Food and Agriculture Organization of the United Nations

ICARDA
Science for resilient livelihoods in dry areas

NENA Regional Network for Evapotranspiration

Vinay Nangia, Ph.D. and Ajit Govind, Ph.D.

Near East and North Africa Regional Network For Evapotranspiration (ET)
NENA ET-Net

NENA-ETNet

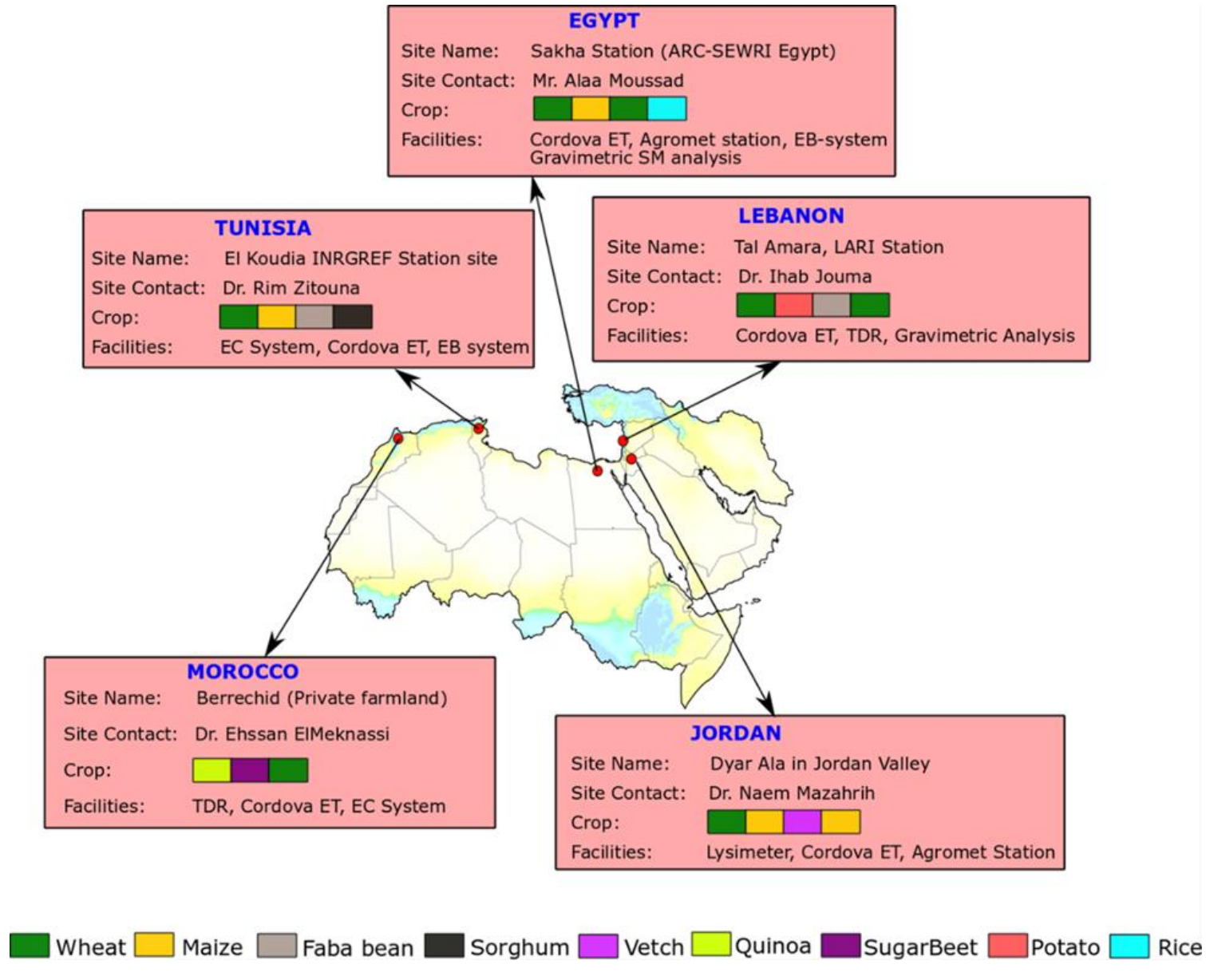
NENA ET - Network: A Successful Model Towards an Operationalized Scientific Partnership

The Issue and the Response

- Several Remote-Sensing ETa data are made freely available at an increasing temporal and ground resolution [SSEBop, WaPOR, ET Enseble, GloDET, OpenET]. This is extremely valuable for progressing in agricultural water management on large areas
- Although many ET RS-based estimates are available that can be used for regional planning and policy development, they **suffer from uncertainties owing to they being not rigorously validated**.
- **The weak point:** these RS data suffer from a **limited field validation** (virtually none in the NENA Region)
- ICARDA, in collaboration with FAO-RNE, has activated a NENA Regional-Network of field ETa monitoring including (**Egypt, Jordan, Lebanon, Morocco, Palestine and Tunisia**)

