Agricultural Extension System, Final Project Report. University of Reading and Practical Action

Key research grants:

Dorward, Stern. Mainstreaming climate change adaptation in Zimbabwe's agricultural extension system, Nuffield Foundation (2011-2013) Amount £119,776

Dorward, Stern. Developing approaches to support smallholder planning and decision making through the use of climate and weather information (East and West Africa), Climate Change, Agriculture and Food Security (CCAFS, CGIAR) (2012-2014) Amount £117,434

Dorward, Osbahr, Stern. The role of learning and communication in NGOs regarding climate smart initiatives in East Africa, Rockefeller Foundation (2012-2014) £64,894

Osbahr, Dorward, Stern. Farmer perceptions of weather-related impact and response in Sorghum production systems in North Kordofan, Sudan (ASARECA)(2009-2010) Amount £4,652

Dorward, Osbahr, Stern. Innovation by small-scale farmers in response to climate change and variability in Uganda (ASARECA, ICRISAT) (2009-2010) Amount £2,593

Dorward, Stern. The potential of novel climate services for smallholder farmers in Lesotho. International Fund for Agricultural Development (IFAD) (2013) Amount £15,892

4. Details of the impact

Dissemination of the research findings and the approach have largely been achieved through publication of a training manual and field guide (see reference 2 above), invited talks, personal contacts and invited presentations at international conferences including: international workshop in

Senegal in December 2012 (Scaling Up Climate Services for Farmers in Africa and south Asia) organised and funded by WMO, CCAFS and USAID; international meeting of national meteorological staff across Africa (Nairobi, April 2013) funded by WMO; and international workshop organised by CCAFS on provision of climate information to farmers through intermediaries (Nairobi, June 2013). These, together with the current international focus on seeking ways to support smallholder farmers to deal with climate variability and change, led to requests for training and support and for further information, which in turn have influenced policies and practices of organisations. Examples of requests include those from IFAD who are developing major national agricultural programmes in several countries, Malawi (National Director of Meteorological services), Tanzania (National Director of Agri Met Services) and Ethiopia (National Director of Agric. Met. services) who requested support with developing information services using the Reading approach, and international NGOs such as CARE and Oxfam. USAID invited and funded Reading to develop a proposal to plan scaling up provision of climate information services to smallholders in six countries in East and West Africa.

Direct training in the approach has been provided across countries. In Zimbabwe, 224 extension staff were intensively trained in the initial phase, followed by a further 1,023 staff [1]. The Rockefeller Foundation funded training by Reading of 24 key staff from NGOs and Met services from Kenya, Tanzania and Ethiopia [2]. Seven National Farmer Organisations (FOs)s from Niger, Mali, Burkina Faso and Senegal received training from Reading in December 2012 (funded by the Mcknight Foundation and CCAFS) [3]. These FOs represent tens of thousands of farmers in their countries. The World Meteorological Organisation has also endorsed the approach and is promoting scaling up of training across Africa through funding the development and delivery of a new e-learning course by University of Reading (currently being taken up by over 200 participants from 5 countries in Africa).

In Zimbabwe during 2012-13, the national agricultural advisory service (Agritex) reported that 6,168 farmers had benefited from the approach [1]. A sample of 58 farmers gave a mean score of 4.6 for usefulness of the approach (using scale of 1-5 with 1=no use, 5=extremely useful) and the end of project final report documents farmers changing to practices that better suit local climate and weather as a direct result of using the approach, including farmers demanding and obtaining seeds of particular varieties for their location and adopting conservation agriculture practices (see reference 4 in section 3 above).

The dissemination and training have directly resulted in a range of NGOs and national organisations adopting the approach. These include Oxfam, Farm Africa, Practical Action and World Vision who have incorporated the approach into their training materials and work [4].

For example, Farm Africa reported that farmers who had been involved in Kenya "*by the end of the training were more knowledgeable and could relate the rainfall patterns to their environment and also make informed decisions especially on choice of crop varieties , when to plant and how to conserve water through the type of farming/land preparation methods they use"* [4] and Practical Action that "*both farmers and extension staff [in Zimbabwe] have recognised the positive impact of the project in assisting them to choose coping and adaptation strategies which enhance crop production and livelihood security*" [7]. The research has had impact on NGOs policies and foci across countries they work in. For example, Practical Action report that "*the success of the above approach and project, along with other Practical Action interventions has influenced Practical Action in making the collation and dissemination of weather and climate information a key component of our work in promoting climate resilient agriculture*" [7].At a broader scale major international organisations have adopted the approach and it is influencing their policies. The global programme of Climate Change Agriculture and Food Security (CCAFS) is the main international organisation working to improve climate services to agriculture in developing countries. For example, Reading's work has led to CCAFS placing much greater emphasis on the use of analysed historical information and participatory planning and CCAFS have incorporated the approach into their plans for climate service provision "...*to lead to better targeted upscaling of climate services for millions of farmers across Africa and south Asia* ..."[5]. In addition, CCAFS notes that the Reading research has *"led to the successful development of an 'approach'….. to develop, tailor, deliver, communicate and evaluate relevant climate and weather information for smallholders in ways that facilitate farmers to use it to improve decision making, agriculture and livelihoods."*[5]

IFAD, a Specialized United Nations Agency present in more than 90 countries, commissioned Dorward and Stern to conduct assessments and prepare plans to "*outscale the approaches*

developed in Zimbabwe throughout its emerging programme in the region" which includes Uganda, Kenya, Malawi, Lesotho, Tanzania, Madagascar [6].

Climate and weather information provided through the approach developed by Reading research has changed the activities of and approaches used by major international, government and non-government organisations working to improve agriculture and reduce poverty in Sub-Saharan Africa and south Asia and helped thousands of smallholders to improve their decisions and livelihoods.

5. Sources to corroborate the impact

1. Correspondence from Head of Crops Branch, Department of Agricultural, Technical and Extension Services (AGRITEX), Department of Agriculture, Mechanisation and Irrigation Development, Zimbabwe.

2. Report on fSIAC Statistics in Agricultural Climatology Face–to–Face Workshop, 8th to 16th April 2013, Adama, Ethiopia, Offered by Walker Institute, University of Reading, under the project Supporting the Rockefeller Foundation Climate Change Units in East and Central Africa: Phase II.

3. Report on Training workshop on climatic risk analysis, December 10-15, 2012, Niamey, Niger, offered by University of Reading, funded by the McKnight Foundation and CCAFS.

4. Correspondence from Maendeleo Agricultural Enterprise Fund (MAEF) Coordinator, Farm Africa, Kenya Country Office.

5. Correspondence from Climate Change, Agriculture and Food Security CGIAR, CCAFS Climate Services Champion, Scientist, CCAFS.

6. Correspondence from Climate and Environmental Specialist, Regional Office for East and Southern Africa (ESA), International Fund for Agricultural Development IFAD.

7. Correspondence from Programme Coordinator, Practical Action Programme Support Unit, Practical Action.

All the documents cited above are available upon request from the submitting unit.