

“Pine tapping in Tunisia: New socio-economic opportunities?”

Science to Practice Event (Webinar INRGREF)
September 8-9, 2020

1. What do we need at the forest level?

Basic management aspects



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Coordinator



Partners



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774632

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1. What do we need at the forest level?

- Basic management aspects
 - Species
 - Minimum diameter / age
 - Stand density
 - Extension of resin tapping unit (ha/tapper)
- Resin tapping oriented silviculture in Spain
- Co-production of resin, pine cones and timber in Portugal



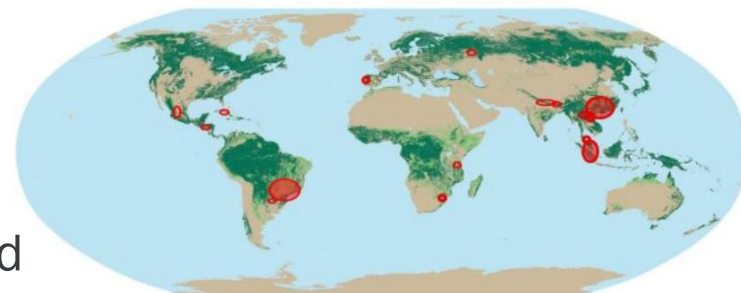
1. What do we need at the forest level? Basic management aspects

Species

- Pine species tapped for resin in the world

✓ <i>Pinus massoniana</i> (CN)	250,000 t/yr
✓ <i>Pinus yunnanensis</i> (CN)	65,000 t/yr
✓ <i>Pinus kesiya</i> (CN)	60,000 t/yr
✓ <i>Pinus elliottii</i> (CN, BR)	250,000 t/yr
✓ <i>Pinus caribaea</i> (BR)	70,000 t/yr
✓ <i>Pinus merkusii</i> (ID)	75,000 t/yr
✓ other pines (*)	120,000 t/yr

Global **900,000 t/yr** (A. Cunningham, 2016)

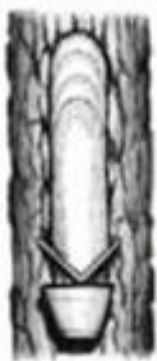


Fonte: Cunningham, 2008

1. What do we need at the forest level? Basic management aspects

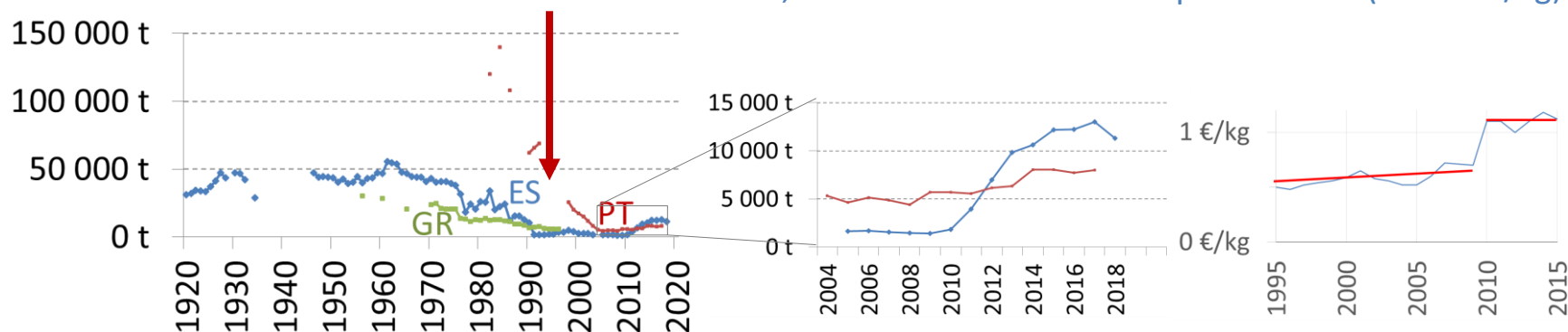
Species

- Mediterranean pine species employed for resin tapping



- ✓ Maritime pine, *Pinus pinaster* (PT, ES, FR) > 150,000 t ↓ 10,000 t ↑ 20,000 t
ine.pt, mapa.es
- ✓ Stone pine, *Pinus pinea* (PT)
- ✓ Aleppo pine, *Pinus halepensis* (GR) <1975 20,000+ t → 1986 10,000+ t
minagric.gr
- ✓ Calabrian pine, *Pinus brutia* (TR) (<500 t)
- ✓ Black pine, *Pinus nigra* (IT, HR, AU) (few t)

