

Climate Information Services for Food and Agriculture:

Opportunities and Constraints for Information Providers and Users

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Food and Agriculture Organization of the United Nations

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Outline

- **Challenges for agriculture and food security**
- **Factors contributing to food insecurity**
- **Application of climate information in agriculture**
- **Opportunities and constraints**
 - **Complexity of farm level decision making**
 - **Climate information for food supply chain**
 - **Crop yield prediction, food security early warning and humanitarian response**
 - **Public-private partnerships**
 - **Observation and monitoring**
 - **Climate services information systems**
- **Strengthening institutional and technical capacities**
- **Selected FAO's programmes**
- **Future directions**



Agriculture in a changing context

- Projected population of **9.1 billion** (34% higher than today) and socio-economic growth will require raising food demand by **70%** by 2050 compared to 2005/2007.
- To meet this challenge:
 - Cereal yields need to increase by **40%**
 - Net irrigation water requirements to improve by **40-50%**,
 - Land area under cultivation need to increase by **100-200 million ha**
 - **One additional billion tonnes** of cereals (2.1 billion today) and **200 million tonnes** of meat to be produced annually by 2050.

How to feed the world (2050), High Level Expert Forum, Rome (12 – 13 October 2009)

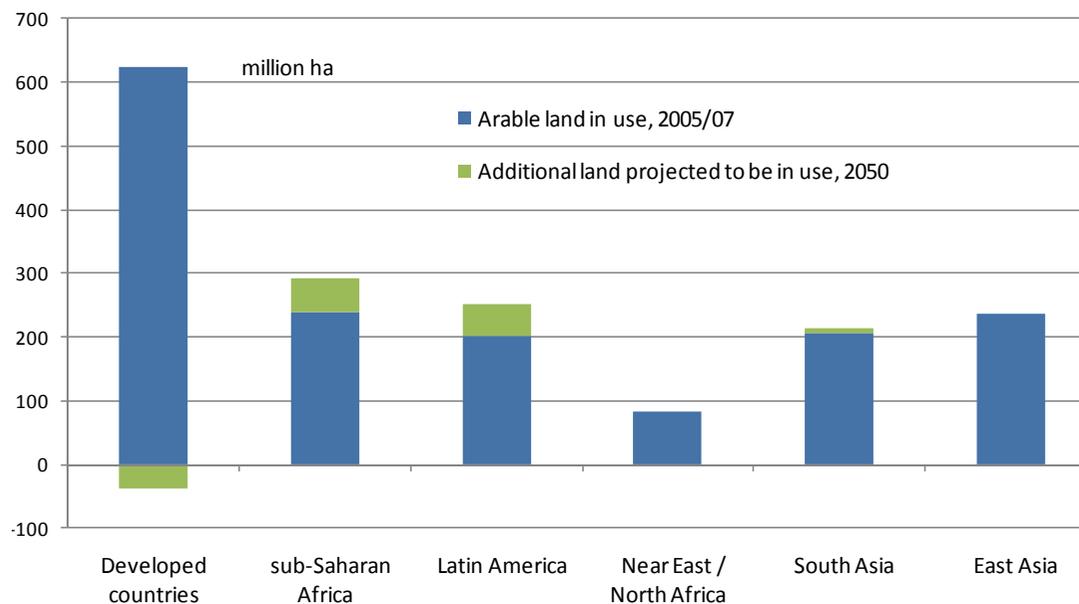


Arable Land in Use

- About 12 percent of the globe's land surface is used for crop production, little more than 1.5 billion ha
- Arable land would expand by some **70 million ha** (< 5 %), the expansion of land in developing countries by about **120 million ha** (= 12 %) being offset by a decline of some **50 million ha** (= 8 %) in the developed countries.

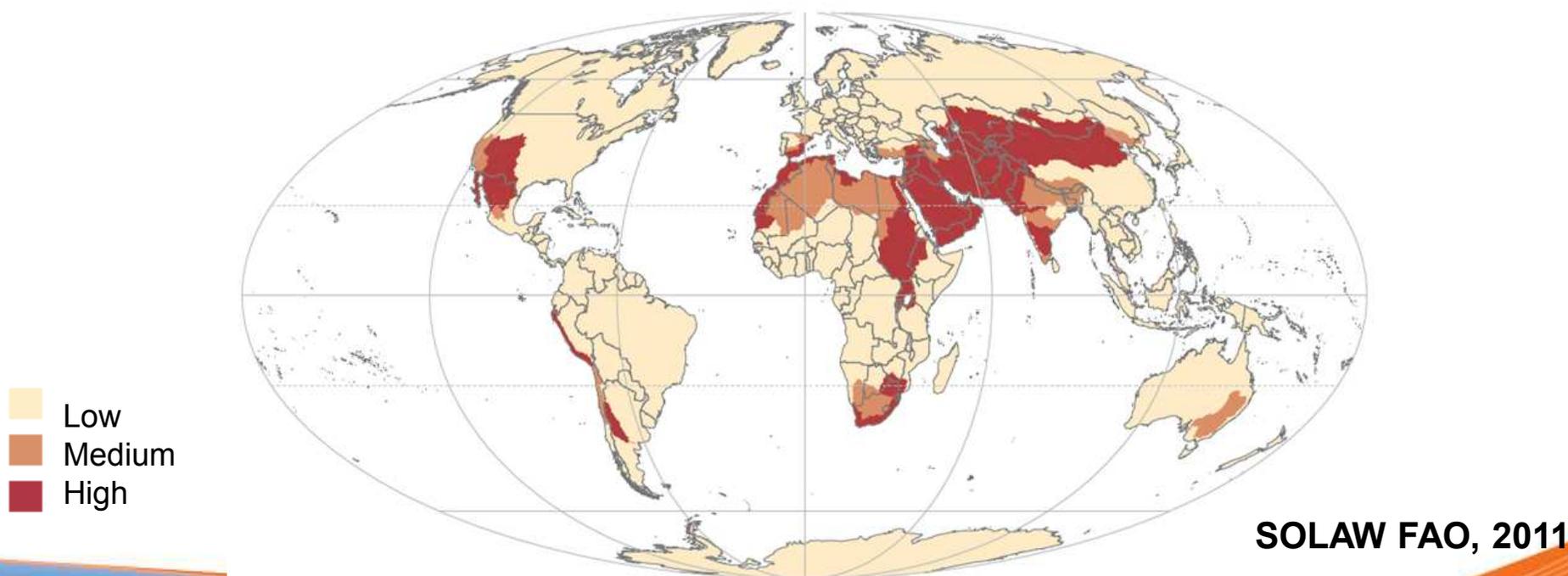
Projected increase in arable land use is concentrated, largely in sub-Saharan Africa and Latin America

How to feed the world (2050), High Level Expert Forum, Rome (12 – 13 October 2009)



