Climate services in agriculture

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Climate Change, Biodiversity and Environment

FAO

SUSTAINABLE DEVELOPMENT GOALS

13 CLIMATE ACTION

Agriculture is key in **responding to climate change**

Indicators under FAO custodianship

2 ZERO HUNGER

2.1.1 Hunger

2.1.2 Severity of food insecurity

2.3.1 Productivity of small-scale food producers

2.3.2 Income of small-scale food producer

2.4.1 Agricultural sustainability

2.5.1.a Conservation of plant genetic resources for food and agriculture

2.5.1.b Conservation of animal genetic resources for food and agriculture

2.5.2 Risk status of livestock breeds

2.a.1 Public Investment in agriculture

2.c.1 Food price volatility

5 GENDER EQUALITY

5.a.1 Women's ownership of agricultural land

5.a.2 Women's equal rights to land ownership

6 CLEAN WATER AND SANITATION

6.4.1 Water use efficiency

6.4.2 Water stress

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

12.3.1 Global food losses

14 LIFE BELOW WATER

14.4.1 Fish stocks sustainability

14.6.1 Illegal, unreported unregulated fishing

14.7.1 Value added of sustainable fisheries

14.b.1 Access rights for small-scale fisheries

15 LIFE ON LAND

15.1.1 Forest area

15.2.1 Sustainable forest management

15.4.2 Mountain Green Cover and Proportion of Degraded Mountain Area

Prevalence of undernourishment

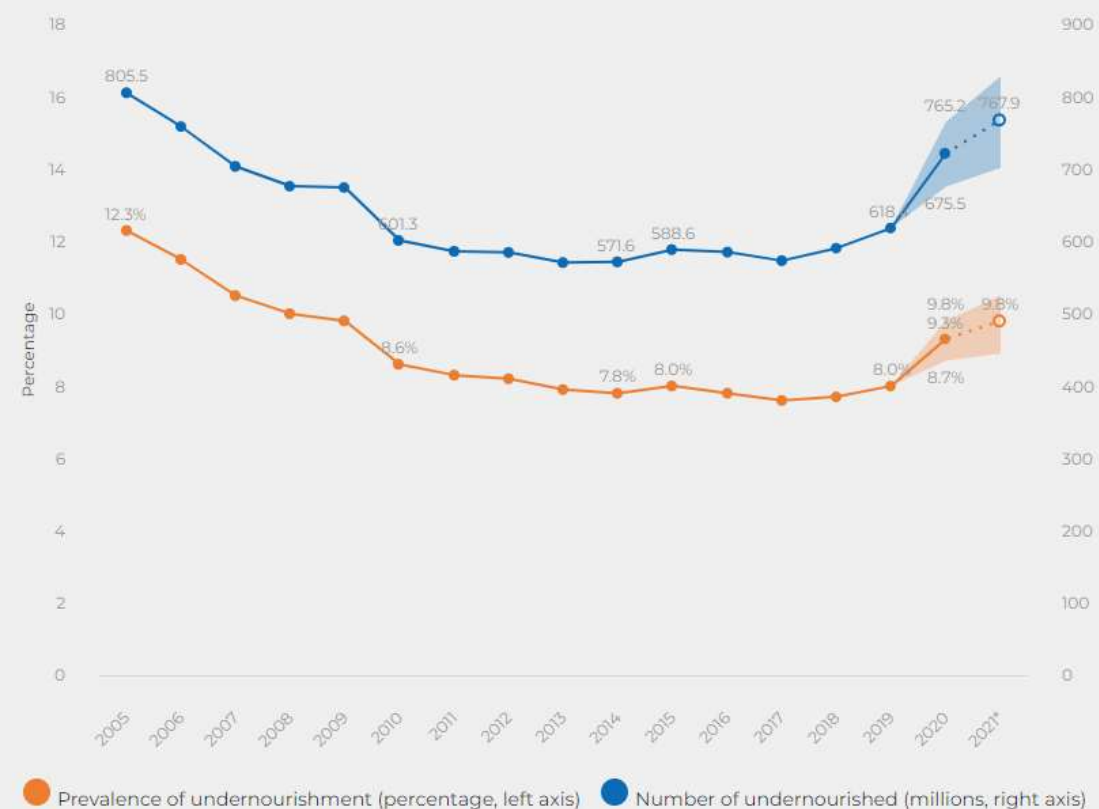**Status assessment: Close to target**

Trend assessment: Deterioration

Target 2.1

By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

The number of undernourished persons has risen sharply over the past two years, with up to 828 million people in the world facing hunger in 2021.

After remaining virtually unchanged for five years, FAO estimates of the prevalence of undernourishment in the world increased from 8 percent in 2019 to around 9.3 percent in 2020, and then further to 9.8 percent in 2021. Given current estimates of the world population, this implies that up to 828 million people may have faced hunger in 2021 globally.

Figure 3: Number and percentage of undernourished people in the world (2005–2021)

NOTE: * Projected values for 2020 and 2021 are illustrated by dotted lines. Shaded areas show lower and upper bounds of the estimated ranges.

Prevalence of moderate or severe food insecurity in the population, based on the food insecurity experience scale (FIES)

Status assessment: Far from the target

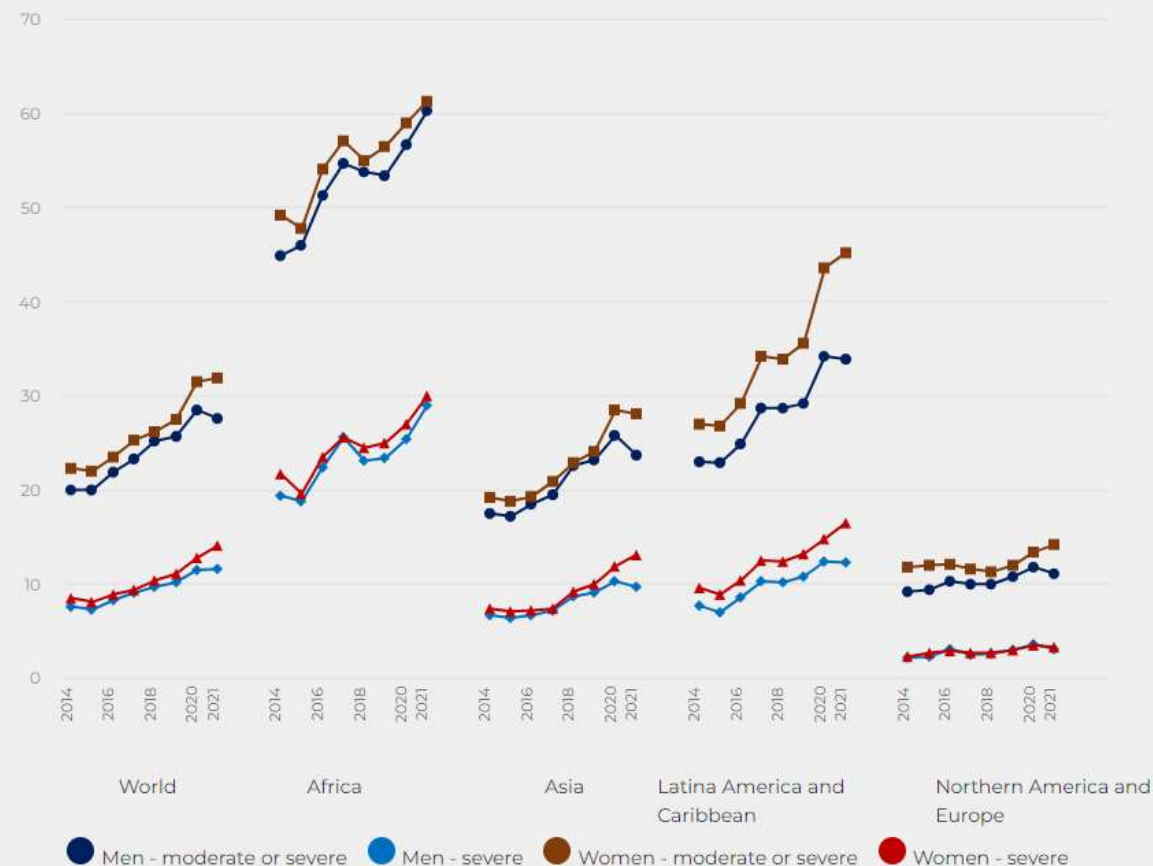**Trend assessment: Deterioration**

Target 2.1

By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round.

Global food insecurity, which rose sharply in 2020, remained at a high level in 2021. Moreover, severe food insecurity continued to increase, and reached 11.7 percent in 2021.

SDG target 2.1 challenges the world to go beyond ending hunger. Indeed, for optimal health and well-being, it is imperative to ensure access to safe, nutritious and sufficient food for all, all year round. SDG indicator 2.1.2 – the prevalence of moderate or severe food insecurity in a population, based on the food insecurity experience scale (FIES) – is used to monitor progress towards ensuring access to adequate food for all. The prevalence of food insecurity at severe levels provides an additional lens to look at hunger that is complementary to SDG indicator 2.1.1.

Figure 8b: Prevalence of food insecurity across regions, disaggregated by sex (2021)

Legend: Men - moderate or severe; Men - severe; Women - moderate or severe; Women - severe

Regions: World, Africa, Asia, Latina America and Caribbean, Northern America and Europe

IPCC AR6 – Key findings for agrifood systems

With every additional increment of global warming, the report states that "changes in extremes continue to become larger" and specifically "extreme heat thresholds relevant to agriculture are projected to be exceeded more frequently.

Take away: Agriculture and land use sector will be severely impacted by extreme heat and agricultural and ecological droughts and livelihoods in crop production, livestock and fisheries will be severely at risk.

Even in the very low-emission scenario (i.e., the SSP1-1.9 scenario), the 1.5ºC warming threshold is more likely than not to be reached or exceeded in the near-term (2022-2040). Agriculture adaptation efforts therefore need to be prioritised.

Take away: Need to address risks to smallholder farmers, fishers, indigenous groups, vulnerable women and youth from extreme heat, increased evapotranspiration and increase in agricultural droughts.