>2011, resin renaissance when price raised (0.5→1 €/kg)



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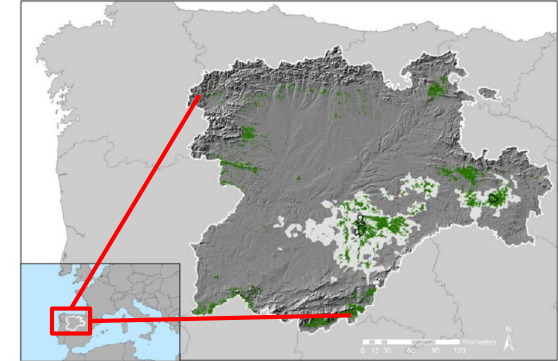
Maritime pine

on inland sands & dunes in Castile:

any alternative products, species or land uses?

Semiarid, continental-supramediterranean climate

...hardly any alternative to pine woodlands



Pinus pinea, but: Climate Change



1. What do we need at the forest level? Basic management aspects

Minimum diameter for starting tapping

PT 20 cm (DL 181/2015),

- to death: trees are tapped the 4 years before felling
- in life: during decades, 1 cut face after another (4 yrs. each)

ES not fixed, e.g. 30 cm (age **40-50 yrs.**)

Rationale: “for the next 40 years” = 8 cut faces

/ 5 years each (H < 2.5 m)

/ 10 streaks each (12x3 cm)

(2 str. per month, June-October)



1. What do we need at the forest level? Basic management aspects

Stand density

Regeneration (natural regeneration, or planting)

→ Development (thinnings, stem pruning < 4m)

150-250 trees/hectare (minimum DBH)