Water Scarcity

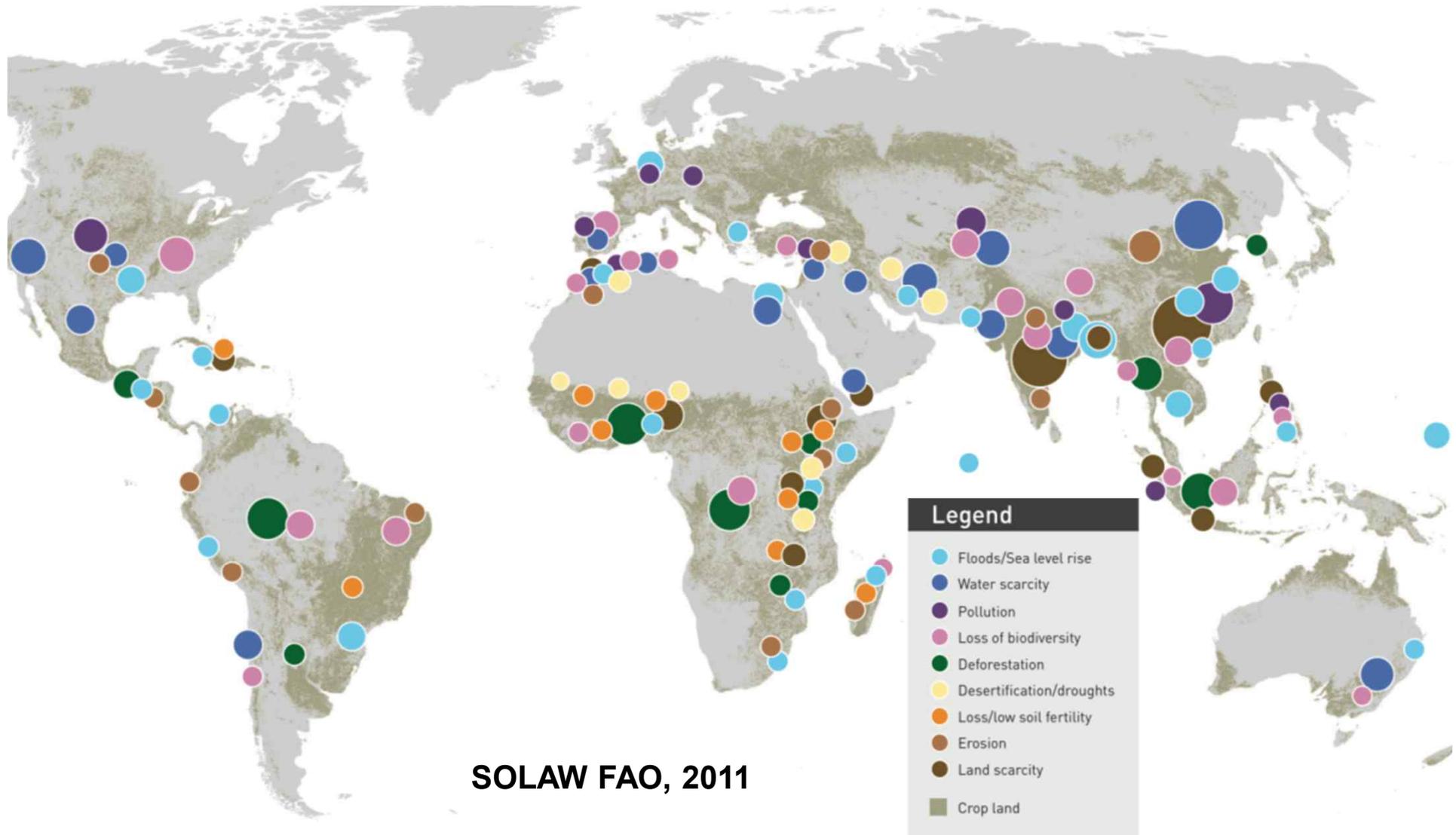
- Water use has increased rapidly over the past century by >7-fold
- Agriculture accounts for about 70% of all water use and upto 95% in many developing countries
- **1/3 of the world's population lives under water scarcity**