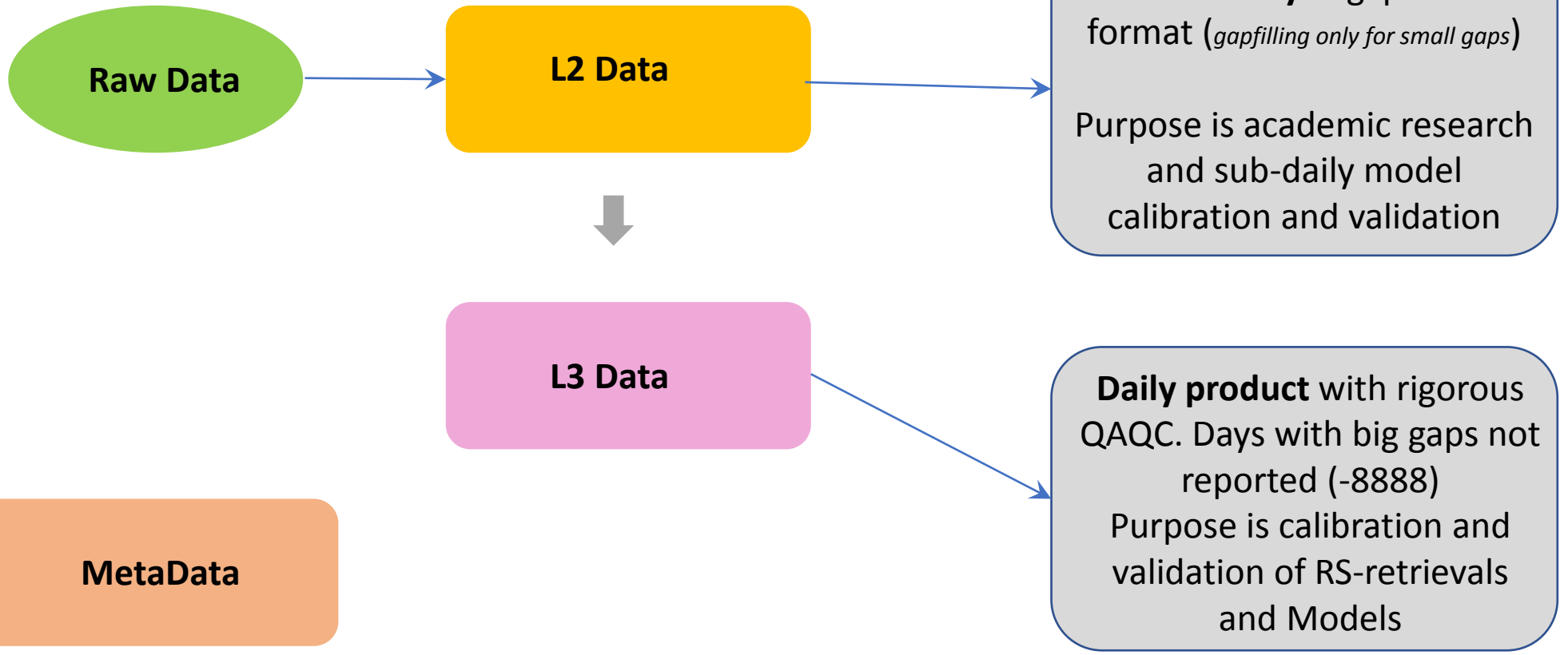
Objective

To build a common understanding and methodology on ETa measurements, in the field and through RS, on accuracy assessments of RS ETa data of different databases and on their analysis and use for agriculture-related applications (e.g., water accounting, water productivity, water management, etc.)


EGYPT
Site Name: Sakha Station (ARC-SEWRI Egypt)
Site Contact: Mr. Alaa Moussad
Crop:
Facilities: Cordova ET, Agromet station, EB-system
Gravimetric SM analysis
TUNISIA
Site Name: El Koudia INRGREF Station site
Site Contact: Dr. Rim Zitouna
Crop:
Facilities: EC System, Cordova ET, EB system
LEBANON
Site Name: Tal Amara, LARI Station
Site Contact: Dr. Ihab Jouma
Crop:
Facilities: Cordova ET, TDR, Gravimetric Analysis
MOROCCO
Site Name: Berrechid (Private farmland)
Site Contact: Dr. Ehssan ElMeknassi
Crop:
Facilities: TDR, Cordova ET, EC System
JORDAN
Site Name: Dyar Ala in Jordan Valley
Site Contact: Dr. Naem Mazahrih
Crop:
Facilities: Lysimeter, Cordova ET, Agromet Station
Wheat
Maize
Faba bean
Sorghum
Vetch
Quinoa
SugarBeet
Potato
Rice