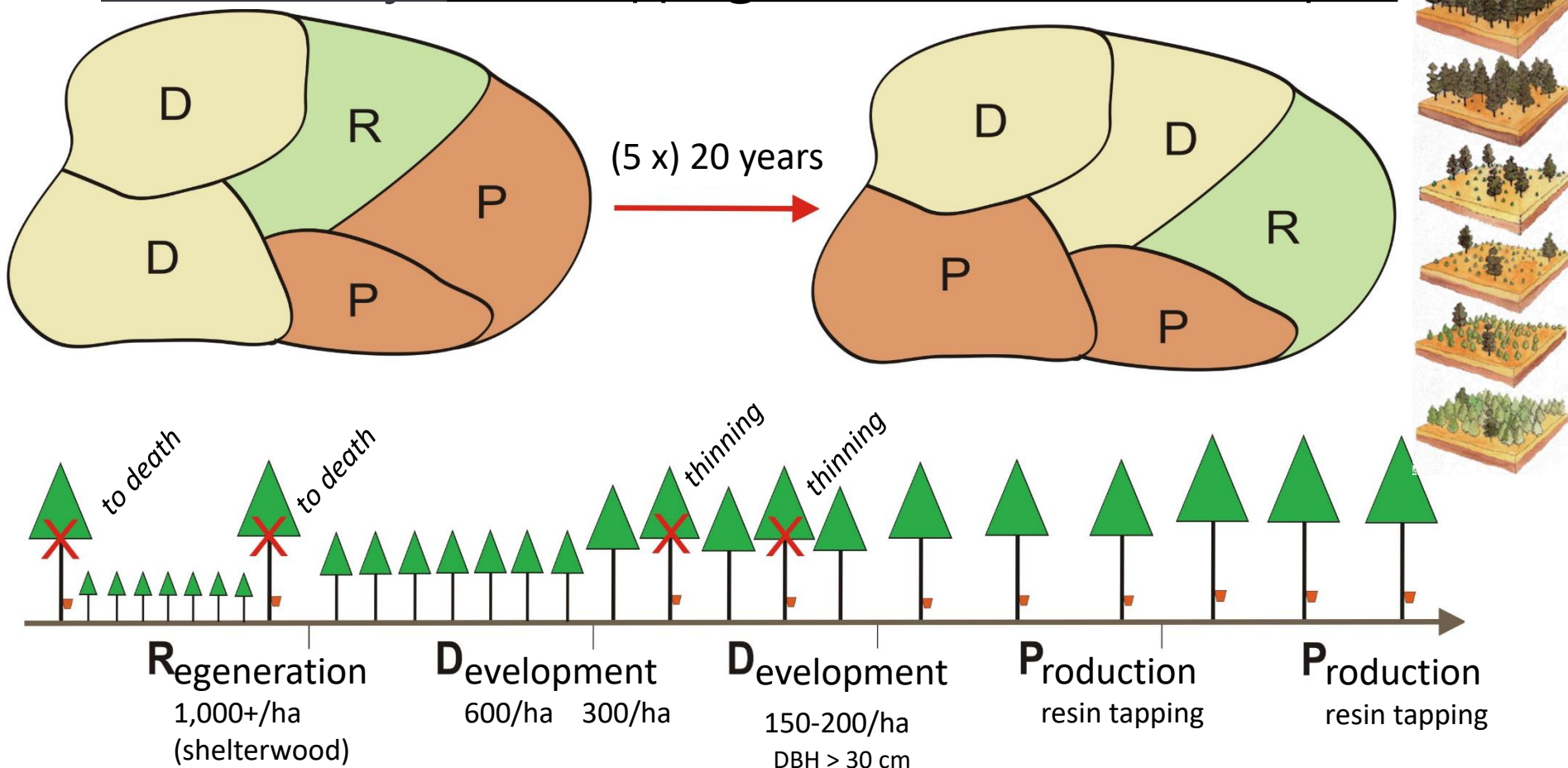
→ Resin tapping

→ Regeneration cutting 80-100 yrs.