Unpacking the agrifood system and its relationship to climate
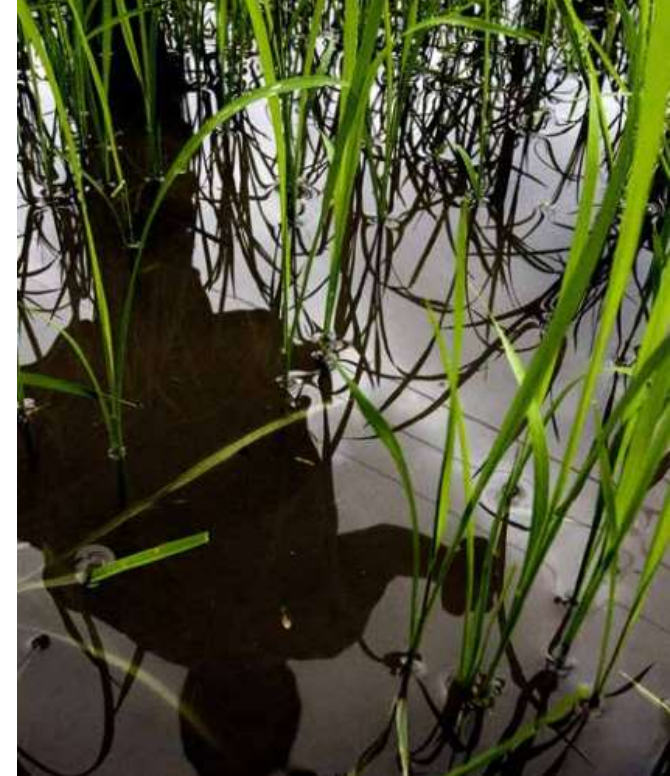

Source: Adapted from IPCC, 2019
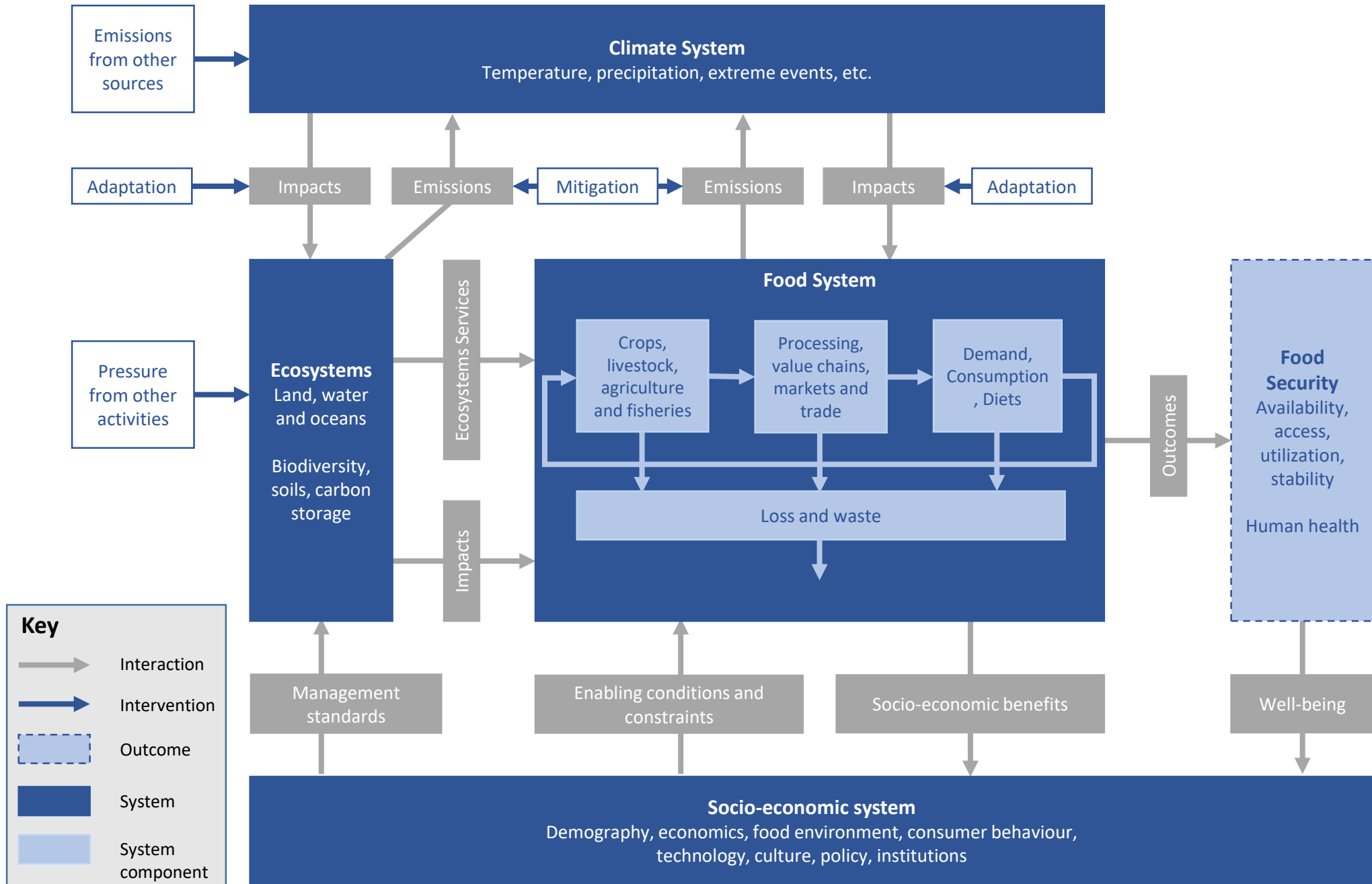
Climate-resilient agrifood systems

Climate change results in a range of shocks to agrifood systems that will differ in frequency and extremity over space and time

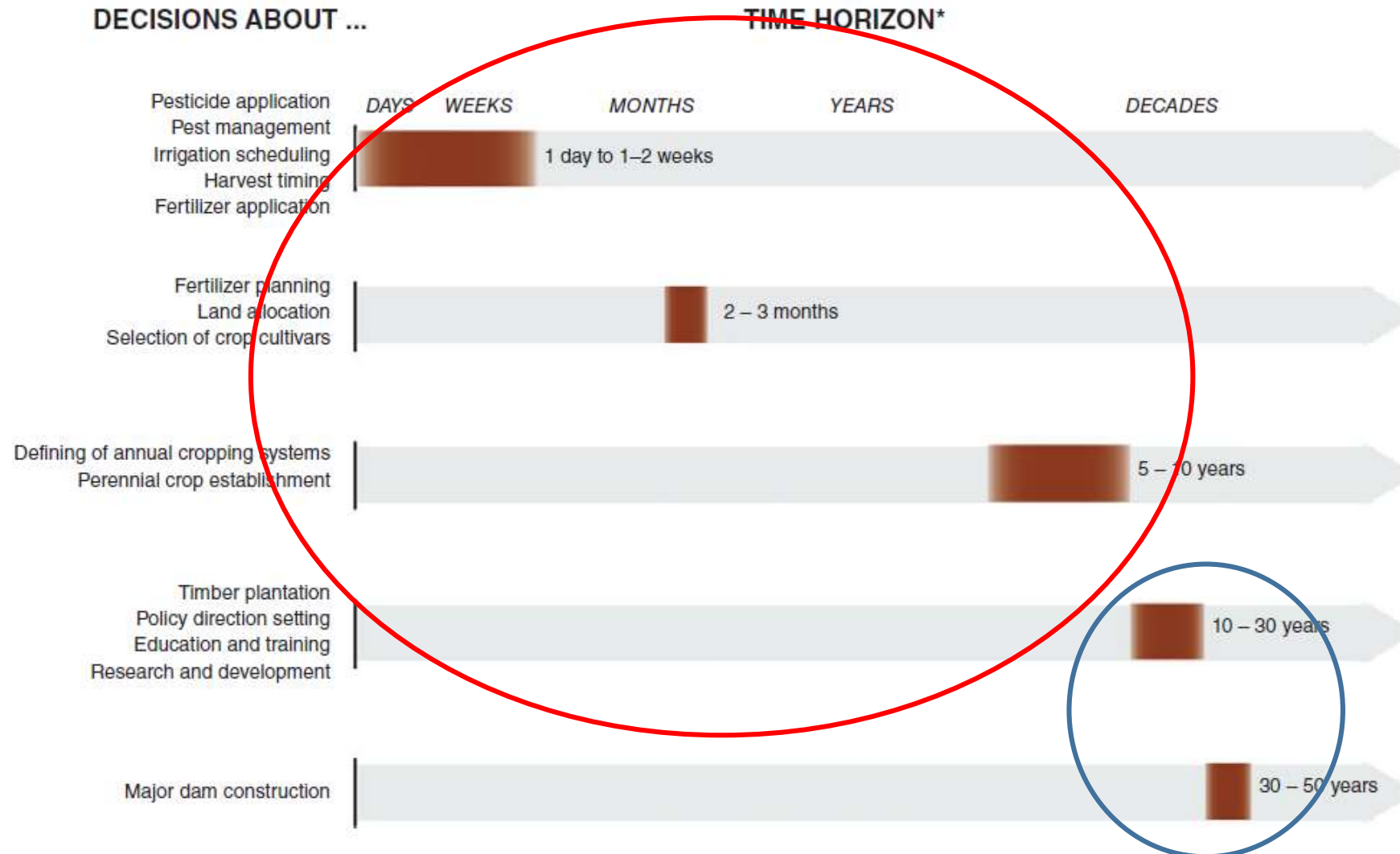Climate resilient agrifood systems address these risks by encouraging action to:

1) Anticipate, absorb and accommodate shocks resulting from climate variability and change; and

2) Minimize future risks through measures that can deliver adaptation and mitigation co-benefits

