Climate Smart Agriculture - Reducing uncertainty on what, and when to grow rice in Colombia

Camilo Barrios

Crop modeler at CIAT - CCAFS

c.barrios@cgiar.org

Montevideo - Uruguay

12/10/2014

CGIAR RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

CCAFS

FEDEARROZ

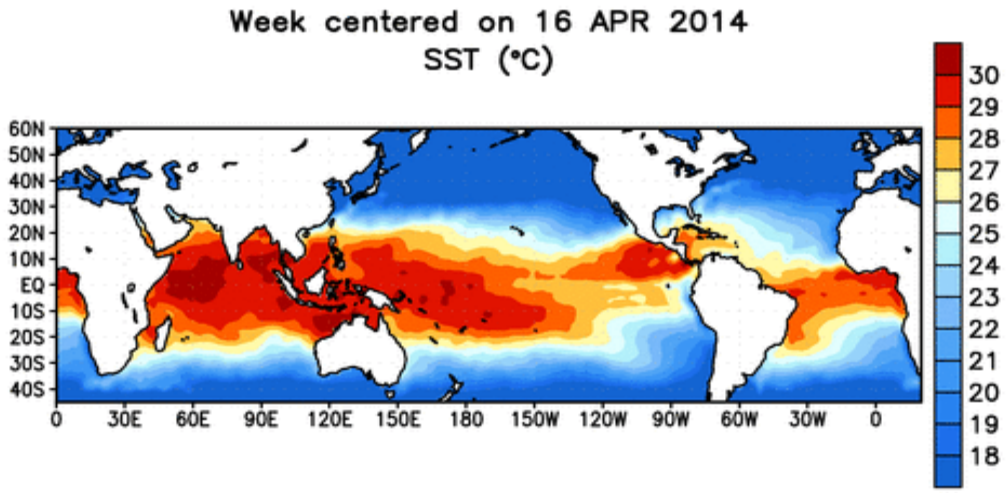
Clima y Sector Agropecuario Colombiano
Adaptación para la Sostenibilidad Productiva

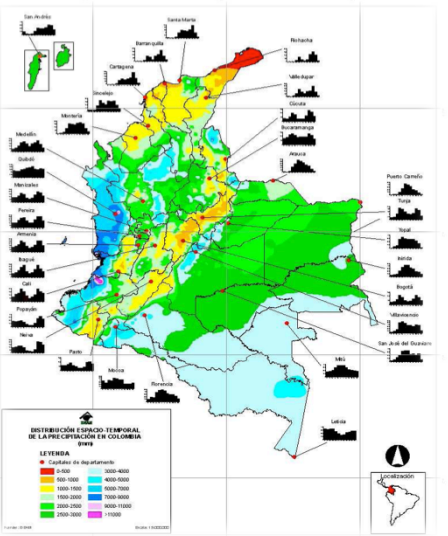
MinAgricultura Ministerio de Agricultura y Desarrollo Rural