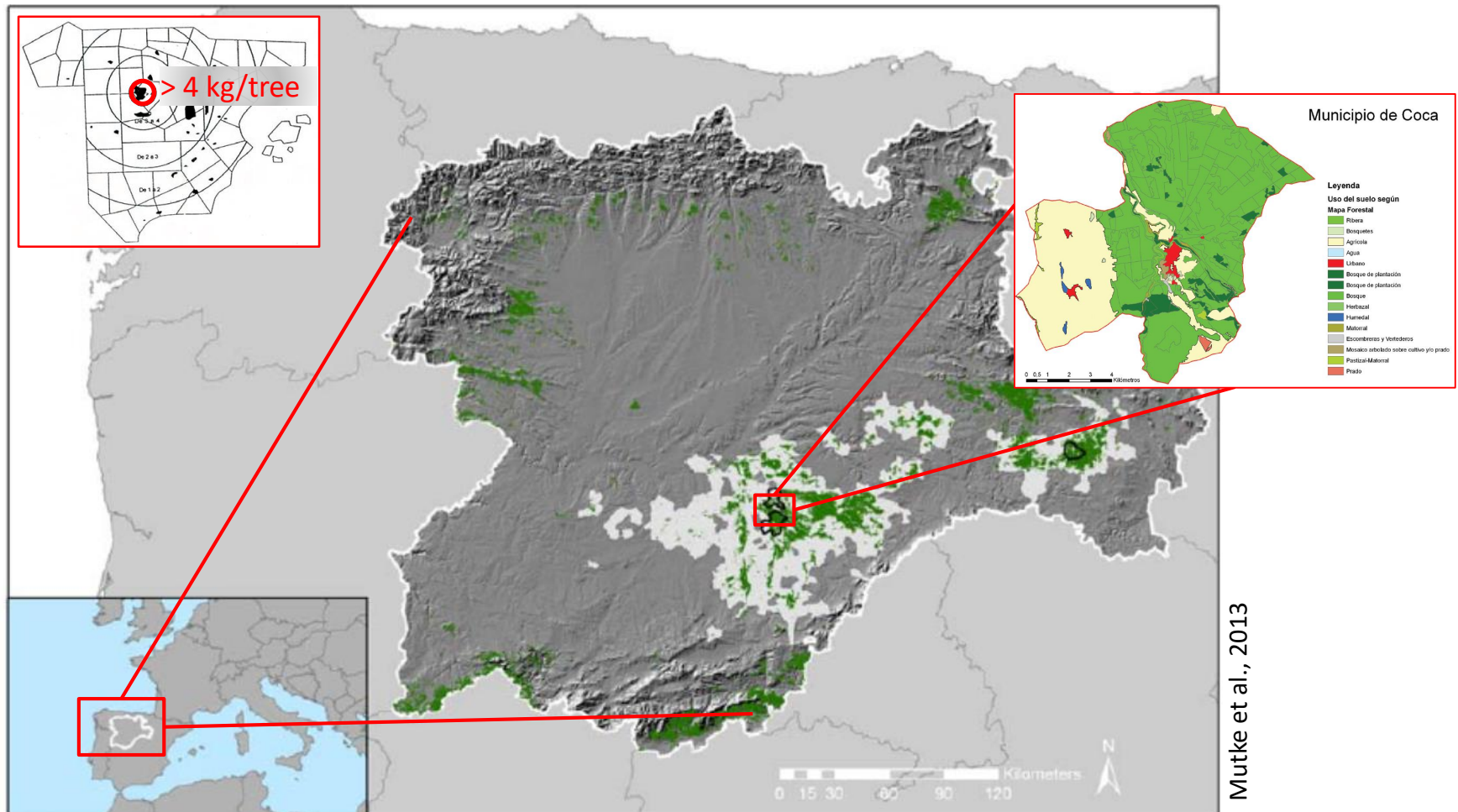
1. What do we need at the forest level? Basic management aspects

Stand density - Resin tapping oriented silviculture in Spain



Stand density - Resin tapping oriented silviculture in Spain

Timber & resin oriented silviculture in Spain (s. 19th c.)



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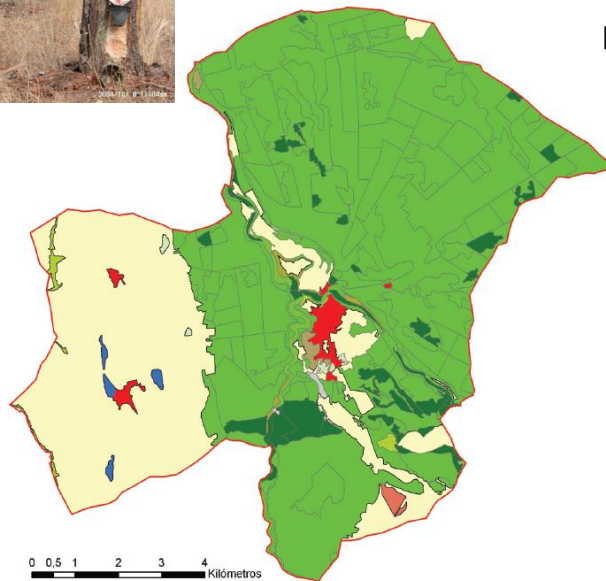
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1. What do we need at the forest level? Basic management aspects

Stand density - Resin tapping oriented silviculture in Spain

Timber & resin oriented silviculture in Spain (s. 19th c. “chessboard” forests)



Municipio de Coca

- Leyenda**
Uso del suelo según Mapa Forestal
- Ribera
 - Bosquetes
 - Agrícola
 - Agua
 - Urbano
 - Bosque de plantación
 - Bosque de plantación
 - Bosque
 - Herbazal
 - Humedal
 - Matorral
 - Escombreras y Vertederos
 - Mosaico arbolado sobre cultivo y/o prado
 - Pastizal-Matorral
 - Prado



2,000 inhabitants
6,700 ha pine forests (70% municipality)
timber & **resin** oriented (since 19th c.)



