

**3<sup>rd</sup> Technical Workshop on Models and Tools for Water,  
Agriculture and Knowledge Sharing**

# Introducing CAMDT

(Climate-Agriculture Modeling and Decision Tool)

February 26, 2015

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# Climate-Agriculture Modeling and Decision Tool (CAMDT)

- CAMDT is an easy-to-use user-interface which integrates downscaling tools (FResampler1 and DisAg) and DSSAT crop model without worrying about model requirements or input format issues.
- CAMDT can contribute to develop better climate adaption strategies by comparing various scenarios with different management practices, cultivars etc. given seasonal climate forecast.
- CAMDT has functionality to easily display crop model outputs (yield, water stress index, and risk of water stress for now).
- CAMDT was developed using Python script language (It's FREE!)



# Climate-Agriculture Modeling Decision Tools (CAMDT)

1) Set up simulation and prediction periods

The screenshot displays the CAMDT User-Interface with the following elements:

- Simulation mode:** Radio buttons for "Hindcast" (selected) and "Forecast". A blue arrow points to "Hindcast" with the text "Test using data from past event".
- Simulation horizon:** Fields for Start Year (2008), Start Month (12), End Year (2009), and End Month (7). A blue arrow points to the "Simulation horizon" label with the text "Approximate crop simulation period".
- Prediction horizon:** Fields for Start Year (2008), Start Month (12), End Year (2009), and End Month (2). A blue arrow points to the "Prediction horizon" label with the text "From available seasonal climate forecasts".
- Planting date (DOY):** A text field containing "357".
- Validation:** A "Validate inputs ?" button with a "Yes" sub-button.
- Exit:** An "Exit" button at the bottom.

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 2) Select temporal downscaling method: FResampler1

The screenshot shows the CAMDT User-Interface with the 'Temporal Downscaling' tab selected. The 'Weather Realization' section has 'FResampler' selected. The 'FResampler' parameters are as follows:

Parameter	Value
Sampling factor (>1):	1
Start Year:	1975
End Year:	2013

The 'Stochastic Disag.' section has 'Num. of realization' set to 'Not added', and 'Amount', 'Frequency', and 'Intensity' are also set to 'Not added'. The '\*Rainfall Target variable for \*.MTH (1 indicates "chosen")' field is empty.

The 'Tercile-baesd Seasonal Forecast' section has 'From CPT' selected. The 'CPT input' section has 'CPT\_file', 'Latitude', and 'Longitude' all set to 'Not added'. The 'User-specified' section has 'Below Normal', 'Near Normal', and 'Above Normal' all set to 'Not added'.

A blue arrow points to the 'Start Year' and 'End Year' fields in the 'FResampler' table, with the text 'First and last year in WTD file'.

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 2) Select temporal downscaling method: DisAg

CAMDT User-Interface

Simulation setup | **Temporal Downscaling** | DSSAT setup 1 | DSSAT setup 2 | \*Scenarios setup

**Weather Realization**

FResampler  Stochastic Disag

Click to add more details for the selected method

**FResampler**

Sampling factor (>1): Not added  
Start Year: Not added  
End Year: Not added

**Stochastic Disag.**

Num. of realization:	100
*Rainfall Target variable for *.MTH (1 indicates "chosen")	
Amount:	0
Frequency:	1
Intensity:	1

**Tercile-baesd Seasonal Forecast**

From CPT  User-specified

Click to add more details for SF input

**CPT input**

CPT\_file: Not added  
Latitude: Not added  
Longitude: Not added

**User-specified**

Below Normal: Not added  
Near Normal: Not added  
Above Normal: Not added

# Climate-Agriculture Modeling Decision Tools (CAMDT)

2) Select temporal downscaling method and seasonal forecast

Seasonal forecast from the closest point is extracted from CPT output file

The screenshot shows the CAMDT User-Interface with the following settings:

- Simulation setup:** Temporal Downscaling (highlighted with a red box), DSSAT setup 1, DSSAT setup 2, \*Scenarios setup
- Weather Realization:**  FResampler,  Stochastic Disag
- Click to add more details for the selected method** (button)
- FResampler settings:**
  - Sampling factor (>1): 1
  - Start Year: 1975
  - End Year: 2013
- Stochastic Disag. settings:**
  - Num. of realization: Not added
  - \*Rainfall Target variable for \*.MTH
  - Amount: Not added
  - Frequency: Not added
  - Intensity: Not added
- Tercile-based Seasonal Forecast:**  From CPT,  User-specified
- Click to add more details for SF input** (button)
- CPT input settings:**
  - CPT\_file: C:/IRI/PH/Philippines Forecasts/OND\_2009\_Fcst\_Probs.txt
  - Latitude: 13.5
  - Longitude: 123.0
- User-specified settings:**
  - Below Normal: Not added
  - Near Normal: Not added
  - Above Normal: Not added

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## Example of seasonal Climate Forecast from CPT output

OND\_2009\_Fcst\_Probs.txt x

xmlns:cpt=<http://iri.columbia.edu/CPT/v10/>

cpt:ncats=3

cpt:field=prcp, cpt:C=1, cpt:clim\_prob=0.333333333333, cpt:T=2009-10/12, cpt:nrow=30, cpt:ncol=22, cpt:row=Y, c

	117.250000000	117.750000000	118.250000000	118.750000000	119.250000000	119.750000000	120.250000000
19.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
19.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
18.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
18.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
17.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
17.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
16.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
16.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	36.4795321705
15.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	35.1974406612
15.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	38.6092297598
14.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
14.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
13.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
13.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
12.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000
12.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	50.0836299273
11.750000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	49.1025050307
11.250000000	-999.000000000	-999.000000000	-999.000000000	-999.000000000	53.5592449163	54.5095328949	

Longitude

Latitude

BN (%)

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 2) Select temporal downscaling method and seasonal forecast

The screenshot displays the CAMDT User-Interface with the following settings:

- Simulation setup:** Temporal Downscaling (highlighted in red), DSSAT setup 1, DSSAT setup 2, \*Scenarios setup
- Weather Realization:**
  - FResampler
  - Stochastic Disag
  - Click to add more details for the selected method
- FResampler:**
  - Sampling factor (>1): 1
  - Start Year: 1975
  - End Year: 2013
- Stochastic Disag.:**
  - Num. of realization: Not added
  - \*Rainfall Target variable for \*.MTH (1 indicates "chosen")
  - Amount: Not added
  - Frequency: Not added
  - Intensity: Not added
- Tercile-based Seasonal Forecast:**
  - From CPT
  - User-specified (highlighted in red)
  - Click to add more details for SF input
- CPT input:**
  - CPT\_file: Not added
  - Latitude: Not added
  - Longitude: Not added
- User-specified:**
  - Below Normal: 20
  - Near Normal: 50.0
  - Above Normal: 30



# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 3) Setup DSSAT input values

CAMDT User-Interface

Simulation setup | Temporal Downscaling | **DSSAT setup 1** | DSSAT setup 2 | \*Scenarios setup

**Irrigation option**

Rainfed  
 Irrigated

**Planting method**

Dry seed  
 Transplanting

**Weather station**

Station name (4char): PILI  
WTD file location: C:/IRI/PH/CAMDT/GUL\_Test/PILL.WTD  
[Click to select WTD file](#)

**Soil**

Soil type: SCL(WI\_ANPH007) | Rooting depth: deep

**Cultivar selection**

Calibrated |  User-specified  
[Click to add more details for cultivar type](#)

**Calibrated**

Cultivar ID: IB0012  
Cultivar name: IR 58

**User-specified cultivar**

Cultivar ID: Not added  
Cultivar name: Not added P2O: Not added  
Ecotype code: Not added G1: Not added  
P1: Not added G2: Not added  
P2R: Not added G3: Not added  
P5: Not added G4: Not added

