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TEXAS A&M AGRILIFE RESEARCH

Integrated Decision Support System: A framework that facilitates the integration of biophysical and economic models.

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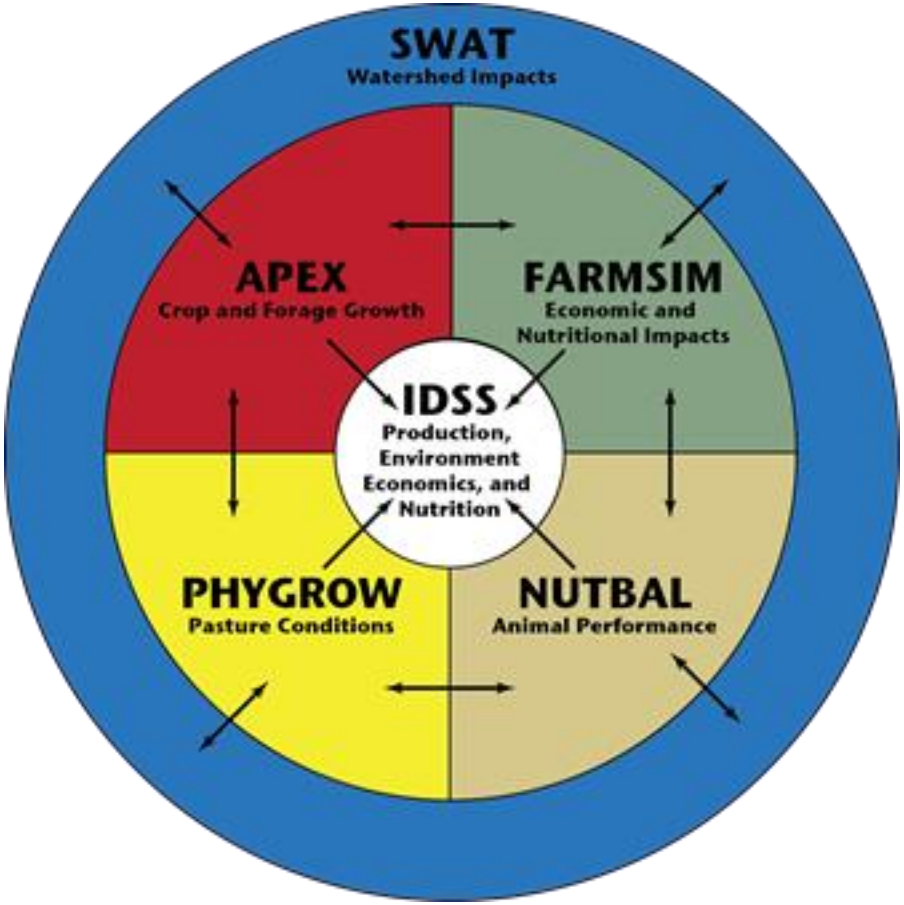
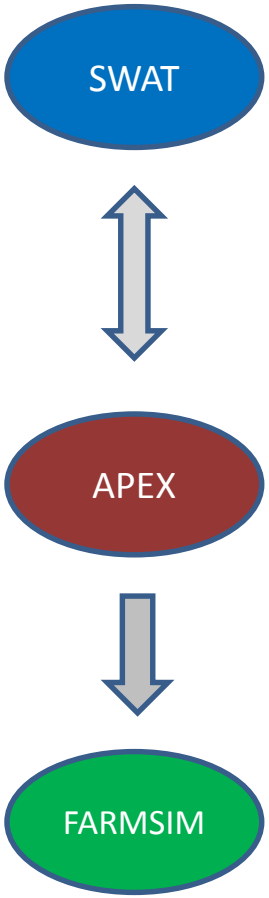
Integrated Decision Support System



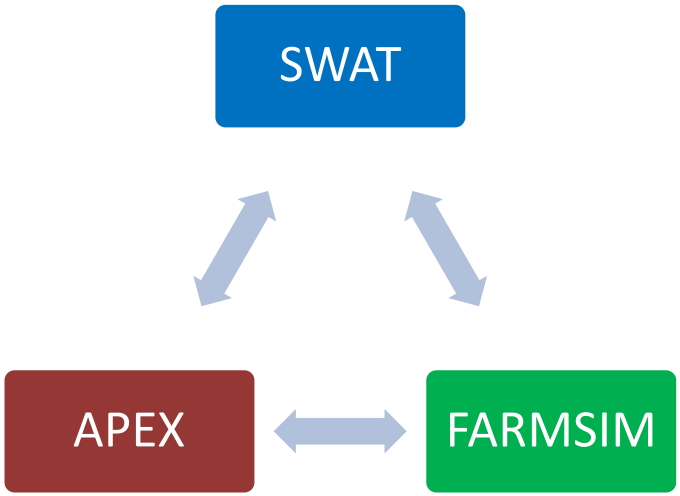
Integration of IDSS



- SWAT and APEX share input data
  - Land use types, Soil types, Elevations, Weather, Crop management
- SWAT results (calibrated) are transferred to APEX
  - Hydrologic properties: Runoff/baseflow ratio and ET
  - Water quality: Edge of field sediment and nutrient loads
- APEX results (calibrated) are transferred to SWAT
  - Crop parameters
  - ET, Edge of field Sediment and nutrient yield

- APEX output is transferred to FARMSIM
  - Calibrated crop yields for 32 years are entered in FARMSIM as to set the reference condition for socio-economic analyses.

