

Instituto  
Latinoamericano  
del Biochar



# Effects of biochar rate on corn germination, development and production in Vertisoil

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# Introduction

What has been the reason behind the significant decrease in the use of land for cereal production in Mexico?

Parameter	Mundial increase (%)	México increase (%)	México reduction (%) 2016-2021
Population	157.77	283.43	-
Cereal production	250.18	359.56	22.11
Land use for cereal	14.11	22.35	10.76
Cereal yield	206.89	329.53	2019-2021 10



# Introduction

## Research goal

Employing biochar to improve soil water retention, enhance fertility levels, and decrease agricultural production costs.

Biochar application in Acámbaro's OFE.  
Esmeralda Mendez



# Introduction

## Specific goals

- **Verify** the effect of biochar and fertilizer doses on the germination, growth, and production of corn;
- **Investigate** the feasibility of reducing corn production costs through the application of biochar and fertilizer dosages.
- **Examine** the impact of biochar and fertilizer dosages on the soil chemical, physical, and hydraulic properties;

Biochar application in Acámbaro's OFE.  
Esmeralda Mendez



# Methodology

Experimental setup



# Methodology

- Treatments applied in Acámbaro's experiment

Acámbaro				
Num.	Treatment	1ª fert. Kg ha <sup>-1</sup>	2ª fert. Kg ha <sup>-1</sup>	3ª fert. Kg ha <sup>-1</sup>
1	00B00F			
2	00B-CPDF	445	520	200
3	00B-100F	865.6	432.6	232.7
4	06B-100F	865.6	432.6	232.7
5	06B-075F	650.75	324.47	174.5
6	06B-050F	433.84	216.32	116.32
7	03B-100F	865.6	432.6	232.7
8	03B-075F	650.75	324.47	174.5
9	03B-050F	433.84	216.32	116.32
10	06B-00F			
11	03B-00F			



# Methodology

- Irrigation Acámbaro's experiments

Place	Irrigation number	Precipitation	Irrigation period	Source
Acámbaro	2	Frecuent	20 days before planting and 2 days after planting	Miguel





# Methodology

- Nutrients from biochar applied in Acámbaro's experiment

Nutrient in biochar	kg/ha 3 Mg	kg/ha 6 Mg
K	52.76	105.52
P	8.01	16.02
N org	25.97	51.94
Nitrate	0.02	0.05
Ammonia	0.03	0.06
total N	26.02	52.05
Fe	22.94	45.89
Zn	0.15	0.31
B	0.05	0.10
Cl	6.88	13.75
Mn	0.32	0.65
Cu	0.11	0.23
Mo	0.00	0.00



