Performance and Correlation for Leaf Dry Matter Yield of Diverse Germplasm of *Panicum maximum* Jacq. under Two Levels of Soil Fertility in the Brazilian Cerrado

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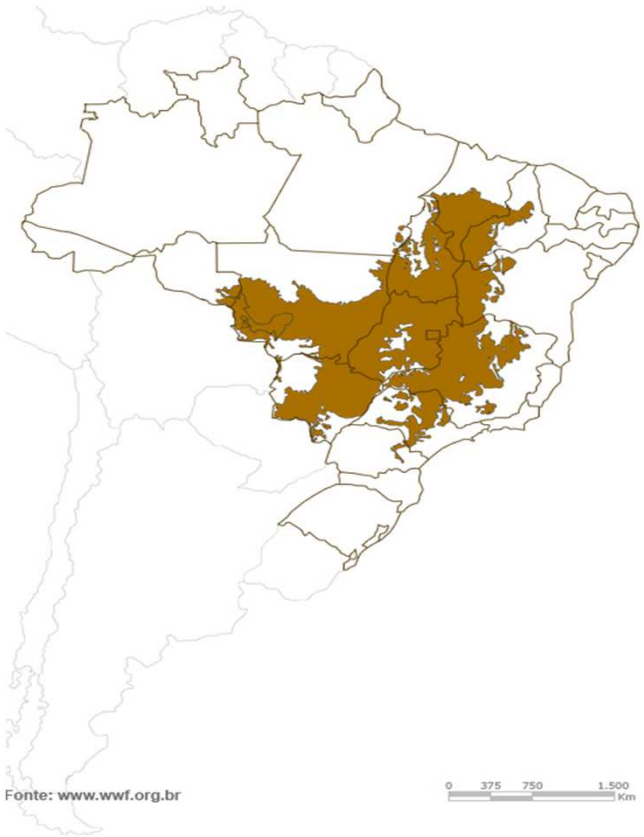
Embrapa

Beef Cattle on Brazilian Cerrado



- Area: 205 million ha
- 50 million ha - cultivated grasslands with more than 50% of beef cattle herd
- Weathered Tropical Soils – Oxisols, Ultisols and Entisols
- Extensive systems are predominant, but things are changing!!!
  - Integrated and intensive systems!

Panicum maximum on Brazilian Cerrado

- Tropical apomictic autotetraploid (x = 8) perennial forage grass
  - 16% of the seed market
- High animal production - 1.200 kg of liveweight gain.$ha^{-1}.y^{-1}$
- High demanding in tecnhology - **Lime, fertilizers**, rotational stocking, farm management

Cerrado Soil vs *Panicum maximum* nutrition

Soil/ Plant	[a]Chemical parameter					
	pH (H_2O)	Ca+Mg $cmol_c.dm^{-3}$	K $cmol_c.dm^{-3}$	P $mg.dm^{-3}$	% Base saturation	% Al saturation
Cerrado	4.5-5.2	0.2-0.7	0.02-0.4	0.5-3.4	5.9-43.9	16.4-85.9
Panicum	>5.5	>2.0	>0.13	>4	>45	<20

- High input of fertilizers: lime, gypsum, potassium chloride, superphosphate
- Is there genotypes more efficient in using nutrients, i.e, lower losses with less nutrients?
- It would be desirable to reduce expending in fertilizers and to increase the profits of cattlemen

[a]Martha Jr. et al. (2007) – Cerrado: uso eficiente de corretivos e fertilizantes em pastagens

