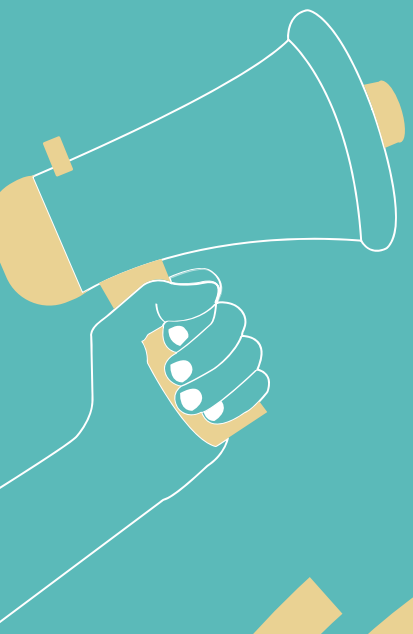
Food and Agriculture Organization of the United Nations

Practical guidelines for Early Warning – Early Action plans on agricultural drought



Practical guidelines for Early Warning – Early Action plans on agricultural drought

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Food and Agriculture Organization of the United Nations
Panama City, 2020

Required citation:
Fuganti, G., Minelli, M. and Rojas, O. 2020. *Practical guidelines for Early Warning Early Action plans on agricultural drought*. Panama City. FAO. https://doi.org/10.4060/cb0624en

ISBN 978-92-5-133548-2

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Foreword

Drought is a devastating and complex natural hazard that represents a constant risk for most smallholder farmers around the world. Between 2006 and 2016, the agriculture sector absorbed about 83 percent of all damage and loss associated with drought according to a study by the Food and Agriculture Organization of the United Nations (FAO), entitled, "The impact of disasters and crises on agriculture and food security". This represents a major threat to food security, especially among the most vulnerable.

Continuous innovation and refinement of the tools and methodologies to systematically analyse hazards and vulnerabilities is at the core of efforts to prevent and/or mitigate these impacts. Disaster management must evolve towards risk management. This guide is a step in that direction, proposing a methodology that links climate perspectives, El Niño forecasts, the Agricultural Drought Monitoring and Early Warning System (ASIS), and the Integrated Food Security Phase Classification (IPC) together with the appropriate early action.

Climate and El Niño forecasts attempt to provide a probability of the occurrence of rainfall anomalies in certain geographic areas. These forecasts, although not perfect, can be used to trigger early actions to prevent and/or mitigate possible negative impacts on agriculture and food security. In addition, innovative satellite-based monitoring of agricultural areas can augment preparedness capacities to prevent and reduce losses.

The IPC is a rigorous evidence-based method that analyses food insecurity and acute malnutrition to assist governments, United Nations agencies, Non-governmental Organizations, civil society and others to reach consensus on the severity and magnitude of food insecurity and inform decision-making.

This Guide seeks to link various instruments to enhance drought monitoring, together with the methods developed to measure impacts on agriculture and food security. This was done through bringing together a number of tools and concepts developed by different FAO divisions including, the Global Information and Warning System, the Early Warning — Early Action system, the Agricultural Drought Monitoring and Early Warning System, and the IPC. Other valuable indicators required for preventive mitigation are also incorporated, including the climate perspectives led by the World Meteorological Organization, the El Niño phenomenon forecasts, as well as work led by the International Research Institute for Climate and Society. By linking these efforts and tools to national drought mitigation plans, a bridge is established between early warning systems and drought mitigation in the field (early action) to avoid losses in agriculture and reduce the risk of food insecurity.

The development of the tool was realized through the former FAO Strategic Objective 5, which sought to increase the resilience of agricultural livelihoods to disasters and crises. It is hoped that the proposed methodology can promote and add to the growing instruments and tools for risk management in agriculture, ultimately helping to reduce the impacts of drought and other hazards on agriculture-based livelihoods and food systems.

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Director of FAO's Emergency and Resilience Office

Acknowledgements

The publication "Practical guidelines for Early Warning — Early Action plans on agricultural drought" has been developed by the Sub-Regional Office for Mesoamerica of the Food and Agriculture Organization of the United Nations (FAO) under the technical supervision of the Office of Climate Change, Biodiversity and Environment (OCB), and the sponsorship of Strategic Objective 5: Increase the resilience of livelihoods to hazards and crises.

The maps and other technical images were developed by Tamara Hernández, FAO Specialist in Geographic Information Systems.

Technical comments provided by Niccoló Lombardi, Early Warning - Early Action Expert; Nora Guerten, Early Warning - Early Action Expert; Marion Khamis, Disaster Risk Reduction Expert, and JungEun Sohn, Early Warning Systems Expert (EST)/GIEWS).

The authors likewise acknowledge the valuable contributions of Raúl Cárcamo, Mariano Peñate Dávila, Gustavo García, Federico Spano, David Morales, Carlos Pulgarin, Alejandro Flores, and Jerry Argüello.

Finally, for the support of Rosana Martín Grillo, FAO Communication Specialist for Mesoamerica for the revision and editing of this publication, and Alba De Obaldía, FAO Communications and Design Assistant for Mesoamerica, for the conceptualization of infographics and diagramming coordination.

Abbreviations and acronyms

AADL	Agriculture Damage and Loss
AFI	Acute food insecurity
AM	Acute malnutrition
AMIS	Agricultural Market Information Systems
ASIS	Agricultural Drought Monitoring and Early Warning System
CAC	Central American Agricultural Council
CFI	Chronic Food Insecurity
CONASAN	El Salvador National Council for Food Security and Nutrition
CRI	Global Climate Risk Index
CRRH	Regional Committee on Hydraulic Resources
DRR	Disaster risk reduction
EAS	Early action specialist
EFSA	Emergency Food Security Assessment
ENSO	El Niño-Southern Oscillation
EWEA	Early Warning — Early Action
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FNS	Food and nutrition security
GAP	Good agricultural practices
GIEWS	Global Information and Early Warning System
IDRM	Integrated Disaster Risk Management
IPC	Integrated Food Security Phase Classification
IPC SC	IPC Global Steering Committee
IPC TAG	IPC Technical Advisory Group
IRI	International Research Institute for Climate and Society, Columbia University
NDVI	Normalized Difference Vegetation Index
NGO	Non-governmental organization
NOAA	National Oceanic and Atmospheric Administration of United States
SESAN	Secretariat for Food and Nutritional Security of Guatemala
SESSAN	Secretariat for Food and Nutrition Security of Nicaragua
SG-SICA	General Secretariat of the Central American Integration System
SICA	Central American Integration System
SIMMAGRO	Regional Intelligence and Agricultural Marketing Monitoring System
SOP	Standard operating procedures
UTSAN	Technical Unit of Food and Nutritional Security of Honduras
VHI	Vegetation Health Index
WFP	World Food Programme

1

Introduction

1 Introduction

The Central American Dry Corridor is the area most prone to drought in Mesoamerica. The CDC covers almost a third of the territory of Central America. It includes the lowest regions of the Pacific slope and a large part of the central pre-mountainous region (between 0 and 800 masl) of El Salvador, Guatemala, Honduras, Nicaragua, the Guanacaste province in Costa Rica and the Dry Arch of Panama. Of the total area of the Central American Dry Corridor, 7.5 percent is classified as prone to high risk of suffering severe effects due to drought; 50.5 percent is classified as a severe to moderate drought zone, and 42 percent to drought with mild effects (FAO and ACH, 2012). The Global Climate Risk Index (Germanwath, 2018) places four Central American countries (Honduras, Guatemala, Nicaragua, and El Salvador) among the top twenty places in the world at risk of suffering severe impacts due to weather events.

FAO promotes an approach to anticipate food crises through the Early Warning - Early Action system (EWEA). This system aims to link the alerts with early actions to act in advance and reduce the impacts of disasters on agriculture and food security (FAO, 2020a). The EWEA system focuses on using climate forecasts, such as projections on the El Niño phenomenon and the Agricultural Drought Monitoring and Early Warning System (ASIS), with the implementation of national plans to mitigate natural-related disasters and ensure quick and effective action on early alerts. Acting ahead can minimize hazards on communities, build resilience, and reduce dependency on humanitarian aid. In Africa, Asia, Latin America, and the Pacific Islands, FAO has successfully implemented a series of EWEA projects to mitigate the impact of drought, cold spells, animal diseases, and forced migration. Timely support has allowed communities to be protected and empowered, giving them the confidence to continue or resume their agricultural activities.

In response to the widespread food crisis in the early 1970s, FAO established the Global Information and Early Warning System (GIEWS) to globally monitor the food security situation and any crises affecting agriculture (FAO, 2020b). The GIEWS has among its tools an agro-meteorological information system and remote sensors to detect the negative impacts of the climate on global production. (FAO, 2020c).

At the Central American level, the Regional Committee on Hydraulic Resources (CRRH) and the Central American Agricultural Council (CAC) of the Central American Integration System (SICA), with the technical support of the FAO Subregional Office for Mesoamerica, developed an alliance in 2017 to consolidate an agricultural drought monitoring and early warning system at the subregion level. The system monitors and generates timely alerts

on agricultural drought using geospatial information. Specifically, this alliance has taken advantage of the Agricultural Stress Index System (ASIS) (FAO, 2018) developed by FAO to detect agricultural areas that have a high probability of suffering water stress (agricultural drought).

Progress has also been made in the subregion, with the implementation of the Integrated Food Security Phase Classification (IPC) methodology to assess food and nutritional security. (SICA, 2020a). The General Secretariat of SICA, is a member of the IPC Global Steering Committee (IPC SC), as well as the IPC Technical Advisory Group (IPC TAG). The IPC is a multi-partner initiative to improve food security, nutrition analysis, and decision-making. Using the IPC classification and analytical approach, governments, United Nations agencies, NGOs, civil society and other relevant actors work together to determine the severity and magnitude of acute food insecurity (AFI) and acute malnutrition situations (AMS) in a country, according to internationally recognized scientific standards.

Given that it is not possible to issue emergency declarations in agriculture before significant damage and losses are reported, the development of an Early Warning - Early Action on Agricultural Drought Plan (EWEA-AD), linked to drought Early Warning Systems, is of vital importance to prevent and mitigate crop damage and loss, as well as to limit the deterioration of food and nutritional insecurity.

This guide is intended to provide orientation to Ministries of Agriculture, meteorological services, comprehensive risk management systems (GIRD), and food and nutrition security (FNS) systems on how to develop plans that integrate ASIS results as triggers for early actions. (FAO, 2019a). These plans should prevent or mitigate losses and damages in agriculture due to drought, while the IPC-AFI will be used to prevent or limit acute food insecurity (AFI) in the population. (IPC, 2020b).

The guide aims to direct governments and other relevant actors in the development of EWEA on agricultural drought plans that must be implemented before a drought event has significant impacts and causes damages and losses that could eventually become a disaster. The manual complements other instruments used at global and local levels to develop EWEA on agricultural drought and response plans related to drought.

Furthermore, it has a global application nature and presents concrete examples considering the countries of Central America. For its implementation in other countries, it is necessary to have an agricultural drought monitoring and early warning system similar to Country level ASIS and a consensual inter-institutional analysis such as the IPC-AFI. If the country does not have an IPC, other systems may be used to define thresholds to activate the alert levels defined in an EWEA-FS plan, to avoid or limit the deterioration of the AFI.

2

What is an Early Warning – Early Action plan on agricultural drought?

2 What is an Early Warning — Early Action Plan on agricultural drought?

An Early Warning — Early Action Plan on agricultural drought establishes in advance a series of provisions and activities that allow timely, effective and appropriate management of the potential occurrence of a severe or extreme drought. The plan is an essential part of a comprehensive disaster risk management strategy in the agriculture and food security sector.

Early actions triggered by early warnings will be used to mitigate the effects of drought in agriculture, that is, before there is a significant reduction in yields or total loss of crops due to water stress in agricultural areas. Early action attempts to prevent substantial damage and loss in agriculture, avoiding a disaster for food security. It allows mitigation measures to be implemented to safeguard livelihoods and assets, reduce impacts, and establish the necessary provisions to take timely, effective, and appropriate actions in advance.

Any action taken to reduce crop yield and the loss of agriculture is considered an early action. The time to implement early actions goes from the release of the forecast of drought and/or the presence of the El Niño phenomenon with a probability higher than 55 percent. (IASC, 2018)[1]. It will end with the conclusion of the agricultural cycle or with the loss of crops or pastures (whichever comes first). It is essential to keep in mind that drought is a slow development event and that crops can recover, depending on the phenological phase that is affected by the reduction in rainfall. For this reason, it is essential to combine weather forecasts with agricultural crop monitoring systems. In case the forecast does not materialize for the region under study, the Agricultural Drought Monitoring and Early Warning System (ASIS) will provide the alert for the implementation of early actions aimed at reducing risk in agriculture. On the other hand, the IPC-AFI will generate information in time to prevent and mitigate the worsening of the FNS conditions of the population. Figure 1 presents a simplified conceptualization of the interaction between the agricultural production system, food security, and the relevant early actions to mitigate the effects of climate shocks. Food security is the centre of these interactions as it is the ultimate goal (telos).

[1] For areas where drought is correlated with the presence of El Niño

Figure 1.

Conceptualization of the interaction between the agricultural production system, food security, and early action.

The main objectives of an EWEA Plan on agricultural drought are:

- Promote the identification of early actions that can be implemented in response to different levels of alert, that is, before an emergency declaration in the agricultural sector and/or in food security.
- Properly articulate the capacities, tools, and actions of the institutions and actors of the meteorological services, the agricultural sector, and the national disaster risk management food security and nutrition systems.
- Facilitate quick and effective early actions in the face of the hazard of drought using an agreed ex-ante plan that contains necessary steps to be carried out based on early warning levels.

Its main scope at the local level is:

- To enable the agricultural producers to have the information and assistance necessary to act on time, preventing or mitigating losses and damages in agriculture, and strengthening resilience to avoid deterioration of food security for households living in conditions of vulnerability.

3

How to formulate an Early Warning — Early Action Plan on agricultural drought?

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3 How to formulate an Early Warning – Early Action Plan on agricultural drought?

The process necessary for the formulation of an Early Warning – Early Action Plan on agricultural drought is detailed in Annex 1, the general lines are described below.

The structure of an EWEA plan on agricultural drought must include the following sections:

- General information ☑
- Context ☑
- Objective ☑
- Strategy ☑
- Early Warning ☑
- Early Actions ☑
- Standard operating procedures (SOP) ☑
- Annexes ☑

How to formulate an Early Warning – Early Action Plan on agricultural drought?

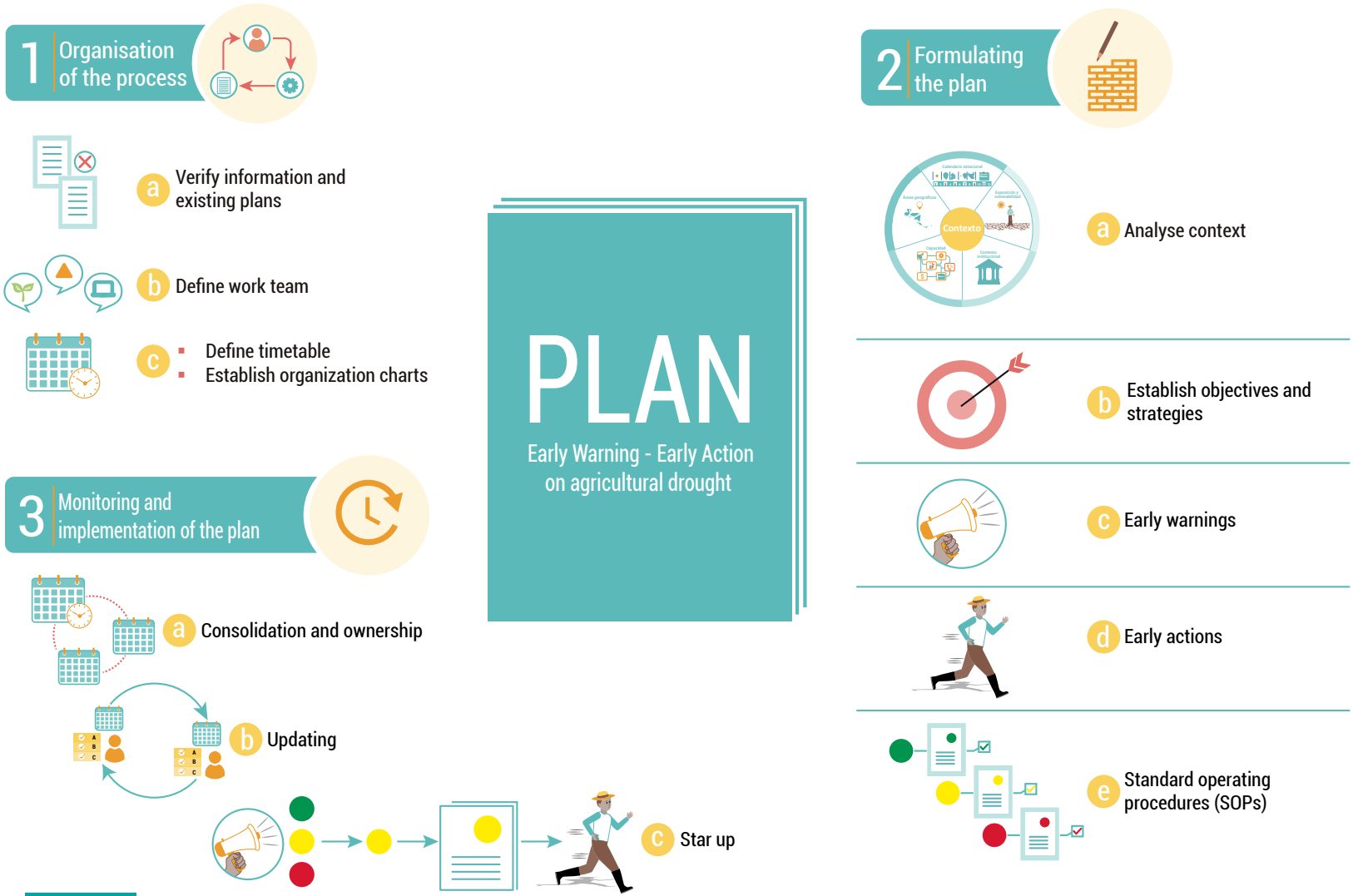


Figure 2.

Activities to prepare an Early Warning-Early Action plan on agricultural drought.

3.1 General information

The following must be included as general information of the EWEA Plan on agricultural drought:

- What is an EWEA Plan on agricultural drought for?
- What is an EWEA Plan on agricultural drought for?
- Information on the process carried out for the formulation of the EWEA Plan on agricultural drought.[2]
- Formulation or update date of the EWEA Plan on agricultural drought .
- Version number of the EWEA Plan on agricultural drought.
- Name and contact details of the institutions responsible for updating the EWEA Plan on agricultural drought .[3]
- The scheduled date for the next update of the EWEA Plan on agricultural drought .

3.2 Context

Figure 3 presents the context in which the EWEA Plan on agricultural drought is elaborated. In this section it is suggested to include the following information:

- Geographical areas more prone to agricultural drought and their classification in terms of the historical probability of the main crops being affected by drought. Annex 2 shows an example of a map of agricultural drought probability of occurrence, recommended to be included in this section.
- Drought risk management capacity available in the country at the different administrative levels (national, departmental, municipal and community level).
- Exposure and vulnerability of crop to drought.
- Exposure and vulnerability to the drought of people expected to be most affected (including the state of food security and nutrition).
- Crop seasonal calendar (phenological calendar), including peak periods of drought (figure 4) for agriculture and livestock. Annex 3 shows an example of the seasonal calendar suggested for this section.
- Indications on how to collect information on food prices and market situation. Examples of information sources that could be included in this section are shown in Annex 4.
- Institutional context: actors and responsibilities.

[2] Annex 2 provides useful information for the development of the EWEA Plan on agricultural drought formulation process

[3] An inter-institutional committee in charge of monitoring agricultural drought and food security in each country, generally conformed by the Ministry of Agriculture, the meteorological service, the Integrated disaster risk management (IDRM) system, and the food and nutritional security (FNS).

