

Supplementary Materials:

Table S1. Characterization of the different plots, including site, plot ID, their respective stage within the forest expansion gradient, latitude and longitude of the midpoint at each plot, their area, and the minimum and mean \pm SE distances among trees at each plot.

| Site | Plot ID | Gradient stage | Latitude | Longitude | Plot area (Ha) | Minimum distance among trees(m) |
|----------------|---------|-----------------|-------------|--------------|----------------|---------------------------------|
| Maranchón | MA-M1 | Mature forest | 41.06547653 | -2.196779023 | 0.75 | 0.92 |
| Maranchón | MA-M2 | Mature forest | 41.06336848 | -2.189763922 | 0.42 | 1.63 |
| Maranchón | MA-T1 | Transition zone | 41.06134867 | -2.193134108 | 1.25 | 5.17 |
| Maranchón | MA-T2 | Transition zone | 41.05829051 | -2.193288466 | 0.50 | 1.92 |
| Maranchón | MA-T3 | Transition zone | 41.0626678 | -2.211347197 | 0.75 | 2.10 |
| Maranchón | MA-E1 | Expanding front | 41.05724199 | -2.205453132 | 1.35 | 3.25 |
| Maranchón | MA-E2 | Expanding front | 41.06498471 | -2.231575187 | 1.55 | 1.56 |
| Huertahernando | HU-M1 | Mature forest | 40.8275308 | -2.274821769 | 0.55 | 2.54 |
| Huertahernando | HU-T1 | Transition zone | 40.82539822 | -2.276986276 | 1.50 | 5.11 |
| Huertahernando | HU-T2 | Transition zone | 40.82939176 | -2.277831822 | 0.50 | 2.98 |
| Huertahernando | HU-E1 | Expanding front | 40.82625881 | -2.278987986 | 1.75 | 1.60 |
| Huertahernando | HU-E2 | Expanding front | 40.82377064 | -2.279617481 | 1.85 | 5.09 |
| Ribarredonda | RI-M1 | Mature forest | 40.87018271 | -2.300790191 | 0.45 | 3.39 |
| Ribarredonda | RI-M2 | Mature forest | 40.86741367 | -2.29848006 | 0.40 | 1.70 |
| Ribarredonda | RI-T1 | Transition zone | 40.87067389 | -2.9977474 | 0.35 | 1.25 |
| Ribarredonda | RI-E1 | Expanding front | 40.87192621 | -2.99921908 | 0.60 | 1.49 |
| Ribarredonda | RI-E2 | Expanding front | 40.87142393 | -2.303029625 | 1.00 | 4.68 |

Table S2. Optimum model (model 1) and set of competing models (Δ AIC < 2) for $\delta^{13}\text{C}$. Explanatory factors are: stage of forest expansion gradient (stage), site, cover of conspecifics, age, C/N ratio, stoniness and gender.

| Model | Explanatory factors | AIC |
|-------|--|-------|
| 1 | Stage + Site + Cover <i>J. thurifera</i> + Age + C/N ratio | 914.7 |
| 2 | Stage + Site + Age + C/N ratio | 915.1 |
| 3 | Stage + Site + Age + C/N ratio + Cover <i>J. thurifera</i> + Gender | 915.8 |
| 4 | Stage + Site + Age + C/N ratio + Gender | 916.0 |
| 5 | Stage + Site + Cover <i>J. thurifera</i> + Age + C/N ratio + Stoniness | 916.3 |
| 6 | Stage + Site + Cover <i>J. thurifera</i> + C/N ratio | 916.5 |