All these input is used to create DSSAT input experimental file (\*.RIX)

```

*PLANTING DETAILS
@P PDATE EDATE PPOP PPOE PLME PLDS PLRS PLRD PLDP PLWT PAGE PENV PLPH SPRL
1 09155 -99 75 25 T H 20 0 2. 0 23 25 3 0

*IRRIGATION AND WATER MANAGEMENT
@I EFIR IDEP ITHR IEPT IOFF IAME IAMT IRNAME
1 -99 -99 -99 -99 -99 -99 1 UNKNOWN
@I IDATE IROP IRVAL
109155 IR008 2.0
109155 IR010 0.0
109155 IR011 5.0
109155 IR009 20.0
109160 IR011 30.0
109160 IR009 100.0
109170 IR011 50.0
109170 IR009 150.0

*FERTILIZERS (INORGANIC)
@F PDATE FMCD FACD FDEP FMN FMP FAK FMC FMO FOD FERNAME
1 1 FE005 AP012 1 50.0 -99 -99 -99 -99 UNKNOWN
1 50 FE005 AP012 1 40.0 -99 -99 -99 -99 UNKNOWN
1 100 FE005 AP012 1 40.0 -99 -99 -99 -99 UNKNOWN

*SIMULATION CONTROLS
@N GENERAL NYERS NREPS START SDATE RSEED SNAME..... SMODEL
1 GE 1 1 S 09125 2150 IRR1, P1LA JAN 85 UREASE
@N OPTIONS WATER NITRO SYMBI PHOSP POTAS DISES CHEM TILL CO2
1 OP Y Y N N N N N N M
@N METHODS WHER INCON LIGHT EVAPO INFIL PHOTO HYDRO NSWIT MESOM MESEV MESOL
1 ME M M E R S C R 1 G S 2
@N MANAGEMENT PLANT IRRIG FERTI RESID HARVS
1MA R R D R M
@N OUTPUTS FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT VBOSE CHOUT OPOUT
1 OU N Y Y 1 Y N Y Y N N D N N
    
```

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 3) Setup DSSAT input values

Cultivar selection

Calibrated  User-specified

Click to add more details for cultivar type

Calibrated

Cultivar ID: Not added

Cultivar name: Not added

User-specified cultivar

Cultivar ID:	IB0012	P20:	13.5
Cultivar name:	IR 58	G1:	65
Ecotype code:	IB0001	G2:	0.025
P1:	460	G3:	1
P2R:	5	G4:	1
P5:	420		

If you have a new cultivar not listed in \*.CUL, and have calibrated the cultivar, you can type your own calibrated parameters. These inputs will be added to RICER045.CUL

Example DSSAT CUL file for Rice with cultivar parameters

```

RICER045.CUL x
@VAR#  VAR-NAME..... EXPNO  ECO#   P1    P2R   P5    P2O   G1    G2    G3    G4
!
990001  IRRI ORIGINALS      . IB0001 880.0  52.0 550.0  12.0  65.0 .0280  1.00  1.00
990002  IRRI RECENT         . IB0001 450.0 149.0 350.0  11.7  68.0 .0230  1.00  1.00
990003  JAPANESE             . IB0001 220.0  35.0 510.0  12.0  55.0 .0250  1.00  1.00
990004  N.AMERICAN          . IB0001 318.0 189.0 550.0  12.8  65.0 .0280  1.00  1.00
!
IB0001  IR 8               . IB0001 880.0  52.0 550.0  12.1  65.0 .0280  1.00  1.00
IB0002  IR 20               . IB0001 500.0 166.0 500.0  11.2  65.0 .0280  1.00  1.00
IB0003  IR 36               . IB0001 470.0 149.0 400.0  11.7  68.0 .0230  1.00  1.00
IB0004  IR 43               . IB0001 720.0 120.0 580.0  10.5  65.0 .0280  1.00  1.00
IB0005  LABELLE             . IB0001 318.0 189.0 550.0  12.8  65.0 .0280  1.00  1.00
IB0006  MARS                . IB0001 698.0 134.0 550.0  13.0  65.0 .0280  1.00  1.00
    
```

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 3) Setup DSSAT input values

The screenshot shows the 'Soil' and 'Cultivar' sections of the CAMDT interface. The 'Soil type' dropdown is set to 'SCL(WI\_ANPH007)'. A red box highlights the dropdown menu, which lists the following soil profiles: 'SCL(WI\_ANPH007)', 'LoamySand(WI\_ANPH008)', 'Clay(WI\_VRPH021)', 'Clay(WI\_VRPH043)', and 'SCL2(WI\_CMPH009)'. The 'Rooting depth' dropdown is set to 'deep'. The 'Cultivar' section has the 'User-specified' radio button selected. Below it, there is a 'User-specified cultivar' section with a table of fields:

Cultivar ID:	Not added		
Cultivar name:	Not added	P20:	Not added
Ecotype code:	Not added	G1:	Not added
P1:	Not added	G2:	Not added
P2R:	Not added	G3:	Not added
P5:	Not added	G4:	Not added

For now, only 5 soil profiles from WI.SOL are available

The screenshot shows the 'Soil' and 'Cultivar selection' sections of the CAMDT interface. The 'Soil type' dropdown is set to 'SCL(WI\_ANPH007)'. A red box highlights the 'Rooting depth' dropdown menu, which lists the following options: 'deep', 'medium', and 'shallow'. The 'Cultivar selection' section has the 'Calibrated' radio button selected.