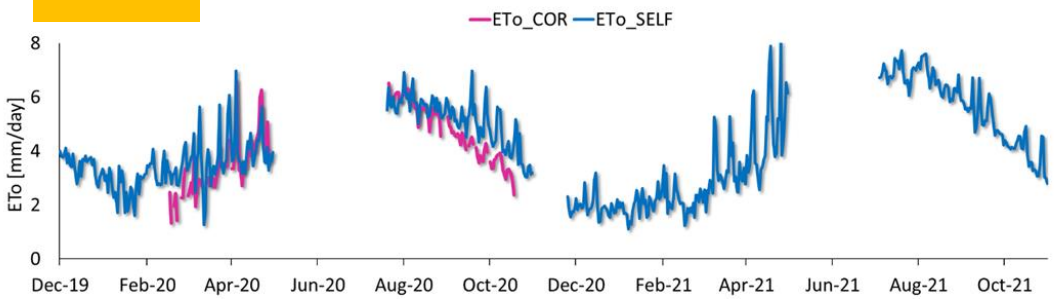
Seasons 1-4: Crops and Seasons

Country	Season-1	Season-2	Season-3	Season-4
Egypt	Winter Wheat *(Dec 1,2019 – May 13, 2020)*	Summer Maize *(July 20, 2020 – Oct 21, 2020)*	Winter Wheat *(Nov. 25, 2020 – April 30,2021)*	Summer Rice *(June 16, 2021 – Oct. 20, 2021)*
Jordan	Winter Wheat *(Dec 25, 2019 – May 5, 2020)*	Summer Maize *(July 15, 2020 – Oct. 20, 2020)*	Fodder Vetch *(Jan. 13, 2021 – April 30, 2021)*	Maize *(June 14, 2021 – Sep. 9, 2021)*
Lebanon	Wheat *(Dec 7, 2019 – July 2, 2020)*	Potato- Fallow *(March 1, 2020 – July 31, 2020)*	Faba bean *(Dec. 3, 2020 – May 6, 2021)*	Maize *(June 17, 2021 – Oct. 8, 2021)*
Morocco	Maize *(Feb 23,2020 – July 3, 2020*	Beetroot *(Aug. 27, 2020 – Nov. 11, 2020)*	Durum Wheat *(Jan 11, 2021 – May 31, 2021)*	NA
Tunisia	Wheat *(Dec 3, 2019 – June 23, 2020)*	Maize *(July 19,2020 – Nov 3, 2020)*	Faba bean *(Dec. 19, 2020 – May 26, 2021)*	Sorghum *(Aug. 9, 2021 – Nov. 2, 2021)*

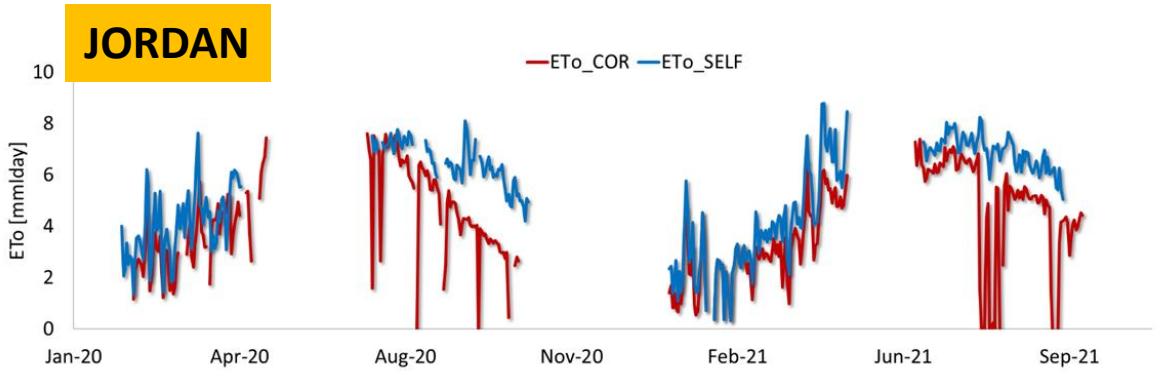

Raw Data
L1 Data
L2 Data
L3 Data
MetaData
Half-Hourly in original format
Purpose is academic research and gap filling research
Half-Hourly in gap-filled format (gapfilling only for small gaps)
Purpose is academic research and sub-daily model calibration and validation
Daily product with rigorous QAQC. Days with big gaps not reported (-8888)
Purpose is calibration and validation of RS-retrievals and Models

How well we measure ETo ?