1. What do we need at the forest level? Basic management aspects

Extension of resin tapping unit

- Resin tapping oriented silviculture in Spain (“chessboard” forests)
- Even-aged, pure maritime pine stands, where all trees can be tapped
- Pluri-annual leases of resin tapping lots to enterprises, cooperatives or self-employed workers
- **5,000 trees/person** (10-15,000 kg resin/year, ~10-15,000 € in factory)
- **20–30 hectares/worker** (in a normalised regular forest: ~40% of the forest-> 50-75 ha)
- in slopes, or denser understory,...: less efficiency, less trees can be attained
- borehole or other less labour-intensive methods: more trees

1. What do we need at the forest level? Basic management aspects

Co-production of resin and timber in Portugal

- in life – tree dbh ≥ 20 cm
- to death - in the last 4 yrs before cut (at the end of the rotation or in a thinning)



Pinus pinaster Ait.

More information: INCREDIBLE FACTSHEET N° 20704



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1. What do we need at the forest level? Basic management aspects

Co-production of resin and timber in Portugal



pulp and paper production



palettes



biomass



chipboard



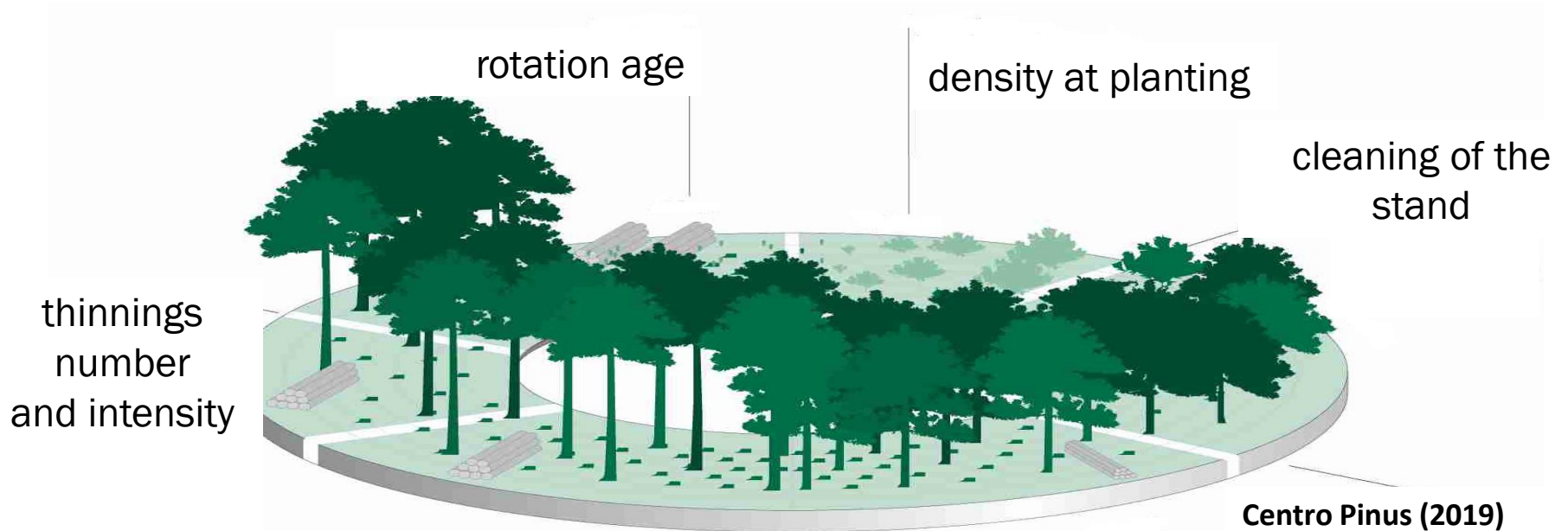
sawmill

How to define
silvicultural
models
compatible to
obtain different
products?

