

## Supplementary Figures

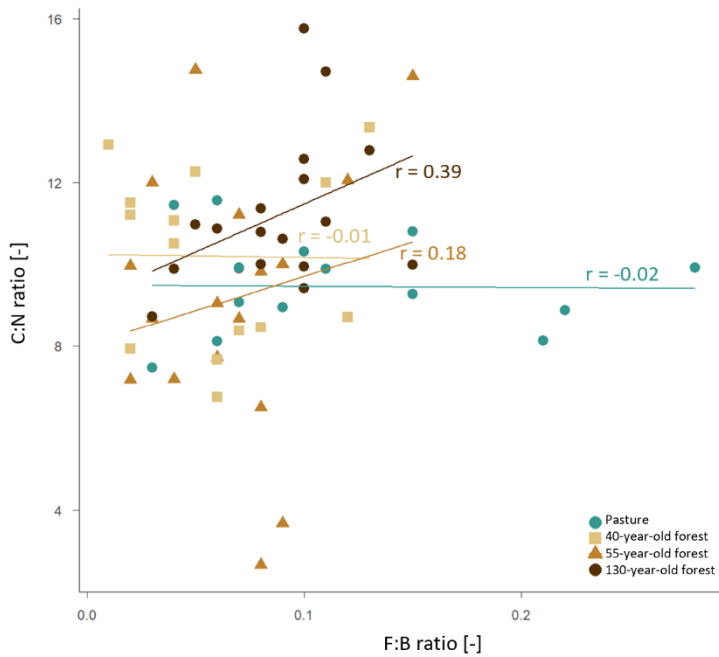


Figure S1. Pearson correlation between the Fungi:Bacteria (F:B) ratio and the C:N ratio of pasture and different forest stand ages. Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

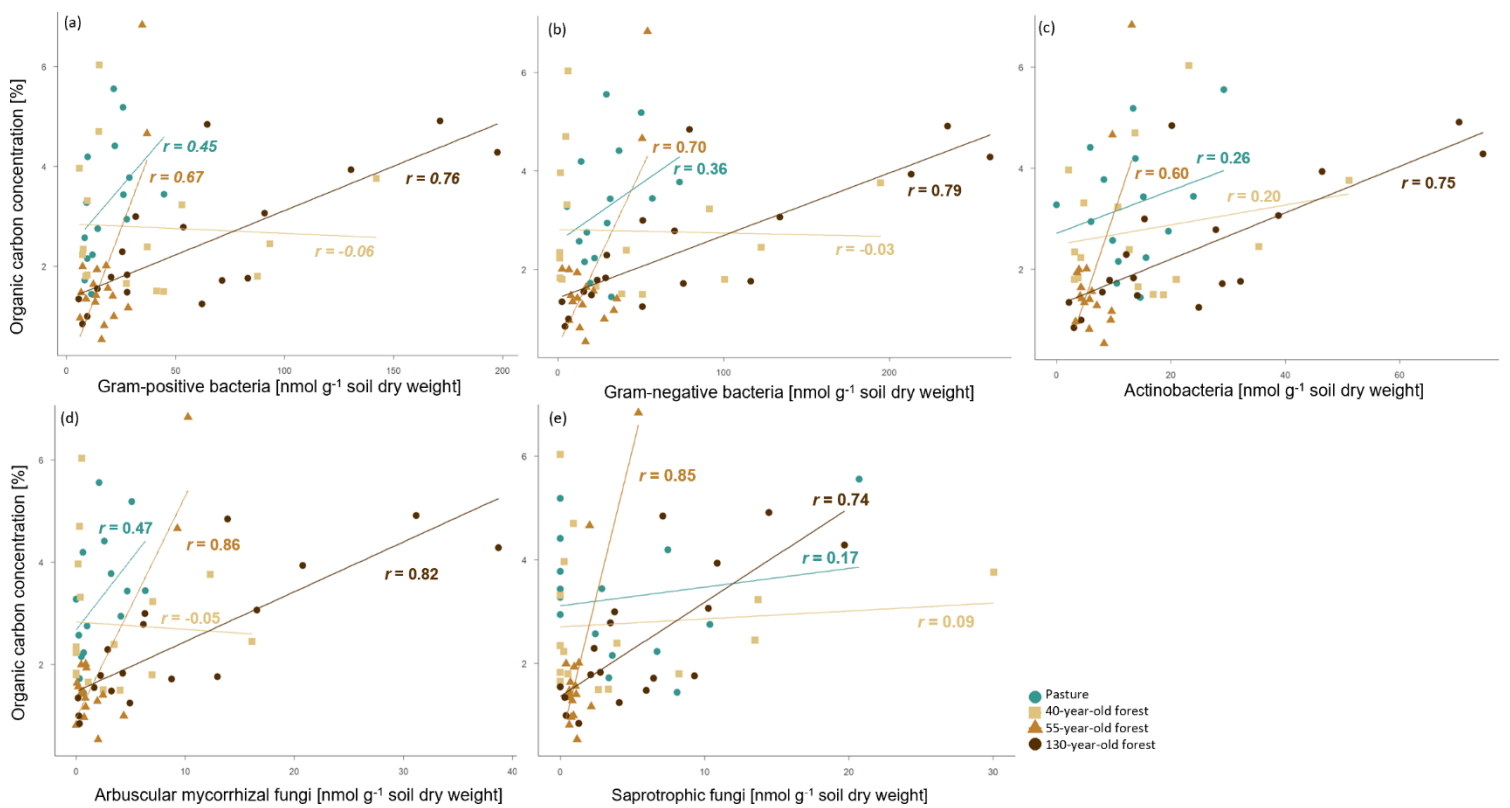


Figure S2. Pearson correlation between soil organic carbon concentration [%] and individual phospholipid fatty acid compounds of the pasture and the different forest stand ages; (a) Gram<sup>+</sup> bacteria, (b) Gram<sup>-</sup> bacteria, (c) actinobacteria, (d) arbuscular mycorrhizal fungi, and (e) saprotrophic fungi. Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

