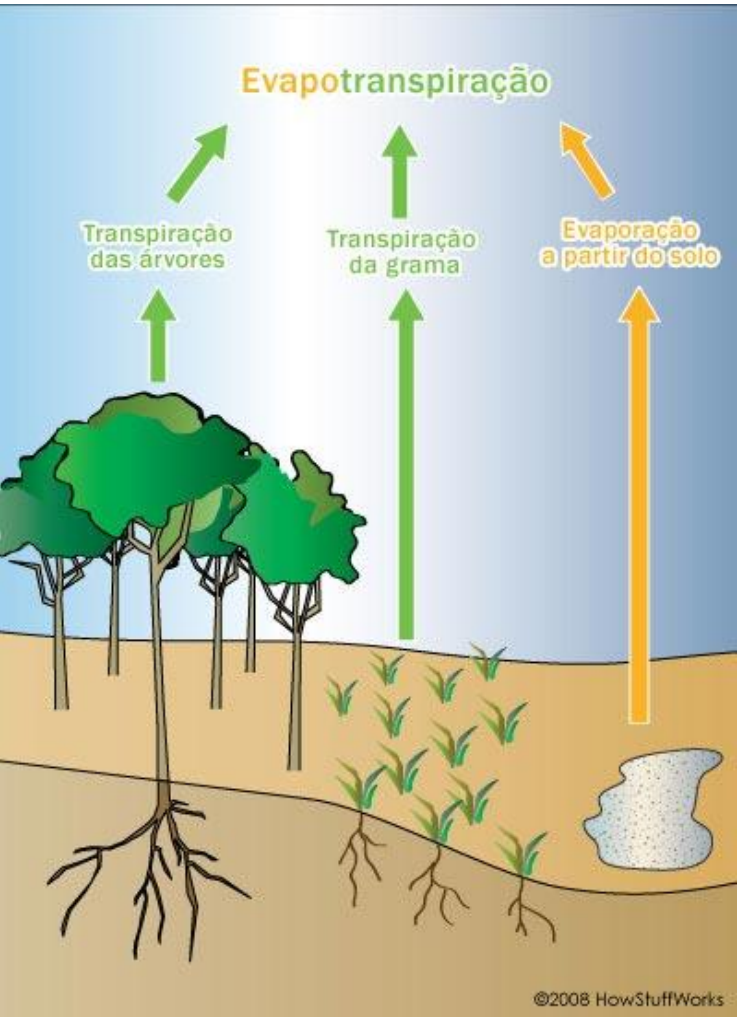
MANEJO DA IRRIGAÇÃO: Quando, Quanto e Como Irrigar?

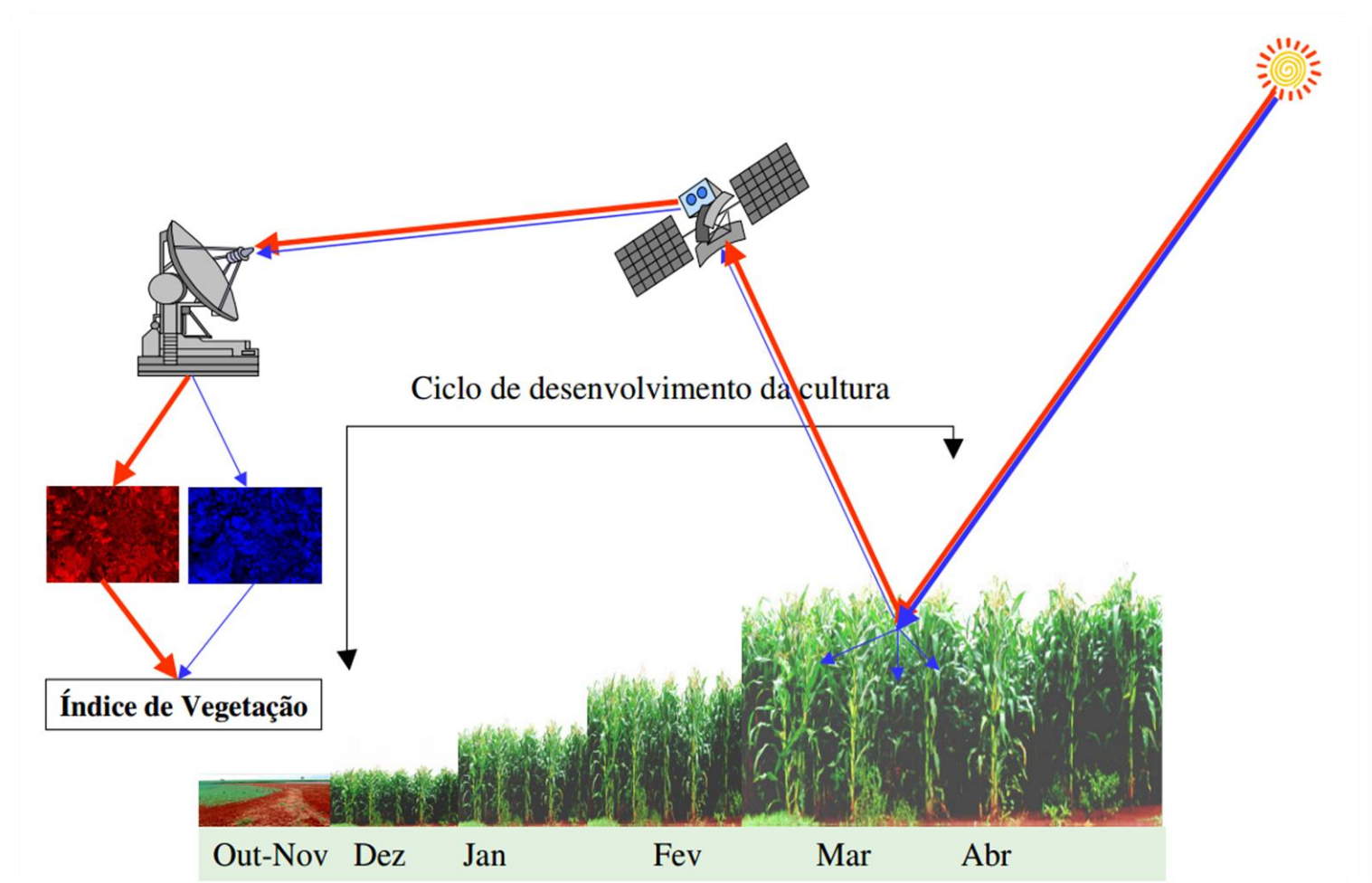


Conhecendo a evapotranspiração atual, a produtividade da água e estabelecendo indicadores de desempenho da agricultura irrigada

