



جامعة القاهرة

FEEDBACK BY KEY

STAKEHOLDERS/USERS:

USING METEOROLOGICAL FORECASTS IN AGRICULTURE
EARLY WARNING: EXPERIMENT AND FEEDBACK



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Prof. of Meteorology
Faculty of Science- Cairo University





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EARLY WARNING: EXPERIMENT AND FEEDBACK



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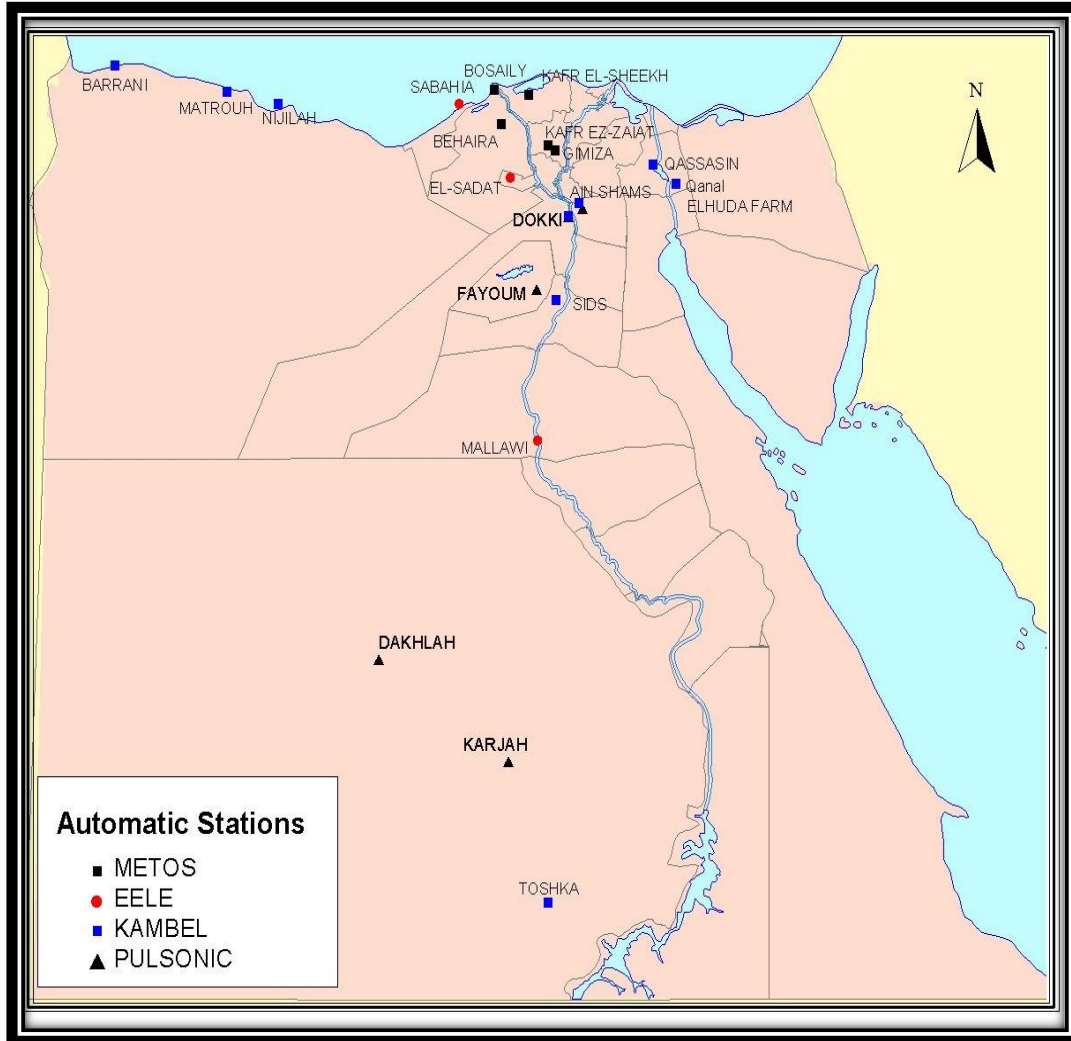
Central Laboratory for Agricultural Climate.



Introduction

- ❑ The management of weather and climate risks in agriculture has become an important issue due to climate change.
- ❑ The Intergovernmental Panel on Climate Change (IPCC) has highlighted multiple climate risks for agriculture and food security as well as the potential of improved weather and climate early warning systems to assist farmers.
- ❑ Wise use of weather and climate information can help to make better-informed policy, institutional and community decisions that reduce related risks and enhance opportunities, improve the efficient use of limited resources and increase crop, livestock and fisheries production.
- ❑ Early warning systems have an important role to play in providing important information to farmers, big and small.