Challenges to action relate to uncertainty and complexity in anticipating impacts
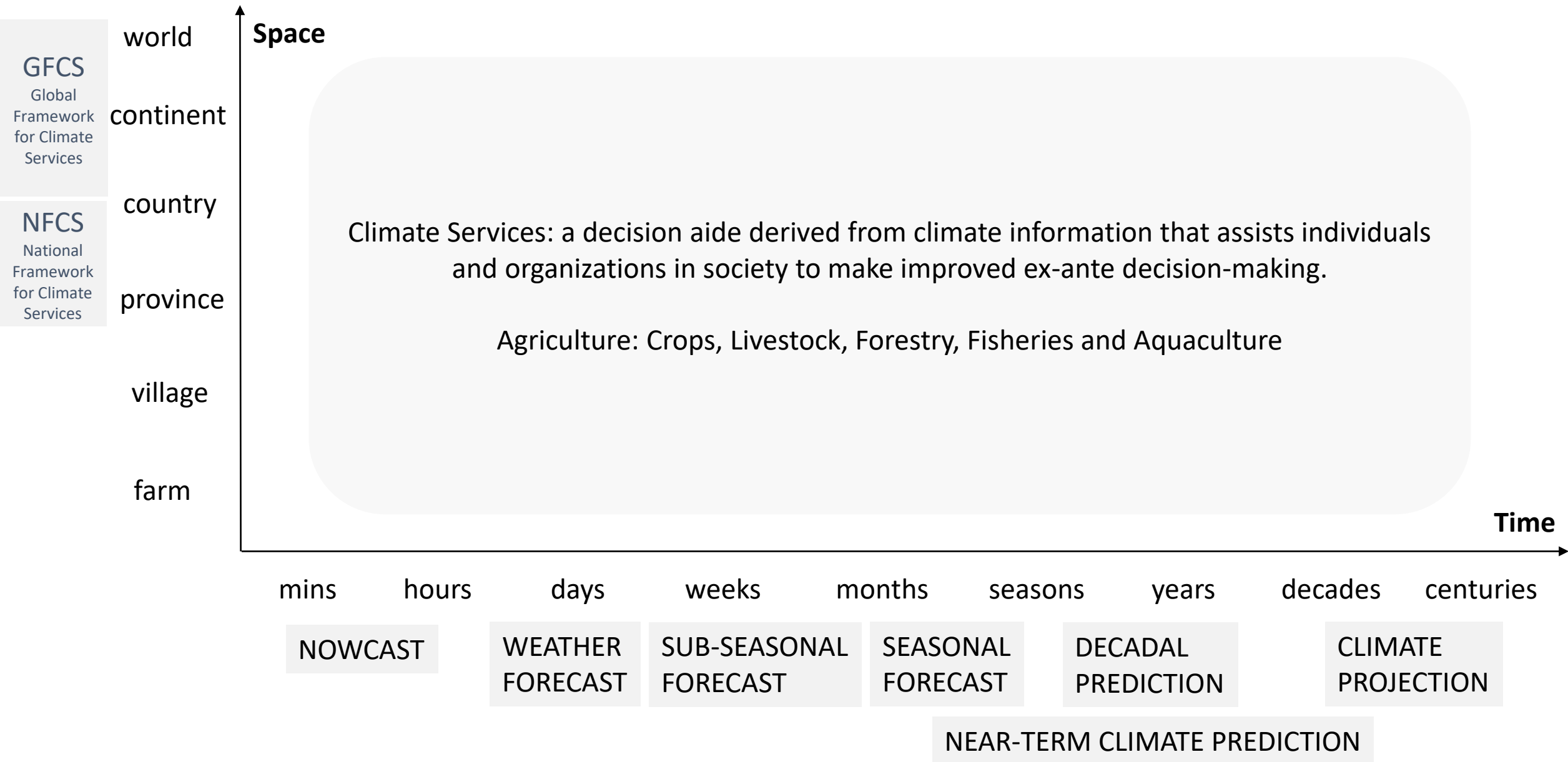
Approximate time horizons of decision-making in the agrifood system

DECISIONS ABOUT ...

TIME HORIZON*

	DAYS WEEKS	MONTHS	YEARS	DECADES

Pesticide application
Pest management
Irrigation scheduling
Harvest timing
Fertilizer application

1 day to 1–2 weeks

Fertilizer planning
Land allocation
Selection of crop cultivars

2 – 3 months

Defining of annual cropping systems
Perennial crop establishment

5 – 10 years

Timber plantation
Policy direction setting
Education and training
Research and development

10 – 30 years

Major dam construction

30 – 50 years
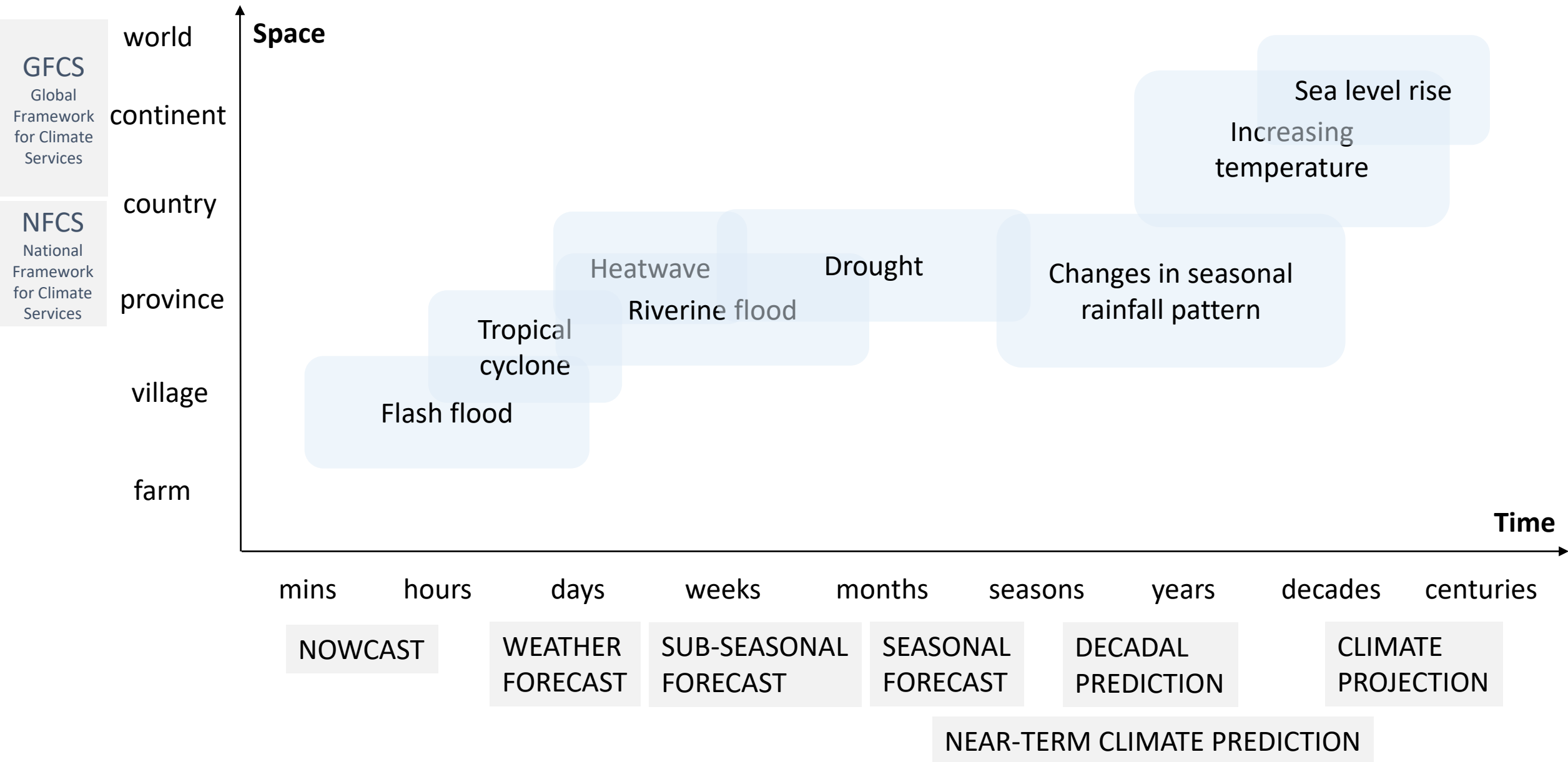
* Note - Approximate logarithmic time scale
Source: Nissan et al , 2018

Agricultural Climate Services – Temporal and Spatial Scales

Space

world

GFCS
Global Framework for Climate Services

continent

country

NFCS
National Framework for Climate Services

province

village

farm

Climate Services: a decision aide derived from climate information that assists individuals and organizations in society to make improved ex-ante decision-making.

Agriculture: Crops, Livestock, Forestry, Fisheries and Aquaculture

Time

mins   hours   days   weeks   months   seasons   years   decades   centuries

NOWCAST

WEATHER FORECAST

SUB-SEASONAL FORECAST

SEASONAL FORECAST

DECADAL PREDICTION

CLIMATE PROJECTION

NEAR-TERM CLIMATE PREDICTION

Agricultural Climate Services – Climatic Hazards

Agricultural Climate Services – Users

GFCS
Global Framework for Climate Services

NFCS
National Framework for Climate Services

Space

world
continent
country
province
village
farm

International (e.g. UNFCCC and governments)