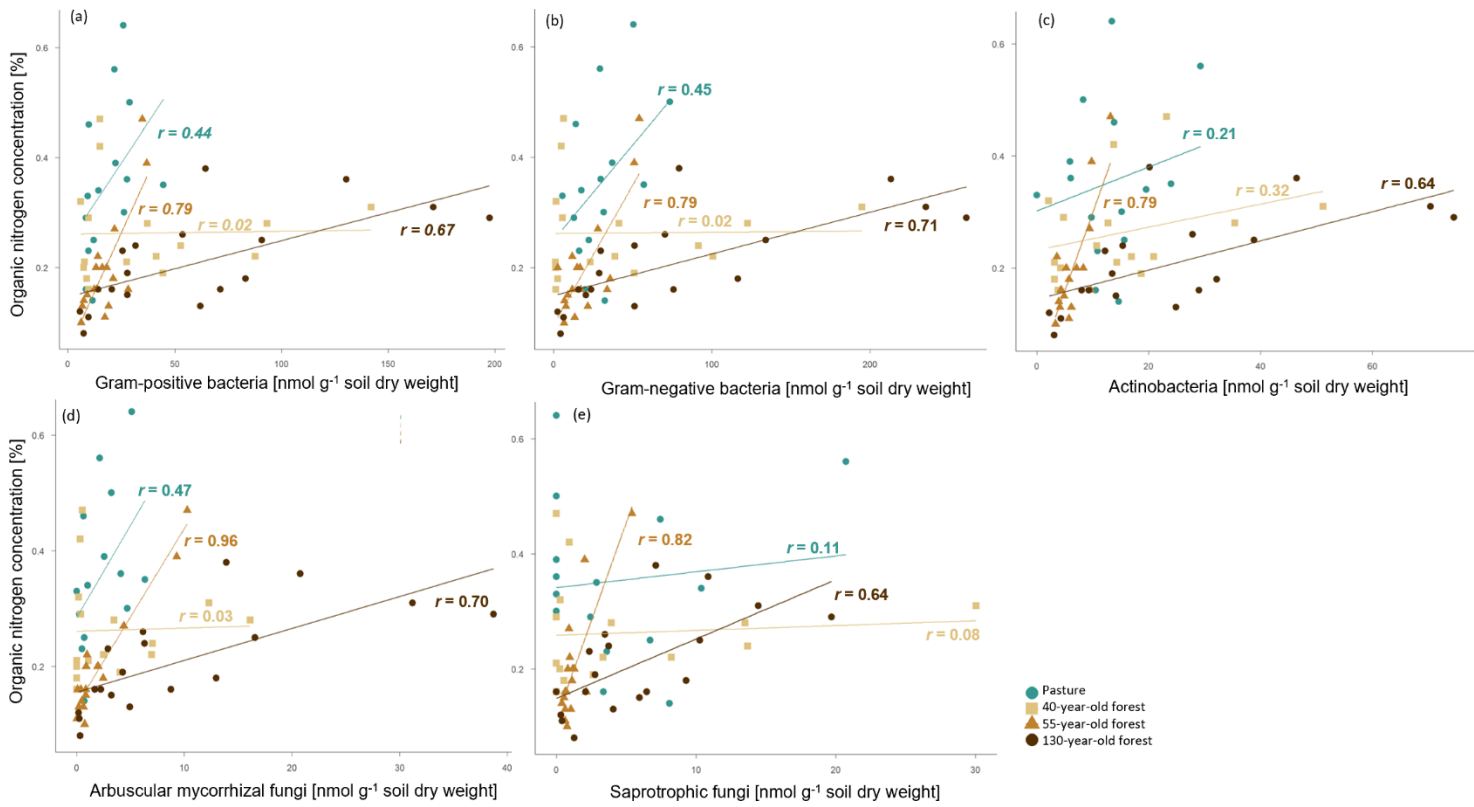


Figure S3. Pearson correlation between the soil organic nitrogen concentration [%] and individual phospholipid fatty acid compounds of the pasture and the different forest stand ages: (a) Gram<sup>+</sup> bacteria, (b) Gram<sup>-</sup> bacteria, (c) actinobacteria, (d) arbuscular mycorrhizal fungi, and (e) saprotrophic fungi. Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

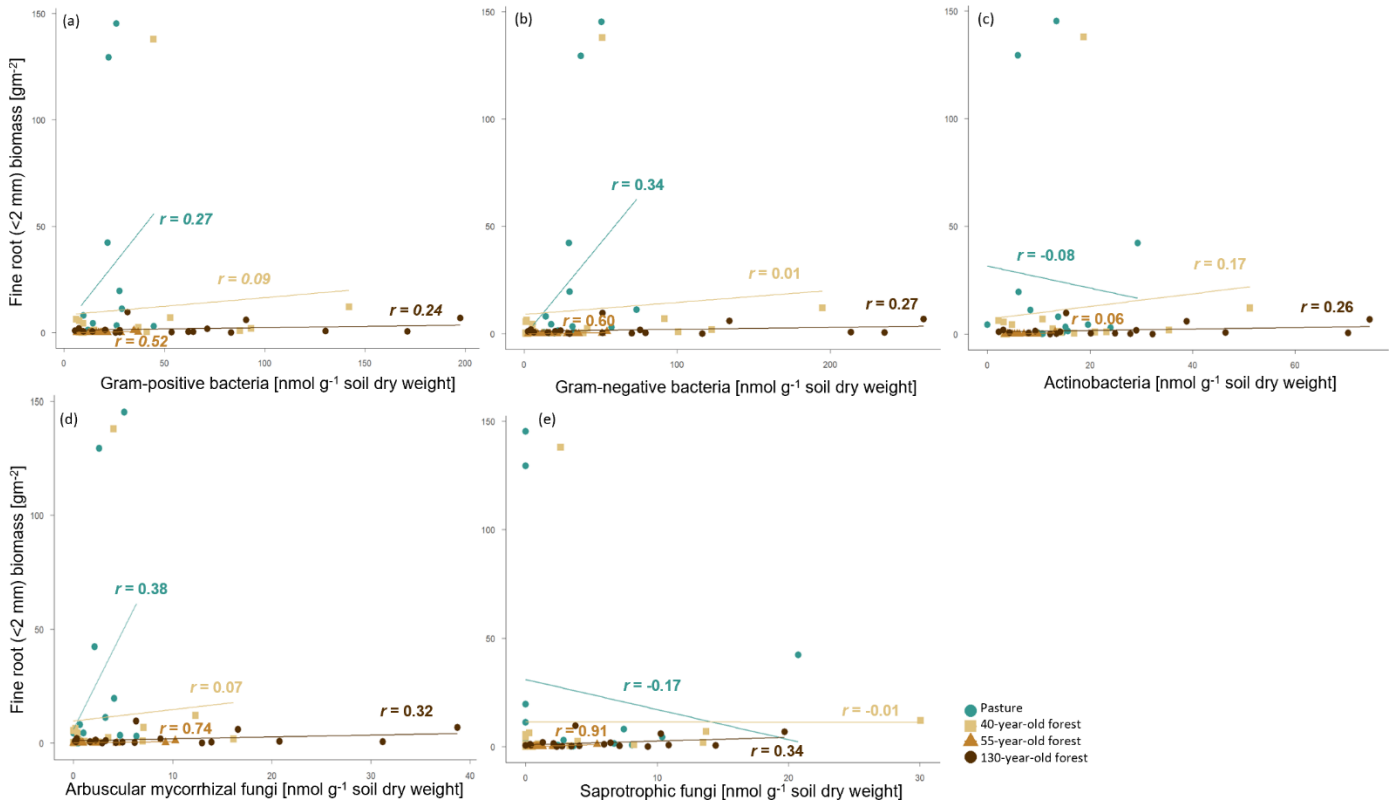


Figure S4. Pearson correlation between fine root biomass (<2 mm) and individual phospholipid fatty acid compounds of the pasture and the c forest stand ages: (a) Gram<sup>+</sup> bacteria, (b) Gram<sup>-</sup> bacteria, (c) actinobacteria, (d) arbuscular mycorrhizal fungi, and (e) saprotrophic fungi. Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