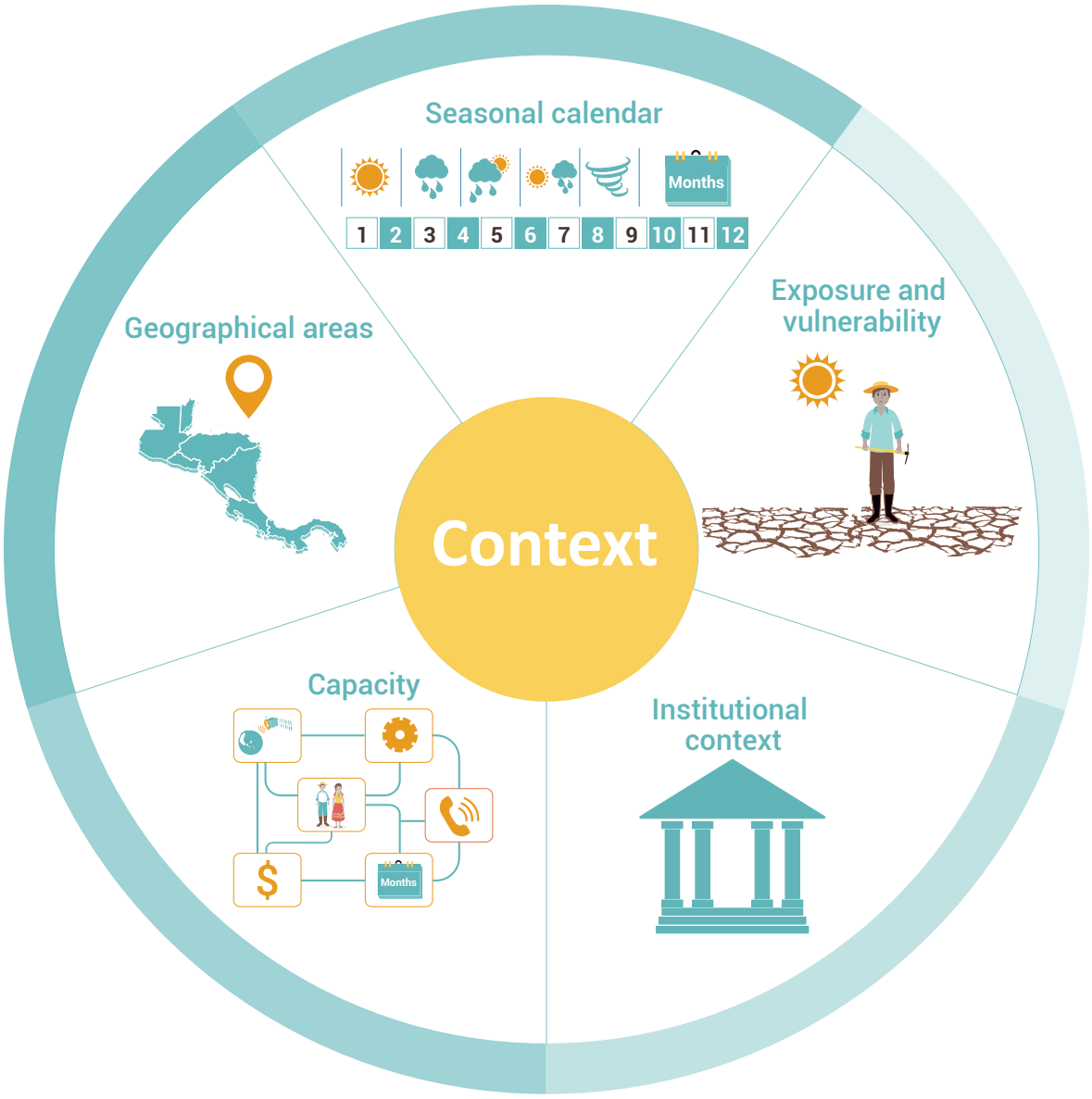


Figure 3.

Context in which an Early Warning - Early Action plan on agricultural drought is developed.

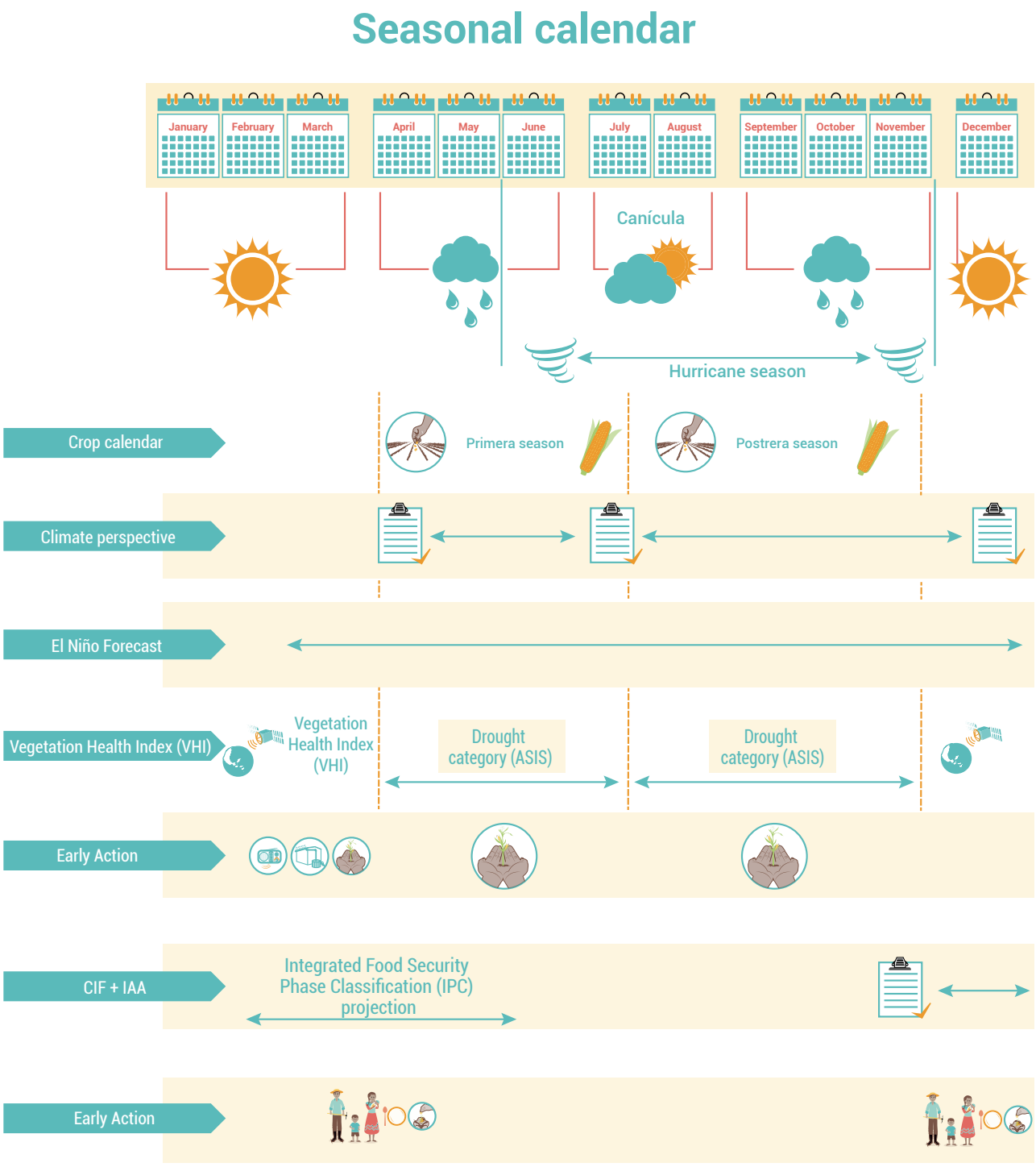


Figure 4.

Crop calendar showing weather events, agricultural seasons, indicators and early action.

3.3 Objective

The following essential elements must be defined for the analysis of the problem and the formulation of the objective (figure 5):

- Hazard (location): geographical area where an agricultural drought event presents a higher probability of occurrence and severity (e.g. Dry Corridor).
- Elements exposed to the hazard (or elements at risk): elements within an identified geographic area exposed to drought (e.g., people, crops, livestock).
- Vulnerability of the elements exposed to the hazard: people, crops highly susceptible to drought. The vulnerability can be:
  - Physical (e.g., crops without irrigation, varieties of maize and long-cycle beans, cattle without access to water or pasture).
  - Socioeconomic (e.g., low-income people dependent on agriculture: subsistence farmers, day labourers), related to underlying risk factors for disasters.
- Main risks faced by the exposed elements and that need to be managed or reduced:
  - Damages and losses in agriculture (e.g., decrease in production, death of livestock)
  - Deterioration of livelihoods (e.g., depletion of assets, adoption of negative strategies, risk evolution).
  - Deterioration of food and nutrition security (e.g., increased food insecurity and acute malnutrition in households with greater socioeconomic vulnerability).

These elements can be formulated, in the first place, in a statement, posing the problem sought to prevent and/or mitigate; subsequently, these elements are taken up in a second sentence where the solution will be proposed.

Example:

Problem

The Dry Corridor of Central America is frequently affected by agricultural droughts that cause damages and losses in agriculture, endangering the livelihoods and food security of subsistence farmers and day labourers.

Objetive

Translate early warnings into early actions to intervene timely, reducing damage and loss in agriculture, and mitigating the negative impact of drought on livelihoods, as well as on food and nutritional security of subsistence farmers and day labourers in the Dry Corridor of Central America.

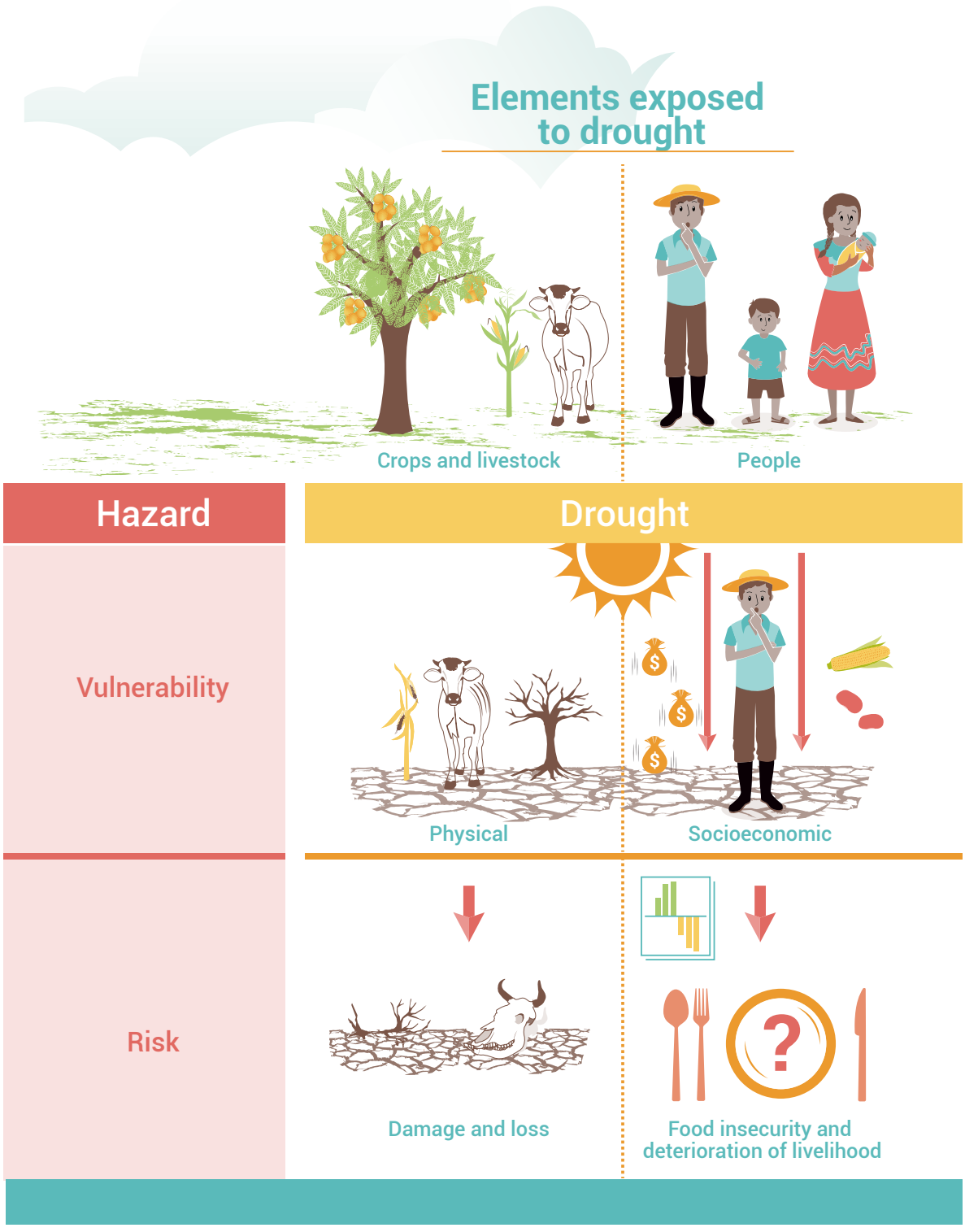


Figure 5.

Elements exposed to the hazard of agricultural drought: a) crops and livestock b) people.

3.4 Strategy

Considering that drought is a slow developing hazard[4], EWEA Plan on agricultural drought will promote a phase intervention strategy, where each phase (figure 6) and alert level (figure 7) corresponds normality, pre-alert, alert to a set of early actions that are executed and intensified depending on the level of risk and the potential impact existing for the elements exposed to the hazard: people, crops or livestock.

Figure 6.

Phases of the Early Warning – Early Action Plan on agricultural drought

The warning phases will be divided into the following alert levels:

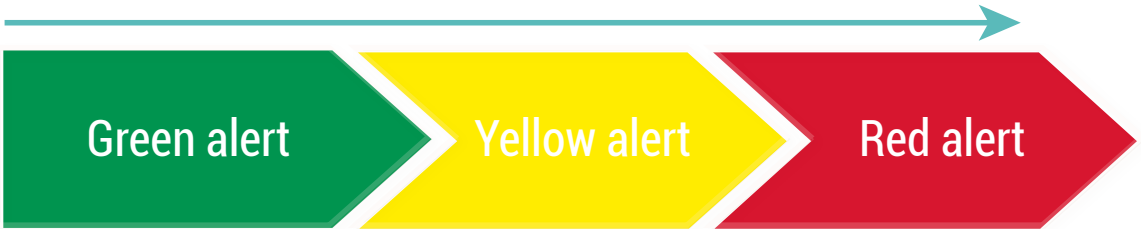


Figure 7.

Alert levels and early actions for agricultural drought

Each alert level will be associated with the colours commonly used in Early Warning Systems at the regional level to indicate incremental levels of risk[5]. A description of the progressive increase in alert levels is presented in Annex 7.

[4] Drought is a slow-developing hazard when compared to others such as hurricanes, earthquakes, and floods, which develop and impact within a few days. The drought begins, but it may decrease and again intensify over several months. This fact requires constant monitoring of the event concerning the exposed element (vegetation or people). In the case of vegetation, its dynamic development must be considered, the most sensitive phases being crop flowering and grain filling. Which implies that there must be a coincidence between the maximum intensity of the drought and the sensitive periods of water stress so that crop yields are considerably reduced. This varies at each geographic point due to the planting date and cycle length of the crop variety used.

[5] In El Salvador and Guatemala, the colour orange is additionally used.

3.5 Early warning

The indicators to monitor and the thresholds that will be used to activate the different phases (normality, pre-alert and alert), as well as alert levels (green, yellow and red) of the EWEA Plan on agricultural drought are different, depending on the elements exposed to the hazard.

In this case, the exposed elements are:

a. Crops and livestock.
b. People.

The type of risk to be reduced is:

a. Damages and losses in agriculture (D&L).
b. Acute food insecurity (AFI) and deterioration of livelihoods.

In the case of crops and livestock, the thresholds and indicators will be a combination of weather forecasts (climate perspective and forecast on the El Niño phenomenon) and the Agricultural Drought Monitoring and Early Warning System (ASIS) (FAO, 2019a). As for people, the IPC-AFI estimated numbers and percentages of the population in food insecurity would be used (IPC, 2020b). In both cases, however, the different indicators and thresholds will be linked and activated in the same phases and alert levels of the EWEA Plan on agricultural drought mentioned in the previous section (Figures 6 and 7). Early actions will be linked to each phase and alert level, and will aim to reduce both risks (Deterioration of livelihoods - AFI and D&L). These risks are highly correlated; food security depends mostly on the availability of agricultural production.

3.5.1 Indicators and thresholds for damages and losses in agriculture

The indicators and thresholds that will be used to activate the different phases and alert levels of the EWEA Plan on agricultural drought to prevent or mitigate damages and losses in agriculture will be weather forecasts (climate prediction and ENSO forecast) and the results of ASIS-Country (Annex 5).

In this case, the exposed element is crops and pastures used to feed livestock. ASIS-Country[6] is an expert detection system for agricultural areas that have a high probability of drought, for which it uses geospatial data. This tool has been developed to support countries in strengthening their monitoring and early warning systems on agricultural drought. The system has an application to make probabilistic forecasts on the development of agricultural drought events (Meroni *et al.*, 2014). This forecast is generated every ten days (dekad) during the crop cycle, and by specific crops (corn, rice, wheat, etc.). Decision-makers will be able to use the forecast before the end of the crop cycle to implement mitigation actions. The ASIS establishes four drought categories considering the intensity and impact of the

[6] For more information on ASIS-Country consult:
Video: https://youtu.be/xbfZhcmrN8s
Informative file: http://www.fao.org/3/ca0986es/CA0986ES.pdf
Manual - Module I: http://www.fao.org/3/ca2242es/CA2242ES.pdf
Manual - Module II: http://www.fao.org/3/ca2247es/CA2247ES.pdf

drought on crops (Extreme, Severe, Moderate and Mild) and produces information in the form of easily interpretable maps and charts, updated every ten days (dekad) at one kilometre resolution. (Annex 6). Figure 8 presents the evolution of the maize and bean areas in Guatemala during the 1991 agricultural season. This agricultural season was characterized by an intense drought, triggered in part by the presence of the El Niño phenomenon. The drought in 1991 put most households engaged in subsistence agriculture in the Dry Corridor of Guatemala and the rest of Central America at risk of food insecurity

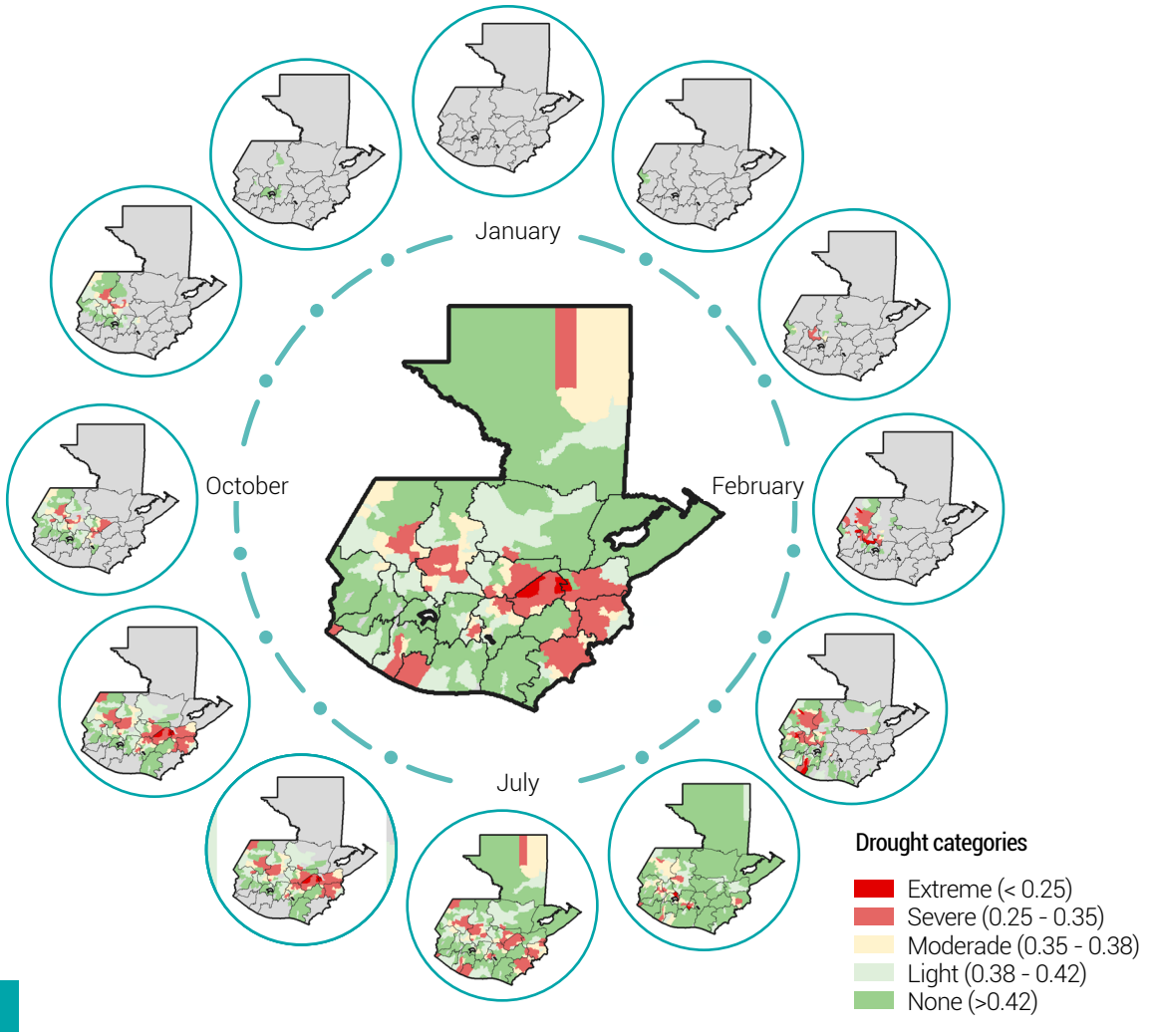


Figure 8.