National government

Local government

Extension workers

Private sector

Farmers

Time

mins | hours | days | weeks | months | seasons | years | decades | centuries

NOWCAST

WEATHER FORECAST

SUB-SEASONAL FORECAST

SEASONAL FORECAST

DECADAL PREDICTION

CLIMATE PROJECTION

NEAR-TERM CLIMATE PREDICTION

Agricultural Climate Services – Types of Services
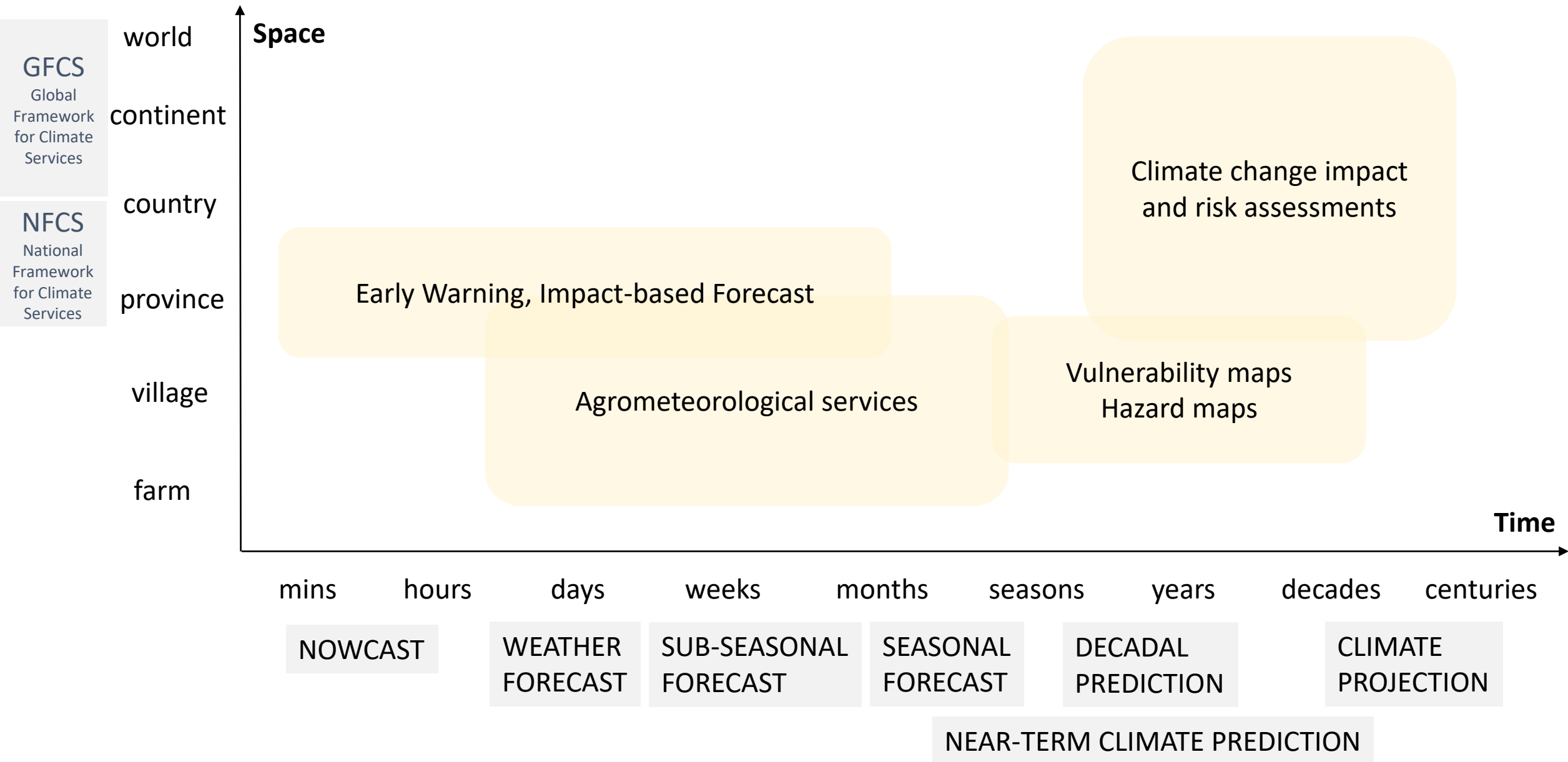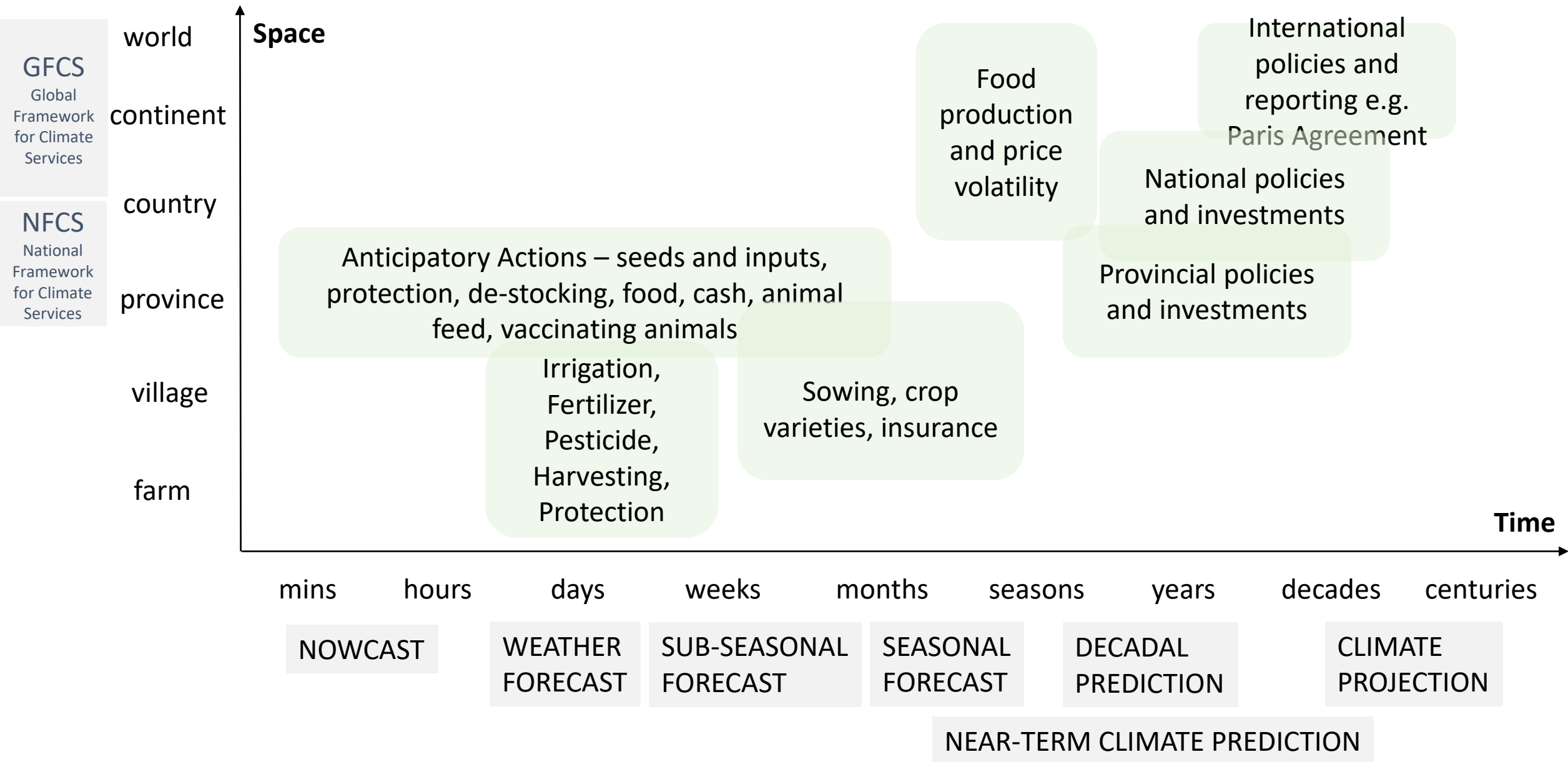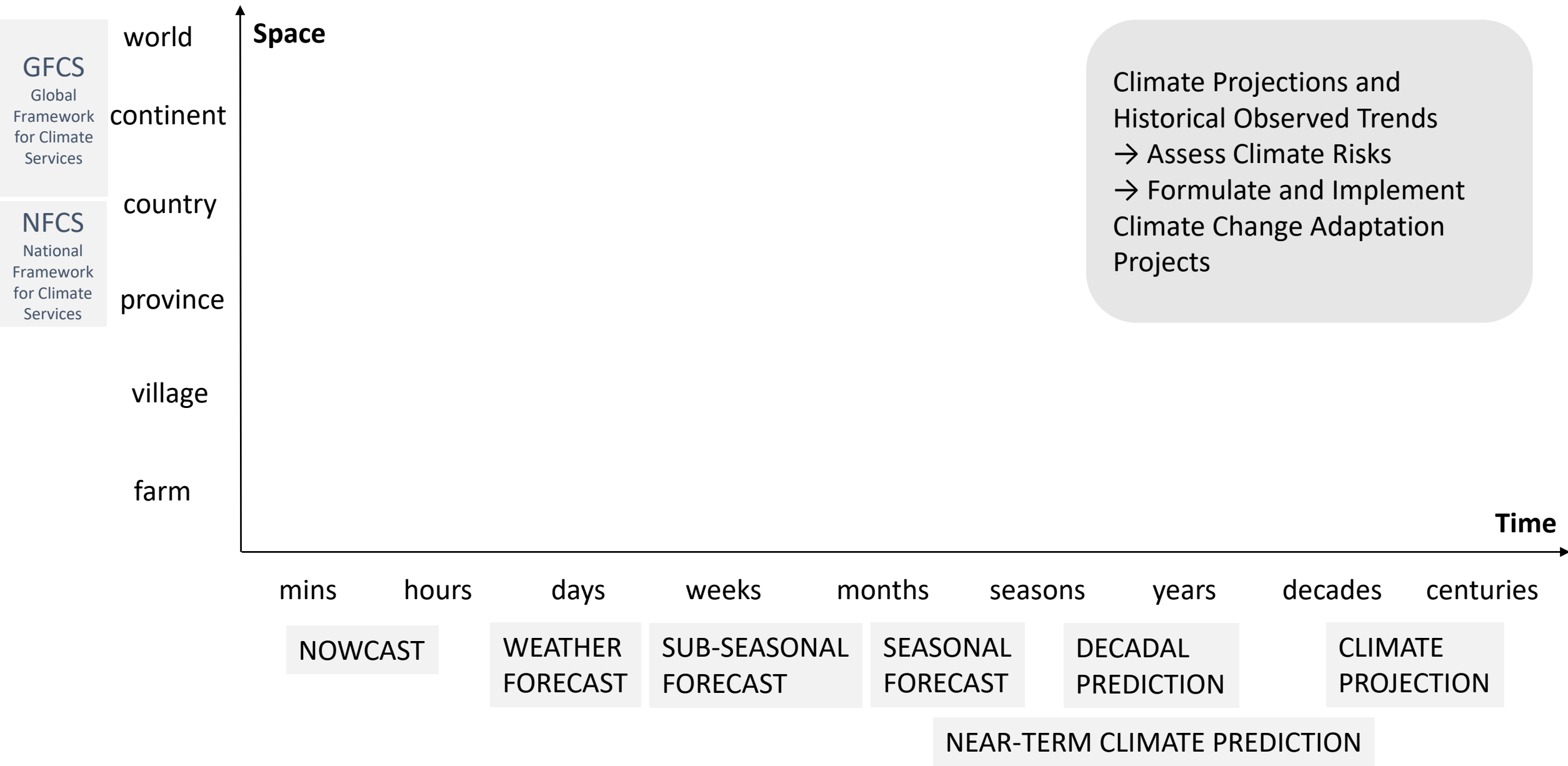
Agricultural Climate Services – Value Chain
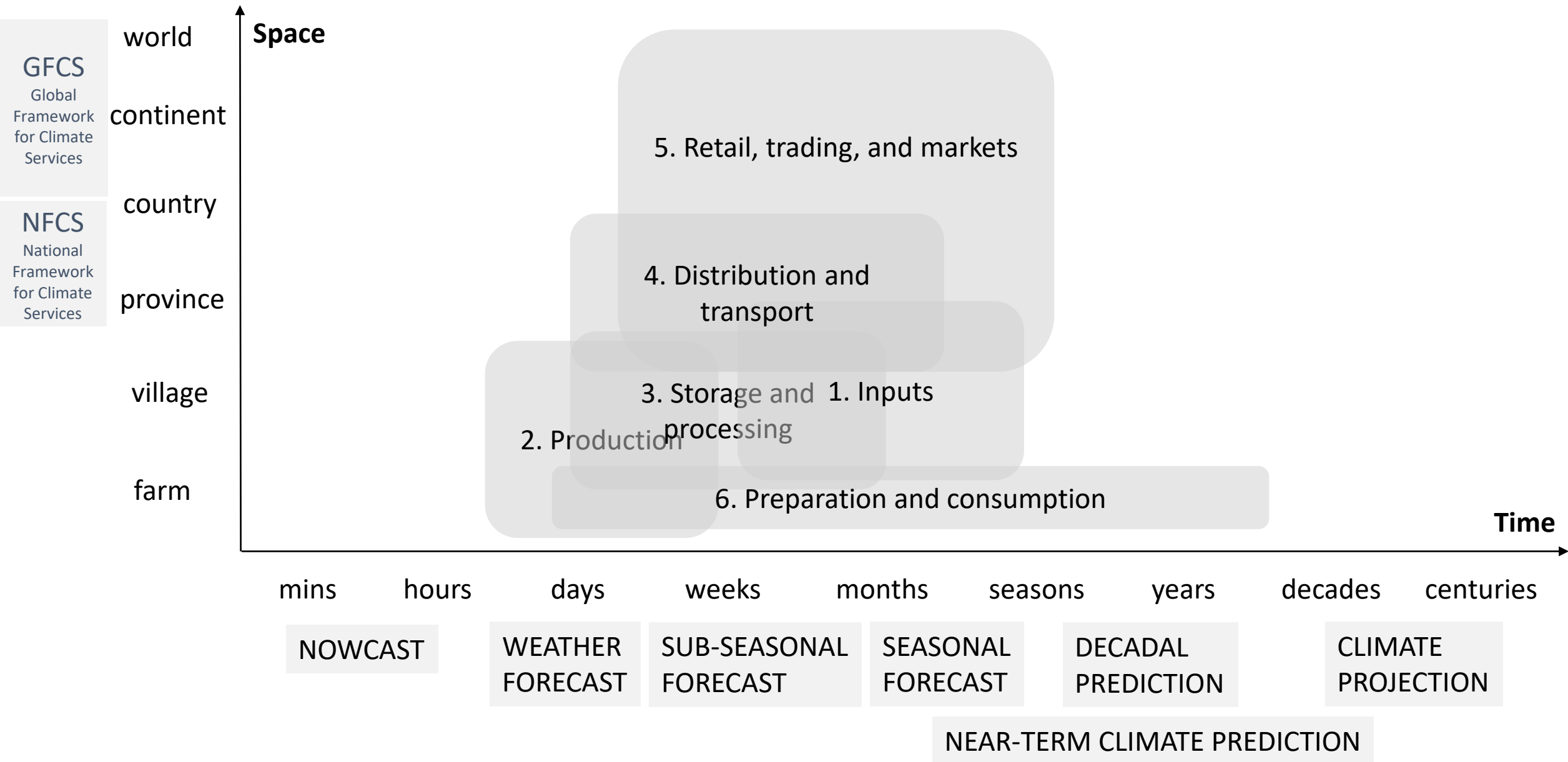
Three main areas of work