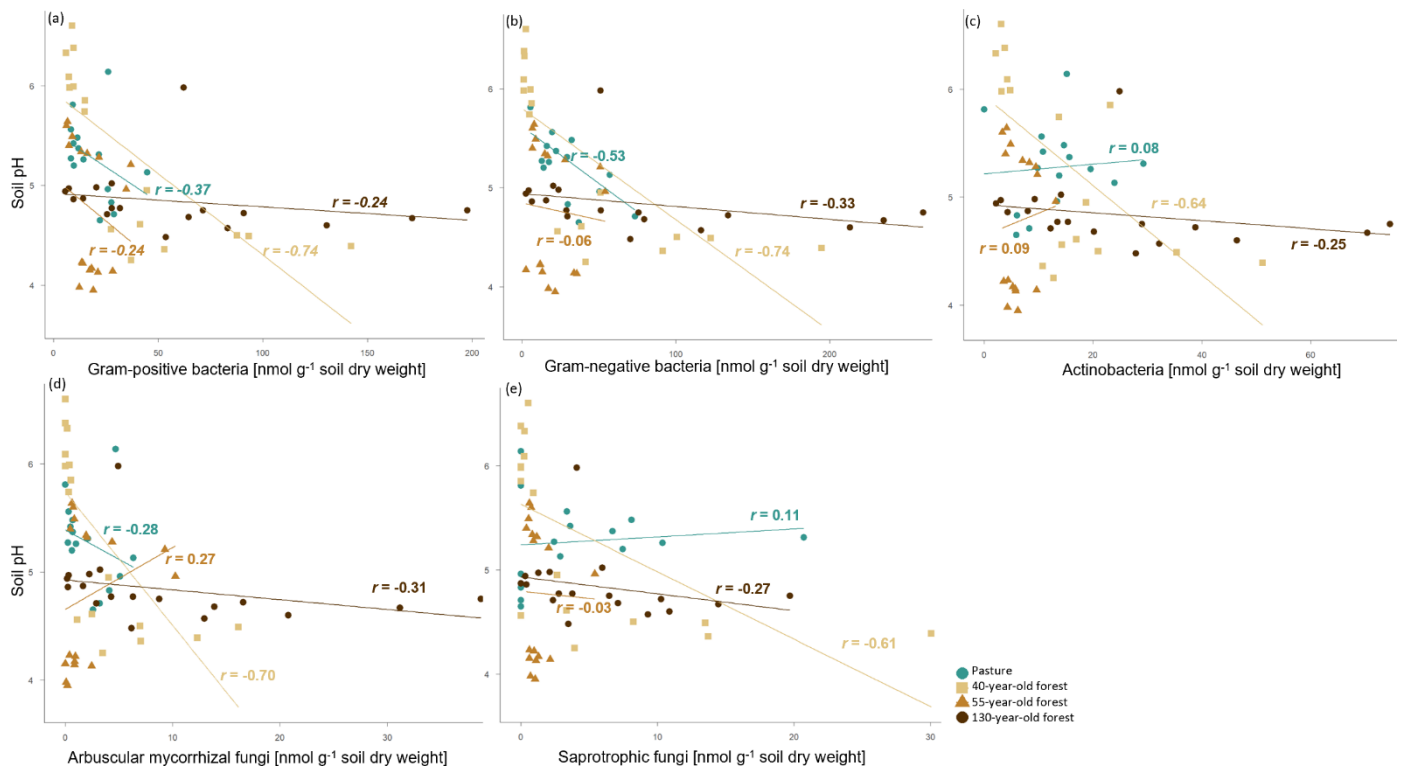


Figure S5. Pearson correlation between Soil pH and individual phospholipid fatty acid compounds of the pasture and the different forest stand ages: (a) Gram+ bacteria, (b) Gram- bacteria, (c) actinobacteria, (d) arbuscular mycorrhizal fungi, and (e) saprotrophic fungi. Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

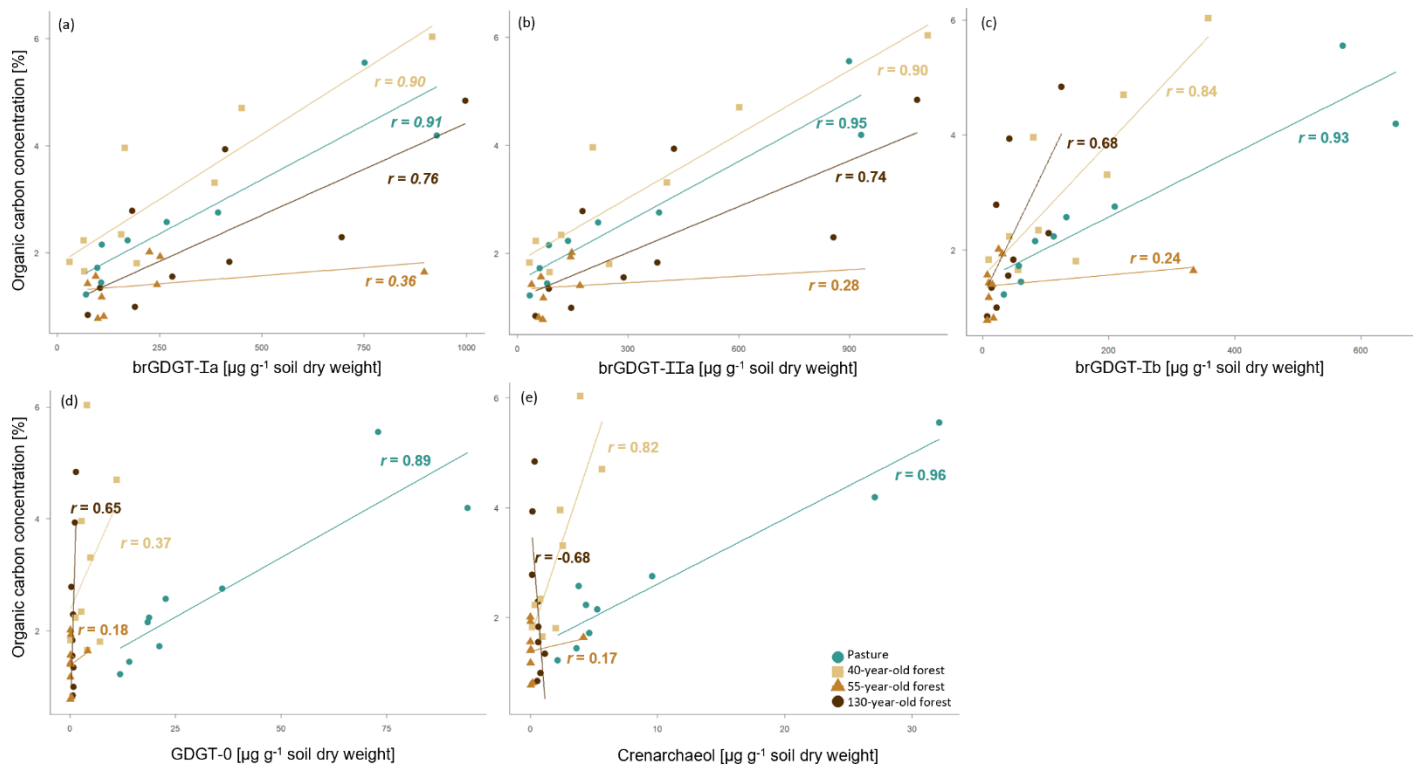


Figure S6. Pearson correlation between the soil organic carbon concentration [%] and the main individual branched glycerol dialkyl glycerol tetraethers (brGDGTs) of the pasture and the different forest stand ages: (a) brGDGT-Ia, (b) brGDGT-IIa, and (c) brGDGT-Ib and the main individual isoprenoid glycerol dialkyl glycerol tetraethers (isoGDGTs) GDGT-0 (d) and Crenarchaeol (e). Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

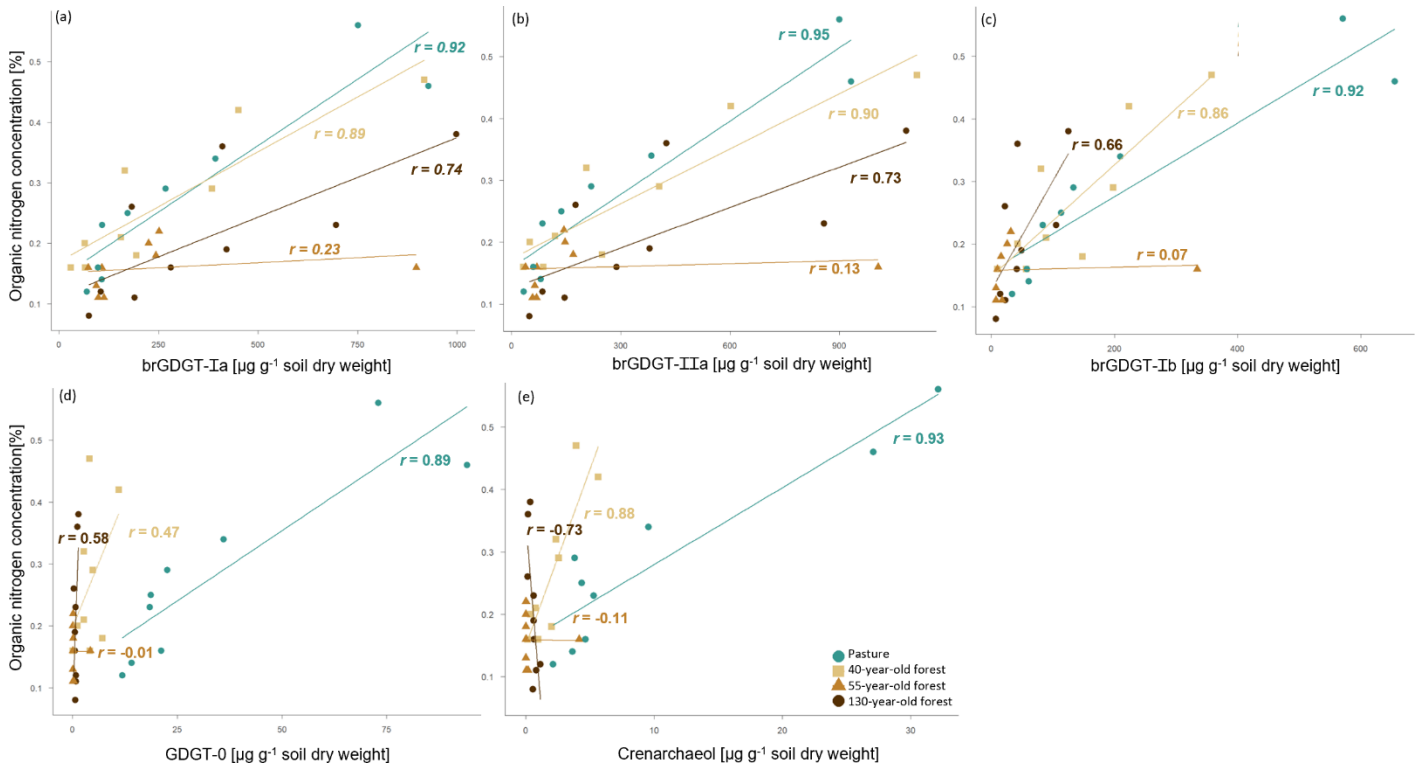


Figure S7. Pearson correlation between the soil organic nitrogen concentration [%] and the main individual branched glycerol dialkyl glycerol tetraethers (brGDGTs) of the pasture and the different forest stand ages: (a) brGDGT-Ia, (b) brGDGT-IIa, and (c) brGDGT-Ib and the main individual isoprenoid glycerol dialkyl glycerol tetraethers (isoGDGTs) GDGT-0 (d) and Crenarchaeol (e). Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