PROSPERIDAD PARA TODOS

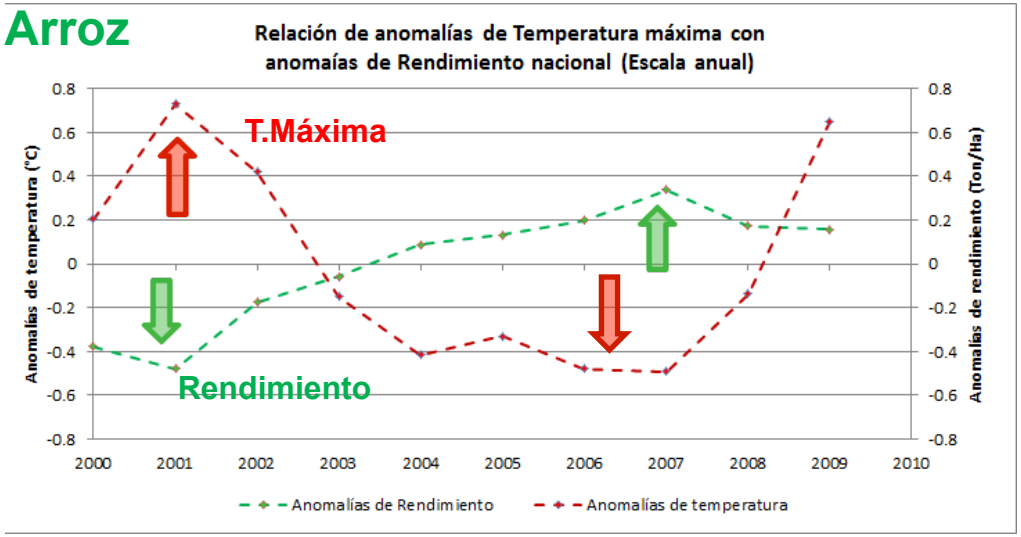
CIAT

We are victims of Climate variability!





Arroz



Relationship between annual climate anomalies and rice yield in Colombia.

How the climate variables have affected rice crop during the latest years?

In the last six years the Colombian rice sector has not been exempt to low yield problems.

- High level of spikelet sterility.
- Low solar radiation, increasing temperatures, low rainfall and irregular distribution.
- New pests and diseases.

High production costs

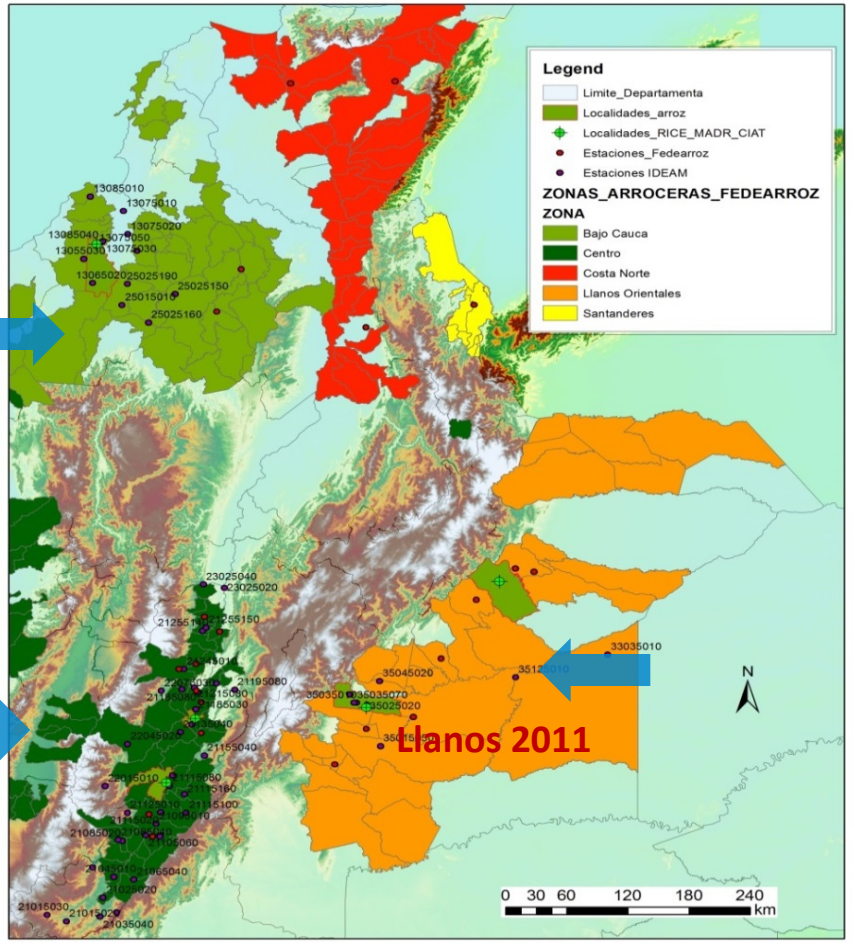
Decreased yields more than 50%

(Hernández L. 2012)

