EARLY WARNING SYSTEMS IN FOOD SECURITY: TACKLING THE HUNGER PROBLEM IN SUB-SAHARAN AFRICA

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INTRODUCTION

In many parts of the world and especially in sub-Saharan Africa, food security continues to be a great challenge for many world leaders who are committed to reducing the number of undernourished people by half by 2015. Even one hungry and deprived person is of great significance, yet the world leaders' goal seems unrealistic based on current achievements in hunger prevention. Sub-Saharan Africa needs to address its food insecurity by being food independent through technology improvement and capacity building. The West needs to assist sub-Saharan Africa in reaching food independency by

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technology transfer. One promising path is that of early warning systems, which aims to prepare countries, donors, policy makers and people on the ground for upcoming food crisis. Additionally, the early warning systems promote sustainable development by providing nations with proper information about underlying causes of food insecurity. Timely and reliable responses to food insecurity are believed to be the greatest contribution of early warning systems. Improvements, however, are needed on many levels.

This article critically analyzes current and previous anticipatory monitoring processes and will evaluate their role in fighting hunger. Early warning systems aspire to serve as a platform for disseminating information among appropriate institutions locally and globally in a timely and effective fashion. The data gathered and analyzed could potentially prepare and prevent food related disasters. Through needs assessment the early warning systems of the early 1970s has evolved from conventional famine oriented system to a more food security oriented one. It is important to examine the reasons as to why theoretically competent early warning systems have not fully met expectations of the constituents. Although effective in their scope, in hands of humans the early warning systems encounter challenges. In order to overcome these challenges, the article examines the history of early warning systems and the reasons behind their existence. Furthermore, an evaluation of their contribution so far will shed lights on the steps needed for their future existence.

THE PHILOSOPHY BEHIND EARLY WARNING SYSTEMS (EWSS)

The 1996 Rome Declaration on World Food Security, held under the auspices of the Food and Agriculture Organization (FAO), "pledged" the "political will" to attain food security for all people in the world.

"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 1996) . During the Summit of 1996, world leaders urged the need to halve the number of people in hunger by 2015. At the time, 800 million people were classified as undernourished[1] (FAO 1996). Progress towards hunger eradication has been slow even during the better times, when economic growth was more robust and the prices of food were lower. If the global goal of the 1996 Summit is to be viewed as successful, the number of "hungry" people should not exceed 500 million by 2015 by the statistics on today's undernourished population (FAO 2010). The increasing trend in the number of people who can be classified as hungry, however, implies that "hunger is a structural problem" (FAO 2010), such that hunger is an established multi-systemic disorder that needs to be analyzed and addressed as such.

According to FAO, There are three pillars of food security (Figure 1):

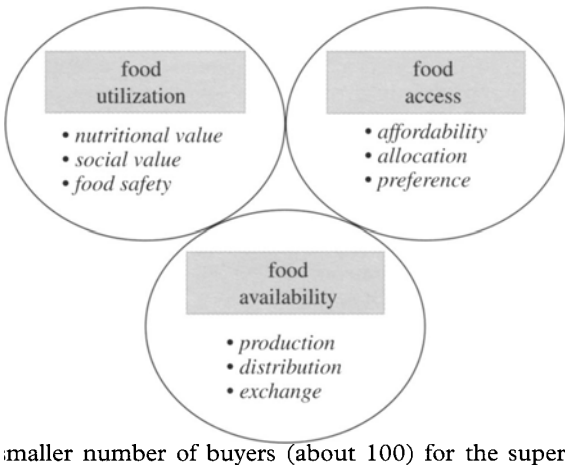
1. Availability. The poorest people are dependent on staple food and the existence of an adequate and stable supply of it. Therefore, at the farm and household level, the self-sustaining producer should be assisted in the production and storage of staple food.

2. Access or the ability to obtain "safe, adequate, nutritious and affordable food" regardless of the economic, social and physical conditions. Lessons learned from past food crises suggest that food availability does not necessarily imply accessibility, especially to low-income non-producer households. Food accessibility is a function of a complex number of factors including infrastructure and markets.