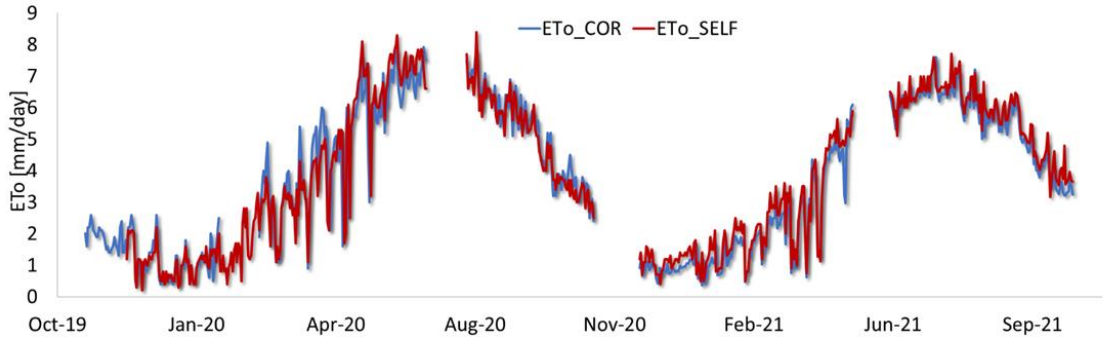
EGYPT



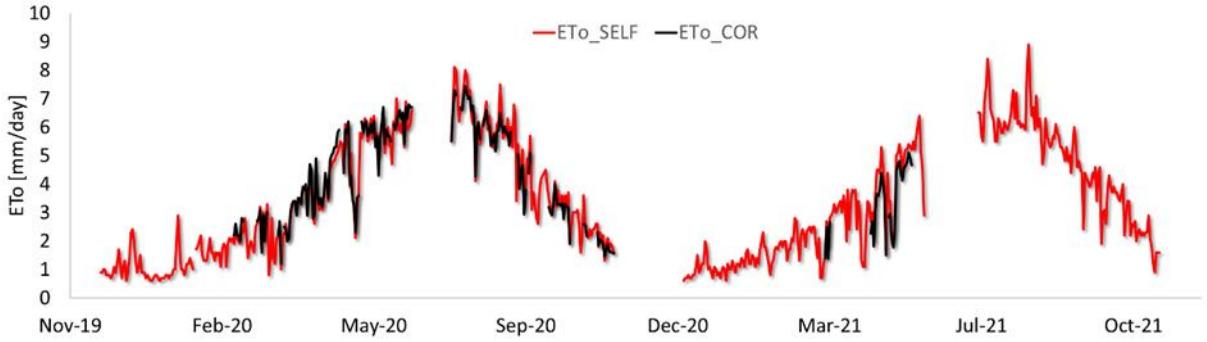
JORDAN



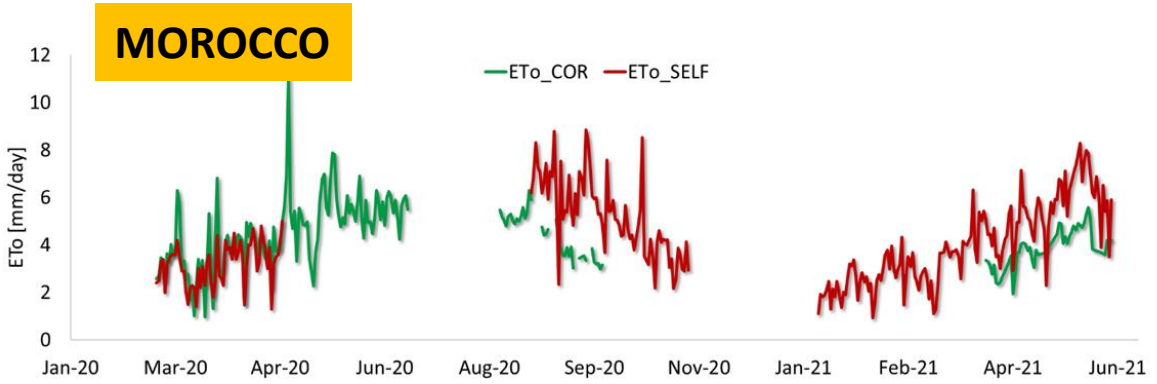
LEBANON



TUNISIA

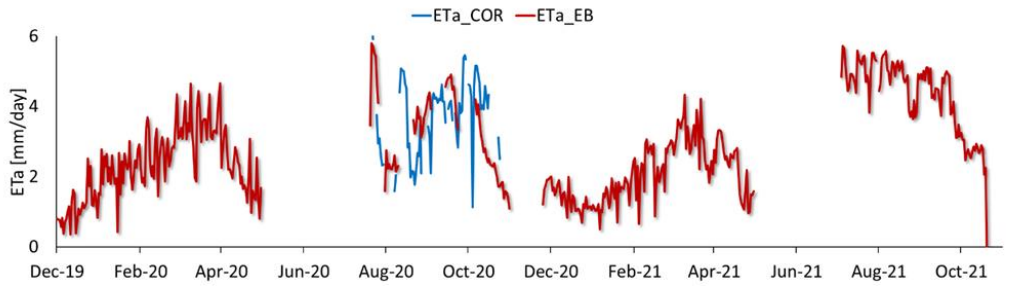


MOROCCO

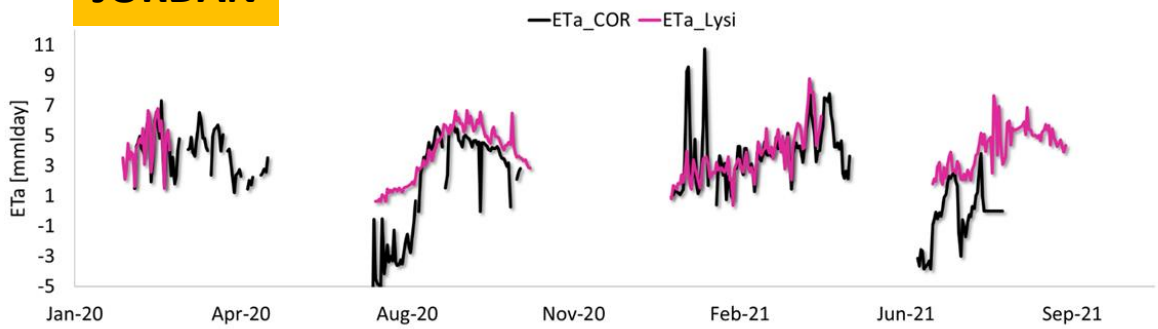


How well we measure ETa ?