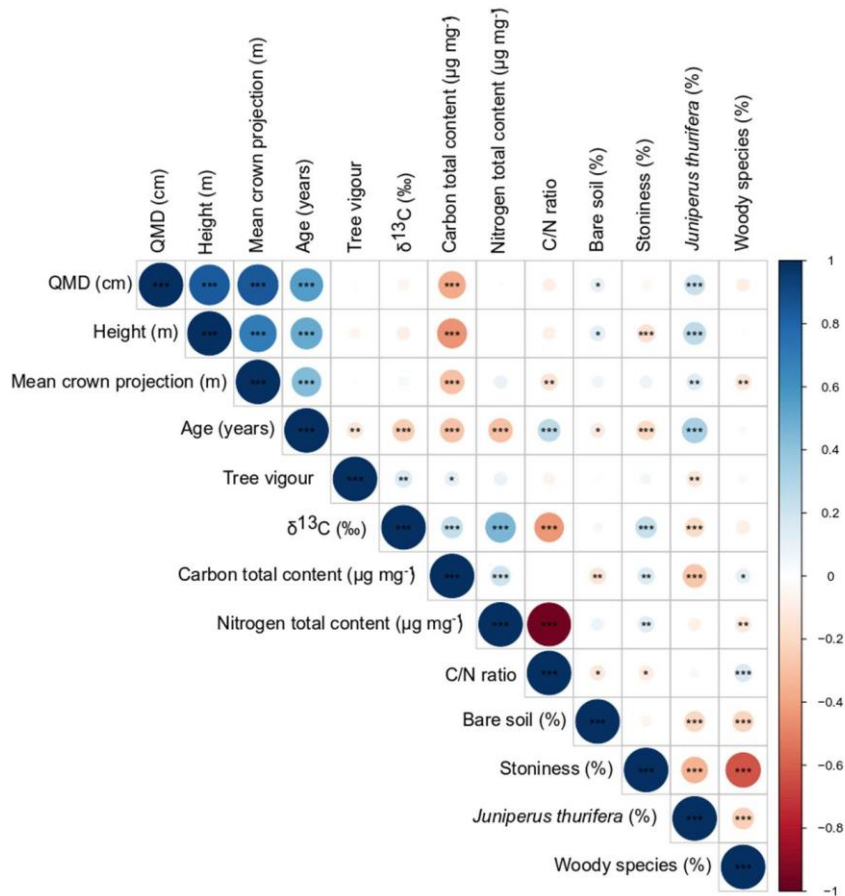


Figure S1. Correlogram that shows Spearman correlations among studied variables. Blue and red circles indicate positive and negative correlations respectively. Size of the circle and intensity of the colour indicate the magnitude of the correlation, being higher with longer size and more intense colour. Significant correlations are indicated with asterisks: $p < 0.001$ (**); $p < 0.01$ (**); $p < 0.05$ (*).

Table S3. Results of the linear mixed effect model for $\delta^{13}\text{C}$. Stage of forest expansion gradient, site, cover of conspecifics, age and C/N ratio were included as fixed factors. Different plots were included as random factor in the model. The percent of variance explained by fixed factors only (marginal R^2 , R^2_m) and fixes + random factors (conditional R^2 , R^2_c) is also provided.

| $\delta^{13}\text{C}$ (‰) | | | | |
|---------------------------|-----------|----------|---------|---------|
| Fixed effects | Estimate | SE | t-value | p-value |
| (Intercept) | -21.11563 | 0.306518 | -68.889 | <2 e-16 |
| Transition zone | -0.379256 | 0.169326 | -2.240 | 0.0449 |
| Mature forest | -0.451561 | 0.180601 | -2.500 | 0.0264 |
| Maranchón site | -0.022328 | 0.170216 | -0.131 | 0.8978 |
| Ribarredonda site | -0.568169 | 0.186899 | -3.040 | 0.0102 |
| Cover of conspecifics (%) | -0.003630 | 0.002455 | -1.479 | 0.1399 |
| Age (years) | -0.004683 | 0.002238 | -2.092 | 0.0370 |
| C/N ratio | -0.078725 | 0.007104 | -11.082 | <2 e-16 |
| Random effects | | | | |
| (plots) | | | | |
| Standard deviation | 0.2632 | | | |
| Residual | 0.6099 | | | |
| R^2_m | 0.4177 | | | |
| R^2_c | 0.5091 | | | |