# Results

- Germination Results

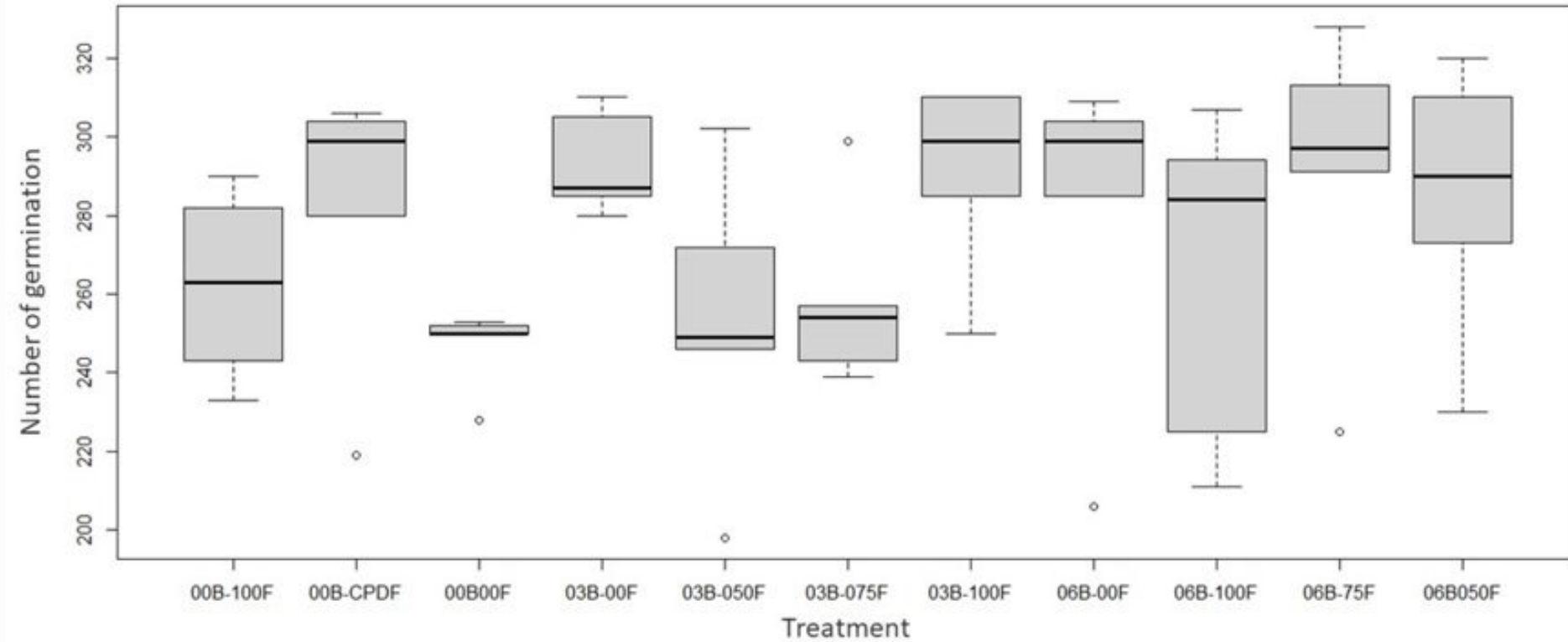


Figure 3. Effects of biochar and fertilizer dosage on corn seed germination in Acámbaro