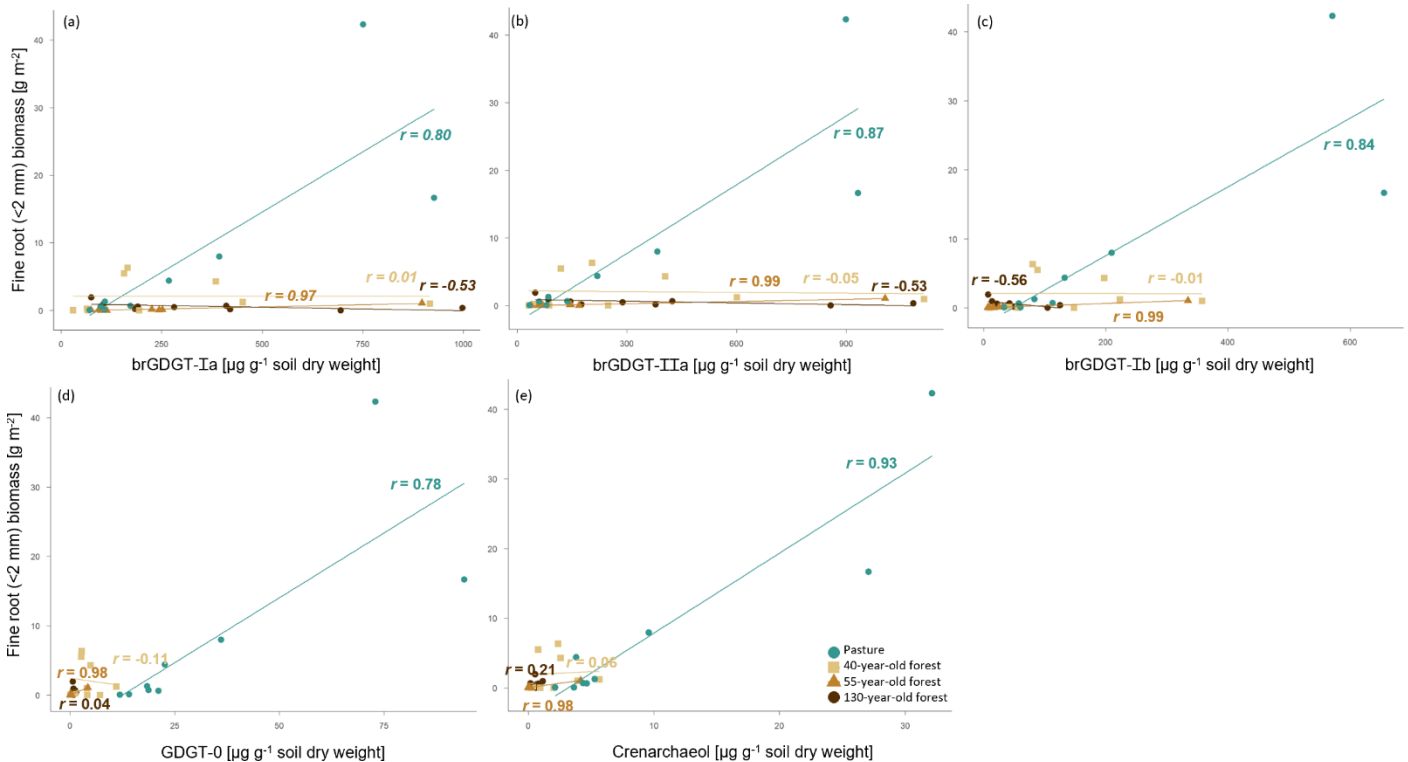


Figure S8. Pearson correlation between the fine root biomass [ $\text{g m}^{-2}$ ] and the main individual branched glycerol dialkyl glycerol tetraethers (brGDGTs) of the pasture and the different forest stand ages: (a) brGDGT-Ia, (b) brGDGT-IIa, and (c) brGDGT-Ib and the main individual isoprenoid glycerol dialkyl glycerol tetraethers (isoGDGTs) GDGT-0 (d) and Crenarchaeol (e). Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

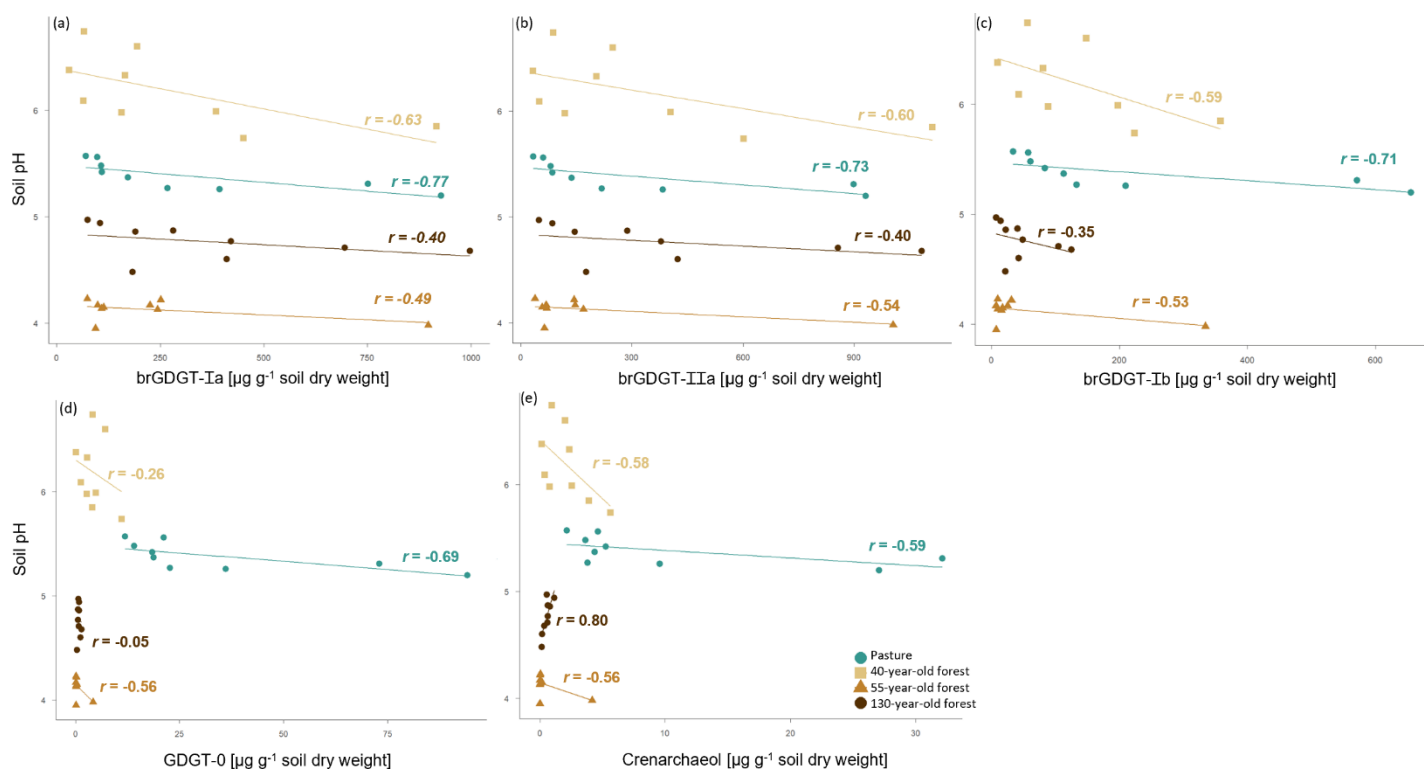


Figure S9. Pearson correlation between soil pH and the main individual branched glycerol dialkyl glycerol tetraethers (brGDGTs) of the pasture and the different forest stand ages: (a) brGDGT-Ia, (b) brGDGT-IIa, and (c) br-GDGT-Ib and the main individual isoprenoid glycerol dialkyl glycerol tetraethers (isoGDGTs) GDGT-0 (d) and Crenarchaeol (e). Individual sampling points represent mineral soil samples of 5 to 45 cm soil depth.