Distribution of physical water scarcity by major river basins



Land and water systems at risk



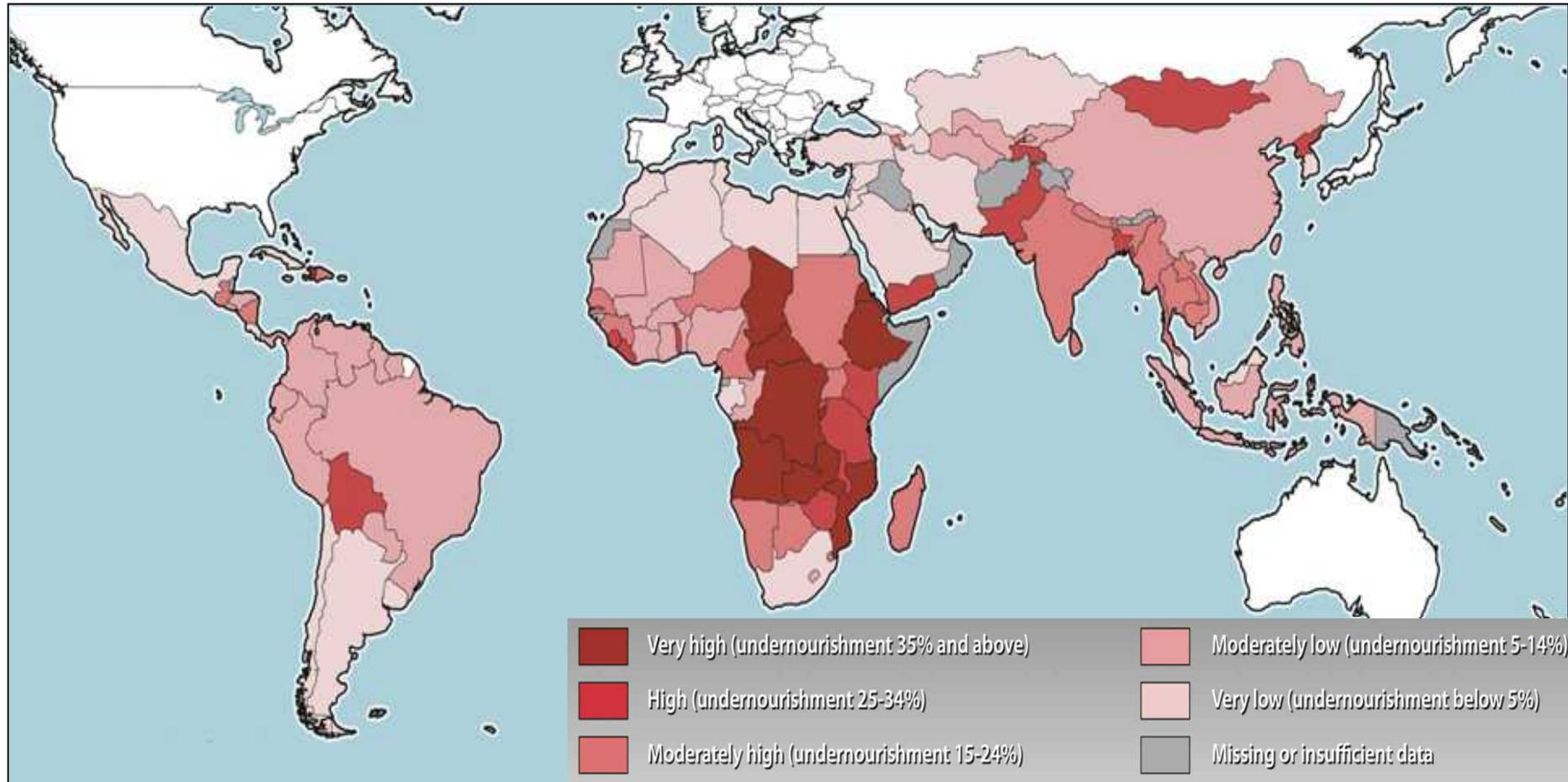
SOLAW FAO, 2011



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World Hunger Map



FAOSTAT 2010 www.fao.org/hunger

925 million people go to bed hungry

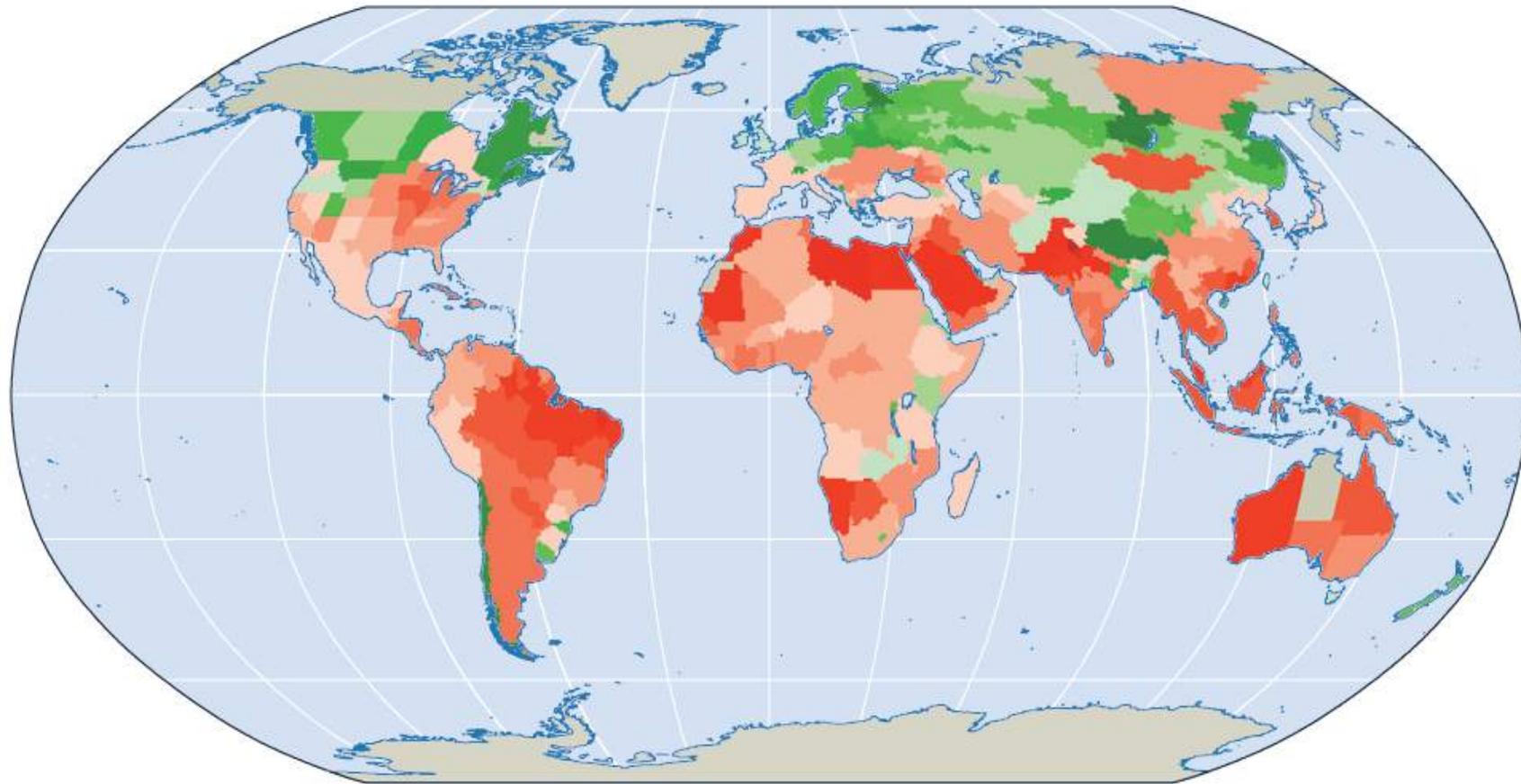


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Climate change will depress agricultural yields in most countries in 2050, given current agricultural practices and crop varieties

Muller at. Al, WB Dev. Report 2010



Percentage Change in yields (2010-2050)



World Bank Development Report (2010)



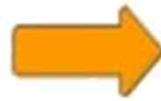
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Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life

Climate affects all four dimensions of food security **simultaneously**

AVAILABILITY



Reduced agricultural production, temporal effects on local markets, food import/export.

ACCESS



Increase in food prices, loss of farm income and reduction in farm employment

UTILIZATION



Dietary patterns and challenges of food safety, lack of capacity to purchase diversity of foods, food safety issues related to temperature increase