Agro-meteorological stations network



Database of Agro meteorological data

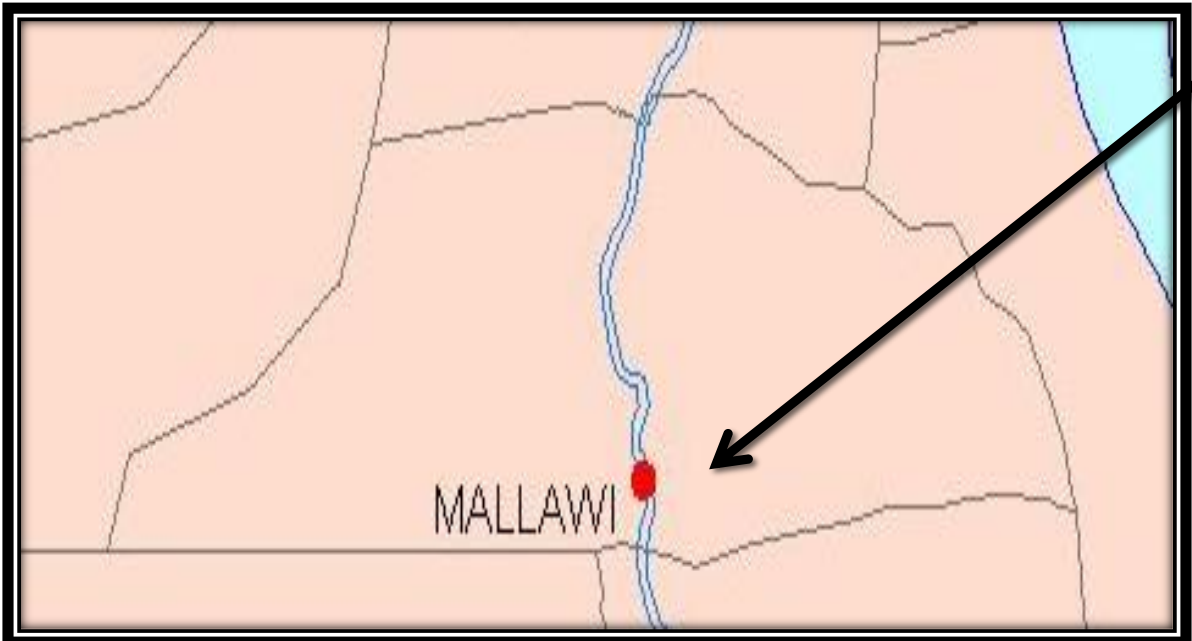
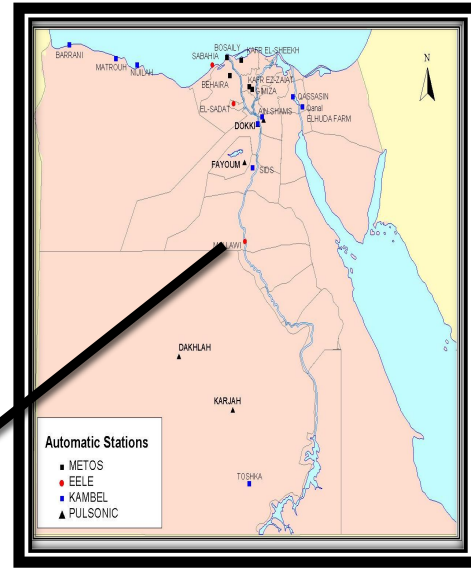
The main objective of WSN

Give the grower the proper **recommendations** in proper time based on the climatic Data and weather extremes.



what is the problem?

- ❑ We have only one or two weather stations for each Governorate.
- ❑ Most of the agro-meteorological applications (ET, irrigation requirements, Crop planting dates, Pest and disease prediction.....,etc) are based on point data, which do not provide a good estimate for large areas.
- ❑ High differentiation of the agricultural lands with different crops in limited area.



