LIMPOPO
PROVINCIAL GOVERNMENT
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DEPARTMENT OF
AGRICULTURE AND RURAL DEVELOPMENT

Local early warning systems for drought – a possibility to add value to nationally disseminated seasonal climate forecasts

This policy brief gives insight to why seasonal climate forecasts are not used to their full potential for local planning and provides some suggestions of how a local early warning system could be designed. This is based on experiences from the development of a prototype of such a system in a pilot study, carried out by the Department of Agriculture and Rural Development, Limpopo Province in collaboration with Swedish researchers.

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Why are Seasonal Climate Forecasts not used more for local planning?

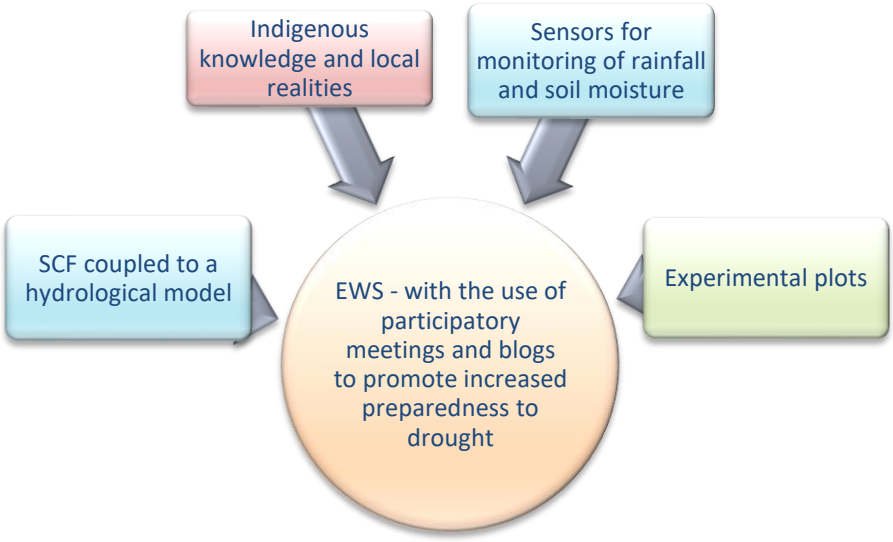
In theory, increased access to Seasonal Climate Forecasts (SCF) make it possible for authorities and farmers, to take early actions to lessen negative impacts of drought conditions. Despite increasing forecast capability in the past years, practical use of SCF at local and regional levels is still limited. This project illustrated that this is could be due to

- lack of awareness, engagement and communication between information producers and users
- lack of locally relevant information of rainfall, streamflow and soil moisture at the right time
- information not being perceived as presented in simple language and format.

If forecasts were used more in local planning, it would be possible to shift the focus from reactive actions after drought has occurred to strengthening communities as conditions are developing.

Could Local Early Warning Systems be useful to farmers and the LDARD?

A pilot study in Limpopo Province was performed to evaluate if and how a local early warning system (EWS) could add value to the Limpopo Department of Agriculture and Rural Development (LDARD) work by increasing proactive actions by LDARD and smallholder farmers' preparedness to drought. A local participatory EWS for local drought monitoring and forecasts was developed and evaluated for two pilot communities in two growing seasons (2013/2014 and 2014/2015). The system focuses on forecasts relevant for farmers: rainfall, soil moisture and streamflow. It integrates information from meteorological seasonal climatological forecasts (SCF) linked to a hydrological model, indigenous climate indicators and a sensor network monitoring rainfall and soil moisture. Demonstrations from experimental plots were used to provide examples of strategies to prepare for drought.



The pilot study was carried out in two communities:

- Lambani (Luvuvhu sub-catchment, Thulamela local municipality, Vhembe district municipality)
- Mokwakwaila (Letaba sub-catchment, Letaba local municipality, Mopani district municipality).

Workshops were held with LDARD representatives from provincial head office and district offices), Extension and Advisory Services from the Letaba and Thulamela local municipalities and service centres, the Agricultural Research Council, the University of Limpopo, the University of Venda, and the non-government organization, Association for Water and Rural Development to discuss:

- the dissemination, content and use of SCF
- common farmer responses to drought conditions

During community workshops, local EWS were presented to and discussed by farmers in connection with their planning and performance of farming activities and with consideration to indigenous knowledge of signs of drought or rain.