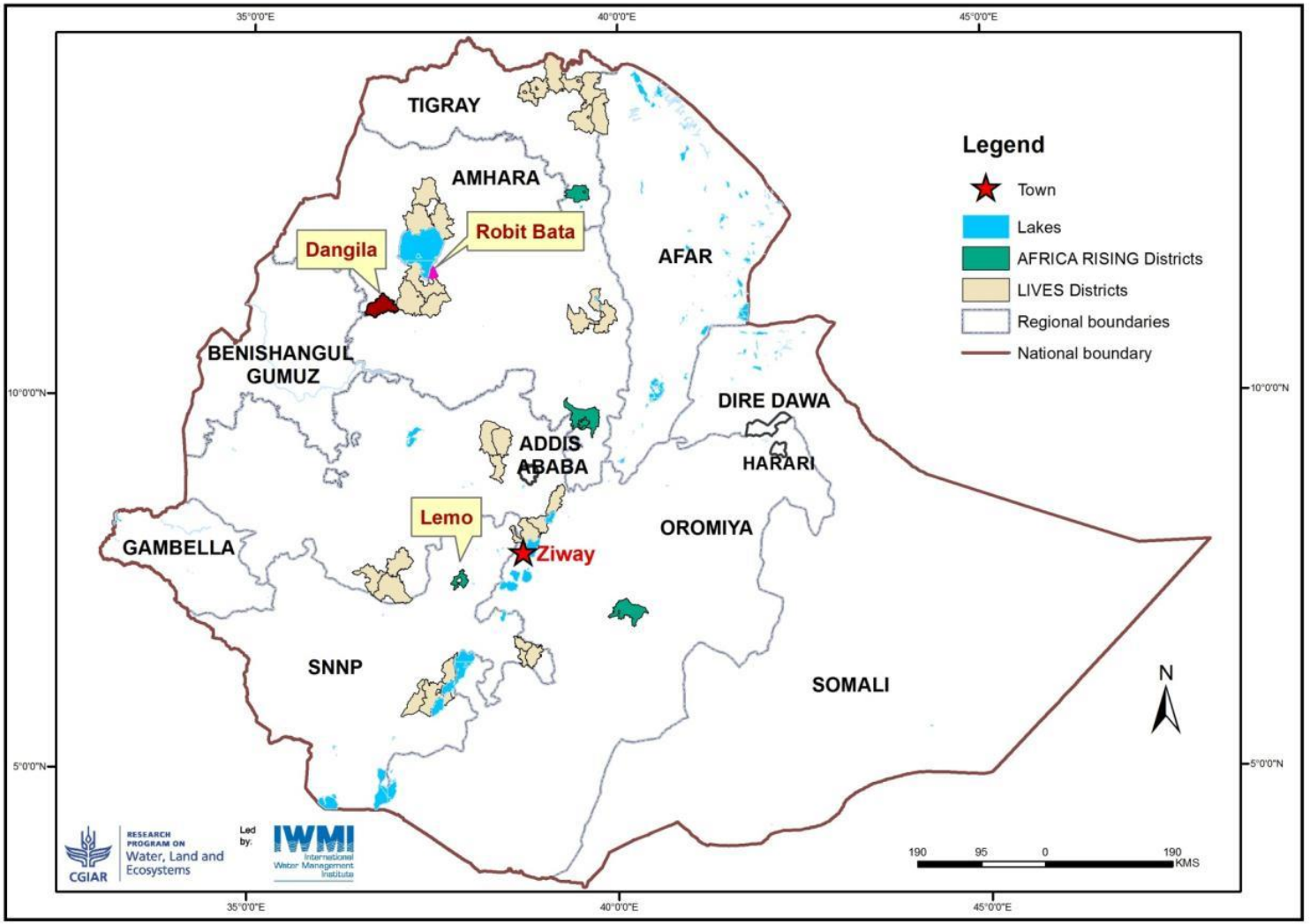
Integration of IDSS



Schematic of the IDSS Integration

- SWAT model to analyze the biophysical impacts of intensification of the interventions at the watershed scale
- APEX model to analyze cropping systems and to quantify benefits on crop yields
- FARMSIM used to assess economic & nutrition impacts

Ethiopia locations



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THE TEXAS A&M UNIVERSITY SYSTEM