Feedback by Key stakeholders/users

Examples of selected extreme events in Egypt

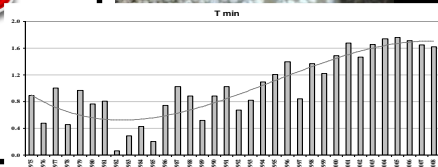
Locust waves

Floods

Frost waves

Snowballs

Heat Waves



Locust attack 2004



Wind direction from the west was the main reason for locust attack

Normally locust attack Egypt from the south

Impact of Cold Waves on crop yield during 2008



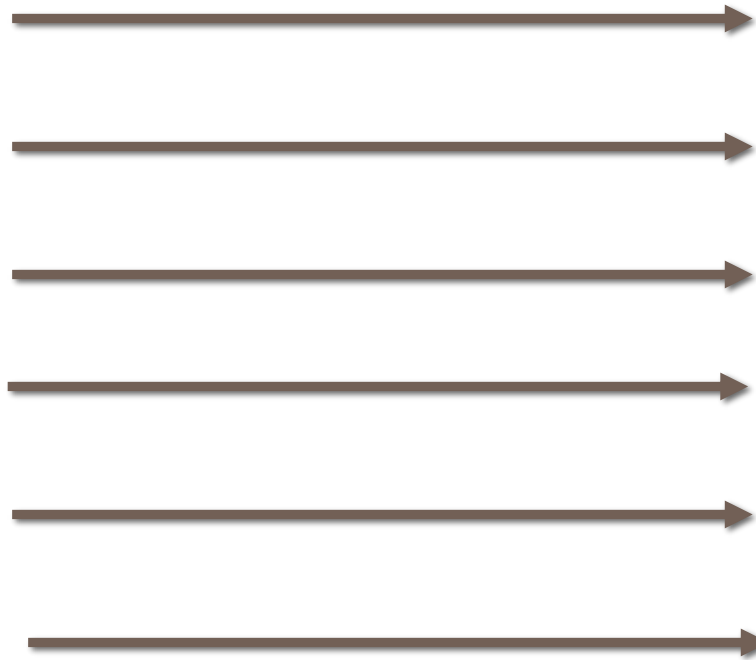
Impact of Cold Waves on crop yield during 2008

Crops

- Tomatoes
- Potatoes
- Mango
- Banana
- Citrus
- Beans

The proportion of damage

- 20 %
- 2 %
- 30 %
- 40 %
- 50 %
- 40 %



Impact of Cold Waves (Snowball) on crop yield during 2011



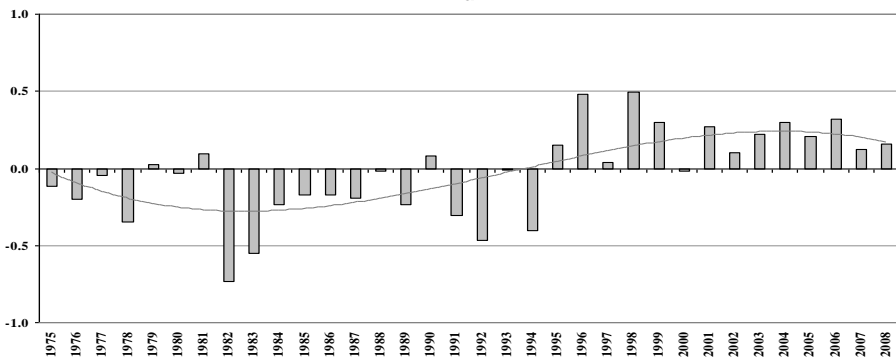
Flood



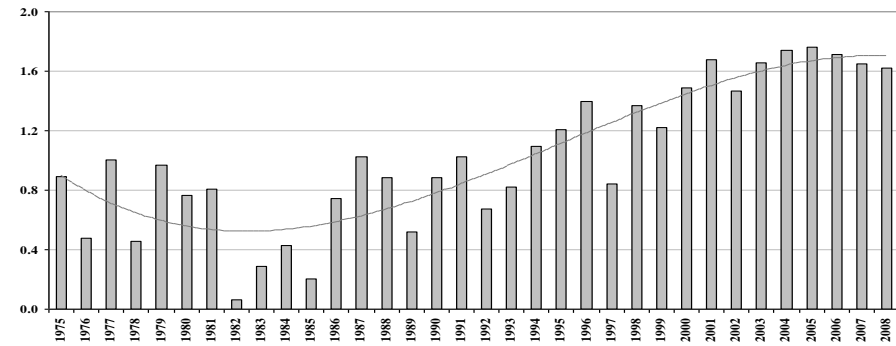
Extreme Weather Risks Heat Wave 2010

Mean annual temperatures during the period from 1975 - 2008 and climatologically normal's

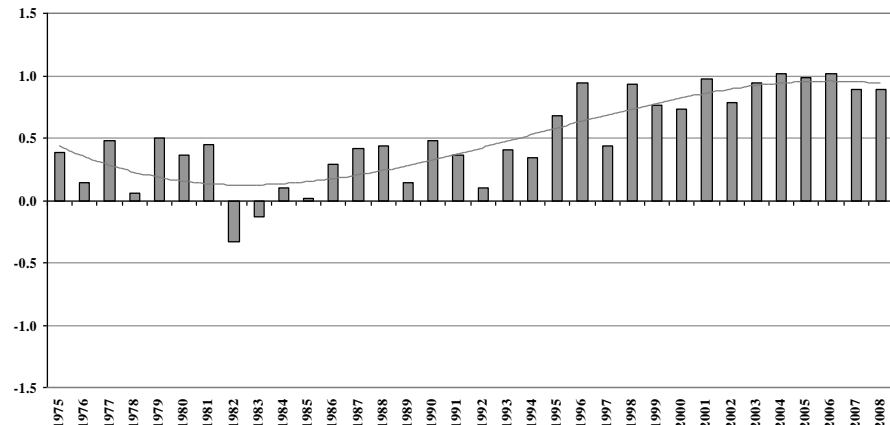
T max



T min



T mean



Change the minimum, maximum and average temperature in the winter of 2010 above the normal rates

