Value Added Seasonal Forecasts for Food Security Applications in the Upper Blue Nile River Basin.

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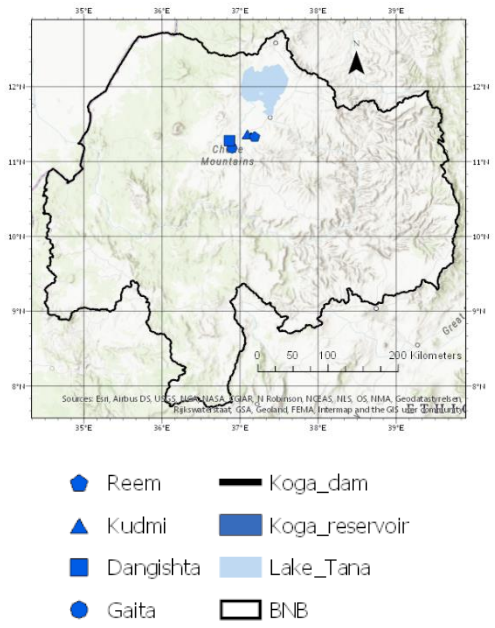
Our goal in this poster is to quantify the value added of reducing the seasonal forecast's bias



Traditional Guidance

Seasonal Forecast

Crop Models
Climate-based tools

Bulletin

Risk Management Perspective

Identify Risky Conditions
(Critical T, P)

