Irish Aid
Rialtas na hÉireann
Government of Ireland

Food security and global framework for climate services

Lessons learned report

Improvement of Agro-meteorological and climate information to enhance agricultural productivity and food security in Tigray and Southern Nations, Nationalities and Peoples' Region (SNNPR) of Ethiopia

Irish Aid, Policy Unity *November, 2018*

Table of Contents

Acronyms

AMCOMET	African Ministerial Conference on Meteorology
AWS	Automatic Weather Stations
BoARD	Bureau of Agriculture and Rural Development
CRGE	Climate Resilient Green Economy Strategy
DAs	Development Agents
GFCS	Global Frameworks for Climate Services
GHACOF	Greater Horn of Africa Climate Outlook Forum
MoU	Memorandum of Understanding
NMAE	National Meteorology Agency of Ethiopia
RFTCs	Regional Farmer Training Centers
SARI	SNNPR Agriculture research Institute
SNNPR	Southern Nations, Nationalities and Peoples' Region
TARI	Tigray Agriculture research Institute
ToT	Training of Trainers
WMO	World meteorology organisation

1.0. Project Background

Irish Aid entered into a Memorandum of Understanding (MoU) with World meteorology organisation (WMO) in December 2012, recognising their role in coordinating the activities of its Members and the generation, processing, exchange and application of meteorological, hydrological and climatological data and products. Also recognising that Ethiopia, the agreed pilot country is prone to climate related impacts, it was agreed to cooperate in the implementation of Food Security related programmes in meteorology and climate applications in the context of Global Frameworks for Climate Services (GFCS).

Ethiopia – the Project Pilot Country

Irish Aid recognised that Ethiopia is prone to climate related impacts including floods, droughts erratic rainfall and change in temperatures, which have an adverse impact on agriculture, both crops and livestock. The vulnerability is made worse by dependence on rain fed agriculture, degraded ecosystems and other socio-economic and environmental factors. Agriculture is a key area where local resilience against current and future climate variability can be strengthened and the success of locally-grown crops helps in addressing food security, nutrition, health and household incomes. Agro meteorological information and mainly climatological data, is essential in agricultural planning and decision making

The project aimed to enhance the resilience of small holder farmers to climate shocks more effectively by bringing synergy to the on-going Irish Aid efforts and other relevant interventions in Ethiopia

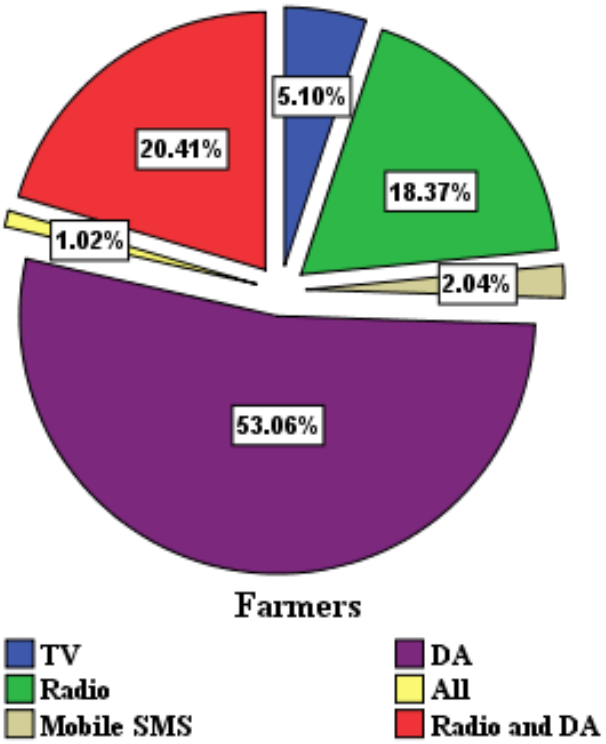
The MoU aimed at supporting the enhancement of climate and weather related services for the agriculture sector globally and in countries of interest to Irish Aid in Africa and Asia in the context of implementation of the global framework for climate services. This would build on the well tested application of Agricultural Meteorology Services for the Agriculture sector and subsistence small scale farmers in particular, in agreed target countries. The total funding for the project was €400,000

2.0. Implementation modalities

The WMO, a partner of Irish Aid established a national partnership with the National Meteorology Agency of Ethiopia (NMAE) to implement the project. NMAE established multi-level partnerships with different, Civil Society organisations, private sector, Universities and Government agencies at regional level including the Regional Bureaus of Agriculture and Natural Resources, Regional Meteorology Service Centers, Ethio- telecom, FM radios, Hawasa University College of Agriculture and Mekelle University. At Woreda level, Government Development Agents (Das) and farmer networks were used to disseminate weather information and advisories. This multi-level partnership supported implementation of the project based on the stakeholders' key comparative advantages.