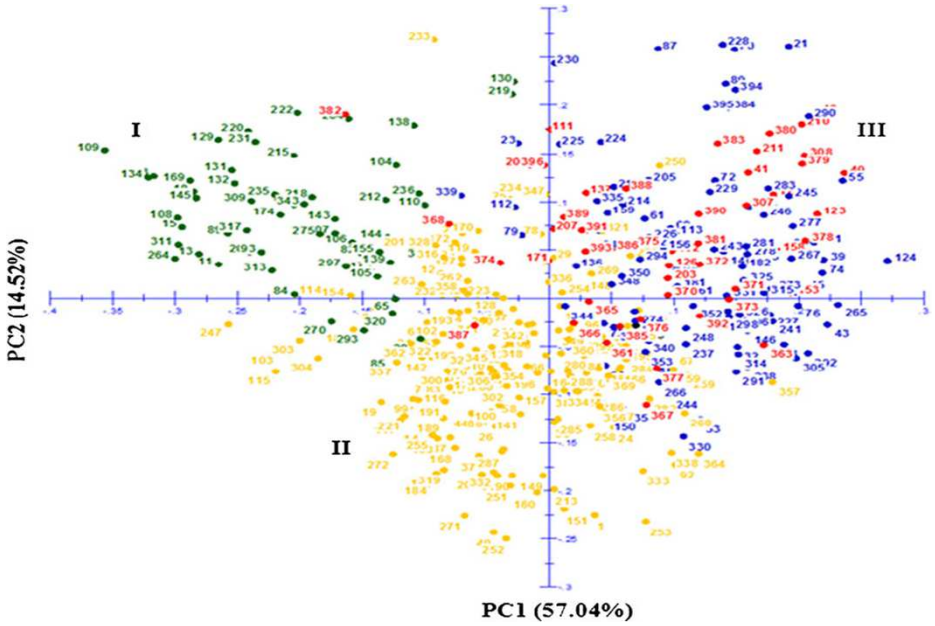
Objectives

- To estimate the losses of a low fertility soil on the performance of *P. maximum;*

- To calculate the correlation between a low and a high fertility soil for diverse cultivars and breeding material.

Material and Methods

- 24 Genotypes (six cultivars, eight accessions and ten sexual plants)



+
Agronomic
Performance

Fig. 4 Association among 396 Panicum maximum accessions revealed using principal components analysis (PCA) based on Jaccard's similarity coefficient calculated from 30 microsatellite loci. Samples are color-coded based on the STRUCTURE results