How to adapt the
silvicultural
models to obtain
wood +resin ?

1. What do we need at the forest level? Basic management aspects

Co-production of resin and timber in Portugal



Resin tapping – effects on tree dbh growth
and wood characteristics

1. What do we need at the forest level? Basic management aspects

Co-production of resin and timber in Portugal

Influence of resin tapping on...

- wood quality

- the wood of tapped trees has a higher resin content and can cause problems in the drying and surface finishing of the boards
- for the production of panels or paper, the authors of the study conclude that resin doesn't cause any problem.

(Resimprove project (UTAD) <http://www.giff.pt/website/resimprove.php>)

- tree dbh growth

- negative effect: Gomes (1954), Figueiredo & Filho (1991), Palma (2007)
- no effect: Rodríguez-García et al. (2015), Silva et al. (2018)

More information: INCREDIBLE FACTSHEETS N° 20255, 20256, 20908



An idea for reflection....

Management regime for combined resin production and timber

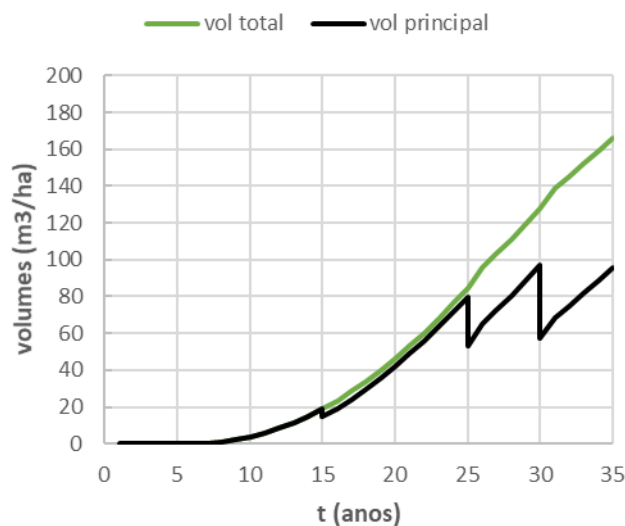
High site quality			Low site quality		
Age	Trees/ha	Operation	Age	Trees/ha	Operation
0-20	850	Low pruning to 3 m when trees are 6 m tall (500 trees/ha)	0-20	850	Low pruning to 3 m when trees are 6 m tall (500 trees/ha)
20	500	Thinning from below	20	500	Thinning from below
25	300	Thinning from below Starting resin tapping (tree dbh>20 cm)	30	300	Thinning from below Starting resin tapping (tree dbh>20 cm)
30	200	Thinning from below	40	200	Thinning from below
80-100		Regeneration cut	100-120		Regeneration cut

In Portugal: Resin tapping to life - minimum dbh: 20 cm (63 cm of perimeter)

Another idea for reflection....

High site quality

Low site quality



N.º arv plantadas	1670
Compasso	3X2
n.º de desbastes e em que idade	- 15 anos - 25 anos - 30 anos
Arv que ficam)	- 15 anos (1000 arvores) - 25 anos (700 arvores) - 30 anos (450 arvores)