3.0. Summary of project baseline findings

Before providing detailed climate information at farm level by meteorological office of Ethiopia a base line assessment on the availability of climate information was conducted and feedback collated from farmers, development agents and experts from 16 Kebeles. The survey address the availability and type of climate information received by the farmers, perception on National Meteorological Agency forecasts, and preferable dissemination Medias/channels, as well as the major gaps in climate service provisions. A total of 110, 48 and 32 respondents from farmers, development agents and experts, were contacted respectively, to obtain information on climate access and use of information and related issues



Preferred channels for information dissemination

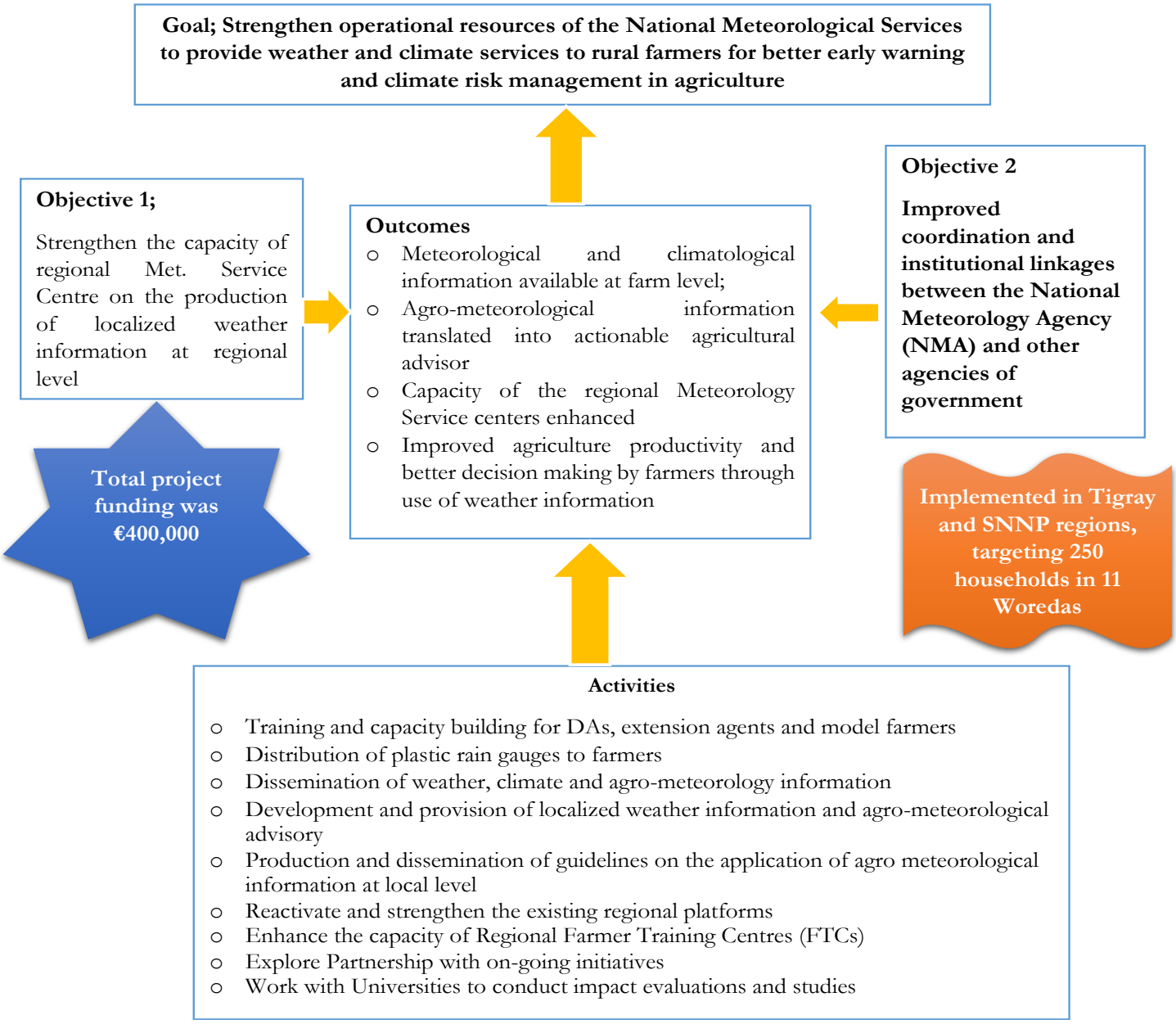
Climate conditions for Tigray region

- Drought prone and food insecure areas and mainly semi-arid
- The mean annual rainfall ranges from 980 mm on the central plateau to 450 mm on the north-eastern escarpments of the region
- The average temperature in the region varies from 16OC in the south west to 25OC in the extreme eastern areas.
- Agriculture is the main stay of the economy and constitutes nearly 85% of the total regional gross domestic product
- Agricultural system is mainly rain-fed type and dominated by small scale farmers.
- Main crops include maize, wheat, barley, millet, Teff, and sorghum

Responses from the baseline survey

- More than 60 % of the farmers did not understand the forecast given by NMAE as rated by both Development Agents (DAs) and subject matter experts.