# Results

- Plant development

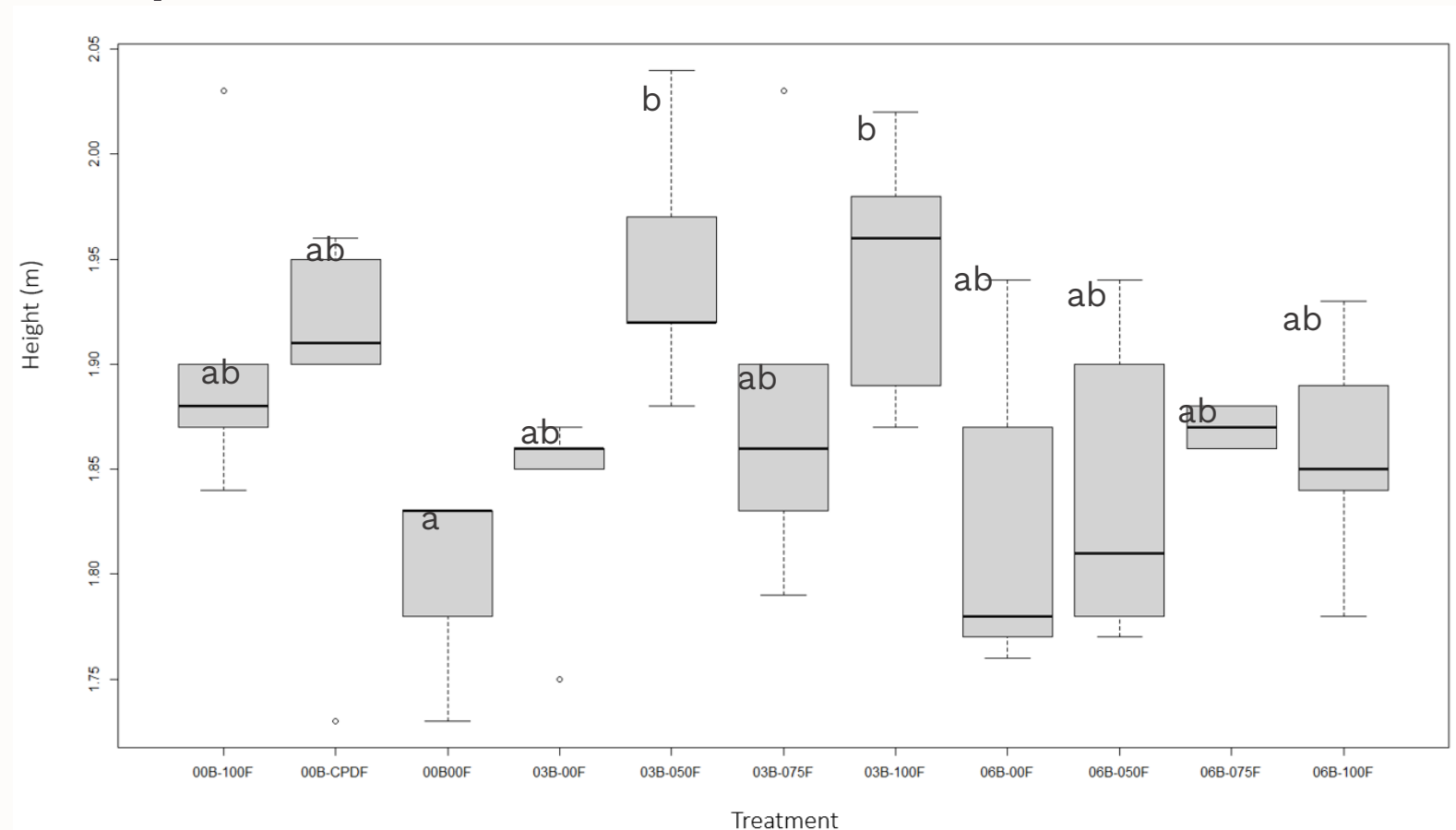


Figure 4. Impact of Biochar and Fertilizer Rate on Plant Height in Vertisol Conditions of Acámbaro, Gto.