	Algharbia	Almnofia	Kafr_Elshikh	Sharkia	Alkaliobia	Giza	Fayoum	Minya	Bani_swaif	Asyout	Kena	Average
Tmin	3.5	2.5	2.5	2.2	3.6	2.1	2.8	4.2	2.0	1.5	0.4	2.5
Tmax	1.9	0.8	0.1	0.8	3.3	2.7	1.5	1.6	2.7	3.2	1.9	1.9
Tmean	3.1	1.7	1.7	1.4	3.3	1.3	2.6	2.9	2.3	2.4	1.2	2.2

	2009		2010		2009 & 2010 %
	Yield	Ardab/Fed.	Yield	Ardab/Fed.	
Nile Delta		18.2		16.7	-8.2
Middle Egypt		18.9		16.6	-12.2
Upper Egypt		18		14.1	-21.9
Average		18.1		15.9	-11.8

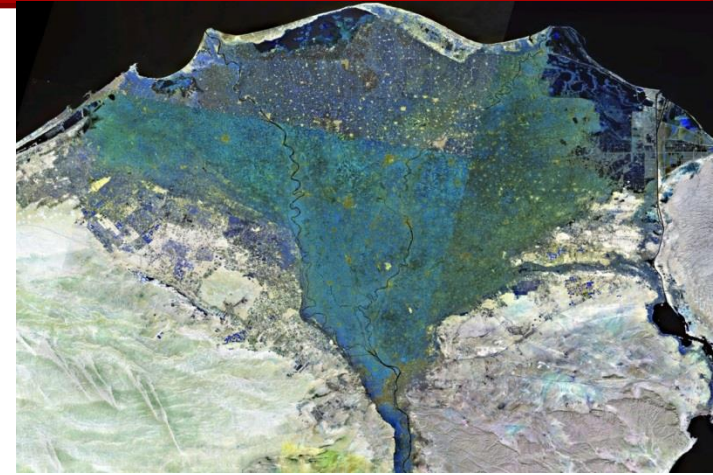


**Decrease wheat
yield in 2010**

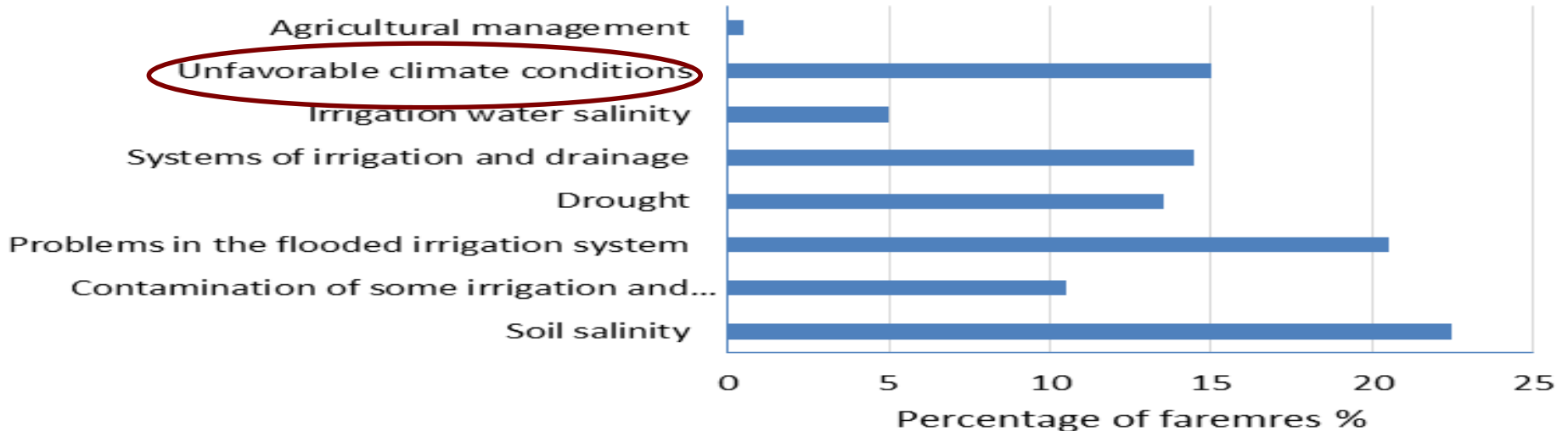
Heat Waves

Farmers feedback in the Delta region governorate.

Soil salinity, problems related to flooded irrigated systems, and unfavorable climate conditions were the three main technical reasons found out through this survey in Delta region.