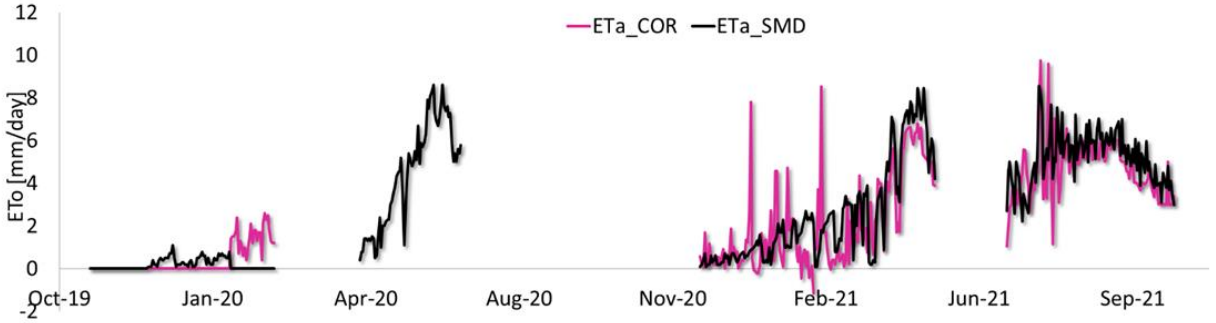
EGYPT



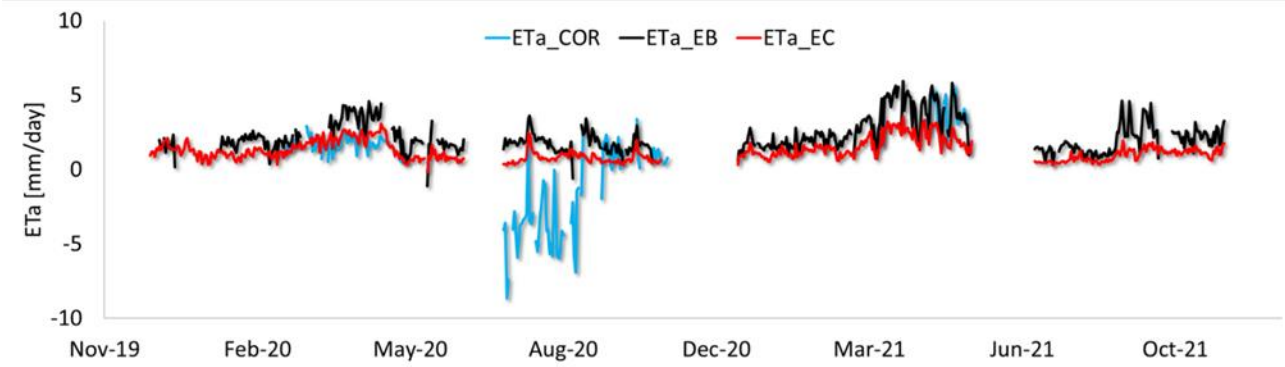
JORDAN



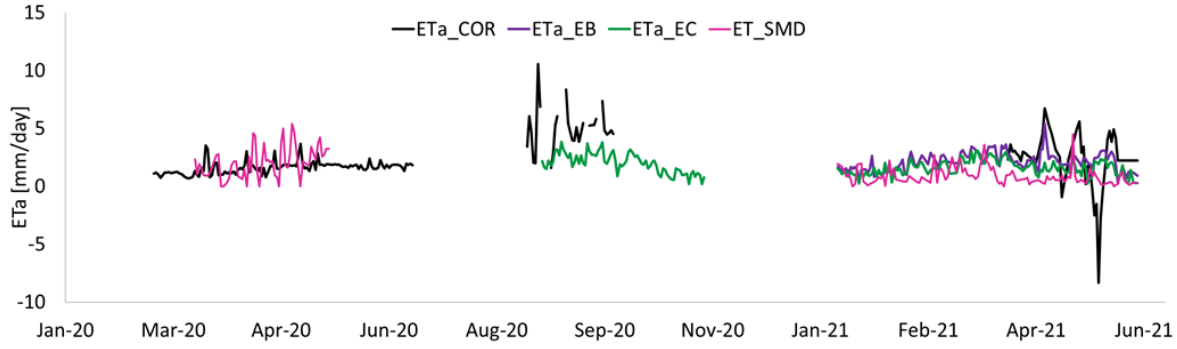
LEBANON



TUNISIA

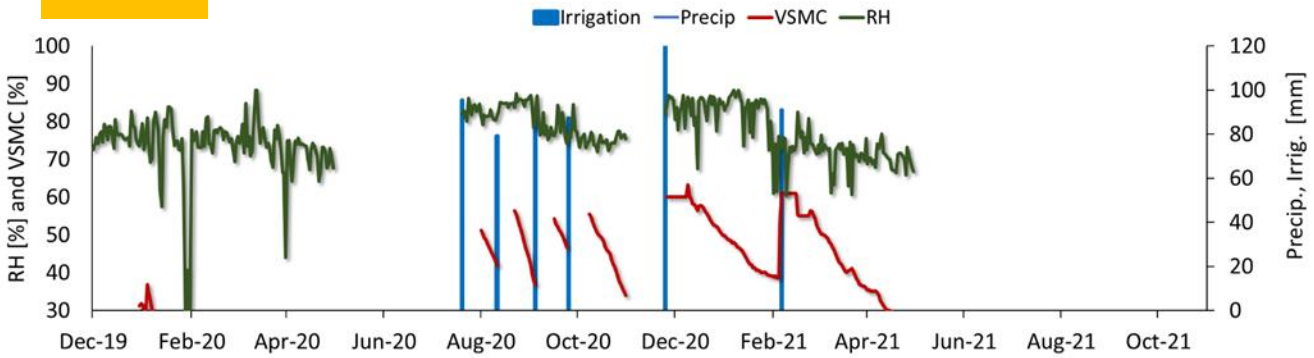


MOROCCO

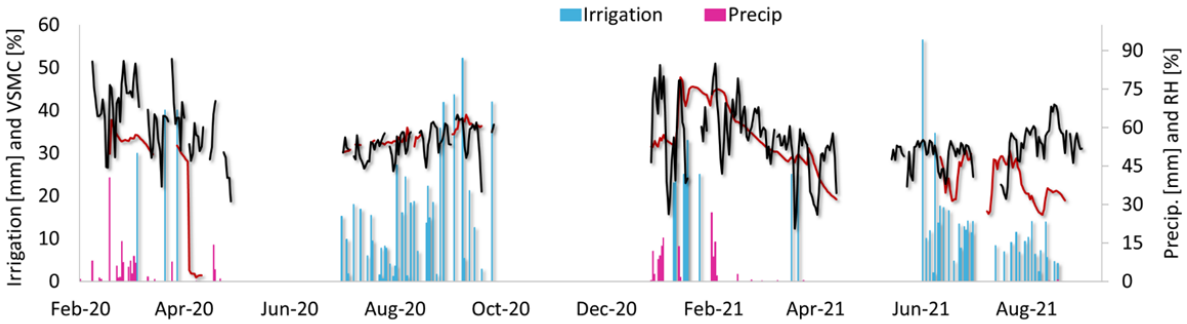


How well we Hydrometeorological Variables?

