Model for *Pinus pinea* Cataluña (Spain)

Model

Ppinea__cat__v01

Model description

- Specie: *Pinus pinea* L.
- Spanish Forest Inventory (SFI) code: 23
- Geographical area: Cataluña
- Geographical area (administrative): Barcelona, Gerona, Lérida y Tarragona

Figure 1: *Pinus pinea*

Model type

- Category: growth
- Model level: distance independent individual tree model
- Reproduction methods: seedling stands
- Stand structure: even-aged stands
- Species composition: monospecific stands
- Forest origin: natural

Figure 2: Details of *Pinus pinea*

Model requirements and recommended use

- Initial inventory requirements: age, dominant height and basal area of the plot; expan and dbh of the trees
- Geographical area: Cataluña, closer places and another places with similar characteristics (assuming differences)
- Stand type: monospecific stands
- Execution recommended time: 5 years executions (growth equation developed by using that criteria)
- Site Index is defined as top height at a base age of 100 years

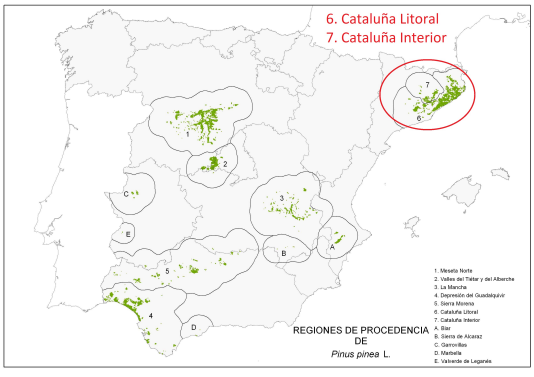


Figure 3: Provenance regions of *Pinus pinea* in Spain

Bibliography

Complete SIMANFOR model recommended citation):

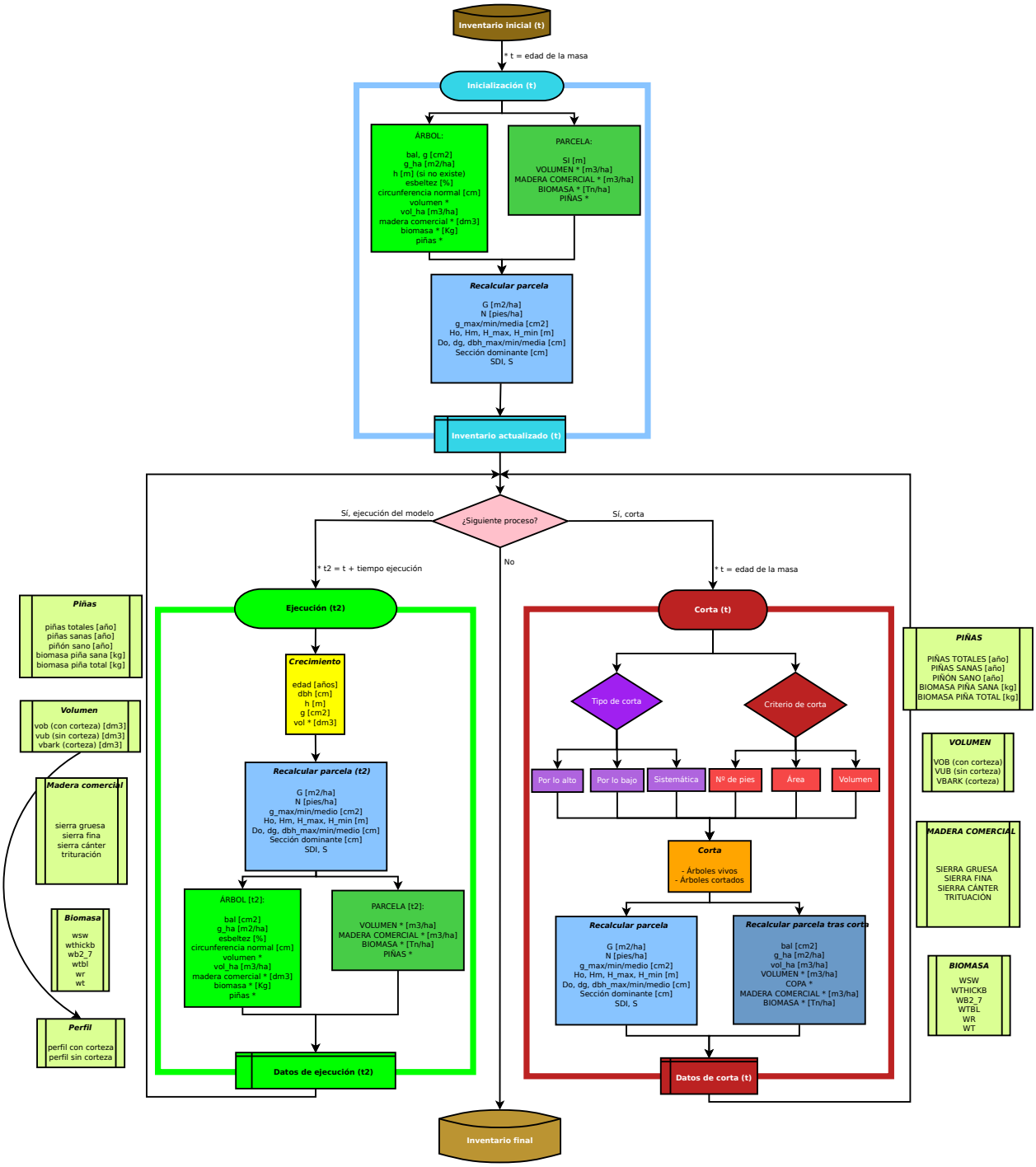
SIMANFOR (2022). Individual tree growth model independent from distance for stone pine (*Pinus pinea*) in Cataluña (Spain).

