ATB
Leibniz-Institut für
Agrartechnik und Bioökonomie

Biokohle-Naturtag Dobbrikow

(18.05.2022)

Laborerkenntnisse zur Biokohle

Leibniz-Institut für Agrartechnik & Bioökonomie (ATB)

Dipl. Biol. Maja Schultze

Leibniz Association

CHARCLE

Climate protection (Klimaschutz)

Health preserve (Gesundheitsschutz)

AD stabilization (Stabilisierung Biogasprozess)

Resource use (Resourcennutzung)

Char self-production (Eigenherstellung der Kohle)

Livestock specifications (Eigenheiten Tierbestand)

Economy of farm (Wirtschaftlichkeit des Agrarbetriebes)

CHARCLE Biochar Cycle

LAND BRANDENBURG

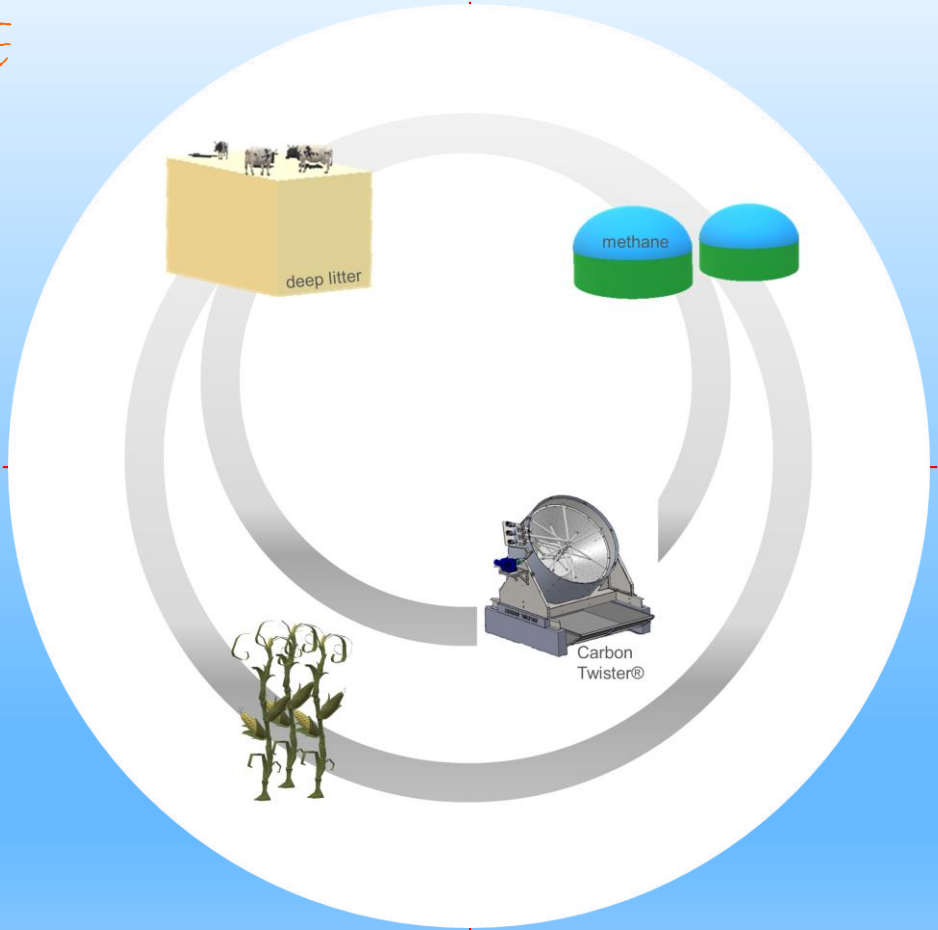
eip-agri AGRICULTURE & INNOVATION

European Commission

CHARCLE

Stall

Biogasanlage

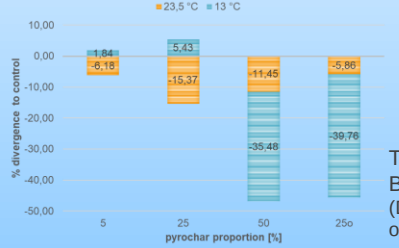


Feld

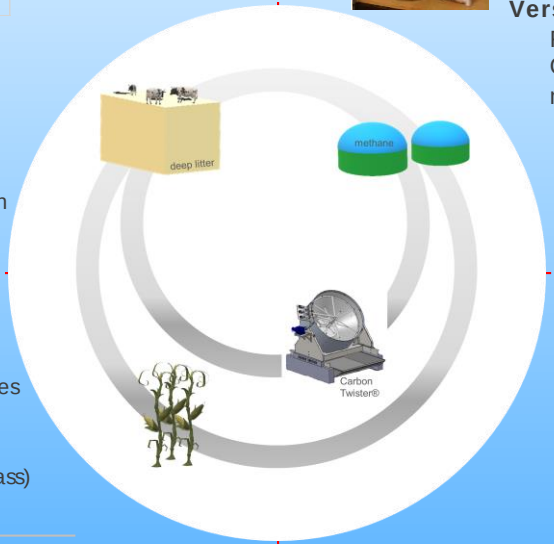
Pyrolyse

Stall

T	pyrochar proportion	CO_2	CH_4		N_2O		∑ $CO_{2\text{-eq}}$
[°C]	[% DM]	MW [kg/ t $FM_{cattle\ manure}$]	MW [kg/ t $FM_{cattle\ manure}$]	$CO_{2\text{-eq}}$ [kg $CO_{2\text{-eq}}$/ t FM]	MW [kg/ t $FM_{cattle\ manure}$]	$CO_{2\text{-eq}}$ [kg $CO_{2\text{-eq}}$/ t FM]	[kg $C_{O2\text{-eq}}$/ t FM]