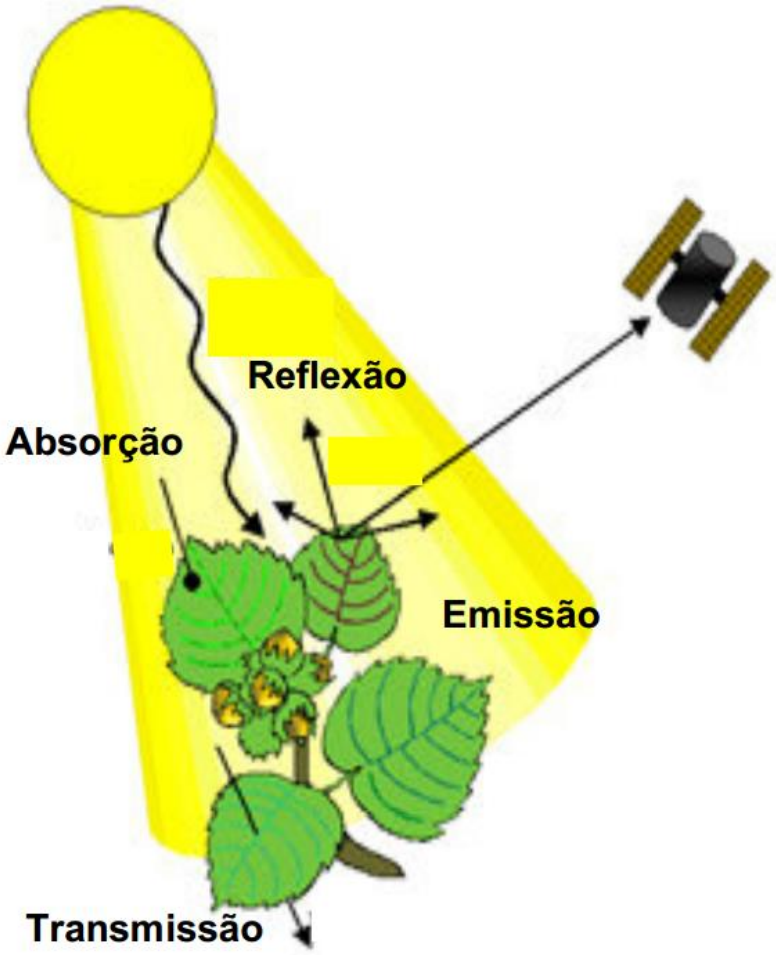
Maio 2016
Ilha Solteira - SP

Daniel N. Coaguila Nuñez

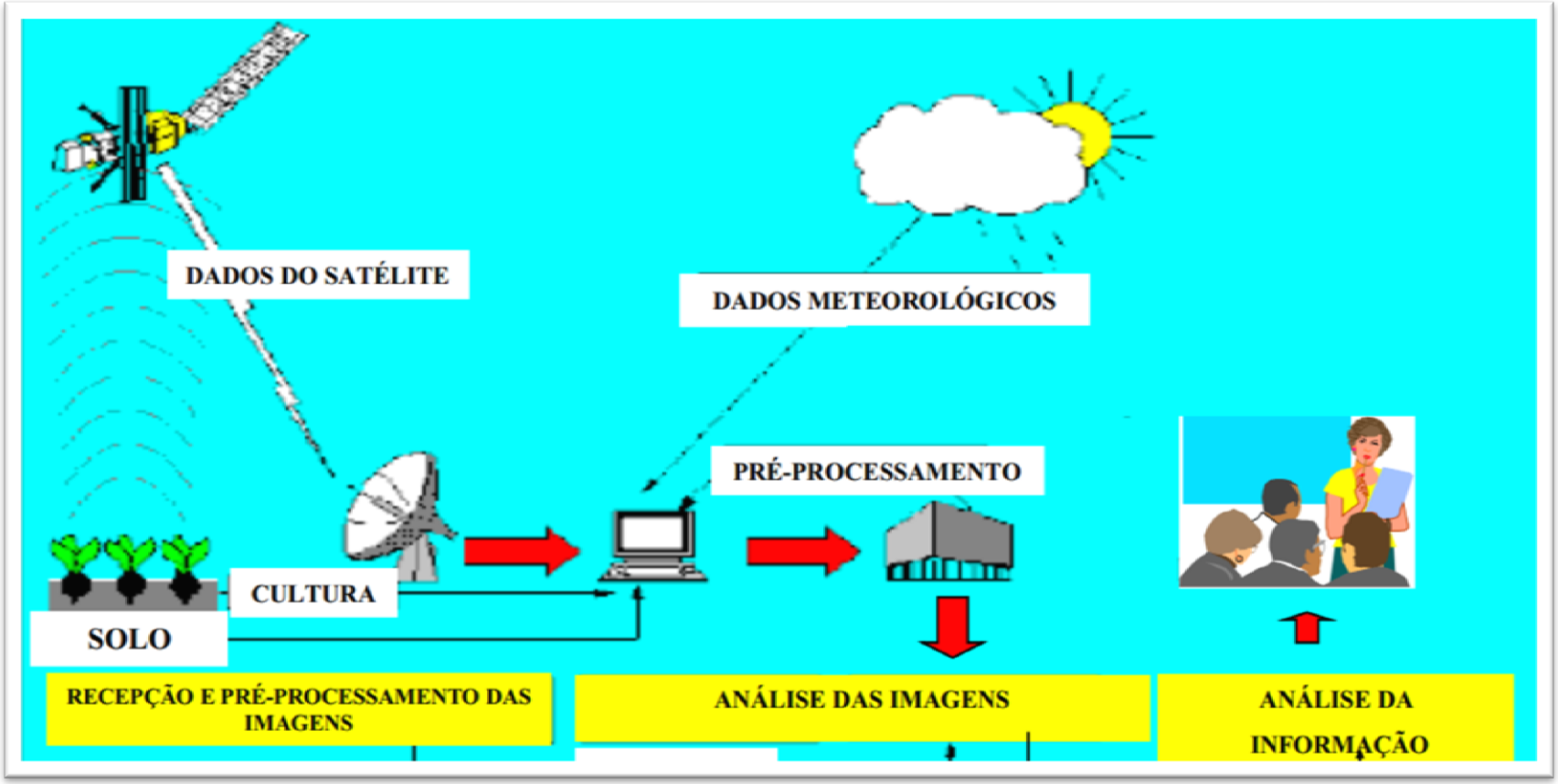
Introdução


Ciclo de desenvolvimento da cultura
Índice de Vegetação
Out-Nov
Dez
Jan
Fev
Mar
Abr

Introdução



Introdução


DADOS DO SATÉLITE
DADOS METEOROLÓGICOS
PRÉ-PROCESSAMENTO
CULTURA
SOLO
RECEPÇÃO E PRÉ-PROCESSAMENTO DAS IMAGENS
ANÁLISE DAS IMAGENS
ANÁLISE DA INFORMAÇÃO

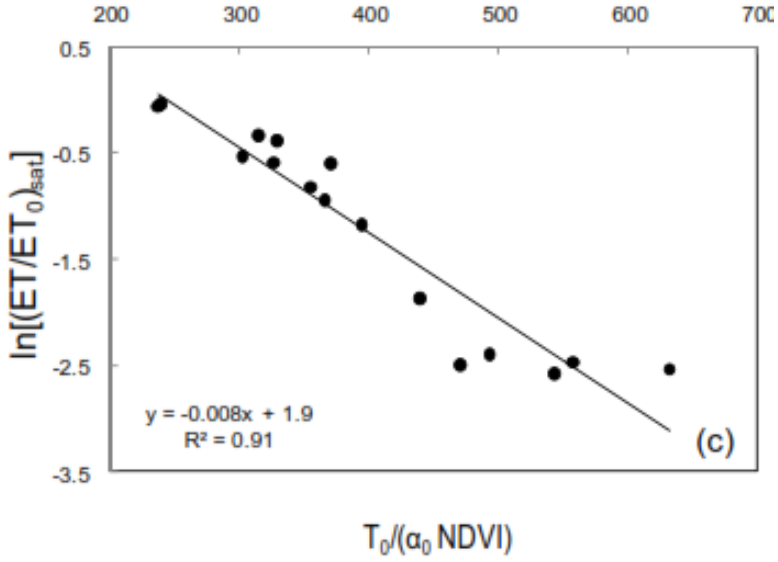
SAFER

Simple Algorithm For Evapotranspiration Retrieving

Article

Determining Regional Actual Evapotranspiration of Irrigated Crops and Natural Vegetation in the São Francisco River Basin (Brazil) Using Remote Sensing and Penman-Monteith Equation