In addition, local sensors for rainfall and soil moisture monitoring were put in place in agreement with the local community.

The systems possibility to predict drought

In the two years of study, the SCF and indigenous drought indicators forecasted similar conditions i.e. wetter in 2013/2014 and drier in 2014/2015. This matched actual conditions, verified by local rainfall observations and the local sensor data of rainfall and soil moisture. However, two years is a limited period of time and longer test periods would be needed to ensure the level of predictive skill of the early warning system.

Identified bottlenecks for using SCF

Access to information

Even with formal channels to disseminate SCF from provincial to extension service level, extension officers might not regularly receive SCF, because of lack of laptops or weak and irregular internet access.

Outreach

Although LDARD staff from different administrative levels are willing to discuss SCF at organised forums, there is a need to ensure that such organized forums exist. Written reports with information of emerging field conditions tend to pass through a long chain of administrative levels causing delays.

Roles and responsibility

Disaster Management Coordinators' duties might mainly focus on reactive reporting of disaster damage rather than on proactive risk management. To encourage proactive disaster management, service centre officers could receive a clearly stated responsibility to interpret, filter and tailor SCF for local conditions. This could include directive or decisions on who should take the lead and organize knowledge forums.

Awareness of that forecasts are predictions

SCF uncertainty must be clearly explained so that farmers do not believe them to be "true" predictions. If SCF prove to inaccurate, this would negatively impact on farmer trust in future forecasts.

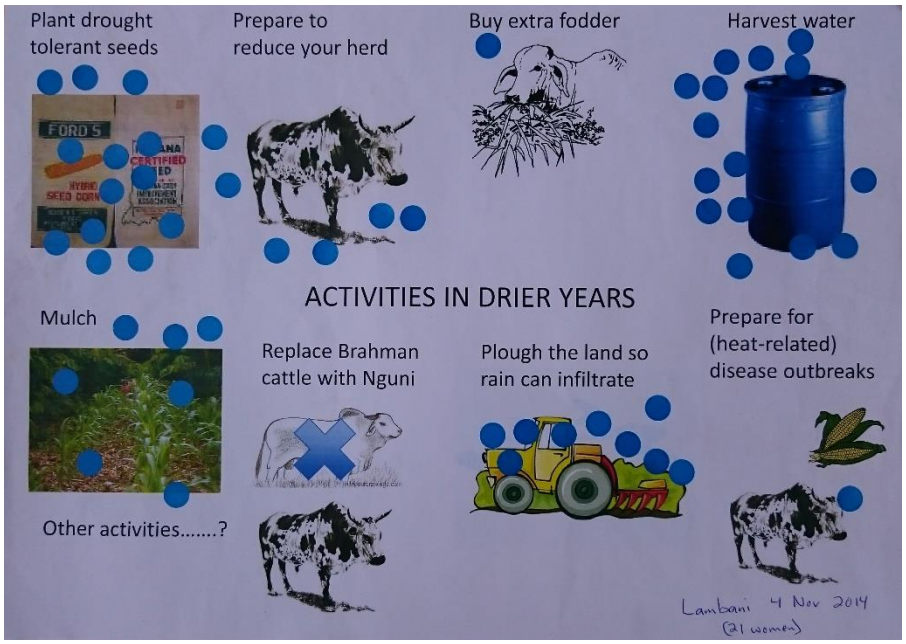
Knowledge interplay

Information from indigenous climate indicators can be perceived as locally relevant, and if similar to SCF, trust in the forecasts would increase. It is thus not a question of using SCF instead of indigenous climate indicators, but rather the knowledge interplay. Some farmers, however, noted that both rain patterns and indigenous forecast signs have become less certain in recent years due to climate change.

Tailoring information

Distributed SCF cannot be understood by smallholder farmers without tailoring the content. It should locally relevant, relate to what really matters to farmers and presented in an understandable manner.