Drought category by administrative units in the maize and bean areas for the 1991 crop season. The maps show the evolution of the drought during the year. Initially, the system detects a delay in the rains that gradually normalizes in certain areas. The most affected areas in 1991 were the central areas of Guatemala, belonging to the Dry Corridor and the coastal districts (Ocós, Santo Domingo, Tiquisate and Nueva Concepción). Source: FAO-ASIS. Maps according to United Nations, 2020.

Each alert level corresponds to one or more of the drought categories defined by ASIS (figure 9).

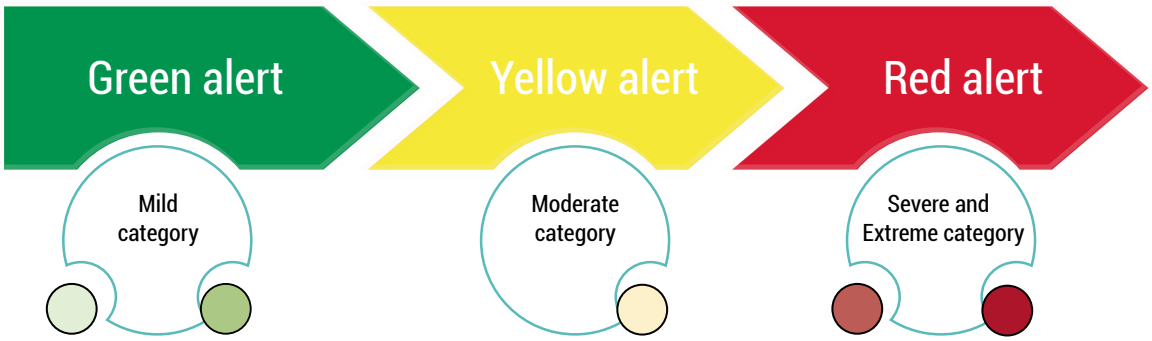


Figure 9.

Correlation between alert level and drought category. The Agricultural Drought Monitoring and Early Warning System (ASIS) calculates agricultural drought categories by administrative unit.

Figure 10 presents the indicators for the activation of each phase and alert level of the EWEA Plan on agricultural drought to mitigate the impacts of drought on agriculture, considering the weather forecasts, El Niño and ASIS-Country.

Phases		Indicators	Thresholds
Normality		Climate Perspective	Accumulated precipitation normal range (N) or above (A).
		ENSO Forecast (January to December)	<55 percent, El Niño forecast is updated every month by IRI of Columbia University.
		VHI (dekad) every 10-day	There is no drought in the vegetation prior to planting the crops.
Pre-Alert		Climate perspective	Accumulated precipitation low range (L).
		ENSO Forecast (January to December)	> 55 percent and the administrative unit presents a high correlation to be influenced by the ENSO phenomenon.
		VHI (dekad) every 10-day	Stressed vegetation prior to planting crops.
Alert	Green	Drought category ASIS probability forecast	There is mild or no drought in crops or pastures. Probability forecast of ASIS <30 percent of the occurrence of drought in crops and pastures
	Yellow	Drought category ASIS probability forecast	Moderate drought in crops and/or pastures ASIS probabilistic forecast (≥30 percent and ≤5 percent) that there will be a drought impact on crops and pastures
	Red	Drought category ASIS probability forecast	Severe or extreme drought in crops and/or pastures Probability forecast of ASIS> 50 percent of the occurrence of drought in crops and pastures

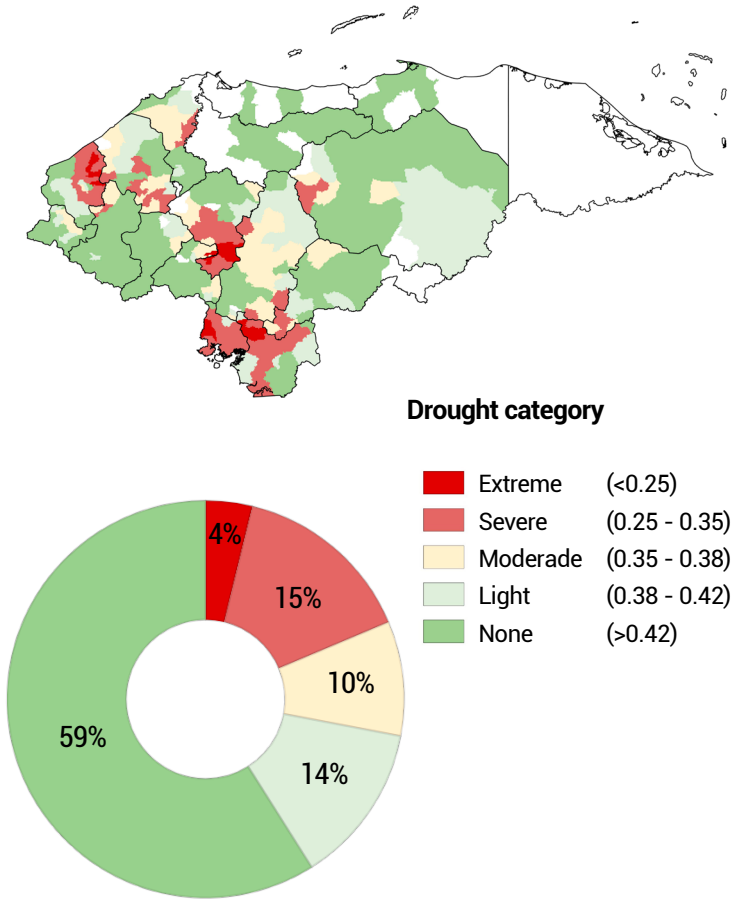


Figure 10.

Indicators and thresholds for each phase (normality, pre-alert, alert) and alert level (green, yellow, red). These indicators are used by the administrative units of a country, according to their correlation with the indicators to trigger early actions necessary to mitigate the impacts of drought on crops and pastures. Maps according to United Nations, 2020.

El Niño phenomenon forecast is valid for one year and is updated every month. The Climate Outlook is valid for three months and is available in December, April, and July of each year. The Agricultural Drought Monitoring and Early Warning System (ASIS) is most useful during each crop season (duration of the cultivation cycle in each region of the country) and is updated every ten days (dekad). For example, the maize cycle for the Primera crops in Central America varies from 90 days in the Dry Corridor, to 250 days in the Guatemalan highlands. On the other hand, in most countries, meteorological institutes publish additional short-term forecasts (10 days, one month) that for operational reasons cannot be integrated into this proposal. Early actions channelled to the small producer are made impossible in the short term by the window so narrow to act, considering the limitations of the small farmer to have direct access to water for irrigation. In the case of medium and large producers using technology in agriculture, the inclusion of short-term forecasts has a relevant value in the application of fertilizers, fungicides, complementary irrigation, etc.

3.5.2 Acute food insecurity indicators (AFI) and thresholds

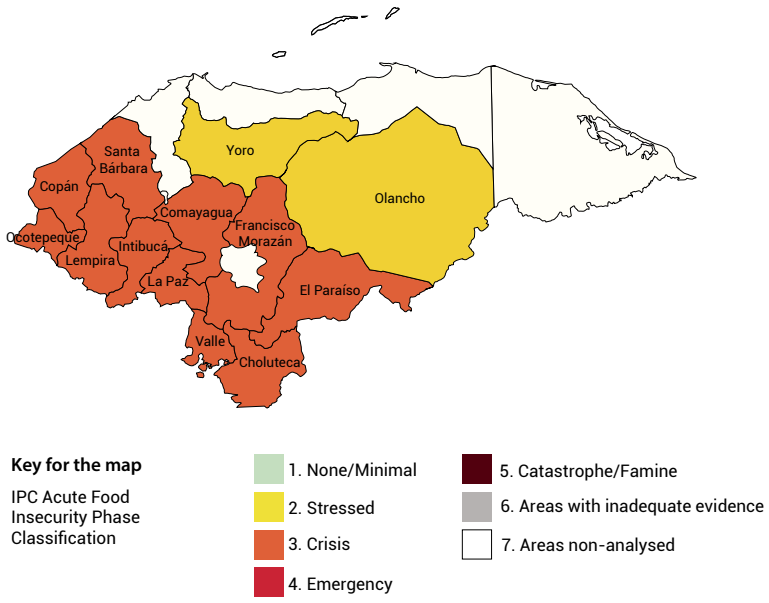
It is suggested to make use of the phases of the Integrated Food Security Phase Classification (IPC) as thresholds to activate the alert levels of the EWEA Plan on agricultural drought to avoid or reduce the deterioration of acute food insecurity (AFI) and malnutrition in a particular territory. Note that the element exposed to the hazard, in this case, is people.

The IPC[7] is a methodological approach made up of multiple partners (UN, NGO, national institutions, etc.) to classify the severity and magnitude of the food insecurity and malnutrition situation and identify its causes. The IPC organises a forum to do a methodology analysis of various indicators (prices, production, health, food availability in the markets, etc.). Key institutions in each discipline (meteorology, agriculture, health, nutrition, disaster prevention, etc.) participate in this forum to develop an evidence-based technical consensus on food and nutrition security. The IPC-AFI identifies the territories and the number of people with food deprivation and for whom their lives or livelihoods are at risk, regardless of the causes, context or duration. The AFI scale foresees five stages of severity (none/minimal, stressed, crisis, emergency and famine). The IPC does not guarantee a follow-up of actions in the country, but provides valuable information to decision-makers for their implementation. The same information is beneficial for early action experts, because, in addition to the five phases that will trigger actions, the IPC makes it possible to know the causes to which early action must respond. It is probable that two regions classified in phase 3 by the IPC, have different causes that justify different early actions.

[7] For more information on the IPC consult website: http://www.ipcinfo.org/ipcinfo-website/ipc-overview-and-classification-system/en/
Technical Manual Version 3.0. Available in: http://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/manual/IPC_Technical_Manual_3_Final.pdf
Key messages technical manual Version 3.0. Available in: http://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Technical_Manual_3_Summary_Final.pdf

The five phases of the IPC reflect the expected characteristics of different indicators (figure 11-B). The IPC analysis estimates the severity phase for each administrative unit (figure 11-A).

A



B

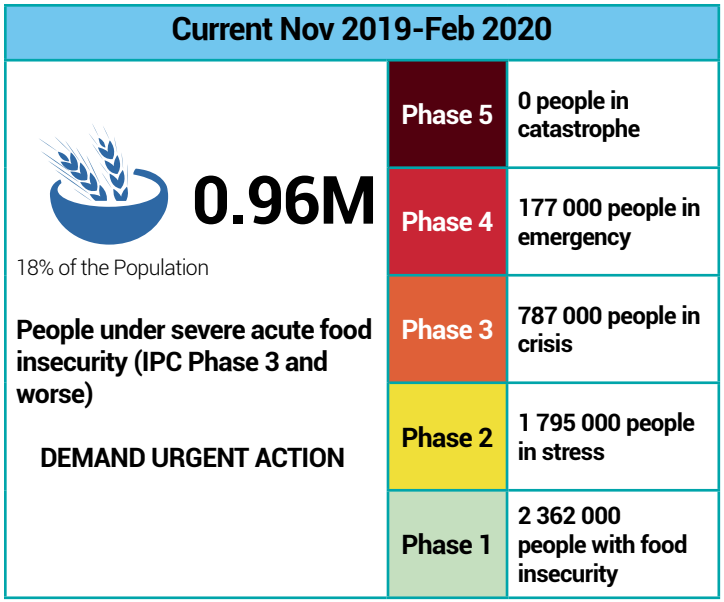
		Phase 1 None/Minimal	Phase 2 Stressed	Phase 3 Crisis	Phaste 4 Emergency	Phase 5 Castastrophe/ Famine
First level outcome	**Food compsuption** (focus on energy intaked)	Adequate	Minimally Adequate	Moderately inadequate	Very inadequate	Extremely inadequeate
	Livelihood change (assets and strategies)	Sustainable	Stressed	Accelerated depletion	Extreme depletion	Near collapse of strategies and assets
Second - level outcome	**Nutritional status**	Minimal	Alert	Serious	Critical	Extreme critical
	Mortality	CDR:<0.5 / 10,000/ day	CDR:<0.5 / 10,000/ day	CDR: 0.5 - 0.99 / 10,000 / day	CDR: 1 - 1.99 / 10,000 / day or >2 x reference	CDR: >2 / 10,000 / day
Contributing factors	**Food availability, access utilization and stability**	Adequate	Borderline adequate	Inadequate	Very inadequate	Extremely inadequate
	Hazards and vulnerability	None or minimal effects	Stressed livelihoods and food comsumption	Results in assets and food losses	Results in large food assets and food losses	Results in near complete collapse of livelihood assets

Figure 11.

(A) IPC-AFI phases by administrative unit. (B) Expected characteristics of the indicators for each phase of acute food insecurity (AFI). Source: UTSAN *et al.*, 2019 and IPC, 2019a. Maps according to United Nations, 2020.

In the Central American region (Guatemala, Honduras, and El Salvador), for example, the IPC classification is carried out in November of each year, the food security and nutrition situation cover the last months (including the months of the *Primera* and *Postrera* crop seasons) and projects four months (March-June).[8]

The current situation (figure 12) can be used as a trigger for response actions, while the projected situation (figure 13) can serve as a trigger for early actions. The IPC analysis provides information that answers the following questions: where should resources be allocated, to whom, to how many people, what are the causes, what are the priority actions recommended, and when should they be implemented.

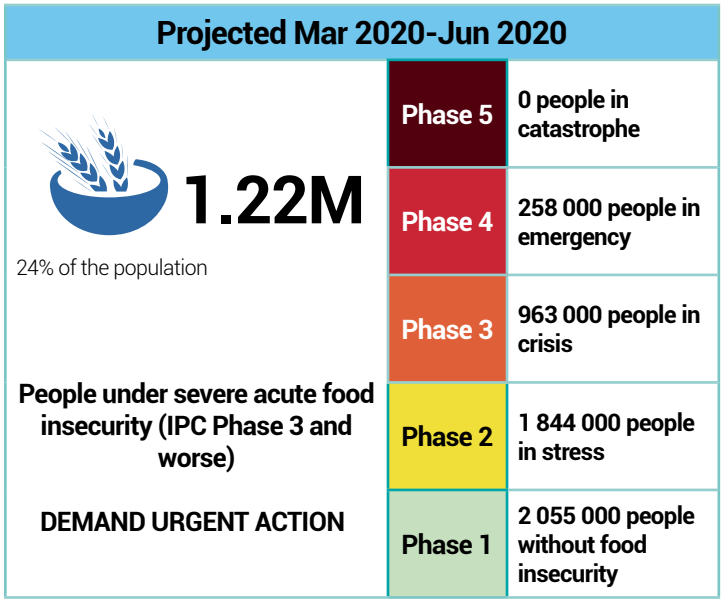


Departments	Rural population	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Area phase	Phase 3+	
		#People	%	#People	%	#People	%	#People	%	#People	%		#People	%
Choluteca	469 848	234 924	50	117 462	25	93 969	20	23 492	5	0	0	3	117 461	25
Comayagua	562 033	196 711	35	281 0616	50	73 064	13	11 240	2	0	0	2	84 304	15
Copán	406 965	203 482	50	113 950	28	73 253	18	16 278	4	0	0	3	89 531	22
El Paraíso	448 119	201 653	45	147 879	33	76 180	17	22 405	5	0	0	3	98 585	22
Francisco Morazán	389 704	144 190	37	159 778	41	66 249	17	19 485	5	0	0	3	85 734	22
Intibucá	260 344	88 516	34	104 137	40	52 068	20	15 620	6	0	0	3	67 688	26
La Paz	220 892	66 267	30	99 401	45	48 596	22	6 626	3	0	0	3	55 222	25
Lempira	357 783	189 624	53	118 068	33	35 778	10	14 311	4	0	0	2	50 089	14
Ocotepeque	162 638	81 319	50	60 176	37	16 263	10	4 879	3	0	0	2	21 142	13
Olancho	570 847	268 298	47	205 504	36	85 627	15	11 416	2	0	0	2	97 043	17
Santa Bárbara	462 774	273 036	59	111 065	24	69 416	15	9 255	2	0	0	2	78 671	17
Valle	187 460	84 357	45	46 865	25	46 865	25	9 373	5	0	0	3	56 238	30
Yoro	622 006	329 663	53	230 142	37	49 760	8	12 440	2	0	0	2	62 200	10
Total	**5 121 413**	**2 362 040**	**46**	**1 795 443**	**35**	787 088	15	176 820	3	0	0		**963 908**	**18**

Figure 12.

Current acute food insecurity situation. The current situation is used as a response trigger to reduce food insecurity. Source: UTSAN *et al.*; 2019.

[8] There is a technical proposal to increase the number of IPC forums to 2 times per year. This would allow follow up and monitoring of the indicators, as well as necessary information more frequently that would improve the assessment of the country's AFI and nutritional situation. Furthermore, this would allow projecting the AFI situation with a greater number of elements and reducing errors in the AFI projection. Note that, in Honduras, for example, the forum takes place in November and a current valid IPC is published from November to February (that is, the situation evaluated in November is expected to remain stable from December to February) and after February, the projected IPC considered as valid is the one from March to June. Early action could start from the publication of the IPC newsletter in November.



Departments	Rural population	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Area phase	Phase 3+	
		#people	%	#people	%	#people	%	#people	%	#people	%		#people	%
Choluteca	469 848	164 446	35	140 954	30	117 462	25	46 984	10	0	0	3	164 446	35
Comayagua	562 033	168 609	30	258 535	46	118 026	21	16 680	3	0	0	3	134 886	24
Copán	406 965	174 994	43	130 228	32	81 393	20	20 348	5	0	0	3	101 741	25
El Paraíso	448 119	188 209	42	134 435	30	89 623	20	35 849	8	0	0	3	125 472	28
Francisco Morazán	389 704	140 293	36	155 881	40	74 043	19	19 485	5	0	0	3	95 528	24
Intibucá	260 344	88 516	34	85 913	33	65 086	25	20 827	8	0	0	3	85 913	33
La Paz	220,892	61 849	28	92 774	42	57 431	26	8 835	4	0	0	3	66 266	30
Lempira	357 783	168 158	47	114 490	32	53 667	15	21 466	6	0	0	3	75 133	21
Ocotepeque	162 638	69 934	43	60 176	37	26 022	16	6 505	4	0	0	3	32 527	20
Olancho	570 847	245 464	43	222 630	39	91 335	16	11 416	2	0	0	2	102 751	18
Santa Bárbara	462 774	198 992	43	152 715	33	92 554	20	18 510	4	0	0	3	111 064	24
Valle	187 460	74 984	40	46 865	25	46 865	25	18 746	10	0	0	3	65 611	35
Yoro	622 006	311 003	50	248 802	40	49 760	8	12 440	2	0	0	2	62 200	10
Total	**5 121 413**	**2 055 451**	**40**	**1 844 398**	**36**	**963 267**	**19**	**258 271**	**5**	**0**	**0**		**1 221 538**	**24**

Figure 13.

Projected acurate food insecurity situation. The projected situation may be the trigger for early actions to reduce food insecurity. Source: UTSAN *et al.*; 2019.

In countries where the IPC-AFI analysis is not carried out, the inter-institutional committee[9] in charge of monitoring agricultural drought and food security in each country will define the indicators and thresholds that will be used to activate the different phases and alert levels of the EWEA Plan on agricultural drought to prevent or limit the severity of food and nutritional insecurity.

The five IPC-AFI phases will activate the three alert levels of the EWEA Plan on agricultural drought (figure 14). Figure 15 presents the phases, indicators, and thresholds for triggering early actions. The early action expert must organise the actions in each territory when the different alert phases occur (green, yellow and, red). However, the actions must respond to the causes detected in each administrative unit by the IPC-AFI.

[9] Generally formed by the Ministry of Agriculture, the meteorological service, the integrated disaster risk management systems (IDRM), and food and nutritional security systems (FNS).

Figure 14.

Correlation between alert level and IPC-AFI phases. The IPC phases are estimated by the administrative unit.