Bajo Cauca 2007

Centro 2009-2010

Llanos 2011



Site-Specific Management approach for reducing yield gaps


+

+

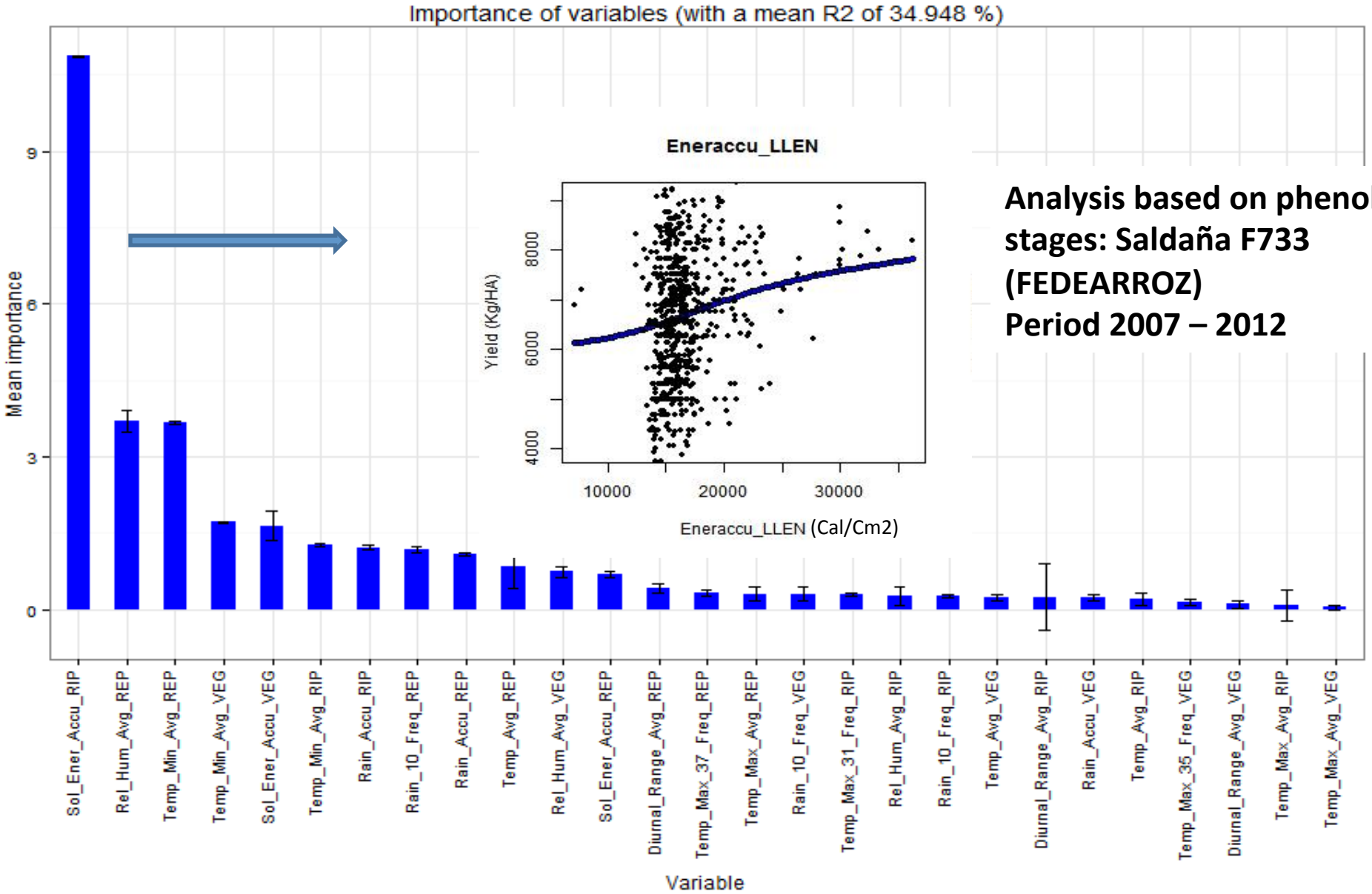
=


Clima Suelo Manejo agronómico Producción Rdto/ha

%? + % ? + %? = 100 % (brecha)

Identify limiting factors by phenological stages:

Commercial data + daily weather data + machine learning

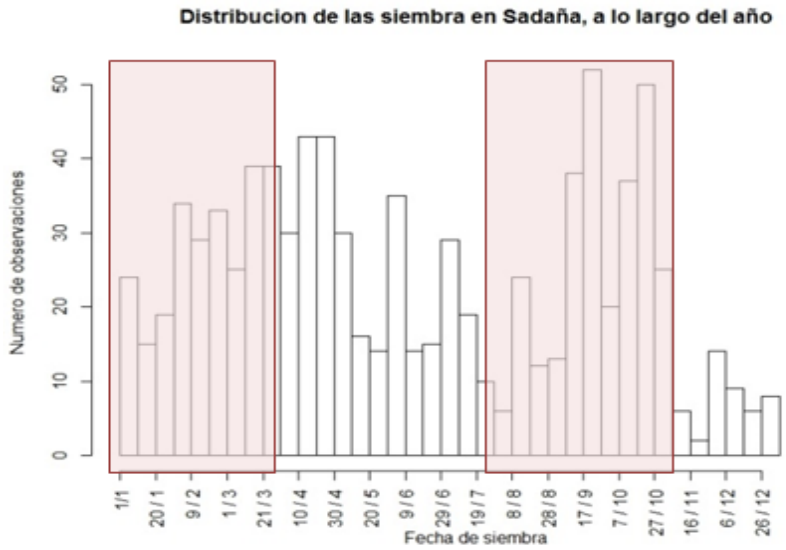


Analysis based on phenological stages: Saldaña F733 (FEDEARROZ)
Period 2007 – 2012

Key message!

The accumulated solar radiation in the grain filling stage is the limiting factor for F733 variety, in Saldaña - Tolima (Using neural Network analysis)

What to do?



The change!

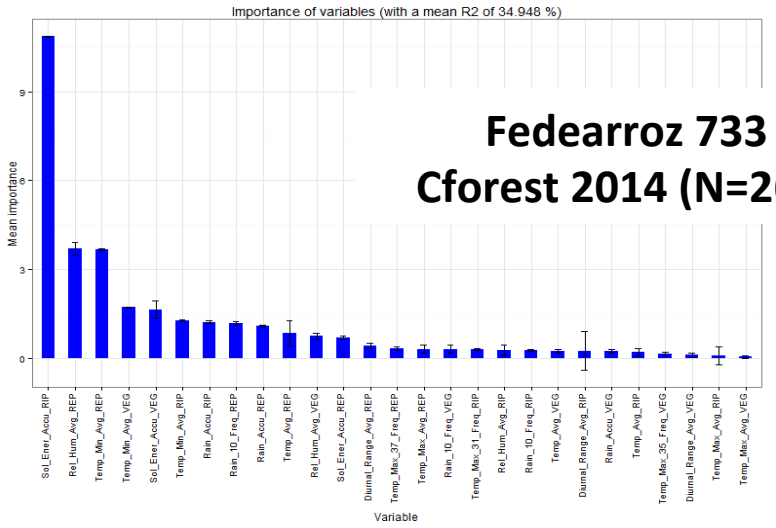
Adjust planting dates to get a better environmental supply

Identify the periods across the year when there are the best solar radiation demand