Model components:

- **Site Index equations**:
  Calama R, Cañadas N, Montero G (2003). Inter-regional variability in site index models for even-aged stands of stone pine (Pinus pinea L.) in Spain. Annals of Forest Science, 60(3), 259-269
- **Diameter growth equation**:
  Calama R, Montero G (2005). Multilevel linear mixed model for tree diameter increment in stone pine (Pinus pinea): a calibrating approach. Silva Fenn, 39(1), 37-54
- **General calculations: bal, g, slenderness, normal circumference**:
  Standard equations
- **Generalized height-diameter equation**:
  Calama R, Montero G (2004). Interregional nonlinear height diameter model with random coefficients for stone pine in Spain. Canadian Journal of Forest Research, 34(1), 150-163
- **Taper equation over bark (volume)**:
  Rodríguez F, Lizarralde I (2015). Comparison of stem taper equations for eight major tree species in the Spanish Plateau. Forest systems, 24(3), 2
- **Taper equation under bark (volume)**:
  Calama R, Montero G (2006). Stand and tree-level variability on stem form and tree volume in Pinus pinea L.: a multilevel random components approach. Forest Systems, 15(1), 24-41
- **Biomass equations**:
  Ruiz-Peinado R, del Rio M, Montero G (2011). New models for estimating the carbon sink capacity of Spanish softwood species. Forest Systems, 20(1), 176-188
- **Technological wood uses information**:
  Rodríguez F (2009). Cuantificación de productos forestales en la planificación forestal: Análisis de casos con cubiFOR. In Congresos Forestales
- **Cone production equations (total)**:
  Calama R, Gordo FJ, Mutke S, Montero G (2008). An empirical ecological-type model for predicting stone pine (Pinus pinea L.) cone production in the Northern Plateau (Spain). Forest Ecology and Management, 255(3-4), 660-673
- **Healthy cones and seed production equations**:
  Calama R, Montero G (2007). Cone and seed production from stone pine (Pinus pinea L.) stands in Central Range (Spain). European Journal of Forest Research, 126(1), 23-35
- **Value for Reineke Index equation**:
  Aguirre A, Condés S, del Río M (2017) Variación de las líneas de máxima densidad de las principales especies de pino a lo largo del gradiente estacional de la Península Ibérica. 7 Congreso Forestal Español

Figures:

- **Figure 1:** by Manfred Werner is licensed under CC BY-SA 3.0
- **Figure 2:** website: `https://www.pinterest.es/pin/443182419564410245/`
- **Figure 3:** extracted from MAPA