Antônio H. de C. Teixeira



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Simple Algorithm For Evapotranspiration Retrieving

O modelo SAFER esta baseado na modelagem da razão ET/ET_o, validado por meio de dados provenientes de culturas irrigadas e vegetação natural nas condições semiáridas brasileiras e testado com sucesso para as condições do noroeste paulista.

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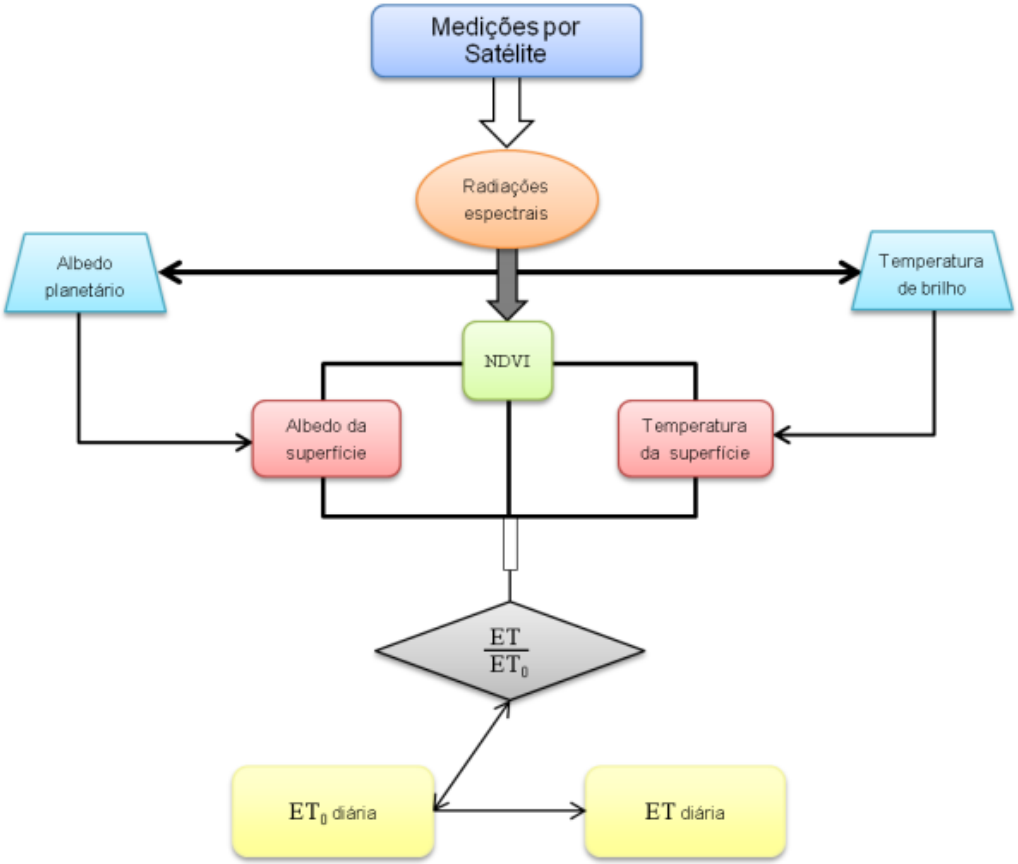

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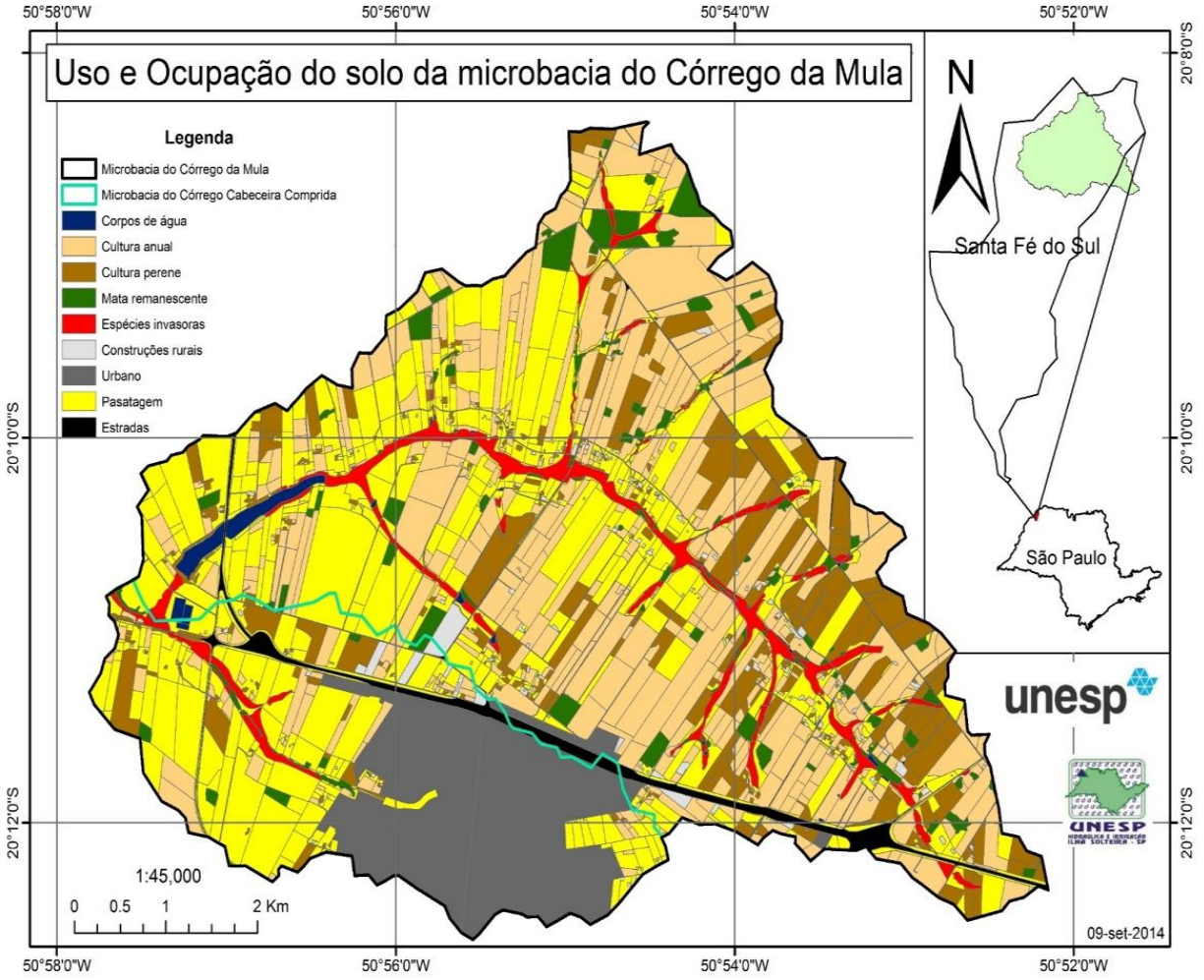
Simple Algorithm For Evapotranspiration Retrieving