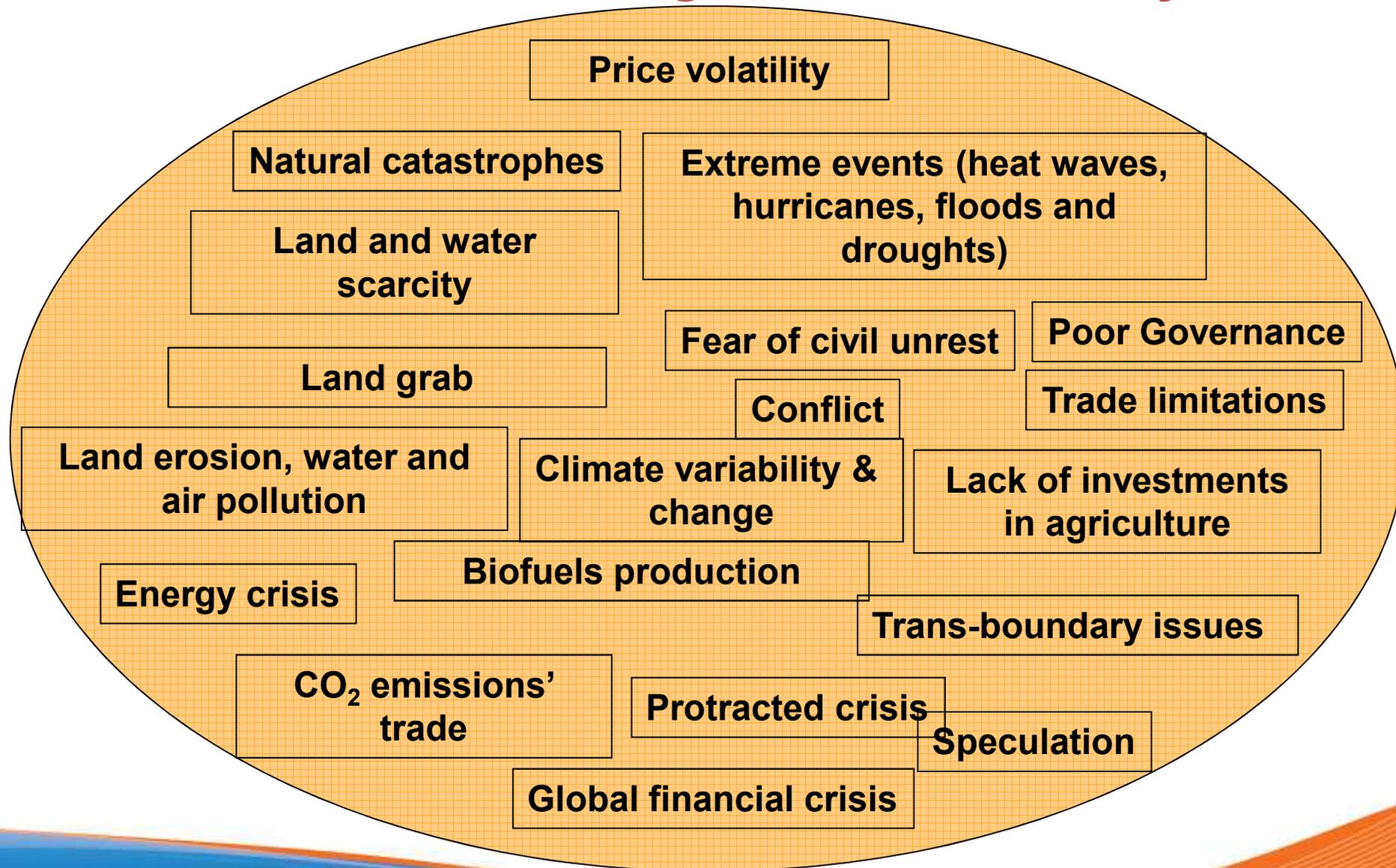
STABILITY



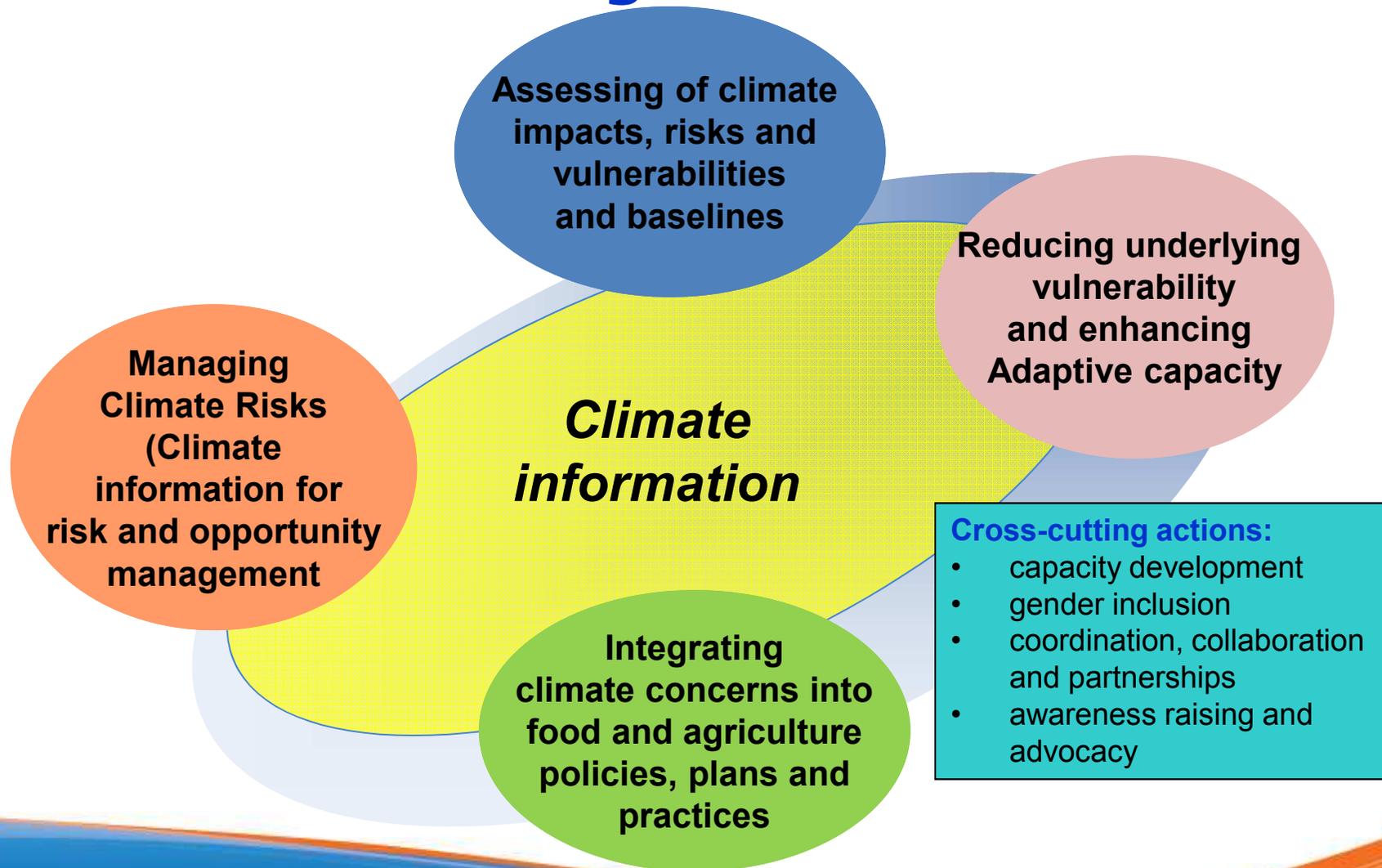
Refers to the vulnerability context and risk factors that impact negatively on food availability or access to food. Greater instability of food supply



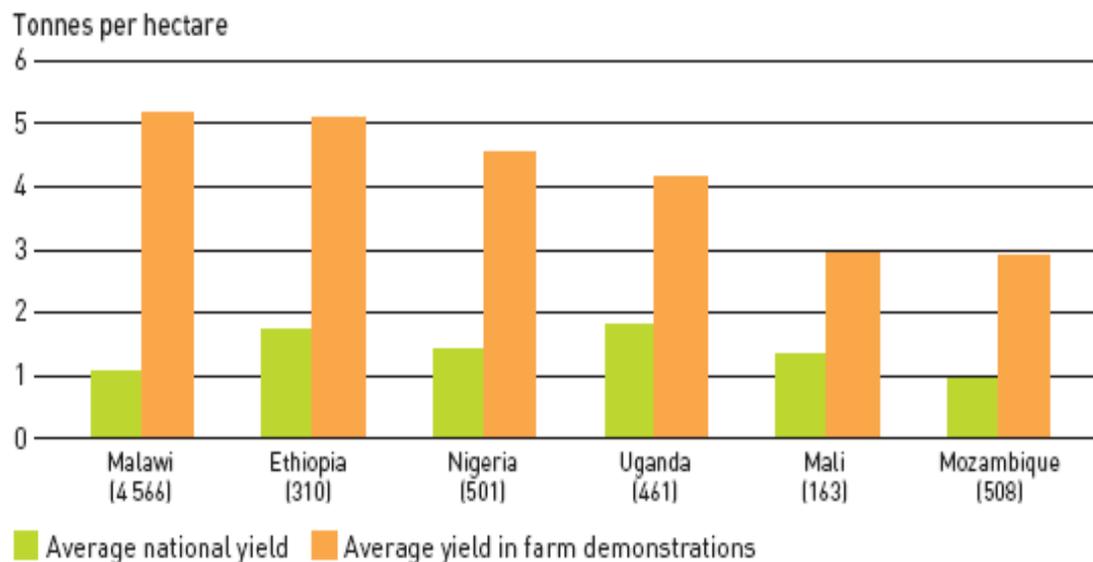
Factors contributing to food insecurity



Climate information services in Food and Agriculture



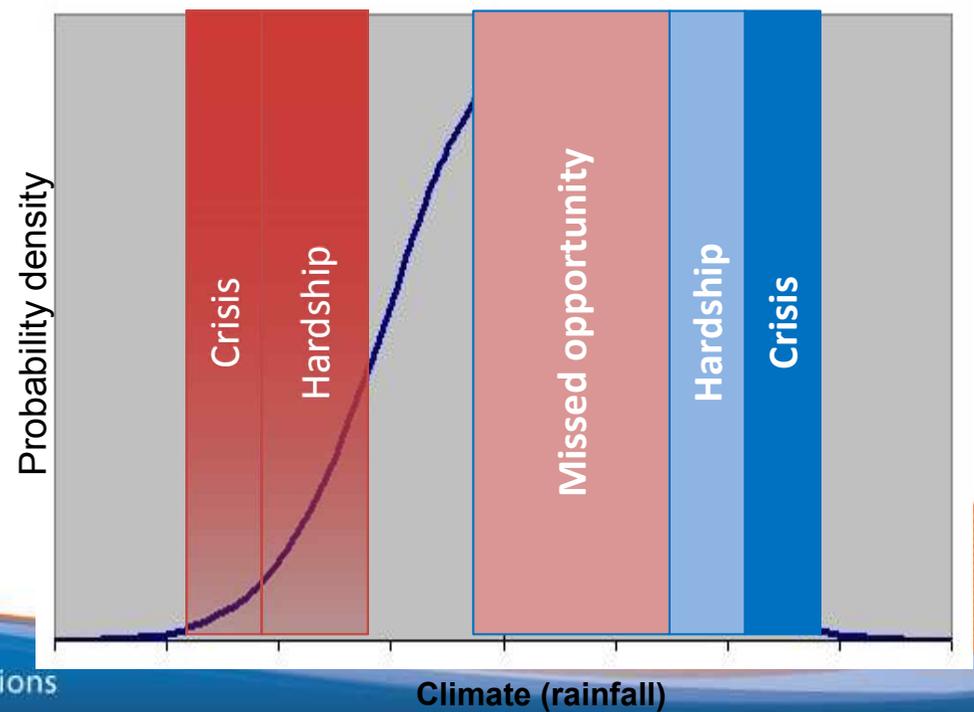
Role of climate information services – Bridging the yield gap