## Supplementary Tables

Table S1. Soil pH, organic carbon and nitrogen concentration as well as the C:N ratio of pasture (n= 5) and different forest stand ages (n = 3) with increasing soil depth (0 – 45 cm).

| <b>Pasture</b>             |                |                   |                     |                |
|----------------------------|----------------|-------------------|---------------------|----------------|
| <b>Soil depth</b>          | <b>Soil pH</b> | <b>carbon [%]</b> | <b>nitrogen [%]</b> | <b>C:N [-]</b> |
| 0-5cm                      | 5.14±0.18      | 5.18±0.13         | 0.46±0.05           | 11.9±1.3       |
| 5-10cm                     | 4.96±0.25      | 4.07±0.09         | 0.41±0.03           | 10.1±0.9       |
| 10-15cm                    | 5.05±0.22      | 2.78±0.11         | 0.30±0.02           | 9.3±0.5        |
| 15-20cm                    | 4.96±0.31      | 2.51±0.45         | 0.27±0.03           | 9.0±1.3        |
| 20-25cm                    | 5.25±0.12      | 2.19±0.30         | 0.23±0.03           | 9.8±0.6        |
| 25-30cm                    | 5.62±0.19      | 2.08±0.30         | 0.22±0.03           | 9.5±0.3        |
| 30-35cm                    | 5.81±0.33      | 1.85±0.38         | 0.18±0.05           | 10.4±0.8       |
| 35-40cm                    | 5.56           | 1.44±0.16         | 0.15±0.02           | 10.1±0.6       |
| 40-45cm                    | 5.57           | 1.26±0.16         | 0.13±0.02           | 10.7±0.9       |
| <b>40-year-old forest</b>  |                |                   |                     |                |
| <b>Soil depth</b>          | <b>Soil pH</b> | <b>carbon [%]</b> | <b>nitrogen [%]</b> | <b>C:N [-]</b> |
| 0-5cm                      | 5.12±0.73      | 4.88±0.53         | 0.38±0.04           | 12.9±0.5       |
| 5-10cm                     | 5.05±0.69      | 4.01±0.35         | 0.30±0.05           | 13.7±1.6       |
| 10-15cm                    | 5.29±1.04      | 3.19±0.37         | 0.30±0.01           | 10.7±1.1       |
| 15-20cm                    | 5.24±0.75      | 2.68±0.26         | 0.26±0.02           | 10.3±0.8       |
| 20-25cm                    | 5.24±0.74      | 2.05±0.13         | 0.20±0.01           | 10.2±0.9       |
| 25-30cm                    | 5.35±0.74      | 2.14±0.28         | 0.23±0.01           | 9.4±1.3        |
| 30-35cm                    | 5.47±0.91      | 1.82±0.08         | 0.19±0.01           | 9.5±0.9        |
| 35-40cm                    | 5.78±0.83      | 1.64±0.09         | 0.19±0.00           | 8.8±1.2        |
| 40-45cm                    | 5.87±0.87      | 1.48±0.10         | 0.17±0.01           | 8.9±1.6        |
| <b>55-year-old forest</b>  |                |                   |                     |                |
| <b>Soil depth</b>          | <b>Soil pH</b> | <b>carbon [%]</b> | <b>nitrogen [%]</b> | <b>C:N [-]</b> |
| 0-5cm                      | 4.47±0.49      | 4.03±1.24         | 0.29±0.07           | 13.1±1.4       |
| 5-10cm                     | 4.58±0.63      | 4.04±1.06         | 0.25±0.06           | 16.6±4.6       |
| 10-15cm                    | 4.71±0.57      | 1.58±0.40         | 0.23±0.03           | 6.8±1.7        |
| 15-20cm                    | 4.73±0.59      | 1.17±0.26         | 0.19±0.00           | 6.3±1.8        |
| 20-25cm                    | 4.76±0.58      | 1.64±0.21         | 0.20±0.00           | 8.2±1.8        |
| 25-30cm                    | 4.81±0.59      | 1.68±0.23         | 0.17±0.02           | 10.1±2.1       |
| 30-35cm                    | 4.86±0.63      | 1.23±0.12         | 0.14±0.01           | 8.5±0.4        |
| 35-40cm                    | 4.88±0.73      | 0.89±0.04         | 0.11±0.00           | 8.2±0.7        |
| 40-45cm                    | 4.91±0.74      | 1.10±0.17         | 0.12±0.01           | 8.8±1.3        |
| <b>130-year-old forest</b> |                |                   |                     |                |
| <b>Soil depth</b>          | <b>Soil pH</b> | <b>carbon [%]</b> | <b>nitrogen [%]</b> | <b>C:N [-]</b> |
| 0-5cm                      | 4.47±0.49      | 4.83±0.41         | 0.34±0.01           | 14.3±1.8       |
| 5-10cm                     | 4.58±0.63      | 4.69±0.17         | 0.35±0.02           | 13.6±0.6       |
| 10-15cm                    | 4.71±0.57      | 2.92±0.06         | 0.26±0.01           | 11.4±0.6       |
| 15-20cm                    | 4.73±0.59      | 2.59±0.19         | 0.23±0.01           | 11.1±0.6       |
| 20-25cm                    | 4.76±0.58      | 1.81±0.02         | 0.19±0.01           | 9.6±0.2        |
| 25-30cm                    | 4.81±0.59      | 1.86±0.19         | 0.17±0.01           | 10.9±0.7       |
| 30-35cm                    | 4.86±0.63      | 1.46±0.20         | 0.15±0.01           | 9.9±0.8        |
| 35-40cm                    | 4.88±0.73      | 1.42±0.03         | 0.14±0.01           | 10.1±0.5       |
| 40-45cm                    | 4.91±0.74      | 1.04±0.12         | 0.10±0.01           | 10.5±0.6       |

Table S2. Individual phospholipid fatty acid compounds [nmol g<sup>-1</sup> dry weight] of pasture (n = 2) and forest stand ages (n = 2) in relation to soil depth (0 – 45 cm). (n.a. = not available).

