agriculture

Supplementary materials (O'Toole et al. 2018)

Fig. S1: (A) Concentrated seams of biochar due to inverse ploughing of surface applied biochar (photo taken june, 2011), and (B) resurfacing of biochar with ploughing in the opposite driving direction (April 2012).

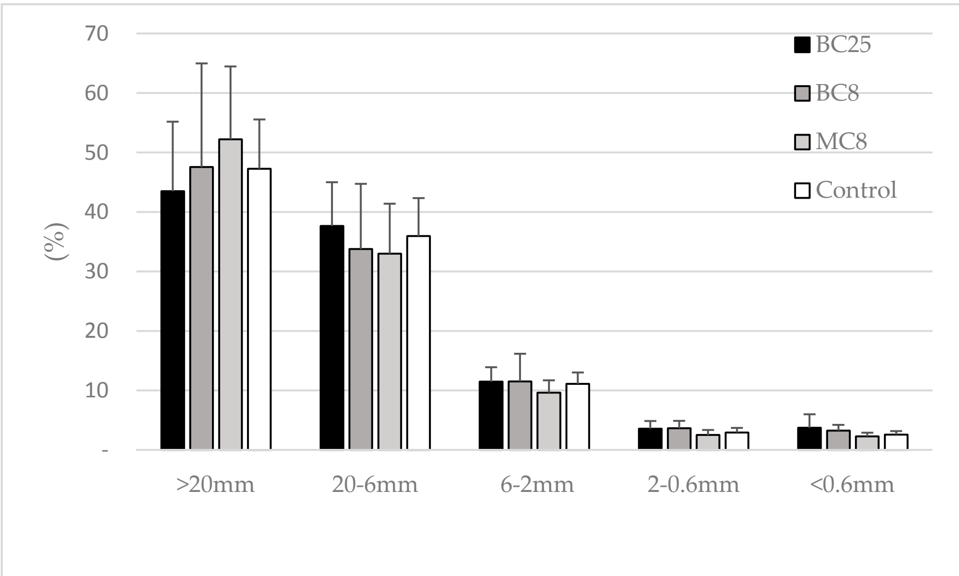

Fig. S2. Aggregate size distribution after machine dry sieving. Error bars indicate ± SD (n=4)