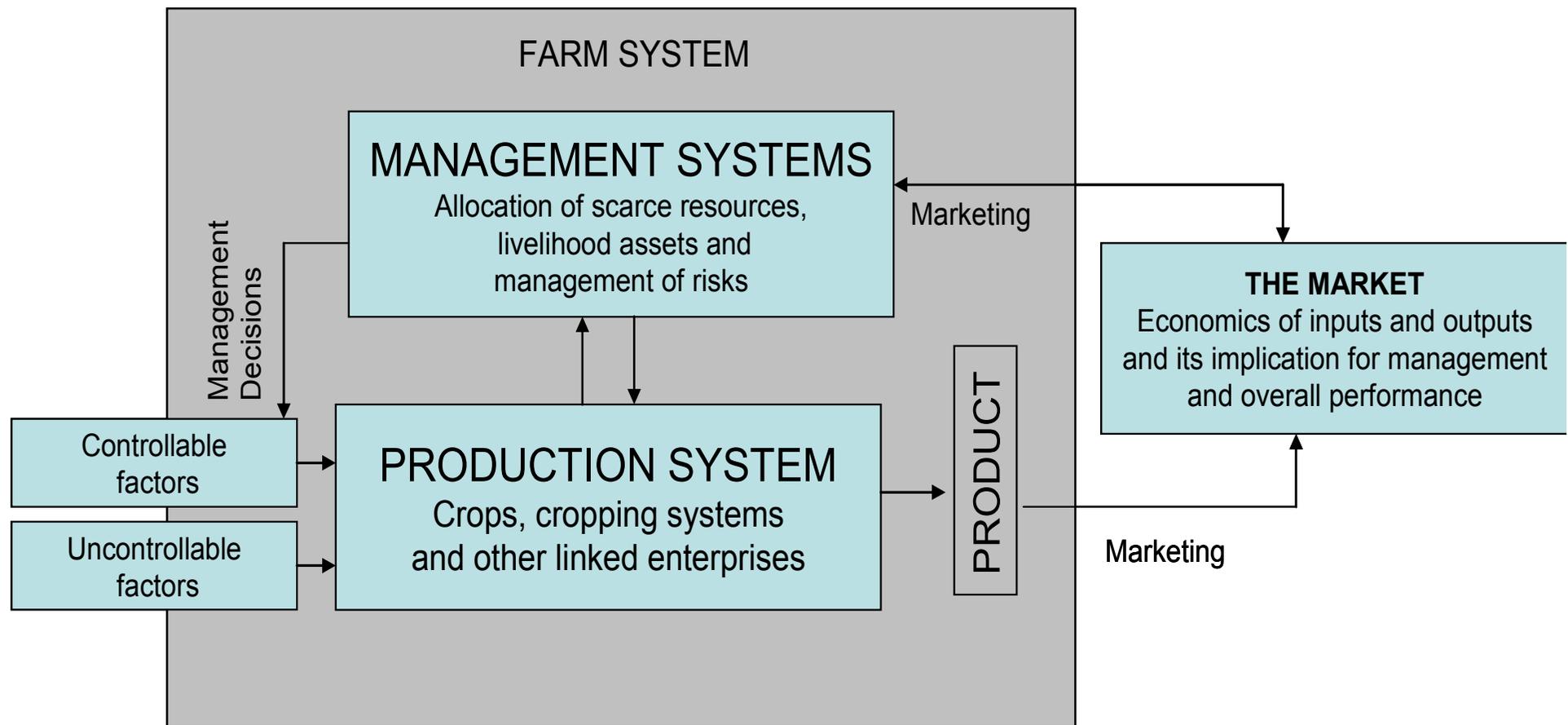
Source: World Development Report, 2008.

Notes: Number of plots in parentheses. Open pollinated improved varieties in all cases except Nigeria, which uses hybrids. Data for 2001 for Ethiopia, Mozambique, Nigeria, and Uganda; 2002 for Malawi; and an average of 2001, 2002, and 2004 for Mali.

- **Risks of climate extremes on either side of the distribution**
 - Extremes of dry and wet and associated impacts
- **Missed opportunities due to risk averse conservative strategies of decision makers**
 - Low input during normal and good seasons



Farm as systems of production and management



Brennan and McCown (2001)



Demand for climate information services in small holder farms are diverse

- Localized, timely and easily understandable
- diverse cropping systems and decision cycles
- User needs –Ag. service providers, irrigation managers, input suppliers, market intermediaries, local cooperatives, micro-financing, farmers, fisherman, livestock herders
- Climate, crop and livelihood data base

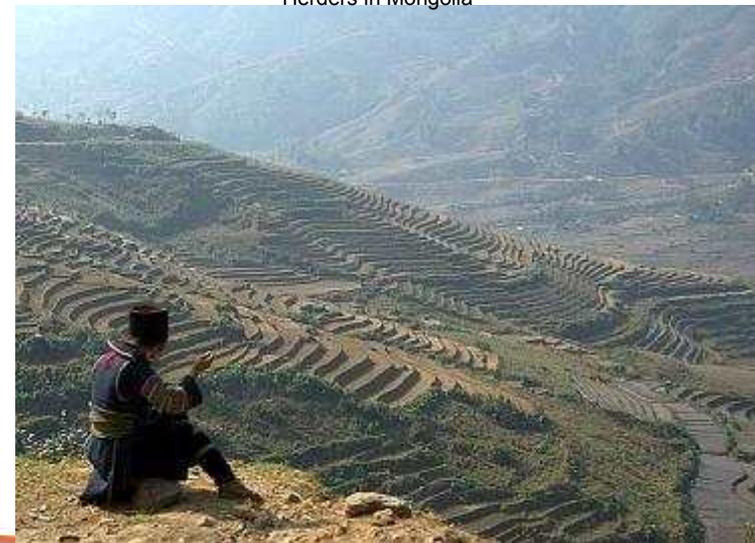


Reaching the most vulnerable

- Observation networks are weak in most vulnerable and fragile eco-systems (e.g. Mountains, grasslands etc.,)
- Promote incentives to local users who can record and send the data (e.g small scale farmers in high altitude Andes; herders in Mongolia)
- Local risk reduction groups engaged in weather observation and communicating climate information at local level