# Results

- Plant development

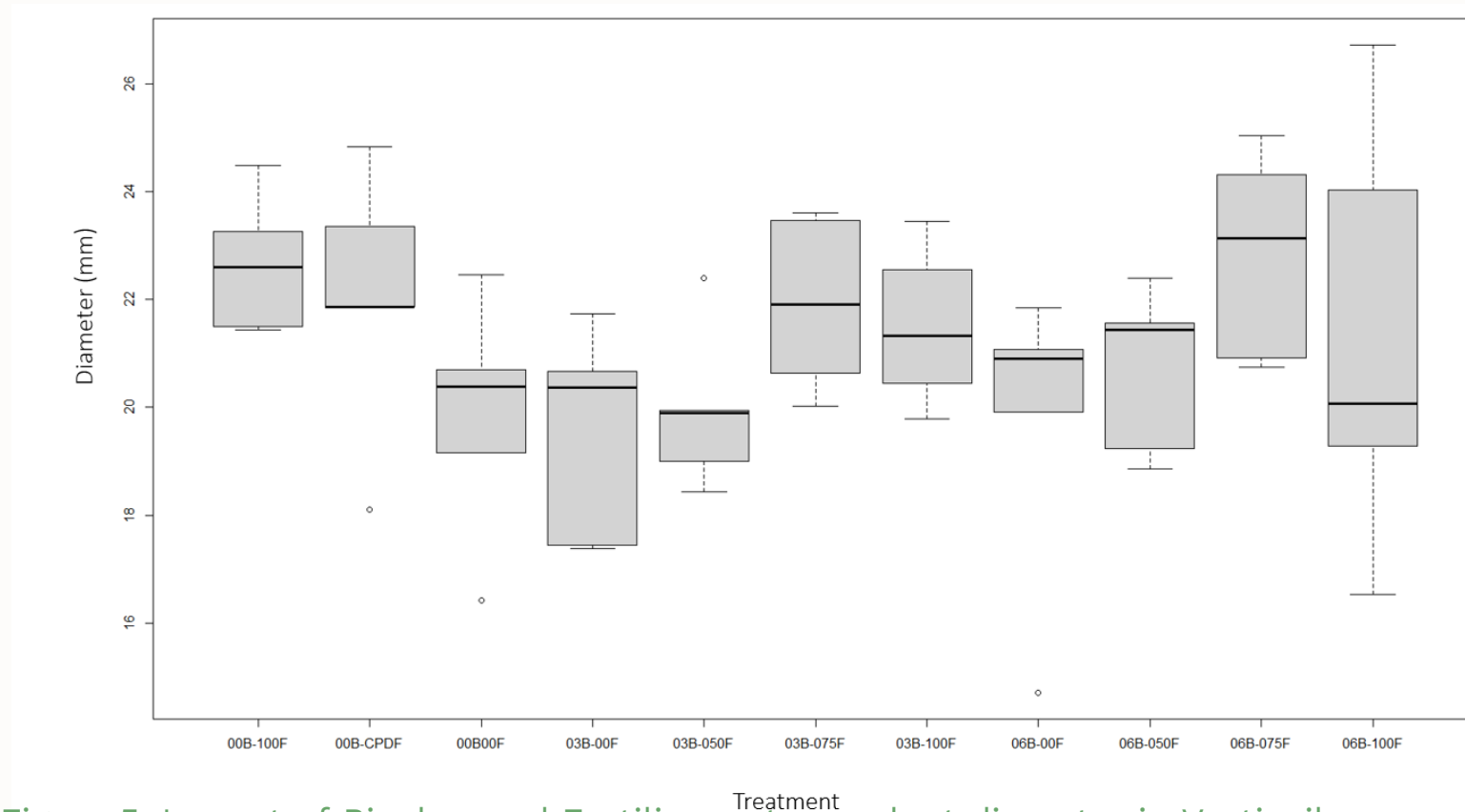


Figure 5. Impact of Biochar and Fertilizer rate on plant diameter in Vertisol conditions of Acámbaro, Gto.