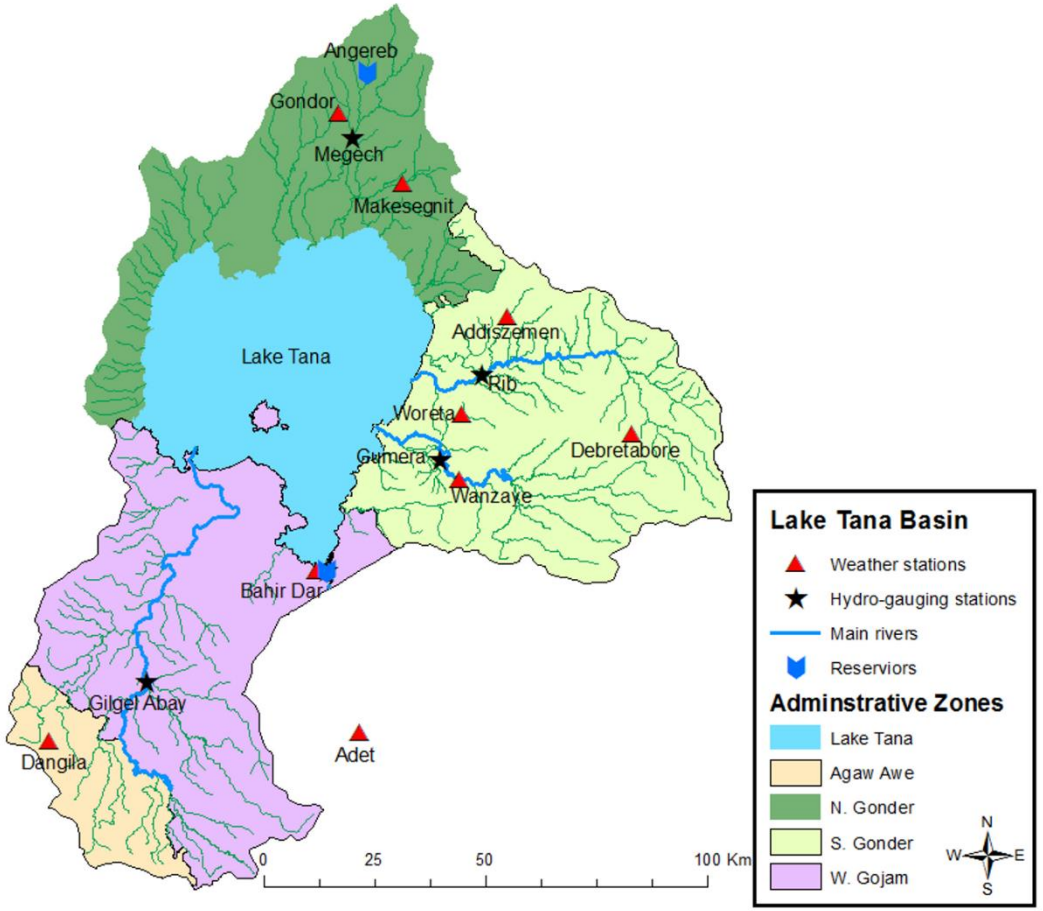
SWAT/APEX model - Input dataset

- Daily weather data
  - B_Dar Syn station - 5 years (2009-2013)
    - Rainfall, Temperature (min/max), Relative humidity, Solar radiation (Sunshine hours), Wind speed
  - B_Dar Syn station - 19 years (1990 - 2009)
    - Rainfall & Temperature
- Soils & Landuse (Source: Ethiopian Ministry of Water, Energy and Irrigation).
- Crop system data
  - Management schedule (IDSS team's data reserve, IWMI & FAO)
  - Crop parameters (Corn, Teff & Finger millet)
- Measured crop yields
  - 2005 SPAM 10 km (IFPRI)

Datasets Model Evaluation

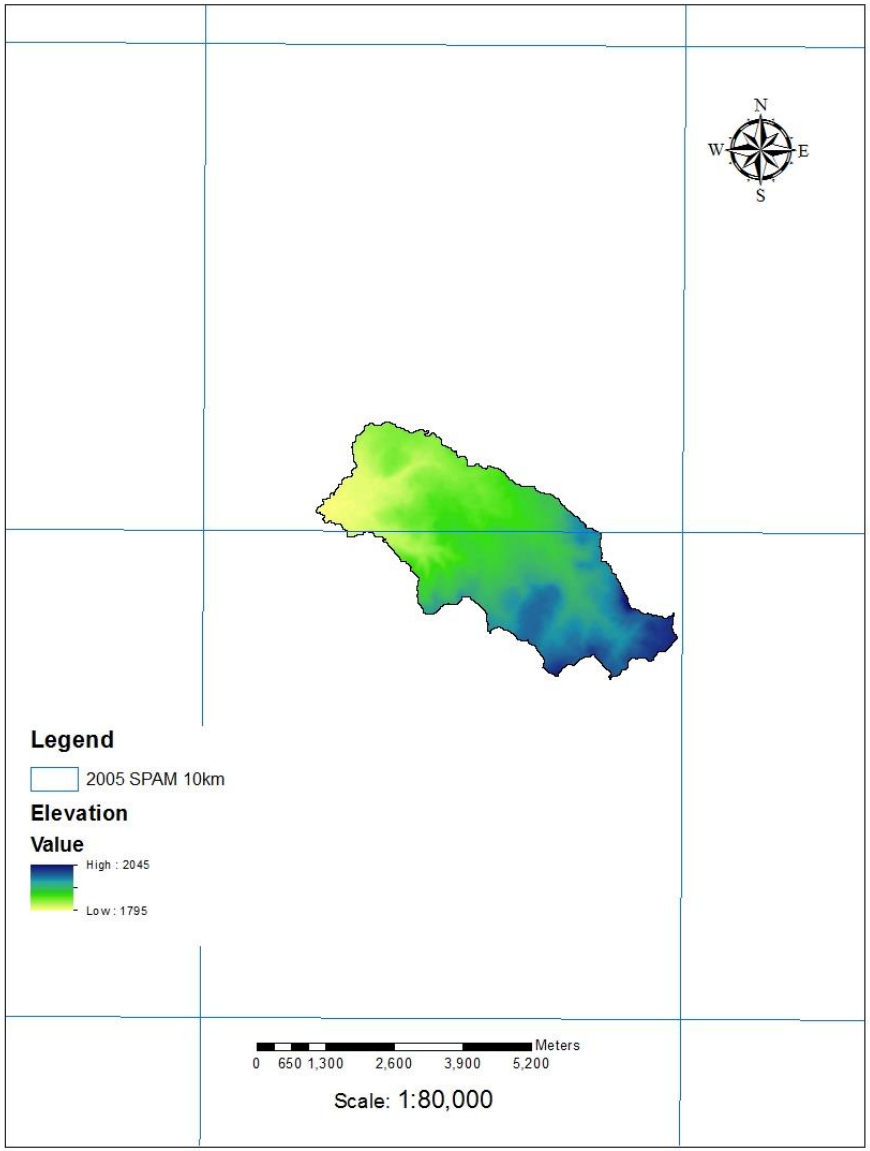
SWAT Streamflow

- Stream flow data for flow calibration SWAT
  - (Source: Ethiopian Ministry of Water, Energy and Irrigation).
  - Model calibration was done at Gilgel Abay river gauging station and Gumera river gauging station.