| Soil depth | Pasture                    |                            |                |                    |                              |
|------------|----------------------------|----------------------------|----------------|--------------------|------------------------------|
|            | Gram <sup>+</sup> bacteria | Gram <sup>-</sup> bacteria | Actinobacteria | Saprotrophic fungi | Arbuscular mycorrhizal fungi |
| 0-5cm      | 23.87±2.15                 | 39.98±10.55                | 21.37±7.94     | 11.65±9.08         | 3.62±1.49                    |
| 5-10cm     | 18.24±10.68                | 45.00±28.45                | 9.37±1.03      | 1.52               | 2.11±1.12                    |
| 10-15cm    | 18.75±8.97                 | 21.96±7.80                 | 9.95±3.87      | 4.45±3.02          | 2.38±1.73                    |
| 15-20cm    | 18.31±3.93                 | 27.34±9.67                 | 12.77±6.84     | 5.86±4.52          | 1.80±0.79                    |
| 20-25cm    | 26.61±18.15                | 35.09±22.08                | 16.91±7.09     | 2.67±0.22          | 3.30±3.05                    |
| 25-30cm    | 10.63±1.35                 | 13.98±8.34                 | 7.83           | 6.73               | 0.35                         |
| 30-35cm    | 17.90±8.34                 | 23.99±7.73                 | 13.02±2.18     | 2.32±1.29          | 2.61±2.10                    |
| 35-40cm    | 11.50                      | 32.32                      | 14.68          | 8.11               | 0.70                         |
| 40-45cm    | 8.40                       | 19.81                      | 10.56          | 3.37               | 0.34                         |
|            | 40-year-old forest         |                            |                |                    |                              |
| Soil depth | Gram <sup>+</sup> bacteria | Gram <sup>-</sup> bacteria | Actinobacteria | Saprotrophic fungi | Arbuscular mycorrhizal fungi |
| 0-5cm      | 78.57±63.52                | 100.53±94.25               | 37.19±14.00    | 15.03              | 6.42±5.89                    |
| 5-10cm     | 33.93±19.00                | 48.28±43.35                | 12.26±1.49     | 7.32±6.39          | 3.69±3.37                    |
| 10-15cm    | 21.58±15.57                | 21.61±19.83                | 7.44±5.30      | 3.11±0.83          | 1.84±1.66                    |
| 15-20cm    | 51.46±41.86                | 64.10±58.55                | 20.11±15.30    | 7.30±6.20          | 8.27±7.87                    |
| 20-25cm    | 47.67±40.01                | 50.93±49.77                | 12.07±8.89     | 4.14±4.01          | 6.98                         |
| 25-30cm    | 41.34                      | 38.70                      | 16.94          | 3.36               | 2.51                         |
| 30-35cm    | 17.47±10.11                | 12.18±11.05                | 9.30±5.01      | 0.24               | 1.11                         |
| 35-40cm    | 9.64                       | 1.36                       | 3.79           | 0.15               | n.a.                         |
| 40-45cm    | 26.72±17.87                | 26.82±24.23                | 10.94±7.78     | 1.60±1.06          | 4.04                         |
|            | 55-year-old forest         |                            |                |                    |                              |
| Soil depth | Gram <sup>+</sup> bacteria | Gram <sup>-</sup> bacteria | Actinobacteria | Saprotrophic fungi | Arbuscular mycorrhizal fungi |
| 0-5cm      | 23.53±11.23                | 35.62±18.51                | 8.74±4.44      | 3.07±2.36          | 5.17±5.10                    |
| 5-10cm     | 27.96±8.98                 | 36.24±14.62                | 7.98±1.80      | 1.54±0.50          | 4.74±4.54                    |
| 10-15cm    | 25.00±3.27                 | 30.90±2.92                 | 9.56±0.08      | 1.53±0.62          | 2.62±1.76                    |
| 15-20cm    | 18.62±2.56                 | 26.16±9.51                 | 7.05±1.27      | 1.14±0.03          | 2.24±0.24                    |
| 20-25cm    | 15.69±2.50                 | 8.74±6.05                  | 6.17±0.92      | 1.06±0.23          | 1.41±0.54                    |
| 25-30cm    | 10.65±3.31                 | 9.26±2.45                  | 3.75±0.17      | 0.68±0.28          | 0.71±0.24                    |
| 30-35cm    | 11.25±2.28                 | 10.40±1.47                 | 4.62±0.24      | 0.59±0.03          | 0.63±0.23                    |
| 35-40cm    | 11.73±5.55                 | 9.99±3.31                  | 4.55±1.20      | 0.69±0.07          | 0.73                         |
| 40-45cm    | 6.74                       | 7.84                       | 4.15           | 0.63               | 0.62                         |
|            | 130-year-old forest        |                            |                |                    |                              |
| Soil depth | Gram <sup>+</sup> bacteria | Gram <sup>-</sup> bacteria | Actinobacteria | Saprotrophic fungi | Arbuscular mycorrhizal fungi |
| 0-5cm      | 150.88±20.38               | 224.28±10.96               | 58.43±11.96    | 12.67±1.79         | 25.98±5.21                   |
| 5-10cm     | 131.07±66.54               | 170.14±90.70               | 47.38±27.20    | 13.42±6.29         | 26.32±12.41                  |
| 10-15cm    | 42.72±11.00                | 60.89±9.60                 | 21.63±6.25     | 3.63±0.15          | 6.25±0.06                    |
| 15-20cm    | 58.25±32.56                | 81.93±52.19                | 25.55±13.31    | 6.33±3.96          | 9.74±6.84                    |
| 20-25cm    | 55.55±27.70                | 72.75±43.75                | 22.84±9.37     | 6.04±3.26          | 8.63±4.35                    |
| 25-30cm    | 42.81±28.63                | 45.83±30.09                | 18.54±10.50    | 3.24±3.24          | 5.23±3.55                    |
| 30-35cm    | 15.07±5.43                 | 15.15±8.69                 | 6.84±2.50      | 1.26±0.85          | 1.25±1.00                    |
| 35-40cm    | 16.72±11.13                | 11.51±8.84                 | 8.21±5.97      | 3.15±2.82          | 1.71±1.54                    |
| 40-45cm    | 34.75±27.37                | 27.82±23.37                | 14.00±10.90    | 2.69±1.40          | 2.64±2.31                    |

Table S3. The F:B ratio of pasture (n = 2) and different forest stand ages (n = 2) in relation to soil depth (0 – 45 cm). (n.a. = not available).

| <b>depth</b> | <b>Pasture</b> | <b>40-year-old forest</b> | <b>55-year-old forest</b> | <b>130-year-old forest</b> |
|--------------|----------------|---------------------------|---------------------------|----------------------------|
| 0-5cm        | 0.17±0.11      | 0.06±0.05                 | 0.085±0.07                | 0.09±0.01                  |
| 5-10cm       | 0.05±0.02      | 0.09±0.05                 | 0.08±0.05                 | 0.12±0.01                  |
| 10-15cm      | 0.14±0.08      | 0.07±0.02                 | 0.07±0.03                 | 0.08±0.02                  |
| 15-20cm      | 0.13±0.09      | 0.07±0.05                 | 0.07±0.01                 | 0.09±0.01                  |
| 20-25cm      | 0.08±0.01      | 0.07                      | 0.08                      | 0.10                       |
| 25-30cm      | 0.15           | 0.06                      | 0.06±0.01                 | 0.07±0.03                  |
| 30-35cm      | 0.09±0.03      | 0.02                      | 0.05±0.02                 | 0.06±0.03                  |
| 35-40cm      | 0.15           | 0.05±0.01                 | 0.06±0.04                 | 0.10±0.05                  |
| 40-45cm      | 0.10           | n.a.                      | 0.07                      | 0.09±0.02                  |



Table S4 Concentrations [ng g<sup>-1</sup> dry weight] of the individual branched glycerol dialkyl glycerol tetraether (brGDGTs) compounds as well as the total brGDGT concentration of the pasture and different forest stand ages in relation to soil depth (0 – 45 cm).