# Results

- Plant production

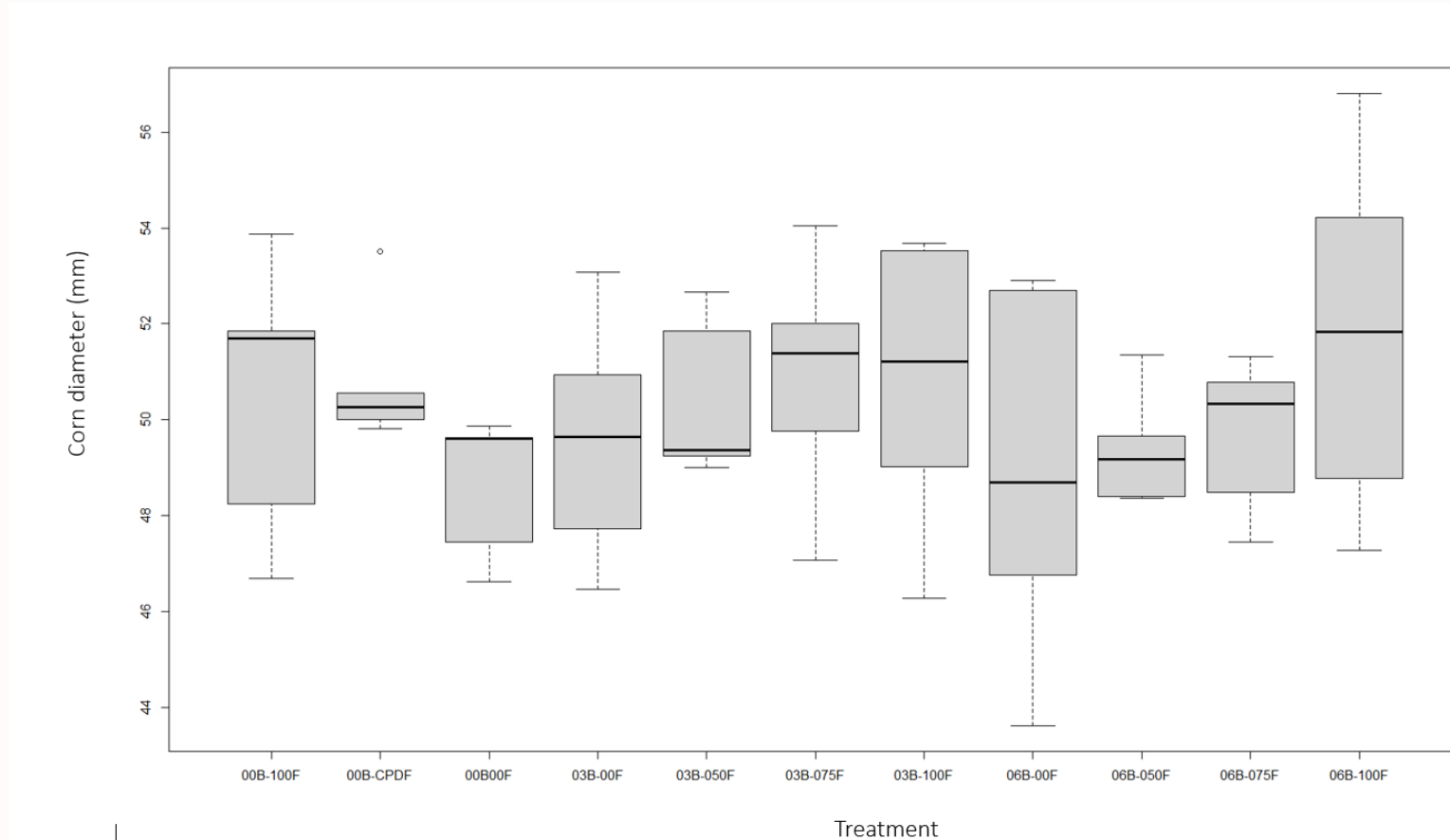


Figure 6. Impact of Biochar and fertilizer rate on corn length in Vertisol conditions of Acámbaro, Gto.

# Results

- Plant production

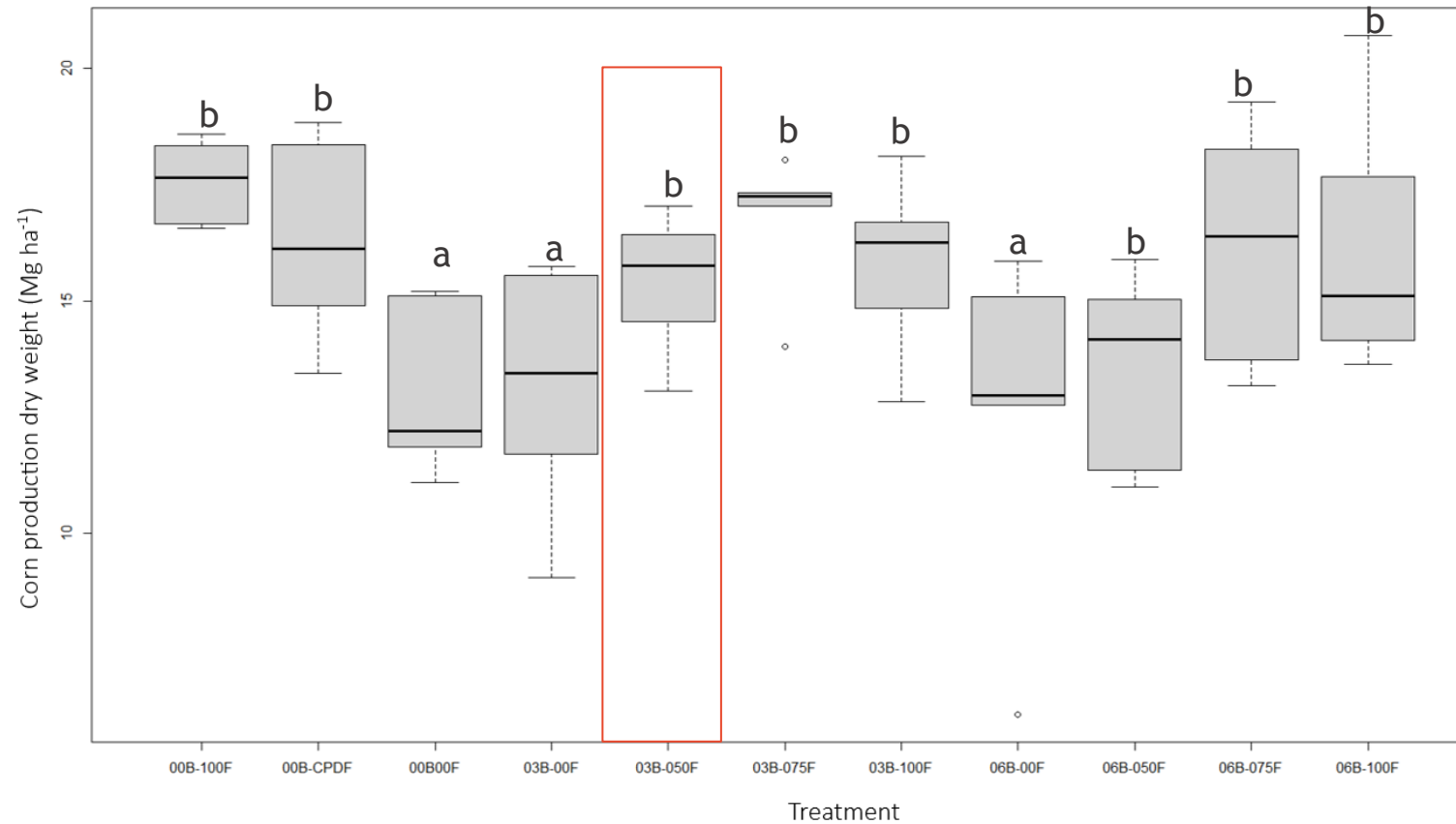


Figure 8. Impact of Biochar and fertilizer rate on corn Production dry weight in Vertisol conditions of Acámbaro, Gto, an Polynomial analysis between 00B-CPDF and the other treatments



# Results

- Plant production

<b>Treatment</b>	<b>Total fertilizer applied per cycle (Kg ha<sup>-1</sup>)</b>	<b>% of fertilizer reduction compared with 00B-CPDF</b>	<b>Cost reduction first year (%)</b>	<b>Cost reduction second year (%)</b>
00B-CPDF	1145			
03B-50F	726.3	-36.56	14%	61%

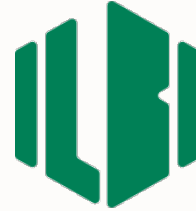


# Conclusions

- Biochar and fertilizer rate didn't affect corn germination
- The treatments had a significant impact on corn development, with the highest average plant height observed in the treatment adding biochar **3 Mg per ha plus 100% (03B-100F)** and **3 Mg ha plus 50% (03B-050F)** of the recommended fertilizer rate in Acámbaro.
- The treatments exerted a substantial influence on corn production. Production levels were notably low when only biochar was added without fertilizer. However, when compared to the typical fertilizer dosage, incorporating **3 Mg ha<sup>-1</sup> of biochar plus 50% of fertilizer allowed a reduction of fertilizer usage by 36%**, while **still maintaining equivalent corn production** in the Vertisoils.







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Thank You! (Gracias)