23,5	0	5,33	2,63	65,78	6,93E-06	2,06E-03	71,11
	5	6,41	2,41	60,30	7,31E-06	2,18E-03	66,71
	25	5,31	2,19	54,87	6,06E-06	1,81E-03	60,18
	50	5,15	2,31	57,82	6,23E-06	1,86E-03	62,97
	25o	4,88	2,48	62,07	6,42E-06	1,91E-03	66,95
13	0	0,77	0,32	7,98	8,87E-07	2,64E-04	8,75
	5	1,41	0,30	7,50	1,06E-06	3,15E-04	8,91
	25	0,63	0,34	8,59	7,13E-07	2,13E-04	9,22
	50	0,42	0,21	5,22	3,98E-07	1,19E-04	5,64
	25o	0,74	0,18	4,53	7,27E-07	2,17E-04	5,27

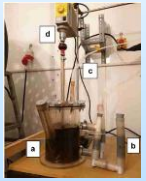


THG-Emissions-Index von Biokohle-Stallmist-Mischungen (Dauer = 14d, n =4, 25o = oberflächliche Applikation)



Biogasanlage

Versuchsspezifikationen

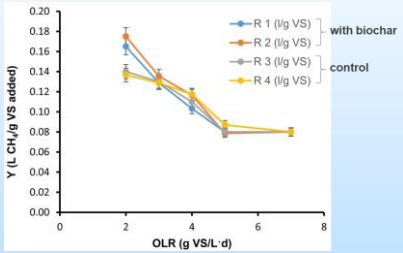


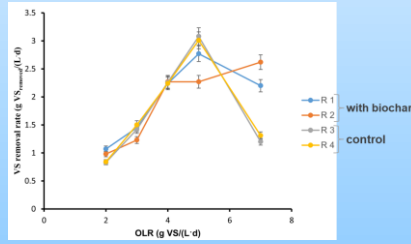
Reaktor

Typ: CSTR
$V_{Arbeits\text{-}V}$: 3L
T: mesophil
n: 100 rpm

Versuchsaufbau

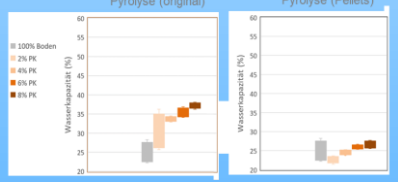
Feed: Schweinegülle
ORL: 2 – 7g VS/L d
$m_{Biokohle}$: 150 g