Kc atual versus ETatual

$$\frac{ET}{ET_0} = \exp\left[a + b\left(\frac{T_0}{\alpha_0 NDVI}\right)\right]$$

$$ET_0 \times K_c = ET_c$$

Estudo de Caso – Bacia degradada



Uso/Ocupação	Bacias dos Córregos	
	da Mula (ha)	Cabeceira Comprida (ha)
Construções rurais	53,01	38,33
Corpos de água	31,99	30,77
Cultura anual	1353,98	1270,88
Cultura perene	519,19	453,69
Estradas	127,23	93,73
Mata remanescente	159,58	142,96
Pastagem	1443,78	1005,40
Espécies invasoras	171,32	148,81
Urbano	482,36	21,12
TOTAL	**4342,45**	**3205,70**

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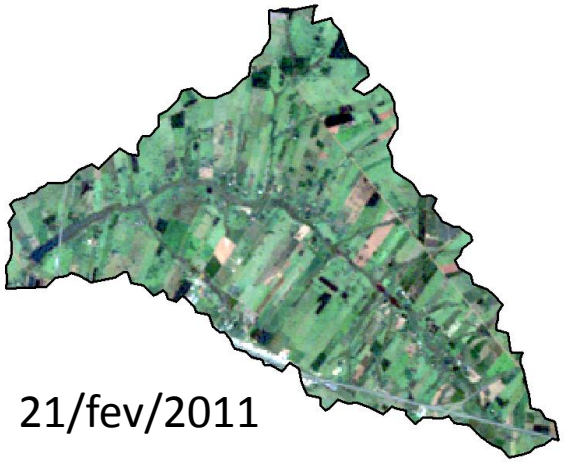
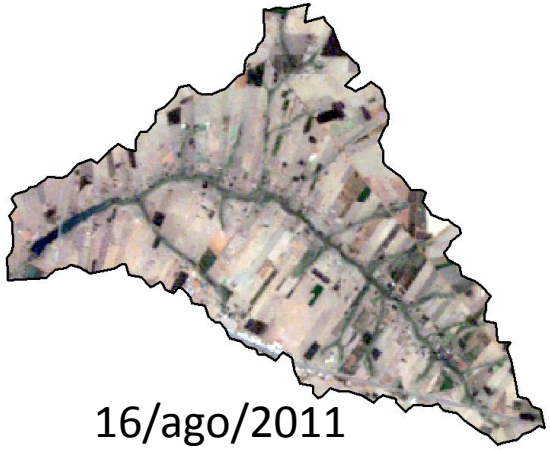
- Landsat 5

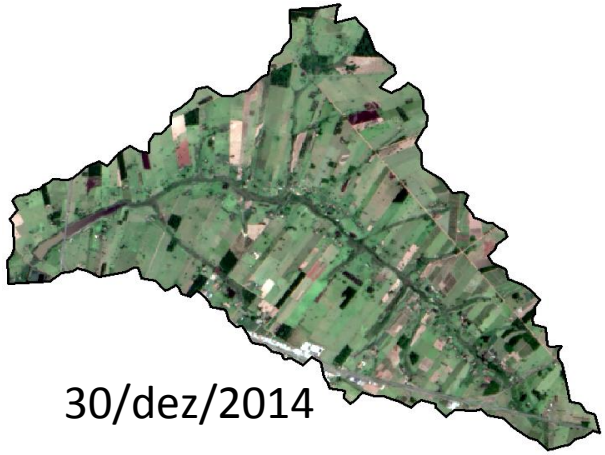


21/fev/2011

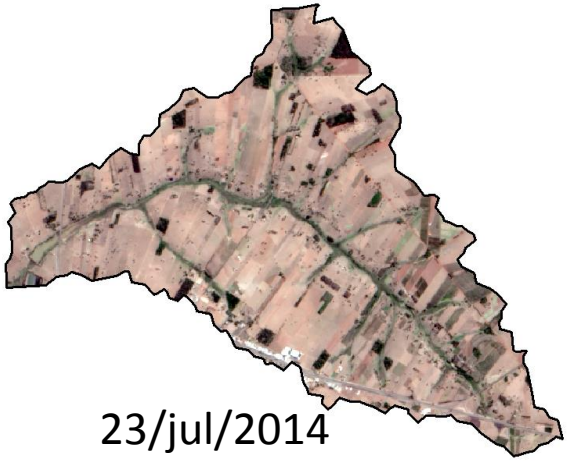


16/ago/2011

- Landsat 8



30/dez/2014

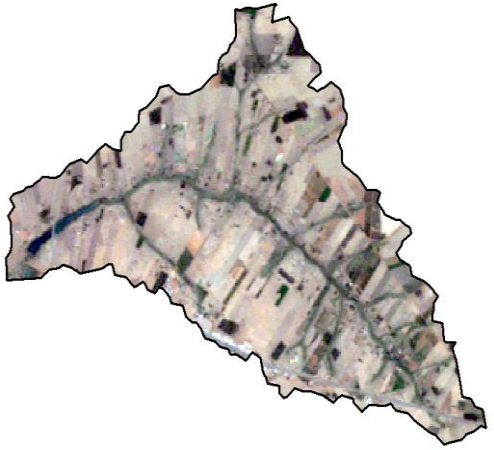


23/jul/2014

Estudo de Caso – Bacia degradada

- Landsat 5

ET_a	21/fev/11	16/ago/11
Mata	2.31 ± 0.42	0.72 ± 0.39
Typha	1.52 ± 0.39	0.55 ± 0.25
Culturas	1.73 ± 0.57	0.24 ± 0.34



Data	21/fev/11	
α_0	0.16 ± 0.01	
T_0	25.47 ± 0.83	°C
NDVI	0.62 ± 0.11	
ET_a/ET_0	0.32 ± 0.11	
ET_a	1.74 ± 0.63	mm dia^{-1}
BIO	59.56 ± 27.23	kg ha^{-1} dia^{-1}
WP	3.25 ± 0.7	kg m^{-3}

Data	16/ago/11	
α_0	0.17 ± 0.02	
T_0	29.19 ± 1.39	°C
NDVI	0.33 ± 0.11	
ET_a/ET_0	0.05 ± 0.07	
ET_a	0.26 ± 0.39	mm dia^{-1}
BIO	6.29 ± 12.52	kg ha^{-1} dia^{-1}
WP	1.63 ± 0.84	kg m^{-3}

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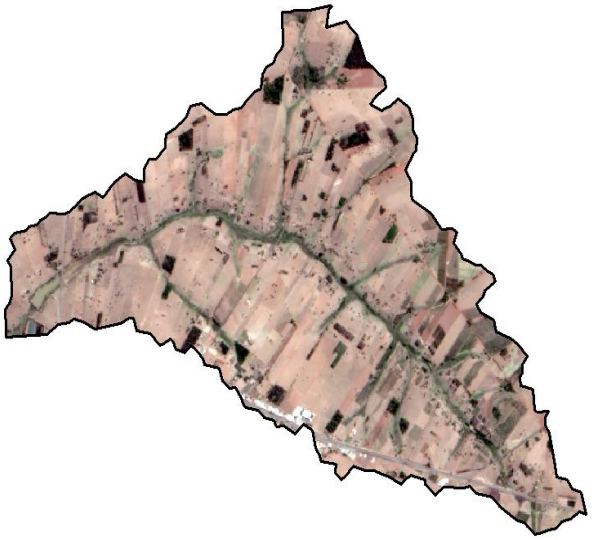
Estudo de Caso – Bacia degradada

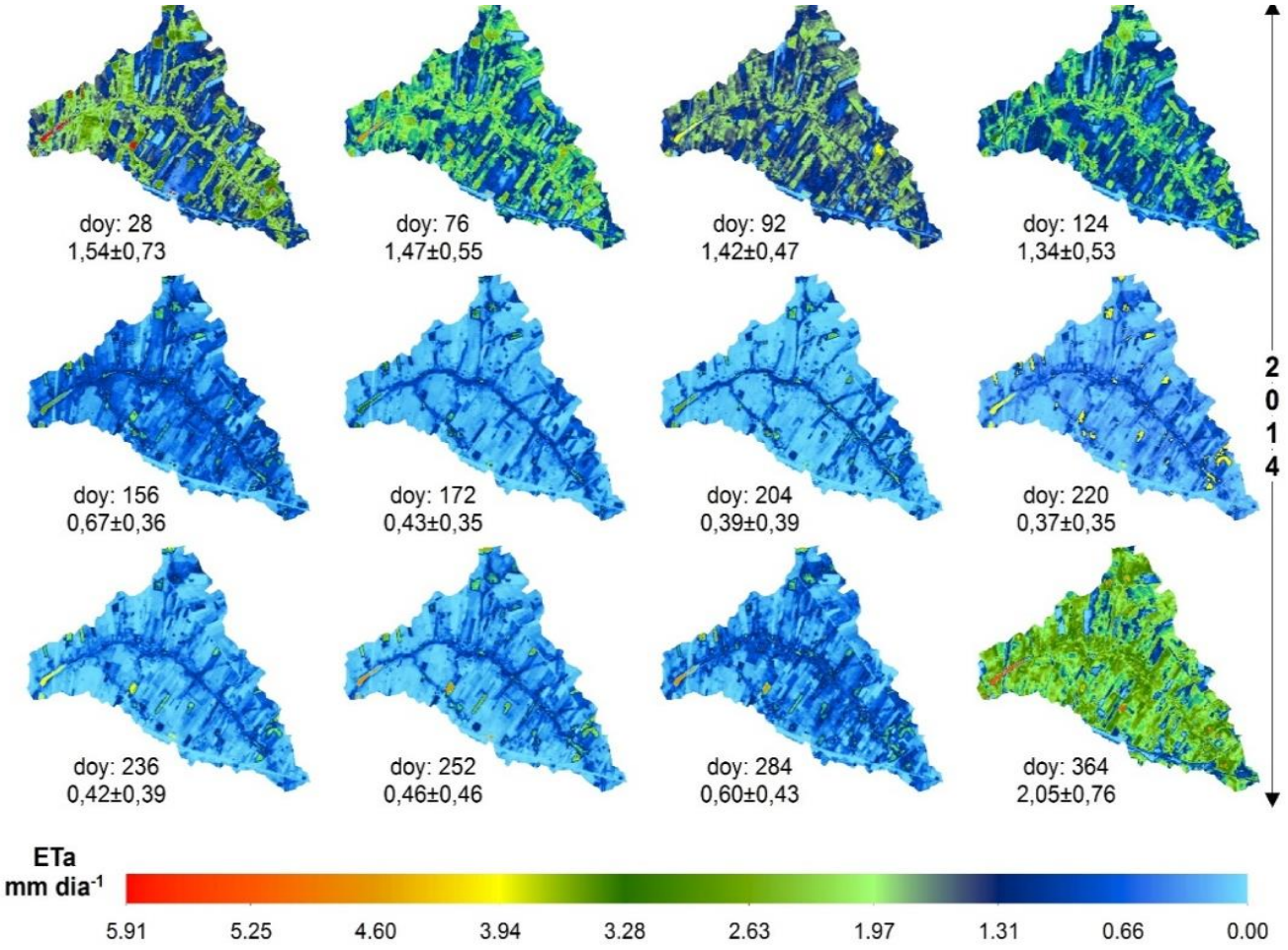


- Landsat 8

Data	23/jul/14	
α_0	0.17 ± 0.02	
T_0	25.05 ± 0.92	°C
NDVI	0.34 ± 0.12	
ET_a/ET_0	0.10 ± 0.10	
ET_a	0.40 ± 0.40	mm dia^{-1}
BIO	10.84 ± 16.33	kg ha^{-1} dia^{-1}
WP	1.89 ± 0.96	kg m^{-3}

Data	30/dez/14	
α_0	0.17 ± 0.02	
T_0	25.65 ± 1.17	°C
NDVI	0.62 ± 0.14	
ET_a/ET_0	0.37 ± 0.14	
ET_a	2.06 ± 0.76	mm dia^{-1}
BIO	71.62 ± 35.55	kg ha^{-1} dia^{-1}
WP	3.24 ± 0.81	kg m^{-3}

Estudo de Caso – Bacia degradada



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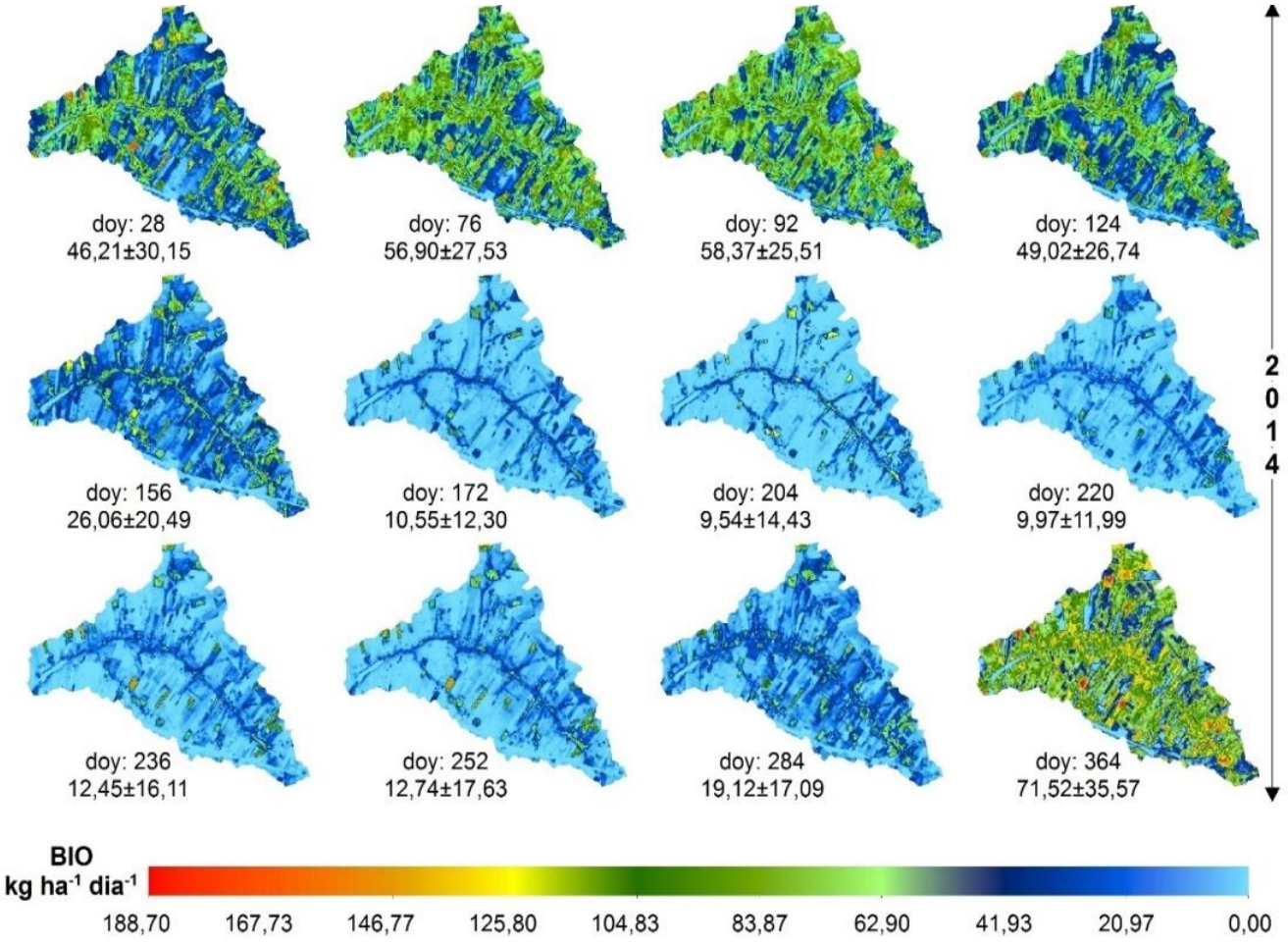

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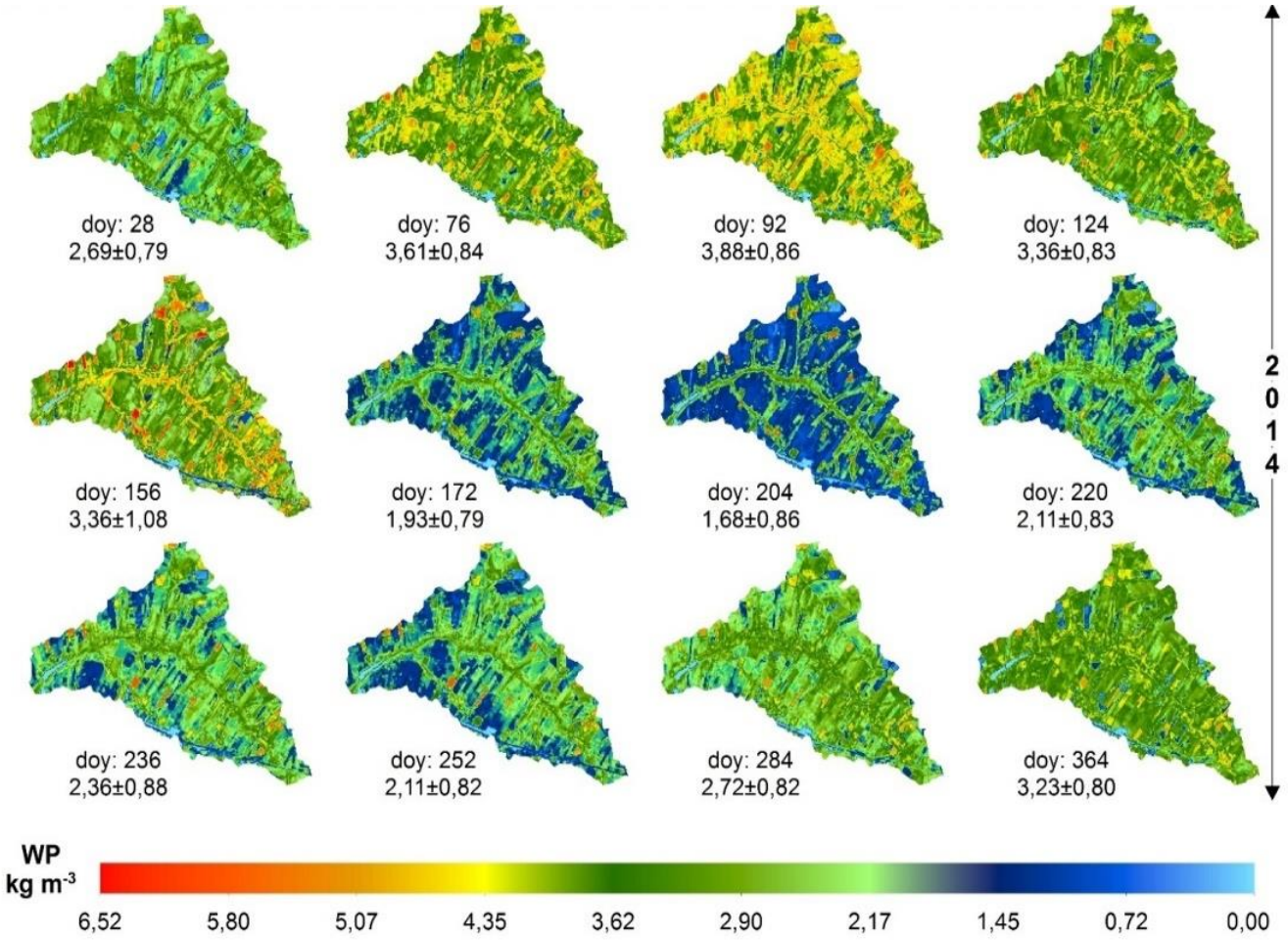

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Indicadores de desempenho

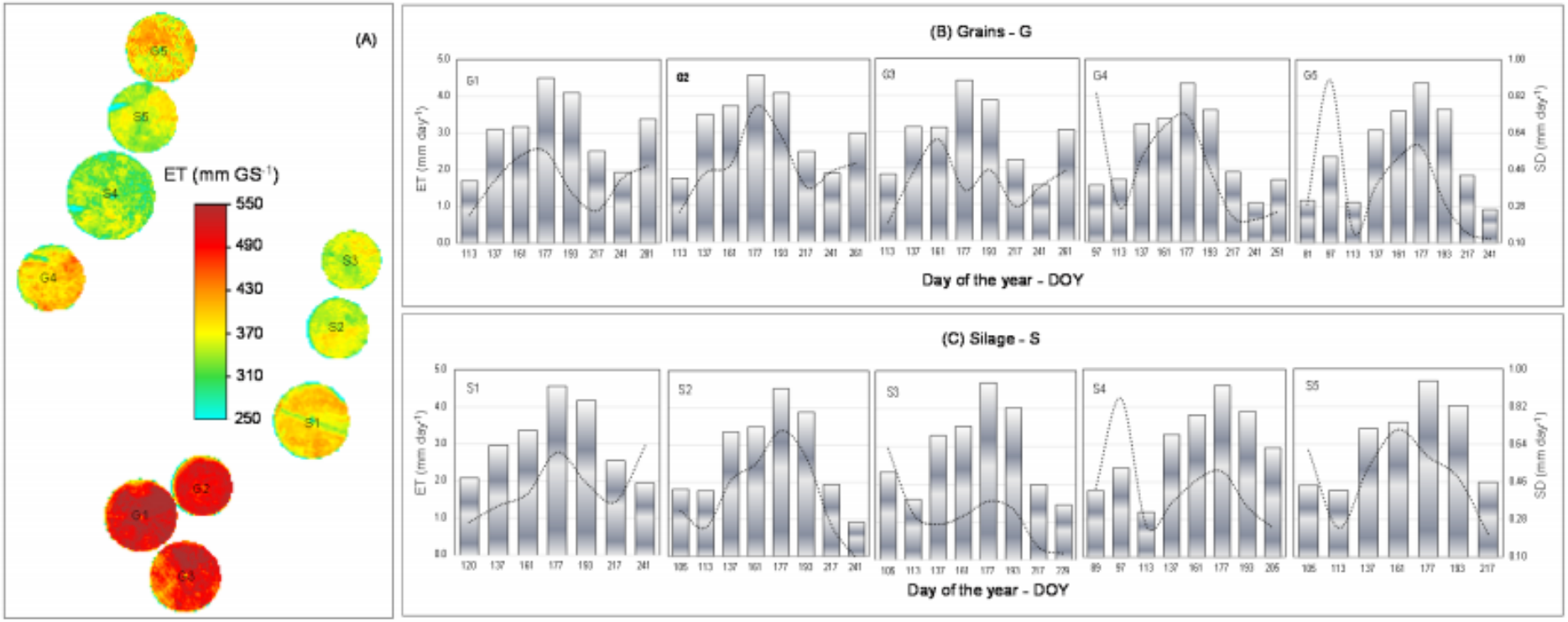

Figure 6. Evapotranspiration for ten corn crop irrigation pivots. (A): spatial variation of the growing season (GS) totals for grains (G) and silage (S) corn pivots; (B): seasonal variation of the daily pixel values for grains corn pivots; and (C): seasonal variation of the daily pixel values for silage corn pivots. DOY is day of the year

Water Resources and Irrigation Management, v.3, n.2, p.91-100, 2014

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Indicadores de desempenho

Table 1. Irrigation performance indicators of corn crop for grain (A) and for silage (B). Area; Growing season (GS); water applied through irrigation (V_I); precipitation (P), relative evapotranspiration (R_{ET}); water deficit (WD); relative water supply (R_{WS}); productivity (Y_p) and water productivity based on evapotranspiration (WP_{ET}) and on irrigation (WP_I)

Pivots	Area (ha)	GS (days)	V_I (mm)	P (mm)	R_{ET} (-)	WD (mm)	R_{WS} (-)	Y_p (t ha^{-1})	WP_{ET} (kg m^{-3})	WPI (kg m^{-3})
(A) Irrigation performance indicators for grain										
G1	108.0	169	436.9	240.0	0.98	11.8	1.3	7.2	1.4	1.7
G2	74.0	155	498.2	48.0	0.96	20.0	1.1	10.3	2.1	2.1
G3	108.0	168	463.7	242.0	0.93	36.5	1.4	8.0	1.6	1.7
G4	91.0	155	495.6	65.0	0.78	110.2	1.1	8.9	2.3	1.8
G5	100.0	158	405.9	160.0	0.79	100.4	1.2	10.7	2.8	2.6
Mean	96.2	161	460.1	151.0	0.89	55.8	1.2	9.0	2.0	2.0
(B) Irrigation performance indicators for silage										
G1	118.0	123	454.9	57.0	0.99	2.6	1.3	33.3	8.8	7.3
G2	77.1	129	443.2	77.0	0.90	40.7	1.3	31.2	8.9	7.0
G3	75.0	124	442.1	77.0	0.95	20.5	1.4	36.5	10.3	8.3
G4	157.2	111	358.6	95.0	0.99	2.6	1.4	46.5	14.1	13.0
G5	100.0	114	361.8	52.0	1.00	0.0	1.2	48.2	13.8	13.3
Mean	105.5	120	412.1	71.6	0.97	13.3	1.3	39.1	11.1	9.5

$$$$$$$$$

Water Resources and Irrigation Management, v.3, n.2, p.91-100, 2014

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Indicadores de desempenho

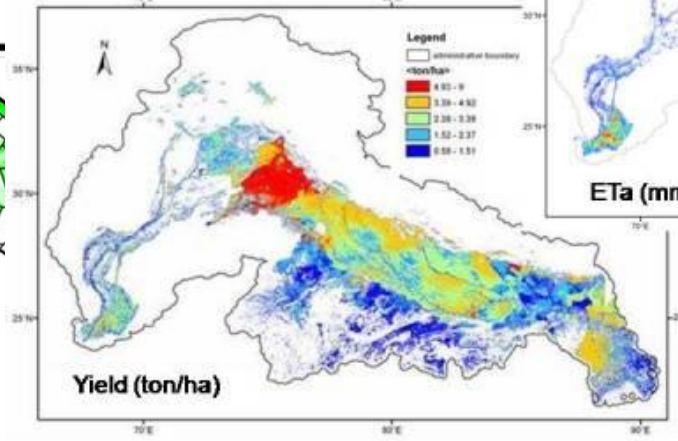
Water Productivity (kg/m3) of Cotton

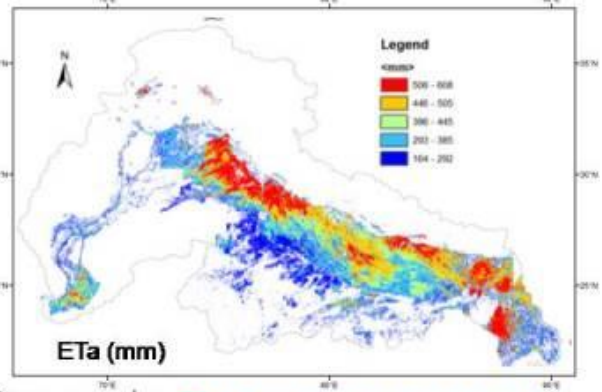
- 0.00 - 0.06 (786 ha)
- 0.06 - 0.12 (2403 ha)
- 0.12 - 0.18 (5231 ha)
- 0.

IWMI International Water Management Institute

Rice yield and ETa maps

Huge variation in yield, indicating significant scope for improvement





ET is high where yield is high. However, ET might also be high where yield is not (so) high. Why?

	Pakistan	India	Nepal	Bangladesh
Yield	2.6	2.53	3.54	2.75
ET	386	417	499	477

CGIAR Challenge Program on WATER & FOOD

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Indicadores de desempenho

Rice yield and ETa maps

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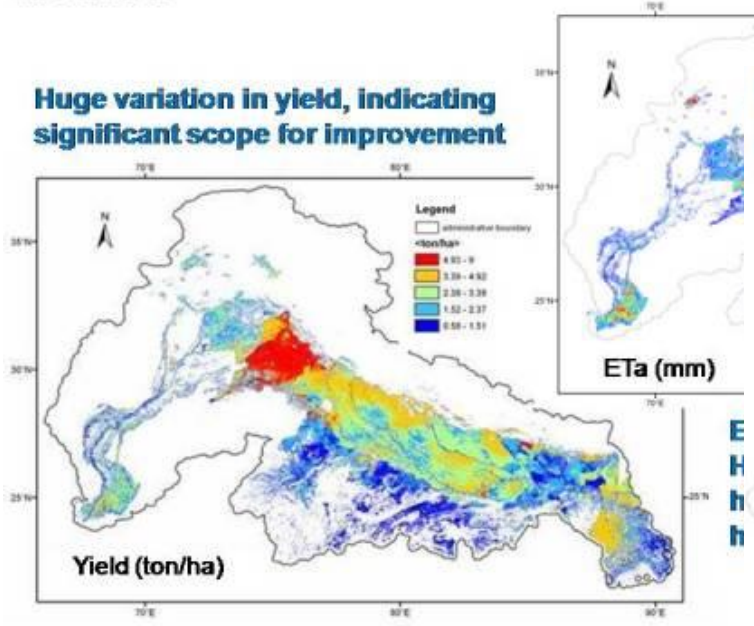
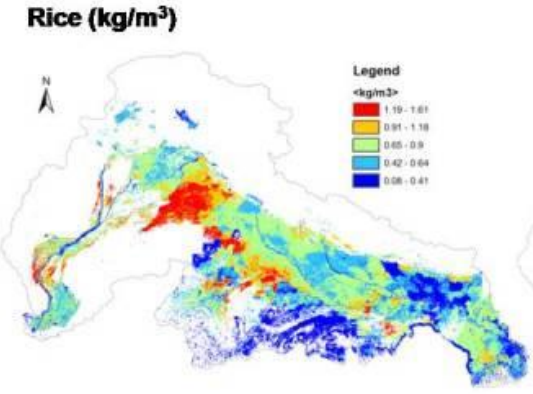
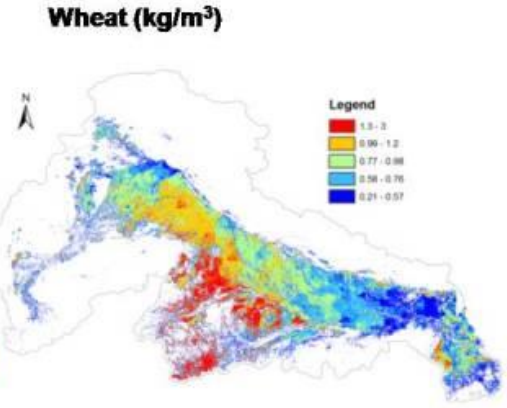


	Pakistan	India	Nepal	Bangladesh
Yield	2.6	2.53	3.54	2.75
ET	386	417	499	477

Water productivity maps



AVG	SDV	Min	Max
0.74	0.33	0.18	1.80



AVG	SDV	Min	Max
0.94	0.43	0.28	2.97

Note: 1% of the points with extremely low and high values are sieved from the statistics

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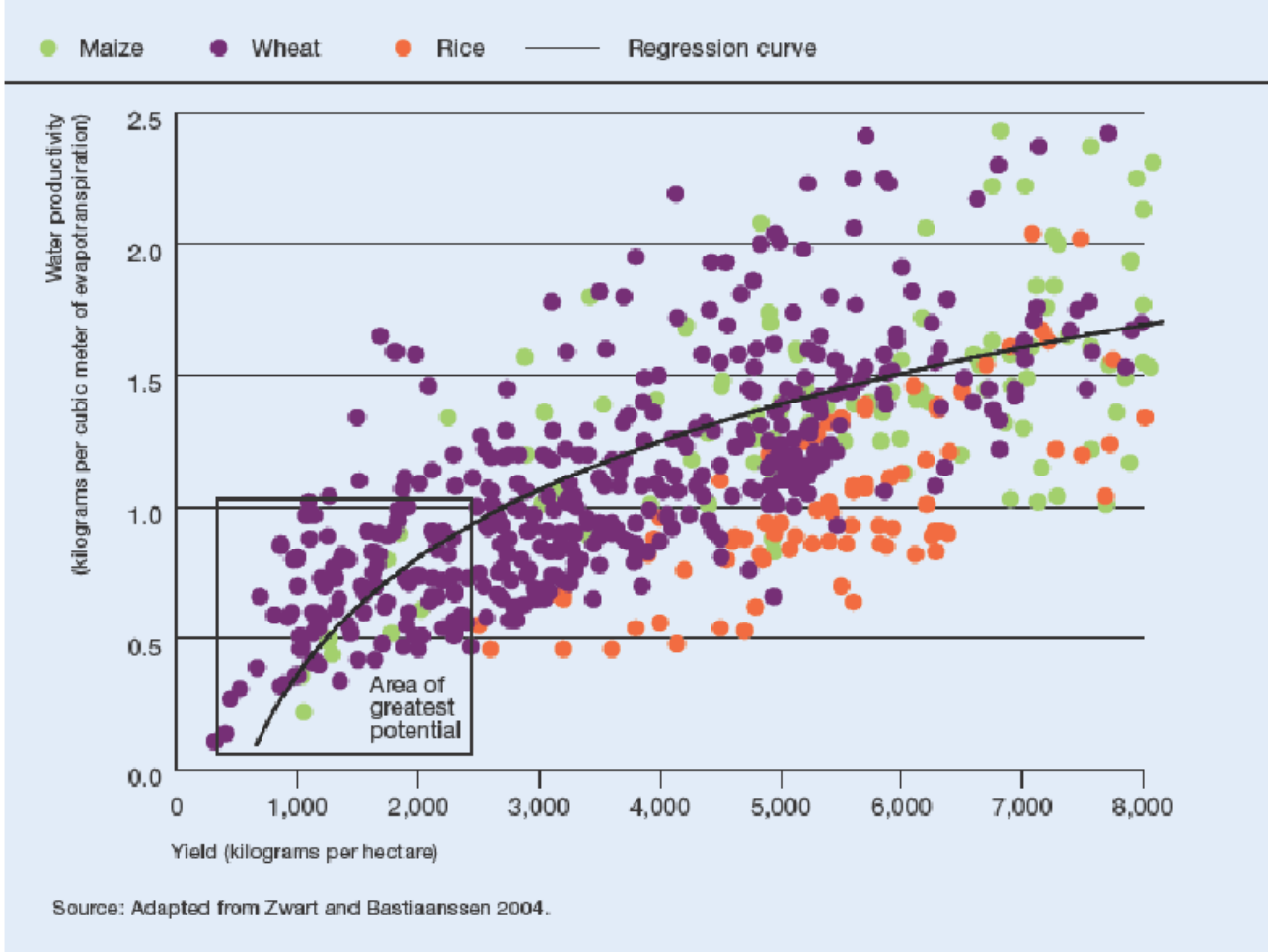
Indicadores de desempenho



Source: Adapted from Zwart and Bastiaanssen 2004.

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Obrigado!!!!!!

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