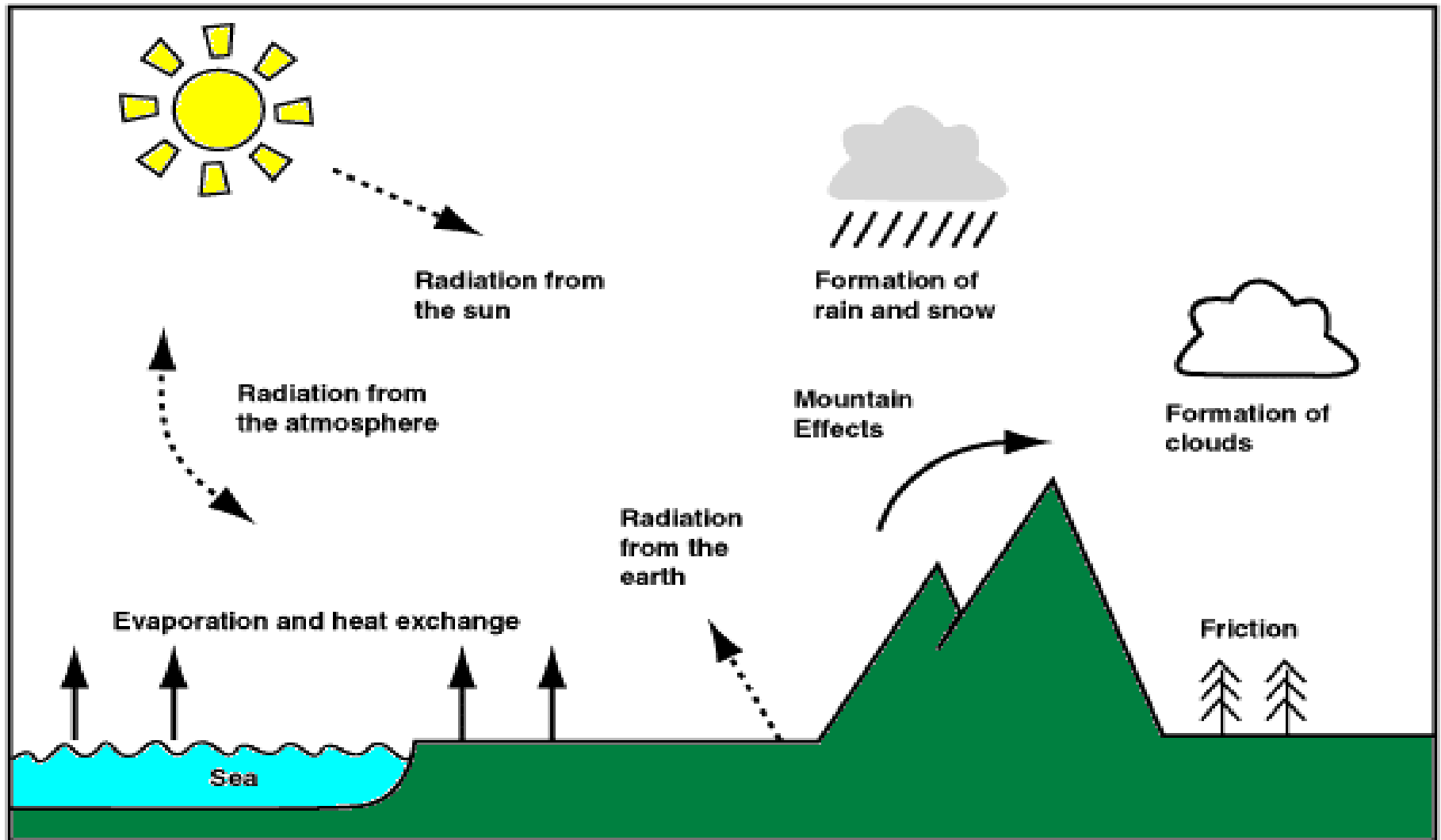
Technical Reasons of Land Deterioration



Meteorological forecasts

- ❑ Most weather forecasts today are based on the output of complex computer programs, known as forecast models, which typically run on supercomputers and provide predictions on many atmospheric variables such as temperature, pressure, wind, and rainfall. A forecaster examines how the features predicted by the computer will interact to produce the day's weather.
- ❑ Numerical models of weather (and climate as well) are based on the fundamental mathematical equations which describe the physics and dynamics of the movements and processes taking place in the atmosphere, the ocean, the ice, and the land.

Meteorological forecasts



Types of interactions considered in a weather forecast Model

Why meteorological forecasts important for agriculture sector?

- The density of weather stations is often low.
- The maintenance of weather stations is very high cost.
- Most of the agro-meteorological application requires continues series of weather data.
- Most of crop simulation models require continues series of weather data (DSSAT- CROP SYS- PERUN- etc.)

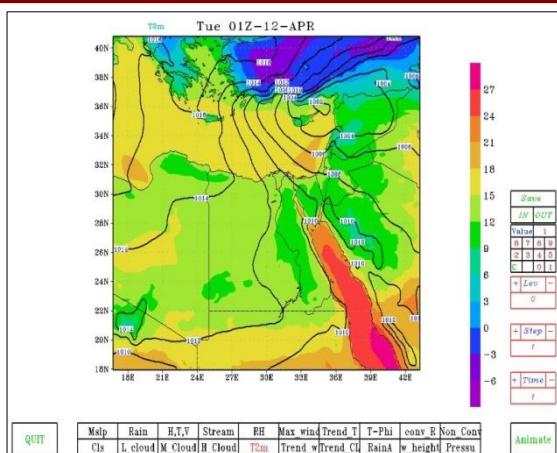
Using meteorological forecasts in agriculture to....