1. "Undernourishment refers to the condition of people whose dietary energy consumption is continuously below a minimum dietary energy requirement for maintaining a healthy life and carrying out a light physical activity with an acceptable minimum body-weight for attained-height" UN (2009). The Millennium Development Goals Report..

3. Utilization, which implies the ability to consume and benefit from nutritious foods. This axis pertains to the individual's health status and the "readiness" to safely obtain, consume and ultimately absorb and process the given nutritional intake. This is another multifactorial segment of the food security pyramid that must be analyzed and addressed in each setting. For certain, this will need to be accompanied by nutrition education in order to maintain a healthy diet as utilized by healthy individuals.

Figure 1. The three pillars of food security.



smaller number of buyers (about 100) for the super

Sources: (Gregory, Ingram et al. 2005)

Constant and reliable food access, in the light of political and socio-economical instabilities in "hunger zones", is of fundamental importance (FAO 1996; FAO 2000).

To assure food security for a population, one first needs to be able to identify the affected people who lack access to one or more of the three pillars of food security. The next step after identification is to move to secure food availability for the population. In a recent report, the FAO and the United Nations World Food Programme (WFP) recognized that sub-Saharan Africa (SSA) has the highest proportion of undernourished people in the world. Specifically 30 percent of the

population, or 239 million people, still remain hungry in sub-Saharan Africa, which means one in every three sub-Saharan Africans struggles to be fed (FAO 2010).

In addition to identification of the at-risk or affected population(s) and securing food availability, a quality food security program should incorporate processes to monitor the three components of the food system and to prepare (create reserves) to address times of relative food insecurity. There are a number of ways to assist people who have been identified as vulnerable to food insecurity. Food aid from external sources (mostly from international rescue agencies) aimed at stabilizing food availability has been practiced for many decades. In 1984, One of the greatest international charity events that gathered more than $323 million also saved the life of 3-year-old Ethiopian Birhan Woldu. Recently that very child, Birhan Woldu, now an educated young woman, spoke critically of her experience and her current views of the system that once saved her: “As well as being demeaning to our dignity, my education has taught me that constantly shipping food is costly, uneconomic, and can encourage dependency,” says Woldu. (Pflanz 2009).

Indeed, the 1984 famine in Ethiopia attracted global attention and resources. The food aid however, arrived in Ethiopia much too late, after many had already died and by the time local food production had resurged. The unfortunate timing of this food aid not only missed the opportunity to prevent death but further jeopardized local famine recovery by flooding post-famine markets with excess food and denying fair market prices to local farms (Barrett 2001).

With the benefit of hindsight, the difficulties of addressing food insecurity in sub-Saharan Africa require a much more in depth analysis to provide insight into the causes of food aid processes and their advantages or failures. Studies and analyses conducted about food aid in SSA, have established the consensus that food aid as a

passive top-down strategy has proven to be ineffective, delayed, misallocated and mismanaged. The underlying factors contributing to this includes unclear, bureaucratic and complex allocation mechanisms in addition to "small volumes" of aid (Barrett 2001) whereby political games have been allowed to play an instrumental role in food aid and its unfair allocation. This conclusion applies to both "emergency" and "development" food aid programs. (Barrett 2001)

Crucially, development food aid harms the countries it is supposed to help by being unreliable, dampening much needed local policy reforms, reducing farm prices and interfering with traditional food consumption habits (Eicher 1982; Barrett 2001). In addition, the delayed response to food emergencies has frequently cost many lives in Africa, while also weighing on the budgets available from Western countries for food emergency relief (Walsh 1986).

