Are there rainfall-based predictive indicators of the onset of the rainy season in the Sahel?

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Outline

1- Introduction

2- Methodology

a) The rainfall stations

b) The homogeneous climatic zones in BF

c) Definition of the onset date

d) Definition of the planting date

e) Discrimination between real and false starts of the rainy season/planting period

3 – Results and comments

4- Concluding remarks

1- Introduction

- Rain-fed agriculture; the dominant practice in the Sahel.

- The climatic parameters influencing yields are in order of importance:

1) The onset date of the rainy season

2)The cessation date of the rainy season

3)The amount of seasonal rainfall

1- Introduction

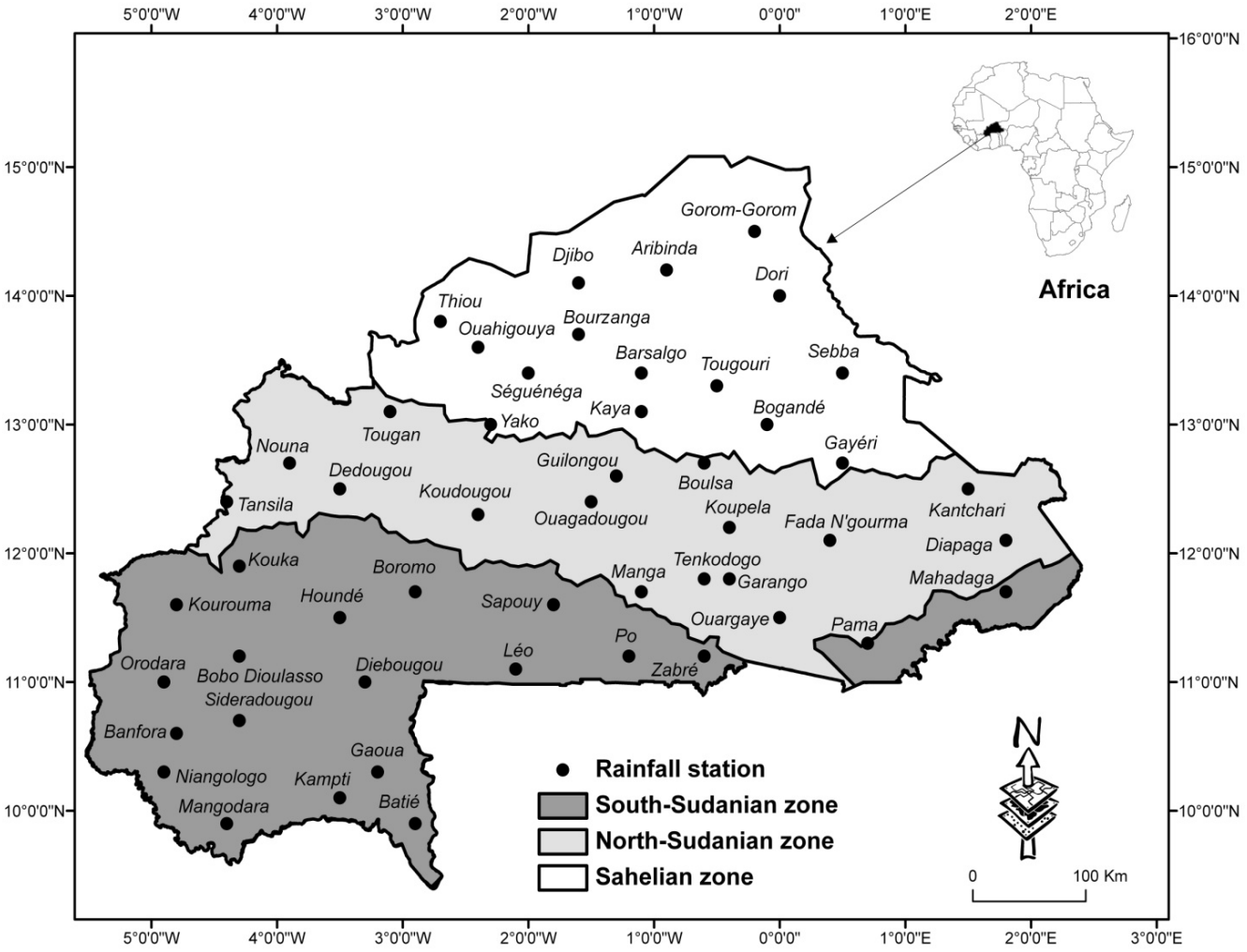
❑Prediction of the onset of the rainy season: one of the ways to stabilize and improve crops yield.

Goal:
Help smallholder farmers cope with the high inter-annual variability of climate in the Sahel.

Objectives:
Seek rainfall-based clues that can help smallholder farmers distinguish between:
1- the false and real onset dates;
2- the false and the real planting dates.

2- Methodology

a) Rainfall stations: 51 (1920-2008/1971-2000)



2- Methodology

b) Homogeneous climatic zones in BF

Daily rainfall dataset over the 1971-2000 period

Principal components analysis

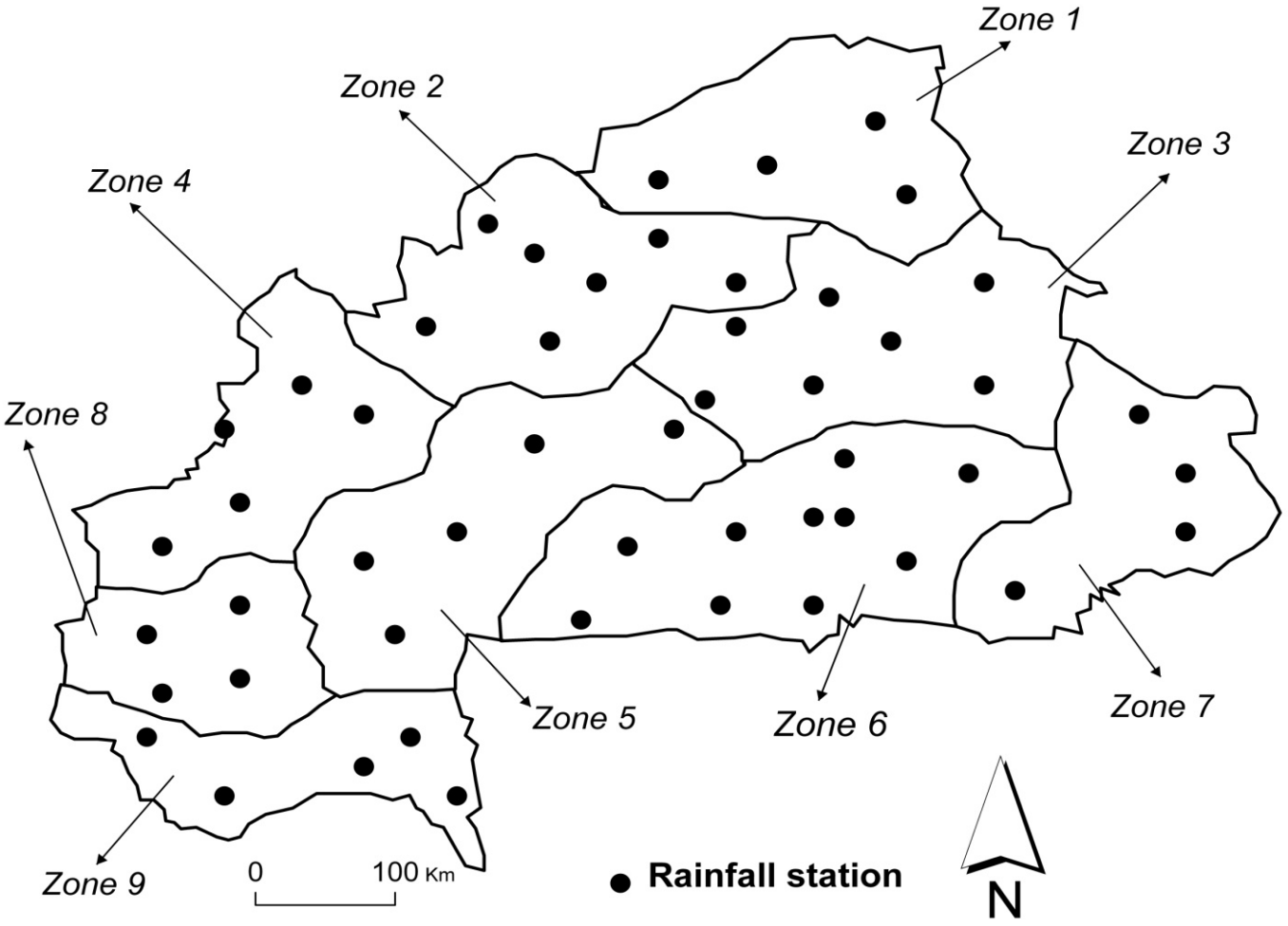
9 principal components

Correlation between PCs and the stations

9 homogeneous climatic zones

2- Methodology

b) Homogeneous climatic zones in BF



2- Methodology

c- Onset date of the rainy season

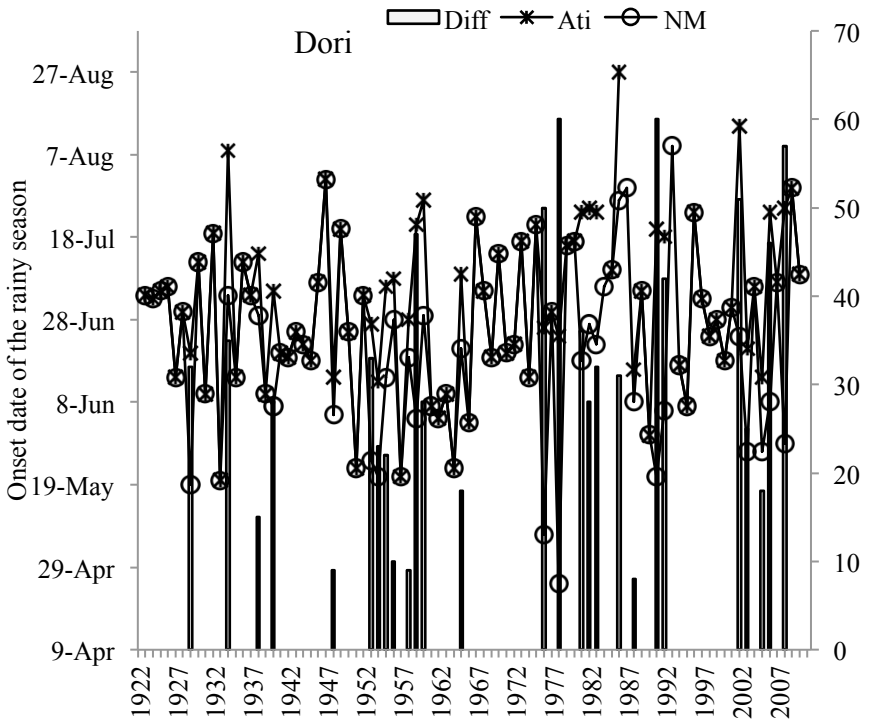
Aty et al., 2002: Rainfall at least 25mm in 10 day period, and no dry spell exceeding 7 days during the following 30 day period.

Improved: Rainfall at least 25mm in 10 day period, and no dry spell exceeding 10 days during the 30 following day period

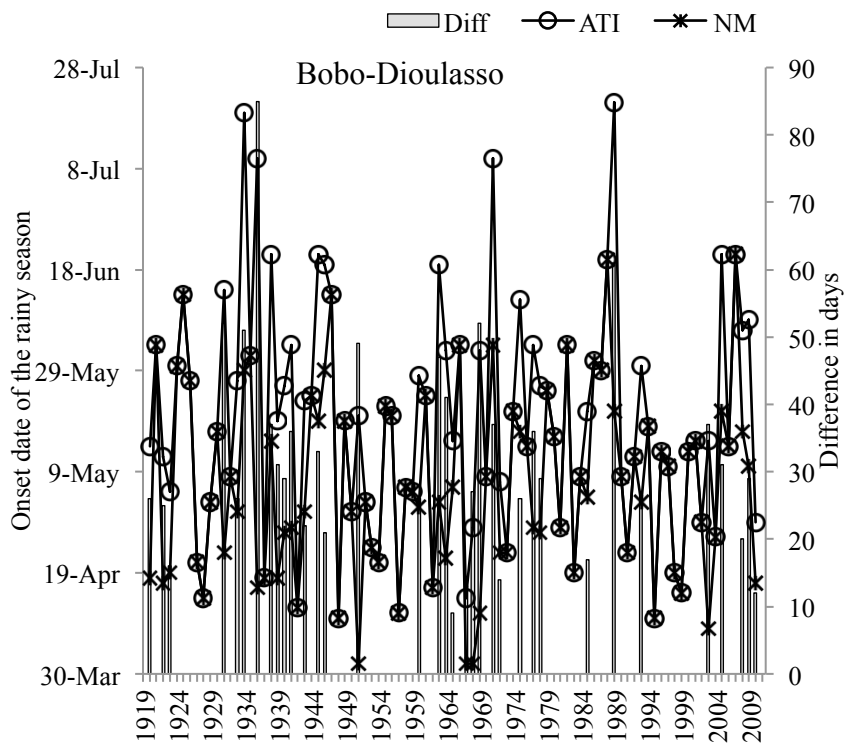
Remark: a rainy day is a day with at least 0.85mm of rainfall.

2- Methodology

C- Onset of the rainy season



Difference= 31%



Difference= 40%

2- Methodology

d- Planting date:

- Rainfall at least 25mm in 10 day period, and no dry spell exceeding 7 days during the following 20 day period;

- Rainy day is a day with at least 5mm of rainfall.

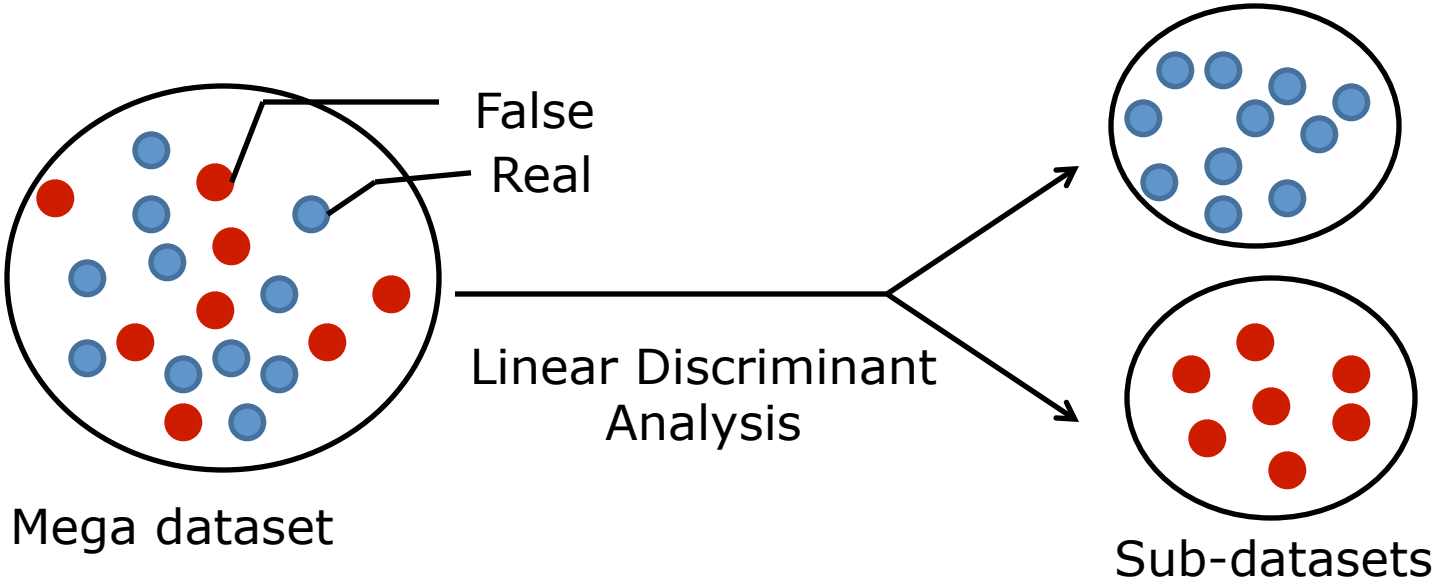
2- Methodology

e- Discrimination between real and false onsets/planting dates

-**Potential onset/planting date**= Rainfall at least 25mm in 10 day period

-**Real onset/planting date**= When the dry spell criteria in the definition is met

-**False onset/planting date**= when the criterion of the dry spell in the definition is not met



2- Methodology

e- Discrimination between real and false onset /planting date

Variable	Description
DATE	Day of the year in which the potential onset has started (Julian day)
W_5	Number of wet days in the 5 days preceding the potential onset
R_5	Amount of rainfall in the 5 day period preceding the potential onset
W_{10}	As W_5 but referring to 10 days
R_{10}	As R_5 but referring to 10 days
W_{15}	As W_5 but referring to 15 days
R_{15}	As R_5 but referring to 15 days
W_{20}	As W_5 but referring to 20 days
R_{20}	As R_5 but referring to 20 days
W_{25}	As W_5 but referring to 25 days
R_{25}	As R_5 but referring to 25 days
W_{30}	As W_5 but referring to 30 days
R_{30}	As R_5 but referring to 30 days
PW_5	Number of wet days in the 5 day-period following the potential onset
PR_5	Amount of rainfall in the 5 day-period following the potential onset

3- Results

Zone 1

	Onset of the rainy season	Planting period
Model	0.041Date + 0.488 PW_5 - 7.251	0.031Date + 0.043 R_{30} - 6.120
Real	76.3% (+)	73.8% (+)
False	67.6% (-)	65.1% (-)
Total	73.6%	67.5%
Baseline	69.3%	28.1%

3- Results

Zone 2

	Onset of the rainy season	Planting period
Derived model	0.055Date + 0.236 PW_5 – 8.428	0.037Date + 0.038PR_5 – 5.976
Real	80.2% (+)	64.7% (+)
False	76.3% (-)	76.1% (-)
Total	78.9%	72.7%
Baseline	66.9%	30.2%

3- Results

Zone 3

	Onset of the rainy season	Planting period
Derived model	0.053Date + 0.287 PW_5 – 7.749	0.038Date + 0.509PW_5 + 0.030R_{10} - 6.329
Real	74.7% (+)	73.4% (+)
False	71.1% (-)	67.3% (-)
Total	73.2%	68.8%
Baseline	58.8%	25.5%

3- Results

Zone 4

	Onset of the rainy season	Planting period
Derived model	0.051Date + 0.303PW_5 – 6.937	0.048Date + 0.042 R_{10} - 6.794
Real	71.1% (+)	77.0% (+)
False	77.4% (-)	72.2% (-)
Total	73.5%	73.5%
Baseline	61.0%	27.2%

3- Results

Zone 5

	Onset of the rainy season	Planting period
Derived model	$0.048Date + 0.176R_{20} - 6.390$	$0.042Date + 0.022PR_5 - 5.537$
Real	70.3% (+)	68.8% (+)
False	76.9% (-)	71.5% (-)
Mean	72.7%	70.7%
Baseline	63.0%	29.6%

3- Results

Zone 6

	Onset of the rainy season	Planting period
Derived model	0.054Date + 0.312PW_5 – 6.846	0.045Date + 0.028 PR_5 – 5.924
Real	68.8% (+)	67.6% (+)
False	75.1% (-)	74.2% (-)
Mean	71.6%	72.5%
Baseline	56.1%	26.3%

3- Results

Zone 7

	Onset of the rainy season	Planting period
Model	$0.050Date - 0.487R_{20} + 0.511R_{30} - 6.714$	$0.026Date + 0.030PR_5 - 0.381W_{15} + 0.468W_{30} - 4.234$
Real	73.8% (+)	73.3% (+)
False	80.7% (-)	76.0% (-)
Mean	77.0%	75.3%
Baseline	53.6%	25.5%

3- Results

Zone 8

	Onset of the rainy season	Planting period
Model	0.051Date + 0.423 PW_5 – 0.027R_{15} - 5.747	0.052Date + 0.272 PW_5 + 0.080W_{25} - 6.426
Real	67.6% (+)	55.5% (+)
False	68.5% (-)	70.6% (-)
Mean	67.9%	66.6%
Baseline	61.3%	26.5%

3-Results

Zone 9

	Onset of the rainy season	Planting period
Model	0.040Date + 0.677 PW_5 – 0.020R_{20} – 4.339	0.048Date + 0.012PR_5 + 0.588PW_5 - 5.837
Real	71.4% (+)	58.9% (+)
False	65.7% (-)	68.3% (-)
Mean	69.4%	65.3%
Baseline	64.7%	32.0%

4- Concluding remarks

- The discriminant analysis carried out at sub-regional level identified good rainfall-based predictive indicators of the onset date of the rainy season, and the planting date in Burkina Faso.

- The findings can help farmers to improve their management practices, and take advantage of each rainy season. They can also prompt insurance companies to intervene in the agricultural domain since the risk can be assessed.

- Upcoming work:

- identify the rainfall-based predictive indicators of the seasonal rainfall amount;
- identify the rainfall-based predictive indicators of the season with long dry spell at the end,
- Go beyond the boundaries of Burkina Faso;
- Make the link between the scientific-based predictive indicators and the empirical ones used by farmers on the ground.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Thanks for your attention