Phases		Indicators	Thresholds
Alert	Green alert	IPC-AFI	**Phase 1** Most people are in minimal food insecurity. The trend of the indices or information of the current IPC should be analysed with the projected IPC (for example, changes in the percentage of people from the current IPC versus the projected one). ○
	Yellow alert	IPC-AFI	**Phase 2** Most people are in acute food insecurity. The trend of the indices or information of the current IPC should be analysed with the projected IPC (for example, changes in the percentage of people from the current IPC versus the projected one). ○
	Red alert	IPC-AFI	**Phases 3, 4 y 5** Most people are in food insecurity classified as critical, emergency or famine. The trend of the indices or information of the current IPC should be analysed with the projected IPC (for example, changes in the percentage of people from the current IPC versus the projected one). ○○○

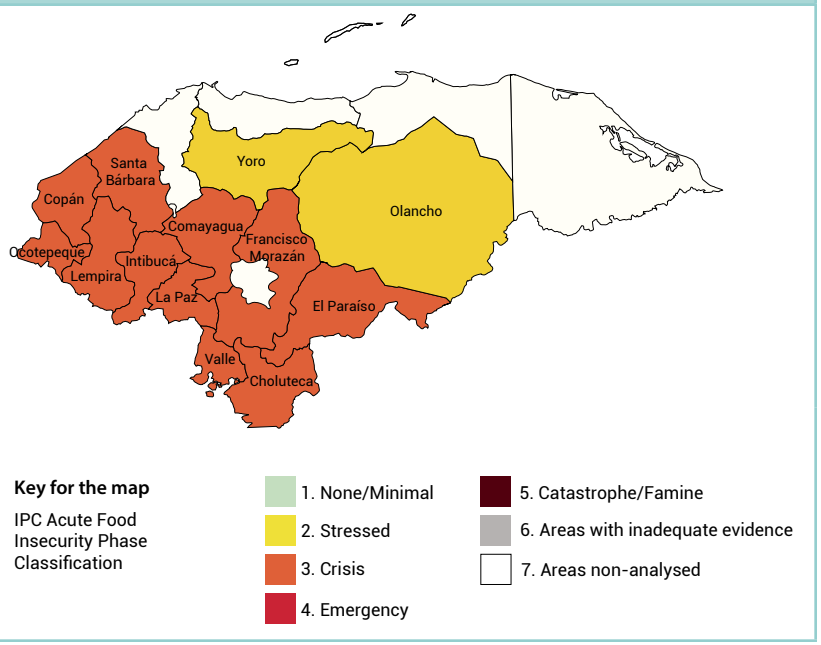


Figure 15.

Alert level indicators (green, yellow, red). These indicators are used at the administrative units' levels of a country according to the Integrated Food Security Phase Classification (IPC) to trigger the early actions necessary to mitigate food insecurity and malnutrition in people. Map according to the United Nations, 2020.

3.5.3 Integration of early action triggers for crops and food security (D&L and AFI)

The early action specialist is interested in integrating the results of the IPC-AFI to prevent and mitigate drought on agriculture, which serve to trigger early actions aimed to protect people from acute food insecurity and malnutrition. The availability of food, by itself, does not guarantee adequate nutrition and food security. For this reason, the IPC-AFI complements the indicators for the activation of each phase and alert level of the EWEA Plan on agricultural drought, described in point 3.5.1. For example, the urgency of an early action to mobilize resources in the face of the hazard of drought (forecast) will not be perceived the same by governments or donors if a deterioration of the AFI (phase 3 or higher of the IPC) is present three months earlier. Both the government and donors would be more willing to finance early actions in this case.

The two proposed trigger systems to protect crops and prevent deterioration of people's food security are closely interrelated (figure 16). Household food security depends on the availability of food (agricultural production), but it is not the only variable that must be evaluated. For this reason, the IPC plays a significant role, contributing to socioeconomic and nutritional indicators that define the food and nutritional security of a country. Conceptually and for practical operational reasons, the two systems are presented independently, but the food security analyst and the early action specialist must consider both results in their analysis. The result of the first (agricultural production) becomes an input to the IPC-AFI. However, it should be regarded that the early actions that trigger the IPC-AFI indicators are different from those triggered to protect crops and pastures.

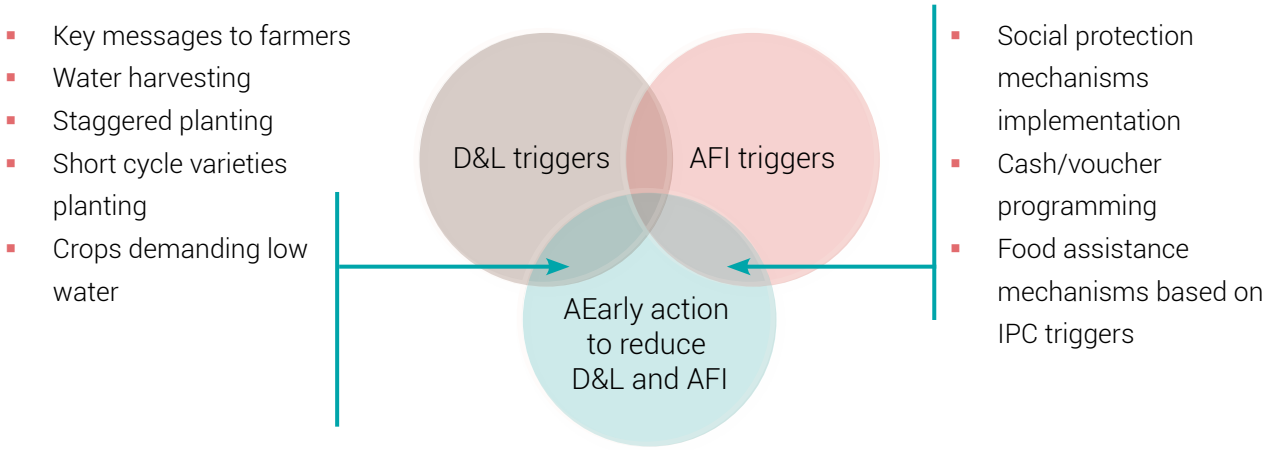


Figure 16.

Complementarity and integration of the proposed indicators and thresholds to trigger early action to prevent and mitigate the impacts of drought in agricultural and food security.

On the other hand, the windows for early action in time are different, depending on the indicators used (climatic perspective, El Niño forecast, drought categories, Vegetation Health Index (VHI), and the IPC-AFI phases). Figure 17 shows the temporary windows for early action that trigger each index. It is recognised that some indices prompt early actions at the beginning. However, as time passes, early action has less time to be implemented and therefore achieve the expected results, as in the case of the climate perspective. Of the proposed indices, the El Niño forecast has the highest temporal validity, presented in the case of Central America, with a bi-modality in the year due to the two agricultural seasons. The IPC-AFI allows for early action to mitigate the impacts of agricultural drought on food security with higher intensity from December to April. The Agricultural Stress Index System (ASIS) triggers early actions in various time windows: April-May (using VHI), June-July (using drought categories during the *Primera* season), and September-October (using the drought categories during the *Postrera season).*

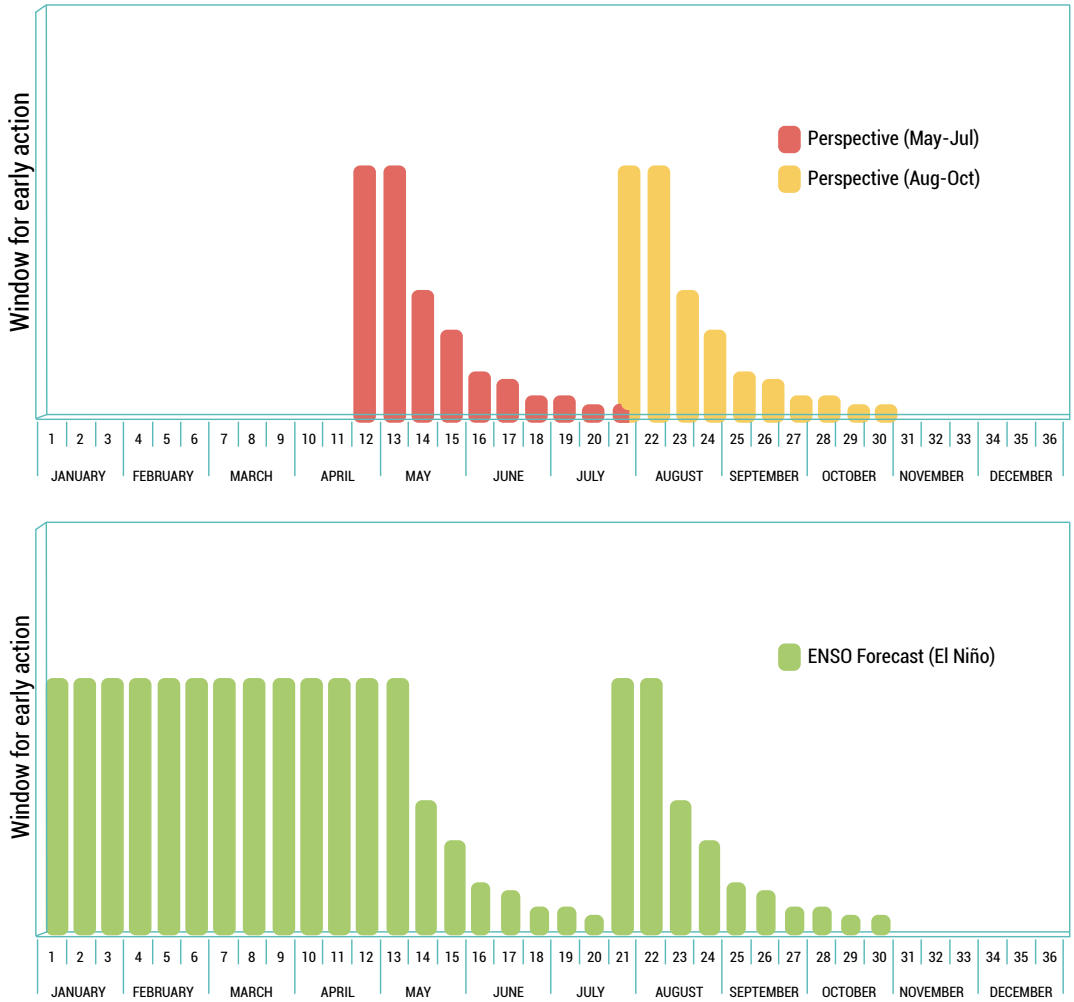


Figure 17.

Time windows for early action that trigger each indicator (climate perspective, El Niño forecast, IPC, VHI, and drought categories) for each 10-day (dekad) period of the year.

On the other hand, the implementation, interpretation, and operating costs of both systems proposed to trigger early action are different. The drought prevention and mitigation system is based entirely on quantitative information (probability of occurrence of an event, biomass production measured by satellite). While, the IPC integrates quantitative and qualitative information. The IPC assigns a relative degree of confidence to qualitative information.

Implementation of the proposed EWEA system in a country will require an initial investment for the installation and training of

national personnel.[10] Once this investment is made, the operating cost is extremely low.[11] To establish an IPC in a country, an IPC working group must be conformed and trained in the methodology. Thereupon the number of national forums necessary to analyse the food security and nutrition indices will be decided.[12] The number of national forums depends on the financial and human resources available to carry out the IPC; as well as the productive system, in some countries, such as within Central America, where there are 2 or 3 agricultural seasons per year. It is recommended to perform two IPCs a year in Central America. Currently, in the case of Honduras, an IPC forum is held annually in November.

It is not advisable to carry out a quantitative weighting of the specific weight of each indicator. The indicators do not have the same relevance and the same predictive power. It is essential to consider the accessibility, quality, periodicity, relevance, and reliability of the indicators in order to determine an Early Warning System. For instance, a forecast loses weight for implementing early actions when there is measured field evidence of crop damage. A favourable climatic outlook during the agricultural season decreases its weight as an early action trigger when damage by drought in crops is verified in the field or vice versa. The same happens with the projected IPC-AFI indicators (figure 17). In other words, the information projected, estimated or forecasted, loses value over time to trigger early actions, while the information measured in the field becomes relevant to trigger the actions.

3.6 Early actions

To identify the most effective early prevention and mitigation actions in reducing the risk of damage and loss in agriculture, and to avoid or limit the deterioration of the AFI, the following concepts shall be considered:

- Priorities perceived by the population concerning their capacities and vulnerabilities. In relevance with:
  - Social and cultural factors (context); technology used (appropriate technology);
  - Temporality of the actions.
- Logistical and institutional capacity.
- Disaster Risk Reduction (DRR).
- Gender equality and inclusion of vulnerable groups.
- "Do no harm" actions.
- Cost-benefit analysis.
- Environmental sustainability.
- Consistency with other actions.

Actions may be similar to those promoted and implemented by the FNS sector and

[10] The cost of installation and training for interpreting the indices to operate ASIS is approximately USD 100,000. This estimated cost may vary depending on the size of the country, the computer equipment (software and hardware) already in hand, as well as the derived studies that the country decides to carry out with the results of agricultural drought indices.

[11] The climate perspective is provided by the CRRH and is institutionally consolidated. The Columbia University IRI publishes the El Niño forecast with monthly updates on its website. The Agricultural Drought Monitoring and Early Warning System (ASIS) has been calibrated in Guatemala, Honduras, El Salvador, and Nicaragua, and the results are published on the respective websites of each country. The CRRH publishes the results of ASIS every 10 days at the Central American level for staple grains and other coverage for the Dry Corridor. All this information is freely available. Satellite images to operate ASIS every 10 days are provided by FAO.

[12] The estimated cost of each IPC forum in Central America is approximately USD 15,000; however, in case there is a need to collect the primary data (as happens in Central America) it is estimated that the amount increases up to USD 90,000. This cost may vary depending on the country where the IPC is established, its production system, and the level of involvement of national institutions in the IPC process.

in agriculture in terms of prevention and mitigation in the Central American Dry Corridor. These actions will be adjusted to be implemented timely, intensively, quickly, and focused on the administrative units that the information from ASIS-Country and the IPC-AFI detect as the most affected.

The standards and guidelines used in the interventions by the FNS sector, including the selection of people to whom the actions will be directed, will be those defined by the National FNS Systems of the countries concerned (e.g., SESAN and UTSAN, CONASAN, and SESSAN), taking into account international guidelines (e.g. Sphere Handbook, with emphasis on Food Security and Nutrition).[13]

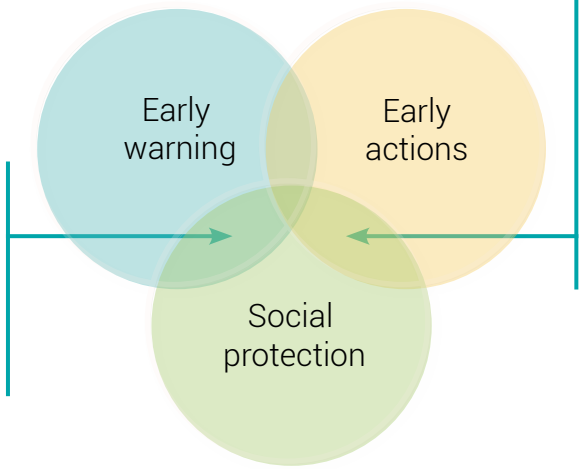
Concrete examples on early prevention and mitigation actions in the agricultural, livestock, forestry, and fishing sectors can be found in Annex 6.[14] Annex 3, corresponds to the seasonal calendar, and figure 17 provides examples of when the different early actions should be executed depending on the agricultural calendar and the triggers.

Early actions may consider the use of mechanisms established for social protection. FNS and livelihood programs could be coordinated with existing social protection systems or lay the foundation for the future creation of such systems. Social protection mechanisms, warning systems and early action systems share several essential links (FAO, 2019b). When combined, they can provide a useful structure to support vulnerable populations quickly and efficiently in the face of "shocks," allowing households to protect their assets, rather than lose them during a crisis (figure 18).

[13] The Sphere Manual may be found at: https://spherestandards.org/wp-content/uploads/EI-manual-Esfera-2018-ES.pdf. Other useful elements may be found in: https://fscluster.org/country-level-food-security-cluster

[14] An inventory of good agricultural practices for comprehensive disaster risk management and climate-adapted sustainable agriculture for Central America and the Dominican Republic (SICA countries) is under formulation and will be available soon.

- Quickly identify vulnerable population to be supported via early action
- Channelling early action interventions
- Encourages partnership and collaboration with governmments and humanitarian actors



- Adapt social registers to include people vulnerable to climate shocks
- Provide information on where people are most likely to be impacted to adjust social protection programming
- Inform social protection design and programming to include timely actions based of early warning triggers

Figure 18.

Integration of social protection systems with Early Warning - Early Action systems. Source: FAO, 2019 b.

Figure 19.

Elements exposed to agricultural drought and the corresponding early actions to mitigate the impacts.

3.7 Standard operating procedures (SOP)

The purpose of the SOPs is to define the management and coordination arrangements necessary to promote and guide the implementation of the EWEA Plan on agricultural drought based on the agreed early warnings and actions. The SOPs define activities, step by step, to help the institutions responsible for implementing the plan to achieve quality results, in an efficient and coordinated manner.

The SOPs define what to do, when to do it, how to do it, and who does it, as well as:

- Actions.
- Roles.
- Times.
- Tools.

The SOPs will be structured according to the four principal elements within an Early Warning System (ISDR; 2006):

- Awareness of the risk (collection and systematic analysis of the information).
- Forecast and monitoring.
- Activation and dissemination of alerts.
- Early or response action.

Annex 8 presents a SOP proposal for each phase (Normality, pre-alert, alert) and alert level (green, yellow, red) of the EWEA Plan on agricultural drought (based on ASIS-Country, IPC-AFI, climate perspective, ENSO Forecast, and VHI), which in addition to being relevant, is generic enough to adapt to different contexts and geographic scales quickly. A SOP proposal is also presented for increasing phases and defining alert levels. Users will be able to adapt the suggested actions according to whether they are appropriate to the national, departmental, or local context (Annex 8). The SOP can be accompanied by flowcharts, in which the sequence of actions and their correlation is displayed. Figure 20 presents the graphic example of the sequence of actions to be considered for preparing a SOP.

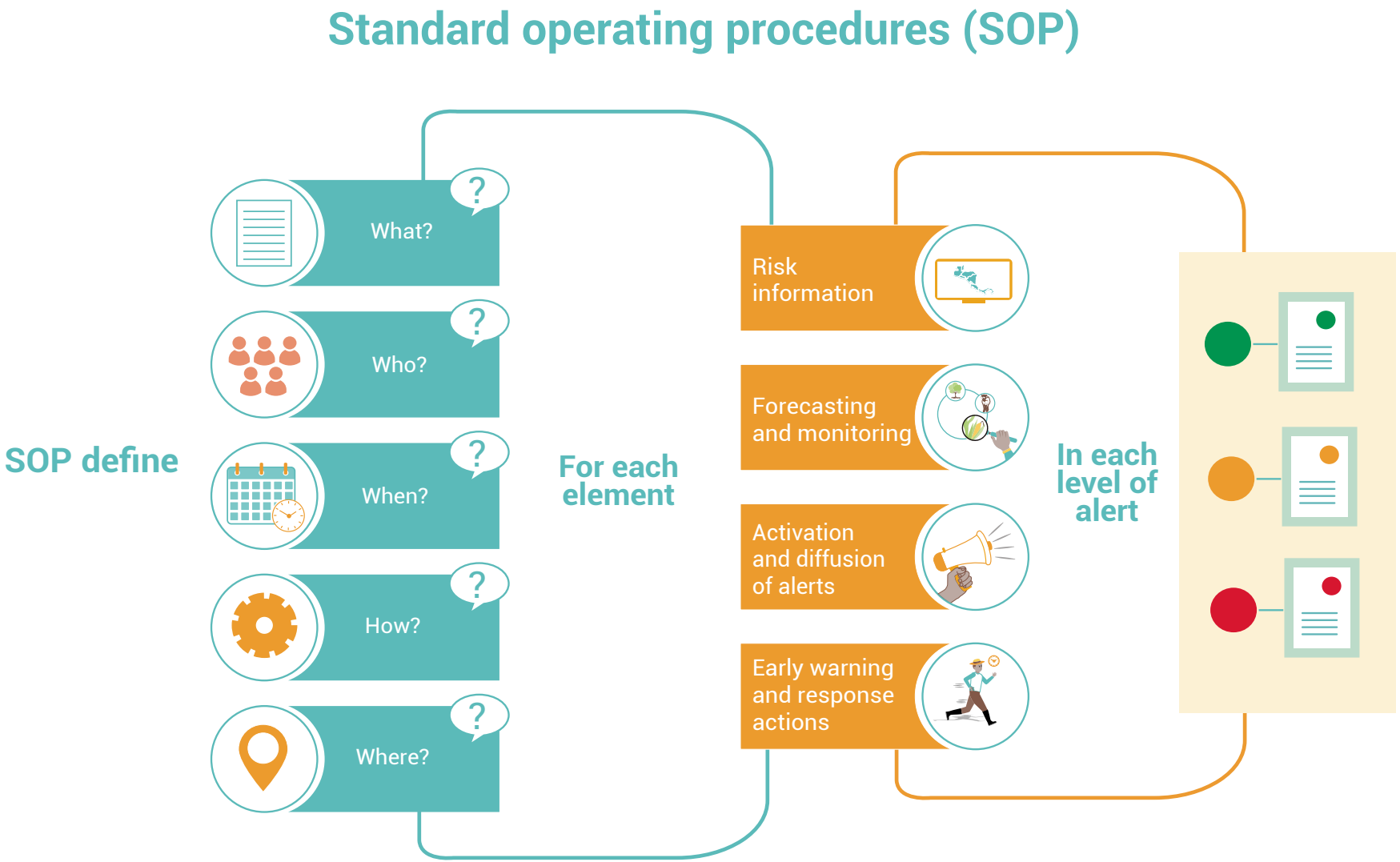


Figure 20.

