Table S1: Description of amylase [33] and cellulase [34] evaluation in soil samples and calculation of their activities following the reducing sugar released determination, in both methods, using the colorimetric method of Nelson-Somogyi as described by Oser [44].

Enzymes	Evaluations and calculations
Amylase activity in the soil (modified method of Ross [33])	10 g of air-dried soil sample were placed in a 125-mL Erlenmeyer flask plus 2.5 mL of toluene, and the mixture was shaken for few minutes and allowed to stand for 15 minutes. Subsequently, 20 mL of acetate-phosphate buffer (pH 5.5) plus 20 mL of a starch solution (2% w/v), as substrate (MERCK, 98.8% of purity), were added. The flasks were sealed and placed inside a B.O.D. (biological organism development) chamber at 30°C, for 24 hours. The flasks were opened, and solutions were filtered (Whatman® qualitative filter paper, Grade 1) to produce a clear supernatant. A control (blank) solution was conducted for each soil sample, with the addition of starch solution just before filtering. Soon after, the reducing sugar released was determined by colorimetric method and amylase activity calculated: $AA = 4.25\ x\ (GCSS - GCSC)$ *AA* = amylase activity (ug of glycose released per g of soil sample per day) GCSS = ug of glycose released by soil sample per mL per 24 hours GCSC = ug of glycose released by soil control per mL per 24 hours 4.25 = factor to correct ug of glycose per mL of supernatant to g of soil
Cellulase activity in the soil (modified method of Pancholy and Rice [34])	10 g of air-dried soil sample were placed in a 125-mL Erlenmeyer flask plus 1.0 mL of toluene, and the mixture was shaken for few minutes and allowed to stand for 15 minutes. Then, 10 mL of acetate-phosphate buffer (pH 5.9) and 10 mL of carboxymethylcellulose (1% w/v), as substrate (MERCK, 98.5% of purity), were added. The flasks were sealed and placed inside a B.O.D. (biological organism development) chamber at 30°C, for 24 hours. After that, the flasks were opened, and 20 mL of distilled water added to transferee the solution to centrifuge tubes, which were centrifuged at 5000 rpm by 10 minutes and filtered (Whatman® qualitative filter paper, Grade 1) to produce clear supernatants. A control (blank) solution was conducted for each soil sample, with the addition of acetate-phosphate buffer before incubation, and the addition of carboxymethylcellulose plus distilled water just prior to centrifugation and filtering. Soon after, the reducing sugar released was determined by colorimetric method and cellulase activity calculated: $CA = 4.1\ x\ [GCSS - GCSC)$ *CA* = cellulase activity (ug of glycose released per g of soil sample per day) GCSS = ug of glycose released by soil sample per mL per 24 hours GCSC = ug of glycose released by soil control per mL per 24 hours 4.1 = factor to correct ug of glycose per mL of supernatant to g of soil

Table S2: Average maize, sorghum, lablab and weed dry phytomass, excluding grain yield, produced and incorporated into topsoil, along the three crop succession cycles.

Treatments	Maize	Sorghum	Lablab	Weed-
	kg ha^{-1}			
Maize crop for soil homogenization, before experiment setup	9,255			
Sorghum/maize	10,713±1,529	6,761±1,035		
Lablab/maize	9,885±1,364		2,082±735	
Fallow/maize	8,909±1,407			1,346±570