- Decision makers had medium to high understanding regarding usage of the meteorological information
- Farmers accessing the weather information were not using it for planning and decision making
- Most of the farmers affirmed that the information is too generalised, based on zonal data which could not give location specific information reducing levels of accuracy
- The majority of the farmers (46%), DAs (53%), and experts (71%) noted that the forecast given is partially correct, 10% of farmers, more than 25 % of the DAs and more than 15 % experts said it was inaccurate.
- The information delivered by NMAE is low quality due to limited weather stations at local level
- Farmers recommended using DAs to disseminate the climate information to the farmers than rely on external channels like radios and Televisions
- Low levels of trust in the scientific information given by NMAE, thus the need for awareness raising through trainings, workshops and through Media.
- Most households did not have easy access to television, internet and other updated written documents in related to climate information, due to lack of electricity, phones etc

4.0. Project Summary

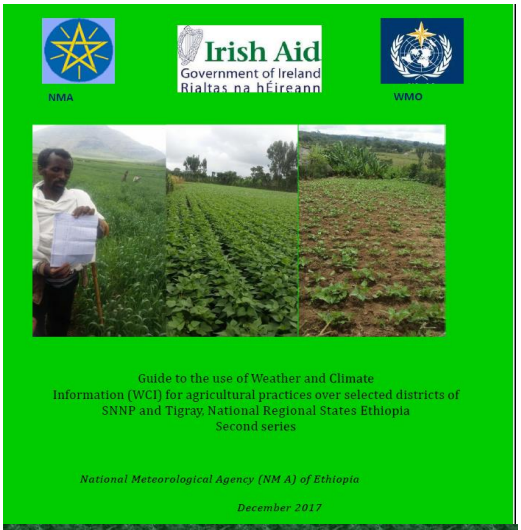


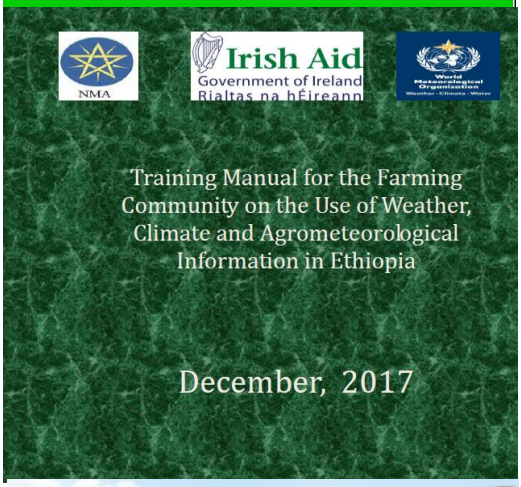
5.0. Key results

5.1. Access and use of meteorological and climatological information by farmers

NMAE and partners supported **Training of Trainers (ToT) programmes and roving seminars at the regional level focusing on development agents, extension agents and model farmers**, including a ToT programme for Development Agents and Subject Matter Specialists (SMSs) on climate risk management, including weather index insurance.