Sequence of actions for the elaboration of standardized operating procedures (SOP).

4

Conclusions

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4 Conclusions

- Drought is a slow-developing event that may subside and again intensify over several months. Moreover, the vulnerability of the crops is not a constant variable and changes according to the phenological phase, with the most drought-sensitive phases being the crop flowering and grain filling. For this reason, it is essential to combine weather forecasts with agricultural crop monitoring and early warning systems.

- The impact of the El Niño on administrative units at the country level varies according to geographic location. There are administrative units that, during an ENSO event, are more likely to have an impact on agriculture and AFI. Sometimes, within the same administrative unit, the vulnerability can vary due to different factors such as height or access to markets. For this reason, early actions should vary according to the most vulnerable areas to drought and AFI within a country.

- Early actions should be implemented in the administrative units that the IPC defines with the highest incidence of AFI. On the other hand, for early actions in agriculture, the focus will be on the administrative units with the highest occurrence of agricultural drought, defined by the Agricultural Drought Monitoring and Early Warning System (ASIS). Early actions will be put into action as soon the presence of the El Niño phenomenon is forecasted with a higher probability of 55 percent and/or a climate prediction anticipating a reduction in rainfall is released. The ASIS, through its agricultural drought categories, will issue the alert to advance towards early actions.

- For the sustainability, interpretation, and adoption of the ASIS, it is imperative to ensure an effective mechanism for validating information in the field. Validation can be done through constant consultation with agricultural extension agents, in areas detected by ASIS as affected by water stress, or using technology such as drones or mobile phones.

- There are multiple ongoing initiatives on the topic of agrometeorology and FNS promoted by different institutions in Central America. In this context, it is crucial to have an adequate inter-institutional and intersectoral coordination to avoid the dispersion of information and provide a better service to the population.

- In this same sense, to work towards a better uniformity and compatibility of data capture, transmission, storage, and quality control protocols is required. The use of geoportals, where georeferenced information is shared among national institutions, is viewed as the essential technological development in the short.

5

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6

Glossary

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6 Glossary

Agricultural Stress Index System (ASIS)
System that evaluates the severity (intensity, duration and spatial extent) of agricultural drought and generates information at the administrative level in the form of maps and charts, giving the possibility of comparing them with the country's agricultural statistics. ASIS is based on the Vegetation Health Index (VHI) and can detect "hotspots" around the world where crops can be affected by drought (FAO, 2019a).

Capacity
The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience (UN, 2016).

Climate perspective
It is an estimate of the possible behaviour of rain and temperature, generated by statistical tools, comparison with analogous years, and analysis of the results of global and regional models on sea surface temperatures, wind patterns, atmospheric pressure and precipitation, whose objective is to complement the forecasting activities carried out by the Meteorological and Hydrological Services in each of the countries of the region that participate in the working group called Central American Climate Forum (FCAC) coordinated by the Regional Committee on Hydraulic Resources (SICA-CRRH (available at: https://www.sica.int/clima/perspectiva).

Cost benefit analysis
A systematic process for calculating and comparing the benefits and costs of a given action/project/investment. It is based on assigning a monetary value to all the activities performed as either input or output (FAO, 2019b).

Disaster
A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (UN, 2016).

Disaster risk
The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity (UN, 2016).

Disaster risk management
Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses (UN, 2016).

Disaster risk reduction

Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development (UN, 2016).

Do no harm

The definition of "Do no harm" is when our action to mitigate a shock does not expose people to additional risks. "Do no harm" suggests a reflection of the potential impact that the intervention will have in a broader context and mitigate the possible adverse effects on society, the economy and the environment (Humanity &Inclusion, 2018).

Early warning - early action

The early warning and action system translate early warning into early action to intervene at the right time, before a risk becomes a humanitarian disaster. The system consolidates current and timely forecast information; plans are developed to ensure that action is taken when an alert occurs. It is essential to have a proactive role, to act early before a disaster occurs. EWEA can save lives and protect livelihoods from immediate hazards, as well as safeguard long-term development achievements by increasing the resilience of local communities over time (FAO, 2019b).

Early Warning System

An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment,communicationandpreparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events (UN, 2016).

ENSO – El Niño- South Oscillation

El Niño consists of a large-scale sea surface temperature anomaly of the central and eastern Pacific Ocean that takes place off the Peruvian coast. The Southern Oscillation consists of an oscillation of atmospheric pressure in the western Pacific. The relationship or coupling between these two phenomena (El Niño and the Southern Oscillation) has significant climatic consequences in most of the world. During the phenomenon, there are significant variations in temperatures and rainfall regimes, with positive or negative effects on agriculture (FAO. 2004).

Exposed elements or elements at risk

All objects, people, animals, activities, and processes that can be negatively affected by dangerous phenomena, in a particular area, either directly or indirectly. Including: buildings, facilities, population, crops, livestock, economic activities, public services, environment. (http://www.charim.net/methodology/52).

Exposure

The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard prone areas (UN, 2016).

Gender equality

Defined as the equal rights, responsibilities, and opportunities of women and men, and

girls and boys. Equality means that rights, responsibilities and opportunities do not depend on the sex of people. Gender equality assumes that the interests, needs and priorities of both women and men are taken into account, recognizing the diversity of different groups of women and men (UNESCO, 2014).

Hazard

A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation (UN, 2016).

Integrated Food Security Phase Classification (IPC)

The IPC is a set of standardized tools that aims to provide a "common currency" to classify the severity and magnitude of food insecurity in different countries. It builds on consensus-building processes to provide decision-makers with a rigorous analysis of food insecurity along with response objectives in both emergency and development contexts. Consensus is obtained by involving most national and international actors in the evaluation of the current food security situation (GFSC, 2017).

Mitigation

The lessening or minimizing of the adverse impacts of a hazardous event (UN, 2016).

Prevention

Activities and measures to avoid existing and new disaster risks (UN, 2016).

Resilience

The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management (UN, 2016).

Response

Actions taken directly before, during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected (UN, 2016).

Social protection

Social protection comprises a set of policies and programs that address economic, environmental, and social vulnerabilities of food insecurity and poverty by protecting life and promoting livelihoods. FAO recognizes that expanding social protection systems is a strategic priority to enhance the resilience of vulnerable populations. Social protection is a crucial area of work, since, in many countries, national programs already reach significant segments of the population, offering excellent opportunities for programming in rural areas. Furthermore, social protection systems are often based on sophisticated targeting and delivery structures, necessary to provide regular and predictable support to program participants (FAO, 2019b).

Underlying factors of disaster risk

Processes or conditions, often development related, that influence the level of disaster risk by increasing levels of exposure and vulnerability or reducing capacity (UN, 2016).

Vulnerability

The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (UN, 2016).

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Annexes

Annex 1. EWEA Plan on agricultural drought formulation process

The agricultural drought early warning - early action planning process aims to develop a shared understanding of possible anticipatory actions needed to intervene at the right time in response to different levels of alert; that is, before an emergency declaration. The process involved in formulating the EWEA Plan on agricultural drought is highly significant because, in addition to allowing ex-ante consensus on these actions, it allows for the agreement of the roles and responsibilities of the institutions and the adequate articulation of the capacities and tools necessary to carry out the planned actions. The document serves as a record of agreements reached and decisions made during the planning process, and to communicate the results of the process to others.

The main steps in the EWEA Plan on agricultural drought planning process are:

Step 1: Organization of the planning process

Proper organization of the process is essential for the success of inter-institutional planning. The following preparatory steps should be observed:

a. Take stock of existing measures, information, and plans to will ensure that the EWEA Plan on agricultural drought is consistent with and based on previous efforts, hence avoiding duplication.

b. Define the participation scope in the process. It must be made official through the formation of an inter-institutional working group. The definition of participants should take into account several factors, including the sensitivity of possible topics for discussion, the number of participants, and the ability to manage the planning process. It is a recommendation that the government should lead the process, although it is also advised to involve other relevant actors (academia, UN; NGO, private sector). The leading state institutions expected to participate in the planning are the ministries of agriculture, meteorological services, integrated disaster risk management systems (IDRM), as well as food and nutrition security systems (FNS). These are indeed the main actors to whom this guide is directed.

c. Define how the inter-institutional planning process will be structured, managed and undertaken. It should include scheduling planning meetings, defining roles, and organizing the support needed for the process. It is advisable to prepare terms of reference for the inter-institutional working group that will prepare the EWEA Plan on agricultural drought .

Step 2: Preparation of the EWEA Plan on agricultural drought

The indications defined in section 3 of the guide will be followed to prepare the plan.

a. Context analysis: carry out an analysis focused on the hazard of drought and its impacts, considering the different elements exposed, as well as vulnerability, existing capacities, and associated risks. This analysis will also take into account the timing (seasonal calendar with information on crops and periods with significant food deficits), and how drought can affect other factors (e.g. food prices, market situation, institutional context) in increasing or decreasing the existing risk.
b. Objective and strategy: to carry out a synthesis of the risks to be prevented and/or mitigated, and to establish objectives and strategies to reduce identified risks.
c. Early Warning: define the indicators to monitor and thresholds that will be used to activate the different phases (normality, pre-alert, alert) and alert levels (green, yellow, red) of the plan. The elements exposed / at risk (people, crops and livestock) are the subjects to which the analysis refers to, and that must be taken into account when selecting the indicators to be monitored.
d. Early Action: establish the prevention and mitigation actions to be carried out when an alert phase or level is activated, to reduce the identified risks, such as the assistance required and the identification of possible limitations and gaps. This phase foresees planning assumptions at different levels, including general contextual assumptions, such as humanitarian consequences that could materialize based on the identified risks.
e. Standard operating procedures (SOPs): define the management and coordination arrangements necessary to promote and guide the implementation of the EWEA Plan on agricultural drought based on the agreed early alerts and actions. The SOPs define instructions, step by step, to help the institutions responsible for implementing the plan to achieve quality results efficiently. SOPs define what to do, when to do it, how to do it and who does it.

Step 3: Consolidation of the process and follow-up actions

The consolidation of the planning process, the carrying out of follow-up actions and the activation of the alerts included in the EWEA Plan on agricultural drought are activities that turn intentions into actions.

a. The inter-institutional team responsible for the implementation of the EWEA Plan on agricultural drought will meet periodically with the parties involved in the planning process to ensure full understanding and agreement with the content of the Plan.
b. The EWEA Plan on agricultural drought must be periodically updated, and the follow-up actions identified during the planning process must be undertaken. In each periodic update of the EWEA Plan on agricultural drought, any

changes (including in the institutional context) that may impact the plan and its implementation must be reviewed. The progress made in the implementation of preparatory actions planned for the implementation of the plan should also be evaluated.

c. Depending on the activation of the alerts, guidelines defined in the SOPs will be followed. With the increased probability that the identified risks will materialize, the EWEA Plan on agricultural drought will become an operational plan. Assumptions made during planning will be verified with an actual assessment of the situation, and the plan will be adjusted according to the updated context. EWEA Plan on agricultural drought planning should not be a theoretical exercise, but a planning process rooted in reality and made up of real elements of operational.

Annex 2. Historical agricultural drought probability map

Figure A2-1, shows by each district in Guatemala, the probability of experiencing drought affectation of more than 30 percent and 50 percent in the agricultural area impacted. The Dry Corridor and Pacific coastal zone districts show 15-20 percent probabilities of having more than 30 percent and 50 percent of maize and bean areas affected by drought, considering the 1984-2018 analysis period.

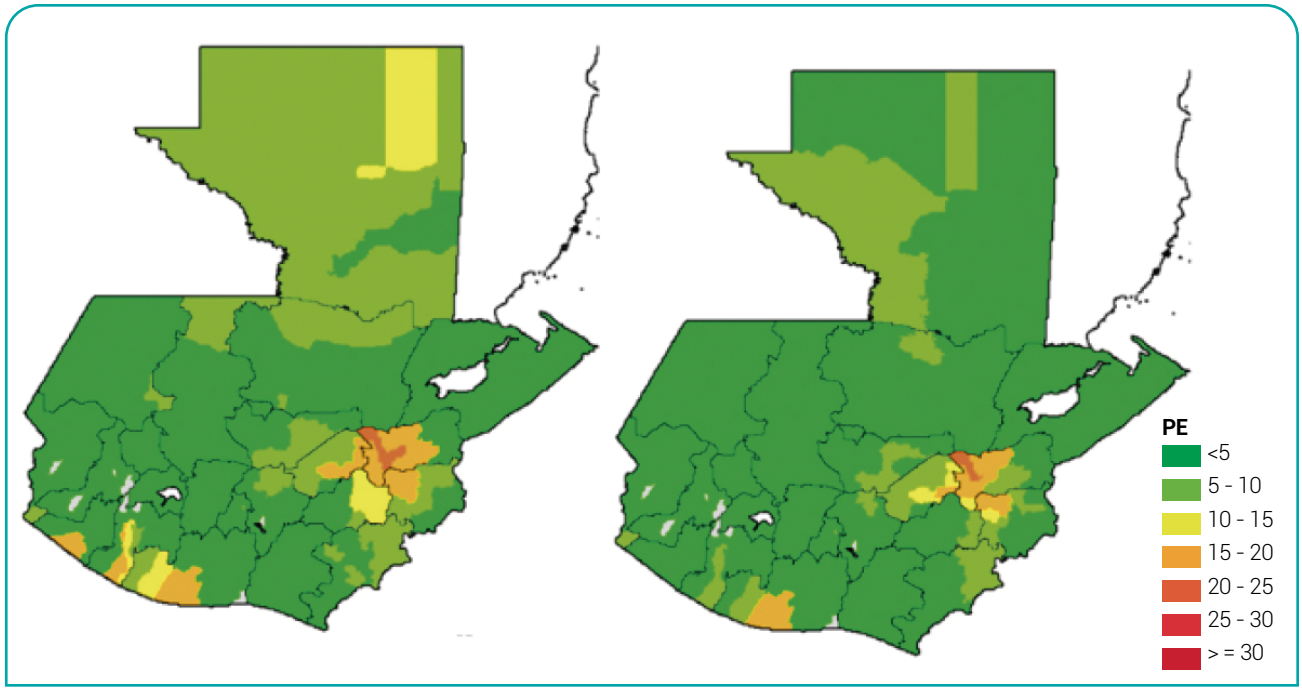


Figure A2-1

Probability of drought within the maize and bean areas at the district level for more than 30 percent and 50 percent of affected area.

Annex 3. Seasonal crop calendar for staple grains

Primera sowing

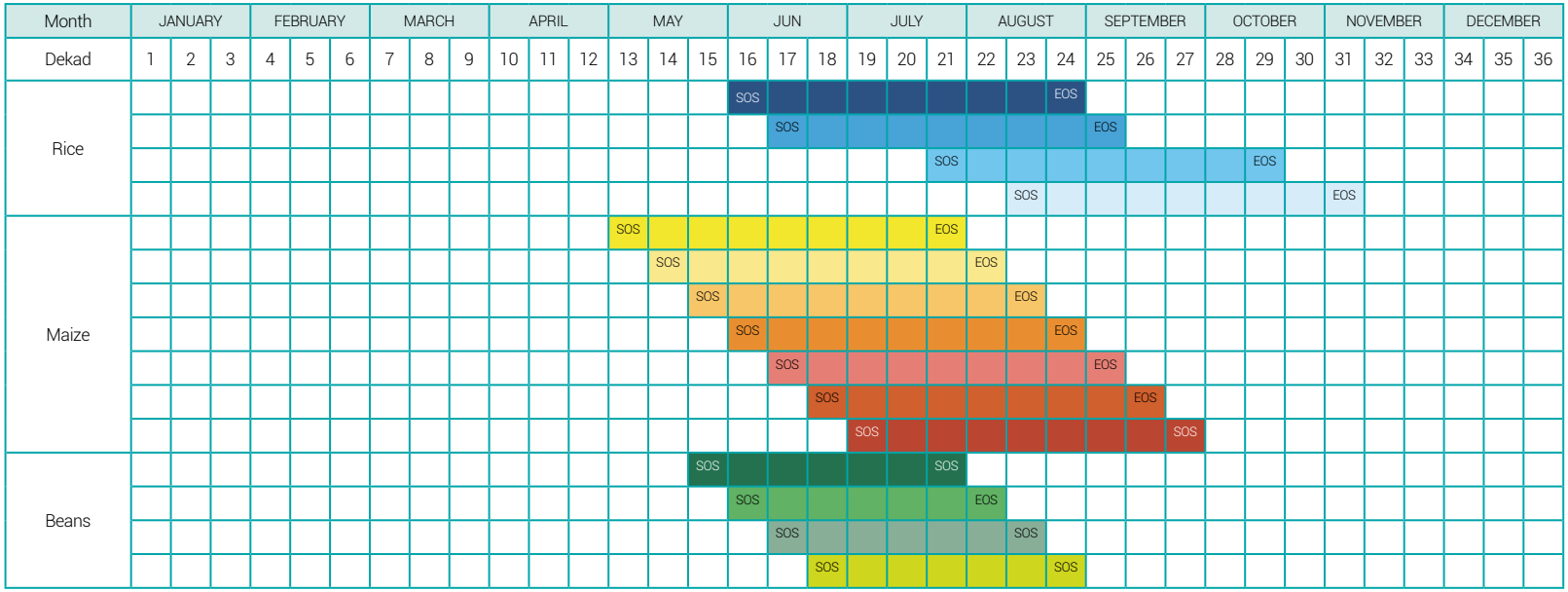
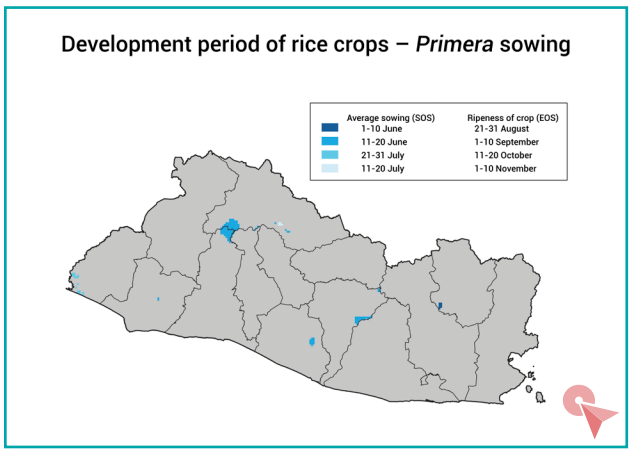
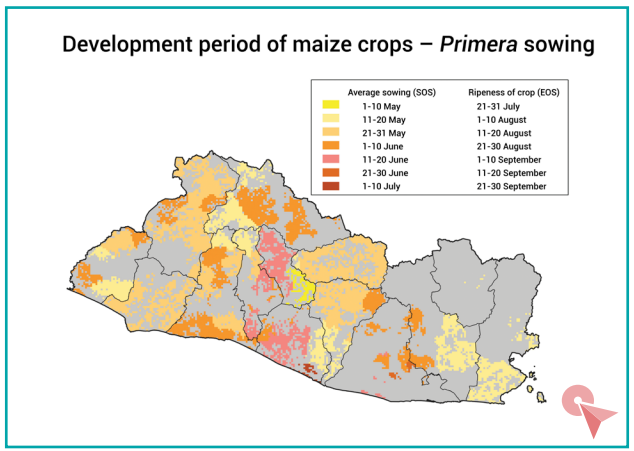
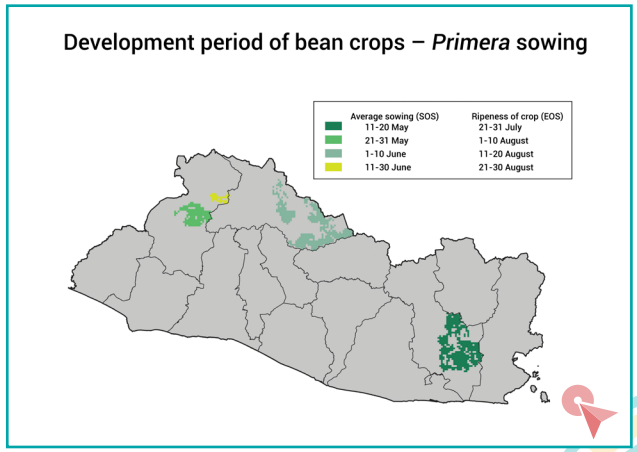


Figure A3-1

Crop calendar for staple grains planted at *Primera* season in El Salvador. Maps according to United Nations, 2020.