For each profile, rooting depth can be adjusted

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 3) Setup DSSAT input values

CAMDT User-Interface

Simulation setup | Temporal Downscaling | DSSAT setup 1 | **DSSAT setup 2** | \*Scenarios setup

**Fertilization application**

Fertilization  No Fertilization

Click to add more details for fertilizer

Fertilizer application

Number of fertilizer applications? 3

No. application	Days after planting	Amount (N, kg/ha)	Fertilizer material	Application method
1st:	1	50	FE005(Urea)	AP012(Broadcast on flooded/satu
2nd:	50	40	FE005(Urea)	AP012(Broadcast on flooded/satu
3rd:	100	40	FE005(Urea)	AP012(Broadcast on flooded/satu

**Irrigation**

Automatic when required  Fixed Amount Automatic  On Reported dates  No Irrigation

Click to add more details for irrigation

Irrigation (Automatic)

Management depth(cm):	30	Threshold(% of max available):	50
End point(% of max available):	100	Efficiency fraction:	1
End of application, growth stage:	IB001	Method:	IR001(Furrow)
Amount(mm):	Not added		

Irrigation (Reported)

Number of irrigations?

Puddling date(YYDOY):

Puddling:

Percolation rate(mm/day):

No. irrigation	Date(YYDOY)	Bund height	Constant flood depth
1st:	Not added	Not added	Not added
2nd:	Not added	Not added	Not added
3rd:	Not added	Not added	Not added

All these input is used to create DSSAT input experimental file (\*.RIX)

```

TLMH0001.RIX x
*PLANTING DETAILS
@P PDATE EDATE PPOP PPOE PLME PLDS PLRS PLRD PLDP PLWT PAGE PENV PLPH SPRL
1 09155 -99 75 25 T H 20 0 2. 0 23 25 3 0

*IRRIGATION AND WATER MANAGEMENT
@I EFIR IDEP ITHR IEPT IOFF IAME IAMT IRNAME
1 -99 -99 -99 -99 -99 -99 1 UNKNOWN
@I IDATE IROP IRVAL
109155 IR008 2.0
109155 IR010 0.0
109155 IR011 5.0
109155 IR009 20.0
109160 IR011 30.0
109160 IR009 100.0
109170 IR011 50.0
109170 IR009 150.0

*FERTILIZERS (INORGANIC)
@F PDATE FMCD FACD FDEP FMN FMP FMK FMC FMO FOD FERNAME
1 1 FE005 AP012 1 50.0 -99 -99 -99 -99 UNKNOWN
1 50 FE005 AP012 1 40.0 -99 -99 -99 -99 UNKNOWN
1 100 FE005 AP012 1 40.0 -99 -99 -99 -99 UNKNOWN

*SIMULATION CONTROLS
@N GENERAL NYERS NREPS START SDATE RSEED SNAME..... SMODEL
1 GE 1 1 S 09125 2150 IRR1, P1LA JAN 85 UREASE
@N OPTIONS WATER NITRO SYMBI PHOSP POTAS DISES CHEM TILL CO2
1 OP Y Y N N N N N N M
@N METHODS WTHR INCON LIGHT EVAPO INFIL PHOTO HYDRO NSWIT MESOM MESEV MESOL
1 ME M M E R S C R 1 G S 2
@N MANAGEMENT PLANT IRRIG FERTI RESID HARVS
1MA R R D R M
@N OUTPUTS FNAME OVVEW SUMRY FROPT GROUT CAOUT WAOUT NIOUT MIOUT DIOUT VBOSE CHOUT OPOUT
1 OU N Y Y 1 Y N Y Y N N D N N
    
```