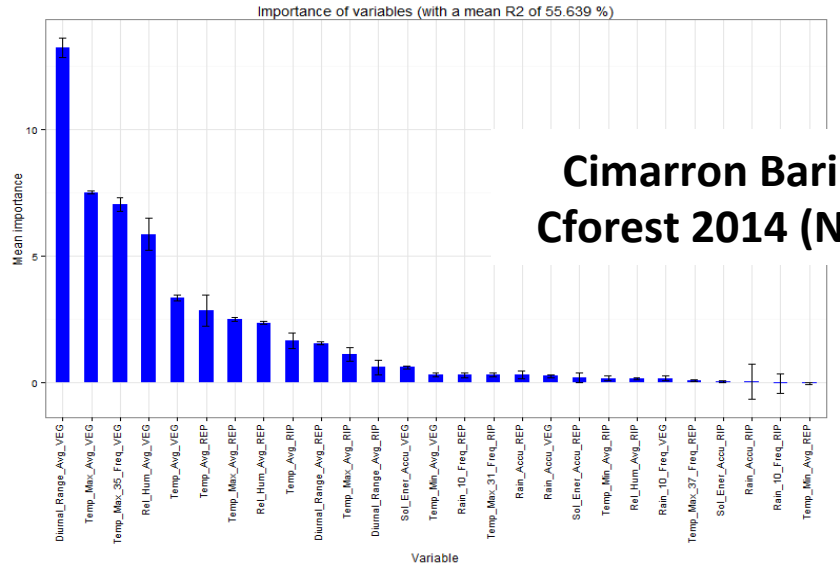
Respuesta diferencial entre materiales

Análisis basado en etapas fenológicas Saldaña (FEDEARROZ) – Periodo 2007 – 2012

Saldaña - riego



Fedearroz 733
Cforest 2014 (N=267)



Cimarron Barinas
Cforest 2014 (N=78)

Para FEDEARROZ 733, el clima explica aproximadamente el 35% del rendimiento

Factores diferentes!
Las variedades responden de manera diferente al clima !

Para Cimarrón Barinas, el clima explica aproximadamente el 55% del rendimiento

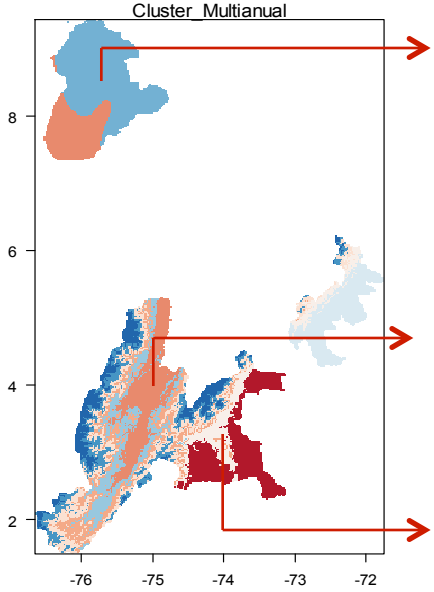
Repuesta al clima de cada material en cada región = insumos para Fito mejoradores + ayuda a la elección para los agricultores

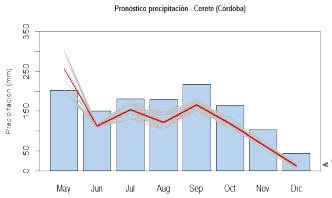
Generating agroclimatic seasonal forecast for rice productive regions in Colombia

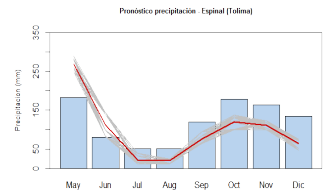
What it consist?

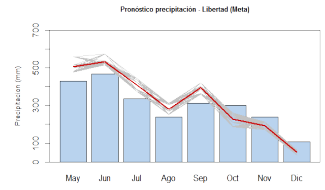
Establish agro-climatic forecasts using seasonal climate prediction models and crop models (mechanistic models).

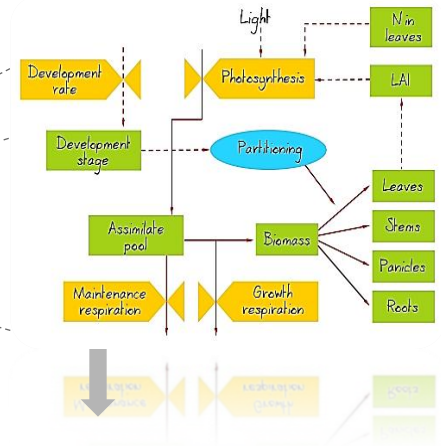
Agro-climatic rice productive regions







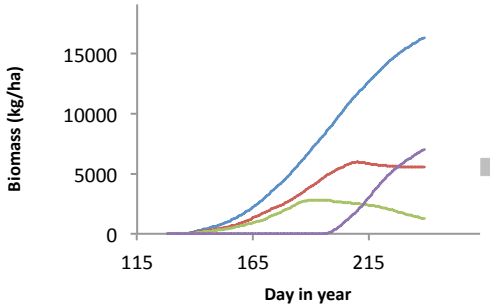




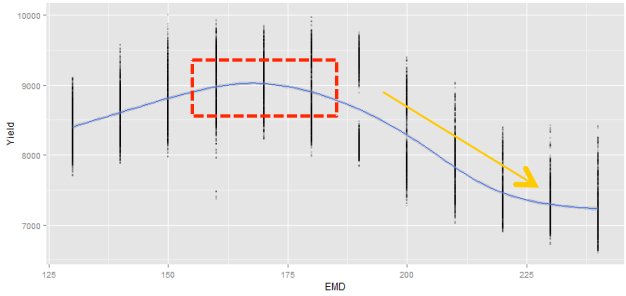
Crop model calibrated and evaluated

Future climate conditions enter in the crop model.