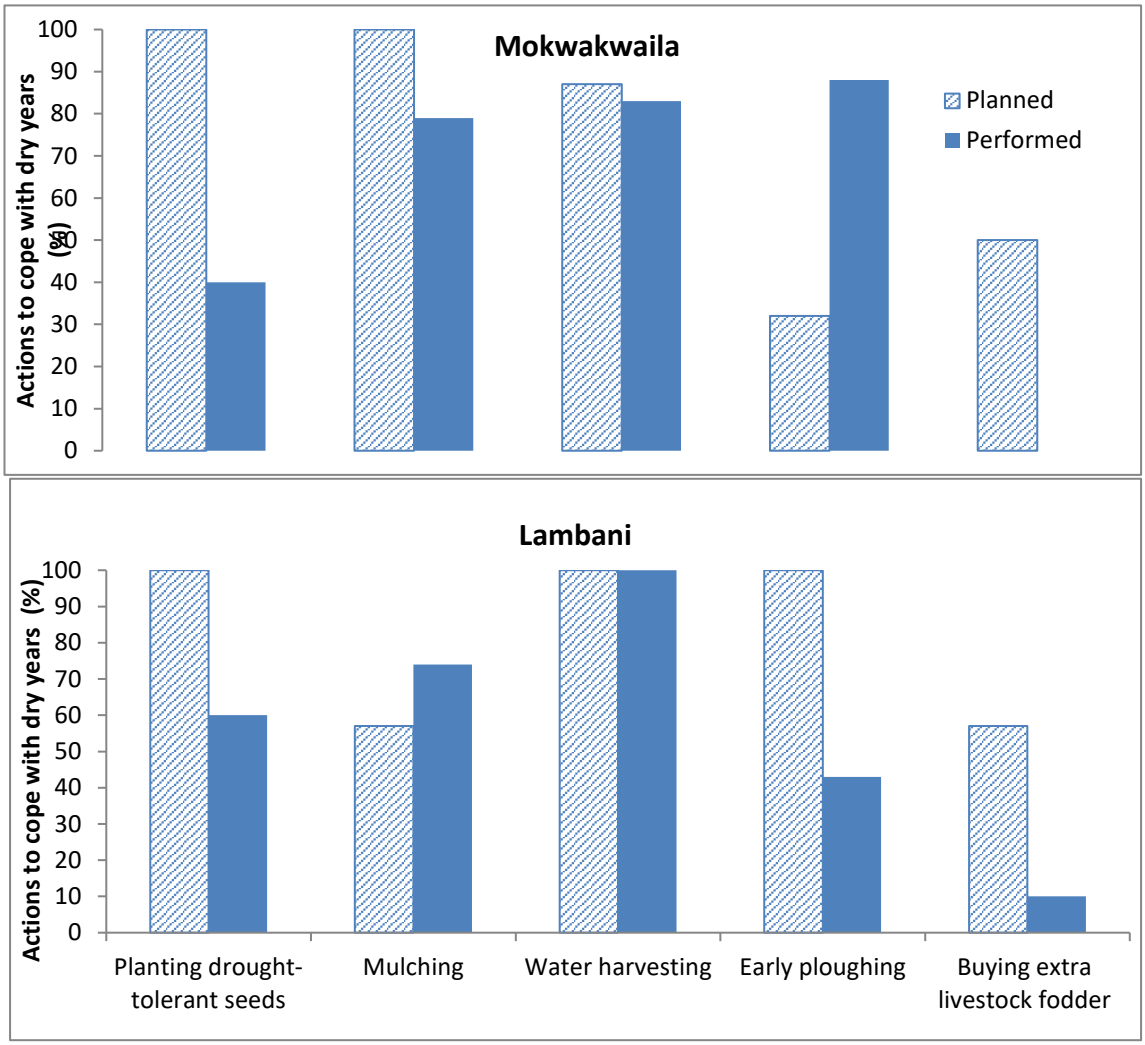
Possibilities to prepare for drought



Only a small number of farmers responded to the presented EWS information in the 2-year study. Many farmers had not reduced their planted areas, to save seed and manual labour as they remained hopeful for rain. However, some, contrary to how they usually acted, planted at the first rains when a drier than usual growing season was forecasted. A few planted drought-tolerant seeds even when they were not distributed in government programs.