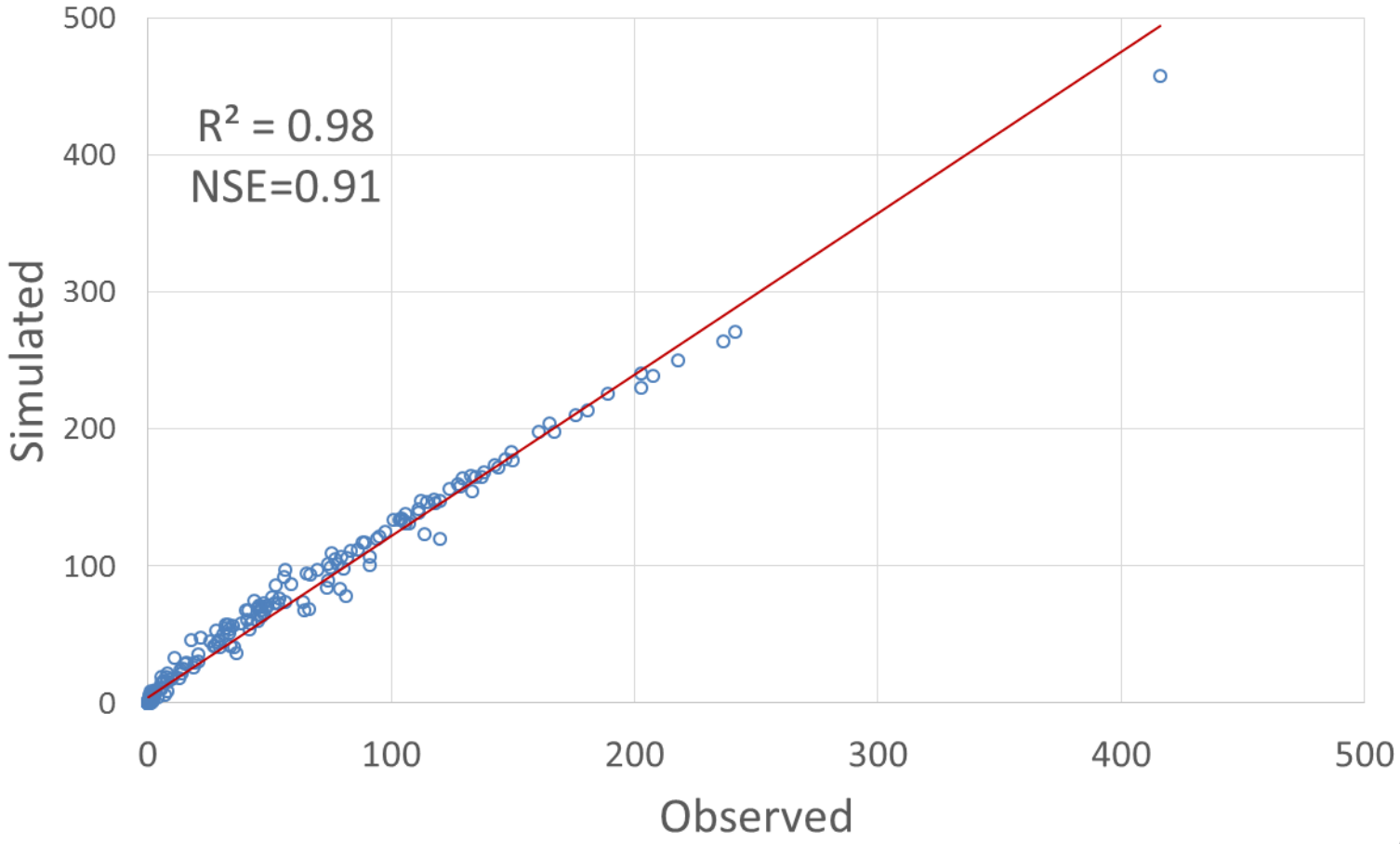


APEX Crop yield

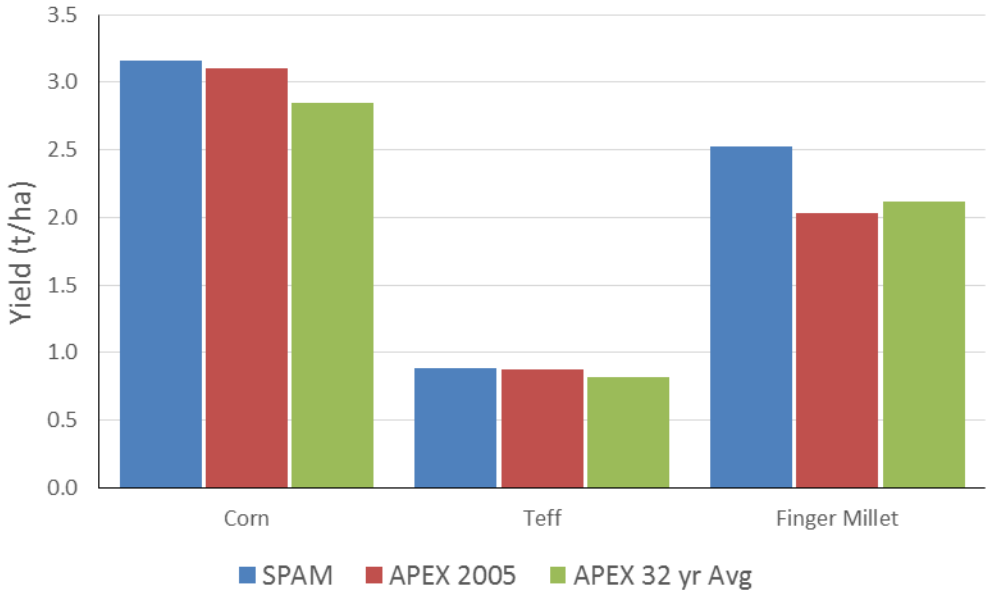
- SPAM
  - (Source: IFPRI - Liangzhi You)
- Cycle: 2005
- Resolution: 10 km
- Information:
  - Crop yield
  - Cultivated area
- Crop grouping
  - Corn – SPAM: Corn
  - Teff - SPAM: Other cereals
  - Finger Millet – SPAM: Small millet (Finger millet, Foxtail millet, Kodo millet, Little millet, Proso millet & Banyard millet)