Postrera sowing

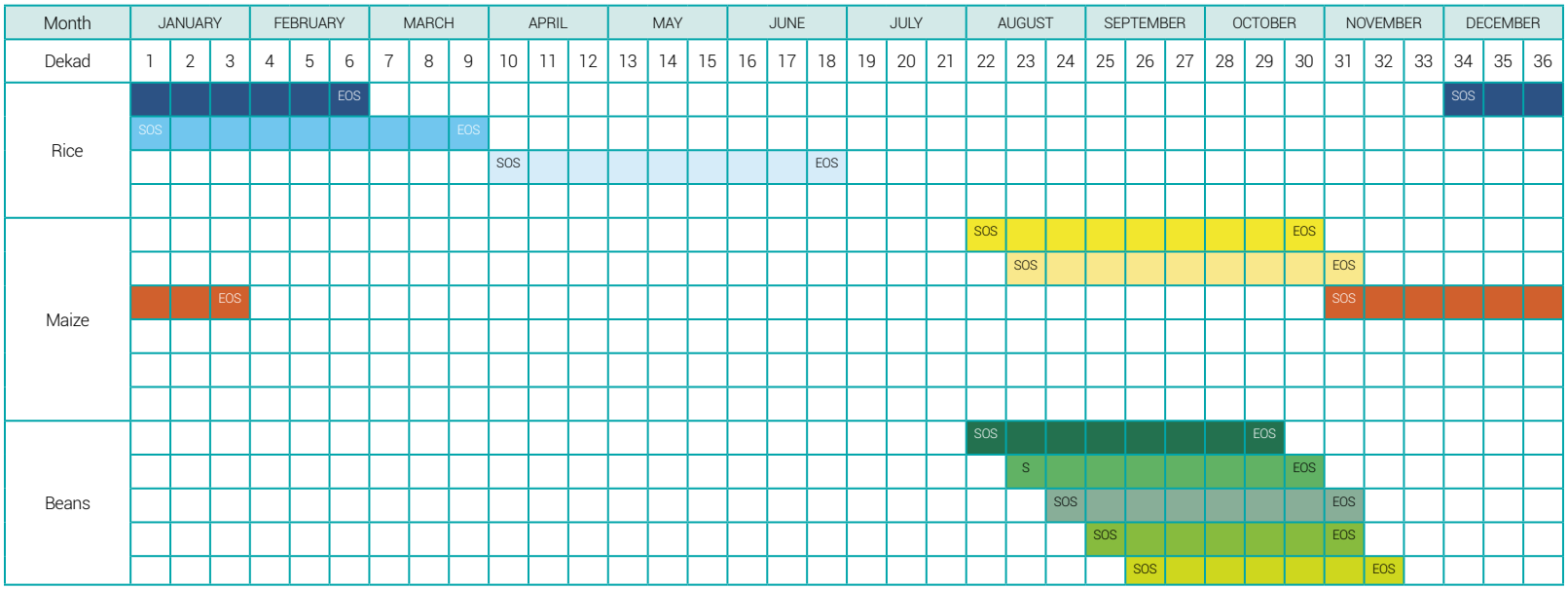
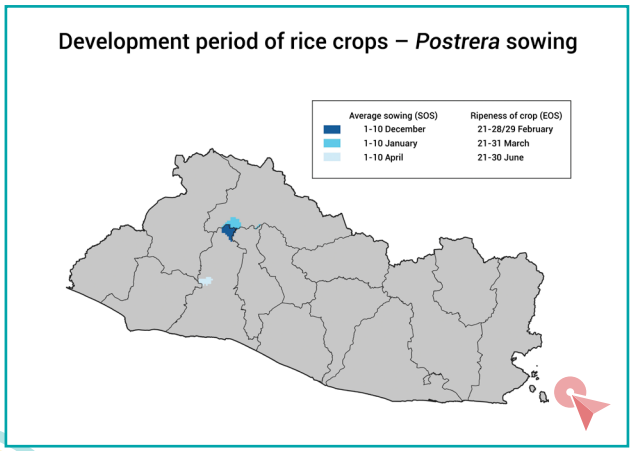
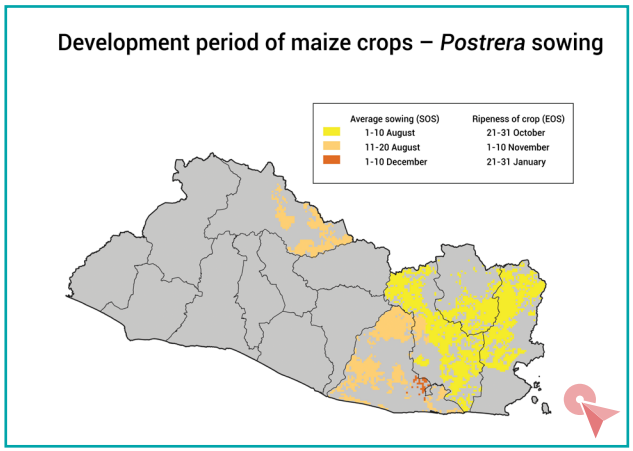
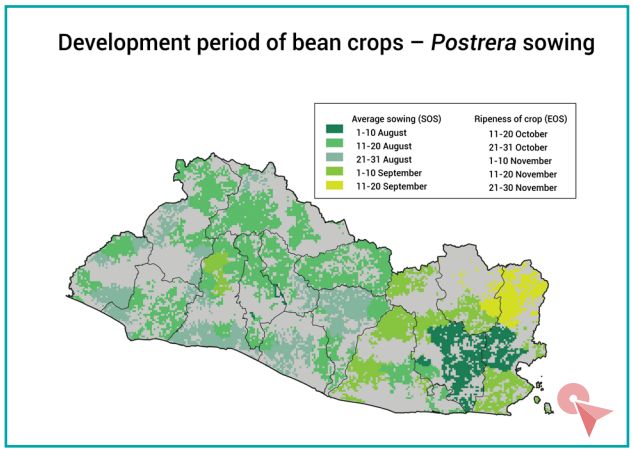


Figure A3-2

Crop calendar for basic grains planted in *Postrera* season in El Salvador. Maps according to United Nations, 2020.







Annex 4. Information on food prices and market situation

Food prices and the market situation are part of the information to be considered when activating early warnings aimed at avoiding or limiting the deterioration of the AFI and livelihoods. For countries that use the IPC-AFI defined thresholds for the activation of the three alert levels of the EWEA Plan on agricultural drought (paragraph 3.5.2), this information is already included in the protocols used for this type of analysis.

Such information may also be useful to inform on the selection of early actions (e.g. execution modality: design of "cash" versus "in-kind" programs).

FAO, in the framework of the Global Information and Alert System (GIEWS), monitors and analyses food prices through the SMIA FPMA Tool and publishes a monthly bulletin on the behaviour of food prices at the global, regional and national levels, focusing on developing countries

The Regional System of Intelligence and Monitoring of Agricultural Markets (SIMMAGRO) is one of the tools of the SICA Regional Market Information Network, which is a regionally organized body, made up of the Agricultural Market Information Systems (AMIS) of Belize, Guatemala, El Salvador, Honduras, Costa Rica, Panama, and the Dominican Republic. SIMMAGRO includes daily information on wholesale prices, trade, and production information on the 40 most widely traded products in the region.

At the country level, the sources of information that can be useful for monitoring food prices and the situation of the markets in the countries of the SICA region are reported below.

Belize

- Production
  Ministry of Agriculture
- Agrometeorological information
  National Meteorological Services
- Others
  Institute of Statistics
  Institute of Statistics (II)
  Central Bank

Costa Rica

- Production
  INFOAGRO
- Agrometeorological information
  National Meteorological Services
- Private Sector
  Conarroz
- Others
  Institute of Statistics
  Central Bank

El Salvador

- Production
  Yearbooks of agricultural statistics
- Prices
  Monthly report of prices of agricultural products
  Weekly report of prices of agricultural products
- Agrometeorological information
  Agrometeorological bulletins
  Drought monitoring

- Macroeconomic information and consumer price index (inflation)
  General Directorate of Statistics and Censuses
  Central Bank

Guatemala

- Production
  MAGA - Documents for open data
  Dekad Crop Monitoring System
- Agrometeorological information
  INSIVUMEH - Agroclimatic bulletins
- Others
  Institute of Statistics
  Banco Central

Honduras

- Prices
  INFOAGRO – Agricultural prices
- Macroeconomic information and Monthly Index of Economic Activity
  Monthly economic activity index (MEAI)
- Agrometeorological information
  Agrometeorology
- Others
  National Institute of Statistics
  Central Bank

Nicaragua

- Production
  Ministry of Agriculture
- Agrometeorological information
  INETER
  SINAPRED
- Private Sector
  Bolsagro
  APEN
- Others
  Institute of Statistics
  Central Bank. (Inflation and energy prices for irrigation and water)

Panama

- Production
  Ministry of Agricultural Development
- Agrometeorological information
  ETESA
- Others
  Institute of Statistics
  Central Bank

Dominican Republic

- Production
  Ministry of Agriculture
- Agrometeorological information
  ONAMET
- Others
  National Office of Statistics
  Central Bank
  Institute of Price Stabilization

Annex 5. Climate perspective, El Niño forecast, the Agricultural Drought Monitoring and Early Warning System (ASIS)

Climate perspective

The climatic perspective is prepared by the Regional Committee of Water Resources (CRRH) with the participation of the meteorological institutes of Central America. The climate perspective is available on the CRRH Website https://recursoshidricos.org/

Technical forums are held in April, July and December of each year, to analyse the following information:

- Forecasts of the surface temperatures of the Equatorial Pacific and Tropical Atlantic oceans.
- The recorded values of the ocean-atmospheric indexes of the ENSO (El Niño Southern Oscillation) phenomenon N3.4, N3, ONI, MEI, IOS; sea temperatures in the North Tropical Atlantic (ATN) and the Caribbean Sea (CAR); the Atlantic Multidecadal Oscillation (AMO), atmospheric pressures, trade winds, vertical wind shear and dust levels in the Sahara.
- Seasonal climate predictions derived from global (WMO climate centres) and regional (WRF) dynamic models.
- Historical rainfall records in analogous years for the forecast period provided by the Central American Climate Database (BDCAC) and data provided by national meteorological services.
- The canonical correlation analysis prepared through the climate prediction tool (CPT) of the International Institute for Research on Climate and Society (IRI).
- Seasonal predictions of the tropical cyclone season for the Atlantic and Eastern Pacific basin.
- The expert judgment of professionals in meteorology and climatology that make up the working group of the Climate Forum of Central America

From the analysis of this information, a technical consensus is obtained that is reflected in the following maps indicating the accumulated rainfall probabilities for the months of December to March, May to June, and August to October. Figure A5-1 shows the results of the 3 annual forums.

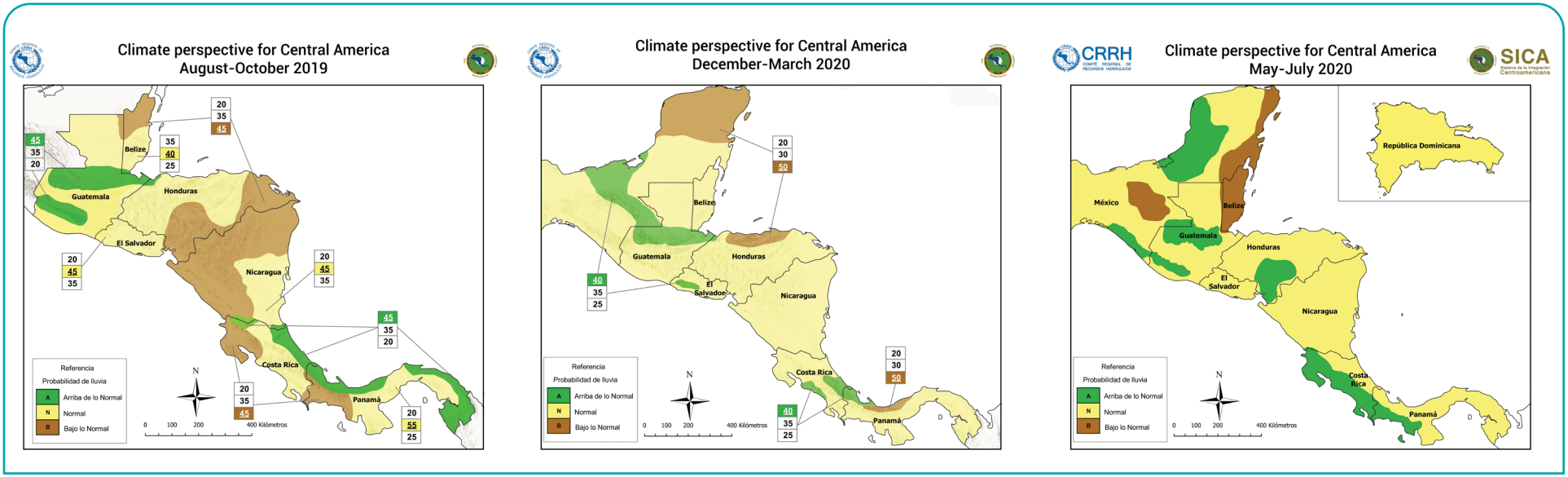


Figure A5-1

Climate perspective for the periods August-October 2019, December-March 2020, and May-July 2020. Probability that the accumulated rain in the respective periods is in the low range of normal (b), in the normal range (n), or in the range above normal. Areas with similar prospects for accumulated rainfall to fall within each of these ranges are identified with colors on the map. For early warning purposes in relation to crops and pastures, the climatic perspective corresponding to the period May-July and August-October will be used, periods that cover the sowing of staple grains of Primera and Postrera. Maps according to United Nations, 2020.

El Niño Forecast

The International Institute for Climate Research and Society of Columbia University (IRI) has established itself as the global benchmark in terms of the probability of occurrence of the El Niño phenomenon. This source is endorsed by the World Meteorological Organization (WMO). IRI analyses the results of various international models and publishes a monthly update of results (figure A5-2). This joint analysis of dynamic and statistical models has been called the "plume of forecasts". The probabilities are assigned according to the possibility of occurrence of a La Niña, Neutral or El Niño event. (figure A5-3).

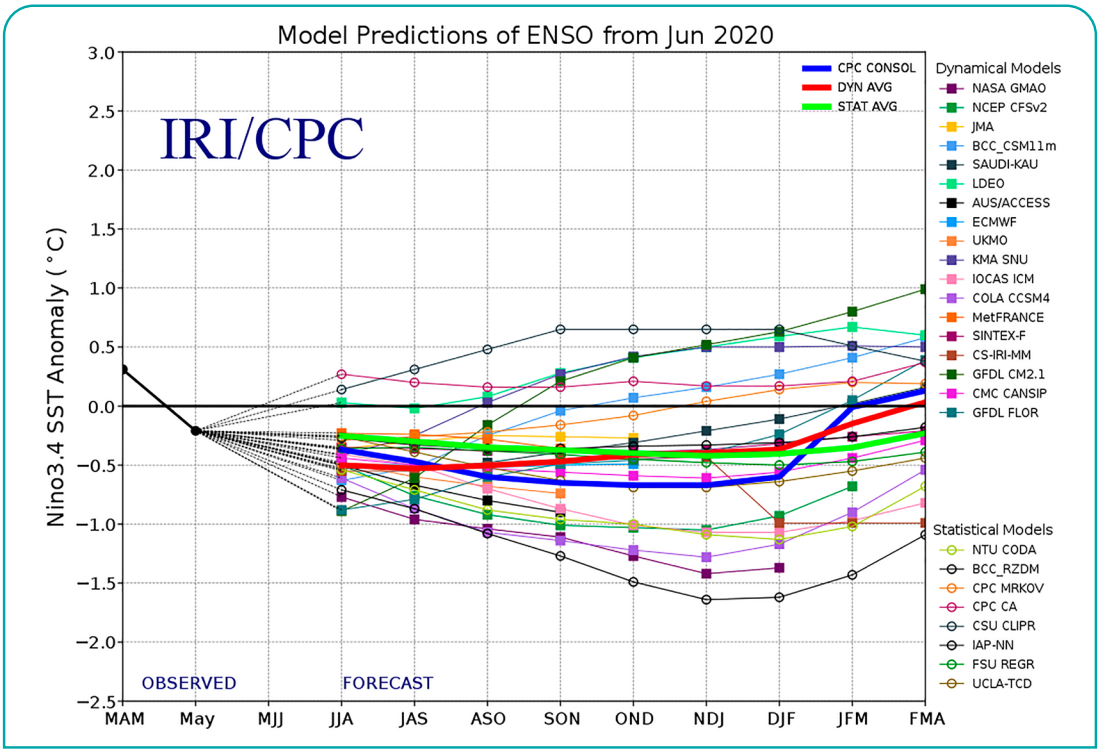


Figure A5-2

Plume of forecasts models based on the surface temperature anomalies of the Niño 3.4 region. It includes dynamic and statistical models updated in the middle of each month. Based on this analysis, IRI assigns the probability of occurrence of a La Niña, neutral or El Niño event. The blue line on the graph represents the average of all forecasts. Source: IRI, https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Season	La Niña	Neutral	El Niño
FMA 2020	0%	61%	39%
MAM 2020	0%	70%	30%
AMJ 2020	1%	75%	24%
MJJ 2020	10%	66%	24%
JJA 2020	19%	57%	24%
JAS 2020	28%	52%	20%
ASO 2020	35%	44%	21%
SON 2020	37%	39%	24%
OND 2020	34%	36%	30%

Figure A5-3

Probability assigned to each event of: La Niña, Neutral or El Niño per quarter with monthly update. Source: IRI, https://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Agricultural Drought Monitoring and Early Warning System (ASIS)

The Food and Agriculture Organization of the United Nations (FAO) developed the Agricultural Drought Monitoring and Early Warning System (ASIS), which utilises information measured by satellite to detect areas with crops and grasses showing a high probability of suffering water stress (dry periods and drought). The system simulates the analysis of the applied satellite images to detect problems in agriculture and simplifies the results in maps that are easy to interpret for users who are not experts in remote sensing.

The system proposes several indices to asses the vegetation condition, but to detonate the early action the use of two is recommended: the Vegetation Health Index (VHI) and the categories of agricultural drought (extreme, severe, moderate, and mild). Figure A5-4 shows the spatial mean values by municipality in Nicaragua. In April, before planting crops in the first season (primera), several municipalities can be seen with stressed vegetation due to lack of water (category in yellow). For these municipalities, it was urgent to detonate early actions to avoid the potential reduction in yields in annual crops. The year 2014/2015 was under the influence of El Niño. In August, the municipalities of Nicaragua (orange and red) with losses in staple grains are displayed.

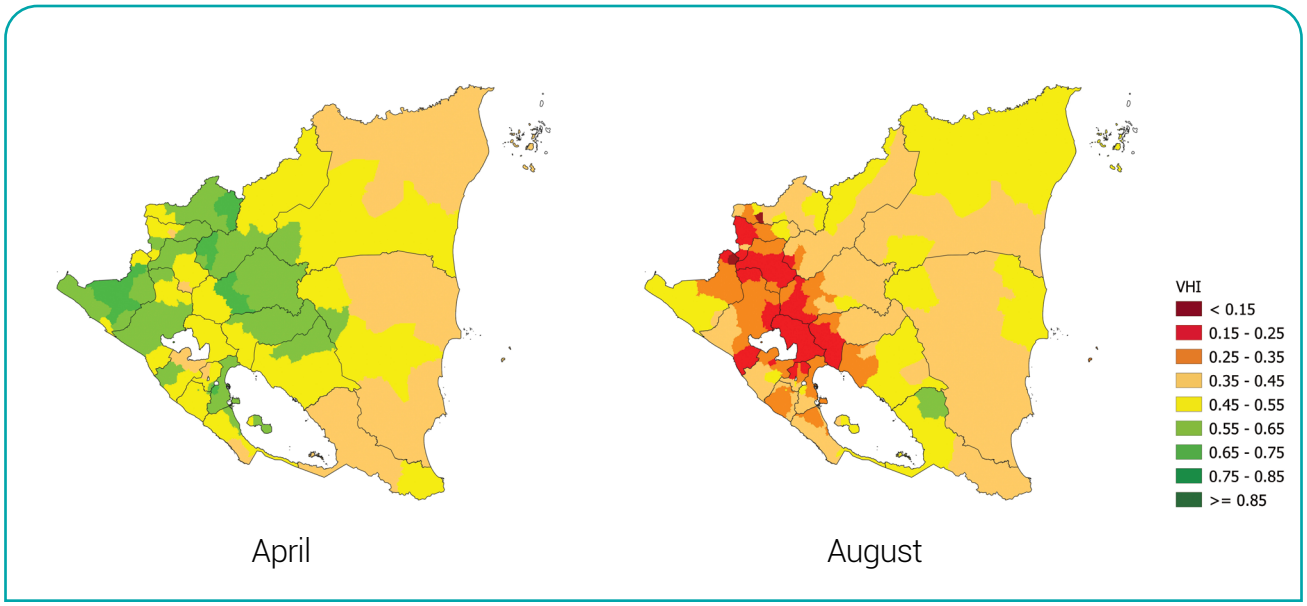


Figure A5-4

Vegetation Health Index (VHI) during the last dekad of April (before planting annual crops) and the first dekad of August 2014, in Nicaragua. VHI values between 0.45 and 0.55 (in yellow) represent vegetation stressed before planting crops, which could trigger early actions. In August, at the end of the Primera sowings, the VHI values below 0.35 are interpreted as the total loss of the crops in the field (in orange and red). Maps according to United Nations, 2020.