t (anos)	Thinning	hdom (m)	N (ha-1)	G (m2/ha)	dg (cm)
0	0	0.0	1670	0.0	0.0
1	0	0.0	1604	0.0	0.0
2	0	0.2	1572	0.0	0.0
3	0	0.5	1540	0.0	0.0
4	0	0.9	1510	0.0	0.0
5	0	1.4	1479	0.0	0.0
6	0	1.9	1450	0.0	0.0
7	0	2.4	1421	0.2	1.3
8	0	3.0	1392	0.5	2.2
9	0	3.6	1365	1.0	3.0
10	0	4.2	1337	1.6	3.9
11	0	4.8	1310	2.4	4.8
12	0	5.4	1320	3.1	5.5
13	0	5.9	1320	4.0	6.2
14	0	6.5	1320	5.0	6.9
15	0	7.1	1320	6.0	7.6
15	1	7.1	1000	4.7	7.7
16	0	7.7	1000	5.6	8.5
17	0	8.2	1000	6.6	9.2
18	0	8.8	1000	7.7	9.9
19	0	9.3	1000	8.7	10.5
20	0	9.8	1000	9.8	11.2
21	0	10.3	1000	10.9	11.8
22	0	10.8	1000	12.0	12.4
23	0	11.3	1000	13.2	12.9
24	0	11.8	1000	14.3	13.5
25	0	12.3	1000	15.4	14.0
25	1	12.3	700	11.1	14.2
26	0	12.7	700	12.1	14.8
27	0	13.2	700	13.1	15.4
28	0	13.6	700	14.1	16.0
29	0	14.0	700	15.1	16.6
30	0	14.4	700	16.1	17.1
30	1	14.4	440	10.2	17.2
31	0	14.8	440	11.0	17.8
32	0	15.2	440	11.8	18.5
33	0	15.6	440	12.6	19.1
34	0	16.0	440	13.3	19.6
35	0	16.4	440	14.1	20.2

t (anos)	Thinning	hdom (m)	N (ha-1)	G (m2/ha)	dg (cm)
0	0	0.0	1670	0.0	0.0
1	0	0.0	1604	0.0	0.0
2	0	0.1	1572	0.0	0.0
3	0	0.3	1540	0.0	0.0
4	0	0.6	1510	0.0	0.0
5	0	0.9	1479	0.0	0.0
6	0	1.3	1450	0.0	-0.3
7	0	1.7	1421	0.0	0.3
8	0	2.2	1392	0.1	1.0
9	0	2.6	1365	0.3	1.6
10	0	3.1	1337	0.6	2.4
11	0	3.6	1310	1.0	3.1
12	0	4.1	1284	1.5	3.8
13	0	4.6	1259	2.0	4.5
14	0	5.0	1260	3.0	5.5
15	0	5.5	1260	3.8	6.2
15	1	5.5	1000	3.0	6.2
16	0	6.0	1000	3.8	6.9
17	0	6.5	1000	4.5	7.6
18	0	7.0	1000	5.3	8.2
19	0	7.4	1000	6.2	8.9
20	0	7.9	1000	7.0	9.5
21	0	8.3	1000	7.9	10.0
22	0	8.8	1000	8.8	10.6
23	0	9.2	1000	9.8	11.2
24	0	9.6	1000	10.7	11.7
25	0	10.0	1000	11.6	12.2
25	1	10.0	680	8.2	12.4
26	0	10.4	680	9.0	13.0
27	0	10.8	680	9.9	13.6
28	0	11.2	680	10.7	14.2
29	0	11.6	680	11.5	14.7
30	0	12.0	680	12.4	15.2
30	1	12.0	440	8.2	15.4
31	0	12.3	440	8.8	16.0
32	0	12.7	440	9.5	16.6
33	0	13.0	440	10.1	17.1
34	0	13.4	440	10.8	17.7
35	0	13.7	440	11.4	18.2

Resin tapping to life – dbh>20 cm
 Resin tapping to death- last 4 yrs

1. What do we need at the forest level? Basic management aspects

Co-production of resin and timber in Portugal

- Climate change
- Pests and diseases
- Invasive species
- **Forest fires**
- Market demand/new products

1. What do we need at the forest level? Basic management aspects

Co-production of resin and pine cones in Portugal

Pinus pinea L.



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Co-production of resin and cones in Portugal

In the past it was common to resin tapping stone pine trees.
But there is no information about the effect of tapping on the production of cones.