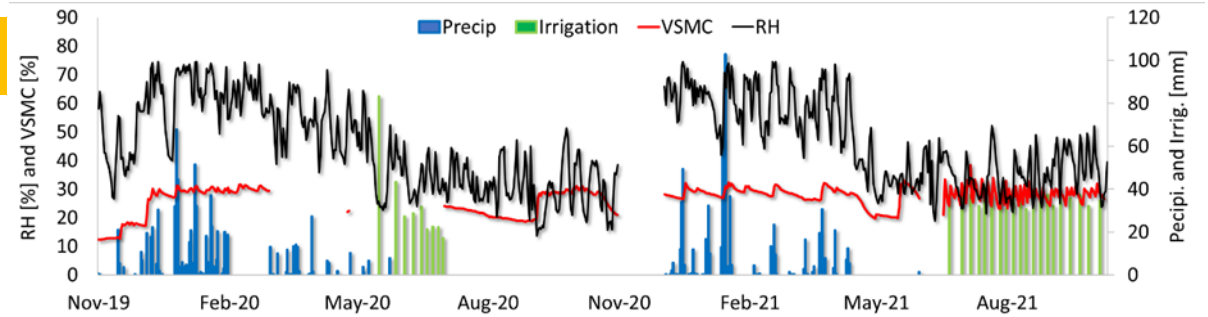
EGYPT



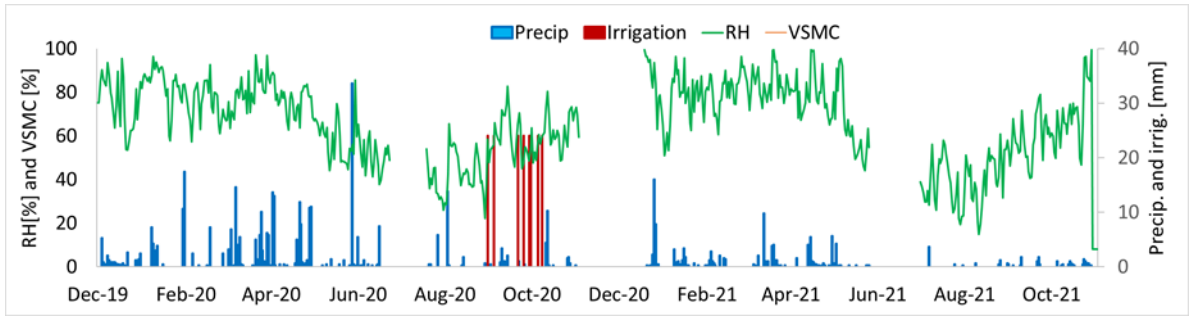
JORDAN



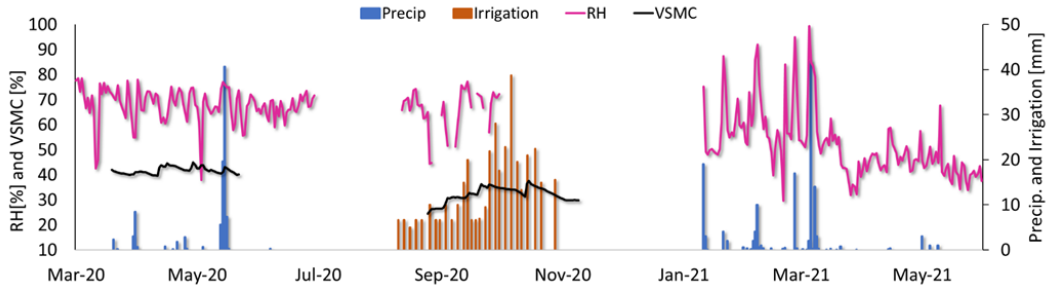
LEBANON



TUNISIA



MOROCCO

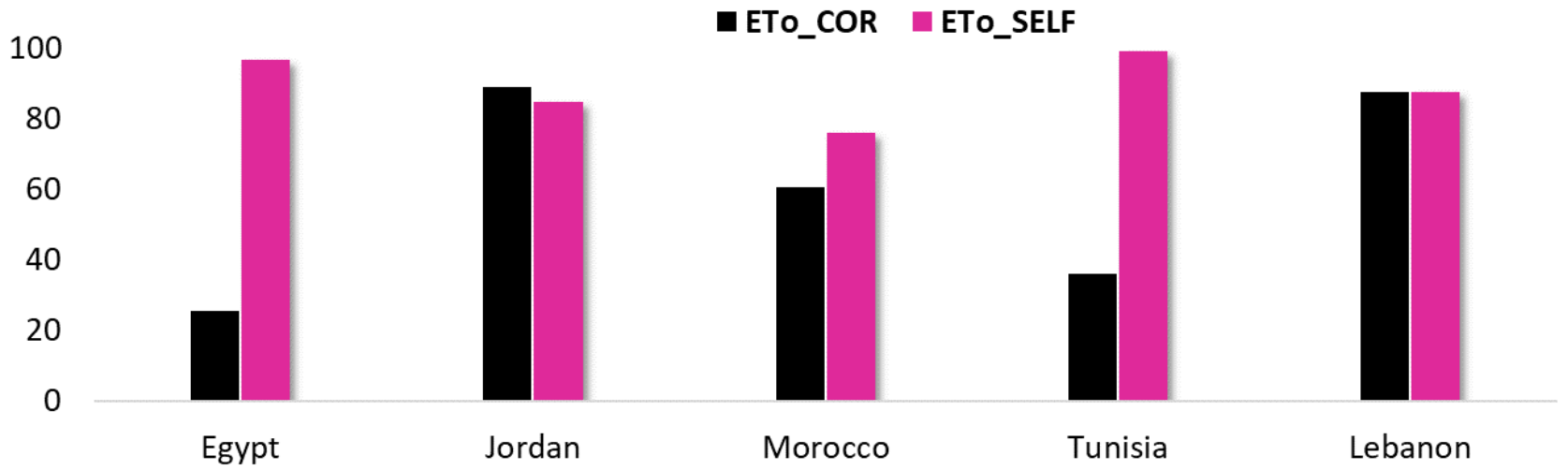


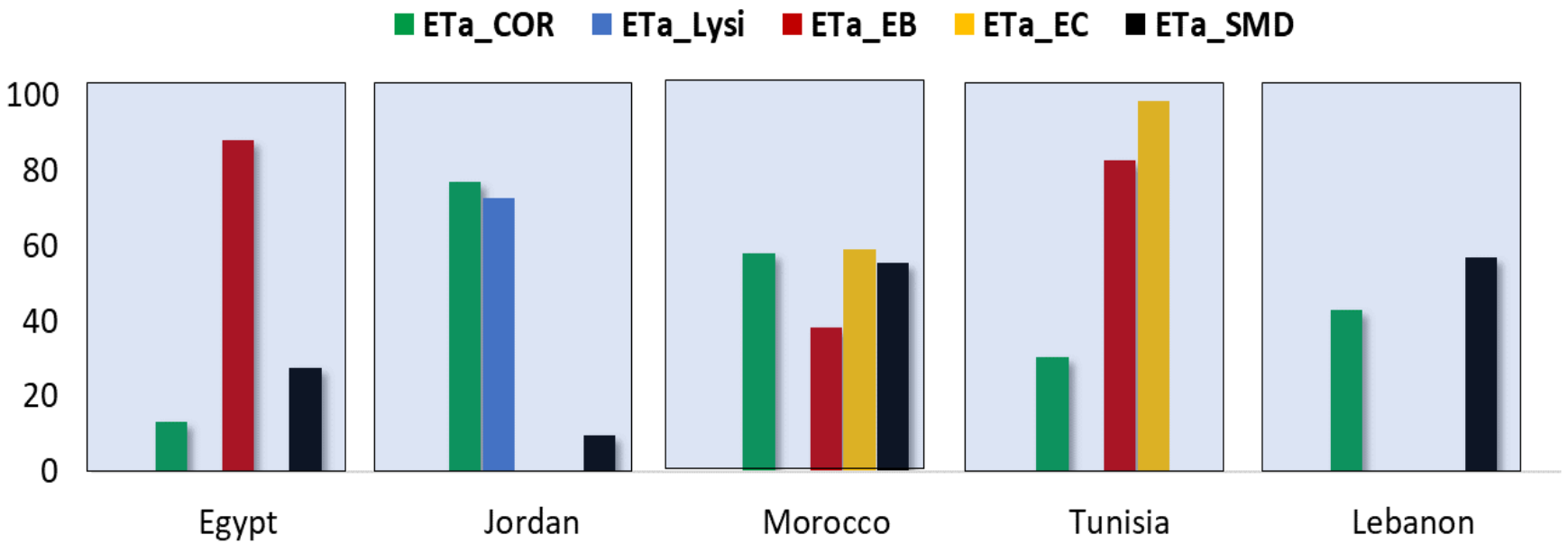
Data Completeness

	Egypt	Jordan	Morocco	Tunisia	Lebanon
ETo_COR	25	89	61	36	88
ETo_SELF	97	85	76	99	88
ETa_COR	13	77	58	30	43
ETa_Lysi		73			
ETa_EB	88		38	83	
ETa_EC			59	98	
ETa_SMD	28	10	56		57
H	70	60	59	98	4
G	64	60	59	61	
LE	64	60	59	98	
Precip	75	89	98	100	96
A_Temp	84	83	82	100	100
S_Temp	76	71	70	59	95
Canopy_Temp	25	71	56	84	83
SW_In	66	60	18	86	45
SW_Out	55			86	4
LW_In	55			86	
LW_Out	55			86	
NetRad	70	60	93	86	
RH	75	83	82	100	100
VSMC	58	65	78	1	81
WS	98	83	82	99	100
LAI				2	2
NDVI				3	
Cnpy_Ht	4	9	41	6	8
Irrigation	1	58	26	1	4
Runoff					
Capillary					
Pressure	18	83	49	53	96