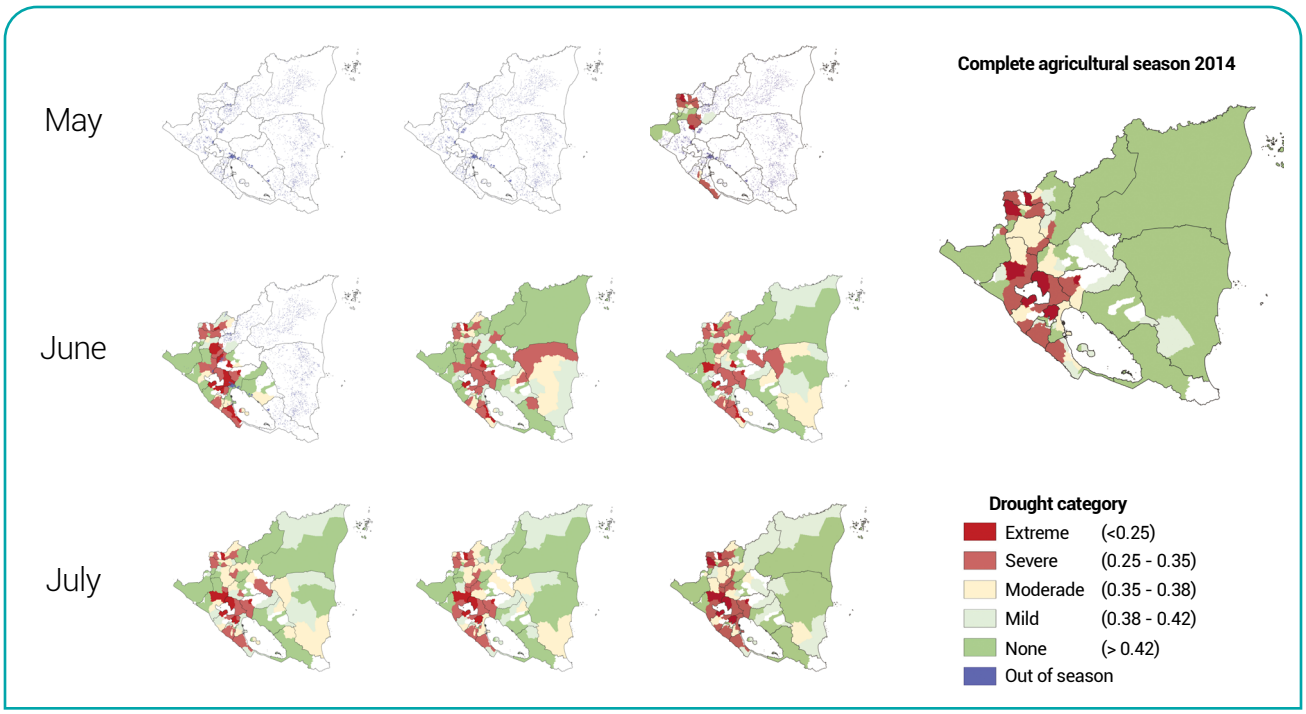


Figure A5-5

Agricultural drought categories during the first crop season of 2014 in Nicaragua. Mild to extreme categories will trigger early action activities to mitigate the impact of the drought on the staple crops area of the country. Maps according to United Nations, 2020.

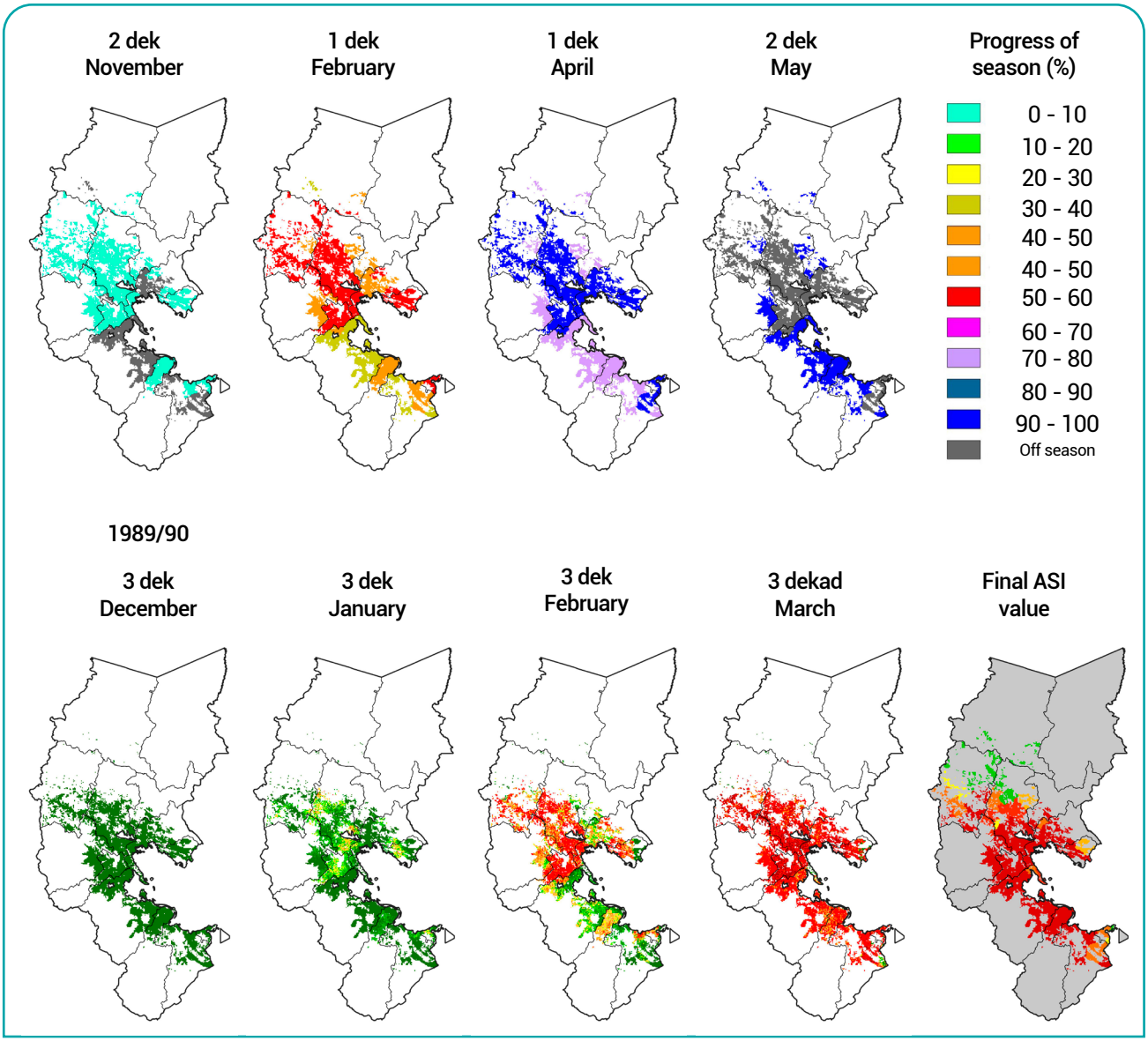
In figure A5-5, it can be seen how from the beginning of planting, there was a lack of water for the development of annual crops (corn and beans). Normally, the categories of severe and extreme, at the beginning of plantings should be interpreted as a delay in the planting season due to the late start of the rains. However, in 2014, the drought had its impact from the beginning of the crop cycle. Early actions, such as the construction of small reservoirs for water harvesting accompanied by cultural practices such as soil cover to reduce evapotranspiration, staggered planting, replacement of corn by local varieties such as sorghum, among others, could have mitigated the effects of the drought.

Probability forecast for agricultural drought

ASIS, using a machine learning approach, can perform a probabilistic drought forecast at pixel level. The drought forecast would provide more time to the decision makers for implementing early actions to mitigate the drought in agriculture. Different options provided by ASIS were tested to calculate the probabilistic forecast and the best result was obtained using as a minimum threshold on wVHI= 0.35 and percentage of bad years=15.

Figure A5-6 shows the drought forecast in Puno, Peru for the agricultural areas of fodder-oats. Fodder-oats are planted mainly

in November with some areas planted in December. Harvesting time is in April and for the late planting in May. We selected three examples of drought intensity, first an extreme drought occurred in 1990, a 2007's moderate drought that affected central and southern part of the province and finally, 2014 crop season that developed under very good conditions for fodder-oats. It is noticed that drought forecast application in ASIS performs well from 3rd dekad of February; providing more than 2 months in advance for decision makers to implement early actions to mitigate the drought impacts in agriculture.



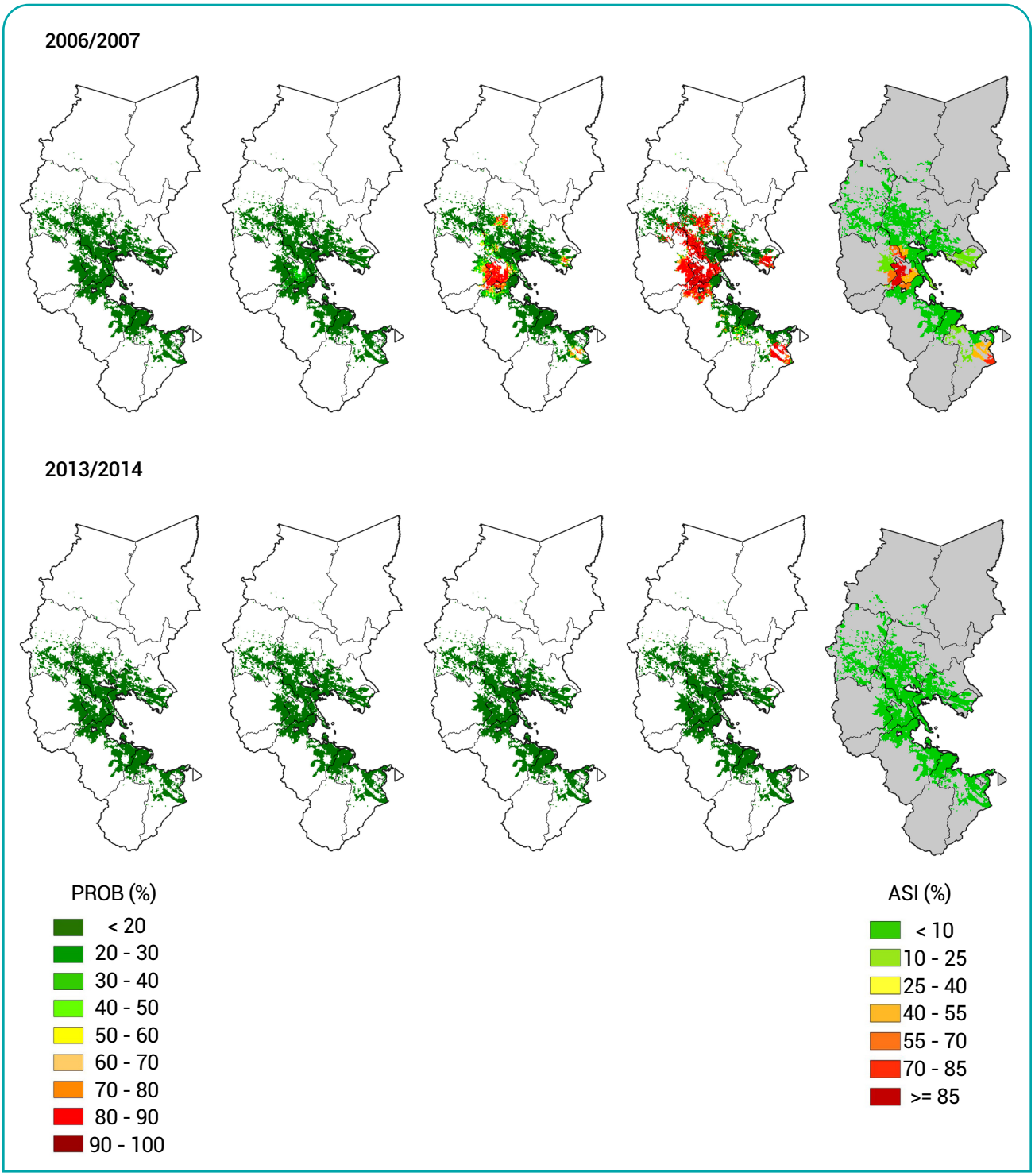


Figure A5-6

Top: Progress of season of fodder-oats, starting in November and finishing in May. Bottom: Extreme drought in 1989/90, moderate drought in 2006/07 and good crop season in 2013/14. The drought forecast has a good accuracy from 3rd dekad of February; providing two and half month in advance to implement drought mitigation activities. Maps according to United Nations, 2020.

Annex 6. Early drought prevention and mitigation actions

Below are examples of early actions to prevent and mitigate drought in crops, livestock, aquaculture, forestry, and people's food and nutrition security.

Crops		
Protection of crops	**Seed safety**	**Water resources management**
▪ Dissemination of information on planting season. ▪ Staggered planting. ▪ Training and distribution of supplies and materials for post-harvest handling.	▪ Increased availability and access to seed of different varieties and crops in markets to increase flexibility in response. ▪ Distribution of resistant and/or short-cycle varieties that have the acceptance of the producers. ▪ Strengthen storage and post-harvest handling capacities.	▪ Training in the construction of water collection and harvesting systems for agriculture. ▪ Distribution of supplies and materials for water collection systems. ▪ Implementation and/or rehabilitation of mini-irrigation systems.

Livestock		
Livestock management	**Animal health**	**Grass, fodder and water provision**
▪ Reduction in the number of cattle/sale of livestock (e.g. transport subsidies and loans to merchants). ▪ Livestock reduction due to on-site slaughter for feeding programs. ▪ Selective breeding of strategic herd (e.g. young reproductive females). ▪ Assisted or negotiated transhumance.	▪ Support of veterinary functions in the public sector. ▪ Vaccination and parasite control campaigns. ▪ Increase of animal health monitoring systems.	▪ Rehabilitation of drinking fountains. ▪ Establishment of surface water collection and storage systems. ▪ Provision of concentrates or multi-nutritional blocks.

Aquaculture		
Integration of water collection systems (rainy season)	**Aquaculture health**	**Strengthening infrastructure to maintain water quality**
▪ Use of the infrastructure generated to collect water for productive diversification through aquaculture (rainy season). ▪ Use of water and land deposited at the bottom of aquaculture ponds for irrigation and fertilization of agricultural crops. ▪ Use of dams-cattle troughs, for fish farming.	▪ Strengthening of veterinary services in control and surveillance. ▪ Strengthening of veterinary and co-management systems for early detection of diseases. ▪ Use of kits for rapid detection of diseases. ▪ Prevention with adequate food, density and water quality. ▪ Prevention, using low densities of fish and natural feeding.	▪ Modification of aquaculture ponds and production systems (small, medium to large or community producers): ▪ Production insurance against drought. ▪ Community production systems in dams with evaluated carrying capacity.

Forestry
▪ Awareness campaigns. ▪ Fire prevention systems and establishment of corridors in forested areas. ▪ Increased fire surveillance. ▪ Strengthening capacities in fire control. ▪ Maintenance of evacuation routes. ▪ Controlled grazing to eliminate weeds and vegetation that could prompt the spread of fire.

People AFI
▪ Conditional or unconditional cash transfers, possibly through established mechanisms for social protection. ▪ Establish strategies for food for work or cash. ▪ Food distribution or redeemable coupons. ▪ Request for funds from governments and donors for early action.

Annex 7. Description of phases and alert levels for crops and pastures

This Annex presents the description of phases and alerts for crops and pastures

	Description
Normality Phase	Climate forecasts do not foresee a drought and ASIS monitoring confirms that natural vegetation is developing normally, prior to planting crops. In this phase, the inter-institutional committee concentrates on monitoring the indicators and on the production, analysis, validation and socialization of the information. It may happen that the forecasts do not foresee drought, but it will occur in certain areas affected by drought in some crops. In this case, the trigger for the activation of the territorial plans will be based only on the results of the agricultural drought monitoring system (ASIS). For example, in Central America there is a risk of an accentuation of the phenomenon known as "canicula", which is a reduction in rainfall during July and August. In years where the heat wave intensifies, flowering and grain filling can be seriously affected. A seasonal weather forecast is unlikely to anticipate an intensification of the heat wave before planting of crops begins.
Pre-alert Phase	The El Niño forecast and the climate outlook (May-July) indicate that conditions exist for a drought to occur. The agricultural drought monitoring system (ASIS) detects abnormally stressed vegetation (negative VHI anomaly), prior to planting the crops. In this phase, farmers are advised to prepare for a dry scenario during the growing cycle. In addition, this message must be complemented with the implementation of early actions "without regret", that is, early actions that need more time to carry out and could be financed to reduce the existing risk, even if the alerts have not been activated. The drought monitoring and coordination dynamics established in the normal phase must continue. Additionally, preparatory measures are carried out for early action in alert situations.
Phases of Alert	
Green Alert	In this phase, water stress begins to be noticed in specific areas. Monitoring and validation actions will be focused and a communication campaign will be implemented to prevent and mitigate the impact of agricultural drought on livelihoods and FNS, promoting the adoption of good practices at local level. A mapping of local institutional and non-governmental actors working on prevention and mitigation actions will be carried out.
Yellow Alert	In this phase, water stress has spread to a more significant percentage of arable areas. In a coordinated manner, prevention and mitigation actions are concentrated and intensified towards the affected areas. Considering that the affectations could exceed the response capacities at the local level, conditions are set to carry out early actions from the central level.
Red Alert	In this phase, water stress affects a considerable percentage of arable areas, which will result in significant crop losses. Emergency response activities should be prepared.

Annex 8. Standard operating procedures (SOP)

SOP, escalating of phases and defining alerts for agriculture (example)

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
	Objetive ▪ Establish specific procedures to activate the different phases of the EWEA Plan on agricultural drought as well as the definition of alert levels					
Forecast and monitoring	1	Regional climatic perspectives.	▪ Meteorological Service ▪ CRRH ▪ IRI	▪ Agricultural sector.	Valid for three months, distributed in April, September and December of each year	Distributed in the country by the national meteorological service or by the CRRH (e.g. Climate Outlook).
Forecast and monitoring	2	El Niño forecast.	▪ Meteorological Service (considering the IRI forecast in its analysis)[15]. ▪ United Nations World Meteorological Organization (WMO).	▪ Agricultural sector.	Every month.	Study of the most vulnerable agricultural areas during an El Niño event (e.g. ENSO Discussion on diagnosis coordinated by NOAA).
Forecast and monitoring	3	▪ Monitor agricultural drought through the Agricultural Drought Monitoring and Early Warning System (ASIS-Country).	▪ Entity in charge of administering ASIS (e.g. Meteorological Service). ▪ Ministry of Agriculture, or Ministry of Environment.	▪ Agricultural sector.	Every 10 days.	Agricultural drought monitoring and Early Warning System (ASIS-Country).

[15] IRI: International Research Institute for Climate and Society

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Activation and dissemination of alerts	4	▪ When the forecast indicates El Niño development probabilities greater than 55%, and the regional climate outlook indicates accumulated probabilities of rain in the low-normal range (B), the pre-alert phase must be activated.	▪ Interinstitutional committee.	▪ Agroclimatic technical tables (MTA). ▪ Departmental government. ▪ Municipal government-FNS system.	Once the regional climate perspective indicates accumulated probabilities of rain in the below normal range (B) and/or the El Niño forecast, probabilities of occurrence> 55% Every four months (current and projected IPC analysis).	Defined by country (ex. Climate perspective -CRRH).
Forecast and monitoring	5	▪ Generate descriptive maps and reports on agricultural drought at the national, departmental and municipal levels based on ASIS that will be shared with the institutions of the Agricultural Sector for their interpretation and validation. The index maps will be automatically generated through the ASIS national page.	▪ Meteorological service or Ministry of Agriculture.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system.	Every 10 days	Agricultural drought monitoring and Early Warning System (ASIS-Country).