Crop growth projection



Crop yield forecasts

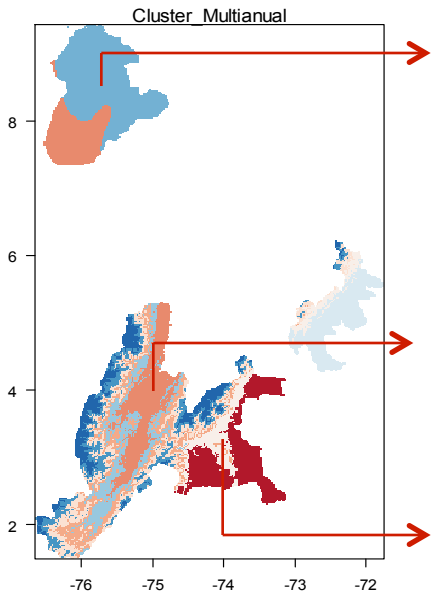


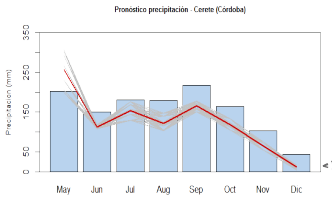
Generación de pronósticos agro-meteorológicos: caso arroz en Colombia

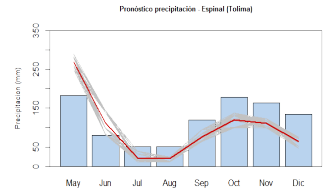
En qué consiste?

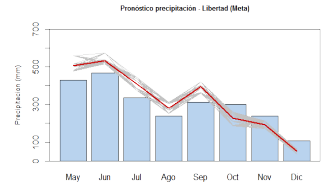
Establecer pronósticos agroclimáticos a partir del uso de modelos de predicción climática periódica y modelos de cultivos (modelos mecanísticos).

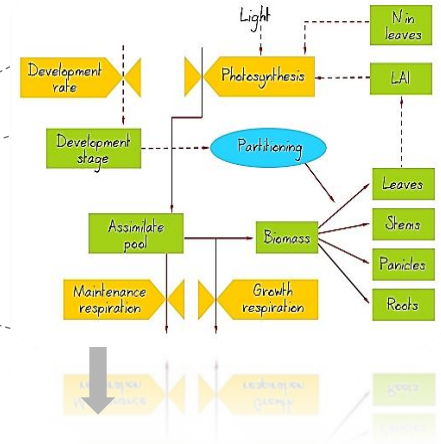
Regiones agroclimáticas
Cultivo de arroz







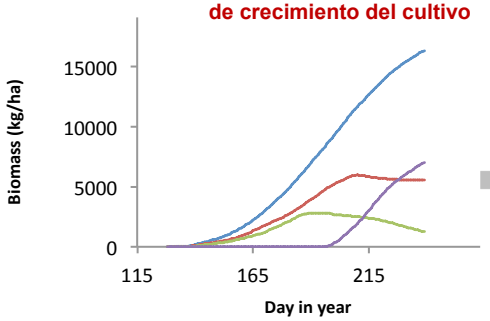




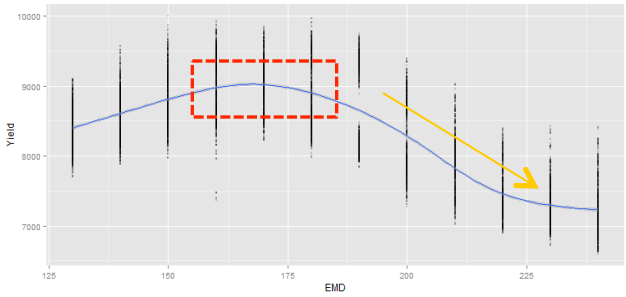
Modelo calibrado y evaluado

Información de condiciones climáticas pronosticadas (precipitaciones, Temperaturas y Rad. Solar) ingresan al modelos de cultivo.

