SUPPLEMENTARY MATERIAL
Deep tillage improves degraded soils in the (sub) humid Ethiopian highlands

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TEXT S1: Calculation of discharge and soil loss for the plots

Runoff depth was calculated as follows:

$$d = \frac{V}{A} \quad \text{S1}$$

where d is the runoff depth form the plot. Vi s the volume of runoff collected in the barrel and A is the area of the plot (120 m^2)

The volume of runoff is collected in two barrels. The second barrel collects runoff when the first barrel with a volume of 127 l is full. The second barrel receives only one tenth of the overflow.

When the first barrel only contains water, the volume of runoff equals

$$V = \frac{\pi {D_1}^2 h_1}{4} \quad S2$$

where h_1 is the height of the water in the first barrel and D_1 is the diameter of the first barrel.

When the second barrel contains water, the volume of runoff equals

$$V = V_1 + 10\ \frac{\pi {D_2}^2 h_2}{4} \quad S3$$

where V_1 is the total volume if the first barrel h_2 is the height of the water in the second barrel and D_2 is the diameter of the first barrel,

To determine the amount of sediment lost, 1 l samples were taken from each barrel. Water samples were filtered using 100um filter paper. The filter paper and the sediment were oven dried for 24 hours at 105ºC. After oven drying, the weight of the sediment was measured and the weight of the and filter paper subtracted. The total sediment load L per plot can the found as follows

When the first barrel only contains water only contains water, the sediment load per plot is

$$L = VC_1 \quad S4$$

where C_1 is the sediment concentration in the first barrel.

When the second barrel contains water the total sediment load is

$$L = V_1 C_1 + (V - V_1)\, C_2 \qquad S5$$

where C_2 is the sediment concentration in the second barrel.

The sediment load per ha can be simply found by dividing the sediment load of the plot by the plot area in ha

Table S1. Soil chemical properties of the top 60 cm before and after the application of the tillage treatments. "Values with different letters at the same depth show a significant difference at $p<0.05$ between the tillage treatments and the pre-treatment value.

				After 2 years 2016		
Parameter	**Depth (Cm)**	**Prior to treatment 2015**	**CV%**	**DT**	**CT**	**NT**
pH	0-20	4.97±0.28^{a}	5.7	5.63±0.49^{b}	5.55±0.60^{b}	5.52±0.48^{ab}
	20-40	5.30±0.27^{a}	5.0	5.66±0.46^{a}	5.61±0.54^{a}	5.59±0.34^{a}
	40-60	5.39±0.27^{a}	5.1	5.73±0.47^{a}	5.70±0.45^{a}	5.76±0.33^{a}
OM (%)	0-20	1.21±0.6^{a}	50.5	1.72±1.04^{a}	2.03±0.9^{b}	1.80±0.56^{a}
	20-40	1.07±0.37^{a}	60.1	1.79±0.76^{bc}	2.76±1.15^{c}	1.33±0.75^{ab}
	40-60	0.75±0.29^{a}	38.7	2.29±1.49^{b}	1.84±0.92^{b}	1.78±0.47^{b}
Sand (%)	0-20	18.00±14.8^{a}	82.4	20.4±12.09^{a}	22±8.59^{a}	24.4±11.89^{a}
	20-40	17.20±22.0^{a}	127.8	21.60±9.50^{a}	20.00±11.73^{a}	22.00±11.31^{a}
	40-60	16.00±19.6^{a}	122.8	22.4±12.24^{a}	17.20±13.65^{a}	22.00±13.38^{a}
Clay (%)	0-20	60.40±18.1^{a}	29.9	56.2±16.59^{a}	54.0±14.96^{a}	56.2±13.92^{a}
	20-40	65.20±20.9^{a}	32.1	59.40±8.57^{a}	58.60±4.9^{a}	60.00±14.03^{a}
	40-60	67.20±20.9^{a}	31.1	62.2±10.99^{a}	63.80±13.04^{a}	62.60±11.12^{a}
Silt (%)	0-20	21.6±7.9^{a}	36.7	23.40±10.34^{a}	22.6±8.93^{a}	20.2±7.96^{a}
	20-40	17.60±4.1^{a}	23.3	19.00±5.37^{a}	21.00±4.73^{a}	18.00±3.58^{a}
	40-60	16.8±0.4^{a}	13.6	15.40±3.44^{a}	16.20±4.30^{a}	15.40±4.17^{a}
TN (%)	0-20	0.06±0.04^{a}	50	0.09±0.05^{a}	0.10±0.04^{a}	0.09±0.03^{a}
	20-40	0.06±0.03^{a}	58.7	0.09±0.04^{ab}	0.14±0.06^{b}	0.07±0.04^{a}
	40-60	0.04±0.01^{a}	34.3	0.12±0.07^{b}	0.09±0.05^{ab}	0.08±0.02^{ab}
CEC cmol (+)/kg	0-20	25.64±12.6^{a}	49.0	25.44±11.76^{a}	20.96±9.79^{a}	25.28±5.09^{a}
	20-40	26.24±12.8^{a}	48.8	25.68±7.04^{a}	24.12±10.65^{a}	24.08±4.48^{a}
	40-60	20.60±5.7^{a}	27.8	27.24±15.48^{a}	23.44±6.07^{a}	25.5±11.62^{a}
Av.P (ppm)	0-20	7.76±10.2^{a}	131.2	12.88±9.90^{a}	7.39±5.18^{a}	14.33±12.89^{a}
	20-40	6.88±4.2^{a}	61.2	5.63±4.37^{a}	5.76±4.38^{a}	6.93±6.80^{a}
	40-60	6.24±5.56^{a}	89.2	4.23±3.00^{a}	2.62±1.71^{a}	4.66±4.63^{a}