Another way to alleviate food insecurity is to support and improve the local conditions and to invest in methods of sustainable productivity. In fact, Woldu articulated the importance of self-sustenance by stating : "Let us grow our own food and help manage our own systems so we are not hit so hard when the next drought or flood comes" (Pflanz 2009). As a matter of fact, a product of the absence of a so-called Green Revolution in Africa- (Sachs 2008) has shown that donors should shift their emphasis from top-down food aid to helping African institutions to adopt modern technologies and to achieve larger scale local food production and storage methods through strengthened national and regional research programs (Eicher 1982). Local voices are advocating for independence from food aid and argue that "it is better for us, and cheaper for the West, in the long run if more money comes for early warning programmes or better roads or schools, to prepare us before a crisis starts" (Pflanz 2009).

In addition to the dismal situation in the sphere of food provision,

climate change is believed to be intensifying the food crisis. Changes in rainfall, temperatures and seasons will directly affect food productivity. Indirectly, climate change will impact food availability by altering the markets (Gregory, Ingram et al. 2005). In sub-Saharan Africa, as in many other developing regions across the world, weather crises such as drought and floods are likely to increase. All in all, climate change will widen the north-south gap and intensify the underlying causes of food insecurity in developing countries (Fischer, Shah et al. 2005).

Figure 2. The primary drivers of food insecurity

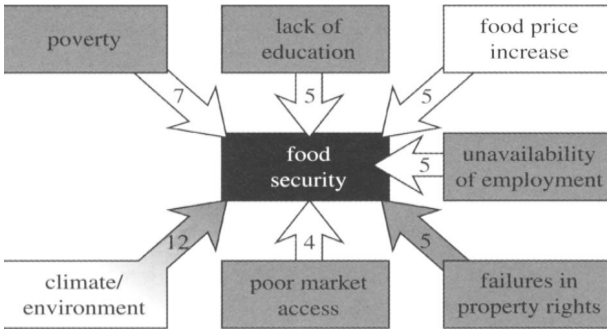


Figure 2: The seven most frequently cited drivers in 49 studies of household-level food insecurity in southern Africa. The numbers in the arrows indicate the number of citations, as a percentage of 555 citations of 33 possible drivers. The drivers shaded in grey were noted as being chronic, while those in white indicate drivers experienced mainly as 'shocks'. The shaded arrows indicate drivers that acted primarily via reductions in food production, while the white arrows indicate those which acted by restricting access to food.

Source: (Gregory, Ingram et al. 2005)

According to the Intergovernmental Panel on Climate Change, the increase in average temperatures will negatively affect cereal yield in Africa, as "[t]he area suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease" (IPCC 2007).

THE FUNCTION OF THE EARLY WARNING SYSTEMS

Given the observed and potential effects of climate change on local food production in addition to the already poor food production, it is necessary to develop and utilize appropriate anticipatory monitoring processes for both climate and agricultural activities. According to the ISDR, early warning is "[t]he provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response" (UNISDR 2004).

An early warning system (EWS) is a system of data collection and analysis that generates a response to a food crisis and aims to prevent famine (Buchanan-Smith 1997). Given a past history of tragic time lags for food aid to reach sub-Saharan Africa (SSA) during times of acute famine and that food crises often occur in environments that present fragile situations of widespread chronic hunger and malnutrition, early warning systems can enable policy makers, nations, donors and local people to respond in time to different threats. They also afford information systems that can be used to inform and prepare better and efficient local responses to future challenges.

Early warning systems are designed to work at different levels of ranging from global to local allocations (Buchanan-Smith 1997). For example, at the global level, the Global Information and Early Warning System (GIEWS) "provide early warnings of impending food crises in individual countries" (FAO 2010). At the national level,

many countries have their own early warning systems. The proper data integration, information and analysis from local, national, regional and global systems can contribute to much needed knowledge at the household and individual levels to mitigate the mostly tragic effects of food famine conditions (Buchanan-Smith 1997).