- Climate risks assessments
- Agrometeorological services/advisories
- Early Warning and Anticipatory Actions

- Three communities of practice are now converging through seamless provision of Agricultural Climate Services

Agricultural Climate Services

Space

world

GFCS
Global
Framework
for Climate
Services

continent

country

NFCS
National
Framework
for Climate
Services

province

village

farm

Climate Projections and
Historical Observed Trends
→ Assess Climate Risks
→ Formulate and Implement
Climate Change Adaptation
Projects

Time

mins   hours   days   weeks   months   seasons   years   decades   centuries

NOWCAST

WEATHER
FORECAST

SUB-SEASONAL
FORECAST

SEASONAL
FORECAST

DECADAL
PREDICTION

CLIMATE
PROJECTION

NEAR-TERM CLIMATE PREDICTION

GREEN CLIMATE FUND

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Food and Agriculture Organization of the United Nations

FAO

Overview   Projects   Documents   Stories   Contacts

Food and Agriculture Org... ▼

TYPE

International

DATE OF ACCREDITATION

14 Oct 2016

The Food and Agriculture Organization of the United Nations (FAO), is an international organization whose main goals are the eradication of hunger, food insecurity and malnutrition; the elimination of poverty and the driving forward of economic and social progress for all; and the sustainable management and utilization of natural resources, including land, water, air, climate and genetic resources for the benefit of present and future generations.

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FAO Food and Agriculture Organization of the United Nations

Projects

FP188 — CROSS-CUTTING

GAMBIA

Climate Resilient Fishery Initiative for Livelihood Improvement in the Gambia (PROREFISH Gambia)

FP187 — CROSS-CUTTING

BENIN

Ouémé Basin Climate-Resilience Initiative (OCRI) Benin

FP159 — MITIGATION

CONGO

PREFOREST CONGO - Project to reduce greenhouse gas emissions from forests in five departments in...

FP155 — ADAPTATION

JORDAN

Building resilience to cope with climate change in Jordan through improving water use efficiency in t...

SAP019 — CROSS-CUTTING

SUDAN

Gums for Adaptation and Mitigation in Sudan (GAMS): Enhancing adaptive capacity of local commu...

FP145 — ADAPTATION

GUATEMALA

RELIVE — REsilient LIVElihoods of vulnerable smallholder farmers in the Mayan landscapes and the Dry...

FP142 — MITIGATION

ARGENTINA

Argentina REDD-plus RBP for results period 2014-2016

SAP015 — MITIGATION

CÔTE D'IVOIRE

Promoting zero-deforestation cocoa production for reducing emissions in Côte d'Ivoire (PROMI...

SAP014 — CROSS-CUTTING

ARMENIA

Forest resilience of Armenia, enhancing adaptation and rural green growth via mitigation

FP134 — MITIGATION
COLOMBIA
Colombia REDD+ Results-based Payments for results period 2015-2016

FP126 — CROSS-CUTTING
CUBA
Increased climate resilience of rural households and communities through the rehabilitation of produ...

FP120 — MITIGATION
CHILE
Chile REDD-plus results-based payments for results period 2014-2016

FP118 — CROSS-CUTTING
NEPAL
Building a Resilient Churia Region in Nepal (BRCRN)

FP116 — CROSS-CUTTING
KYRGYZSTAN
Carbon Sequestration through Climate Investment in Forests and Rangelands in Kyrgyz Republic (CS...

FP108 — ADAPTATION
PAKISTAN
Transforming the Indus Basin with Climate Resilient Agriculture and Water Management

FP089 — CROSS-CUTTING
EL SALVADOR
Upscaling climate resilience measures in the dry corridor agroecosystems of El Salvador (RE...

FP062 — CROSS-CUTTING
PARAGUAY
Poverty, Reforestation, Energy and Climate Change Project (PROEZA)

Climate Risks

- Climatic hazards (past and future)

- Exposure

- Vulnerability

- Sub-sectors (crops, livestock, fisheries, aquaculture, forestry)

- Livelihoods

- Climate risks information would justify target areas and adaptation actions that lead to transformational changes in agri-food systems

- Climate data, loss/damage data, agricultural statistics, socio-economic data

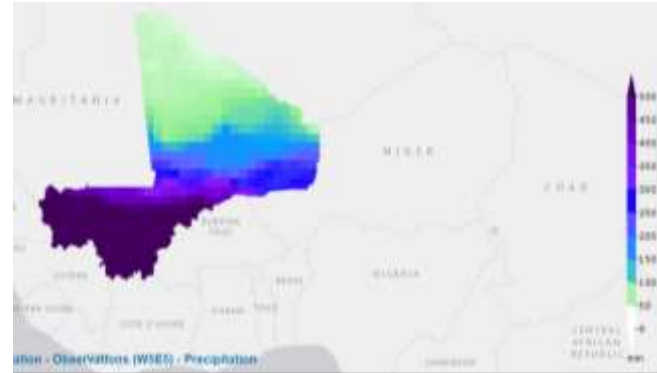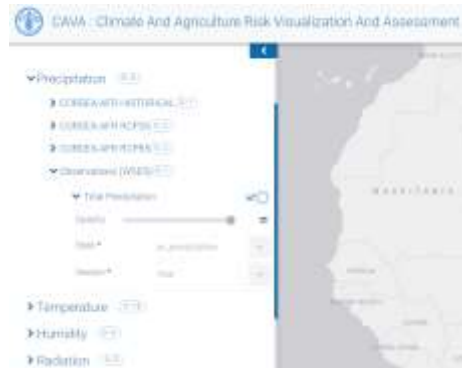- Climate tools plus impact models (e.g. crop model)

Food and Agriculture Organization
of the United Nations

Climate Projections and Historical Observed Trends

	WHY?	WHERE?	WHO?
Climate Risk ToolBox (CRTB)	GEF project PIF climate risk screening	Hand-in-Hand Geospatial Platform	Project formulators
CAVA Platform	GCF project climate rationale	Web platform	Project formulators
CAVA Analytics	More detailed analyses for climate project designs and implementations	Cloud server environment	Expert users

More complex tool
More detailed climate info

Food and Agriculture Organization
of the United Nations

CAVA Platform

Average total rainfall

Automatic report

CAVA Analytics
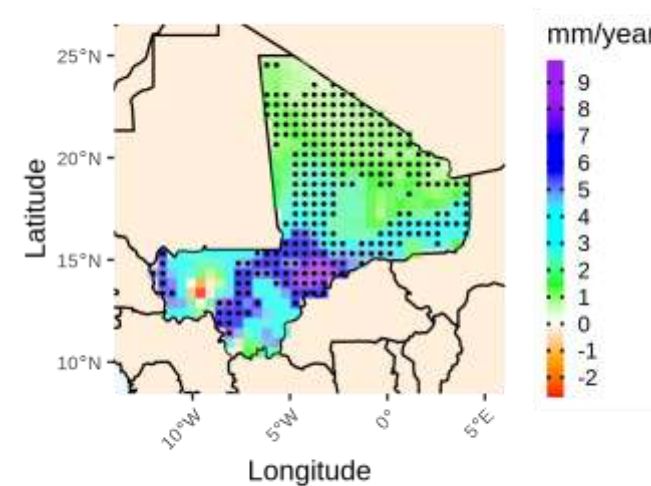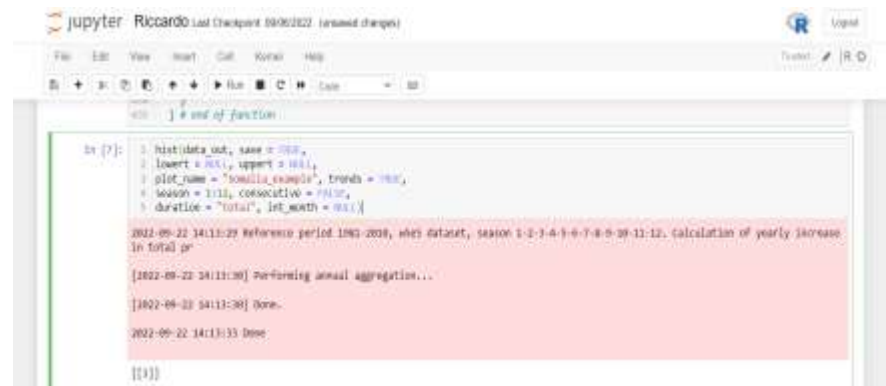
Statistical significance of annual precipitation trends