Herders in Mongolia



Smallholders in high altitude Andes

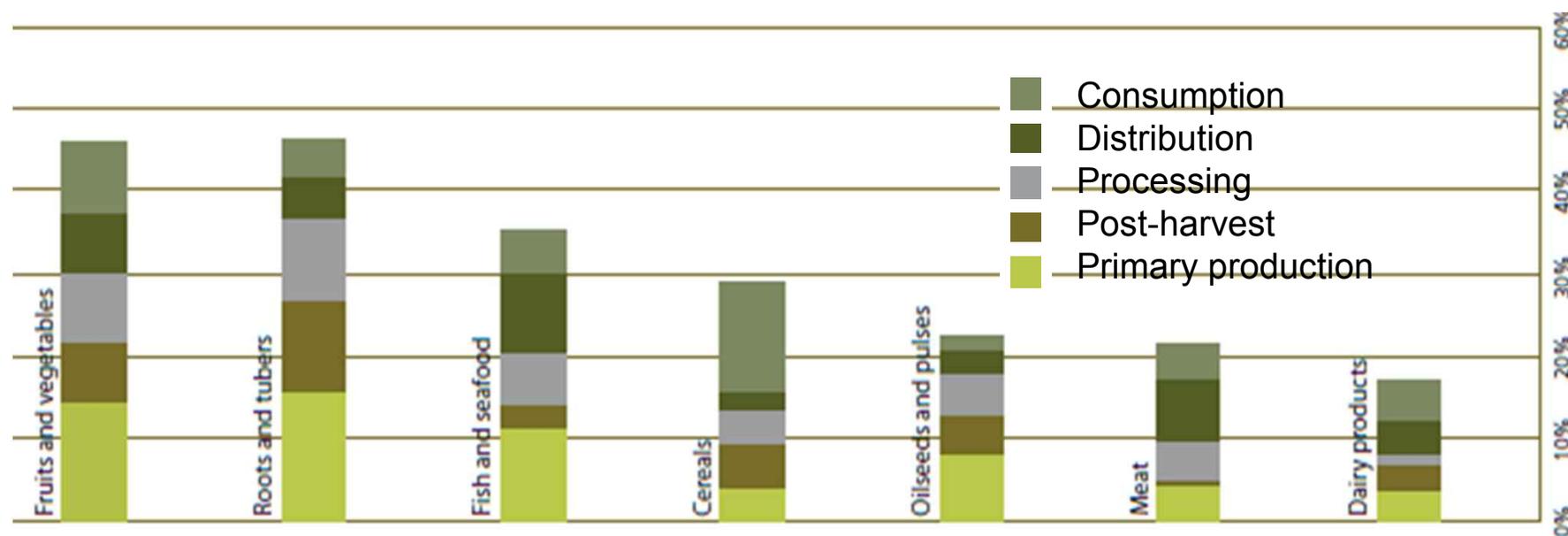


End-user's social capital

- **Social cohesion (e.g. community networks, local institutions, norms and relationships) are relatively well developed**
 - Providing credible information to farmers as a group can motivate pro-active decision making
 - Local networks shape the farmers social interactions leading to better participatory decisions
- **Farmers knowledge sharing mechanisms relevant to local context is the key**
 - Farmer field schools/Climate field schools
 - Farmer participatory climate workshops
 - Local climate information centers
 - Roving Seminars



Climate information services: Reducing waste and losses in food supply chain



FAO, 2011



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Crop monitoring and yield/production forecasting

- **Analysis of meteorological, climatic and crop data**
 - provision of near real-time information about the crop state, in quality and quantity
 - possibility of early warning on expected production
- **Planning for timely interventions by the Government**
 - contingency plans
 - alternate livelihood strategies
 - response plans for food aid
- **Lack of capacity of user agencies (e.g. Ministry of Agriculture)**
 - emphasis on data collection from different sources: meteorological, agrometeorological, soil, inputs, phenology, crop condition, remote sensing, and agricultural statistics



Famine Early Warning Systems

- **Implications for key food security questions are readily derived, such as:**
 - which vulnerable livelihood groups are facing food insecurity, and for how long?
 - What are the best ways to mitigate adverse shocks to their livelihood systems?

- **There are constraints in matching climate information and livelihood zones**
 - translating a climatic shock into consequences that affect livelihood groups
 - combining the climate forecasts with potential cropping zones and vulnerable livelihoods
 - Limitation of response options for livelihood groups



Humanitarian response: Climate services for protecting livelihoods

- **Emergencies are on the rise - especially sudden onset disasters and series of low and high rainfall extreme events**
 - number of floods have increased from 14% of all natural disasters in the 1980s to 20% in the 1990s and 27% since 2000
 - World wide, flood occurrences has risen from about 50 floods per year in the mid-1980s to more than 200 today
- **Need based early warning systems have important implications**
 - mobilization of resources needed to prepare for, and respond to, emergencies in order to save lives and protect livelihood systems
 - planning for mitigation measures as part of short term responses to build resilience against future impacts



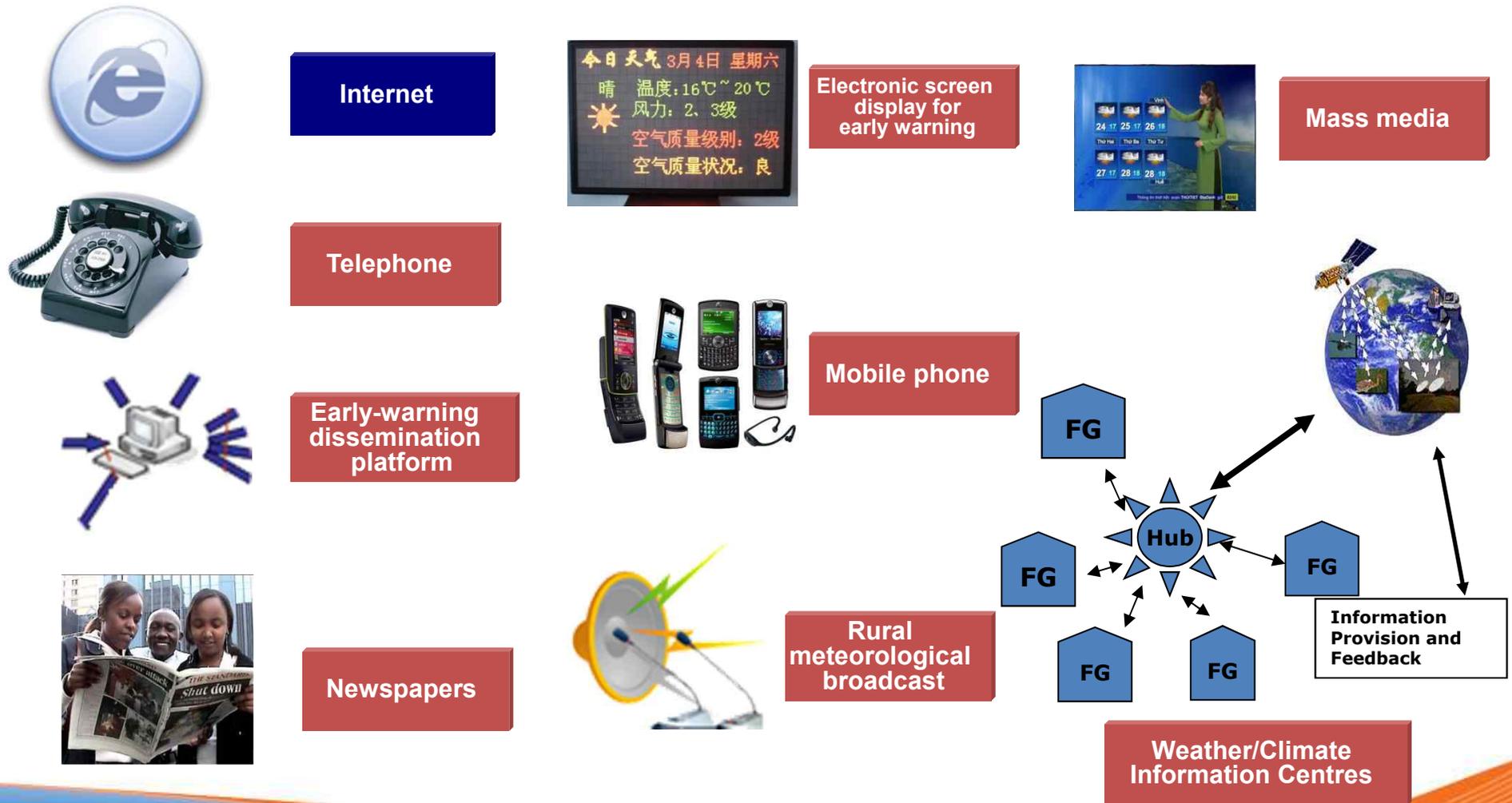
Public - private partnership: Risk Insurance