Existing early warning systems differ in their objectives and characteristics (table1). Although, categorizing early warning systems is difficult since their objectives cross-cover, two types are recognized here: *the conventional famine early warning system,* which aims to prevent famines like the one in 1984-1985 in Ethiopia and counts for the majority of EWSs, especially at the national level; and *the alternative food information system*, which has broader objectives and is mostly "food security oriented" at the local level. Food insecurity was viewed as a shortage of food supply in the1970s; however, continuous research has demonstrated that famine is a multi-focal problem involving many factors, including but not restricted to socioeconomic conditions. Hence, early warning systems have evolved from being thought of as situations of food scarcity or supply-driven system to "food-access" and "food purchasing power" systems (Buchanan-Smith 1997).

Table 1. Early Warning Systems (EWSs) types.

	Conventional Famine Early Warning System	Alternative Food Information System
Scope	Famine-oriented	Food Security oriented
Determinants of food security	Food production	Access to food
Level of operation	Macro centralized	Micro decentralized
Unit of analysis	Geographic, e.g. nation/districts	Socio-economic, e.g. vulnerable groups
Approach	Top-down Data-centered	Bottom-up People-centered
Response	Food-aid oriented	Sustainable improvement in access to food

Source: (Buchanan-Smith 1997)

THE ROLE OF FAO AND USAID IN FOOD PRODUCTION AND AVAILABILITY IN S-SA

FAO

The United Nations Food and Agriculture Organization and its Global Information and Early Warning System on Food and Agriculture (GIEWS) have actively been involved in providing information about food supply and demand globally, regionally and nationally since the early 1970s. Information exchange is the heart of the GIEWS. Several UN organizations, 115 governments, four regional organizations, sixty-one NGOs, many international research institutes and news as well as private services are collaborating and exchanging data and information on a daily basis in order to be able to answer many questions regarding food security. Few examples of such questions are: "*How much food and at what cost is the world producing? What is the impact of climactic phenomena such as El Niño and La Niña weather events on food production? Will there be a drought in southern Africa this year? What is the impact of floods and other weather hazards on food production? What are the food security implications of civil war, economic crises or other man-made disasters? Which countries are the most food-insecure? Where is food interventions most needed? Where are cereal surpluses available for local purchases or triangular transactions?"(FAO)*

Information about migratory pest movements and about their control operations, related crop activities, and agrometerological assessments is provided by the Emergency Centre for Locust Operations (ECLO), the Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES), the Africa Real Time Environmental Monitoring Information System (ARTEMIS) and the Agrometeorology Group respectively. Additionally, emergency assistance is performed by FAO's

Emergency Coordination Group (ECG), which provide information on "agricultural emergency and rehabilitation requirements" by field observation (FAO).

The main building-block of GIEWS is the national data systems. FAO provide technical assistance to governments and other interested organizations in order to set up their own Food Security and Early Warning Information System (FSEWS). Food security indicator data are collected and analyzed with the information thereafter communicated to decision makers. The forty government-operated national systems, three regional intergovernmental-operated systems, and several sub-national systems operated by local or international NGOs constitute the global, regional, national and local Early Warning and Food Information Systems (EWFIS). A close collaboration between GIEWS and other FSEWS is maintained not only through information exchange, but also by the exchange of views, methods and software in addition to technical assistance. All the available information may be publicly obtained at http://www.fao.org/giews/english/giewse.htm.

THE USAID FAMINE EARLY WARNING SYSTEM(FEWS)

As with the other EWSs, the USAID Famine Early Warning System (FEWS) is a "system for collecting, organizing and analyzing information relevant to food access and availability," consisting of three parts: the field representatives on the ground in different countries, the Washington office in the United States and the collaborators in other organizations (Nall and Josserand 1996). The drought in Sahel in the 1980s and concerns about future famines gave rise to the FEWS. Just as the rest of the developed world did, the United States learned from past famine mismanagement and aimed to prevent food insecurity in Africa. It was thought that early warning systems could contribute to early prevention rather than the usual "late

cure" in the form of food aid.