Dissemination of weather, climate and agro meteorology information was done seasonally and Climate outlook workshops organized in both regions on the short rain seasons *(belg)* and main rainy season *(Keremet)* in the presence of key stakeholders. In addition, NMAE developed and provided localized weather information and agro-meteorological advisories to targed farmers. Communication channels mostly used included radios, mobile phones, email, and use of development agents at community level. **Farmer training centres were also used as a means for weather information dissemination** to increase weather information delivery to end users. **Testimonies from farmers indicate that access to weather information improved their decision making and planning amidst climate change uncertainty.**





In addition, **localized climate and weather information was translated into local language** by the Mekelle Branch Meteorological Directorate before disseminated to the farmers. A team of experts established from the forecast and agro-meteorology of both Mekelle and SNNPR branches of Meteorological Directorate and Head Office worked on the preparation of **localized, downscaled and tailored weather/climate information and agro-meteorological advisory. This enabled farmers get information in understandable formats.**

A Climate Guide and training module for the agricultural community were prepared, reviewed, and published. They were disseminated to key stakeholders at national, regional and local level. The climate guide explains the basic climatology of Tigray and SNNPR regions in general and detailed climate analysis of the pilot woredas. The guides were useful for the general agricultural practices in line with weather and climate information and are anticipated to be used going forward even after the project has closed.

Five Automatic Weather Stations (AWS) were procured and installed in the pilot Woredas to help localized monitoring of the weather. The AWS measure six key atmospheric parameters and soil moisture every fifteen minutes and send it to the central server at the head office, where a quality control and data analysis is done. **250 plastic rain gauges were also installed in pilot Woredas** which enabled monitor the rainfall and localized farm level moisture availability to help decision making at farm level. Rainfall data from the plastic rain gauge was collected by the farmers themselves with support from development agents, the data is shared with Met. Offices for development of advisories. The AWS and the plastic rain gauges helped in localized monitoring of the weather and enhanced the skills of the

farmers in characterizing the different amount rainfall and intensity and application at farm level. The equipment also improved the accuracy and reliability of the weather forecasts.

5.2. Improved agriculture productivity and better decision making by farmers through use of weather information

The project targeted Woredas and Kebeles where low agricultural productivity has been experienced. Recognising that access to weather information is not the only factor of increased production, an integrated approach was undertaken to give holistic support to pilot farmers. In addition to dissemination of weather and agro meteorology advisories, **the project conducted experiments through establishing eexperimental and control plots at a 50:50 ratio in the two regions and both farmers on experiments plots and control plots got seeds, fertilisers and extension services.** The difference however is that farmers on control plots do not get advisories for the weather forecast and they make their own efforts to get the seasonal forecast from the normal channels or they don't access it. For the farmers on experimental plots, dissemination of the weather forecast and advisories is done by the development agent and through farmer networks who get information from the Woreda NMAE office.

The users of plastic rain gauges highlighted benefits obtained including;

- **Deciding when to apply fertilizers or chemicals**
- **Land preparation (tillage) and timely planting**
- **Making decisions like water conservation when precipitation is low or change crop variety, if there is too much drain excess water from the field.**

The Bureau of Agriculture supported farmers with improved cropping methods like planting in lines, applying fertilisers, etc and the Agriculture research institutes supported with recommending the suitable seeds as well as testing the soil samples. Soil PH[1] tests (physical and chemical) were conducted in both experimental and control farms of Tigray and SNNPR selected pilot areas in order to ascertain the homogeneity of the soil used for the experimental and control farms. Universities got involved in monitoring the process of setting up plots, soil measurements assessing the process, which informed the impact evaluations.

Results from the impact evaluation show that all experimental plots attained yield in excess of the control plots, which reached as much as 28.9 quintal[2]/ha in one Woreda of Tigray and 21.4 quintal/ha in SNNPR. This provided about 25% increase in yield for farmers who had used the agro-meteorological advisories and services.

