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AGRICULTURE GLOBAL PRACTICE NOTE

Early Warning Systems for Improving Food Security in East and Southern Africa

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Changing weather patterns associated with climate-related phenomena such as the El Niño–Southern Oscillation are projected to worsen food insecurity throughout the 25 countries of East and Southern Africa in the coming years. Rising temperatures and the increasing incidence of extreme events such as droughts and floods are making investment in early warning systems in the region markedly more urgent—an urgency underscored by the effects of El Niño on food production in 2016, the recent outbreak of Fall armyworm, the elevated risk of potential famine in northern Kenya, Somalia, Ethiopia, and South Sudan, and the threat of Cyclone Idai of March 2019 to food security and health in Mozambique, Malawi, and Zimbabwe. A combination of changing and chronic environmental conditions, as well as socioeconomic issues,

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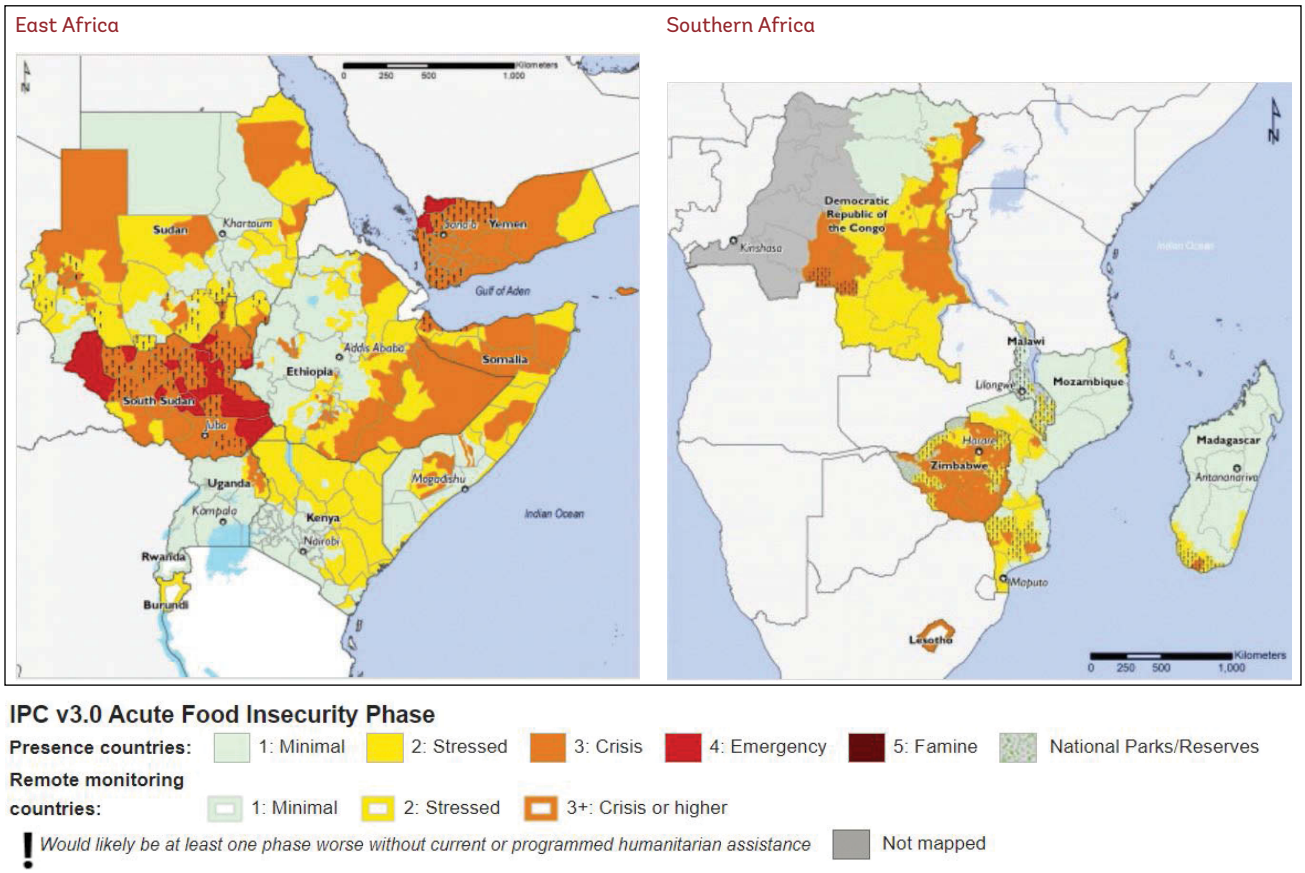
FIGURE 1: Integrated Food Security Phase Classification (IPC) for East and Southern Africa, February—May 2019



