

# Operationalizing the use of weather and climate information for agriculture in Asia

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Regional Integrated Multi-hazard Early-warning System (RIMES)

**APEC Climate Symposium 2016  
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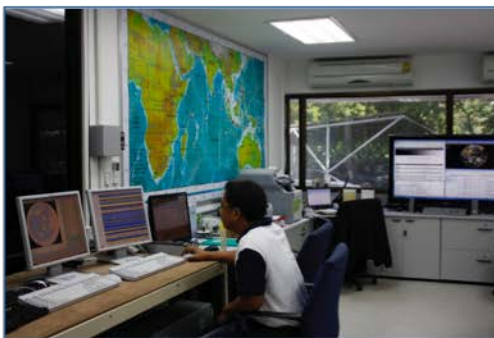


# Overview

- ✧ **RIMES Intro**
- ✧ **Weather and Climate information**
- ✧ **Agromet advisory expert system  
Myanmar**
- ✧ **Summary points**

# About RIMES

- ✧ Established on 30 April 2009
- ✧ **Intergovernmental**, owned and managed by Member States
- ✧ Registered with the United Nations under Article 102 of UN Charter
- ✧ UN ESCAP support for RIMES institutional development

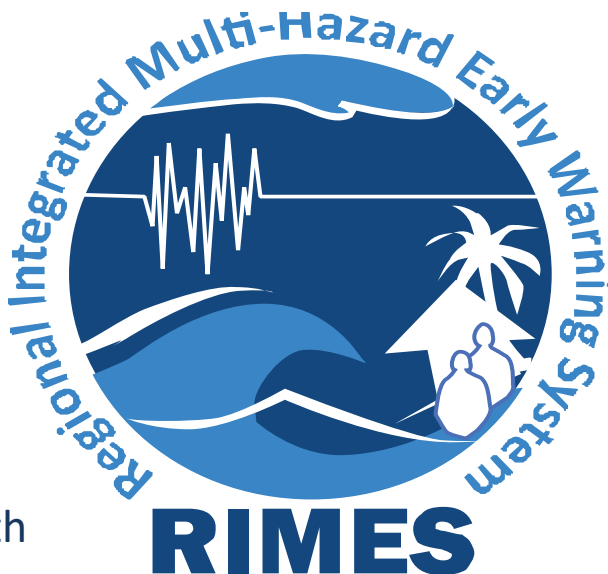


# About RIMES

**Regional:** 32 Member and Collaborating States in Asia and Africa

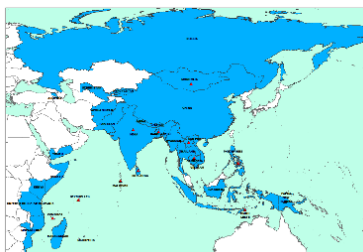
**Integrated:** links science with generators and users of early warning information

**Multi-hazard:** started with tsunami and earthquake, and expanded to include hydro-meteorological hazards



**Early warning:** with mandate to provide early warning services for enhanced preparedness for, responses to, and mitigation of natural hazards

**System:** consists of regional technical support unit, connected to national and local systems



# Operationalization

- Translation of science and technology into **services** – result in benefits by **influencing decisions**
- The **appropriate** levels of complexity that result in acceptability
- **Scalable** to accommodate better technologies
- **Institutional** connect
- High degree of **end-user linkage** and participation, feedback
- **Standards** – accountability, confidence



Successful agricultural production involves minimizing impacts of adverse climate and maximize the favorable periods

– *with changing climate we need to take note of its “enhanced relevance”*  
***Making more effective use of climate information***  
***SDGs/DRR/CA***

# Climate Smart Agriculture



INCREASES PRODUCTIVITY AND INCOME – sustainably

*Stress Tolerant Crops / Crop diversification.*

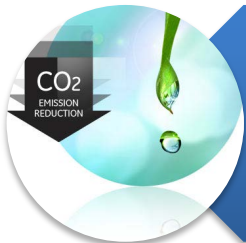
*Water harvesting/saving technologies*



STRENGTHENS RESILIENCE – to climate change and variability

*ICT-based agricultural management*

*Alternative wetting and drying (AWD) of rice paddies*



REDUCES AGRICULTURE'S CONTRIBUTION TO CLIMATE CHANGE – carbon storage and reduce emissions