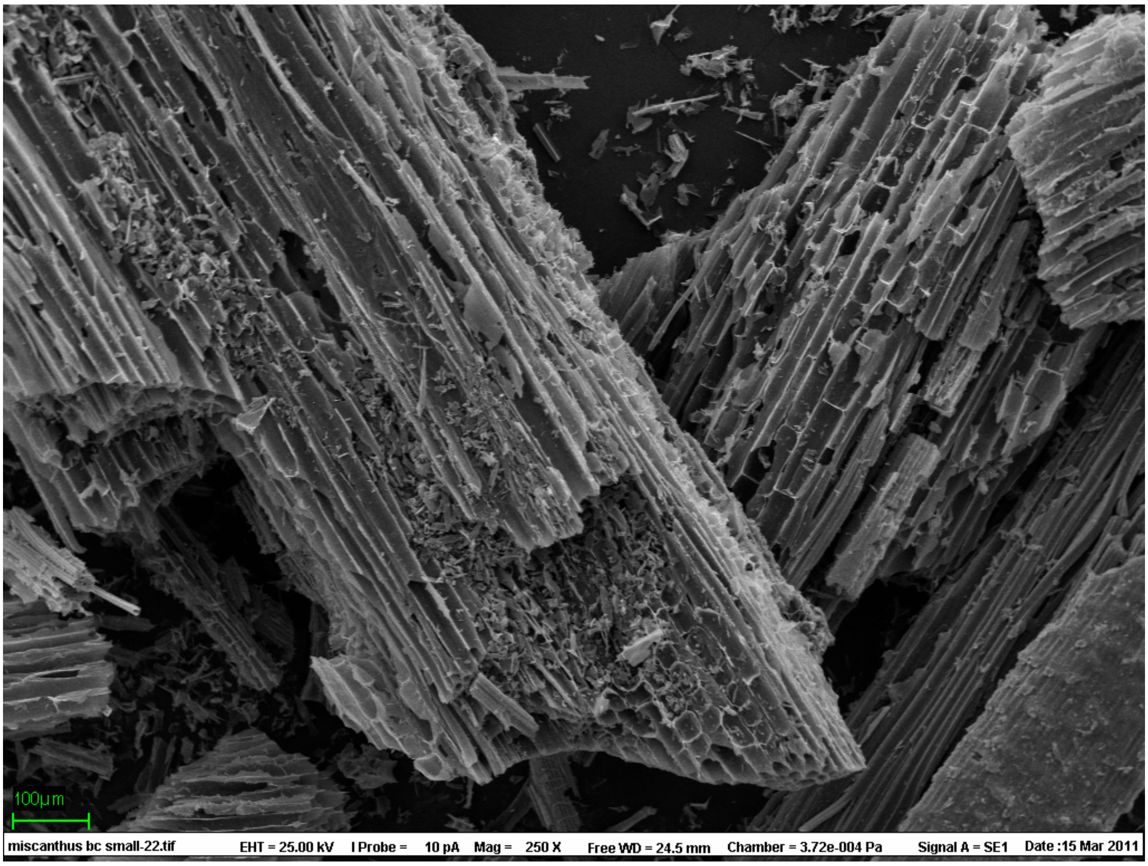

Fig.S3 SEM images of fresh *Miscanthus* biochar showing the porous surface and irregular shape