Source: FEWSNET, 2019.

converge to increase vulnerability among food insecure populations (Figure 1). Early warning systems enable more proactive, less reactive responses which are well tailored for local conditions. The practical information generated by reliable hydromet monitoring and effective forecasting, which underpins early warning systems, is a public good with which governments and their partners can protect the productivity of agricultural livelihoods and food security among both producers and consumers. Moreover, other climate-sensitive sectors of the economy beyond the agricultural sector would also benefit from hydromet and early warning systems (EWSs).

The necessary early warning systems are not yet in place, and gaps in the flow of information between agencies and levels of government in east and southern African countries greatly limit the governments' abilities to prepare and respond to emerging problems or to communicate actionable warnings and advisories to affected audiences, such as producer groups. The development of these systems remains an area of underinvestment throughout the region.

Within the greater Africa region, the importance of early warning systems is broadly recognized by the African Union (AU) and the Comprehensive Africa Agriculture Development Program (CAADP). In its 2014 Malabo Declaration, the AU urged member states to make and maintain the financial commitments necessary for multi-hazard early warning systems and disaster risk information to be readily accessible by affected communities. This need for effective systems is required to achieve the goals of the Sendai Framework for Disaster Risk Reduction and has been reaffirmed both by the Yaoundé Declaration in 2015

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and by the Mauritius Declaration of 2016 in statements of support for that framework.

Early warning systems generally consist of four elements. The first is a clear understanding of risk and the factors that drive risk. The second element is continuous monitoring of the parameters and precursors that enable administrators to anticipate hazards and to generate timely and accurate information about those hazards. The third is the ability to communicate and disseminate highly useful, practical information that enables affected parties to respond purposefully. The fourth element is the formulation of disaster management plans that facilitate those purposeful responses. These four elements of early warning systems require substantial coordination across multiple agencies and levels of government, from the national to the local, in order to work. Any failure of this coordination, or bottleneck on the part of any one element of the early warning system, can lead to failure on the part of the entire system.

Early warning systems are employed both within and between countries, at the level of the regional economic community. The African Union recognizes five such communities among the 25 countries of east and southern Africa. A World Bank report published in January 2018, *Assessment of Food Security Early Warning Systems for East and Southern Africa,*[1] documented the findings and recommendations of a survey of the performance of national and regional early warning systems in the area and their effectiveness in meeting the needs of users. The survey was conducted through both interviews and questionnaires.

Country-level early warning systems were assessed fairly positively by respondents in terms of the clarity of their roles, responsibilities, and application of national standards

1 The report can be downloaded at http://documents.worldbank.org/curated/en/454781516290787924/pdf/122857-ESW-P161298-PUBLIC.pdf

for risk assessments. Some 71 percent of the respondents reported their impression that hazards were regularly evaluated (Table 1). Respondents were less favorably disposed toward the extent to which country-level systems involved local communities and private sector participants and users in risk assessments—an involvement most saw as limited. Approximately 67 percent felt that a central database—a necessary element of early warning systems—did not exist.

