منظمة الأغذية والزراعة للأمم المتحدة | 联合国粮食及农业组织 | Food and Agriculture Organization of the United Nations | Organisation des Nations Unies pour l'alimentation et l'agriculture | Продовольственная и сельскохозяйственная организация Объединенных Наций | Organización de las Naciones Unidas para la Alimentación y la Agricultura

Viale delle Terme di Caracalla,
00153 Rome, Italy

Fax: +39 0657053152 Tel: +39 0657051 www.fao.org

Our Ref.: Your Ref.:

Submission by the Food and Agriculture Organization of the United Nations (FAO) on issues related to agriculture, as requested in the conclusions of SBSTA 40 (FCCC/SBSTA/2014/L.14, Item 8, Paragraphs 3(a) and 4). Parties and admitted observer organizations have been invited to provide their views on issues relating to the conclusion that SBSTA would undertake scientific and technical work in the "development of early warning systems and contingency plans in relation to extreme weather events and its effects such as desertification, drought, floods, landslides, storm surge, soil erosion, and saline water intrusion".

FAO is pleased to submit its views on issues relating to the "development of early warning systems and contingency plans in relation to extreme weather events and its effects such as desertification, drought, floods, landslides, storm surge, soil erosion, and saline water intrusion".

(1) Vulnerability of agriculture, food and nutrition security to extreme weather events

The agricultural sectors (including crops, livestock, fisheries and aquaculture and forestry) reveal significant vulnerability and exposure to increasing weather and climate variability and to sea level rise. Extreme weather/climate events such as drought, floods, cyclones and related phenomena such as storm surges, soil erosion and saline water intrusion negatively affect all agricultural sectors and all components of food security and nutrition. In addition to their short term impacts they have long-term effects, such as degrading ecosystems, eroding livelihoods, reducing income, and interrupting market access, trade and food supply. It is likely that mean sea levels have increased since 1970,[1] and are expected to aggravate the risks of saline water intrusion in low-lying coastal areas. FAO estimates that a third of overall land area is degraded due to a number of factors that include saline water intrusion and soil erosion. Recent estimates show that annual soil loss through erosion in some areas of Africa can reach over 140 tons/ha/year.[2]

FAO's recent study[3] on the economic impact of natural hazards and disasters indicates that the agricultural sectors absorb approximately 22 percent of the economic impact caused by medium- and large-scale natural hazards in developing countries. Almost 60 percent of the damages and losses were caused by floods, followed by storms with 23 percent. For floods, droughts and tropical storms, 25 percent of all damage and losses are experienced in the agricultural sectors. Agriculture is the single most affected sector by droughts, absorbing about 84 percent of their economic impact. The 2012 IPCC Special Report[4] *"Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation"* also concluded that economic losses from weather- and climate-related extreme events have increased, but with large spatial and inter-annual variability.

The development of early warning systems (EWS) and contingency plans is essential to strengthen proactive decision-making at all levels that aims to reduce the impacts of extreme weather and climate events and to integrate risk reduction measures and building resilience. Early warning systems and contingency plans targeting food and agriculture can benefit over 2.5 billion vulnerable people who depend on smallholder agriculture,

[1] IPCC (2014) *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

[2] FAO (2014) *Global Land Degradation Information System – GLASDIS*, FAO 2011, rev. 2014. www.fao.org/nr/lada/gladis/gladis

[3] FAO (2015) *The Impact of Natural Hazards and Disasters on Agriculture and Food and Nutrition Security - A Call for Action to Build Resilient Livelihoods*. (This assessment was based on data for the decade 2003–2013.)

[4] IPCC (2012) *Summary for Policymakers.* In: *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 1-19.

livestock and fisheries for their livelihoods especially in Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

(2) Developing and managing monitoring and early warning systems for agriculture and food security

Support to the monitoring and observation of weather and climate extremes has steadily decreased over the past decades, mainly as a result of discontinuation of a number of regional and country support programmes. Further, lack of infrastructure for the improved monitoring and analysis of multiple threats has also constrained the development of EWS. The accuracy of EWS on food and agriculture rely, amongst others, on the availability and accessibility of data, including hourly/daily/monthly weather data; data on extreme weather events, their anomalies and impacts; satellite-based weather monitoring; vegetation characteristics; seasonal climate forecasts; crop prospects and the food situation and food prices. For instance, FAO's Agricultural Stress Index System (ASIS) [1] monitors vegetation indices and detects hotspots where crops may be affected by drought using data on vegetation and land surface temperature. The system contributes greatly to the food security monitoring work of FAO's Global Information and Early Warning System on Food and Agriculture (GIEWS).[2]