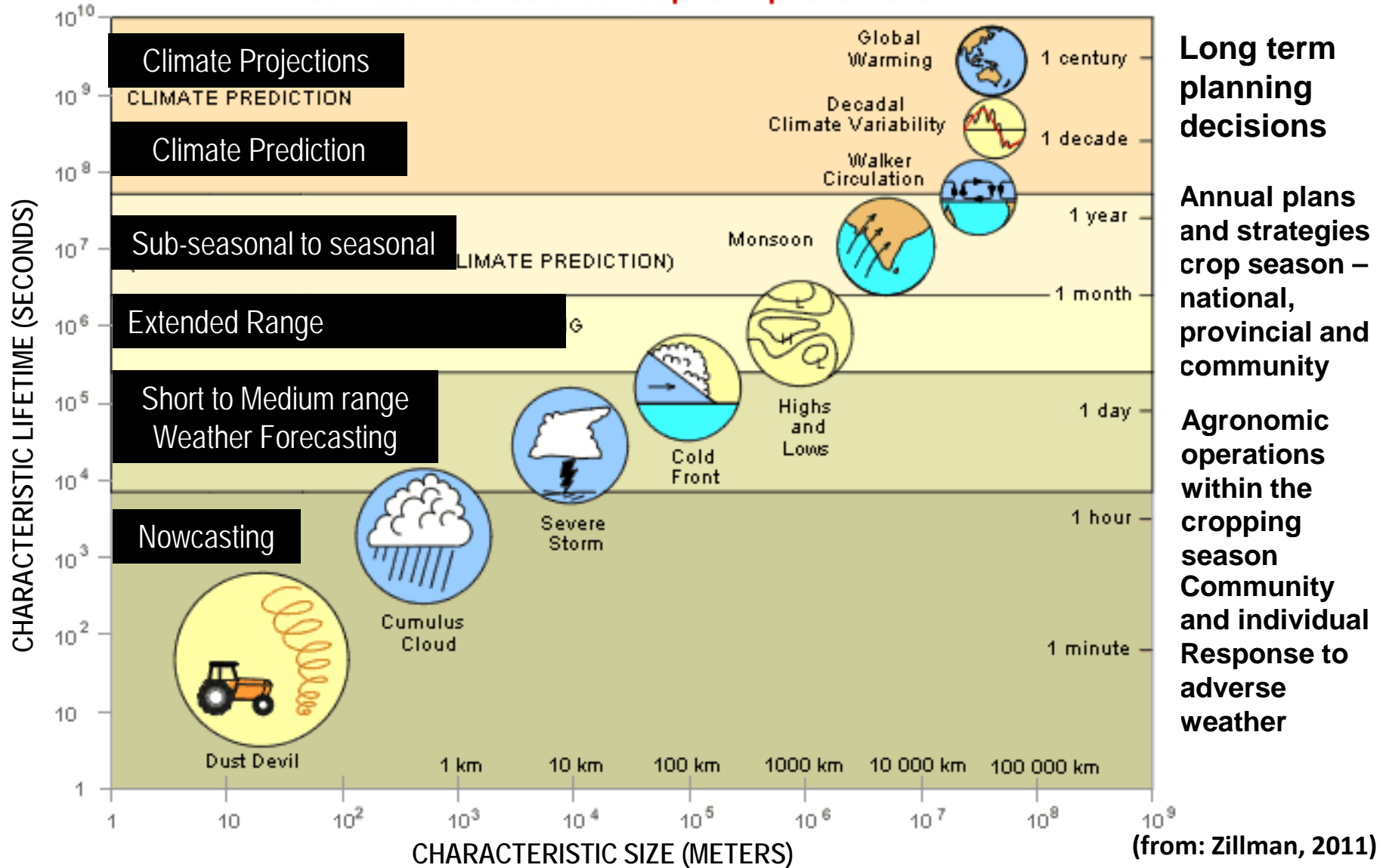
*No-till technology*

*Climate Smart Villages (CSVs)*

Climate Information

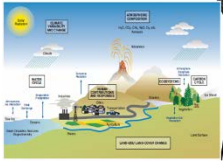
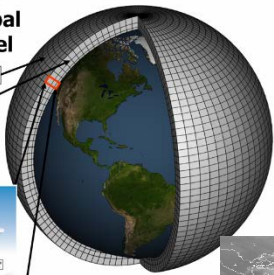
# Scales of weather & climate information