While 75 percent of respondents and key informants felt that hazard monitoring based on early warning systems was in place, field consultations revealed that food security information systems tend to be fragmented along sector lines, making it more difficult for users to access information. Much of this appeared to be attributable to the tight division of labor between government departments and agencies, and their tendency to not share information and data with one another. Respondents also noted a lack of 24 hours a day, 7 days a week warning services, which are another vital requirement of effective early warning systems.

Communications and information dissemination on the part of country-level early warning systems continues to rely heavily on traditional means such as radio, telephone, sirens, and in some remote areas, drums and messengers. This leads to uneven and not altogether timely communication, particularly in those remote settings. The introduction of RANET radios in Kenya and parts of Zambia has improved this coverage and timeliness in these places. However, the use of social media outlets such as Facebook, Twitter, and WhatsApp are still in their infancy owing to poor mobile network coverage and prohibitive Internet costs.

Some 76 percent of respondents believed that their countries had in place some system for translating information from early warning systems into preparedness and response plans, and contingency plans in particular. Interviews with key informants however revealed serious doubts about the quality of contingency plans and the impression that at least some were not based on plausible scenarios. These interviewees viewed the contingency

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TABLE 1: Performance of Different Components of Food Security Early Warning Systems at the National Level in East and Southern Africa

	Frequency, percentage				
Subjects	*Strongly Agree*	*Agree*	*Somewhat Disagree*	*Disagree*	*Strongly Disagree*
Risk assessment					
Hazards are regularly analyzed and evaluated	24	47	14	10	5
Affected communities and industries are consulted in risk assessments	10	29	19	32	10
Central database for risk assessments exists	0	33	9	29	29
Monitoring and warning services					
Food security information system is in place	40	35	0	20	5
Warning centers are staffed 24 hours	0	25	10	50	15
Data are received and processed and warnings disseminated timely, in meaningful formats, and in real or near-real time	15	25	15	35	10
Early warning information dissemination and communication					
Communication and dissemination of warnings are tailored to the needs of individual communities	6	41	23	12	18
Private sector resources are used in disseminating warnings	6	18	29	41	6
Warning alerts and messages are tailored to the specific needs of those at risk	0	29	24	35	12
Application of early warning information for response planning					
Hazard and vulnerability maps are used to develop national emergency preparedness and response plans	29	47	6	18	0
Regular public awareness/education campaigns are conducted	18	47	0	29	6
Regular simulation exercises are undertaken to test the effectiveness of the EWS systems	0	26	26	16	32
EWS governance mechanisms and investment					
Economic benefits of EWSs are highlighted to senior government and political leaders	24	18	18	34	6
Early Warning is integrated into national economic planning	12	29	24	29	6
Capacities of agencies are assessed and capacity-building plans developed and resourced	6	29	18	29	18
Early Warning System legal or policy framework exists	10	45	15	25	5

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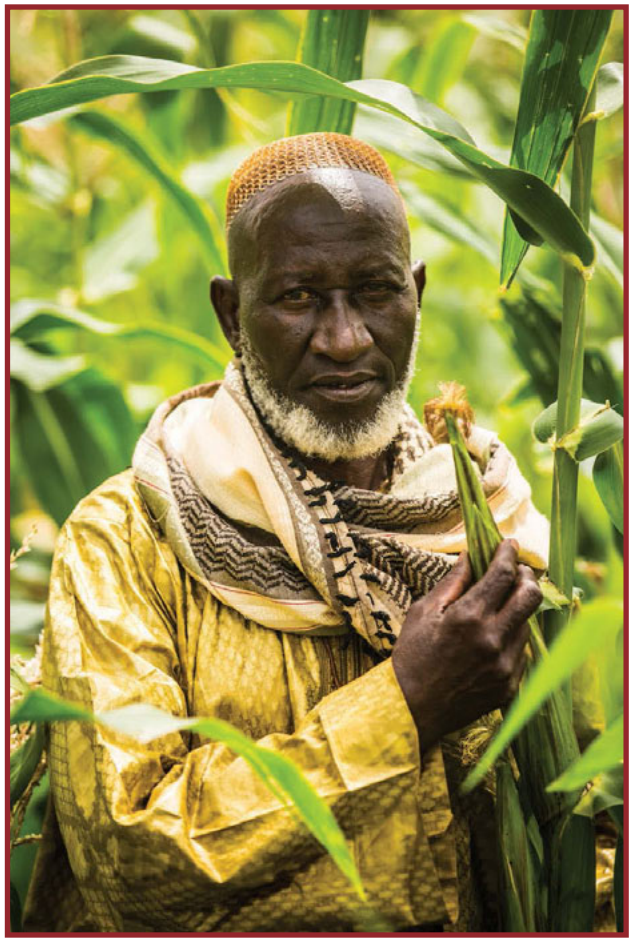