Tropical Plant Biol. (2011) 4:185–202

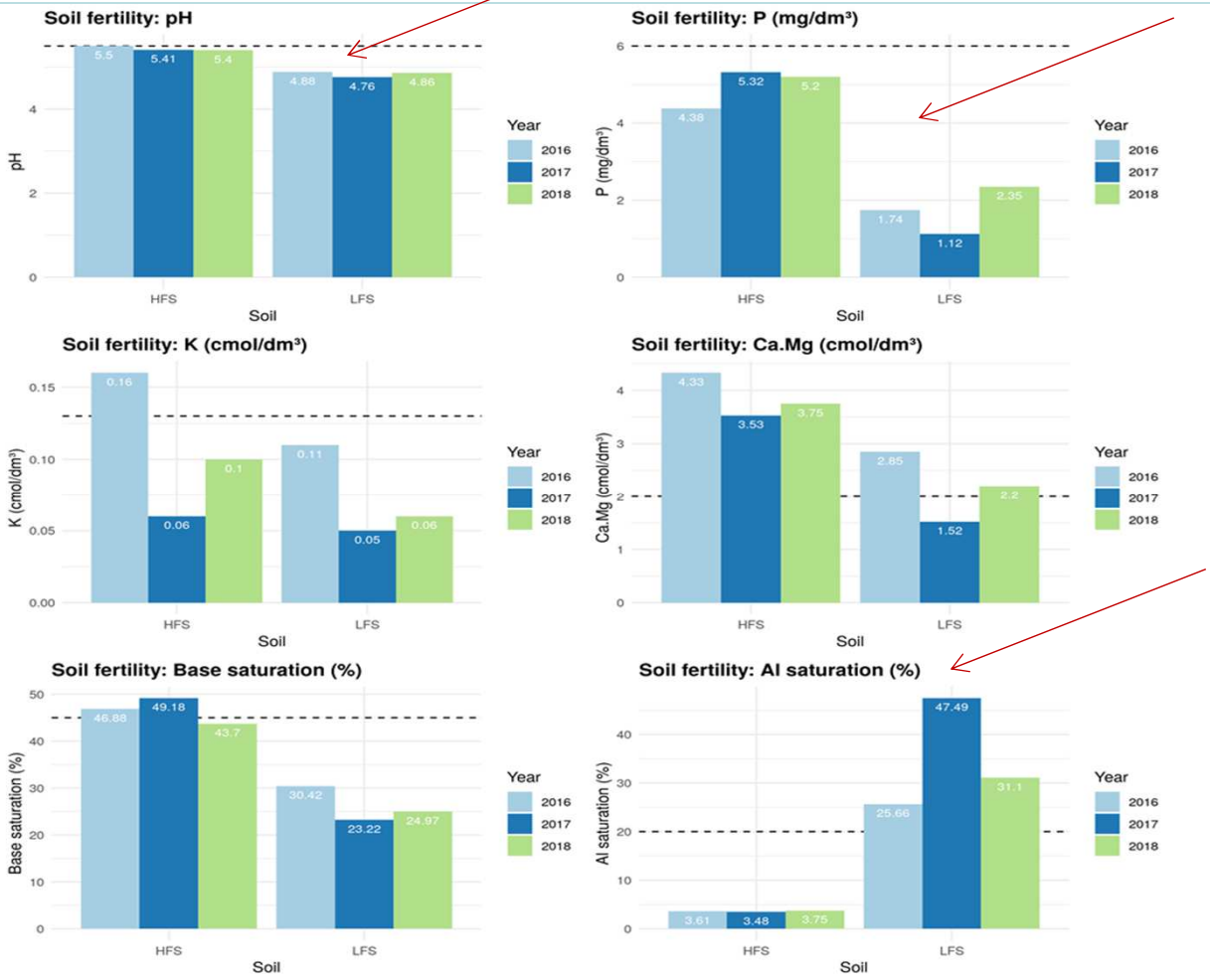
Material and Methods

- Soil – Haplic Ferralsoil – Clay soil – 55% of Clay – Campo Grande, MS, Brazil
- Use of lime, gypsum, superphosphate (18%) and potassium chloride to generate two levels of fertility

Goal!!!

- **High Fertility Soil - 6 ppm of P_2O_5 and 45% of base saturation (Ca+Mg+K)**
- **Low Fertility Soil – 2 ppm of P_2O_5 and 35% of base saturation**

Levels of Soil Fertility



Evaluations

Low fertitily soil

High fertitily soil

- Design- RCB – three replicates
- Plots - 4.5 m^2
- Trait - Leaf dry matter yield ($kg.ha^{-1}.y^{-1}$)
- Seven harvests from March 2017 to February 2018
- Nitrogen fertilization after each harvest in the rainy season - 150 kg $N.ha^{-1}.y^{-1}$
- Variance components based on REML and BLUPs for genotypes (Resende, 2016)

Heritability, accuracy and Mean BLUP ($kg.ha^{-1}.y^{-1}$)

Parameter	**LRT Test**
Heritability	0.91**
Accuracy	0.95
Range	10,210 - 16,662

Economic losses for a system of growing and finishing phases

Forage yield and liveweight gain in kg.ha^{-1}

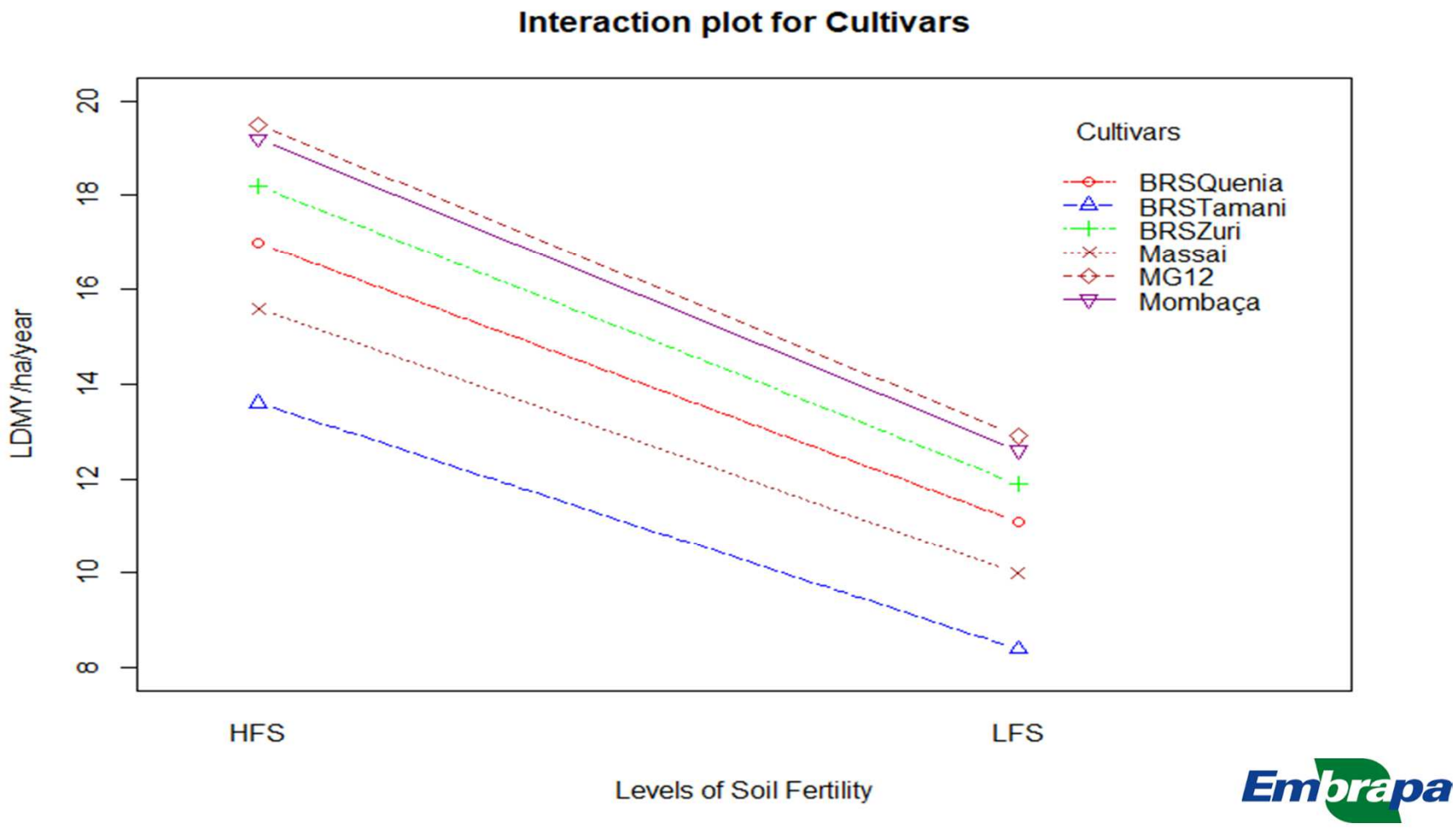
Soil	Forage yield.y^{-1}	Forage yield.d^{-1}	[a]Forage Availability .d^{-1}	[b]Stocking rate	[c]Liveweight gain.d^{-1}	Liveweight gain.y^{-1}	Profit in US$.y^{-1}
HFS (1)	16,275	44.59	22.30	3.38	2.03	740.95	889.14
LFS (2)	10,263	28.12	14.06	2.13	1.28	467.20	560.64
2 - 1	-6,012	-16.47	-8.24	-1.25	-0.75	-273.75	**-328.50**

Parameters: [a]Forage availability=50%; [b]Animal of 330 kg with 2% of LDMY consumption; [c]Average daily liveweight gain=0.6.kg^{-1}; [d]US$ 1.2.kg^{-1}.

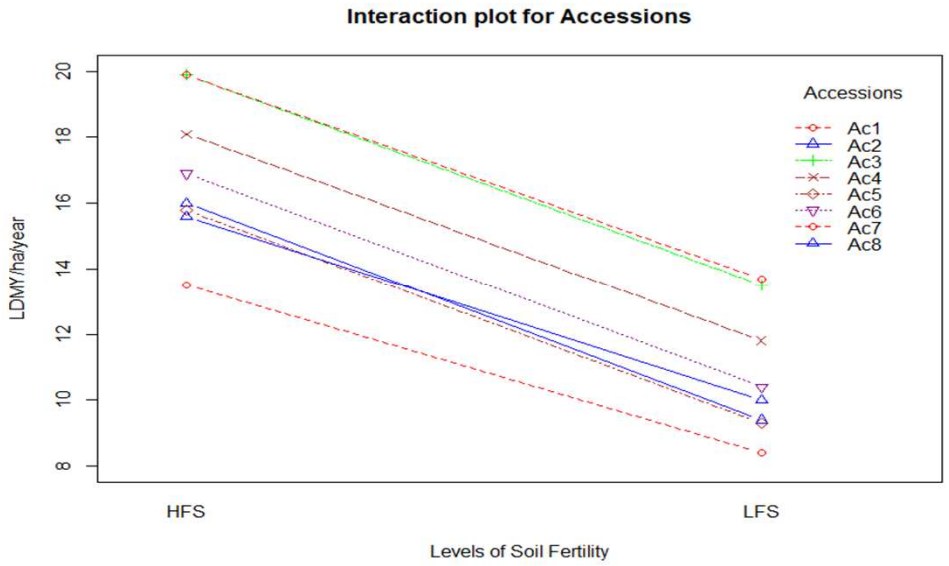
Average losses: -37%

Embrapa

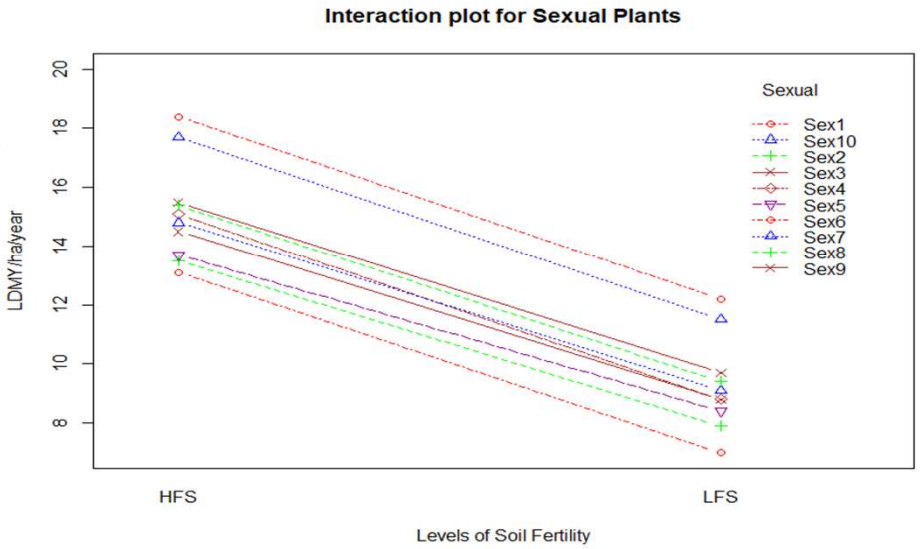
Genotype by Soil Interaction



Genotype by Soil Interaction



$r_{GxSoil} = 0.91$



Concluding Remarks

- Low soil fertility caused high mean losses in *P. maximum*
- There were no cultivars or breeding material more tolerant to lower soil fertility
  - **The use of genetic tolerance is a challenge**
- Research in other areas should be encouraged
  - Example: Use of microrganisms?
  - *Tropical Grasslands* (2006), 40, 94–101

Funding:

Collaborator:

Thanks!