- Give a complete view in the atmospheric environment.
- Take action before the disaster weather (such as frost and wind extremes) impact on crops.
- Scheduling irrigation (the period between irrigations based on the water requirements of plants and evapotranspiration).
- Prediction of pest and diseases
- Chilling requirements for fruit trees.
- Determine the optimum planting dates for each crop in each region.

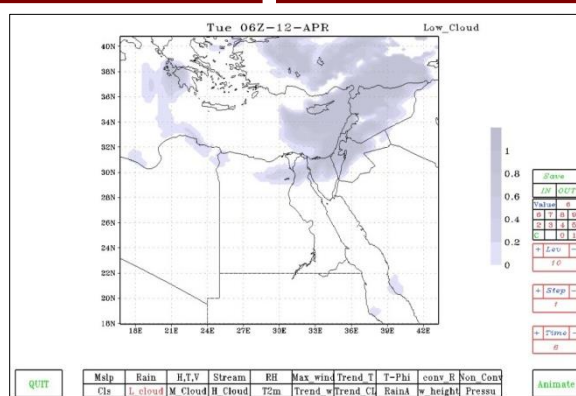
Using meteorological forecasts in agriculture to....

- Reduce the risk of disasters weather in the agriculture sector by using numerical weather prediction models in Agricultural Applications to helping the farmers to taking suitable decisions at the proper time.
- Improving the livelihood of the rural society through optimized income generation capability.
- Facilitating the farm-level decision-making for ensuring the optimum allocation and utilization of agricultural resources in order to achieve sustainable and increased income from agriculture.

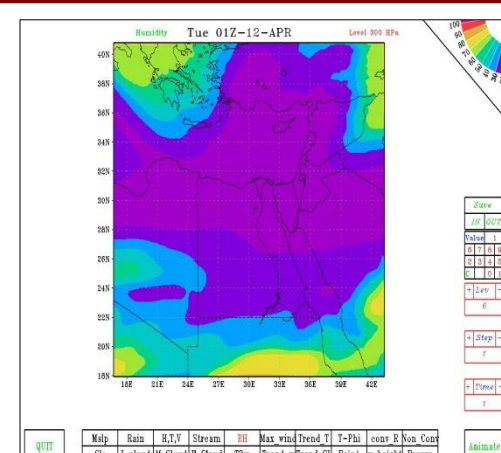
Example of the weather forecast model outputs