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Forecast and monitoring	6	▪ Divulgation of the maps and descriptive reports, departmental and municipal, with the agricultural extension agents for their validation.	▪ Agricultural sector.	▪ FNS system. ▪ Governing body of the IDRM system. ▪ Meteorological service. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	Every 10 days.	Validation can be done with field visits by extension agents or using drones (defined by the country).
Forecast and monitoring	7	▪ Validate the information with local actors (including individual and organized producers).	▪ Agricultural sector.	▪ Governing body of the IDRM system. ▪ Meteorological service. ▪ MTA. ▪ Departmental government ▪ Municipal government.	Every month.	Defined by country.
Forecast and monitoring	8	▪ Study whether to increase or decrease the implementation phase of the EWEA Plan on agricultural drought, based on the previously established thresholds and feedback from the land.	▪ Inter-institutional committee.	▪ MTA. ▪ Departmental government. ▪ Municipal government.	Every month.	EWEA Plan on agricultural drought.
Forecast and monitoring	9	▪ Request analysis of damages and losses in areas affected by agricultural drought.	▪ Agricultural sector.	▪ FNS System. ▪ Governing body of the IBRM system. ▪ Meteorological service.	When ASIS-Country shows values of mild or moderate drought and after having validated the information in the field.	Defined by country.

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Activation and dissemination of alerts	10	▪ If the analysis of damages and losses is consistent with the category of mild drought, activate green alert	▪ Inter-institutional committee.	▪ MTA ▪ Departmental government ▪ Municipal government.	Once the loss and damage analysis has been received, quantifying the existence of a mild drought.	EWEA Plan on agricultural drought.
Activation and dissemination of alerts	11	▪ If the analysis of damages and losses is consistent with the category of moderate drought, activate yellow alert.	▪ Inter-institutional committee.	▪ MTA. ▪ Departmental government. ▪ Municipal government.	Once the loss and damage analysis has been received, quantifying the existence of a moderate drought.	EWEA Plan on agricultural drought.
Activation and dissemination of alerts	12	▪ If the analysis of damages and losses is consistent with the category of severe or extreme drought, activate red alert.	▪ Inter-institutional committee.	▪ MTA. ▪ Departmental government. ▪ Municipal government.	Once the loss and damage analysis has been received, quantifying the existence of a severe or extreme drought.	EWEA Plan on agricultural drought.

SOP for the Normality phase for agriculture (example)

	N	Actions	Responsible	Other actors	Time	Tools
Normality Phase						
SAT Component	**Indicators** ▪ **El Niño occurrence:** <55% ▪ **Regional Climate Forecast:** Accumulated precipitation in the Normal (N) or Above (A) range of normal ▪ **ASIS Category:** There is no evident drought prior to planting the crops					
	Main objectives: ▪ Carry out the monitoring and production of public information on drought based on climate perspectives and ASIS. ▪ Promote inter-institutional coordination between meteorological services, the agricultural sector, FNS systems, and IDRM. ▪ Activate the ASIS validation/calibration mechanisms. ▪ Perform IAA monitoring through IPC-AFI reports (current and projected).					
Risk awareness	1	▪ Have livelihood profiles of areas potentially affected by drought ready and updated.	▪ Inter-institutional committee.		Every year.	Defined by country.
Risk awareness	2	▪ Have the baseline (pre-disaster/crisis) updated, as well as relevant information for agriculture and FNS.	▪ Inter-institutional committee.		Every month.	Defined by country.
Forecast and monitoring	3	▪ National climatic perspective.	▪ Meteorological service.	▪ Agricultural sector. ▪ FNS System. ▪ Governing body of the IBRM system.	Valid for three months, distributed in April, September and December of each year.	Defined by the national meteorological service or the CRRH.
Forecast and monitoring	4	▪ El Niño Forecast.	▪ Meteorological service ▪ IRI. ▪ WMO.	▪ Agricultural sector. ▪ FNS System. ▪ Governing body of the IBRM system.	Updated every month.	Defined by country (e.g. ENSO Analysis Discussion -NOAA, IRI, WMO, Australian Meteorological Service).

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Forecast and monitoring	5	▪ Monitor agricultural drought through the agricultural drought monitoring and Early Warning System (ASIS-Country). ▪ Monitor the IPC-AFI thresholds.	▪ Meteorological service or Ministry of Agriculture. ▪ FNS Sector.	▪ Agricultural sector. ▪ Governing body of the IBRM system.	Every ten days, from the start of planting of Primera, for all crops of interest in the different planting cycles (*Primera, Postrera, Postrerón* and *Apante*). Current and projected IPC analysis.	Agricultural Drought Monitoring and Early Warning System (ASIS-Country). IPC-AFI.
Forecast and monitoring	6	▪ Generate descriptive maps and reports on agricultural drought at the national, departmental and municipal levels based on ASIS that will be shared with the institutions of the Agricultural Sector for their interpretation and validation. The index maps will be automatically generated through the ASIS national page.	▪ Meteorological service or Ministry of Agriculture	▪ Agricultural sector. ▪ FNS System. ▪ Governing body of the IBRM system.	Every ten days from the beginning of the First sowing; for all crops of interest in the different planting cycles (*First, Postrera, Postrerón* and *Apante*)	Defined by country.
Forecast and monitoring	7	▪ Divulgation of the maps and descriptive departmental and municipal reports among agricultural extensionists previously trained for their validation.	▪ Agricultural sector.	▪ FNS system. ▪ Governing body of the IDRM system. ▪ Meteorological Services.	Every ten days from the beginning of the First sowing; for all crops of interest in the different planting cycles (*Primera, Postrera, Postrerón* and *Apante*)	Defined by country.

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Forecast and monitoring	8	▪ Consolidate the inputs received from the institutions of the agricultural system and elaboration of an electronic bulletin containing information on climate forecasts and agricultural stress maps that will be published on the website of the meteorological services/Ministry of Agriculture.	▪ Meteorological service.	▪ Agricultural sector. ▪ FNS System. ▪ Governing body of the IBRM system.	At the beginning of each month.	Agrometeorological Bulletin, ASIS-Country, climate forecasts.
Forecast and monitoring	9	▪ Summon periodic meetings of the Inter-institutional Committee (made up of institutions from the agricultural sector and the national disaster management system) to validate and compare the information by dekad (every ten days) of ASIS-Country and of the agrometeorological and alert bulletins	▪ Meteorological service.	▪ Agricultural sector. ▪ FNS System. ▪ Governing body of the IBRM system.	Every fifteen days from the beginning of the First sowing.	▪ Agrometeorological Bulletin, ASIS-Country, climate forecasts.
Activation and dissemination of alerts	10	▪ Develop a communication strategy for effective dissemination of information at all levels (national, departmental, municipal, community, and households) taking into account the different phases (normality, pre-alert, alert) and alert levels (green, yellow, red).	▪ Inter-institutional committee.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IBRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	From the activation of the pre-alert phase.	Defined by country.

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Activation and dissemination of alerts	11	▪ Disseminate the newsletters by email through the institutional distribution lists or through the ASIS-country website.	▪ Meteorological service.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IBRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	Every 10 days, drought category maps, and every month an agricultural situation analysis bulletin.	Defined by country.
Early action or response	12	▪ Carry out a mapping of donors that finance early action projects related to agricultural drought.	▪ Agricultural sector.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IBRM system. ▪ MTA.	From the activation of the yellow alert phase.	Defined by country.
Early action or response	13	▪ Carry out a mapping of institutional actors and others (NGOs, companies, research centres) that work in agriculture and promote climate-adapted sustainable agricultural practices and the reduction of drought risk.	▪ Inter-institutional committee.	▪ Departmental government. ▪ Municipal government.	From the activation of the green alert phase.	Defined by country.
Early action or response	14	▪ Prepare inventories and technical specifications of goods in case of drought (i.e. seed stocks, infrastructure for water harvesting, infrastructure/post-harvest inputs).	▪ Agricultural sector.	▪ Governing body of the IBRM system. ▪ Departmental government. ▪ Municipal government.	From the activation of the pre-alert phase.	Defined by country.

SOP for the PRE-ALERT Phase (example)

	N	Actions	Responsible	Other actors	Time	Tools
Pre-Alert Phase						
SAT Component	**Indicators** ▪ **El Niño Occurrence:** >55% ▪ **Regional Climate Forecast:** Accumulated precipitation in Below range (B) normal ▪ **ASIS Category:** There is no drought in crops. Stressed vegetation before planting of crops (VHI below normal)					
	Main Objectives: ▪ Activate technical, administrative, logistical and communication personnel based on early actions for the preparation, prevention and mitigation of agricultural drought					
Forecast and monitoring	1	▪ Maintain all the actions for monitoring, analysis, validation and dissemination of the information on agricultural drought and IAA mentioned in the normal phase.	▪ Inter-institutional committee.		From the activation of the pre-alert phase.	
Forecast and monitoring	2	▪ Strengthen the capacities of extension technicians to interpret the ASIS-Country maps.	▪ Agricultural sector.	FNS system, governing body of the IDRM system, meteorological service.	From the activation of the pre-alert phase.	Defined by country.
Forecast and monitoring	3	▪ Develop vegetation index maps to assess the impact of drought on agriculture. From the middle of the crop cycle, use the probabilistic forecast generated by ASIS on the potential impact of drought at the end of the agricultural season.	▪ Meteorological Service. ▪ Ministry of Agriculture.		Every ten days from the middle to the end of the cycle for each crop of interest in the different sowing cycles planned.	Agricultural drought monitoring and Early Warning System (ASIS-Country).

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Activation and dissemination of alerts	4	▪ Implement the communication strategy for the effective dissemination of the information foreseen in the pre-alert phase for each level (national, departmental, municipal, community, and households). ▪ Ex. (I) Radio dissemination of key messages to farmers and households; (ii) Inclusion of measures to prevent and mitigate agricultural drought in electronic bulletins.	▪ Inter-institutional committee.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	From the activation of the Pre-Alert Phase.	▪ Defined by country (e.g. (I) Communication, radio; (ii) Agrometeorological bulletin.
Early action or response	5	▪ Review the action plans of the programs and projects in the medium and long term. Promote sustainable agriculture practices adapted to the climate and reduction of the risk of drought, in the areas that are more likely to suffer crop damage. ▪ Promote "no-regret measures" projects, that is, early action projects that need more time to implement and could be financed to reduce the existing risk, even if alerts have not been activated (e.g. rehabilitation of water collection structures, animal vaccination campaigns, etc.).	▪ Agricultural sector	▪ Institutional programs and projects and NGOs that implement agricultural drought prevention and mitigation actions.	▪ From the activation of the Pre-Alert Phase.	▪ Defined by country (e.g. Annex 7).

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Early action or response	6	▪ Update mapping of donors that finance early action projects related to agricultural drought. ▪ Initiate contact with donors who finance "no-regret measures" projects.	▪ Agricultural sector.	▪ Institutions of the agricultural sector and NGOs that implement actions for the prevention and mitigation of agricultural drought.	From the activation of the Yellow Alert Phase.	Defined by country.
Early action or response	7	▪ Update the mapping of institutional actors and others (NGOs, companies, research centres) that work in agriculture and promote sustainable agriculture practices adapted to the climate and reduction of the risk of drought..	▪ Inter-institutional committee.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system. ▪ MTA. Departmental government. ▪ Municipal government.	From the activation of the Green Alert phase.	Defined by country.
Early action or response	8	▪ Update inventories and technical specifications of goods in case of drought (i.e. seed stocks, infrastructure for water harvesting, infrastructure/post-harvest inputs).	▪ Agricultural sector.	▪ Governing body of the IDRM system. ▪ Departmental government. ▪ Municipal government.	From the activation of the Pre-Alert Phase.	Defined by country.
Early action or response	9	▪ Review procurement procedures and update supplier lists.	▪ Agricultural sector.	▪ Governing body of the IDRM system. ▪ Departmental government. ▪ Municipal government.	From the activation of the Pre-Alert Phase.	Defined by country.

SOP for the Alert Phase (example)

	N	Actions	Responsible	Other actors	Time	Tools
Green alert phase						
SAT Component	**Indicators** **ASIS Category:** Mild Drought ▪ **ENSO:** The presence of El Niño is confirmed. Existing coupling between the ocean and the atmosphere. ▪ **Climate Forecast:** Accumulated precipitation in the Below range (B) of normal ▪ **IPC-AFI Category:** Projected situation in phase 1 (minimum / none)					
	Main Objectives: ▪ Encourage and support early actions to prevent and mitigate AFI and agricultural drought in areas of mild impact					
Forecast and monitoring	1	▪ Focus the actions of monitoring, analysis and validation of the information on agricultural drought and AFI within the areas that show affectations. Use the historical probability of the most susceptible areas to drought calculated by ASIS-Country.	▪ Inter-institutional committee.		For the entire duration of the green alert phase.	Defined by country (e.g. ASIS-Country and IPC-AFI).
Activation and dissemination of alerts	2	▪ Implement the communication strategy for the effective dissemination of the information foreseen for the green alert phase at each level (national, departmental, municipal, community, and households) with an emphasis on the affected areas that show signs of mild affectation.	▪ Inter-institutional committee	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	From the activation of the Green Alert Phase.	Defined by country.

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Early action or response	3	▪ Encourage and support early actions to prevent and mitigate AFI and agricultural drought in areas with mild impact.	▪ Agricultural sector. ▪ FNS sector.	▪ Institutional programs and projects, as well as NGOs that implement agricultural drought prevention and mitigation actions.	From the activation of the Green Alert Phase.	Defined by country (e.g. Annex 7).
Early action or response	4	▪ Contact donors and develop project proposals to be able to act before the agricultural drought causes damages and losses in agriculture and affects food security.	▪ Agricultural sector. ▪ FNS sector.	▪ Institutions of the agricultural sector and NGOs that implement actions for the prevention and mitigation of agricultural drought.	From the activation of the Green Alert Phase.	Defined by country.
Early action or response	5	▪ Keep updated the mapping of institutional actors and others (NGOs, companies, research centres) that work in agriculture and promote sustainable agriculture practices adapted to the climate and reduction of drought risk.	▪ Inter-institutional committee	▪ Agricultural sector ▪ FNS system. ▪ Governing body of the IDRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	From the activation of the Green Alert Phase.	Defined by country.
Early action or response	6	▪ Keep updated inventories and technical specifications of goods in case of agricultural drought.	▪ Agricultural sector.	▪ Governing body of the IDRM system. ▪ Departmental government. ▪ Municipal government.	From the activation of the Green Alert Phase.	Defined by country.

	N	Actions	Responsible	Other actors	Time	Tools
Yellow alert phase						
SAT Component	**Indicators** **ASIS Category:** Moderate Drought **ENSO:** The presence of El Niño is confirmed. Existing coupling between the ocean and the atmosphere. **Climate perspective:** Accumulated precipitation in the Below (B) range of normal **IPC-AFI:** Projected situation in Phase 2 (Stress/Accentuated)					
	Main objectives ▪ Concentrate and intensify early actions for the prevention and mitigation of agricultural drought and AFI. ▪ Carry out planning to implement early actions from the central level.					
Forecast and monitoring	1	▪ Concentrate the actions of monitoring, analysis, validation and communication of information on agricultural drought in areas that show moderate affectations.	▪ Inter-institutional committee.		For the entire duration of the yellow alert phase.	Defined by country (e.g. ASIS-Country, Agrometeorological Bulletin, IPC-AFI, etc.).
Activation and dissemination of alerts	2	▪ Implement the communication strategy for the effective dissemination of the information foreseen in the yellow alert phase for each level (national, departmental, municipal, community, and households) with emphasis on the areas that show signs of moderate affectation.	▪ Inter-institutional committee.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	From the activation of the yellow alert phase.	Defined by country.
Early action or response	3	▪ Concentrate and intensify early AFI and agricultural drought prevention and mitigation actions in areas with moderate affectation.	▪ Agricultural sector.	▪ Institutional programs and NGOs with a presence in areas of moderate affectation that implement agricultural drought prevention and mitigation actions.	From the activation of the yellow alert phase.	Defined by country (e.g. Annex 7) Category of mild and moderate drought estimated by ASIS-Country.

SAT Component	N	Actions	Responsible	Other actors	Time	Tools
Early action or response	4	▪ Continue to contact donors and develop project proposals to be able to act before agricultural drought causes damage and loss in agriculture and affects food security.	▪ Agricultural sector.	▪ Institutions of the agricultural sector and NGOs that implement actions for the prevention and mitigation of agricultural drought.	From the activation of the green alert phase.	Defined by country.
Early action or response	5	▪ Maintain an updated mapping of institutional actors and others (NGOs, companies, research centres) that work in FNS, agriculture, and that promote sustainable agriculture practices adapted to the climate and the reduction of the risk of drought.	▪ Inter-institutional committee.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	From the activation of the green alert phase.	Defined by country.
Early action or response	6	▪ Maintain updated inventories and technical specifications of goods in case of drought.	▪ Agricultural sector.	▪ Governing body of the IDRM system. ▪ Departmental government. ▪ Municipal government,	From the activation of the yellow alert phase.	Defined by country.
Early action or response	7	▪ Secure human and material resources to carry out a joint FNS evaluation mission in an emergency.	▪ FNS system.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system. ▪ FAO and WFP.	From the activation of the yellow alert phase.	Defined by country (e.g. Emergency Food Security Assessment - EFSA).
Early action or response	8	▪ Design a logistics supply strategy and pre-positioning of stocks.	▪ Agricultural sector.	▪ Governing body of the IDRM system. ▪ FNS system.	From the activation of the yellow alert phase.	Defined by country.

	N	Actions	Responsible	Other actors	Time	Tools
Red alert phase						
SAT Component	**Indicators** ▪ **ASIS Category:** Severe and extreme drought ▪ **ENSO:** The presence of El Niño is confirmed. Existing coupling between the ocean and the atmosphere. ▪ **Climate perspective:** Accumulated precipitation in the Below (B) range of normal ▪ **IPC-AFI:** Projected situation in Phase 3, 4 and/or 5 (crisis, emergency or catastrophe/famine).					
	Main Objective: ▪ Activate early mitigation actions from the central level. ▪ Assess the impact of agricultural drought on food security and livelihoods. ▪ Develop response plans to protect or guarantee food security and activities aimed at the rapid restoration of production and the protection of livelihoods.					
Activation and dissemination of alerts	1	▪ Implement the communication strategy for the effective dissemination of the information foreseen in the red alert phase for each level (national, departmental, municipal, community, and households) with emphasis on the areas that show signs of moderate affectation.	▪ Inter-institutional committee.	▪ Agricultural sector. ▪ FNS system. ▪ Governing body of the IDRM system. ▪ MTA. ▪ Departmental government. ▪ Municipal government.	From the activation of the red alert phase.	Defined by country.
Early action or response	2	▪ Intensify early agricultural drought mitigation actions (Annex 7) towards affected areas with support from the Central Government.	▪ Agricultural sector.	Institutional programs and NGOs that implement agricultural drought prevention and mitigation actions in the affected departments and municipalities.	From the activation of the red alert phase.	Category of mild, moderate, severe and extreme drought estimated by ASIS-Country.
Early action or response	3	▪ Send a joint mission to assess food and nutrition security in affected areas to evaluate the impact of agricultural drought on food security in areas confirmed and detected in the different categories by ASIS-Country.	▪ National FNS System.	▪ Agricultural sector ▪ Governing body of the IDRM system. ▪ FAO and WFP.	From the activation of the red alert phase.	Defined by country (e.g. EFSA) Category of mild, moderate, severe and extreme drought estimated by ASIS-Country.

	N	Actions	Responsible	Other actors	Time	Tools
Red alert phase						
Forecast and monitoring	4	▪ Receive and analyse the results of the joint evaluation mission and compare the information with other climatic, socioeconomic, health and production indicators, assess whether to request an emergency declaration on food security.	National FNS System.	▪ Agricultural sector. ▪ Governing body of the IDRM system. ▪ FAO and WFP.	As of the receipt of the evaluation report.	Defined by country (e.g. EFSA).
Early action or response	5	▪ Formulate response projects: interventions to protect or guarantee food security (e.g. cash/voucher programs, social protection, etc.), and activities aimed at the rapid restoration of production and livelihoods (e.g. supplementary feeding to ensure the survival of animals; provision of inputs, seeds, fertilizers and tools, etc.).	FNS System and Ministry of Agriculture.	▪ FNS and agricultural sector institutions and NGOs that implement response actions (humanitarian action).	As of the reception of the evaluation of damages and losses.	Defined by country.
Early action or response	6	▪ Keep inventories of goods updated in case of drought to identify eventual deficits.	Ministry of Agriculture.	Governing body of the IDRM system.	As of the reception of the evaluation of damages and losses.	Defined by country.
Early action or response	7	▪ Implement the logistics supply strategy and pre-positioning of stocks.	Agricultural sector.	Governing body of the IDRM system.	As of the reception of the evaluation of damages and losses.	Defined by country.

The impact of drought in agriculture is one of the most complex natural hazards to predict and mitigate. It carries a constant risk for most smallholder farmers around the world. According to studies conducted by the Food and Agriculture Organization of the United Nations (FAO), 83 percent of all damages and losses caused globally by drought between 2006 and 2016 have been absorbed by agriculture, putting a good part of the world population at risk of food insecurity.

The guide aims to guide governments and other relevant actors in the development of early warning - early actions on agricultural drought plans that must be implemented before a drought event has significant impacts and causes damages and losses that could eventually become a disaster.

The manual complements other instruments used at global and local levels to develop EWEA on agricultural and response plans related to drought.

ISBN 978-92-5-133548-2

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CB0624EN/1/11.20