planning as having failed to identify vulnerable communities, at-risk livelihoods, lacking infrastructure, and low capacity. Most worrying was that the national contingency plans were rarely informed by sector and subnational plans because the systems for these plans were either less developed or nonexistent. With respect to public education and awareness, 65 percent of the participants felt that the public education programs were appropriate. Key informants also stated that interest had grown in disaster education, particularly following the Hyogo Framework for Action 2005–2015. Some 74 percent of the respondents indicated that simulation exercises were not regularly conducted to test the EWS. The added value of simulation exercises is their role in testing and validating the planning assumptions. Exercising enhances the awareness of the roles and responsibilities of responders, tests standard operating procedures and action triggers, and builds morale among responders.

Only 55 percent of respondents indicated their impression that their country had a legal or regulatory framework that incorporated early warning systems in some way. However, most saw an absence of an overarching legal or policy framework with which to bring stakeholders together, with the result that early warning systems in some countries are overly fragmented along sector lines. Some 65 percent of respondents felt that the early warning system–related activities were not adequately resourced. Only about 41 percent of stakeholders felt that Early Warning is integrated into national planning, while about 60 percent felt that senior government and political leaders are not aware of the economic benefits of early warning systems because a cost-benefit analysis of previous disasters was seldom conducted. This resulted in limited buy-in on the part of decision makers, who tended to view monitoring the systems' indicators as an ad hoc, often seasonal activity unrelated to national economic planning. This tends to leave the early warning system reliant on emergency budgets and rife with competition and trade-offs with other regular activities on the development agenda.

Many of the findings at the regional level were similar to those concerning country-level early warning systems. Risk assessment at this level was similarly prone to working in silos according to the stark division of labor between agencies and directorates. Close to 93 percent of respondents saw limited to no private sector involvement in the conduct of risk assessments. Monitoring and warning services were identified as a problem area by 70 percent of respondents, who found them ineffective at the regional level. Communications and the dissemination of information within regional economic communities were identified as problematic by a majority of respondents who felt that warning messages were not tailored to fit the needs of at-risk communities, and that the information related therefore had little practical use in informing decision making on the part of those communities. Communications was another area in which private sector investment and participation were underrepresented.

Some 79 percent of respondents indicated that the use of early warning information lacked any systems for simulation exercises—an area of response planning that would otherwise be especially promising in preparing for the threat of Fall armyworm outbreaks. The same proportion of those interviewed felt that regional responses were often late in coming, until problem situations had already graduated into emergencies. This is essentially the definition of a reactive, as opposed to a proactive response.

The results of the assessment of early warning systems pointed to a number of directions warranting increased public sector investment, and these can be usefully parsed into three categories: institutional capacity, technical knowledge and its exchange, and leveraging financial resources.