Calibration – Runoff

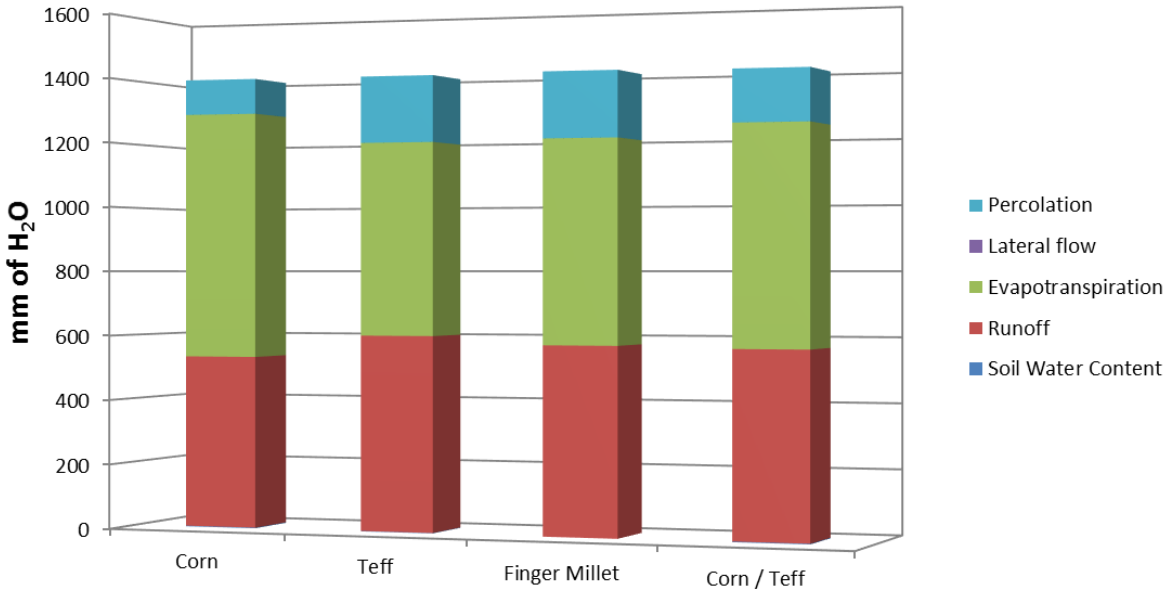


Calibration – Crop Yield



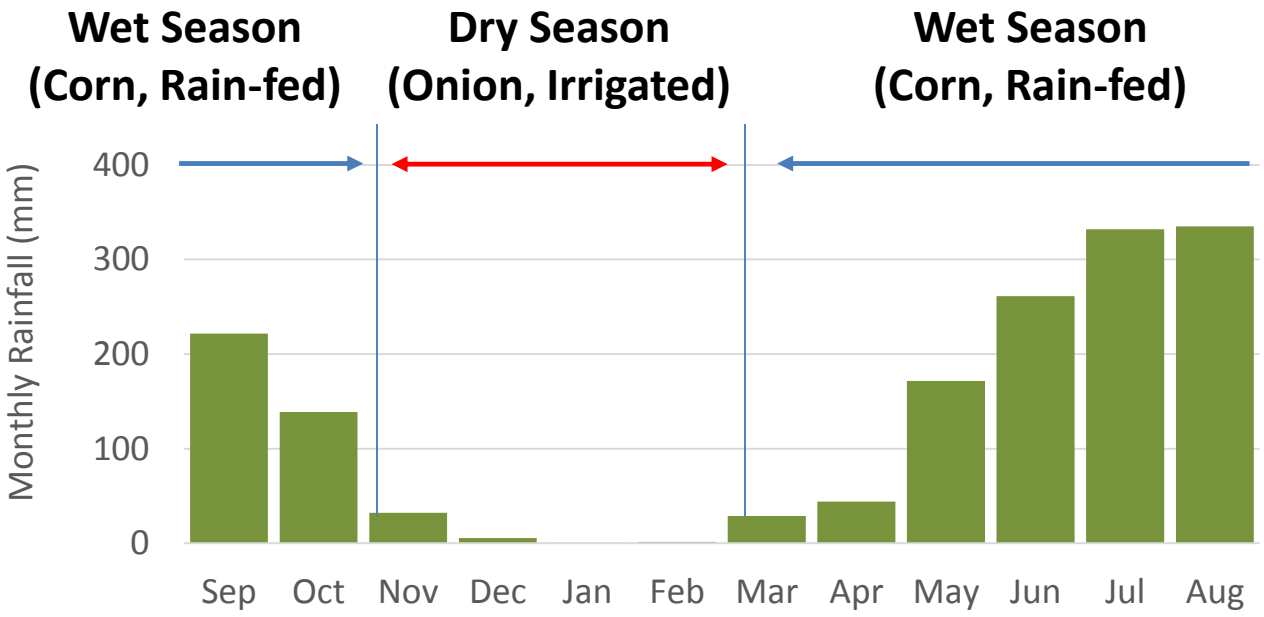
	UNITS	SPAM	APEX 2005	APEX 32 yr Avg
Corn	t/ha	3.16	3.10	2.85
Teff	t/ha	0.88	0.88	0.82
Finger Millet	t/ha	2.53	2.03	2.12

Water Balance



	Corn	Teff	Finger Millet	Corn / Teff
Soil Water Content	1.9	1.2	0.0	2.0
Runoff	531.1	600.8	576.7	568.3
Evapotranspiration	757.1	592.6	623.5	668.6
Lateral flow	0.001	0.001	0.001	0.001
Percolation	108.3	203.9	202.1	159.5
Precipitation	1398.4	1398.4	1398.4	1398.4