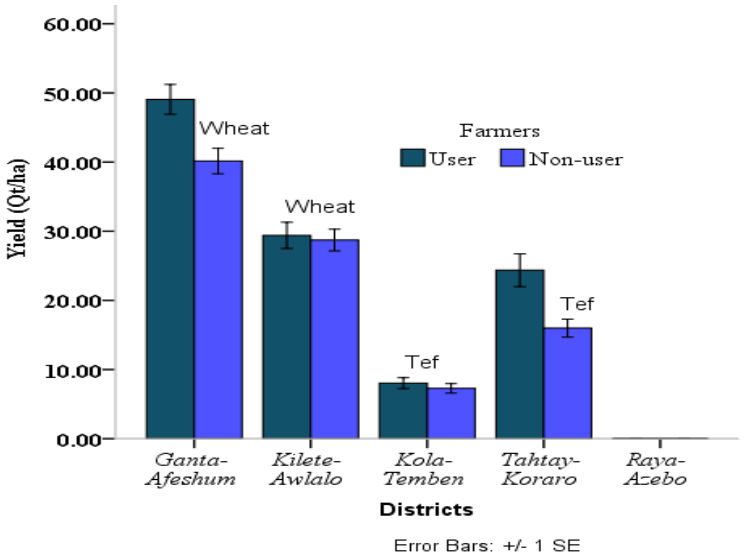
From the yield collected, user farmers in Kola-Tembien, Ganta-Afeshum, Tahtay-Koraro and Kilet-Awlalo districts obtained a yield increment by about 9%, 14%, 34.4% and 2.4%, respectively as compared to non-users. Moreover, a yield increment by about 3.8%, 10.8%, 12.4%, 20%, 24%, and 29 % was obtained in Saharti-Samre, Raya-Azebo, Asgede-Tsimbla, Enda-Mekonie and

[1] Soil pH. Soil pH is a measure of the acidity and alkalinity in soils. PH levels range from 0 to 14, with 7 being neutral, below 7 acidic and above 7 alkaline. The optimal pH range for most plants is **between 5.5 and 7.0**

[2] A unit of weight equal to 100 kilograms

Kilete-Awlalo. **This showed that the intervention of the improved climate information and agronomy advisories were substantial.**

The yield increment was highly significant in some areas that others (e.g. Ganta-Afeshum and Tahtay Koraro while it was not very significant in others like Kilete-Awlalo and Kola Tembene districts. **From the results it was concluded that the yield increment of users from non-users might be as a result of the intervention of the improved climate information, genetic makeup the crop and other uncertainties, such as soil type and topographical condition of the farm land**. **<u>However, over all, all farmers who accessed weather information and advisories got better yield.</u>**



Interviews with farmers revealed that **the project increased productivity through access to the weather forecast information with advisories to guide planning and decision making, which was not happening before. They were also able to access inputs- seeds and fertiliser from the bureau of agriculture which has improved the crop yields and quality. The extension services including training on new farming methods improved their yield.** The whole process has improved planning and decision making based on the weather forecast and the advisories e.g. planting times.

5.3. Improved capacity, coordination and institutional linkages

The project focused on improving the capacity of regional and woreda staff to provide usable information to the farmers as well as improve institutional linkages to deliver holistic services. During the baseline, an assessment was done on how to ensure synergies with other climate information related initiatives, eg. Climate resilient green economy strategy (CRGE) interventions, Irish Aid programmes and research partnerships on agriculture and agriculture insurance projects among others. This would enable different stakeholders to mobilize the farmers to use climate information through different Media as well as introduction of technologies and integrating climate information into different programmes in the regions.

Key successes include;

- Development of robust institutional linkages between Regional Meteorology branch Offices, Bureau of Agriculture and Rural Development (BoARD), Agricultural Research Institutes (TARI and SARI), Mekelle University and Hawasa universities, media and selected civil society organisations. MoUs were signed with the above key project partners and roles identified of each partners in the Tigray and SNNPR Subprojects. These stakeholders were involved in co-production, co-designing and co-dissemination of the tailored weather and climate information and advisories.

- Universities and research institutions were used to develop the scale up plan for the second phase informed by an impact assessment of the first phase in Tigray. Weather, climate and agro-meteorological information needs in the region were assessed and the Universities conducted stakeholder analysis that identified key stakeholders that were relevant for project implementation

- The Universities and research institutions supported on going activities including soil PH testing, distribution of suitable crops for the selected farmers as well as extending advisories on planting methods.

- Linkage was also made with Irish Aid implemented programmes in Tigray and SNNPR especially the livelihood and agriculture programme as well as the research components with TARI, especially on targeting farmers under the same programme. Irish Aid staff also participated in several activities of the project in the two regions.