Agro-ecological zoning and crop suitability maps

Food and Agriculture Organization of the United Nations

- PyAEZ software is designed based on government capacities and needs

- Scalable national modelling to be used at the regional and global model

Suitability of Banana
by input level and year

Low   Medium   High

1990 - 1999

2000 - 2019

Medium cycle variety suitability index

- Very high
- High
- Moderate
- Marginal
- Not suitable
- No data

DALaM and FAO SAMIS, 2021
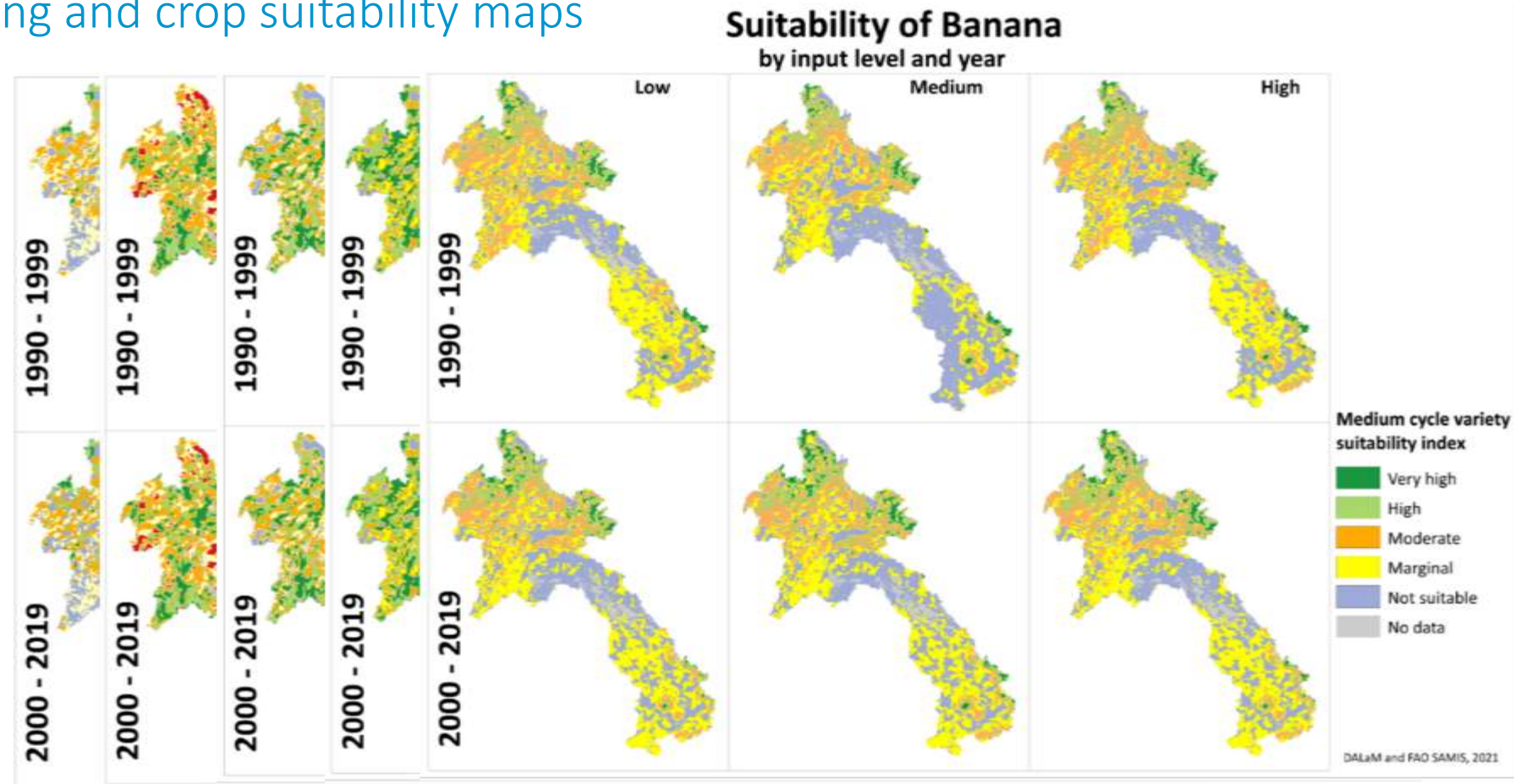
Vision: Regional foresight based on the future of climate

Agricultural Climate Services
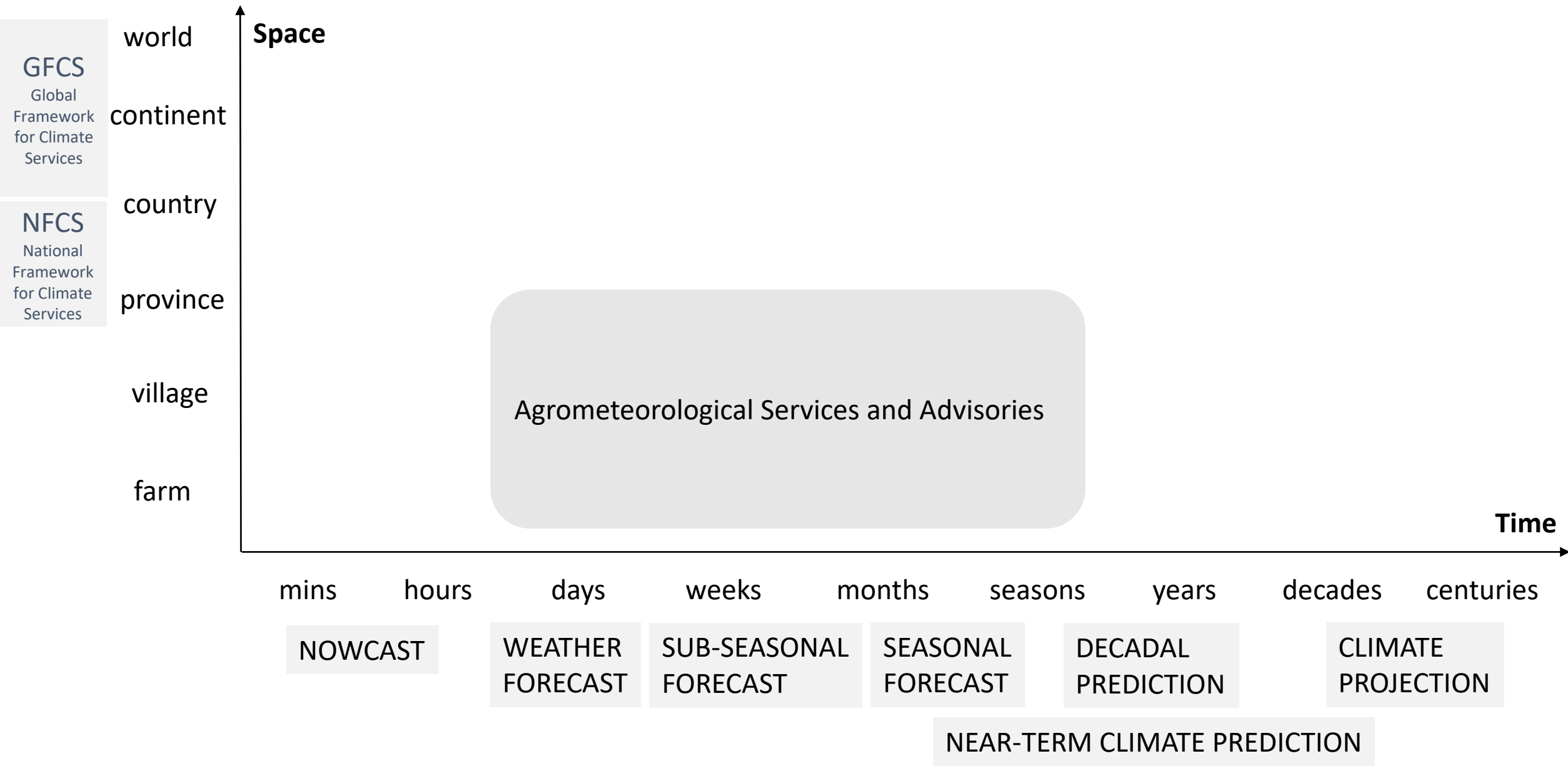
Laos Climate Services for Agriculture (LaCSA)
A transformational national data system

Real time weather and agronomical data collection

Automatic system for bulletin production

Distribution of information through multiple methods

> 100.000 beneficiaries in the first 3 years

Daily tactical decision
Weekly bulletin - district

Seasonal strategic decisions
Monthly bulletin - province

Behavior change (CIAT study)

85 % Change/adjust farm practices
76 % Use of improved crop varieties
65 % Shifts in planting date
40 % Change in water management

Vision: better prediction through machine learning

Agromet Advisory Bulletin for Dhaka District

	Agro-Meteorological Information Systems Development Project **Component-C of BWCSRP** **Department of Agricultural Extension**	
Date: 13rd September 2020 Bulletin No. 180	Agromet Advisory Bulletin for Dhaka District (13th September to 17th September 2020)	

Weather Conditions for last four days (09th September to 12th September 2020)

Weather Parameters	09.09.20	10.09.20	11.09.20	12.09.20	Range
Rainfall (mm)	16.0	2.0	8.0	0.0	0.0-16.0 (26.0)
Maximum Temperature (° C)	34.1	31.5	32.8	34.4	31.5-34.4
Minimum Temperature (° C)	27.2	26.8	26.5	26.5	26.5-27.2
Relative Humidity (%)	62.0-97.0	77.0-93.0	69.0-96.0	62.0-90.0	62-97
Wind Speed (km/h)	1.9	1.9	3.7	1.9	1.85-3.7
Cloud Amount (Okta)	8	7	6	7	6-8
Wind Direction	South/South-westerly	South/South-westerly	South/South-westerly	South/South-westerly	South/South-westerly

Weather forecast as per Bangladesh Meteorological Department for the next 5 days (13th September to 17th September 2020)

Weather Parameters	Range
Rainfall (mm)	0.0-11.3 (23.9)
Maximum Temperature (° C)	32.2-33.3
Minimum Temperature (° C)	25.4-26.2
Relative Humidity (%)	79.0-92.0
Wind Speed (Km/h)	2.5-3.8
Cloud status	Partly Cloudy Sky
Wind Direction	South/South-westerly

Agromet Advisories

Special Agromet Advisories for CORONA virus (COVID-19) transmission in Bangladesh

Farmers and all other farm managements are advised to follow the guidelines of Government of Bangladesh to avoid infection and social transmission of CORONA virus (COVID-19). Precautions and safety measures should be taken up to prevent the Carona virus spread. Simple measures include social distancing, maintaining personal hygiene by washing hands with soap, wearing of face mask, drink hot water, stay at home and cleaning of implements and machinery. Farmers should not work in a group; consult with a doctor in case of any symptom. Please stay at home does not visit the field until it is very necessary.

Salient Weather Conditions & Forecast

The axis of monsoon trough runs through Rajasthan, Uttar Pradesh, Bihar, West Bengal to Assam across northern part of Bangladesh. One of its associated troughs extends up to North Bay. Monsoon is fairly active over Bangladesh and weak over North Bay. As per the weather forecast received from the Bangladesh Meteorological Department (BMD) during next 24 hours, light to moderate rain/thunder showers accompanied by temporary gusty wind is likely to occur at a few places over the district. Day and night temperature may remain nearly unchanged over the district. As per the outlook issued by BMD for next 72 hours, rain/thunder showers activity may increase. During last four days, light to moderate rainfall occurred and as per the quantitative medium range weather forecast trace to moderate rainfall is likely during next five days.