## Lifetimes and sizes of atmospheric phenomena

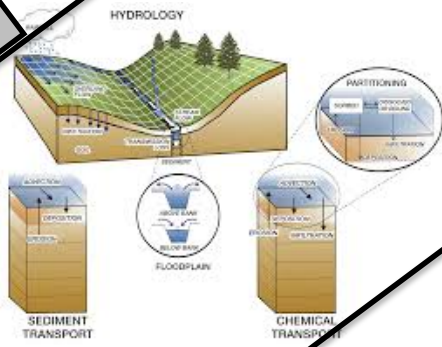
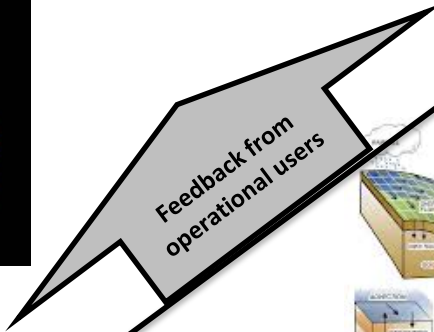
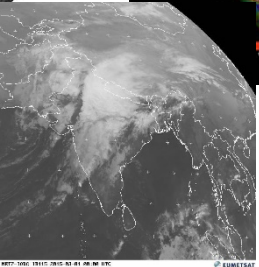
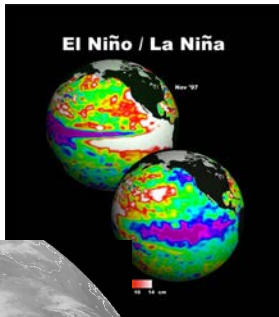
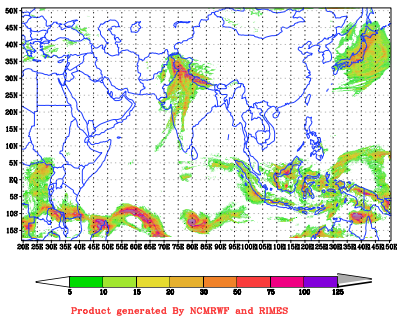


**Schematic for Global Atmospheric Model**

Horizontal Grid (Latitude-Longitude)  
Vertical Grid (Height or Pressure)



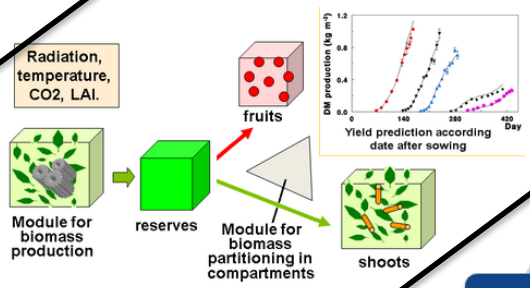
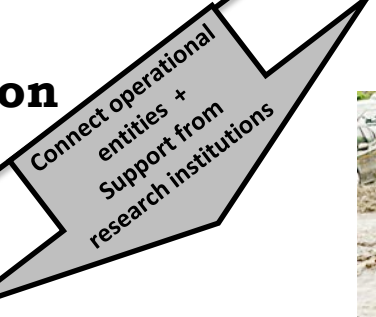
Simulation for 24 Hour Accumulated Rainfall in mm  
Valid from 01032015 00UTC to 02032015 00UTC