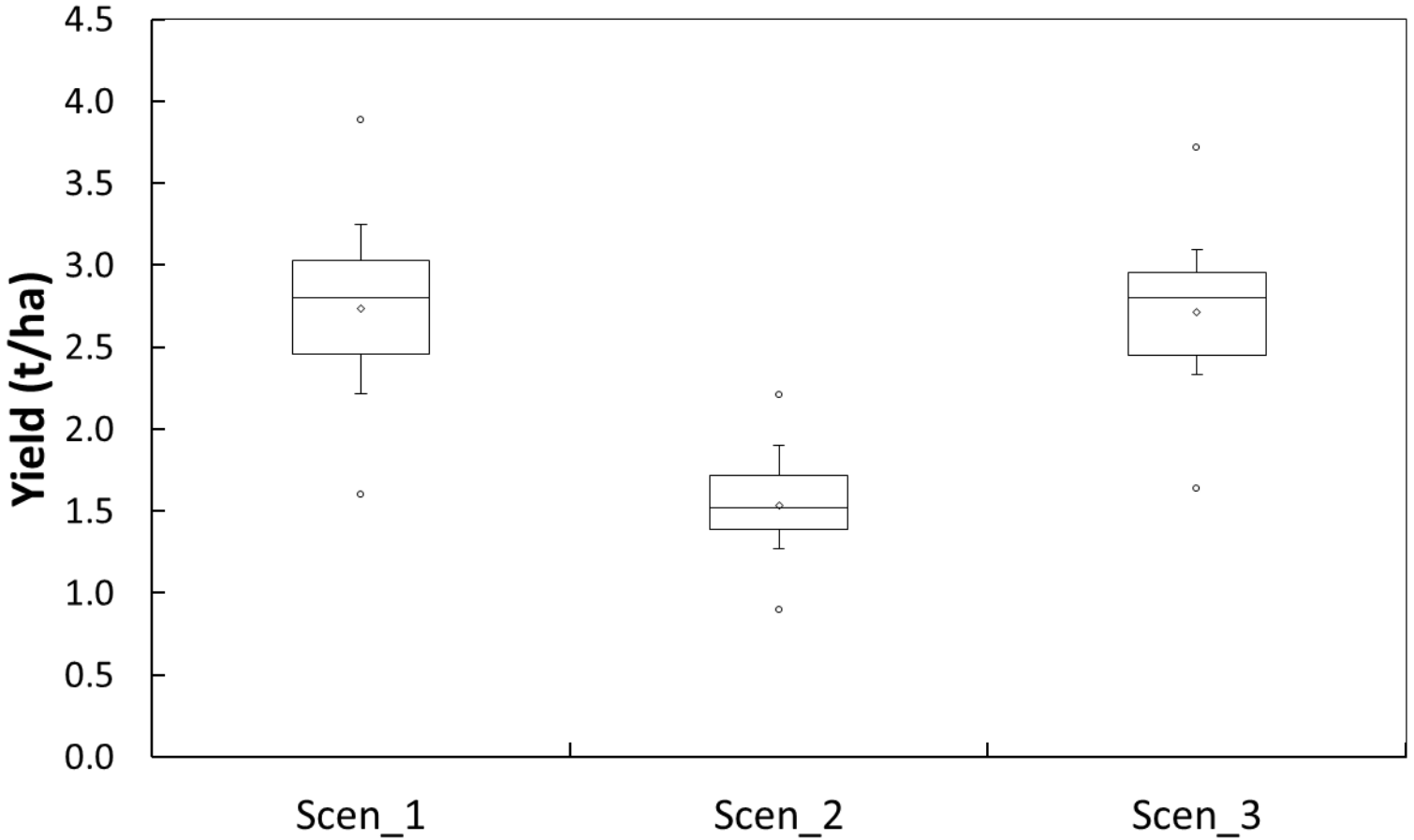
Dry Season Irrigation



Corn Rain fed

- Scenarios:
  - Normal soil vs Hardpan soils
  - Current tillage practice vs Deep tillage
  - Current fertilization (90 kg/ha DAP + 90 kg/ha U)
  - No irrigation

Corn Crop Yield

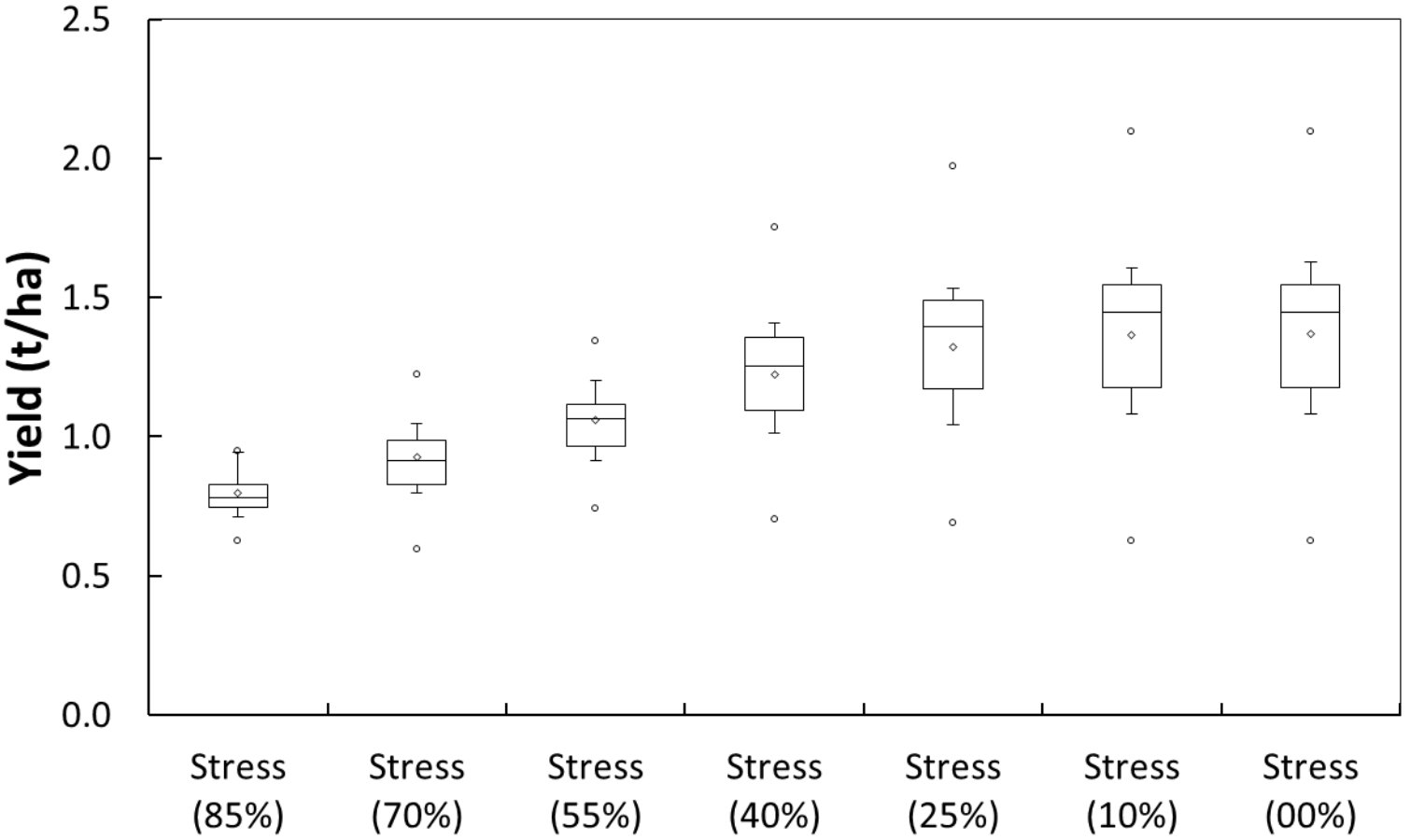


Scen_1: TILL(CUR)+FERT(CUR)+IRR(NON)+SOL(NOR)
Scen_2: TILL(CUR)+FERT(CUR)+IRR(NON)+SOL(HRD)
Scen_3: TILL(DEP)+FERT(CUR)+IRR(NON)+SOL(HRD)