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## 4) Scenario setup for analysis

CAMDT User-Interface

Simulation setup | Temporal Downscaling | DSSAT setup 1 | DSSAT setup 2 | \*Scenarios setup

Working directory

Working directory: C:\IRI\PH\CAMDT\GUI\_Test

Click to select working directory

Threshold for water stress index

Threshold for water stress index? 0.5

What-If scenarios

How many scenarios? 3

No.	Scenario Name(4char)		Created param.txt
1:	PLT1	Click to write param1.txt	C:\IRI\PH\CAMDT\GUI_Test\param_PLT1.txt
2:	PLT2	Click to write param2.txt	C:\IRI\PH\CAMDT\GUI_Test\param_PLT2.txt
3:	PLT3	Click to write param3.txt	C:\IRI\PH\CAMDT\GUI_Test\param_PLT3.txt
4:		Click to write param4.txt	Not added
5:		Click to write param5.txt	Not added

I.Run CAMDT

II. DSSAT output (1) yield

III. DSSAT output (2) Water Stress Index

IV. DSSAT output (3) Probability (Risk) of exceeding X% water stress

Working directory where all required inputs are save and outputs will be created

Threshold for risk analysis

Create several different scenarios with different inputs (e.g., for optimal planting dates)

Click to Run both downscaling tool and DSSAT (it will run all scenarios at once)

Click to plot some of outputs: yield, WSI, risk of exceeding water stress

# Climate-Agriculture Modeling Decision Tools (CAMDT)

Check results – display output (**Effect of different planting dates**)

