NITROGEN INPUTS BY RAINFALL, THROUGHFALL AND STEMFLOW IN BRAZILIAN SEMIARID

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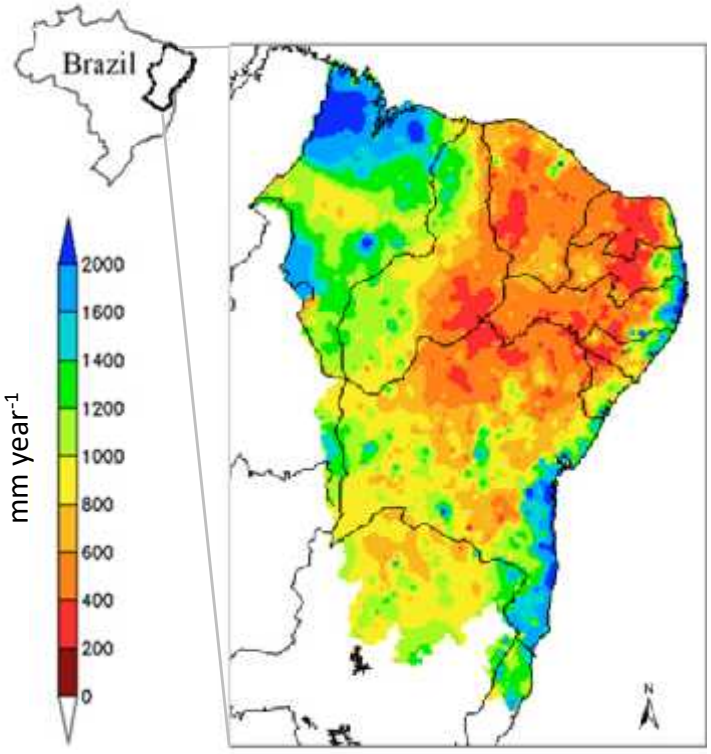
Brazilian semiarid



Vieira et al., 2015.

Localization: northeastern Brazil

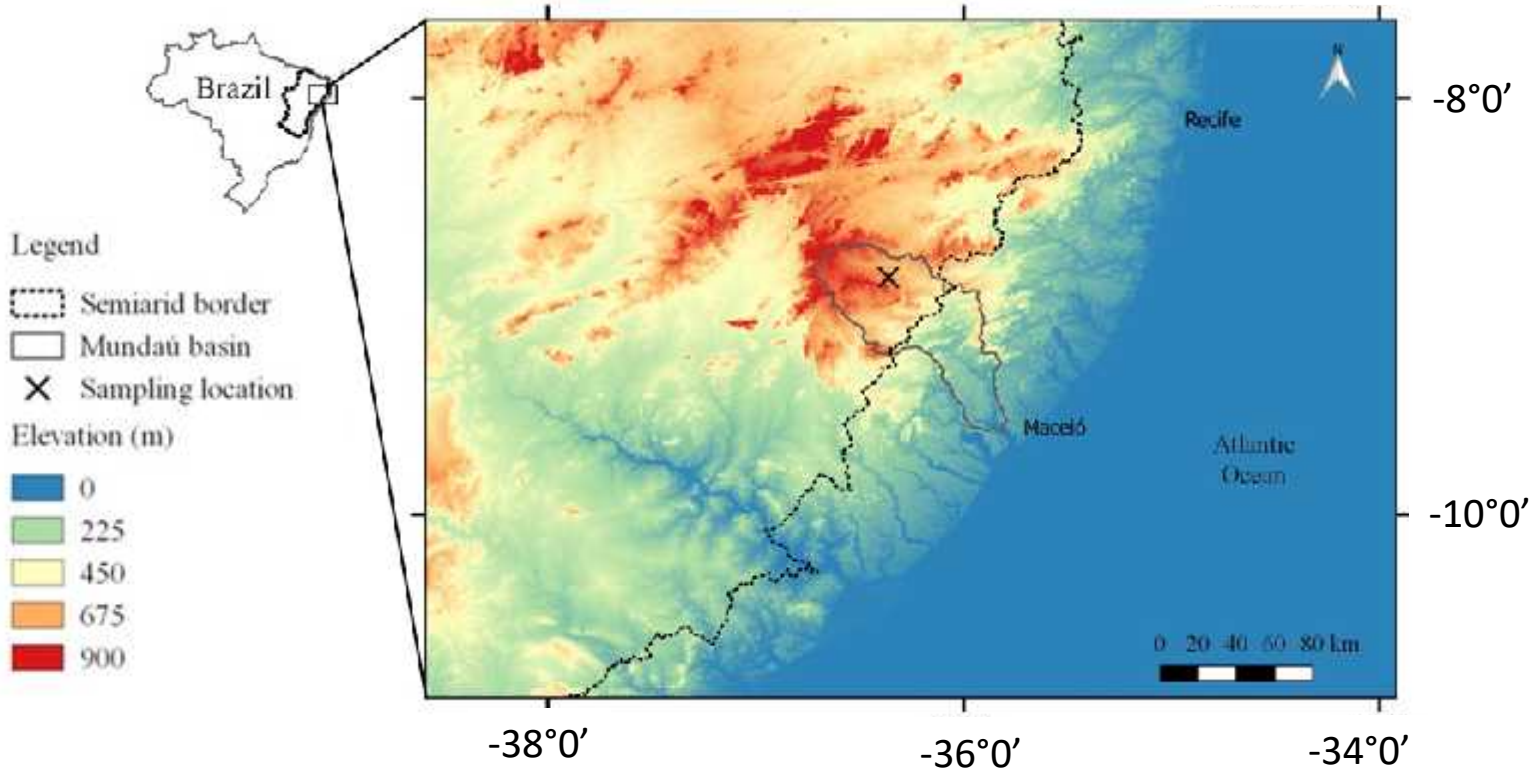
Main biome: Caatinga

~22 million inhabitants (~12% Brazilian pop), one of the most populous semiarid region in the world*

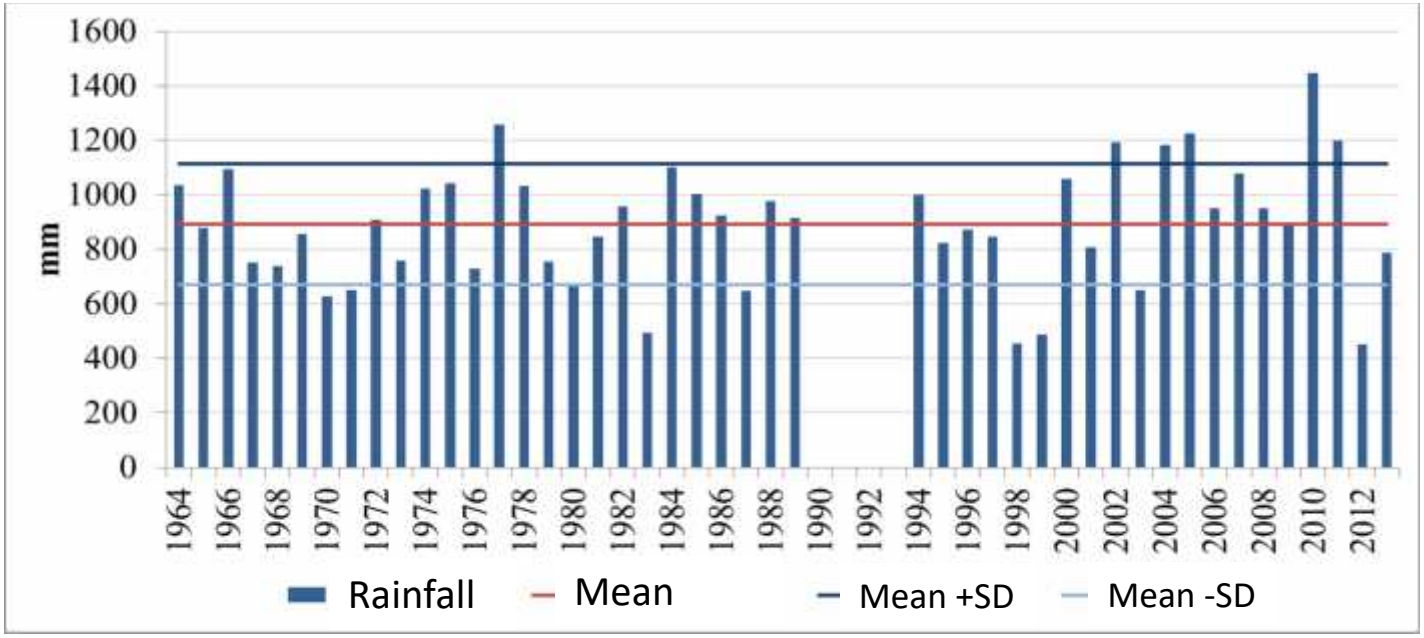
Vulnerability of the natural resources:
Natural factor: water scarcity;
Economic factor: subsistence agriculture, cattle grazing and wood extraction;
Social factor: high rate of poverty.**

*Cunha et al., 2015, Ab´Sáber, 2012; Marengo, 2008. **Source: Carvalho, 2002.

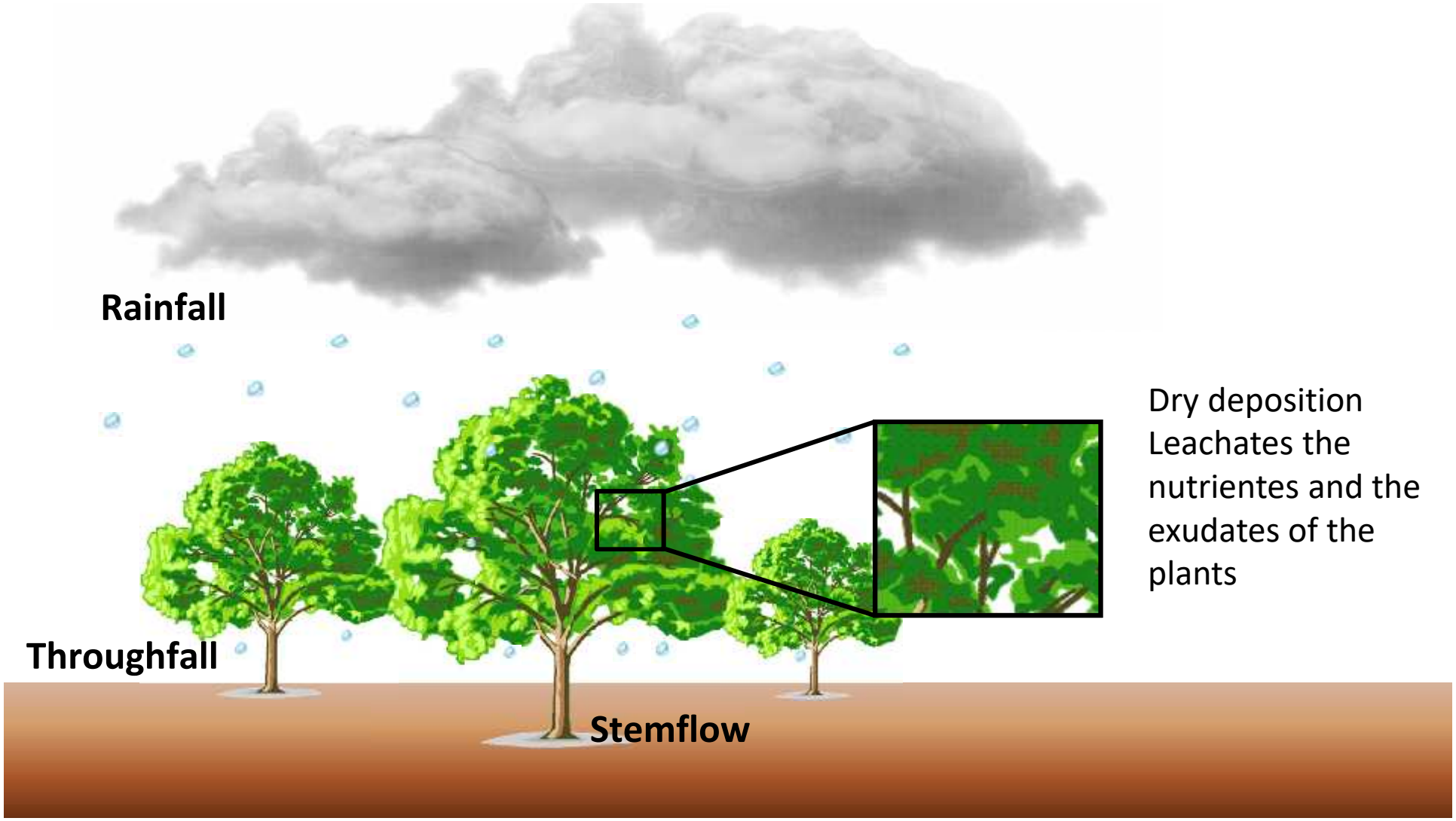
Study area - Brazilian semiarid



Rainfall variability



Wet period extends from April to August and represents ~66% of the annual value.



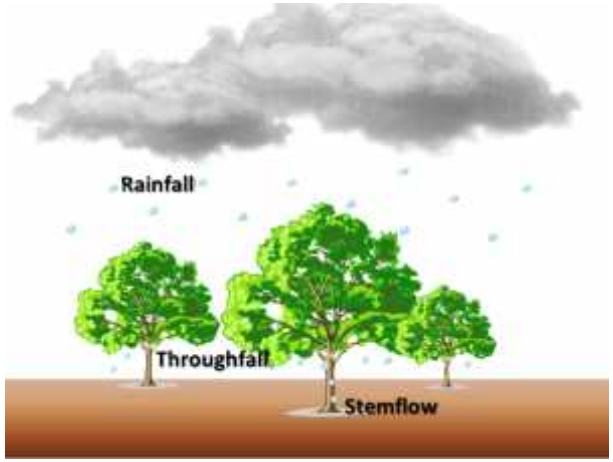
Dry deposition
Leachates the nutrientes and the exudates of the plants

Methods

Weekly sampling

Sampling period: Wet season – Apr to Aug – 2012/2013

Samples were filtered and stored before the analyzes



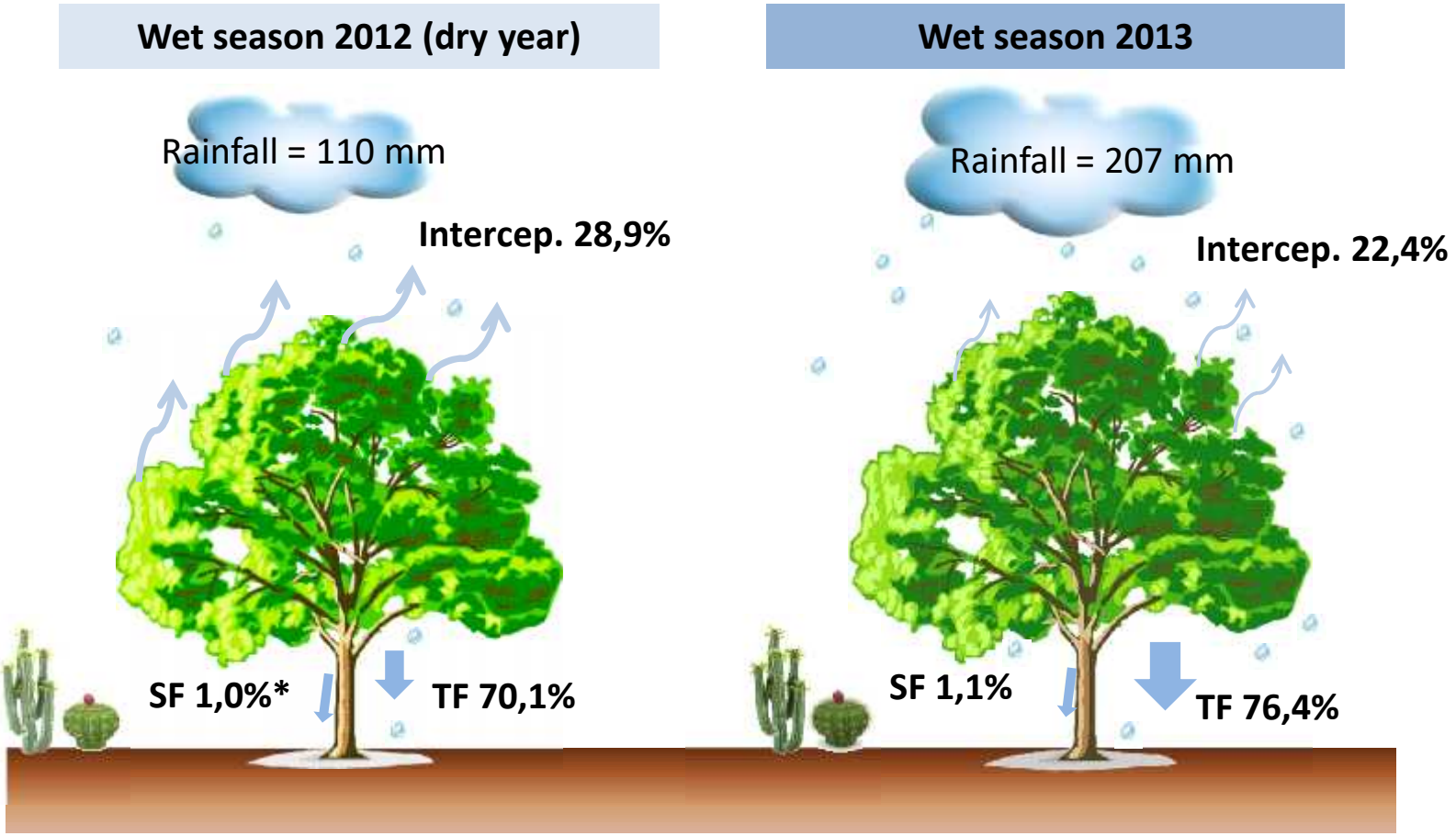
Methods

- NH_4^+ and NO_3^- : liquid ion chromatography
- Total nitrogen: Total carbon and nitrogen analyzator
- Inorganic nitrogen: Total nitrogen – inorganic nitrogen

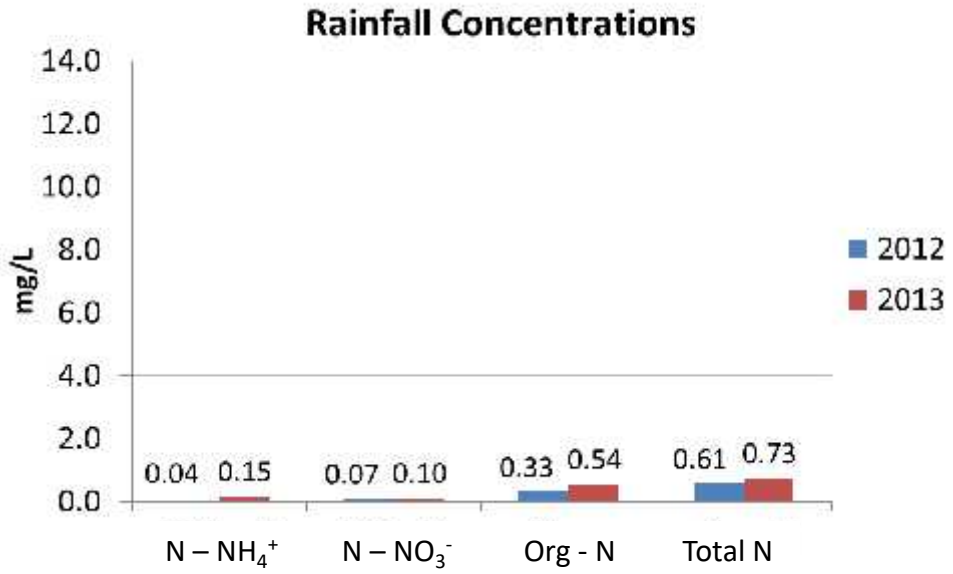
Beginning of the wet season

Middle of the wet season

Rainfall partitioning

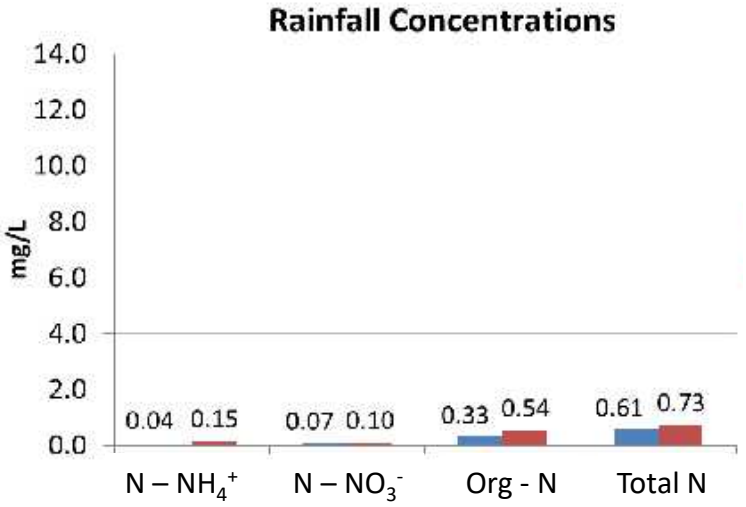


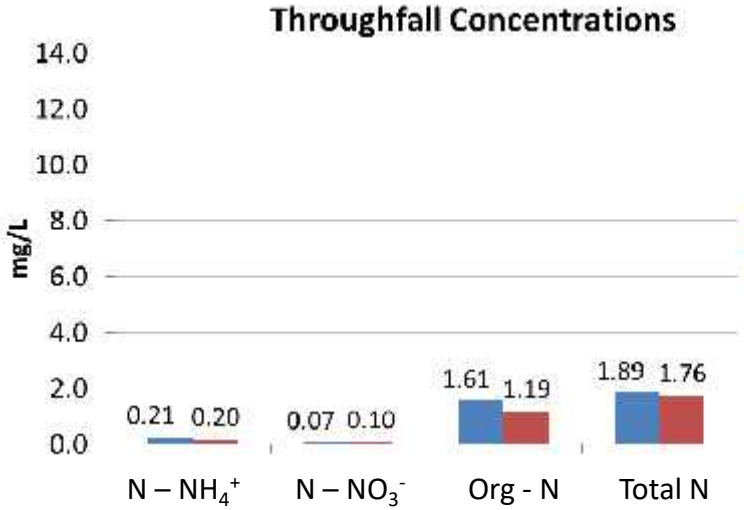
Nitrogen Concentration in rainwater

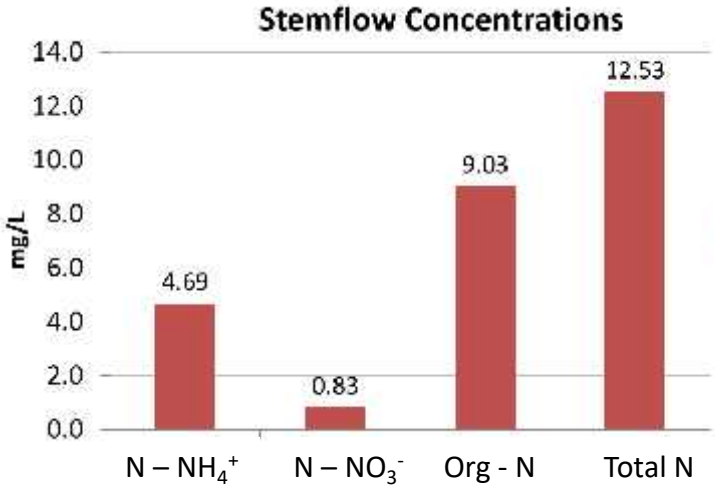


Main source of nitrogen in the rainwater:

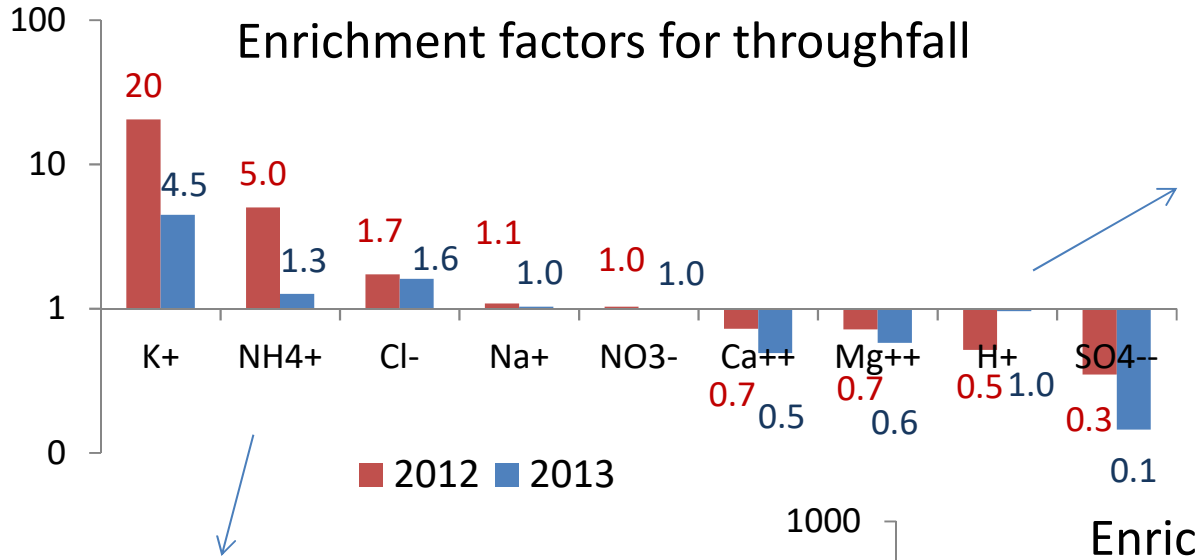
- Volatilization of ammonia from animal excreta under favorable conditions (low soil moisture and high temperatures), as well as organic fertilizers.
- Soil nitrification process: release NO to the atmosphere, which can react with other atmospheric components and be scavenged by clouds in the form of NO_3^-.





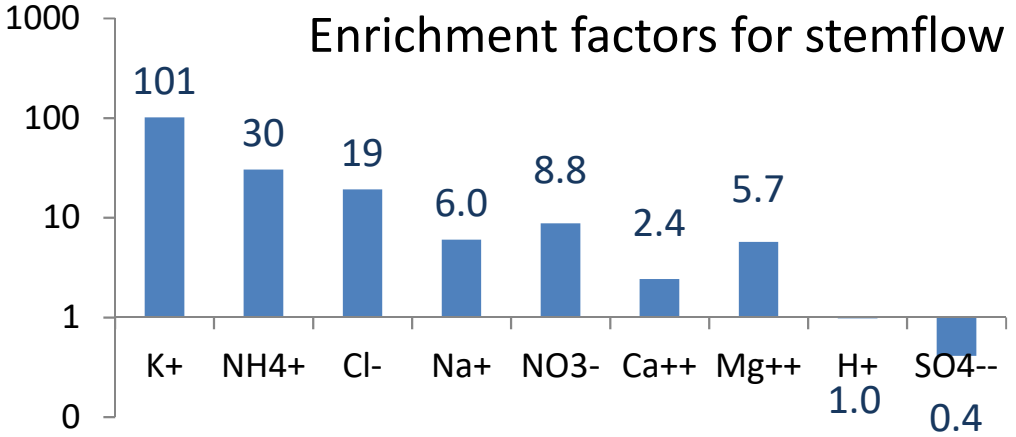


2012 (dry year) 2013



Canopy retention

Dry deposition + Canopy leaching



Nitrogen input for the wet seasons

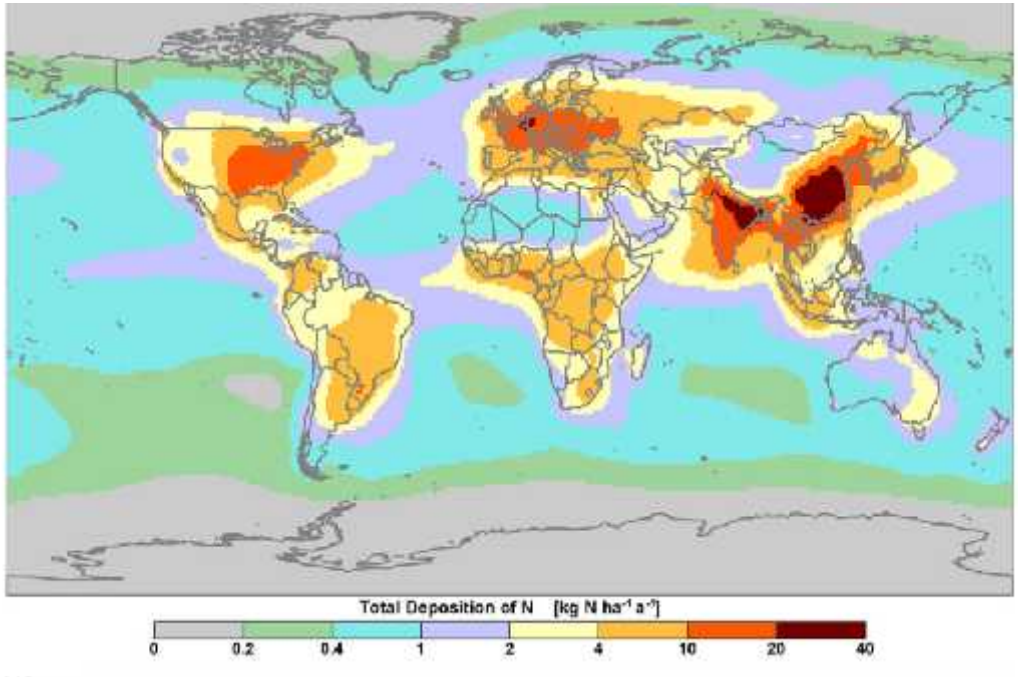
Kg N/ha/wet season

	2012				2013			
	$N\text{-}NH_4^+$	$N\text{-}NO_3^-$	DON	DTN	$N\text{-}NH_4^+$	$N\text{-}NO_3^-$	DON	DTN
Rainfall	0.05	0.08	0.60	0.73	0.30	0.24	1.27	1.81
Throughfall (70 – 76%)	0.13	0.05	1.28	1.46	0.24	0.15	2.40	2.79
Stemflow (1%)	-	-	-	-	0.08	0.02	0.18	0.28
Net	0.08	-0.03	0.68	0.73	0.02	-0.07	1.31	1.26

Net input = (throughfall + stemflow) - rainfall

Annual nitrogen deposition estimate

Our estimate is 2.01 kg N/ha/year that is within the range estimated by the global models for the region of this study.



World Meteorological Organization (WMO) Global Atmosphere Watch (GAW)

*Vet et al., 2014.

Findings

- As the water flows through the canopy it enriches the nitrogen concentrations, denoting the importance of the dry deposition.
- Despite the higher concentrations in stemflow, the input estimation was ten times lower than in rainfall, due to the smaller amount of water through this way.
- Total nitrogen inputs by rainfall was 0.8 and 1.8 kg N/ha in 2012 and 2013, respectively.
- Annual nitrogen deposition estimate was about 2.0 kg N/ha/year.

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Rainwater chemistry and bulk atmospheric deposition in a tropical semiarid ecosystem: the Brazilian Caatinga

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