Feld

Wasserhaltekapazität
(-50hPa ≙ pF=1,6 → bei Starkniederschlägen wassergefüllter Porenraum des Bodens)

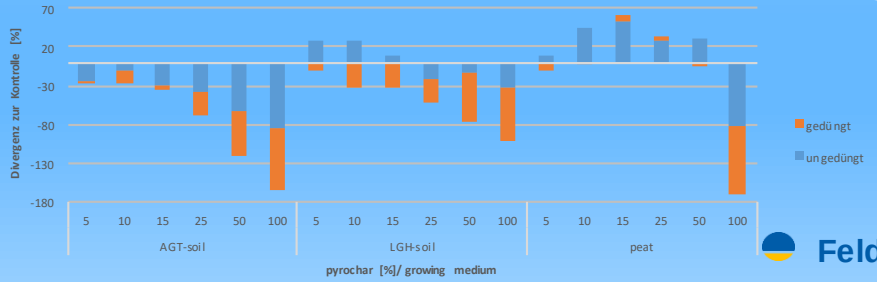


Pflanzenkohle

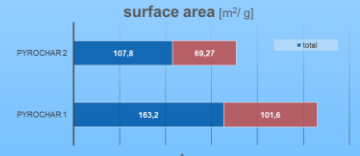
Feed: überständiges Gras

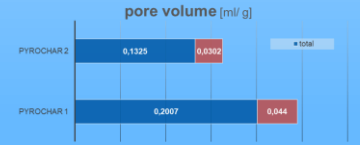
(Nationalpark unteres Odertal; Projekt GoGrass)

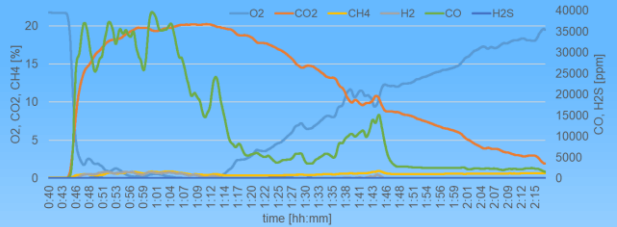
Kressekeimtest: Munoo-Liisa-Vitalitätsindex $MLV[\%]=\sum(|G\,RoKL|)/(nxGRoxRL)]*100$



Pyrolyse







Global warming potentials of various pyrochar-manure-mixtures at average summer and winter temperatures (duration = 14 d, n = 4, 25o = superficial application)

T	pyrochar proportion	CO_2	CH_4		N_2O		∑ CO_{2-eq}
[°C]	[% DM]	MW [kg/ t $FM_{cattle\ manure}$]	MW [kg/ t $FM_{cattle\ manure}$]	CO_{2-eq} [kg CO_{2-eq}/ t FM]	MW [kg/ t $FM_{cattle\ manure}$]	CO_{2-eq} [kg CO_{2-eq}/ t FM]	[kg C_{O2-eq}/ t FM]
23,5	0	5,33	2,63	65,78	6,93E-06	2,06E-03	71,11
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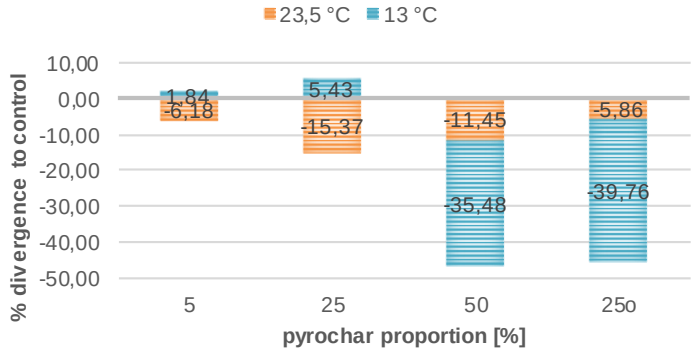
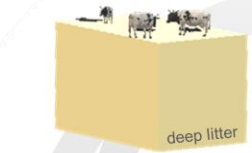
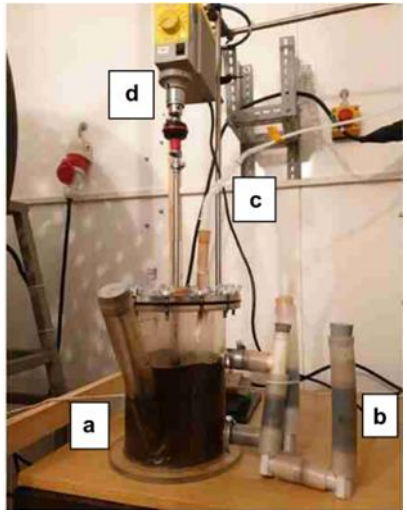
13	0	0,77	0,32	7,98	8,87E-07	2,64E-04	8,75
	5	1,41	0,30	7,50	1,06E-06	3,15E-04	8,91
	25	0,63	0,34	8,59	7,13E-07	2,13E-04	9,22
	50	0,42	0,21	5,22	3,98E-07	1,19E-04	5,64
	25o	0,74	0,18	4,53	7,27E-07	2,17E-04	5,27



GHG emission index of different pyrochar-manure-mixtures
(duration = 14 d, n = 4, 25o = superficial application)

Die Einbringung von Pflanzenkohle in den Stall, führt zur Verminderung der **Spurengasemissionen** des Rindermistes





Reactor

type: CSTR

Voperational: 3L

T: mesophilic

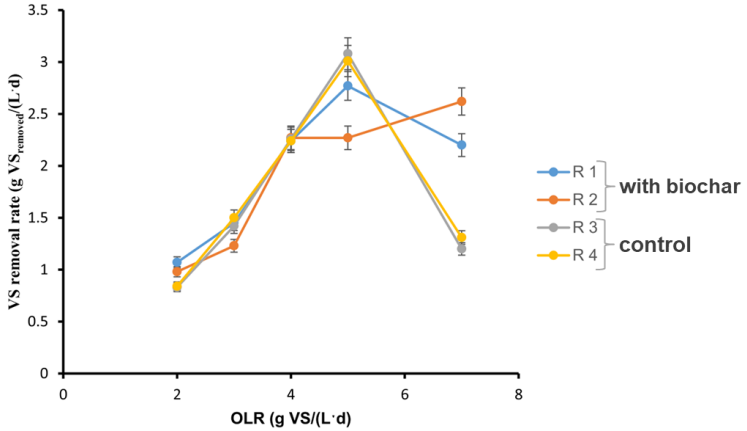
n: 100 rpm

experimental setup

feed: pig manure

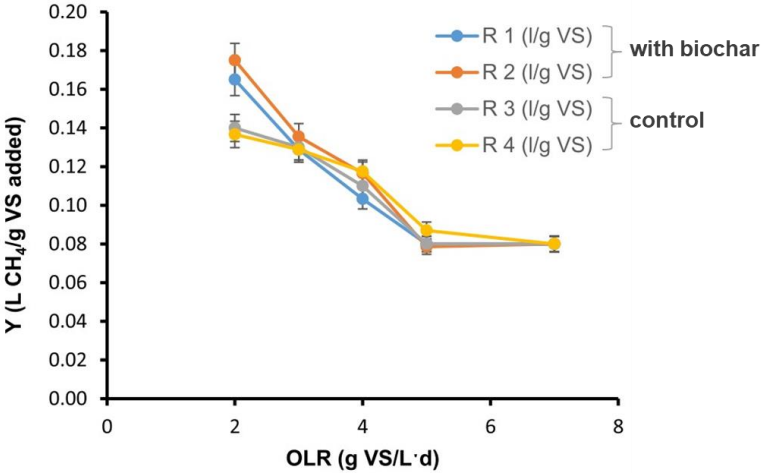
ORL: 2 – 7 g VS/L d

$m_{pyrochar}$ added: 150 g

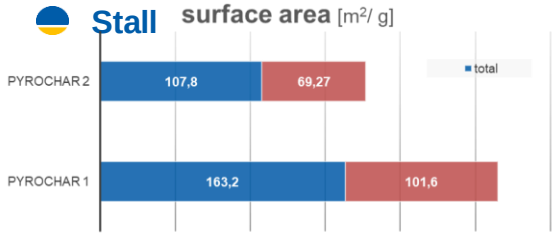


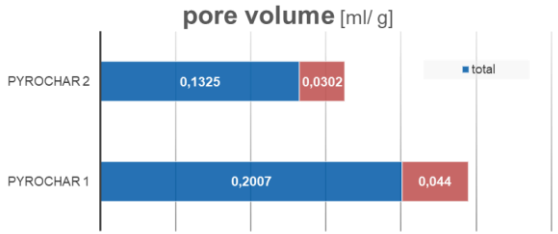
Variation in VS removal rate with the increase in ORL

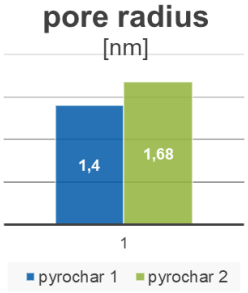
Pflanzenkohleein-bringung verursacht eine Erhöhung der CH4-Bildung bei B_R 2g VS/ (L d) und eine erhöhte Entfernungsrate flüchtiger Feststoffe bei B_R 7g VS/ (L d).



Effect of ORL on methane yield

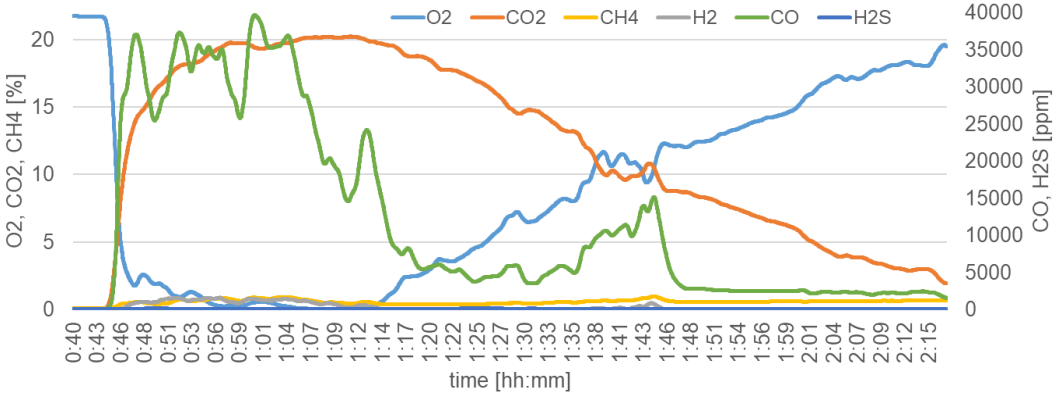






Surface chemical measured values of two char batches (1&2) for specific surface (BET) as well as pore parameters, volume and radius

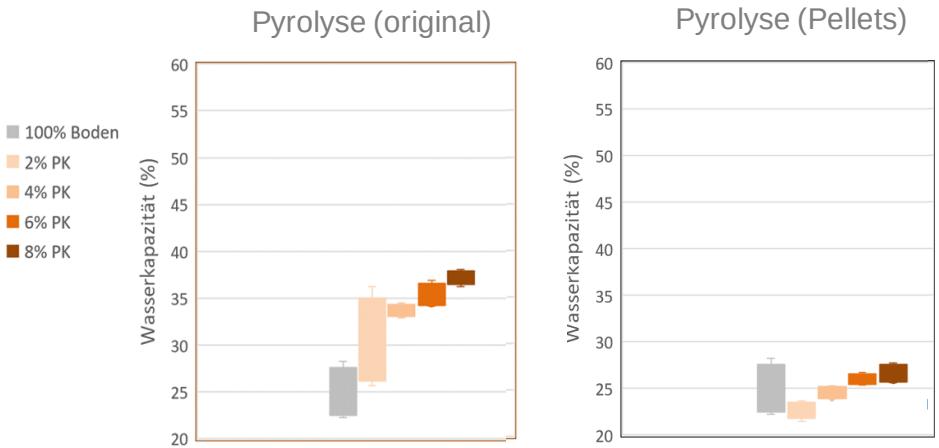
Pflanzenkohleeigen-schaften geringfügig. variierenIm CarbonTwister® werden **echte Pyrolysebedingungen** erreicht.



Combustion gas emissions of the CarboTwister®

Wasserhaltekapazität

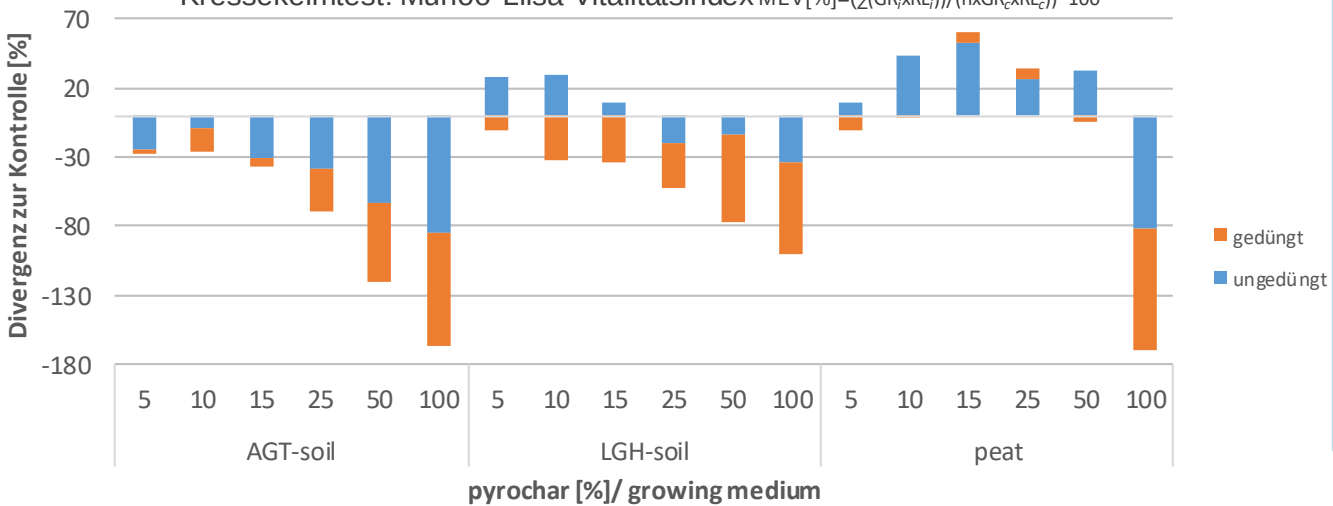
(-50hPa ≙ pF=1,6 → bei Starkniederschlägen wassergefüllter Porenraum des Bodens)



Pflanzenkohle

Feed: überständiges Gras

(Nationalpark unteres Odertal; Projekt GoGrass)



Unbehandelte Pflanzenkohle **verbessert Bodenwasser-haltevermögen** und spezifisch die **Keimung**.

Danke für die Aufmerksamkeit