Water harvesting for household and home garden use was one of the few actions that the farmers highly prioritized and that they also, to a high degree, carried out. Since most farmers only have access to small plots of 1-2 hectares they do not have sufficient space to construct dams to water crops or livestock. Dam construction would require cooperation among several farmers to provide sufficient land, labour and shared benefits.

Additional proactive actions to prepare for drought were suggested as remedies farmers would prioritize. But in general, the ability to actually carry out these actions was limited due to lack of economic resources. These included planting of drought tolerant seeds, mulching, early ploughing and buying extra livestock fodder. Consequently, in spite of plans to carry out these measures when the SCF indicated a drier growing season than normal, they were not performed.



The figure above shows actions that farmers in the two communities planned to do as well as actions that they actually undertook, with a discrepancy mainly related to lack of resources.

In spite of the limited possibility to act without access to resources, the farmers were, however positive to receiving EWS information. Besides concretely guiding actions, both SCF and EWS make it possible to mentally prepare for emerging conditions. Provision of proactive assistance rather than reactive disaster relief would be highly valued.

Conclusions and Recommendations

- The local EWS, including information from hydrological modelling of nationally distributed SCF, signs of indigenous climate indicators and locally situated sensors, was considered useful by extension staff and smallholder farmers.
- The creation of the local EWS gave farmers and extension staff opportunity to discuss the combined forecast information, its implications and relevant responses for farmers.
- Inclusion and discussion of indigenous climate indicators and of local champions and LDARD extension staff in the installation, maintenance of monitoring equipment and uploading and transferring the retrieved information increased trust in the EWS.
- Even if smallholder farmers tended to do "business as usual" in spite of forecasted droughts, a local EWS can aid them to mentally prepare for emerging drought conditions.
- A regularly updated information source, such as a blog, with simplified SCF can increase timely receipt of locally relevant forecasts and recommendations.
- Effective two-way communication channels and increased representation of extension officers in provincial and district forums can provide information about emerging signs of drought to be compared with forecasted conditions and extension can receive relevant site-specific recommendations.
- Strengthening and clarifying roles and responsibilities of LDARD staff at different administrative levels can help SCF dissemination and encourage farmer uptake.
- Extension staff and Disaster Risk Coordinators need to be supported with time and resources to ensure they understand disseminated SCFs and are aware of appropriate and site-specific actions to relay to farmers. Disaster Management Coordinators can play an increasing role in mediating and acting as knowledge brokers between provincial and service centre staff.
- Field trials and demonstrations undertaken by LDARD are important opportunities to concretely illustrate the effects of different response actions that might encourage greater usage and trust in SCF and more adaptive mindsets.
- Champion farmers in every community e.g., those who already collaborate in the performance and dissemination of LDARD field trials, can share knowledge from and with farmers together with LDARD to increase knowledge uptake and understanding.
- Comparisons between forecasted information, locally monitored information and signs from indigenous forecast indicators need to be made a number of years that include wet, dry and normal conditions to understand relationships.
- Locally monitored information e.g., soil moisture and rainfall, from a wide spatial coverage of wireless sensors need to be compared over longer time periods to enable early identification of deviations from normal conditions and validate information from local forecast indicators.
- Successful applications of EWS at local level require a shift where those in need are engaged with as drought conditions emerge and not after the event.
- Although the study results are based on the findings from two pilot communities, they could inform the development of other local EWS in new pilot locations.

Acknowledgements

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The following publications are available from the project and are provided by request:

Wilk, J. Andersson, L., Graham, L.P, Wikner, J. Mokwatlo S, Petja, B. 2017. From forecasts to action - What is needed to make seasonal forecasts useful for South African smallholder farmers? Int. Journal of Disaster Risk Reduction, 25: 202-211.

Andersson, L., Wilk, J., Graham, L.P., Wikner, J. Mokwatlo, S., Petja, B. 2020. Local early warning systems for drought – Could they add value to naturally disseminated seasonal climate forecasts? Weather and Climate Extremes 28 100241.

Graham, L.P, Andersson, L, Warburton Toucher, M, Wikner JJ, Wilk, J. Seasonal local rainfall and hydrological forecasting for Limpopo communities – a pragmatic approach (manuscript, submitted for publication in Climate Services, Dec 2020).