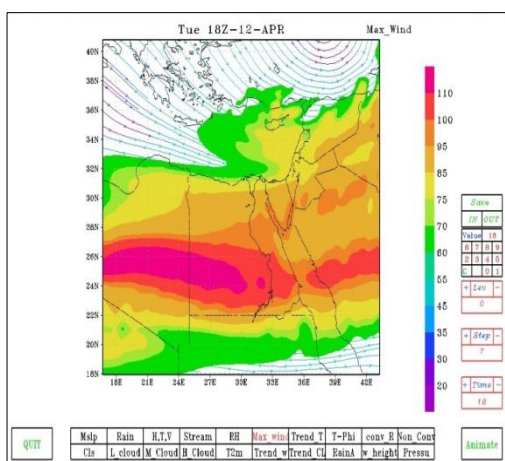
Temperature



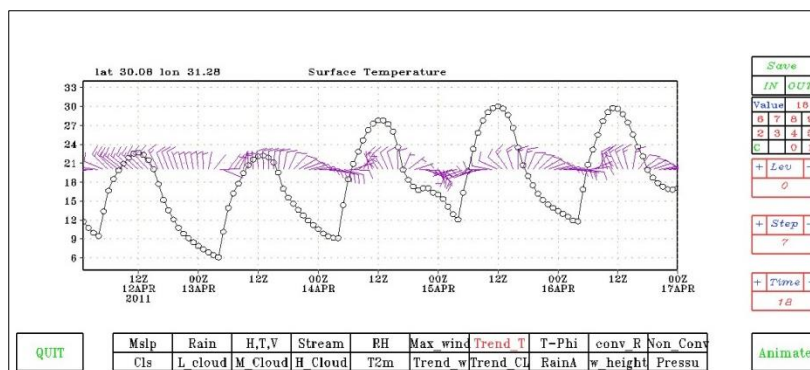
Cloud cover



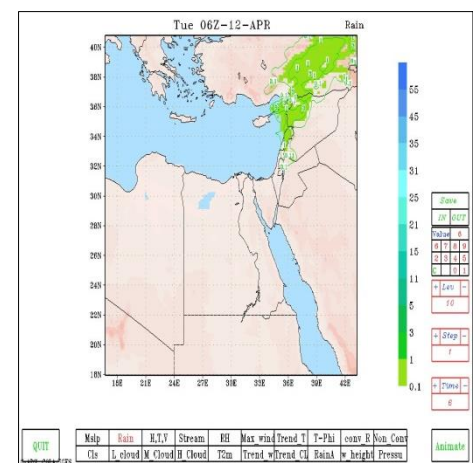
Relative Humidity



wind speed and direction

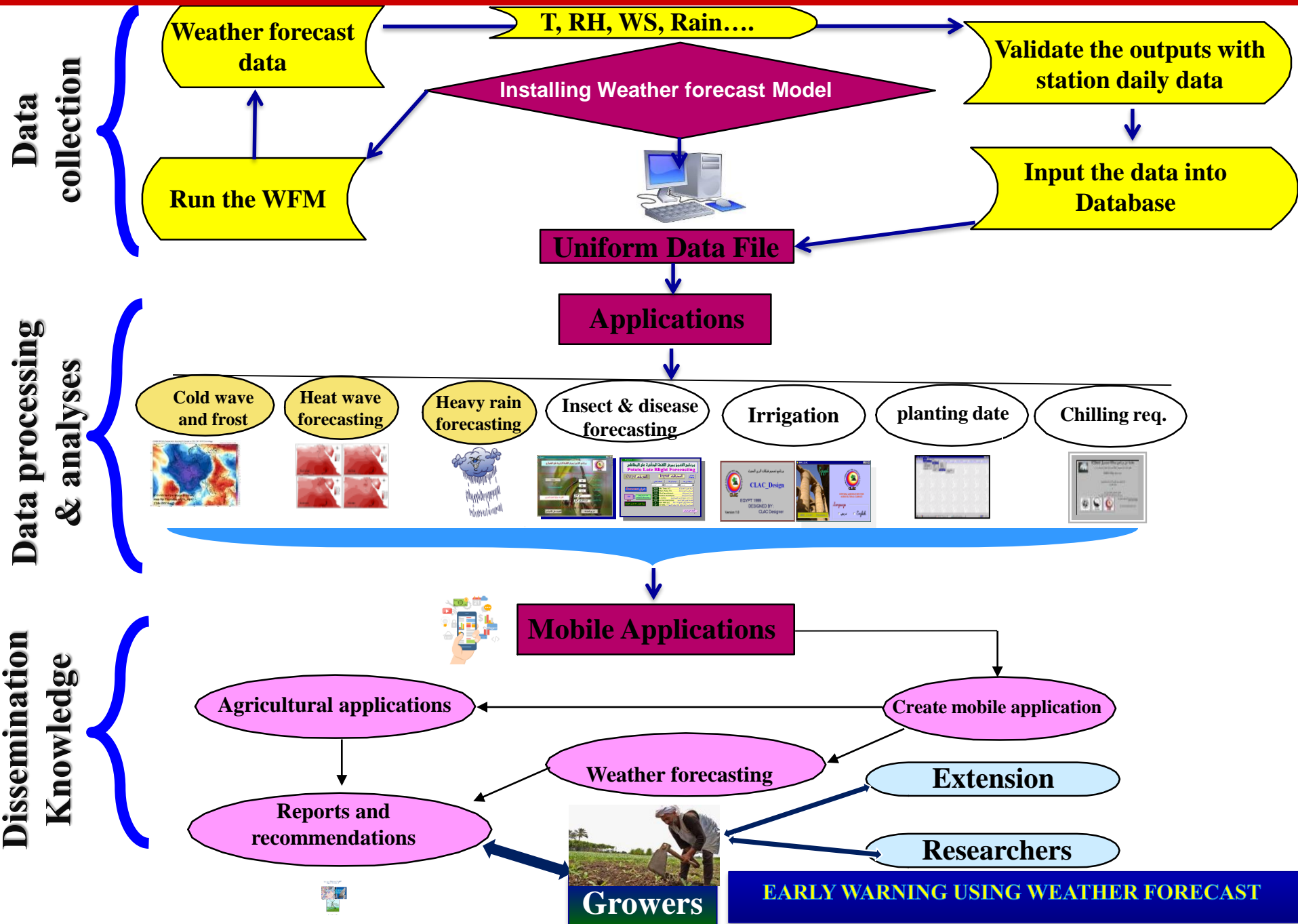


Temperature curve over a specific location



Rain

Information system for integrated farm management framework



Agricultural applications

Tools for Climate Impact Assessment: Simulation Models



Sowing Date Program

برنامج التنبؤ بمواعيد زراعة القطن بناءً على درجة حرارة التربة على عمق ٣٠ سم

المنطقة	درجة الحرارة	الصلاحيّة للزراعة
دمياط	16	بصلح
كفر الشيخ	15.7	بصلح
الدقهلية	18.5	بصلح
البحيرة	19	بصلح
الغربية	18	بصلح
الإسماعيلية	22.8	بصلح
المنوفية	17	بصلح
الشرقية	17	بصلح
القليوبية	18.2	بصلح
الجيزة	19.5	بصلح
الفيوم	20.5	بصلح
بنى سويف	21.2	بصلح
المنيا	19.8	بصلح
اسيوط	22	بصلح
سوهاج	20.8	بصلح

Inputs:

- ✓ Soil temperature

Output:

- ✓ Recommendation of planting date.