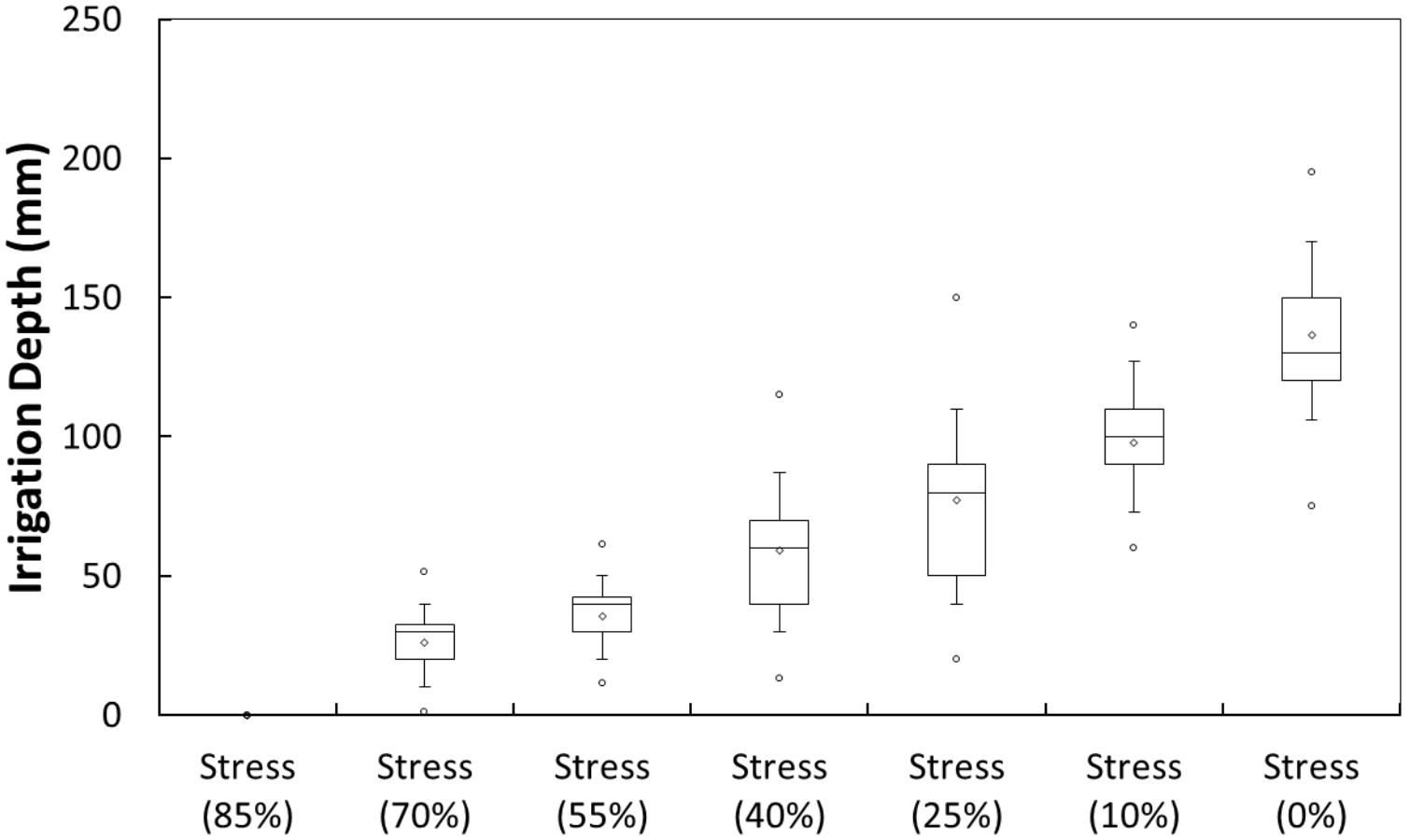
Onion Dry Season

- Scenarios:
  - Normal soil
  - Current tillage practice
  - Current fertilization (90 kg/ha DAP + 90 kg/ha U)
  - Levels of irrigation