**Sector Departments that use climate information**



**Sector level translation of weather and climate information**



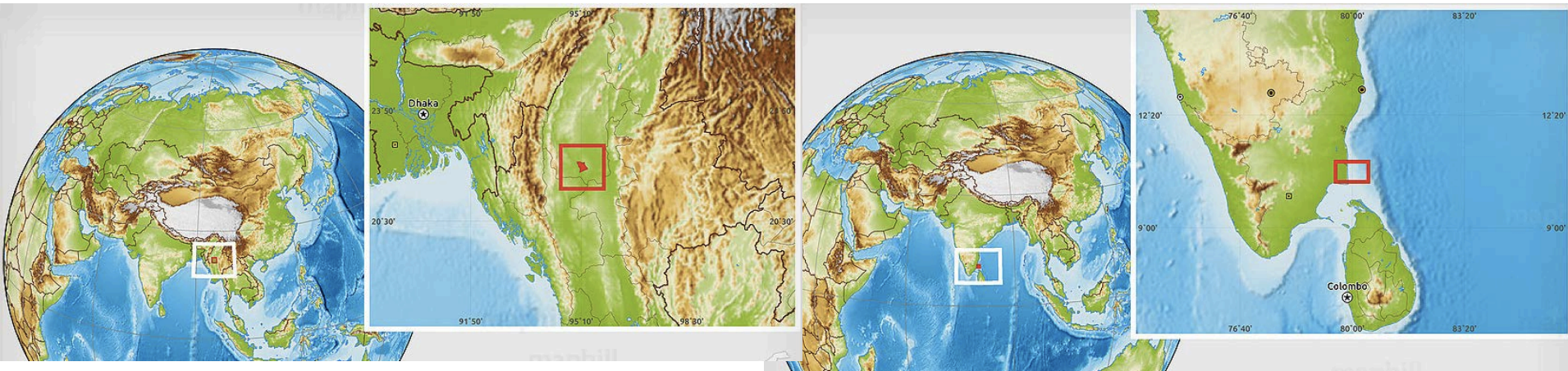
**End users**





- Integrate data from diverse sources
- Maximize the utilization of Obs/AWS/remote sensing data being generated
- Use in conjunction with forecast information
- Produce weather/climate information to enable coping to climate variability and extremes

# Agro-Met Data Management and Advisory System



Myanmar Dry Zone

Tamil Nadu - Thiruvavur

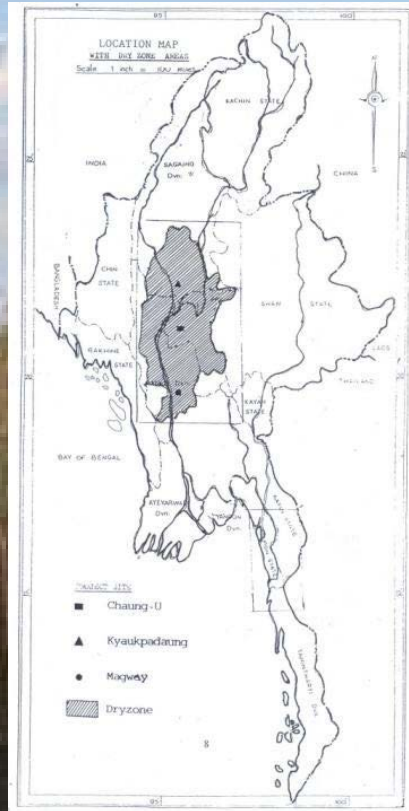
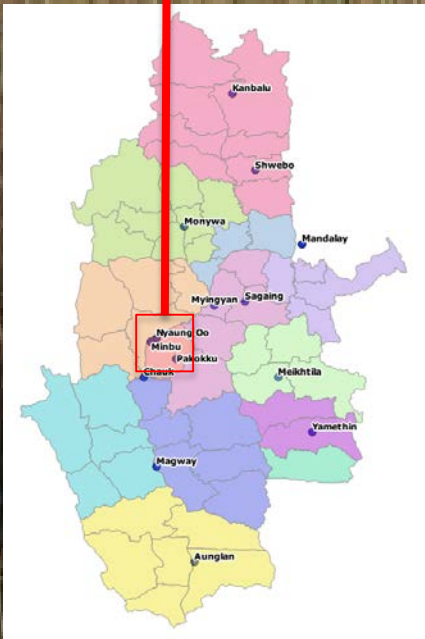
# Myanmar Agro-advisory system



- **RIMES has been working** with Dept of Meteorological and Hydrology since 2009 on National Monsoon Forums and other projects
- Improvements in **Agromet Services has been a priority for DMH**
- Present project **supported by the UN ESCAP** – under a broader Capacity Development project of DMH
- Development of the Agromet Observational network – **17 AWS stations** installed in diverse agro-climate zones.
- **Agro Met advisory bulletins** based on DMH dekdal bulletins

# Myanmar Dry Zone

Nyaung Oo  
Monywa

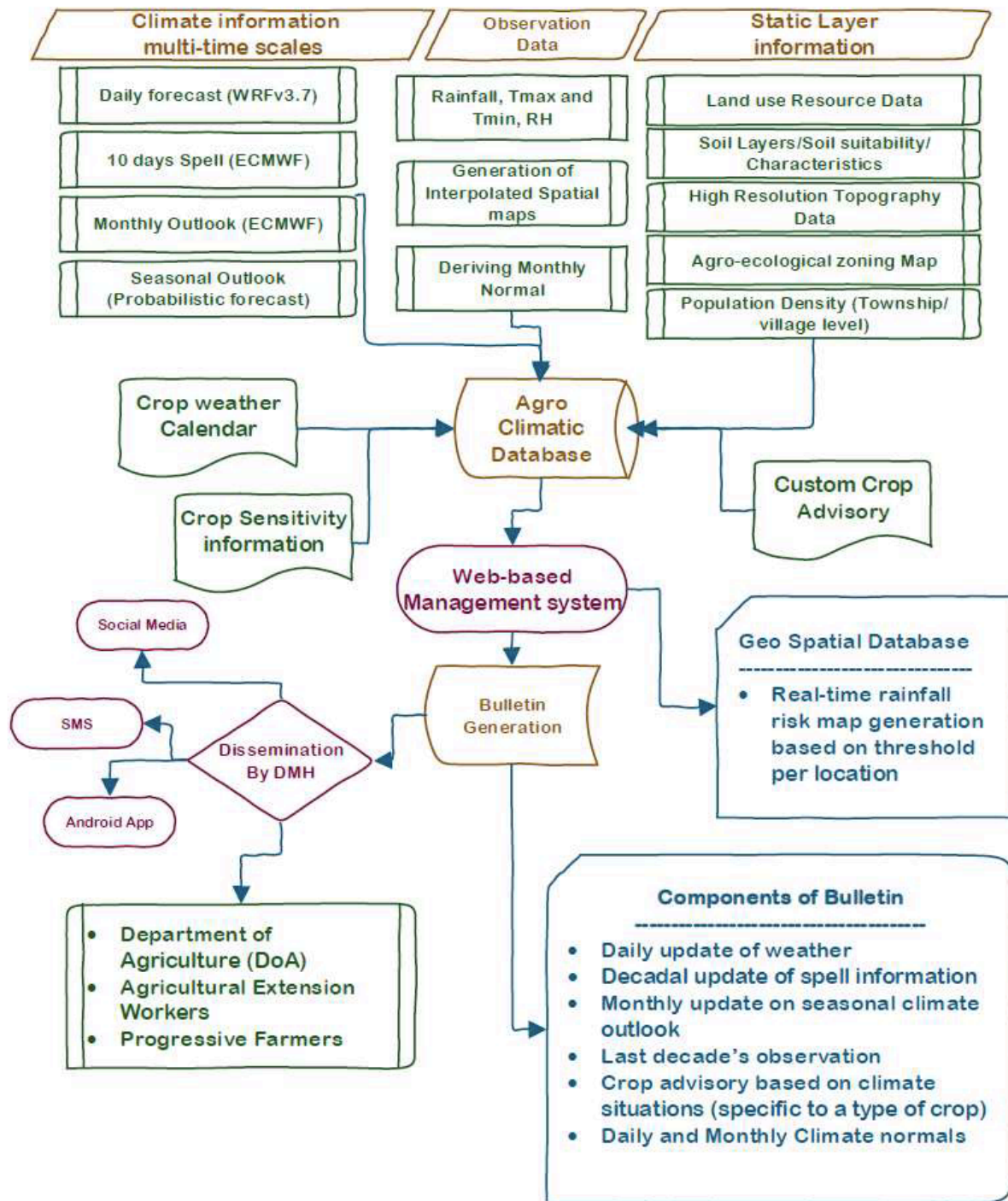




# SESAME

A web based online platform to generate and disseminate agro-met bulletins based on short and medium range weather and climatic parameters <http://agro.rimes.int/myanmar>

- Customized for two pilot sites of Dry Zone in Myanmar viz. Nyuang Oo and Monywa.
- Built on two weather model input datasets
  - ECMWF Deterministic Forecast with 10 days lead time
  - WRF Model data from RIMES with 3 days lead time
- Operationally ingest two datasets and generate 10 days or decadal Agro-Met bulletins (email and fax) and 3 days short-term forecasts disseminated by SMS messages/social media
- DMH and DoA Myanmar institutional partnership & support



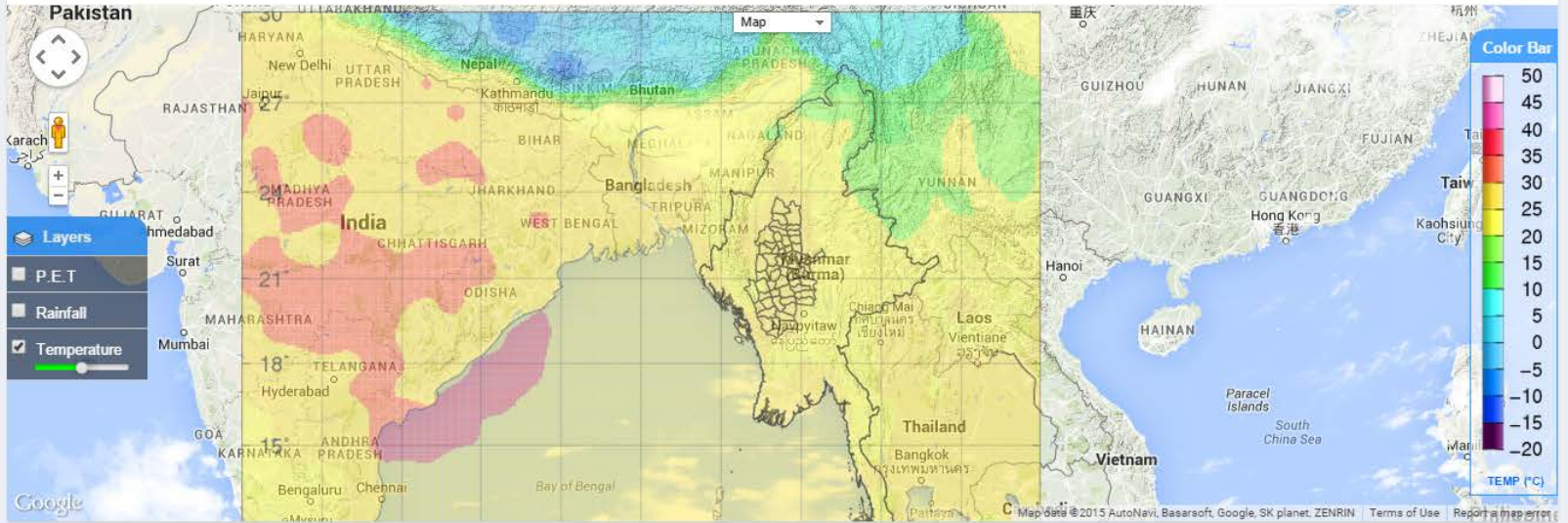
Dashboard

Overview Dashboard

10 DAYS FORECAST OBSERVATION MONITORING

Day [ From 2015-05-28 To 2015-06-07 ]

D1 D2 D3 D4 D5 D6 D7 D8 D9 D10



Most Recent Advisories

<p><b>May</b> 21-31</p>	<p><b>Location Name</b>      <b>Monywa</b></p> <p><b>Accumulated Rainfall</b>      Expected accumulated rainfall for dekad 21-31 May 2015 is 3.0875 The spell is expected to be mostly Dry</p> <p><b>Temperature Forecast</b>      Expected variation in this dekad 21-31 May 2015 is likely to from maximum temperature of 37.345 to minimum temperature 27.0625</p> <p><b>Wind Forecast</b>      Expected Wind for 21-31 May 2015 is likely to to be of Average wind speed of 14.4875</p>	<p>Bulletin</p>
<p><b>May</b> 21-31</p>	<p><b>Location Name</b>      <b>Nyuang Oo</b></p> <p><b>Accumulated Rainfall</b>      Expected accumulated rainfall for dekad 21-31 May 2015 is 1.555 The spell is expected to be mostly Dry</p> <p><b>Temperature Forecast</b>      Expected variation in this dekad 21-31 May 2015 is likely to from maximum temperature of 36.52 to minimum temperature 26.54</p> <p><b>Wind Forecast</b>      Expected Wind for 21-31 May 2015 is likely to to be of Average wind speed of 16.7025</p>	<p>Bulletin</p>



# System Components

- Overview
  - Display dashboard for weather and bulletin board
- Advisory
  - Compose and send bulletins
- Data Panel
  - Administration panel for data and maps.
- Climate Monitoring Panel
  - Monitoring panel for observed data



# Data and Models

## Crop data and Crop weather Calendar

## Crop data and Crop weather Calendar

6 crops for both locations is incorporated within the system.

- Paddy
- Sesame
- Pigeon pea
- Cotton
- Chili
- Groundnut

Crop Weather Calendar is also incorporated within the system to relate decadal weather parameters with present crop stage.

Inputs from Farmer Field Schools

Decades	Period	Paddy	Sesam	Pegion Pea	Cotton	Chilli	Groundnut
1	1-10 Jan			EH 1 2 4 5		7 1 2	
2	11-20 Jan			1 2 4		1 2	
3	21-31 Jan					LH 1 2 4 7	
4	1-10 Feb	1 2 4				1 2 4 7	
5	11-20 Feb	LH (1, 2, 4)				1 2 4 7	
6	21-28 Feb	1 2 4					
7	1-10 March	1 2 4		LH 1 2 5			
8	11-20 March			1			
9	21-31 March			1			
10	1-10 April		ES 1		1		
11	11-20 April		1 2		1	1	
12	21-30 April		1 2		1	1	1 1 2
13	1-10 May		1	ES 1	ES 1 2		1 ES 1
14	11-20 May		1	1 2	1 2	1 2	1 2
15	21-31 May				1	1 ES 1 2 4	1 2
16	1-10 June	ES (1)	S 1		1 LS 1 2	1 2	1 2
17	11-20 June	1 2	1 2		1 1 2	1 2	1 2
18	21-30 June	1 2		1 LS 1 2		1 1 2	1 2
19	1-10 July		1 LS 1	1 2		1 1 2	LS 1
20	11-20 July		1 1 2		1	1	1 1 2
21	21-31 July	1 2	1 2	1 2	1 5	1 2	1 2
22	1-10 August	LS (1, 2)	EH 1 2 4		1 EH	LS 1 2 4	1 2
23	11-20 August	1 2	1 2		1 1 5	1 2	1 2
24	21-30 August	1 2	1 2		1 1 5	1 2	1 2
25	1-10 September		1		1 1 5	EH 1 2 4 7	1 2
26	11-20 September		1		1 1 5	1 2 4 7	1 2
27	21-31 September	1 2 4	LH 1 2 4		1 LH	1 2 4 7	EH 1 2
28	1-10 October	EH (1,2,4)	1 2		1	1 2	LH 1 2
29	11-20 October	1 2 4	1 2		1	1 2	
30	21-30 October	1 2 4			1	1 2	
31	1-10 November				1	1 2	
32	11-20 November				1	1 2	
33	21-30 November				1	1 2	
34	1-10 December			1 5		7 1 2	
35	11-20 December			1 5		7 1 2	
36	21-31 December			1 5		7 1 2	

**Code Identification:**  
 S- Sowing  
 ES- Early Sowing  
 LS- Late Sowing  
 EH- Early Harvesting  
 LH- Late Harvesting  
 1- Rainfall forecast Required  
 2- Temp.Max. Forecast Required  
 3- Temp.Min. Forecast Required  
 4- Windspeed Forecast Required  
 5- Fog Warning  
 6- Hailstorm Warning  
 7- Thunderstorm Warning



# Weather Forecasts

D1

D2

D3

D4

D5

D6

D7

D8

D9

D10

Map

China

Shanghai

East China Sea

Taipei

Osaka  
大阪

Color Bar

50

45

40

35

30

25

20

15

10

5

0

-5

-10

-15

-20

TEMP (°C)

**Weather forecasting system use two forecast models for generating forecast at two lead time**

**ECMWF Deterministic Forecast → 10 days lead time**

Gridded maps are generated based on ECMWF Deterministic Data with 10 days lead time.

ECMWF deterministic forecast is used to generate decadal agro-met bulletins (10 days)

A larger domain of lat → 5 to 30 degrees and lon 75 to 105 degrees is taken to accurately capture climatic variation over Myanmar.

Potential Evapotranspiration is based on Hargreaves Method and is a derived parameter from ECMWF data.

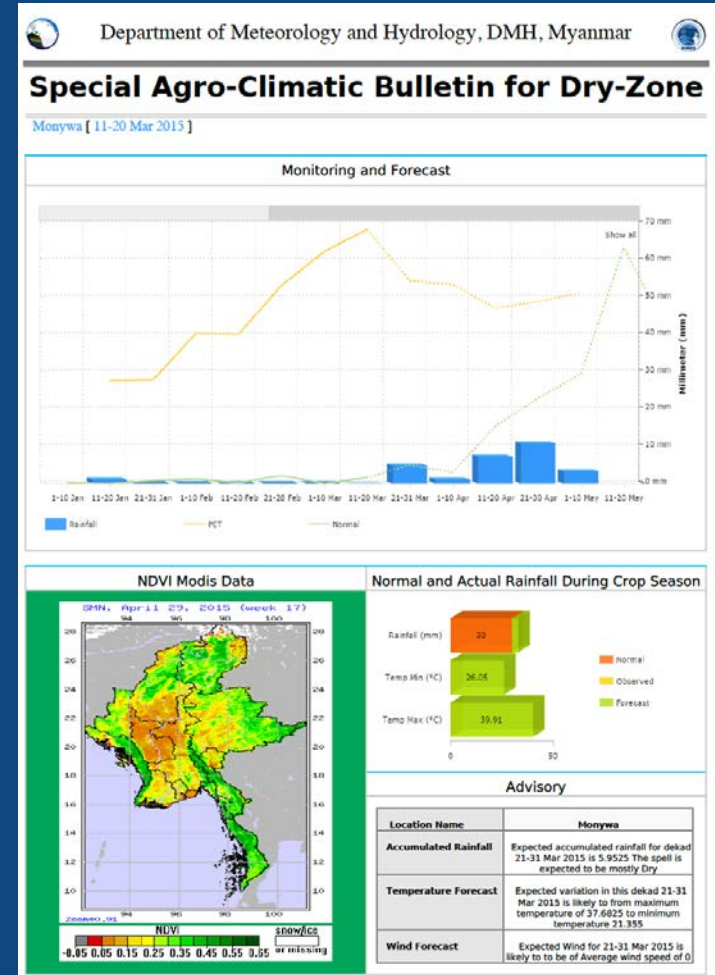
**WRF Forecast from RIMES with 3 days lead time**

WRF forecast is used to generate short term weather watch of 3 days and is send via SMS.



# System Components: Advisory

- Create Advisory section allows DMH agromet forecasters expert users to create and disseminate 10 days or decadal agro-met bulletin
- Bulletin could be generated and shared to whole group of Agril extension workers at one instance.





# System Components: Data Panel

- **Add Crop:** To add crop and location information
- **Crop List:** View current crop existing in the system
- Observation Data
- NDVI Image upload for monitoring

Add Crop

Add Crop Information

Crop Name

Crop Location Name

Latitude

Longitude



# System Components: Data Panel

- Add Receivers

– This section enables Admin or expert users to Update the general users or farmers database who will receive SMS and Bulletin.

View All Receivers

[Add Record](#) [Export](#) [Print](#)

First Name	Last Name	Location Name	Email	Mobile No.	Designation	Department	Actions
Pemjit	Aphimaeteethomrong	Monywa	pemjit.a@rimes.int	66891154327	RIMES	RIMES	
Das	Das	Monywa	dwijendra@rimes.int	66949120119	RIMES	RIMES	
Pemjit	Aphimaeteethomrong	Nyung Oo	pemjit.pui@gmail.com	65555555555	DMH	DMH	
das	das	Nyung Oo	dwijendra.kumar@gmail.com	776767676	das	das	
Pemjit	Aphimaeteethomrong	Monywa	pemjit.a@gmail.com	65555555555	DMH	DMH	

Search:  Search all

Show 10 entries Page 1 of 1 Displaying 1 to 5 of 5 items

# Steps for operationalization

- Extension workers at township level
- Coordination with provincial or divisional level
- National level – collaborative effort between the Departments of agriculture and Meteorology & Hydrology
- Remain embedded in existing systems and practices

*End-to-end systems, updated on sub-seasonal times scales, medium-range and short-range - overall ensure continuous flow of information to help support decisions.*



# Monsoon/National Forums in South Asia



**Bangladesh, Bhutan,  
Myanmar, Maldives,  
Nepal, Pakistan, Sri  
Lanka**

# Operational Use

## *Maximize uptake of climate information*

- Location specific and requirement oriented
- Build on existing capacities and evolve gradually to more sophisticated systems with steady capacity development of NMHSs as well as Dept of Agriculture
- Pilot locations – scalable
- Involve agricultural extension workers very closely
- Involve interested farmers on a experimental basis
- More user friendly graphics and web-based system
- Innovative dissemination systems
- Regular farmer and extension workers feedback sessions – participatory process – traditional knowledge incorporation

# Concluding thoughts

- Identify how climate information is generated, shared and used; critical assessment of requirements – national contexts.
- Identify gaps and try to strengthen them –
  - Better observations and data management systems
  - Operational linkages to build a culture of effective interpretation and best use
  - Information sharing
  - Adherence to standards
  - Strong research support to operations
  - Awareness and involvement in policy process
- Demonstration projects
- Ensure long term sustainability



**...thank you**

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