At national and local level, risk and opportunity management are enhanced by weather, climate and flood information systems tailored to the needs of farmers, fishers and foresters, alongside improved outreach to agriculture support services. Experiences from FAO's localized climate information systems[3] indicate the need to link information providers and users and customizing information products with impact outlooks and management options for use in the agricultural sectors. Though significant progress has been made in recent years to improve the monitoring of drought, desertification and soil erosion processes to contribute to early warning systems, their effectiveness and delivery systems remain a significant challenge due to the unique characteristics of these events and their increasing frequency.[4] Similarly, warning systems for flash floods, landslides, storm surges and saline water intrusion are not yet available to farmers, fishers and foresters.

(3) Formulating contingency plans to improve preparedness and response to extreme weather and climate events in the agricultural sectors

Preparedness for effective response to, and recovery from, future threats to food and nutrition security, and to reduce their potential negative impact on livelihoods require hazard-specific contingency and preparedness plans. These plans define the roles and responsibilities of various actors to better prepare for responses and recovery. Sound management of the necessary human resources (e.g. establishing response teams; stocking of inputs for response) is an integral part of successful contingency plans. Weaknesses have often been experienced with respect to coordination and timely delivery of response measures. Strengthening capacity and preparedness for a timely delivery of inputs are crucial areas for improvement in agriculture, food and nutrition security. Partnerships must be explored with multiple agencies at different levels to help develop and implement contingency plans.

The majority of emergency response operations in the aftermath of weather and climate extremes continue for periods of more than two to three years. There is thus an opportunity for the incorporation of risk reduction measures and medium- to long-term adaptation practices with a view to enhance resilience. However, funding for planning and preparatory work at country level and the availability of additional resources to implement risk reduction and adaptation measures are major constraints.

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[1] FAO (2014) *Agriculture Stress Index System (ASIS)* Monitoring of Agriculture Drought with Remote Sensing. FAO, Rome.

[2] FAO (2015) *Global Information and Early Warning System on Food and Agriculture* (GIEWS), FAO, Rome. www.fao.org/giews/english/index.htm

[3] FAO (2013) *Localized Climate Information Services for Agriculture*, WMO Bulletin 62, Special Issue on Global Framework for Climate Services (GFCS), 2013.

[4] WMO (2013) *High-level Meeting on National Drought Policy. Towards more drought resilient societies.* World Meteorological Organization (WMO), Geneva, Switzerland.

(4) Linking key elements of protection, prevention and risk reduction with early warning systems and contingency plans

In addition to warning of impending weather and climate extremes, early warning systems should carry value added information products with impact outlooks and response options. In the agricultural sectors, value added early warning information provides an unique opportunity to prioritize not only short-term response measures but also medium- to long-term protection, prevention and risk reduction measures that reduce underlying risk drivers. Similarly, contingency plans should advocate for investment in protection, prevention and risk reduction measures.

Drought- and flood-related EWS and contingency plans should be capable of providing options for risk reduction and medium-term adaptation strategies for enhancing resilience. Best practices include: better management of crops, the promotion of plant, livestock and fish varieties that are more resilient to stress (floods, droughts or salinity), seed supply systems, conservation agriculture, soil and water conservation, water harvesting, Slope Agriculture Land Technology (SALT) for landslide prevention, integrated territorial planning and watershed management, and Sustainable Land Management (SLM) practices for crop-, pasture-, rangeland- and forest-based systems. Establishing monitoring mechanisms to assess the efficiency of protection, prevention and risk reduction measures is key in helping decision-makers to revise or modify their contingency plans.

(5) Creating an enabling environment to sustain monitoring and early warning systems and to prepare and implement contingency plans

Effective EWS and contingency planning depends on sustained commitment from national governments, support from the international community, enabling legal and policy environments, appropriate institutional mechanisms and capacity development. Global dialogue, coordination, political and financial commitments can provide the necessary enabling environment to advance the development of EWS and contingency plans. For example, the global declaration at the High-level Meeting on National Drought Policy (HMNDP, 2013)[1] encouraged all governments to develop National Drought Management Policies. The Global Framework for Climate Services (GFCS),[2] led by the World Meteorological Organization (WMO) and partners including FAO, promotes institutional arrangements for User Interface Platforms (UIPs) to bridge the gaps between weather and climate information providers (e.g. meteorological services) and users (agricultural extension systems and farmers). Similarly, the Inter-Agency Standing Committee (IASC) Sub-group on Preparedness and Contingency Planning[3] provides contingency planning guidelines for humanitarian assistance, and FAO has developed emergency response guidelines for fisheries and aquaculture.[4]