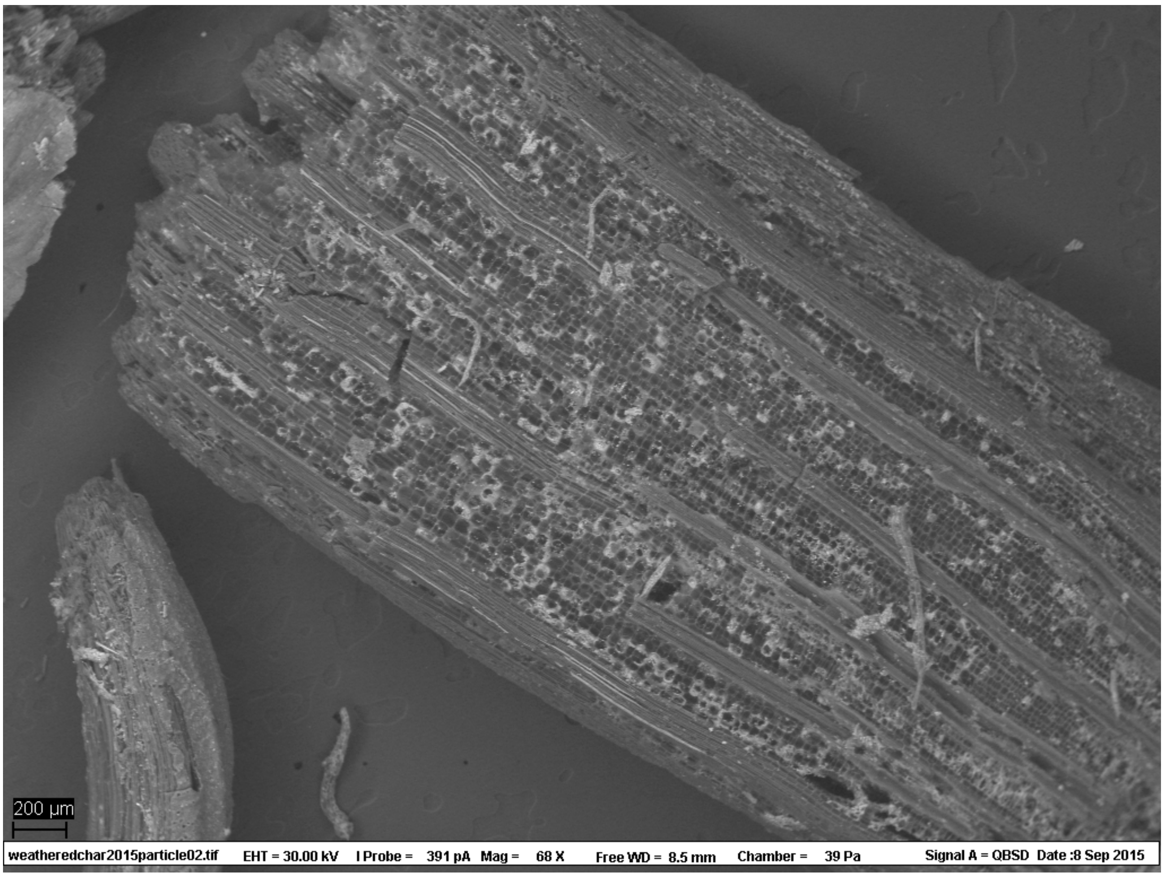

Fig.S4. SEM image of weathered *Miscanthus* biochar collected after 5 years of field incubation. Evidence of partial clogging of surface micropores with soil particles.

Fig. S5. Approximately 15 g of 2-6mm sized aggregates placed in small sieves prior to pre-wetting and wet sieving. Some of the aggregates were later found to be large biochar particles encrusted in thin films of clay.

Fig. S6. Illustrative evidence of "Biochar patchiness" from field samples. This sample is from 4 years after biochar addition and is the same sample used for the retention curve in Fig. 9a.

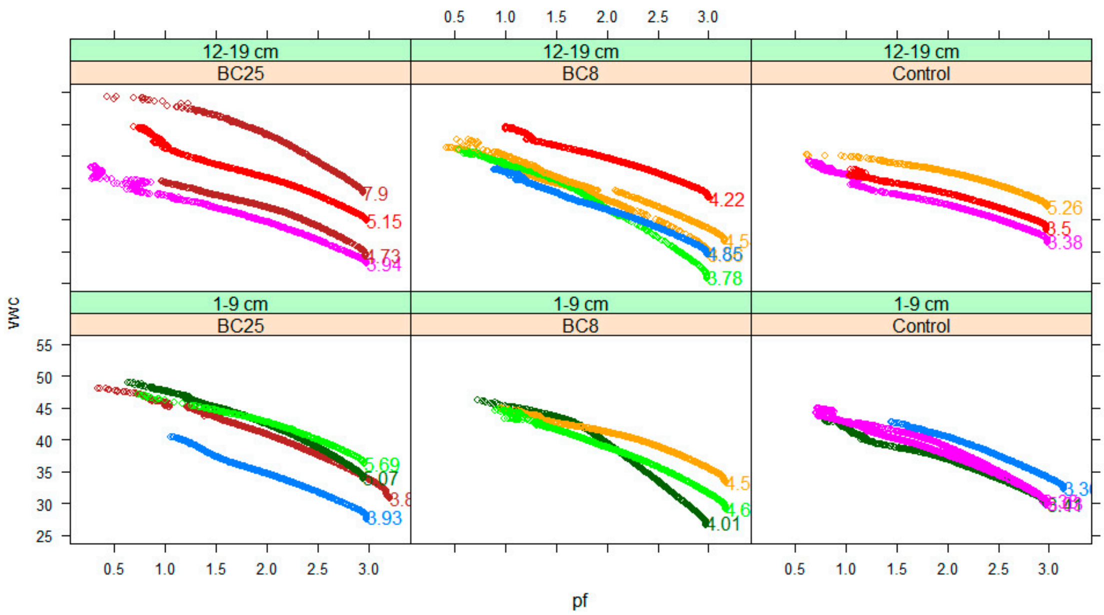

Fig.S7. Water retention curves for each intact soil core in each treatment and depth, with corresponding SOM content for each soil core

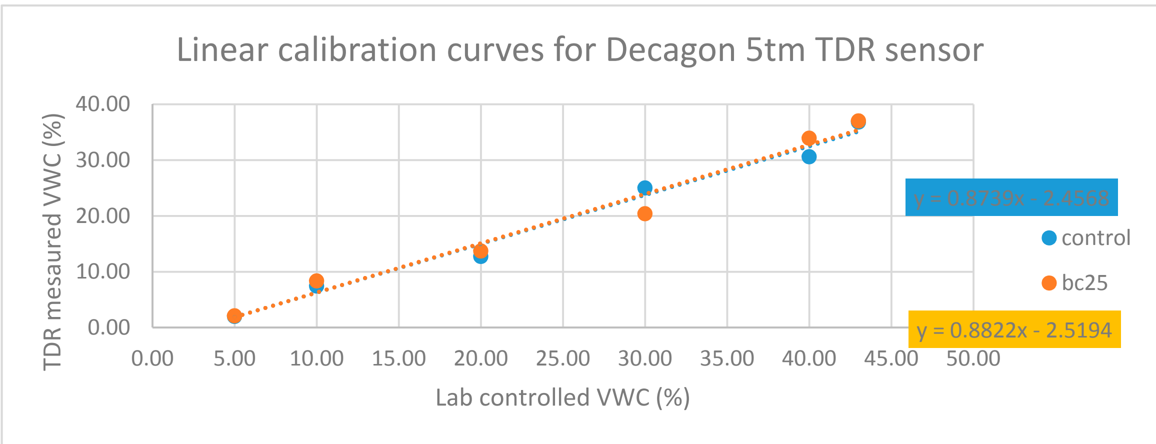

Fig.S8. Linear calibration curves for Decagon 5TM TDR sensor used for field based soil water content measurements. Calibration is presented only for BC25 and control. BC8 and MC8 calibration were not different from the control, and thus control calibrations were used for BC8 and MC8.

Table S1. Mean air temperature (°C) and monthly precipitation (mm) in Ås, Norway for four growing seasons (2011-14) compared with normal (1961-1990) monthly averages

Month	Mean daily air temperature (°C)					Total precipitation (mm)				
	Normal (1961-1990)	2011	2012	2013	2014	*Normal (1961-1990)*	2011	2012	2013	2014
April	*4*	8	4	3	7	*39*	41	31	57	62
May	*10*	10	11	12	11	*60*	63	14	64	40

June	*15*	15	13	14	15	*68*	136	84	112	25
July	*16*	17	16	17	20	*81*	89	110	12	46
Aug.	*15*	15	15	16	15	*83*	175	83	57	123
Sept.	*11*	12	10	11	12	*90*	158	83	57	31

Table S2: Classes of stability and crustability according to MWD values (reprinted with permission from Le Bissonnais (1996))

Class	MWD (mm)	Stabilty	Crustability
1	**<0.4**	**Very unstable**	**Systematic crust formation**
2	**0.4-0.8**	**Unstable**	**Crusting frequent**
3	**0.8-1.3**	**Medium**	**Crusting moderate**
4	**1.3-2.0**	**Stable**	**Crusting rare**
5	**>2.0**	**Very Stable**	**No crusting**

Table. S3 Maximum limit for heavy metals for soil improvement materials from organic origin (according to Norwegian law 'Gjødselvareforskriftet' (Mattilsynet, 2003) and actual values for Miscanthus biochar used in field trial

Quality class	0	1	2	3	Miscanthus biochar
mg kg^{-1} DM					
Cd	0,4	0.8	2	5	<0.01
Pb	40	60	80	200	<0.31
Hg	0.2	0.6	3	5	<0.01
Ni	20	30	50	80	2.50
Zn	150	400	800	1500	39.00
Cu	50	150	650	1000	4.60
Cr	50	60	100	150	1.50