- **Weather/climate-based risk insurance**
 - Agricultural insurance is growing due to increased commercialism, availability of new types of insurance products
 - The total annual agricultural insurance premiums worldwide is very low - amounted to US\$6.5 billion, and represents just 0.4% of the total farm gate value of agricultural production (FAO 2005).
- **Offers several benefits at the household and Government level**
 - provides greater flexibility in investment decisions and motivates the farmers to manage full range of climate variability (risks and opportunities)
 - Banks renewed interest in lending removes constraints and enhances credit facilities during adverse extremes
 - spreads the risk of climate impacts (e.g. asset depletion) by securing needed resources sooner to protect livelihoods
- **Lack of coordination and collaboration with operational climate services and agro-meteorological services; lack of dense observation networks, problems in interpretation of satellite products are considered major constraints**



Public - private partnership

Expanding the reach of early warning and climate information



Mainstreaming climate information into sectoral policies, programmes and investment plans

- User agencies seek climate data and information to prepare sectoral policies, programmes and investment plans
- National processes (e.g NAPA, National Communications, National Action Programme on Land Degradation and Desertification etc.,) are in place to promote integration of climate knowledge into policy planning
- Mainstreaming climate considerations into Food and Agriculture Policies, National disaster risk reduction strategies etc.,
- Integration of climate information into long-term adaptation investment decisions
 - Water (e.g Reservoirs, irrigation systems, water harvesting structures),
 - Disaster Risk Reduction (safe harbor, dyke systems, shelters, flood diversions systems)
 - Agriculture and Food (crop improvement, food storage facilities etc.,)

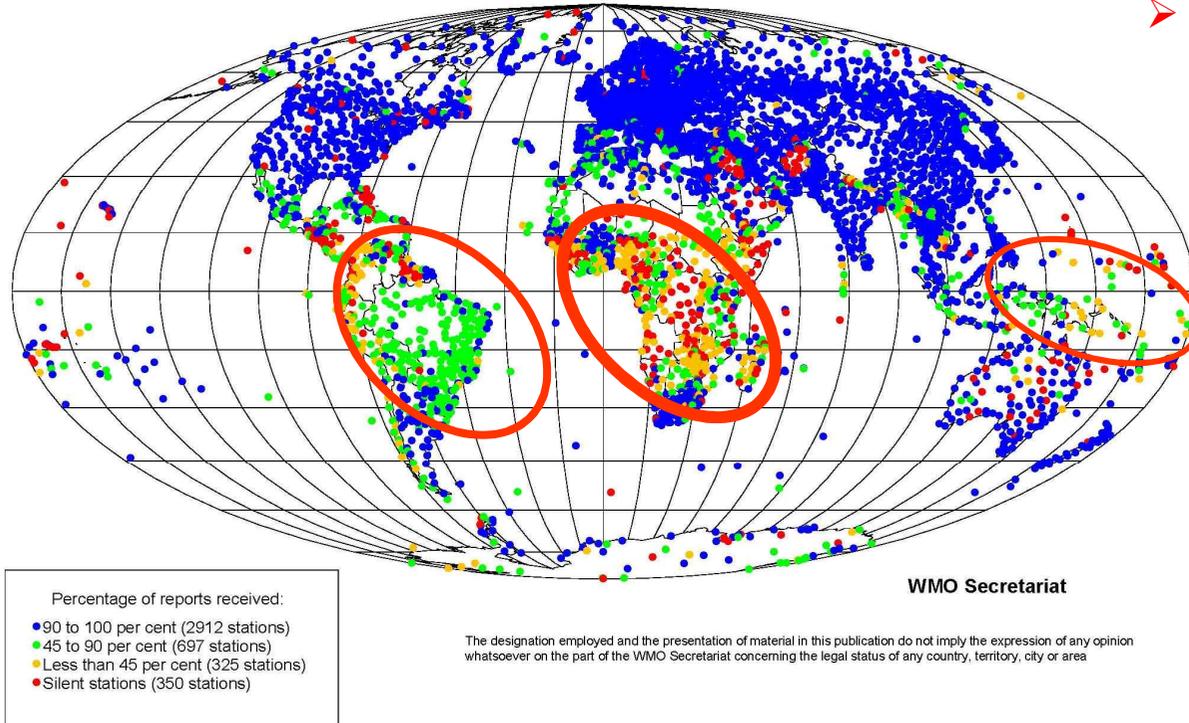


Observations and Monitoring

Gaps in climate monitoring infrastructure and data collection networks, arrangements for data sharing

Annual Global Monitoring 1-15/10/2008

SYNOP reports made at 00, 06, 12 and 18 UTC at RBSN stations



➤ **Synoptic and agrometeorological stations in developing countries are thin and declining**

- For example, there are just over 1150 World Weather Watch stations in Africa giving a density of 1 per 170 km²
- Several existing station data remain paper based and are inaccessible to users

➤ **Efforts need to be strengthened to fill the gaps in time series and increase the resolution**

- Spatial interpolation to fill the missing data, Proxy measurements using satellites, Rain Fall Estimate (RFE)



Fragmented observation and monitoring networks

- Interest of development partners and funding agencies
- Maintenance of high-tech and automatic observation stations
- Integrated national system design should consider beyond observation and monitoring networks
 - partnerships
 - knowledge sharing
 - user perspectives
 - research – operational linkages



Climate Services Information Systems

- **Advances in climate prediction, biophysical modeling, economic optimization, participatory decision making, advancement in decision support and discussion support systems have raised exciting opportunities**
- **Number of constraints limit advancement in climate services information systems**
 - Lack of institutional and technical capacity
 - Perceived institutional boundaries
 - Additional commitment without adequate resources
 - Handling of probabilistic information
 - communication – inequitable access, mismatch between user needs and the scale, inadequate content, format, accuracy and timeliness of operational forecasts
- **Lack of partnership between operational forecasts and research/prediction centers at the national level**



Decentralized climate information services

- National climate services at decentralized levels are primarily involved in recording data and communicating it to the national centers and back to the users
- Increased engagement of the local staff with intermediaries (e.g Agricultural extension personnel, water managers, disaster managers) can play an important role between developers of climate information and users in different sectors.
- Promoting volunteers (e.g Cyclone preparedness Programme in Bangladesh), local observers (part time) to enhance interaction with users
- User community especially advisory services (agriculture, water, risk reduction and health) that provide specific value added products need local partner from NMHS
- **Redefining institutional roles and responsibilities can overcome the existing constraints**

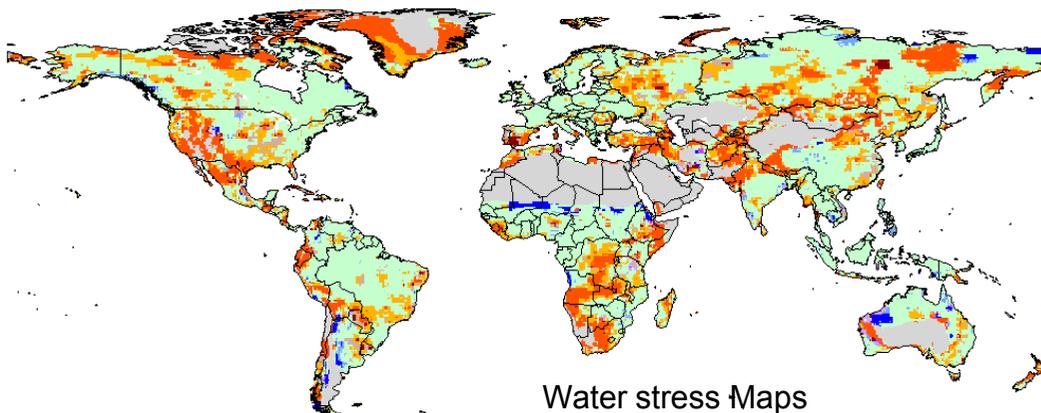
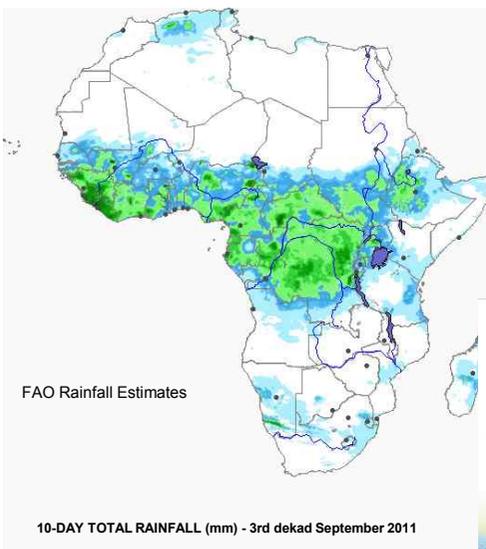