Aus Paddy:

Ripening to Harvesting stage

- Drain out water from crop field 15 days before harvesting.
- Harvest the matured crop in sunny weather while 80% rice ripen.
- Harvest and dry well the grains in sunny weather (12% moisture contain e.g teeth testing) and keep it shady condition for cooling and finally store it air tight container

Aman Paddy

- Since there is possibility of getting moderate rainfall in the coming 5 days, it is advised to repair the bunds in the paddy fields to conserve rain water
- Maintain 5-7 cm standing water up to maximum tillering stage.
- Second weeding should be done 30-35 days after transplanting. Weeding may be done either by hand or using weedicides. 2-4 D Amine or Butachlor may be used for weeding.
- Taking the advantage of the presence of sufficient amount of soil moisture,.apply 1/3rd nitrogen as top dressing 15-20 days after transplanting. Last 1/3 nitrogen as top dressing should be applied 5-7 days before panicle initiation. Before the top-dress of Nitrogenous fertilizer in the field farmers are advised to weeding their rice plot by manually or using herbicide
- Due to substantial decrease in sunshine hours with occasional rain there is chance of attack of Yellow stem borer in Aman rice; to manage the attack, spray Carbofuran @10kg per ha.

SAMOA AGROMETEOROLOGICAL BULLETIN

OBSERVATIONS FOR OCTOBER 2020

Monthly Rainfall Observations (mm)
November 2019 - October 2020

■ Observed Rainfall ■ Normal Rainfall
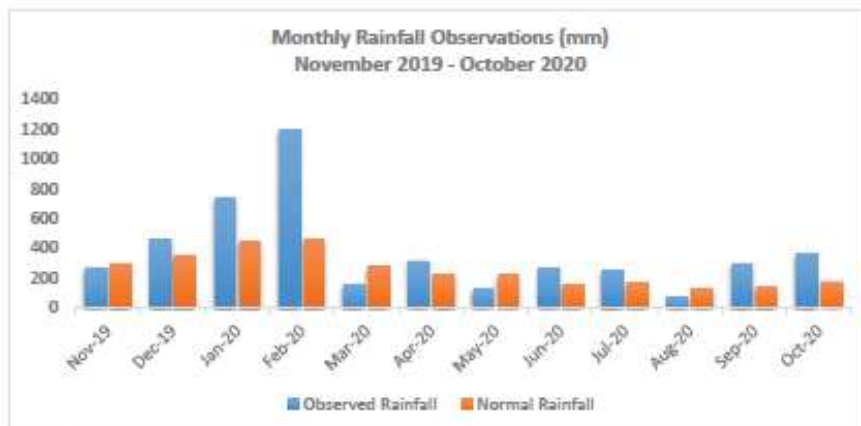
Monthly Rainfall Observations collected at Alafua Station from November 2019 to October 2020. The graph shows that October 2020 observed 'above normal' rainfall of 366.6mm in comparison to its normal rainfall of 172mm.

REPORTS FROM CROP FIELD

- Cabbages transplanted in the first week of October and long beans sown in the same week are growing well under tunnel house conditions.

- Field tomato intercropped with sweetcorn planted on the 31st of September are at the early fruiting stage. No major problems seen except several plants have died from bacterial wilt. Intercropped tomatoes appear to grow better than sole tomatoes at this stage, may be due to high temperatures during dry spells. Flowering and fruit set in both systems look comparable, and a final assessment will be done when harvest is completed.

- Sweetcorn planted on August 17th are also growing well and are in the early fruiting stage. Only a few plants are exhibiting yellowing of young leaves similar to 'dead heart' in this case aphids and mites are seen.

- Taro planted in April 5th is currently at corm bulking stage and is growing well. Only a few plants is showing symptoms of taro leaf blight.

- Eggplant transplanted first week of September are at flowering stage and growing well except for a few bacterial wilt infected plants which is rare for Alafua. Pak Choi cabbage was transplanted into the eggplant plot 14 day ago are also growing well with no pest or disease problems

14 DAYS RAINFALL FORECAST (NOVEMBER 04TH – 17TH)

Wed 04th	Thur 05th	Fri 06th	Sat 07th	Sun 08th	Mon 09th	Tue 10th

Wed 11th	Thur 12th	Fri 13th	Sat 14th	Sun 15th	Mon 16th	Tue 17th

KEY		Light = 0 – 29mm/24hrs		Moderate = 30 – 69mm/24hrs		Heavy = > 70mm/24hrs

RAINFALL OUTLOOK FOR NOVEMBER 2020
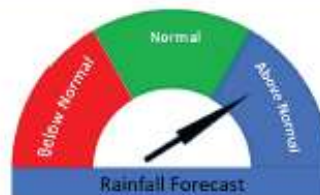
Rainfall Forecast

Rainfall Forecast indicating high possibility of above normal for November 2020

RAINFALL OUTLOOK FOR DECEMBER 2020
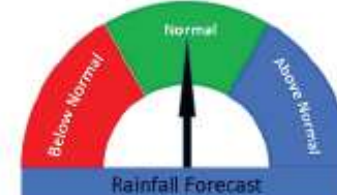
Rainfall Forecast

Rainfall Forecast indicating high possibility of normal rainfall for December 2020

AGRICULTURAL DROUGHT & INSECTS PEST RISK OUTLOOK

Agricultural Drought

Insect Pest Risk

Stages for effective development and provision of *short-term* climate services for the agriculture sector = *agromet services*
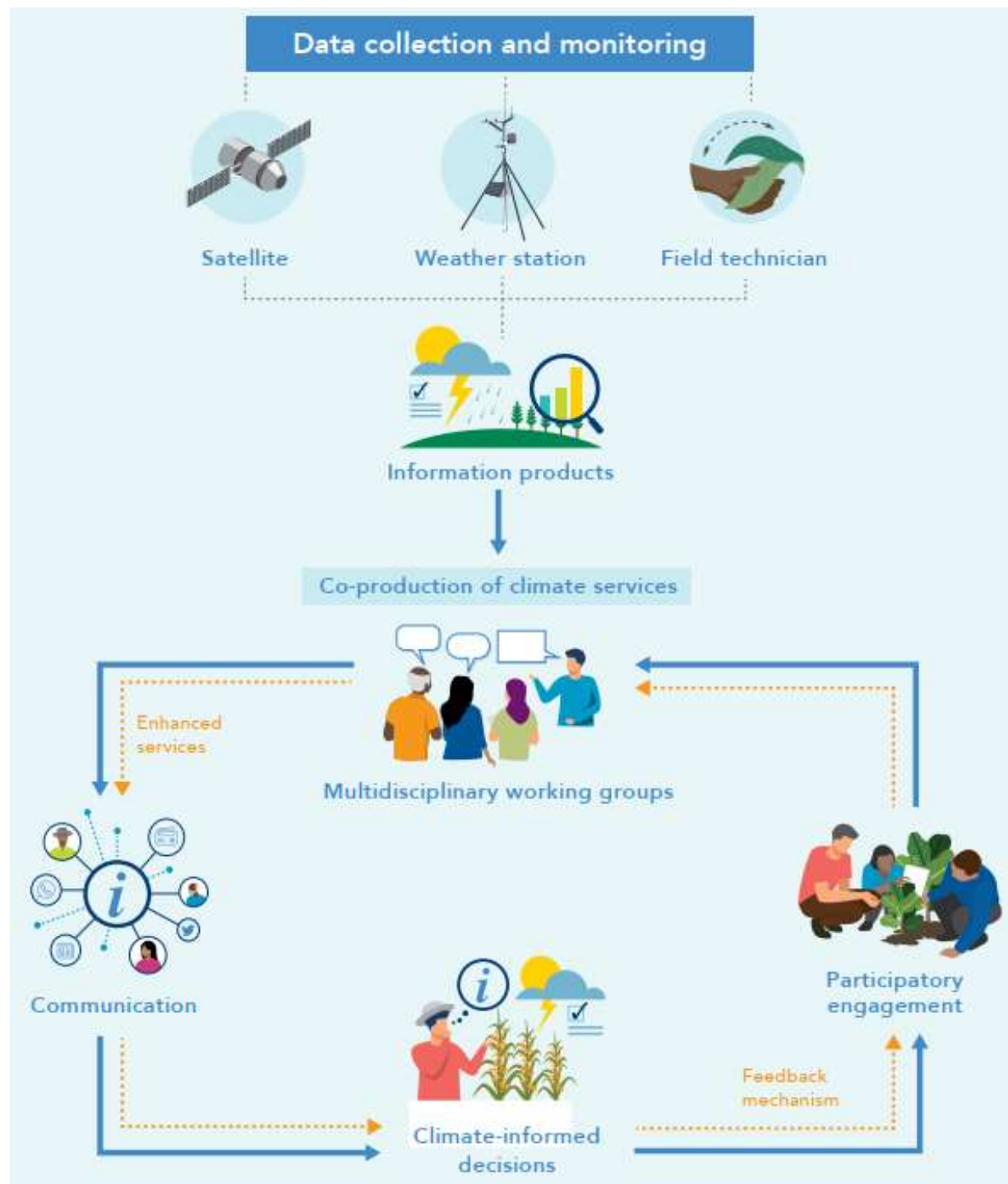
Key components of
short-term climate services for agriculture
= *agromet services*

Knowledge and Capacity Building

- Establish multidisciplinary Technical Working Groups consisting of Ag and Met stakeholders
- Identify risks, needs, and information networks at scales to understand scale-dependent contexts of climate services
- Capacity building of key stakeholders in the value chain for climate services

Information Products

- Tailored information with appropriate spatio-temporal resolution for informed decision making in different scales
- Ministry of Agriculture: monitoring, predicting production of crop/livestock and pest/disease
- National Meteorological Service: climate observations/forecasts, extreme warnings

Climate Services for Agriculture

Institutional and Policy Support

- Standard operating procedures with coordinated role and responsibility among government institutions
- National climate risk adaptation plans
- Institutionalized information delivery and feedback and evaluation mechanism
- National policy support for climate services

Information Delivery and Use

- Climate service delivery channels (bulletin, social/public media, loudspeakers, meetings) considering low climate and/or digital literacy
- Indigenous and state-of-the-art climate smart agriculture practices not only to modulate agro-climatic risks but also to mitigate greenhouse gas emissions
- Integrated pest management practices

Prospects for Enhancing Climate Services in Agriculture

Kwang-Hyung Kim[ID], Chris D. Hewitt, Hideki Kanamaru, Jorge Alvar-Beltrán, Ana Heureux, Sook-Young Park, Min-Hye Jung, and Robert Stefanski