- The capacity of NMAE Tigray and SNNPR regional Meteorological branches were improved. The directorates engaged in **developing tailor made advisories** based on data collected using rain gauges in addition to national data. Working with other specialists in agriculture was also helpful in **understanding how to deliver full agro -meteorology packages**. The extensive participation of senior head office staffs of NMAE and its top management throughout the project period gave the leverage and experience to Tigray and SNNP Regional Meteorological Services Centres. Two training workshops were also conducted for meteorological professionals who were directly involved in the project.

- The project lessons were shared by the WMO office at the inaugural African Ministerial Conference on Meteorology (AMCOMET**)** Africa Hydromet Forum, which took place 12 – 15 September 2017 at the African Union Commission Headquarters in Addis Ababa. The best practices were also shared during the Greater Horn of Africa Climate Outlook Forum (GHACOF) in Addis Ababa.

  It is yet to be seen how the built institutional linkages and level of service delivery will be maintained beyond the project period to strengthen the weather and climate information dissemination network.

5.4. Joint Monitoring and learning

- The project had a strong monitoring and learning component involving all stakeholders. The baseline was participatory and involved Meteorology and universities, the findings informed the project design. The research institutes, universities and development agents engaged with farmers throughout the project through collection of rain gauge data, providing advisory and extension services as well as soil testing and collecting experimental results. The regional farmer training centres worked as centres of learning and demonstration of best practices to the farmers, with model gardens also using plastic rain gauges and improved seed.

- Impact assessment surveys were conducted by the universities to assess the results at end of phase 1 and phase 2. The survey findings provide important learning from the results of the project implementation. TARI and University of Mekelle in Tigray, and University of Hawasa and BoANR in SNNPR undertook the evaluations with the involvement of NMAE, Tigray Mekelle Branch and BoARD of Tigray.

- Toward the end of the project, an evaluation workshop was organized to bring together stakeholders to discuss successes, lessons learned, challenges and a way forward for the project. Regional, federal level stakeholders attended the workshop as well as farmer's representatives and other Woreda and Kebele level stakeholders. Sustainability of institutional linkages and future cooperation were discussed.

6.0. Key Challenges

- Dissemination through general intermediaries including agricultural extension services and media was not very effective as a result of inadequate coordination. A systematic and strategic approach introduced in Phase I for wider dissemination was effective, but required follow-up in order to gain more stability in Tigray, taking advantage of the use of ICT technology in Ethiopia.

- There was progress in institutional linkages but still required further coordination among stakeholders working on food security and climate adaptation issues. Even in cases where climate information reached end users at the right time and was well understood, farmers often had few options to react to avert, mitigate and transfer the negative impacts of weather and climate related shocks. This was due to different risk management tools provided to farmers by different projects/initiatives and not always well coordinated. Farmers had a fragmented picture of climate risk management.

- The linkages and capacity of NMAE Regional Branch Offices and other development partners particularly the Bureau of Agriculture and Rural Development was initially weak and it was difficult to achieve coordination in the limited project time frame. This sometimes affected dissemination and application of weather and climate information at farm level which required better strategies to maintain the gains and keep it going.

- The plan to use the telecommunication networks in Ethiopia to enhance the number of dissemination channels for weather and climate information to ensure timely delivery was stalled due to high cost. The deployment of SMS-based system that automatically disseminates localized agro-meteorological advisory to predefined list of DAs in their localities was envisaged. A specification was developed and an open bid published in a newspaper, but only a single bidder gave offer, which itself failed to comply with the requirements and the cost was very high.

- The time allocated to the project was not sufficient to achieve the envisaged changes despite the intermediate results achieved. In addition, dealing with behaviour change for adaptation takes time. Although farmers were given enough training and advisories, some farmers were unwilling to follow the advice and training given by the experts, e.g. some farmers were reluctant to minimize the seed rate of their experimental plot, some farmers allotted marginal land to the experiment yield for fear of computing their arable land, some were harvested before maturity without communicating to the Development Agents.

- There were fewer female farmers involved during phase I and phase II project period as compared to the male farmers. Few women (mostly from female headed households) were engaged in the trainings, access to weather information and use of rain gauges. The project focused more on men, the very few women engaged were the female headed households who are also considered because they head households not because of their roles and capacities.

7.0. Key lessons learned from the pilot project

7.1. Dissemination and use of weather information

The project evaluated the access and use of information which had gaps, and were addressed by strengthening different dissemination channels. It should however be noted that challenges still remained due to a weak private sector that failed the use of ICT. Some of the channels were also not favourable for some of the farming households, either due to lack of infrastructure like electricity or assets like radios.

It is necessary therefore to consider the dissemination channels in relation to farmer households' capacity to access the weather information. The role of private sector in improving weather and climate services needs to be emphasised.

7.2. Accuracy of the weather information

The concerns of accuracy and reliability of the weather information needs to be prioritised. Like many other developing countries, the accuracy of the forecasts is determined by the availability of weather equipment in the different locations, which is always not the case. The baseline reports cases of farmers doubting the accuracy and reliability of the weather information, as well as generalised forecasts. The project addressed this by providing plastic rain gauges and AWSs, which was innovative and user friendly as well and enabled specialists to generate location specific advisories.

Sometimes reliability is also influencing by timely dissemination which affects interpretation and use of the information by farmers to make decisions. The use of development agents who live within the community was a very useful addition to the project success.

In the long term however, scaling up such good practices would be a well come intervention.

7.3. Capacity of technical staff to provide integrated climate services

The project in different ways attempted to build the capacity of staff at regional and Woreda level to generate usable products and advisories for farmers, including developing user guides and modules for continuous support. Agro- meteorology services would require a combination of skills, not to just provide information but also to respond to the projections in terms of climate risk management – no single individual is an expert in everything. Climate services including meteorology, agro meteorology and hydrology also need to combine messages to make them useful for farmers. The project attempted to address this through working with bureaus of agriculture, universities and other specialists which is very positive and a best practice that needs to be adopted by other stakeholders engaged in providing climate services.

7.4. Institutional coordination for scale and cost effectiveness

The project model of signing MoUs with sister Government institutions, Universities, media and Non-Government Organisations was a welcome approach which made the project stronger in terms of skills and scale of dissemination. Ethiopia is a large country where one institution cannot effectively provide information for farmers, which limits the scale. It is also important to recognise

the use of Government structures which are already in place instead of creating parallel structures. This would ensure sustainability of the interventions and avoid projectised ways of thinking. However, for the above to be successful, it would require influencing Government to allocate resources for dissemination, translation and delivery of climate information services, so that it is institutionalised. The need for harmonisation of Government departments at regional level also needs to be emphasised so that it's not just a one off activity due to a project, but integration of relevant services like climate information into Agriculture should be a Government approach and way of working. **Generating evidence on successes of the approach could aid decision makers in priorities weather and climate information and integrating it with implementation of relevant policies and programmes.**

7.5. Gender Dimensions of weather and climate services

Women's role in agriculture in Africa cannot be over emphasised, they do most of the work at the lower nodes of the value chain where weather information is required. The project did not consider gender dimensions in dissemination, access, and use of the weather and climate information. It should be noted that most of the dissemination channels limit women's participation, including ownership of radios, attending meetings, using phones among others. There is need to identify user friendly channels where women can access information but also intentionally targeting them for training.

7.6. Long term planning and Investment

Irish Aid funded this project as a pilot for 2 years though it was implemented in a phased way. The timeframe, based on weather conditions and planting seasons was too short to measure results in the long term. The project was rigorous in testing different approaches, however, better lessons and conclusions could have been recorded if the project was longer than 2 years. The demand for integrated services was high as recorded from farmer's voices, unfortunately, this ends with the project because the coordination mechanisms are not in build into the Government systems. In addition, adaptive behavioural change takes time, changing farmer's attitudes towards scientific information and implications requires a longer period of time to build and test.

8.0. Conclusion

The project model though short term has displayed that use of agro meteorology information can enhance productivity, but it is not the only factor. Institutional coordination, skills and capacity, finances and natural factors like soil types, type of seed, can have impact on productivity as well. However, in both scenarios, planning and decision making with climate information generated better results however minimal[3].

The model has potential for scalability with better investment, linkages with private sectors, insurance schemes and Government programmes on climate change and would be a contribution to the CRGE implementation as well as improving agricultural productivity, food security, nutrition and household incomes for small holder farmers.

[3] The lessons learnt report was compiled from reviewing project baselines, implementation reports and impact evaluations.