| Pasture             |        |         |         |        |        |        |        |        |      |       |        |       |       |      |       |               |
|---------------------|--------|---------|---------|--------|--------|--------|--------|--------|------|-------|--------|-------|-------|------|-------|---------------|
| Soil depth          | Ia     | IIa     | IIa'    | IIIa   | IIIa'  | Ib     | IIb    | IIb'   | IIIb | IIIb' | Ic     | IIc   | IIc'  | IIIc | IIIc' | total brGDGTs |
| 0-5cm               | 751.10 | 899.46  | 479.92  | 317.16 | 79.62  | 570.82 | 220.11 | 150.78 | 8.27 | 6.49  | 236.34 | 13.71 | 9.16  | 0.85 | 0.59  | 3744.38       |
| 5-10cm              | 927.94 | 932.09  | 435.27  | 322.64 | 109.15 | 655.13 | 261.83 | 123.89 | 9.43 | 6.22  | 231.88 | 13.55 | 10.15 | 0.73 | 0.84  | 4040.72       |
| 10-15cm             | 393.45 | 383.76  | 172.48  | 142.29 | 47.54  | 209.63 | 106.91 | 47.07  | 5.99 | 3.11  | 106.67 | 7.24  | 3.28  | 0.34 | 0.34  | 1630.09       |
| 15-20cm             | 267.63 | 219.20  | 126.37  | 82.61  | 28.32  | 133.24 | 70.09  | 24.58  | 3.17 | 0.68  | 68.45  | 4.80  | 1.58  | 0.47 | 0.30  | 1024.96       |
| 20-25cm             | 172.18 | 137.24  | 109.07  | 63.83  | 23.06  | 113.19 | 53.55  | 41.40  | 2.94 | 1.50  | 63.14  | 9.63  | 2.10  | 1.42 | 0.29  | 794.53        |
| 25-30cm             | 108.76 | 85.51   | 62.66   | 41.78  | 20.59  | 83.44  | 40.45  | 35.61  | 2.99 | 1.52  | 42.54  | 10.54 | 1.95  | 1.51 | 0.31  | 540.16        |
| 30-35cm             | 107.65 | 80.48   | 51.89   | 33.71  | 11.03  | 60.99  | 40.07  | 12.19  | 1.94 | 0.67  | 34.19  | 10.65 | 2.79  | 0.83 | 0.84  | 449.92        |
| 35-40cm             | 98.18  | 60.06   | 41.53   | 31.70  | 13.87  | 57.66  | 31.02  | 26.55  | 2.88 | 2.13  | 32.92  | 15.08 | 4.22  | 1.47 | 0.98  | 420.26        |
| 40-45cm             | 70.33  | 33.65   | 29.31   | 16.92  | 10.93  | 33.91  | 20.61  | 12.35  | 2.02 | 0.77  | 20.43  | 15.45 | 0.40  | 1.26 | 0.62  | 268.94        |
| 40-year-old forest  |        |         |         |        |        |        |        |        |      |       |        |       |       |      |       |               |
| Soil depth          | Ia     | IIa     | IIa'    | IIIa   | IIIa'  | Ib     | IIb    | IIb'   | IIIb | IIIb' | Ic     | IIc   | IIc'  | IIIc | IIIc' | total brGDGTs |
| 0-5cm               | 917.17 | 1112.37 | 510.40  | 322.47 | 147.94 | 357.75 | 174.62 | 121.64 | 3.85 | 8.69  | 290.08 | 9.00  | 4.06  | 0.32 | 0.40  | 3980.76       |
| 5-10cm              | 451.21 | 601.55  | 417.19  | 219.48 | 219.48 | 223.44 | 94.33  | 91.54  | 2.07 | 7.79  | 187.21 | 4.80  | 2.96  | 0.42 | 0.19  | 2455.47       |
| 10-15cm             | 165.41 | 204.88  | 138.46  | 67.03  | 56.21  | 80.81  | 33.21  | 45.03  | 1.66 | 4.34  | 74.36  | 2.21  | 1.54  | 0.09 | 0.31  | 875.57        |
| 15-20cm             | 384.62 | 405.37  | 270.51  | 142.75 | 105.20 | 197.70 | 84.53  | 104.71 | 3.32 | 10.16 | 165.45 | 4.59  | 3.88  | 0.35 | 0.69  | 1883.85       |
| 20-25cm             | 156.26 | 119.03  | 147.08  | 46.54  | 66.09  | 88.69  | 40.15  | 59.98  | 2.90 | 6.85  | 64.57  | 2.16  | 1.91  | 0.25 | 0.39  | 802.85        |
| 25-30cm             | 64.49  | 50.00   | 73.97   | 36.79  | 36.79  | 42.46  | 17.62  | 35.55  | 1.39 | 4.23  | 27.86  | 1.07  | 1.41  | 0.14 | 0.34  | 381.32        |
| 30-35cm             | 29.58  | 32.10   | 16.44   | 9.65   | 4.30   | 10.05  | 4.84   | 2.86   | 4.30 | 0.21  | 9.10   | 0.23  | 0.15  | 0.00 | 0.00  | 119.59        |
| 35-40cm             | 193.96 | 248.34  | 248.34  | 152.58 | 86.36  | 147.95 | 89.53  | 176.03 | 6.25 | 26.54 | 100.58 | 5.29  | 7.78  | 0.98 | 1.87  | 1379.41       |
| 40-45cm             | 66.16  | 87.08   | 87.08   | 58.91  | 58.91  | 56.47  | 26.57  | 71.03  | 2.44 | 10.82 | 29.65  | 2.55  | 2.71  | 0.51 | 0.92  | 482.48        |
| 55-year-old forest  |        |         |         |        |        |        |        |        |      |       |        |       |       |      |       |               |
| Soil depth          | Ia     | IIa     | IIa'    | IIIa   | IIIa'  | Ib     | IIb    | IIb'   | IIIb | IIIb' | Ic     | IIc   | IIc'  | IIIc | IIIc' | total brGDGTs |
| 0-5cm               | 897.25 | 1006.11 | 1058.13 | 317.69 | 169.60 | 334.36 | 141.04 | 101.85 | 4.81 | 7.14  | 258.98 | 8.12  | 3.60  | 0.26 | 0.31  | 3775.86       |
| 5-10cm              | 93.58  | 63.63   | 8.26    | 9.53   | 1.19   | 7.59   | 1.03   | 1.03   | 0.12 | 0.04  | 2.94   | 0.17  | 0.11  | 0.06 | 0.06  | 189.33        |
| 10-15cm             | 108.05 | 69.75   | 9.34    | 12.95  | 0.95   | 10.00  | 1.11   | 0.85   | 0.05 | 0.00  | 4.43   | 0.23  | 0.19  | 0.00 | 0.00  | 217.90        |
| 15-20cm             | 243.23 | 169.30  | 24.19   | 33.01  | 3.26   | 15.71  | 2.69   | 2.39   | 0.16 | 0.33  | 8.77   | 0.49  | 0.38  | 0.07 | 0.08  | 504.06        |
| 20-25cm             | 225.04 | 146.69  | 22.90   | 25.11  | 2.79   | 25.47  | 3.29   | 1.88   | 0.09 | 0.21  | 11.53  | 0.72  | 0.63  | 0.06 | 0.06  | 466.48        |
| 25-30cm             | 251.27 | 144.04  | 3.73    | 28.58  | 2.37   | 31.36  | 3.73   | 2.19   | 0.10 | 0.15  | 13.72  | 0.53  | 0.55  | 0.19 | 0.19  | 505.50        |
| 30-35cm             | 73.64  | 37.84   | 7.28    | 6.47   | 0.79   | 9.92   | 1.63   | 0.24   | 0.00 | 0.00  | 2.37   | 0.15  | 0.10  | 0.00 | 0.00  | 140.46        |
| 35-40cm             | 113.31 | 57.30   | 11.93   | 13.02  | 1.74   | 17.34  | 2.39   | 0.93   | 0.14 | 0.04  | 3.77   | 0.31  | 0.36  | 0.04 | 0.04  | 222.67        |
| 40-45cm             | 98.63  | 68.49   | 8.89    | 12.50  | 1.39   | 7.28   | 1.57   | 1.29   | 0.15 | 0.00  | 3.72   | 0.13  | 0.23  | 0.02 | 0.02  | 204.30        |
| 130-year-old forest |        |         |         |        |        |        |        |        |      |       |        |       |       |      |       |               |
| Soil depth          | Ia     | IIa     | IIa'    | IIIa   | IIIa'  | Ib     | IIb    | IIb'   | IIIb | IIIb' | Ic     | IIc   | IIc'  | IIIc | IIIc' | total brGDGTs |
| 0-5cm               | 410.80 | 424.68  | 58.92   | 86.29  | 7.41   | 42.55  | 12.39  | 5.59   | 0.08 | 0.08  | 27.05  | 2.00  | 0.31  | 0.20 | 0.23  | 1076.50       |
| 5-10cm              | 997.76 | 1083.35 | 259.67  | 325.38 | 37.49  | 125.25 | 52.24  | 28.04  | 1.19 | 0.18  | 72.80  | 6.33  | 1.02  | 0.25 | 0.22  | 2991.17       |
| 10-15cm             | 183.32 | 176.21  | 27.00   | 39.60  | 4.63   | 22.17  | 7.27   | 2.07   | 0.16 | 0.13  | 15.42  | 0.00  | 0.05  | 0.00 | 0.00  | 478.04        |
| 15-20cm             | 695.55 | 857.30  | 147.92  | 222.36 | 31.02  | 105.02 | 52.45  | 13.17  | 1.88 | 0.84  | 57.84  | 5.82  | 0.74  | 0.49 | 0.00  | 2192.38       |
| 20-25cm             | 420.68 | 378.88  | 71.52   | 93.13  | 15.13  | 48.99  | 18.03  | 7.11   | 0.99 | 0.42  | 31.95  | 1.32  | 2.22  | 0.24 | 0.21  | 1090.80       |
| 25-30cm             | 281.26 | 288.00  | 60.42   | 13.07  | 13.07  | 41.18  | 20.37  | 8.09   | 0.90 | 0.55  | 22.08  | 2.04  | 0.23  | 0.16 | 0.16  | 814.45        |
| 30-35cm             | 190.40 | 145.50  | 44.56   | 40.27  | 8.05   | 22.54  | 6.89   | 3.48   | 0.40 | 0.18  | 11.14  | 1.18  | 0.17  | 0.22 | 0.06  | 475.04        |
| 35-40cm             | 104.94 | 85.09   | 35.64   | 25.95  | 6.44   | 14.32  | 7.58   | 3.77   | 0.39 | 0.14  | 7.23   | 0.93  | 0.20  | 0.11 | 0.11  | 292.83        |
| 40-45cm             | 74.93  | 49.23   | 13.46   | 0.55   | 2.63   | 7.57   | 2.50   | 1.07   | 0.14 | 0.00  | 3.14   | 0.47  | 0.05  | 0.00 | 0.00  | 165.33        |