Inventario inicial (t)
* t = edad de la masa
Inicialización (t)
ÁRBOL:
bal, g [cm2]
g_ha [m2/ha]
h [m] (si no existe)
esbeltez [%]
circunferencia normal [cm]
volumen *
vol_ha [m3/ha]
madera comercial * [dm3]
biomasa * [Kg]
piñas *
PARCELA:
SI [m]
VOLUMEN * [m3/ha]
MADERA COMERCIAL * [m3/ha]
BIOMASA * [Tn/ha]
PIÑAS *
Recalcular parcela
G [m2/ha]
N [pies/ha]
g_max/min/media [cm2]
Ho, Hm, H_max, H_min [m]
Do, dg, dbh_max/min/media [cm]
Sección dominante [cm]
SDI, S
Inventario actualizado (t)
¿Siguiente proceso?
Sí, ejecución del modelo
Sí, corta
No
* t2 = t + tiempo ejecución
* t = edad de la masa
Ejecución (t2)
Crecimiento
edad [años]
dbh [cm]
h [m]
g [cm2]
vol * [dm3]
Recalcular parcela (t2)
G [m2/ha]
N [pies/ha]
g_max/min/medio [cm2]
Ho, Hm, H_max, H_min [m]
Do, dg, dbh_max/min/medio [cm]
Sección dominante [cm]
SDI, S
ÁRBOL [t2]:
bal [cm2]
g_ha [m2/ha]
esbeltez [%]
circunferencia normal [cm]
volumen *
vol_ha [m3/ha]
madera comercial * [dm3]
biomasa * [Kg]
piñas *
PARCELA [t2]:
VOLUMEN * [m3/ha]
MADERA COMERCIAL * [m3/ha]
BIOMASA * [Tn/ha]
PIÑAS *
Datos de ejecución (t2)
Corta (t)
Tipo de corta
Criterio de corta
Por lo alto
Por lo bajo
Sistemática
Nº de pies
Área
Volumen
Corta
- Árboles vivos
- Arboles cortados
Recalcular parcela
G [m2/ha]
N [pies/ha]
g_max/min/medio [cm2]
Ho, Hm, H_max, H_min [m]
Do, dg, dbh_max/min/medio [cm]
Sección dominante [cm]
SDI, S
Recalcular parcela tras corta
bal [cm2]
g_ha [m2/ha]
vol_ha [m3/ha]
VOLUMEN * [m3/ha]
COPA *
MADERA COMERCIAL * [m3/ha]
BIOMASA * [Tn/ha]
Datos de corta (t)
Inventario final
Piñas
piñas totales [año]
piñas sanas [año]
piñón sano [año]
biomasa piña sana [kg]
biomasa piña total [kg]
Volumen
vob (con corteza) [dm3]
vub (sin corteza) [dm3]
vbark (corteza) [dm3]
Madera comercial
sierra gruesa
sierra fina
sierra cánter
trituración
Biomasa
wsw
wthickb
wb2_7
wtbl
wr
wt
Perfil
perfil con corteza
perfil sin corteza
PIÑAS
PIÑAS TOTALES [año]
PIÑAS SANAS [año]
PIÑÓN SANO [año]
BIOMASA PIÑA SANA [kg]
BIOMASA PIÑA TOTAL [kg]
VOLUMEN
VOB (con corteza)
VUB (sin corteza)
VBARK (corteza)
MADERA COMERCIAL
SIERRA GRUESA
SIERRA FINA
SIERRA CÁNTER
TRITUACIÓN
BIOMASA
WSW
WTHICKB
WB2_7
WTBL
WR
WT

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Interest Links

SIMANFOR - Support system for simulating Sustainable Forest Management Alternatives. Accessed 11 May 2021, in `https://www.simanfor.es/`

iuFOR - Sustainable Forest Management Research Institute UVa-INIA. Accessed 11 May 2021, in `http://sostenible.palencia.uva.es/`

ETSIIAA Palencia - Higher Technical School of Agricultural Engineering of Palencia. Accessed 11 May 2021, in `http://etsiiaa.uva.es/`

UVa - University of Valladolid. Accessed 11 May 2021, in `https://www.uva.es`