FEWS aims to deliver assistance in a timely manner in two situations. The first is the instance of that of emergency food-shocks, where food shortages and crises are recognized beforehand by evaluating different data from indicators contributing to the upcoming food disaster. The philosophy behind it is that "prevention is better than cure," especially when food aid has arrived much later than help was needed. The idea is that "by acting before situations reach a crisis point, a broader range of response mechanisms are available, so that disruptions to local markets and institutions can be minimized" (Nall and Josserand 1996) The second case in which FEWS looks to provide assistance is in non-emergency situations of food insecurity. Food security is believed to be a component of many factors, which are measured, valued and analyzed. The evaluated indicators are then converted into guidelines for developmental activities and interventions in affected areas with susceptible people.

Many behavioral changes are translatable into signs that diagnose an impending crisis, for example, changes in food consumption patterns, increases in male migration to urban areas and trade of valuable belongings and animals. Another "promising avenue" indicator analysis is the markets and trade evaluation, which provides early indicators for future hunger situations and their related market and non-market responses (Walsh 1986).

FEWS is considered unique in that it gathers direct and indirect data by two means: firstly, by the representatives on the ground who are responsible for collecting and evaluating data related to population, health, nutrition as well as socio-economic factors, and secondly by collaboration with other institutes and governments. Satellite imagery of vegetation, rainfall and cropland use is provided to FEWS analysts respectively by collaboration with National Aeronautics and Space Administration (NASA), the National Oceanic

and Atmospheric Administration (NOAA) and the United States Geological Survey (USGS). The collected data is then analyzed in the FEWS headquarters in Washington, DC. The analyzed data is then distributed in many forms, such as monthly bulletins, monthly monitoring reports and periodic vulnerability assessments (Walsh 1986; Nall and Josserand 1996).

ANALYSIS OF THE EWSS SO FAR

In theory, as presented here and many other readings on hunger prevention, the early warning systems seem to be the panacea in food production and access, hazards avoidance and climate change mitigation. In practice, however, the number of chronically undernourished persons in sub-Saharan Africa although reduced since the 1990s, is unacceptably high[1]. Essentially, one needs to evaluate the EWSs and their multi-sectoral contributions to susceptible regions and peoples. In such evaluations, many questions must be raised related to how to measure the effectiveness of EWSs: for example, should the evaluation be qualitative or quantitative in nature? Should one count the number of hunger-related deaths? Should one consider timely warning about a specific harm and its intensity a success? Or are the collection, analysis and evaluation of underlying causes of hunger and famine crisis a rewarding accomplishment of EWSs? At the end, however, the government, donor and individuals" responses to the warnings from EWSs are the most important factors contributing to the effectiveness of the EWSs. In other words, the timeliness and effectiveness of that response is the principal outcome for evaluation of EWS real impact.

A study conducted by FAO argues that "[g]enerally, these systems (early warning systems) have been effective in alerting countries and

1. The proportion of undernourished population in sub-Saharan Africa respectively for 1990-1992, 2004-2006 and 2008 are: 32%, 28% and 29% (UN 2009).

donors to impending food crises largely in the context of seasonal droughts, helping to mitigate adverse impacts. There are, however, important exceptions that suggest that inadequate early warning analysis, together with poor communication and ineffective coordination and response mechanisms, have often contributed to acute food security emergencies that might have been prevented" (Tefft and McGuire 2006).

A critical review of the literature portrays several recognized weaknesses and suggestions on EWSs improvement:

The first critique and probably the strongest is that response has not been timely enough to avoid disasters (Nall and Josserand 1996; Haile 2005). The recognized reasons contributing to these results are the following:

Firstly, the needs assessment window, which determines the link between the reporting of "warning-information" and the humanitarian response mechanism has been weak(Nall and Josserand 1996; Haile 2005; Tefft and McGuire 2006). This is due to the fact that the needs assessment "report" is delayed (as long as 4 months). Therefore the decision-making at the household level as well as national and global level about essential live-saving matters is delayed. Haile, suggests that the needs assessments windows be shifted from January to October, generating time for agricultural planning and land preparation (Haile 2005). Another factor contributing to the fragmented sequence of events is the poor quality of data due to cloud coverage (preventing accurate satellite readings). Improved satellite imagery is believed to enhance the quality of the data and hence shorten the time gap in data analysis and information dissemination (Huber, Fensholt et al. 2007).