Table S5. BrGDGT indexes: CBT<sub>5Me</sub> (Cyclisation ratio of Branched Tetraethers; Eqs. 1), MBT'<sub>5Me</sub> (Methylation index of Branched Tetraethers; Eqs. 2), and IR<sub>6Me</sub> (Isomer Ratio; Eqs. 3) of the pasture and the different forest stand ages in relation to soil depth (0 – 45 cm).

| Soil depth | Pasture            |                     |                   | 40-year-old forest |                     |                   | 55-year-old forest |                     |                   | 130-year-old forest |                     |                   |
|------------|--------------------|---------------------|-------------------|--------------------|---------------------|-------------------|--------------------|---------------------|-------------------|---------------------|---------------------|-------------------|
|            | CBT <sub>5Me</sub> | MBT' <sub>5Me</sub> | IR <sub>6Me</sub> | CBT <sub>5Me</sub> | MBT' <sub>5Me</sub> | IR <sub>6Me</sub> | CBT <sub>5Me</sub> | MBT' <sub>5Me</sub> | IR <sub>6Me</sub> | CBT <sub>5Me</sub>  | MBT' <sub>5Me</sub> | IR <sub>6Me</sub> |
| 0-5cm      | -0.35              | 0.52                | 0.33              | -0.40              | 0.49                | 0.33              | -0.39              | 0.50                | 0.48              | -1.00               | 0.48                | 0.12              |
| 5-10cm     | -0.43              | 0.54                | 0.31              | -0.26              | 0.48                | 0.44              | -1.13              | 0.58                | 0.13              | -0.82               | 0.45                | 0.18              |
| 10-15cm    | -0.44              | 0.53                | 0.30              | -0.22              | 0.51                | 0.44              | -1.11              | 0.59                | 0.12              | -0.95               | 0.50                | 0.13              |
| 15-20cm    | -0.41              | 0.55                | 0.32              | -0.23              | 0.54                | 0.44              | -1.09              | 0.57                | 0.13              | -0.91               | 0.43                | 0.15              |
| 20-25cm    | -0.23              | 0.57                | 0.40              | -0.06              | 0.60                | 0.57              | -1.03              | 0.60                | 0.14              | -0.90               | 0.51                | 0.16              |
| 25-30cm    | -0.21              | 0.57                | 0.40              | 0.02               | 0.59                | 0.59              | -0.99              | 0.63                | 0.05              | -0.85               | 0.47                | 0.20              |
| 30-35cm    | -0.34              | 0.55                | 0.32              | -0.40              | 0.51                | 0.32              | -1.07              | 0.65                | 0.15              | -0.80               | 0.54                | 0.23              |
| 35-40cm    | -0.24              | 0.58                | 0.39              | 0.13               | 0.58                | 0.52              | -1.03              | 0.65                | 0.17              | -0.66               | 0.51                | 0.28              |
| 40-45cm    | -0.28              | 0.59                | 0.38              | 0.18               | 0.61                | 0.57              | -1.10              | 0.57                | 0.12              | -0.89               | 0.58                | 0.25              |

Table S6. Concentrations [ $\text{ng g}^{-1}$  dry weight] of the main isoprenoid glycerol dialkyl glycerol tetraether (isoGDGT) compounds GDGT-0 and Crenarchaeol and the total isoGDGT concentration of the pasture and the different forest stand ages in relation to soil depth (0 – 45 cm).

|                   | <b>Pasture</b>             |                     |                      |
|-------------------|----------------------------|---------------------|----------------------|
| <b>Soil depth</b> | <b>GDGT-0</b>              | <b>Crenarchaeol</b> | <b>total isoGDGT</b> |
| 0-5cm             | 73.00                      | 32.14               | 114.32               |
| 5-10cm            | 94.18                      | 27.09               | 131.20               |
| 10-15cm           | 36.13                      | 9.58                | 50.10                |
| 15-20cm           | 22.68                      | 3.82                | 28.12                |
| 20-25cm           | 18.76                      | 4.37                | 25.42                |
| 25-30cm           | 18.47                      | 5.28                | 26.38                |
| 30-35cm           | 14.14                      | 3.65                | 19.49                |
| 35-40cm           | 21.19                      | 4.65                | 29.85                |
| 40-45cm           | 11.90                      | 2.14                | 15.66                |
|                   | <b>40-year-old forest</b>  |                     |                      |
| <b>Soil depth</b> | <b>GDGT-0</b>              | <b>Crenarchaeol</b> | <b>total isoGDGT</b> |
| 0-5cm             | 4.07                       | 3.93                | 9.19                 |
| 5-10cm            | 11.05                      | 5.65                | 22.90                |
| 10-15cm           | 2.79                       | 2.36                | 5.87                 |
| 15-20cm           | 4.91                       | 2.56                | 8.52                 |
| 20-25cm           | 2.73                       | 0.77                | 3.88                 |
| 25-30cm           | 1.26                       | 0.39                | 1.75                 |
| 30-35cm           | 0.13                       | 0.16                | 0.37                 |
| 35-40cm           | 7.15                       | 2.02                | 10.36                |
| 40-45cm           | 4.17                       | 0.96                | 5.52                 |
|                   | <b>55-year-old forest</b>  |                     |                      |
| <b>Soil depth</b> | <b>GDGT-0</b>              | <b>Crenarchaeol</b> | <b>total isoGDGT</b> |
| 0-5cm             | 4.25                       | 4.17                | 9.24                 |
| 5-10cm            | 0.14                       | 0.00                | 0.14                 |
| 10-15cm           | 0.11                       | 0.02                | 0.18                 |
| 15-20cm           | 0.17                       | 0.00                | 0.17                 |
| 20-25cm           | 0.12                       | 0.00                | 0.11                 |
| 25-30cm           | 0.19                       | 0.02                | 0.25                 |
| 30-35cm           | 0.14                       | 0.04                | 0.27                 |
| 35-40cm           | 0.38                       | 0.19                | 0.61                 |
| 40-45cm           | 0.09                       | 0.03                | 0.20                 |
|                   | <b>130-year-old forest</b> |                     |                      |
| <b>Soil depth</b> | <b>GDGT-0</b>              | <b>Crenarchaeol</b> | <b>total isoGDGT</b> |
| 0-5cm             | 1.24                       | 0.17                | 1.65                 |
| 5-10cm            | 1.46                       | 0.36                | 2.18                 |
| 10-15cm           | 0.36                       | 0.17                | 0.55                 |
| 15-20cm           | 0.78                       | 0.61                | 1.67                 |
| 20-25cm           | 0.61                       | 0.63                | 1.50                 |
| 25-30cm           | 0.63                       | 0.64                | 1.92                 |
| 30-35cm           | 0.87                       | 0.82                | 2.27                 |
| 35-40cm           | 0.88                       | 1.16                | 2.89                 |
| 40-45cm           | 0.70                       | 0.55                | 1.60                 |