IRRI-CLAC

Inputs:

- Crop data
 - Age
 - Variety
 - Planting date
 - Coefficients
 - Rooting pattern
- Soil information
- Irrigation system info
- Water quality
- Weather data

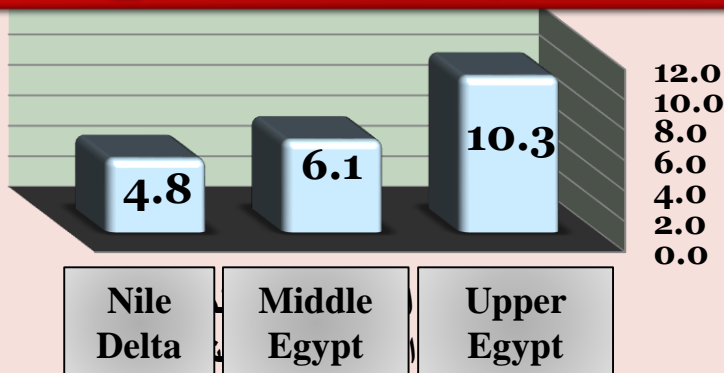


Output:

- ETo
- Water requirements
- Irrigation schedule
- Quantity, time and intervals.

Evapotranspiration (ETo)

Selection
Plantation
Regions



Agro-ecological zones

Diseases Forecasting programs

CLAC_Product

Copyright
CLAC

MILDCAST
Version 1.0.0

GRAPE DOWNY MILDEW FORECASTING

CENTRAL LABROTARY FOR AGRICULTURAL CLIMATE _CLIMATE APPLICATION DEPERTEMENT

Programs

برنامج التنبؤ بمرض اللبحة المتأخرة على البطاطس Potato Late Blight Forecasting

المخرجات Output المدخلات Input

عودة إلى Display

المنطقة الزراعية منطقة الزراعة موسم الزراعة الصنف النباتي

كج لودارد الحروة الخريفى الشرقية

التوقع Forecast

0.0 شدة المرض (%) Disease Severity

درجة الحرارة لا تناسب الإصابة

25.00	Min. Temp. (°C)	درجة الحرارة الدنيا (°C)
34.09	Mean. Temp. (°C)	متوسط درجة الحرارة (°C)
1.69	Wind Speed (m/sec)	سرعة الرياح (م/ث)
44.9	Relative Humidity (%)	الرطوبة النسبية (%)
368	S.S. (h/m)	عدد ساعات سطوع الشمس الشهرية (س)
0.00	Av.Day Cloud (octus)	المتوسط اليومي لكمية السحب
6	RH>=90% (H.)	عدد ساعات الرطوبة النسبية >= 90%
27	M.T.90%	متوسط درجة الحرارة (°C) خلال الرطوبة النسبية >= 90%

التعرف على المرض

التنبؤ بأفات القطن تحت الظروف البيئية المصرية

قائمة إضاءة عرض

MINISTRY OF AGRICULTURE AND LAND RECLAMATION وزارة الزراعة واستصلاح
AGRICULTURAL RESEARCH CENTER مركز البحوث الزراعية
CENTRAL LABORATORY FOR AGRICULTURAL CLIMATE المعهد المركزي للمناخ الزراعي

IPCAST_CLAC

التنبؤ بأهم الآفات الاقتصادية على محصول القطن
** تحديد وميعاد الزراعة ومراحل النمو

Cotton Economical Pests Forecasting

تحديد دقة التنبؤ

الإرتباط بميعاد الزراعة

تجاهل الإرتباط بمواعيد الزراعة

تاريخ الزراعة 17/12/98

تحديد مرحلة نمو نبات القطن النمو الخضري السريع

مدخلات الأرصاد واحتياجات التنبؤ

Form1

برنامج التنبؤ بمرض اللبحة النارية على الكمثرى

مدخلات

درجة الحرارة 20

الرطوبة النسبية 90

كمية المطر 2.3

الحشرات

حالة الأشجار

نحل العسل

فترات التزهير الأولى

التعرف على الأعراض

توزيع المساحة

Feedback by Key stakeholders/users

Education level	illiterate	intermediate education	high education
	20	70	10
Questions	Agree	Maybe	
I find the idea very welcome	100	0	
I find an understanding of the data and description	70	30	
I find help and support when I needed	20	80	
The weather elements in the report are sufficient	90	10	
Description in the report is sufficient	100	0	
The reporting period is sufficient	90	10	
Directs us to the correct handling of agriculture	90	10	
Do you keen to continue the service in the future	100	0	

Conclusion

- Agricultural sector is very sensitive to change in weather conditions,
- Weather forecast models along with observational data is a crucial to reduce the risk of weather disasters in the agriculture sector, support the farmers taking suitable decisions in a proper time, but also decision makers.
- Increasing the awareness on the farmer levels of this technology is highly targeted in order to maximize the benefits which could directly support the medium-long term adaptation strategies (e.g. water saving, increasing productivity, etc.)

Thank

you