Secondly, national data collection systems face a lack of access to "modern methods of data capture, data management, telecommunication, modeling and analysis" in addition to human and

financial resources. The 2011 food crisis in East Africa attest to the failure of the regional early warning systems in predicting the upcoming famine in the region (Ververs 2012). Greater and more urgent knowledge and capacity transfers in advanced climate science and technology into the hands and minds of local people is believed to greatly improve food security and crisis responses since locals usually know better how to adapt and cope with "foreseeable changes" (Verdin, Funk et al. 2005; Tefft and McGuire 2006).

A third critique is that the post-warning assistance continues to be unpredictable and unreliable. Haile argues that even if early warning systems were to be improved it "does not necessarily result in better intervention if not integrated with an appropriate financial response system". As humanitarian responses to emergency situations is conducted through an appeal process—where donors are requested to offer funding based on needs assessment reports—the financial assistance "is not guaranteed" and it is not necessarily timely (Haile 2005). There often seems to be a miscommunication between donors and aids providers. For example, as Haile suggests, the form of aid is not constant to either party, donors or aid providers and is not known in advance in each crisis situation: the assistance is sometimes requested in forms of food aid, while at other times cash donations are more favored. Hence, besides timely communication, "financial flexibility" is of great importance in food security assurance (Haile 2005).

Last but not least, the analyzed data is often categorized to be inaccurate due to "political interference from both governments and donors" as well as an "inadequate attention" to "factors related to food access and utilization" (Tefft and McGuire 2006). The latter ensures that the affected populations, given their underlying health and geo-social status will actually safely receive and be able to appropriately utilize/consume or even absorb the food aid, given its micro and

macronutrient composition. Transparency and a more livelihood oriented analysis that highlights the food access issues are crucial to the effectiveness of early warning systems (Verdin, Funk et al. 2005; Tefft and McGuire 2006).

After all, "Whether a food crisis succeeds in its goal of eliciting an appropriate response is dependent on numerous factors, most of which are beyond the control of the EWS", as Buchanan-Smith correctly points out. Witnessing the unfortunate tragedy of the 2011 famine in the Horn of East Africa reaffirms that even the timely prediction of a forthcoming crisis is not sufficient to prevent a disaster (Ververs 2012). The focus of future action should change towards identification of the causes of inertia by key players especially in the direction of planning and implementation.

CONCLUSION

EWSs exist everywhere where there is human interaction with nature. Human beings have always tried to predict the future in order to be safer or to be damaged less. Natural patterns that have been observed in agriculture and food production have been used by locals to modify their behavior accordingly. Although informal early warning predictions have been a part of human history since the very beginning, a more formal and organized early warning system was developed after devastating famines in SSA in the 1970s and the 1980s.

These "modern" early warning systems aim to inform policy makers, who should caution and assist susceptible people to prepare for upcoming food shortages and disasters. Additionally, they aim to recognize and hence eradicate the underlying causes of food insecurity by analyzing the various factors contributing to hunger. As prevention is better than cure, the EWSs seem to be one of the best options in

hand.

This analysis on EWSs has indicated that the role of human factor in the effectiveness of the EWSs is the key factor and the most appropriate target for improvement. It is, after all, the response to the EWSs' predictions that differentiates a hunger related tragedy from a manageable food shortage. This is especially true as the climate changes and as the occurrence of different natural and manmade hazards is constantly increasing. Nations in SSA and their governments, institutions, as well as their peoples will need assistance in strengthening their institutional and technical capacity as a base for the implementation of EWSs, which are an essential element for meeting critical needs for food-crisis management as well as the promotion of sustainable development. ❖

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