Test simulation

1) PLT1: planting date=337, 2009

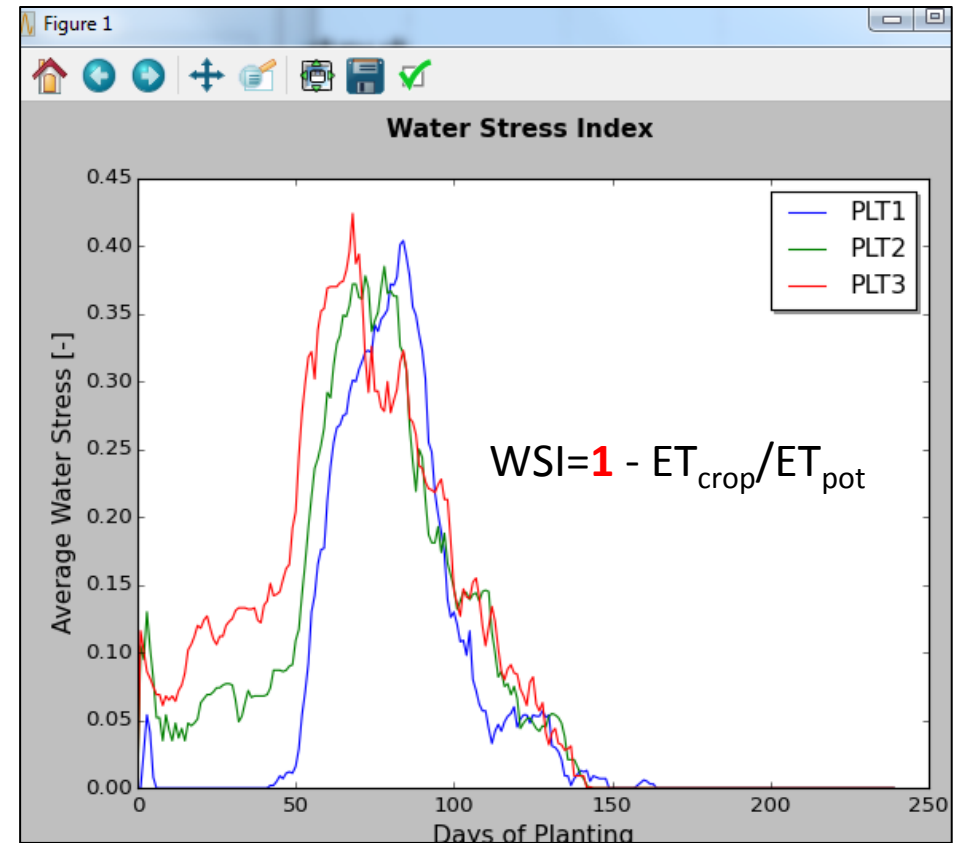
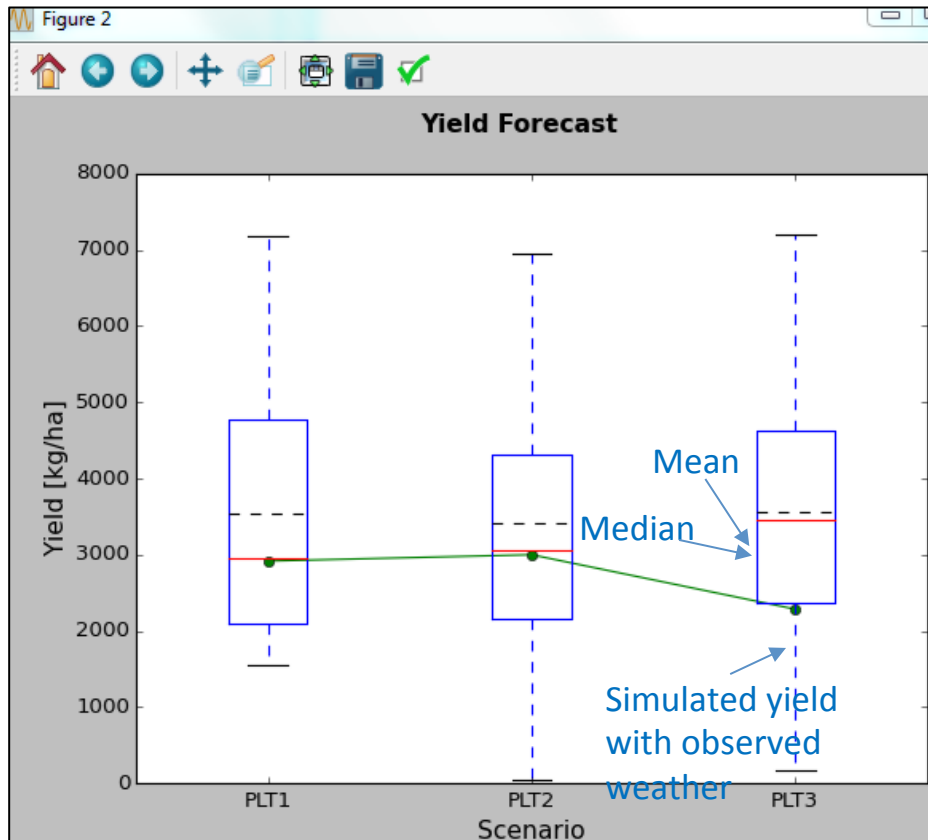
1) PLT2: planting date=347, 2009

1) PLT3: planting date=357, 2009

- Seasonal forecast : 33-34-30 (BN,NN, AN) for DJF

- No irrigation

- Fertilize application when planting (50kg/ha, urea)