Mainstreaming EWS and contingency planning within organizational mandates or strategic frameworks at international and national levels ensures particular advantages in terms of resource allocation and commitment. For instance, FAO's Disaster Risk Reduction for Food and Nutrition Security Framework Programme[5] provides direction for mainstreaming EWS and contingency plans across the agricultural sectors in member countries in line with the Hyogo Framework for Action (HFA). The priorities of EWS and contingency plans and the enabling environment established (in policy, governance and institutional measures) at different levels (community,

[1] WMO (2013) *High-level Meeting on National Drought Policy (HMNDP). Towards More Drought Resilient Societies, Final Declaration.* World Meteorological Organization (WMO), Geneva, Switzerland.

[2] WMO (2014) *Agriculture and Food Security Exemplar to the User Interface Platform (UIP) of the Global Framework for Climate Services (GFCS)*, World Meteorological Organization (WMO), Geneva.

[3] IASC (2007) *Inter-Agency Contingency Planning Guidelines for Humanitarian Assistance.* Developed by the IASC Sub-Working Group on Preparedness and Contingency Planning: www.humanitarianinfo.org/iasc/pageloader.aspx?page=content-products-products&productcatid=13

[4] FAO (2014). *Fisheries and Aquaculture Emergency Response Guidelines.* Rome, FAO. 167 pp.

[5] FAO. 2013. *Resilient Livelihoods – Disaster Risk Reduction for Food and Nutrition Security Framework Programme.* Food and Agriculture Organization of the United Nations (FAO), Rome.

national, regional) to support them should be consistent with international frameworks such as the Sendai Framework for Disaster Risk Reduction 2015-2030.[1]

(6) Recommendations

The following recommendations are based on FAO's experiences in the development of early warning systems and preparation of contingency plans for agriculture and food and nutrition security.

(1) **Improve monitoring infrastructure in fragile ecosystems and enable them to reach the most vulnerable communities:** Monitoring and observation networks in fragile ecosystems such as mountains, drylands and coastal areas should be improved to guide the preparation of targeted warning messages to the most vulnerable communities. The monitoring networks should also focus on hazards such as desertification, soil erosion, landslides, salt water intrusion which have not received due attention in the past. Communication systems must be strengthened to establish end-to-end early warning systems.

(2) **Apply inter-disciplinary and multi-hazard approaches:** Early warning systems on food and agriculture require inter-disciplinary and multi-hazard approaches to address complex inter-relationship between weather/climate hazards, agriculture and food security situations. Such systems should be designed to help development and humanitarian institutions to better respond to needs of the diverse livelihood activities (crops, livestock, fisheries and aquaculture and forestry). Critical factors to be considered are the lead time of EWS, the specificity of the risks they monitor as well as the timeframe of potential preparedness and response measures. For instance, EWS for drought in pastoral areas should enable pastoralists to reduce or move herds in order to better manage pasture and feed availability ahead of crisis situations.

(3) **Consider spatial dimensions and trans-boundary impacts of extreme weather/climate events:** The occurrence of extreme weather and climate events in one country or geographical region can have significant impacts on the food and nutrition security of another country or geographic region. Thus, early warning systems on food and agriculture should consider interconnectedness, spatial (e.g. trans-boundary) and temporal (e.g. seasonal/intra-seasonal) dimensions of extreme weather and climate events.

(4) **Integrate medium- to long-term perspectives into contingency plans and build resilience:** Though contingency plans generally target preparedness/immediate response actions, incorporating medium- to long-term perspectives could help achieve the transition from an emergency response focus to a development focus. The challenges of balancing responses to immediate humanitarian needs with long-term development needs should be analyzed in detail with a view to strengthening links and building on opportunities. Importantly, the integration of long-term sustainable development priorities can lower future costs for humanitarian interventions.

(5) **Improve coordination in the preparation and implementation of contingency plans and establish community of practice:** There is further scope and need for inter-agency collaboration and coordination at international, national and local levels to ensure that vulnerable communities are reached and resources are utilized efficiently. Consideration should be given to the establishment of a community of practice (e.g. supported by a website and/or e-forum) to facilitate the sharing of best practices and the preparation and implementation of contingency plans.

FAO's work in these areas can facilitate the above-mentioned activities.

[1] UN WCDRR (2015) *Sendai Framework for Disaster Risk Reduction 2015 – 2030.* UN World Conference on Disaster Risk Reduction: www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf