Biochar and cocompost: an option for sustainable fertility management of leached tropical ferruginous soils

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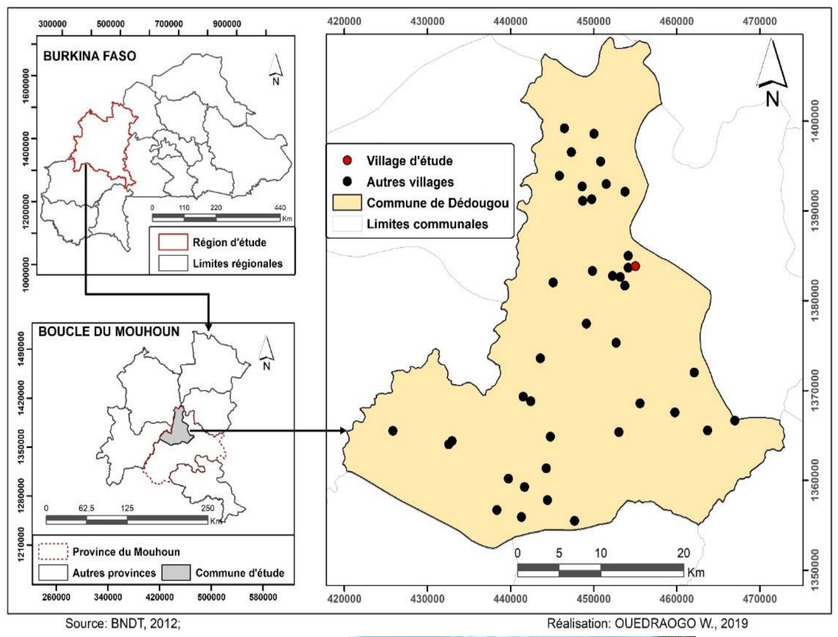
Introduction and objectives

The current challenge for agriculture in Burkina Faso is to find innovative options for sustainable fertility management that use accessible technologies to increase agricultural production while preserving the soil. An experiment to recycle nutrients through the production of biochar from cotton stalks was carried out in the village of Massala in western Burkina Faso. The association of biochar with the composting process called co-composting was tested on 03 types of soil. The experimental design used is a BCR with 03 treatments and 04 replicates to determine the effects of the different treatments on cotton yield for different soil types. The area of each the elementary parcel was 120m2. The 03 soil types according to the CPCS classification (1967) are FLC, FLIMP and FLIPP.

The objective of this study is to evaluate the effects of biochar based on cotton stalks in different fertilization formulas on the productivity of the 3 soil representative of the pedodiversity in western Burkina Faso in cotton cultivation



Materials and methods

The study site is located at Massala (12°31'42.3"N and 3°25'15.5"W), in western Burkina Faso. The Sudano-Sahelian climate with a rainfall between 600 and 900 mm per year. The average temperature is 29°C. The dominant soils are leached tropical ferruginous soils.Three multi-local tests were installed since 2018 on three soil with variable rooting depths (RD) according to the CPCS classification (1967): FLC (PE>60 cm), FLIMP (40≤PE≤60cm) and FLIPP (20≤PE≤40cm). They correspond respectively to ferric lixisol, endoplinthic lixisol and plinthosol according to the WRB classification (2015).The device is a BCR with three (03) treatments and four (04) repetitions. The treatments are: T1=compost; T2=Biochar) and T3= co-compost. The doses of fertilizers provided are: - NPK (14 23 14): 150Kg/ha; - Urea (46%): 50 kg/ha; -Compost, biochar and co-compost: 2.5t/ha

•Cotton yield measured to evaluate the effect of the soil and the different treatments

The influence of biochar and co-compost can be seen on soil productivity and cotton yield

Soils physical reference properties

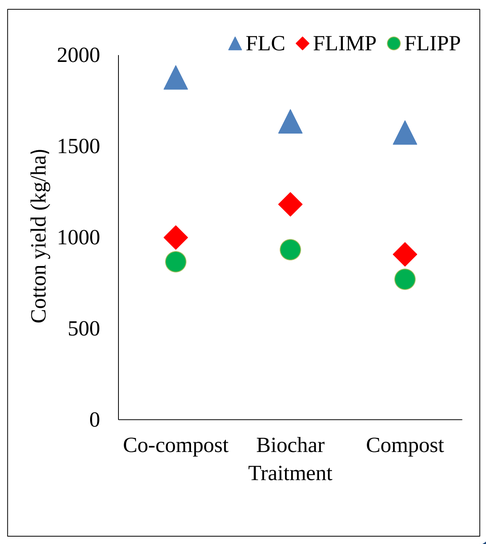
Soil	A (%)	L_tot (%)	S_tot(%)	Texture
FLIPP	40,46	25,11	21,21	LAS
FLIMP	35,55	28,64	26,7	LA
FLC	23,99	46,25	52,09	A

Soils chemical reference properties

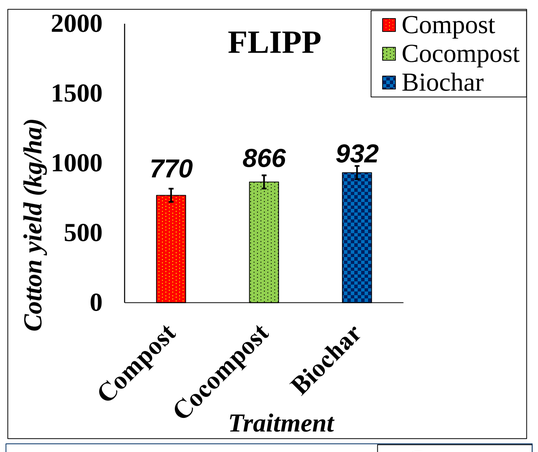
Soil	MO (g/100g)	N_tot (%)	P_disp (mg/100g)	K_disp (mg/100g)	Ca_disp (mg/100g)	Na_disp (mg/100g)	Mg_disp (mg/100g)	CEC (meq/100g)	pH_w
FLIPP	1,06	0,04	0,12	10,77	45,35	0,56	10,14	3,98	6,31
FLIMP	1,95	0,08	0,16	12,62	80,64	0,007	15,11	6,28	6,27
FLC	1,5	0,06	0,05	5,8	57,4	0,23	13,98	4,92	5,62

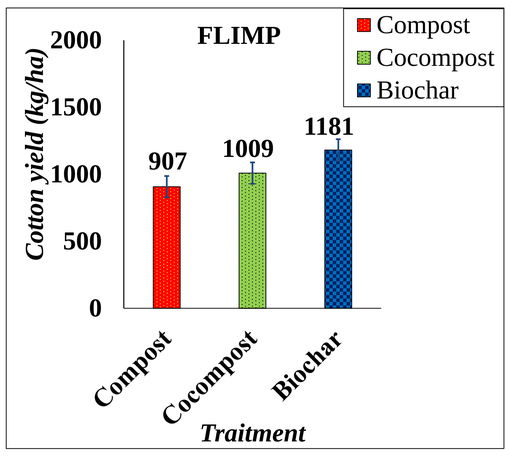
Influence of biochar on cotton yield per soil type

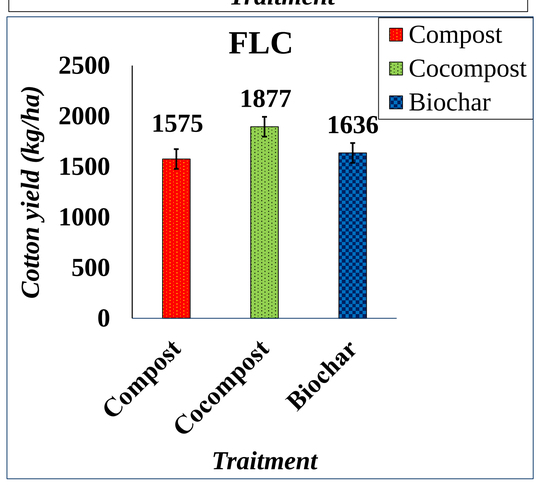
- According to the soils*amendement, statistical analyses have not shown a differences between cotton yield (p=0.24279). But the best yield is obtained with FLC*co-compost (1877 ±312 kg/ha). The lowest yield is obtained with FLIPP*compost (749 ±61 kg/ha).
- However, we nevertheless note that the FLC values organic amendments and particularly the co-compost more highly.
- Biochar and co-compost are better valued than compost by the different types of soil.



Influence o,biochar and cocompost on cotton yield







Biochar gives the best yield on FLIMP and FLIPP with 1181±104 and 932±215 kg/ha respectively, followed by co-compost (1009±135 and 866±124 kg/ha). But on FLC it is the co-compost that gives the best yield (1877±312 kg/ha) followed by biochar with 1636±221 kg/ha..

CONCLUSIONS

Biochar amendment alone or co-composted improve cotton yields better on leached tropical ferruginous soils compared to compost.
The FLC is the soil on which co-composted biochar better expresses its potential.

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BIOPROTECHSOL Project

The Massala village producers

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PROCESSUS DE PRODUCTION ET D'APPLICATION DU CO-COMPOST AU BIOCHAR

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Project BIOPROTECHSOL

Les producteurs des villages de Massala et Koumbia

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