Proyección de la dinámica de crecimiento del cultivo



Pronósticos de rendimiento del cultivo



Agroclimatic forecast
Case: Monteria - Cordoba

What do farmers need to know?

Identify the most appropriate planting date (with best environmental supply) for rice crop in the period May - Dec 2014.

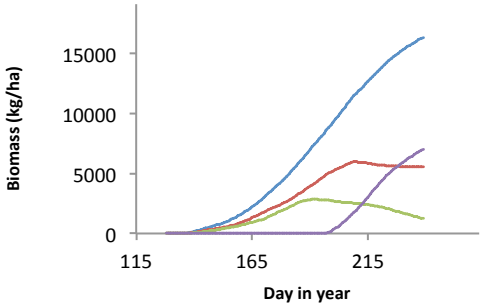
Actions to implement

CIAT
International Center for Tropical Agriculture
Since 1967 / Science to cultivate change

FEDEARROZ
FEDERACIÓN NACIONAL DE ARROCEROS

Implement seasonal weather forecasts + historical events of "El Niño"+ mechanistic crop models

Projected crop performance to future climate conditions

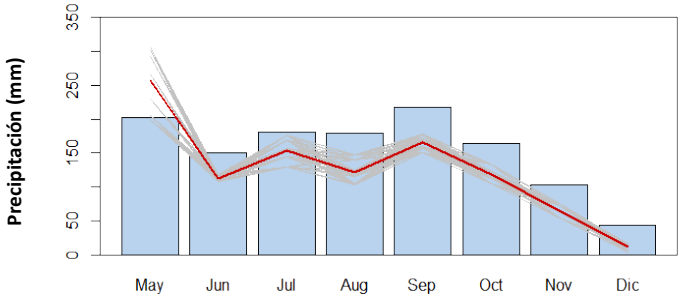


Clima y Sector Agropecuario Colombiano

Adaptación para la Sostenibilidad Productiva

Agroclimatic forecast Monteria (May – Dic)

Pronóstico de precipitación
Mayo – Diciembre de 2014



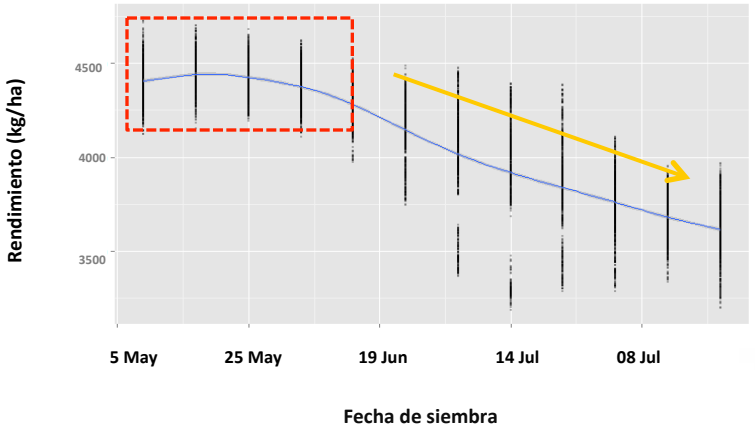
Decreased monthly rainfall

Increased monthly temperatures and solar radiation

Select the best planting date, as a preventive measure.

If farmers make the decision to plant until June 20, the yield obtained can be around 4500 kg/ha.

If the crop sowings are delayed, yields will decrease.