ABSTRACT: Agricultural stakeholders can effectively manage the risks and opportunities arising from climate change and variability by enhancing climate services in agriculture. Key to understanding and addressing the climate challenge is the provision and the use of climate information to aid decision-makers and policy-makers. Climate services are now integral to the United Nations Framework Convention on Climate Change, the Intergovernmental Panel on Climate Change's Assessment Reports, governments' national adaptation plans, funding bodies, and a growing number of sectors and industries worldwide. The article provides our personal perspective, experience, and views on the impor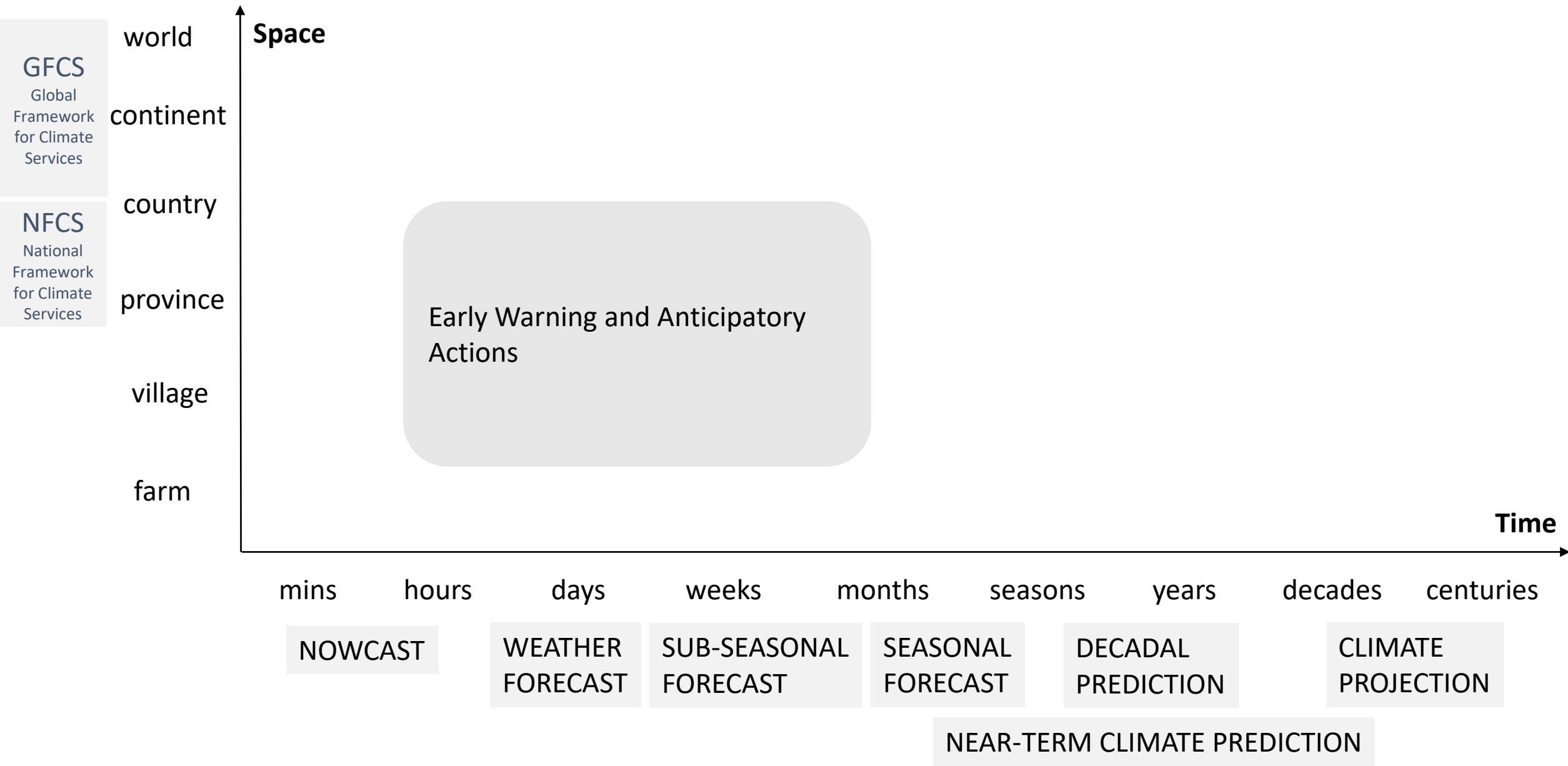tant and timely issue of managing better the risks and opportunities to the agriculture sector and community that are arising from changes in climate. We describe a framework to help drive action to tackle the climate challenge comprising enhanced knowledge and information products, efficient information delivery and use, and assured policy and institutional support, in an iterative loop.

KEYWORDS: Climate services; Climate change; Climate variability; Agriculture

Agricultural Climate Services

Space

world

GFCS
Global Framework for Climate Services

continent

country

NFCS
National Framework for Climate Services

province

Early Warning and Anticipatory Actions

village

farm

Time

mins   hours   days   weeks   months   seasons   years   decades   centuries

NOWCAST

WEATHER FORECAST

SUB-SEASONAL FORECAST

SEASONAL FORECAST

DECADAL PREDICTION

CLIMATE PROJECTION

NEAR-TERM CLIMATE PREDICTION

Anticipatory
Action

WHAT IS ANTICIPATORY ACTION?

Humanitarian response

| Risk of disaster increasing | Preparedness measures implemented | Disaster strikes | Livelihoods impacted or lost | Funds are allocated | Emergency response |

Anticipatory Action Approach

| Monitoring early warning systems | Risk of disaster increasing | Warning trigger | Funds released | Early actions implemented | Disaster strikes | Livelihood support scaled-up |

Mindanao crisis timeline

	AUG 2018	SEP	OCT	NOV	DEC	JAN 2019	FEB	MAR	APR	MAY	JUN	JUL

SEASONALITY MAPPING

Climate patterns

Typhoon season — Peak

Agriculture and livelihood mapping — Dry season rice

Wet season rice

IMPACT ANALYSIS

Drought impact — on rice / on livestock

EMERGENCY RESPONSE TIMING

Typical peak of need

TIMING OF EWEA FOR THE 2018/2019 DROUGHT

Early warning triggers

International forecasts show below-average rainfall and high temperatures over the next three months

Philippines at high risk of emerging weak El Niño

FAO's Early Warning System is triggered:
► immediate anticipatory action

PHASE 2
Livelihood diversification efforts through the provision of quick growing/yielding vegetable seeds, along with garden tool kits, cash for work (particularly to families who could not reach their rice fields due to the conflict) and the procurement of goats and ducks

Anticipatory action

PHASE 1
Rapid assessment to understand crop development and early signs of stress, quickly followed by the procurement of drought-tolerant rice seeds and fertilizers, along with irrigation support

Early Warning

- Monitoring tools aimed to build evidence and confidence about the development and potential impact of these events on lives and livelihoods

- Aim to support decision making, based on **readily and regularly available information** – building upon existing systems if possible

- Hydro-meteorological forecasts, seasonal and vulnerability information

- Provides the **trigger** to act early

- The decision of when and whether or not to take preparatory action on seasonal forecasts depends also on risk appetite

-> **action upon uncertainty required**

Example: The Philippines

- Indicators (range of hydro-meteorological & seasonal, no vulnerability information available):
  - El Niño
  - 1 and 3 month rainfall & temperature forecast (IRI, PAGASA, World Meteorological Organization)
  - Cumulative rainfall (PAGASA)
  - Vegetation health index (GIEWS)
  - Agricultural stress index (GIEWS)
  - Dry spells (PAGASA)
  - Soil Moisture (PAGASA)

- Thresholds: Established based on historical drought events and testing periods

- Triggers for 2018/19 drought: El Niño alert issued, below-average rainfall forecast, dry-spells and aligning with a key cropping season
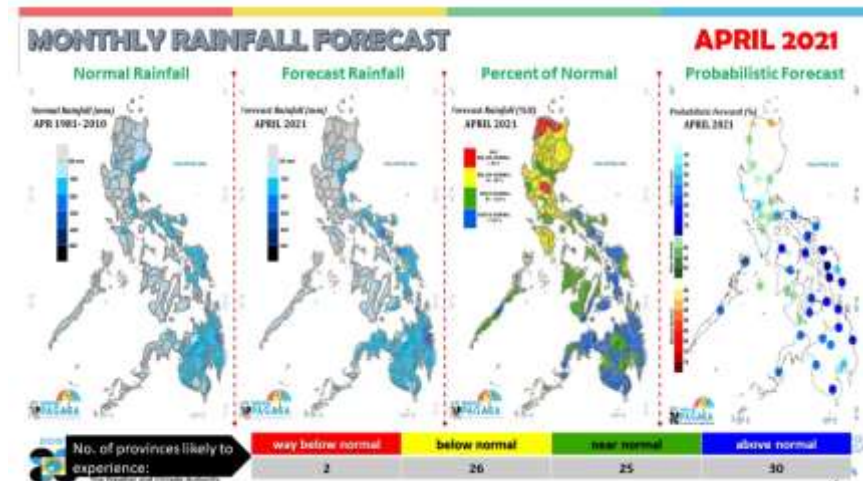
Challenges

- Need to better **assess the skill of the seasonal forecasts** and if they can be connected to national trigger systems

- Collecting and analysing **data to set triggers** (i.e. daily weather records and evidence of extreme events)

- Connecting forecasts to tailored **messages** for communities

- **Risk appetite** of actors to act on the forecasts and confidence on the skill level varies

- **Institutionalisation** and sustainability of trigger methods

Anticipatory Actions

Criteria:

- Timebound

- No harm & no regrets

- Technically sound

- Verified with communities

- Logistically feasible

Examples of Anticipatory Actions

- Ahead of a warning of a severe winter season in Mongolia, **destocking-for-cash and health kits** were provided to herders to keep their animals alive and healthy

- **Before a peak** of drought in Afghanistan provide drought-tolerant seeds, cash and livestock health kits/feed to protect livelihoods

- On a flood trigger warning in Bangladesh, **distribute cash, water proof drums, animal feed and dignity kits** to safeguard food security, livelihoods and vulnerable women and girls

THE EFFECTIVENESS OF ANTICIPATORY ACTION

For every USD 1 spent on interventions, households had a return of:

PHILIPPINES	KENYA	MONGOLIA	MADAGASCAR	SUDAN	COLOMBIA
4.4	3.5	7.1	2.5	6.7	2.6

LINKING ACTIONS TO — Food Security | Nutrition | Resilience

EXPLORING SECONDARY BENEFITS — Education | Health | Dignity | Migration

INSIGHTS INTO — Programming | Coordination | Gender and conflict programming

Conclusion

- Agriculture is one of the most vulnerable sectors to climate change
- Agri-food system is complex and interdisciplinary
- Promoting seamless Agricultural Climate Services that cuts across space and time
  - Long-term information supports policies, programmes and investments for transformation of agri-food systems
  - Short-term information is an integral element to robust adaptation practices
- Need more work in non-crop subsectors
- Bridging gaps between academic research and applications in developing country context