INSTITUTIONAL CAPACITY

Building the capacity of institutions responsible for administering early warning systems will entail clarifying their roles and responsibilities, and developing common methods and procedures for data collection, management, and sharing. The need for this consistency transcends the individual country and regional economic community to extend to the entire African Union and CAADP. Regional technical committees assigned with responsibility for monitoring threats to food security among other hazards may be a logical starting point for coordinating, packaging, and communicating information, especially in terms of joint preparedness and response plans. These are likely to be more effective if their structures and procedures are mirrored by those of individual member states. Public-private partnerships are a potentially effective and sustainable vehicle for hydrometeorological monitoring and forecasting, though most of the services they deliver would consist of public goods and therefore be best carried out by specialized public sector agencies. Legal frameworks and agreements may be necessary to ensure that the services based on early warnings remain public goods. National meteorological and hydrological services will continue to be funded publicly.

TECHNICAL KNOWLEDGE AND ITS EXCHANGE

The capacity of providing agrometeorological and hydrological services that meet user demands warrants considerable priority in investment planning. The ability to carry out reliable crop, livestock, and vulnerability assessments will rely on the quality of the data gathered, while the practical usefulness of the information generated will depend on the ability to provide localized and timely weather and climate forecasts and translate them into actionable information. Diligent monitoring of regional and national food balance sheets, commodity pricing, and trade will enable countries to activate triggers when agreed-on thresholds are reached that indicate potential

Digital Technologies for Early Warning and Food Security: the World Bank's Agriculture Observatory

To enhance readiness and response to weather emergencies, Zambia, Kenya, and Ethiopia are leveraging the geospatial capabilities of the World Bank's Agriculture Observatory, a data platform (provided by aWhere Incorporated) that supplies real-time, high resolution agricultural weather information covering croplands and rangelands globally. The platform is based on a concept of "virtual weather stations" that are generated from a combination of existing meteorological ground stations, satellite platforms, and the application of big data, artificial intelligence, and machine learning. More than 1.5 million big data are generated from the virtual weather stations, and more than 7 billion data points are processed every 6 hours to create accurate agrometeorological data of 9 km spatial resolution. Data for the platform is drawn from open access sources and maintained in the cloud. The platform does not require a dedicated server infrastructure but can be accessed through a password protected log-in and managed via the Internet. The platform does not infringe on or share the country's proprietary national weather data but can integrate such data into the system with government authorization. The platform allows resource managers to monitor actual weather patterns and to make projections of expected agricultural production, crop yields, and forage quality in the areas under investigation. Thus, the platform can be used for effective early warning of potential yield and food production shocks several weeks in advance of normal harvest periods. The high spatial resolution allows for the assessment of actual agricultural weather anomalies and the identification of crop failure 'hot spots' that can cause income losses, displacement, and conflicts. Such projections and analyses can be made at regional, national, or local level, based on need and demand. It effectively serves as a decision support tool for early warning and climate-smart agriculture.

threats to food security. Knowledge about emerging threats, such as Fall armyworm and other agricultural pests and diseases, is obviously a necessary element of preparedness, and systematic communications with universities and research institutions can be indispensable in this regard. The readiness and effectiveness of agricultural extension services to disseminate practical news of what to do about these threats are closely related priorities in areas where these services are underfunded.

LEVERAGING FINANCIAL RESOURCES

Demonstrating the current economic value of national meteorological and hydrological services to policy makers and other officials in financially constrained governments is a very real challenge that requires evidence-based advocacy of the economic necessity of early warning systems.

This really needs to become a matter of consensus among a large number of leaders and partners concerned with economic development. The practical application of principles underpinning climate-smart agriculture[2] relies on hydromet monitoring and forecasting capabilities that actively inform medium- and long-term strategies improving food security and reducing the risks that threaten it. A growing body of evidence suggests that the societal benefits of meteorological and hydrological services (as well as other publicly funded services such as health and education) carry value that substantially exceeds the costs of those services. Even currently available financial resources can be leveraged to achieve greater effectiveness. Scaling up technical support and investment in the capacity of meteorological and hydrological services by development institutions such as the World Bank may be one of the best options available to those agencies for leveraging climate and development finance.

2 Climate-smart agriculture is an approach for transforming and reorienting agricultural systems to support food security under the new realities of climate change. It addresses three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing greenhouse gas emissions from agriculture.

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