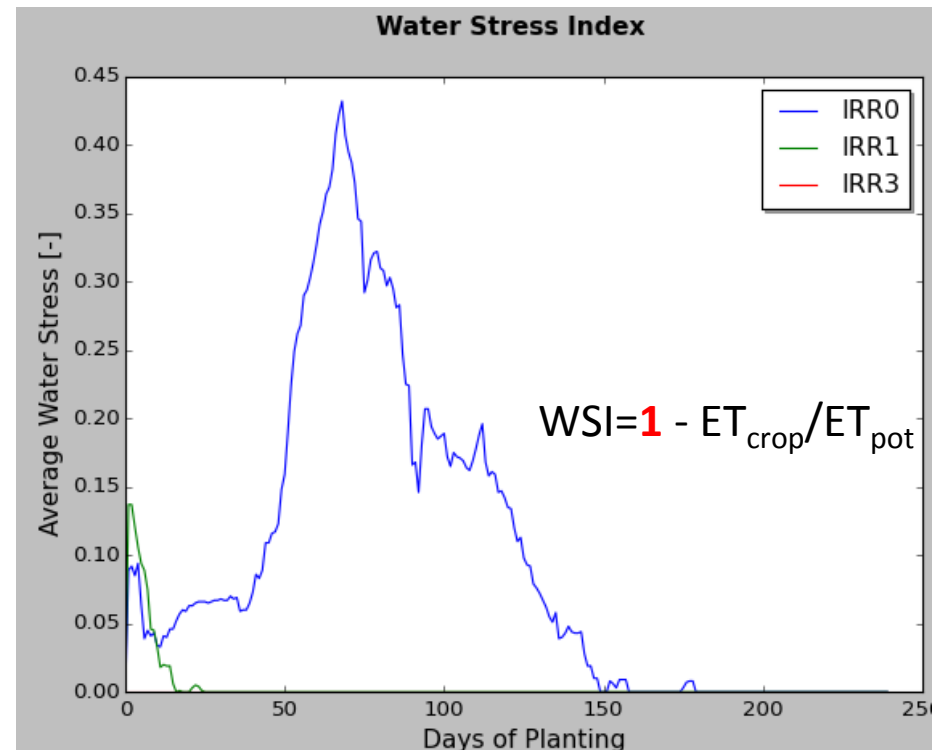
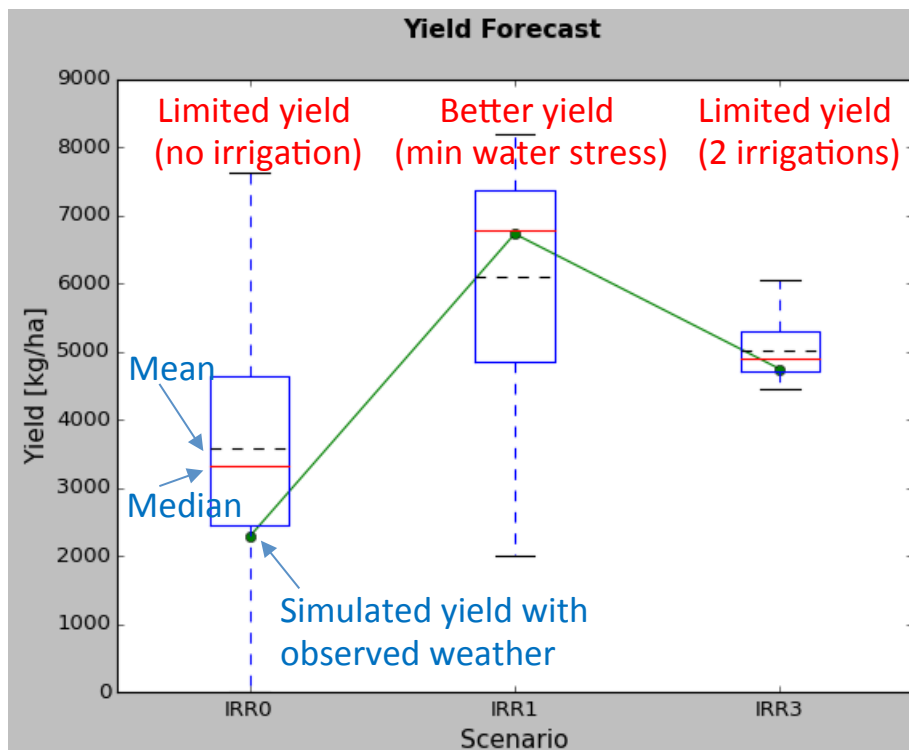
(Note: JFMAM, 2010 was El Nino year)

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## Check results – Effect of irrigation option

### Test simulation

- Scenario 1: No irrigation
- Scenario 2: Automatic irrigation when required
- Scenario 3: Irrigated twice (planting and 18 days after)
- Planting date=357, 2009
- Seasonal forecast : 33-34-30 (BN,NN, AN) for DJF
- Fertilize application when planting (50kg/ha, urea)



(Note: JFMAM, 2010 was El Nino year)

# Climate-Agriculture Modeling Decision Tools (CAMDT)

## Check results – Effect of fertilizer option

- Scenario 1: No fertilizer
- Scenario 2: fertilizer only when planting (50kg/ha, urea)
- Scenario 3: 3 fertilizer applications
  - (1) DOP=1: 50kg/ha, urea
  - (2) DOP=50, 40kg/ha, urea
  - (3) DOP=100: 40kg/ha, urea

- Planting date=357, 2009
- Seasonal forecast : 33-34-30 (BN,NN, AN) for Dec – Feb
- Irrigation when planting