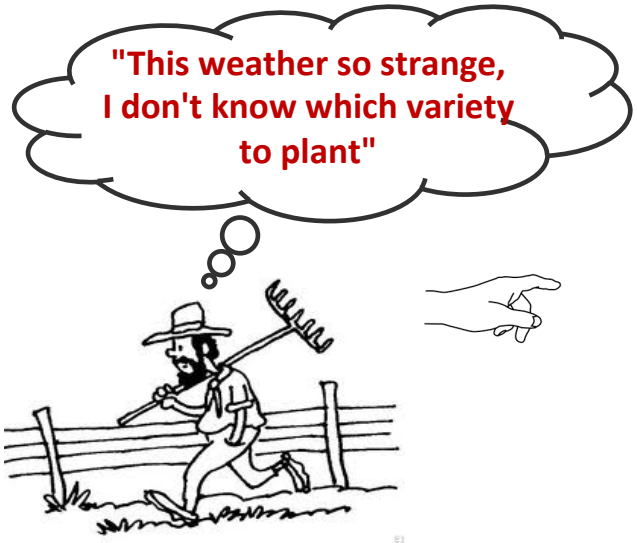
By this measure:

- ✓ **Great economic losses to 170 rice farmers was avoided.**
- ✓ **1,800 hectares of rice were saved to being destroyed by the intense summer.**

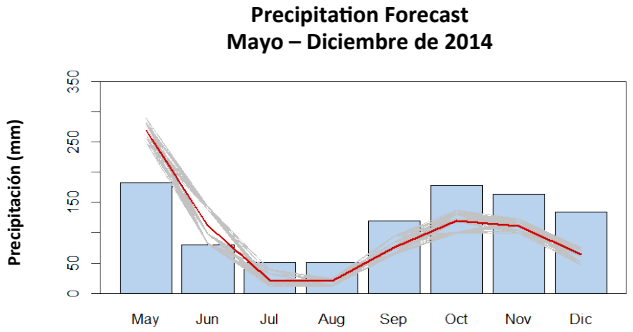
Clima y Sector Agropecuario Colombiano

Adaptación para la Sostenibilidad Productiva

Selecting the best variety
Case study: Espinal - Tolima

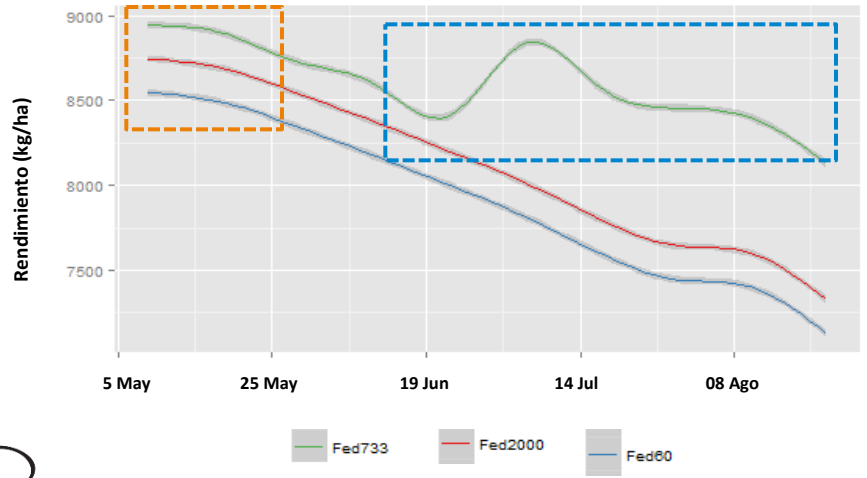


In addition to know when sow, **You can also know the best cultivar to sow!**



Seasonal climate forecast + Crop models

Selecting the best variety



With sowings until early June, the yield difference between varieties will not exceed 500 kg/ha.

If farmers decide to sown after June 15, the best choice will be the variety Fedearroz 733.

According to this recommendation, pilot plots were established to validate the agroclimatic forecasts.

Field results:

Fedearroz 733: 6860 kg/ha PS

Fedearroz 60: 4600 kg/ha PS

Generating new knowledge at the service of farmers

Knowledge transfer to technical staff of rice producers' association in Colombia.

Knowledge transfer to farmers


Thanks.
RESEARCH PROGRAM ON
Climate Change, Agriculture and Food Security
CGIAR
CCAFS
Clima y Sector Agropecuario Colombiano
Adaptación para la Sostenibilidad Productiva
MinAgricultura
Ministerio de Agricultura y Desarrollo Rural
PROSPERIDAD PARA TODOS
CIAT