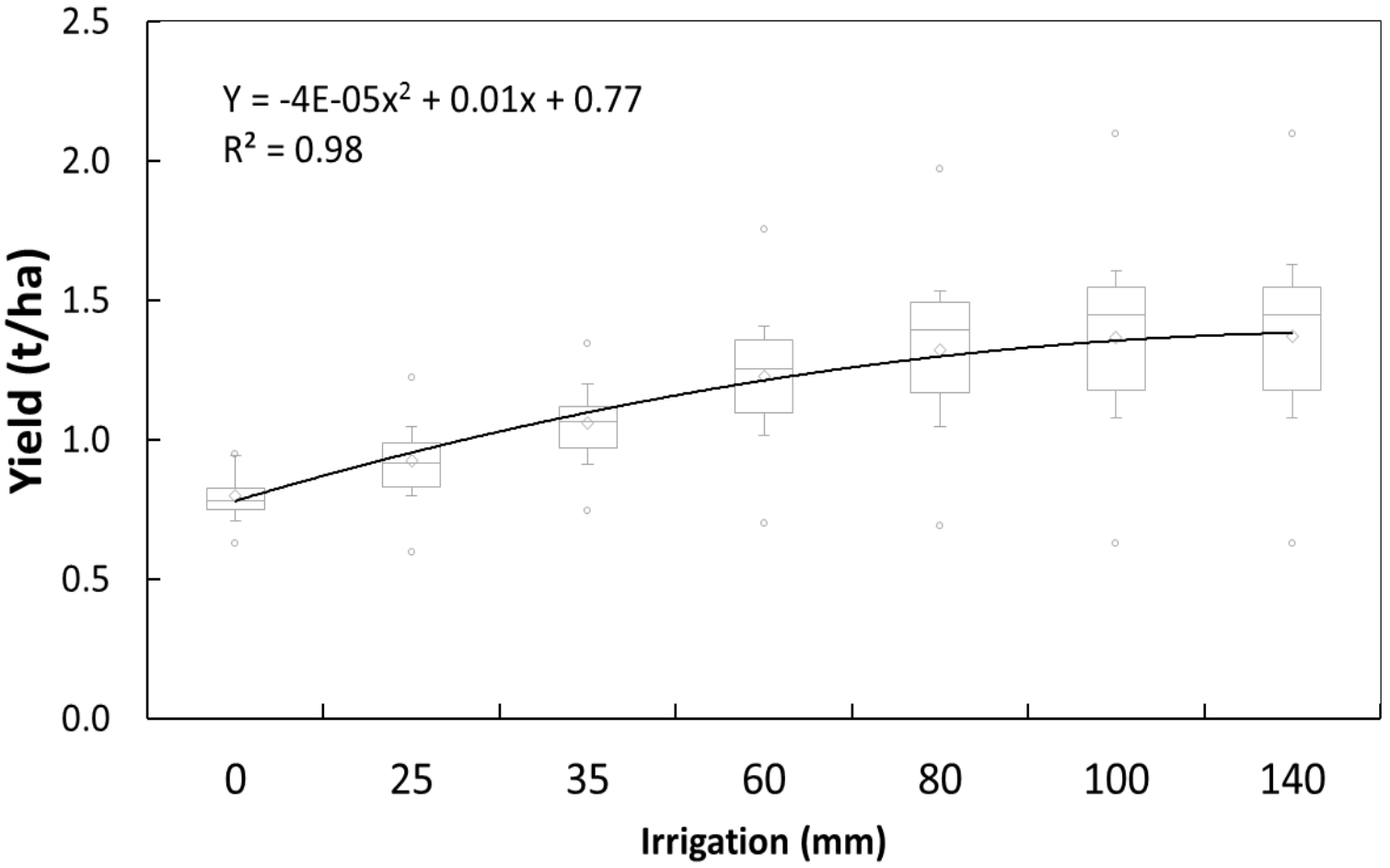
Onion - Crop Yield



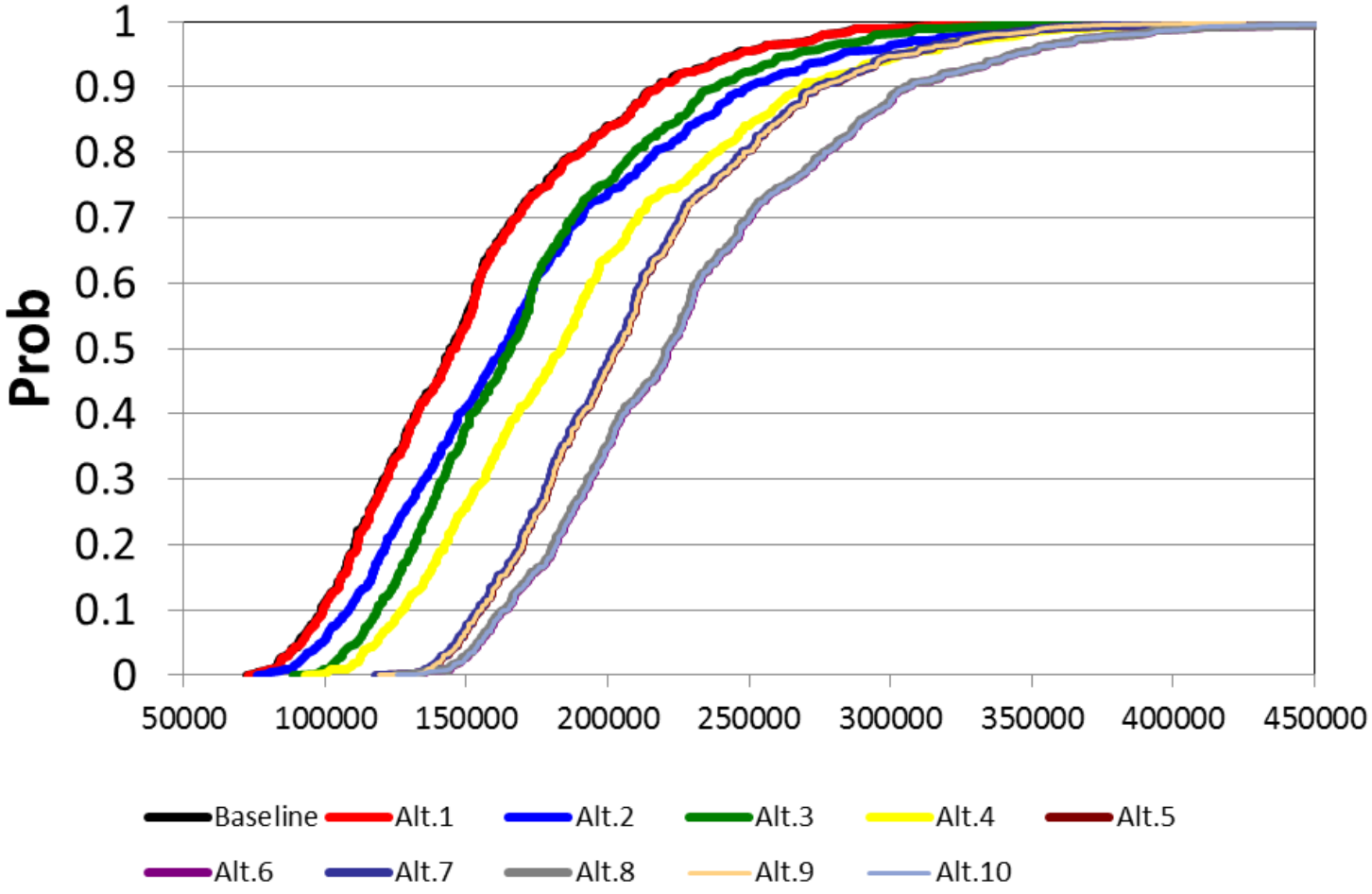
Onion - Irrigation



Onion - Irrigation



Net Present Value



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