Capacity Development Priorities

	Institutional	Technical	Infrastructure
Enabling environment	Enabling environment Promoting preparation of Master Plan Mainstreaming Institutional mechanisms at decentralized levels Establish additional centres at sub-national level Linking with agrometeorological services	Incorporating user data; perception of impacts; Effective use of existing climate data; Analysis Customized information products (weather, climate, hydrological) Forecasts (time/space)	Data collection, communications and archiving Computing Observation networks Communication facilities, hubs Harmonizing integrated design Data representing vulnerable eco-systems
Information services	Mechanisms to receive information Sectoral nodes Mainstreaming climate concerns into sectoral policies, processes and plans	Interpreting forecast products Biophysical modeling Customized Advisories Format of advisories Impact outlooks Decision capacity Understanding information	Receiving nodes Information centers Briefing facility Knowledge centers Linking to existing service providers and end users



Enhanced collaboration to improve methods, tools and value added information

Desert Locust early warning system

FAO Desert Locust Information Service

GAEZ Global Agro-Ecological Zones

Global Information and Early Warning System

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS for a world without hunger

GIEWS Updates

Early Warning Indicators

GIEWS Calendar

Working with us

Global Watch

Source: FAO (2011)



Medium Term (5 –10 years) Warning Systems (MTWS)

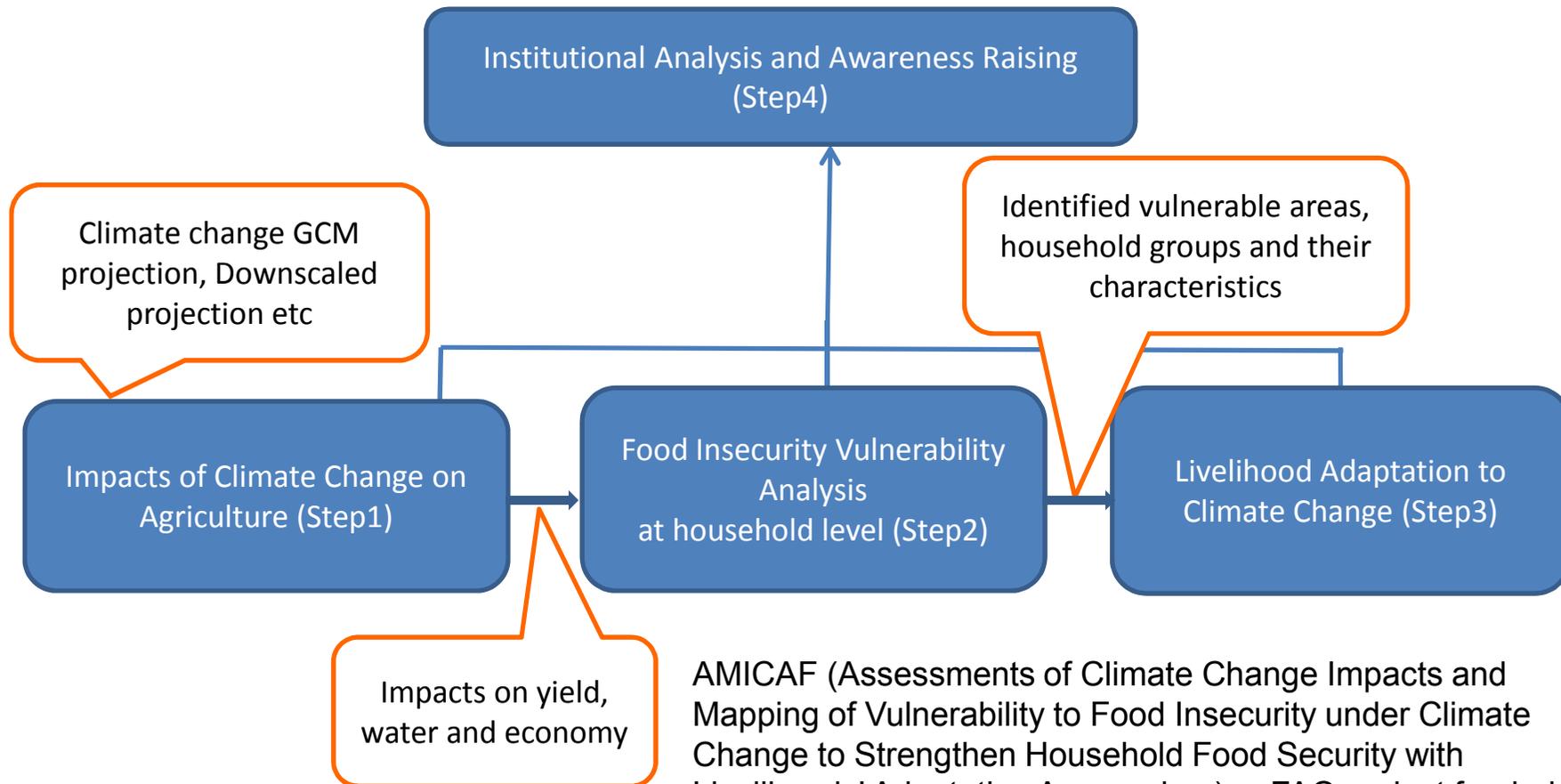
- The MTWS is intended to fill the gap between seasonal – scale assessments and long-term impact projections
- Identify the future Areas of Concerns (AOCs) and likely hotspots of vulnerabilities and sensitivities



adaptation

AMICAF:

Climate and Impacts/Vulnerability Information from Providers to Users



AMICAF (Assessments of Climate Change Impacts and Mapping of Vulnerability to Food Insecurity under Climate Change to Strengthen Household Food Security with Livelihoods' Adaptation Approaches): a FAO project funded by Japan as part of their APEC initiatives.



Future directions

- ✓ **Agrometeorological and climate data collection and use**
 - monitoring and data collection network in rural areas, systematic data archival and management
 - ensure to make use of modern information products (e.g. RFE), forecasts from regional and international centres and are implemented at the national level

- ✓ **Increasing farm level productivity to bridge yield gaps and reduce risks**
 - Mechanisms to reach the most vulnerable population; the climate impacts and response strategies should consider their livelihood strategies
 - deliver reliable, timely, locally understandable climate information with response options to the farmers considering inputs, credit, market and financial aspects

- ✓ **Strengthen climate and agriculture service to protect livelihoods**
 - integrate climate information into insurance, credit provision, crop monitoring and yield forecasting and humanitarian response to facilitate protection of livelihoods
 - establish reliable communication mechanisms to provide need based information and feedback to NMHS, agronomic research and extension systems

- ✓ **Strengthening farmers and institutional capacity to better respond to crisis**
 - building social capital and awareness raising are the key to enhance trust at the community level
 - Number of cross-cutting elements such as capacity building, gender inclusion, awareness, collaboration are prerequisite



Thank you



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