Description of Variable	Variable Shortname	Units used
Year	YEAR	YYYY
Month	MONTH	MM
Julian Day of the Year	DOY	DDD
Local Time (2400hr format)	TIME	2330
Potential ET (ETo) by CORDOVA method	ETo_COR	mm/day
Potential ET (ETo) by other methods	ETo_SELF	mm/day
Actual ET (ETa) measured by CORDOVA method	ETa_COR	mm/day
Actual ET (ETa) measured with Lysimeter	ETa_Lysi	mm/day
Actual ET (ETa) measured with EB Method	ETa_EB	mm/day
Actual ET (ETa) measured with EC Method	ETa_EC	mm/day
Actual ET (ETa) measured with SM Depletion	ETa_SMD	mm/day
Sensible Heat Flux	H	W/m2
Ground Heat Flux	G	W/m2
Latent Heat Flux	LE	W/m2
Precipitation	Precip	mm/day
Air Temperature	A_Temp	oC
Soil Temperature at 10cm	S_Temp	oC
Plant Canopy Temperature	Canopy_Temp	oC
Incoming SW Radiation Flux	SW_In	W/m2
Outgoing SW Radiation Flux	SW_Out	W/m2
Incoming LW Radiation Flux	LW_In	W/m2
Outgoing SW Radiation Flux	LW_Out	W/m2
Net Radiation Flux	NetRad	W/m2
Relative Humidity	RH	%
Volumetric Soil Water Content	VSMC	fraction
Wind Speed at 2m	WS	m/sec
Normalized Difference Vegetation Index (optional)	NDVI	-1 to +1
Canopy Height (optional)	Cnpy_Ht	m
Runoff from the Field (optional)	Runoff	mm/day
Capillary Rise (optional)-estimated	Capillary	mm/day
Air Pressure- measurement height	Pressure	mbar
Leaf Area Index	LAI	m2/m2
Irrigated Water	Irrigation	mm/day
Method used for Gap Filling	Gap_Method	Regression
Person who prepared the file	Prepared By	Initials of Technician
Date of this dataset preparation	Date of Prep	24/2/2020
Attested By	CountryManager	Initials of CM

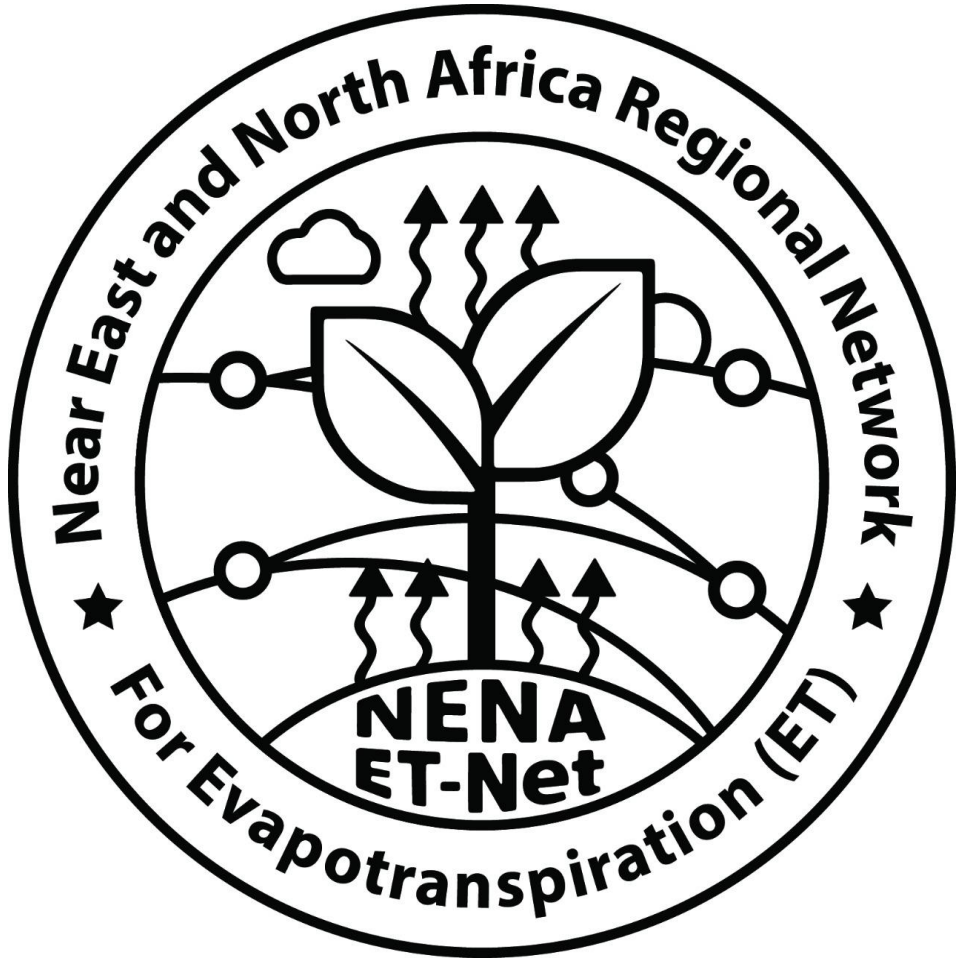
Data Completeness for ET variables per se





Knowledge sharing and management

- Have conducted a **webinar series** – recordings available
- Have a **co-learning platform and data sharing dashboard**
- Have expanded to Palestine, need to expand further
- Datasets useful for remote sensing validation, for Kc estimation, for crop modeling, for WP assessments, for water accounting et al.
- Need to continue supporting this network but need to **move from measurements to application development to benefit from datasets**


Near East and North Africa Regional Network
NENA
ET-Net
For Evapotranspiration (ET)

Thank You