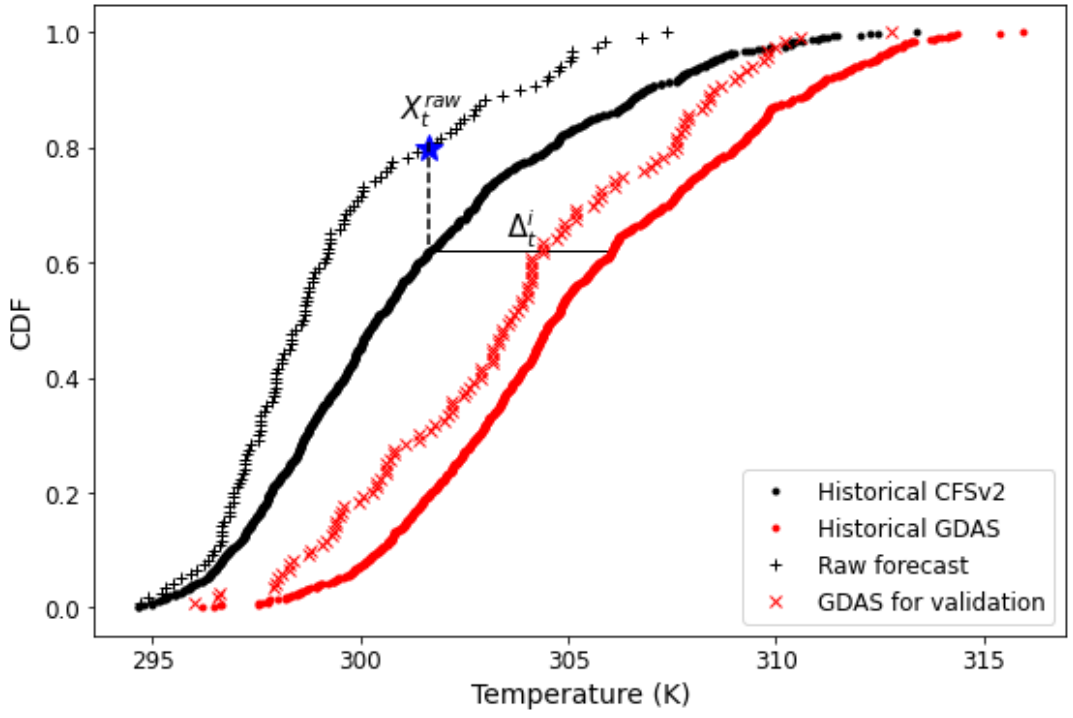
Seasonal Forecast

Likelihood Critical T, P will be reached

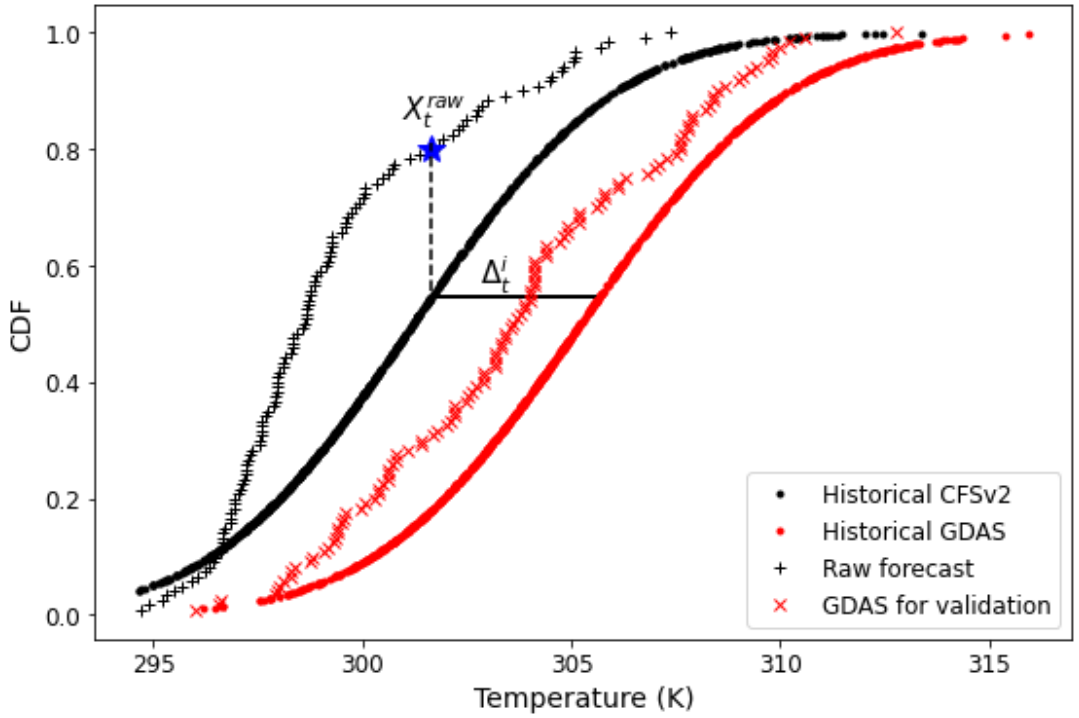
Mitigation tools

Bias correction

Distribution Derived Transformation



Non-parametric Transformation



Parametric Transformation: $\Delta_t = ax^5 + bx^4 + cx^3 + dx^2 + ex + f$ (1)

$T_{corr} = T_{mod,raw} + \Delta_t$ (2)

Where, Δ_t is the bias at a time step *t*; *a*, *b*, *c*, *d*, *e*, and *f* are the fitted coefficients; *x* is the raw forecasts.

Clustering of dataset:

Transformation	Daily	6-hourly
Non-parametric	NDay	N6hr
Distribution derived	GsnDay	Gsn6hr
Parametric	PDay	P6hr

Economic benefits of bias corrected forecast

Temperature Threshold (T_0): Temperatures above 303.15 K increasingly impaired cell division in Maize kernels, and thus reduced yield (Commuri and Jones, 2001)

Contingency Table

		Observed	
		Yes	No
Forecast	Yes	Hits (***h***)	False Alarms (***m***)
	No	Misses (*l*)	Correct Negatives (c)

Expected Expense (E):

$$E(forecast) = \boldsymbol{h}a\Delta P + \boldsymbol{l}b\Delta P + \boldsymbol{m}a'\Delta P \quad (3)$$

$$E(climate) = \boldsymbol{h}a\Delta P + \boldsymbol{l}b\Delta P \quad (4)$$

$$E(perfect) = o(a\Delta P) \quad (5)$$

where o is climatological frequency

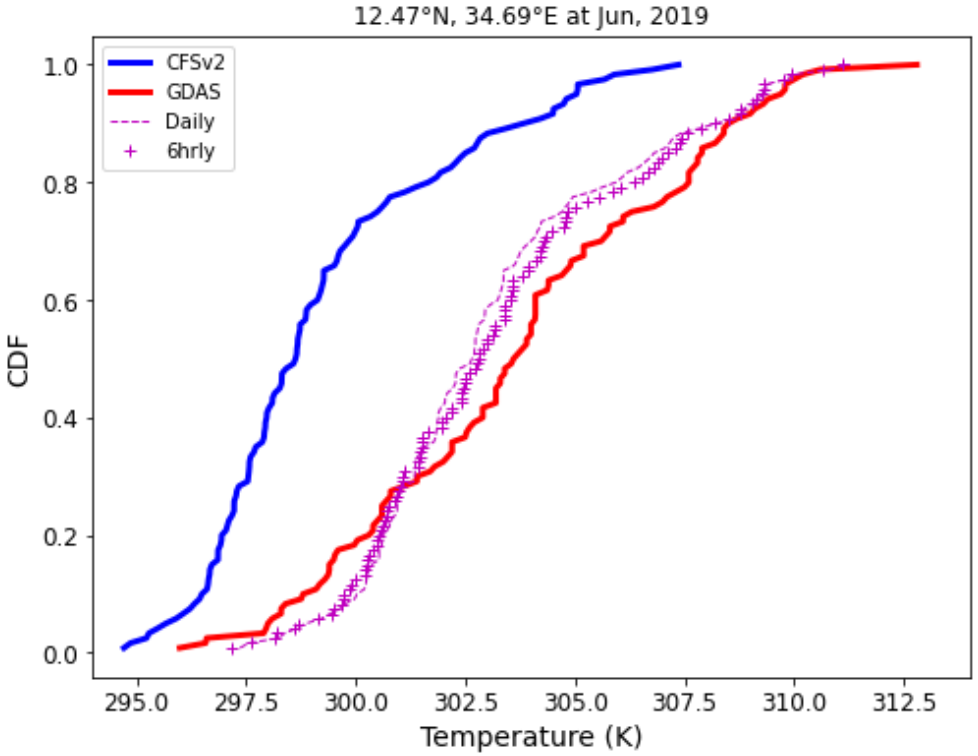
Economic Value (V):

$$V = \frac{E\,(climate) - E(forecast)}{E(climate) - E(perfect)} \quad (6)$$

Commuri, P.D., Jones, R.L. High Temperatures during Endosperm Cell Division in Maize: A Genotypic Comparison under In Vitro and Field Conditions. 2001. Crop Science. https://doi.org/10.2135/cropsci2001.4141122x

Results

Distribution Derived Transformation



Raw forecast:

		Observed	
Forecast		Yes	No
	Yes	13	1
	No	57	49

Gsn6hr:

		Observed	
Forecast		Yes	No
	Yes	46	9
	No	24	41

	Raw	Bias corrected							
	CFSv2	NDay	N6hr	GsnDay	Gsn6hr	PDay	P6hr	Climate	Perfect
E (Million $/100ha)	2.47	1.61	1.50	1.66	1.49	1.60	1.53	2.47	1.16
V	0.00	0.65	**0.74**	0.61	**0.75**	0.66	0.72	0.00	1.00