Nº cones/kg: 3 – 4



Fecundation occurs 2 yrs after pollination
and cones reach maturity in 3 yrs

<http://www.inia.pt/menu-de-topo/divulgacao/edicoes-proprias/manuais-tecnicos>

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Co-production of resin and cones in Portugal

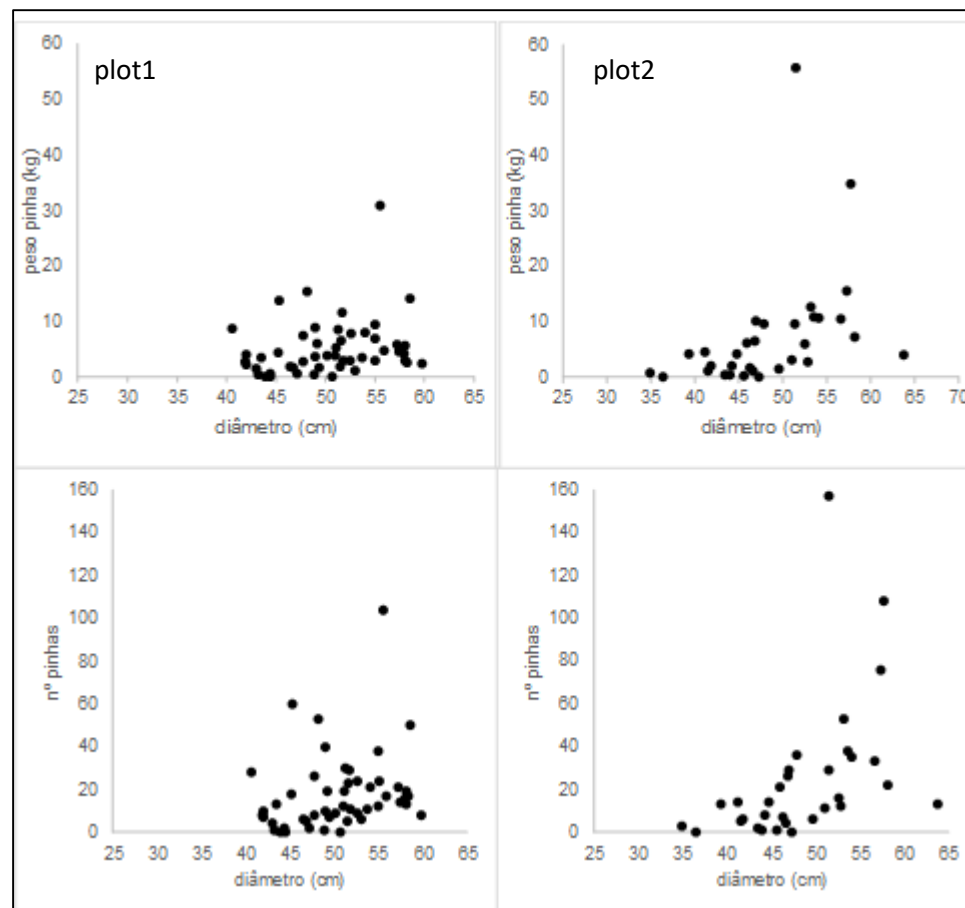
Two permanent plots

First resin tapping: march 2017

Collection of cones:

1/December – 31/March

(Law n.º 77/2015, 12 May)



December 2017

1. What do we need at the forest level? Basic management aspects

Co-production of resin and cones in Portugal

Two permanent plots

First resin tapping: march 2017

	2016/17		2017/18	
plot	nº cones/tree	mean cone weight (gr)	nº cones/tree	mean cone weight (gr)
non-tapped	17	0.286	20	0.227
tapped	28	0.304	39	0.210

	2018/19		2019/20	
plot	nº cones/tree	mean cone weight (gr)	nº cones/tree	mean cone weight (gr)
non-tapped	35	0.288	43	0.188
tapped	56	0.344	92	0.232

1. What do we need at the forest level? Basic management aspects

Co-production of resin and cones in Portugal

Two permanent plots

First resin tapping: march 2017

	2016/17		2017/18	
plot	nº cones/tree	mean cone weight (gr)	nº cones/tree	mean cone weight (gr)

Effect of resin tapping on cone yield:
 ONLY in the campaign
 December 2020/March 2021

plot	nº cones/tree	mean cone weight (gr)	nº cones/tree	mean cone weight (gr)
non-tapped	35	0.288	43	0.188
tapped	56	0.344	92	0.232

Questions/Comments.....

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