An Investigation of the Economic Potential of Short Rotation Forestry in Ireland

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Outline:

- Research question and objectives
- SRF Stands
- Conversion tool
- Market survey
- Log yield products and value optimisation
- Conclusions

Introduction

Research question:

What is the financial value of Short Rotation Forestry in Ireland?

?

Objectives:

1. To identify **market opportunities** for growers of SRF in Ireland.
2. To develop a **conversion tool** to quantify and evaluate wood resources for different purposes.
3. To explore how to **optimise the financial value** of the SRF in Ireland from the point of view of the landowner.

Conceptual framework

SRF **stand** data

SRF potential **markets** data

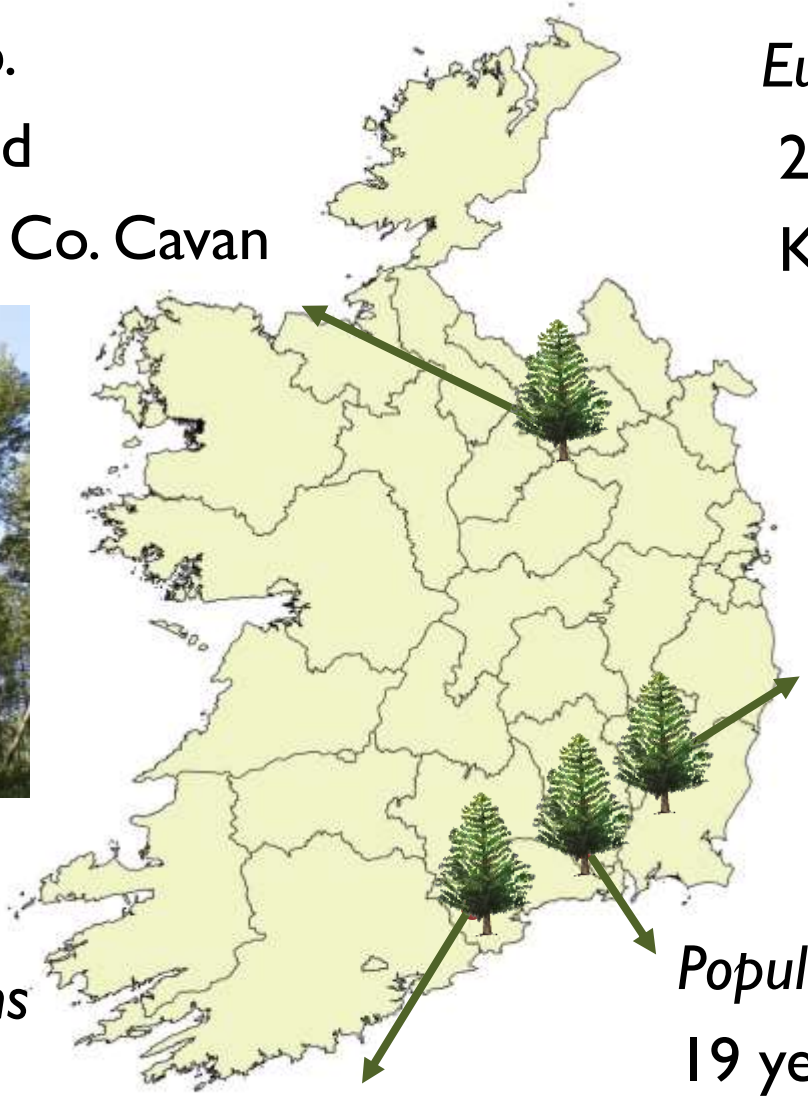
Unit conversion tool

Bucking to **value optimisation**

Potential financial value

Methodology: Stands data

Populus spp.
17 years old
Ballyhaise, Co. Cavan



Eucalyptus delegatensis
22 years old
Kilbora, Co. Wexford

Eucalyptus nitens
23 years old
Cappoquin, Co. Waterford

Populus spp.
19 years old
Kildalton, Co. Kilkenny

➢ Methodology: Stands data

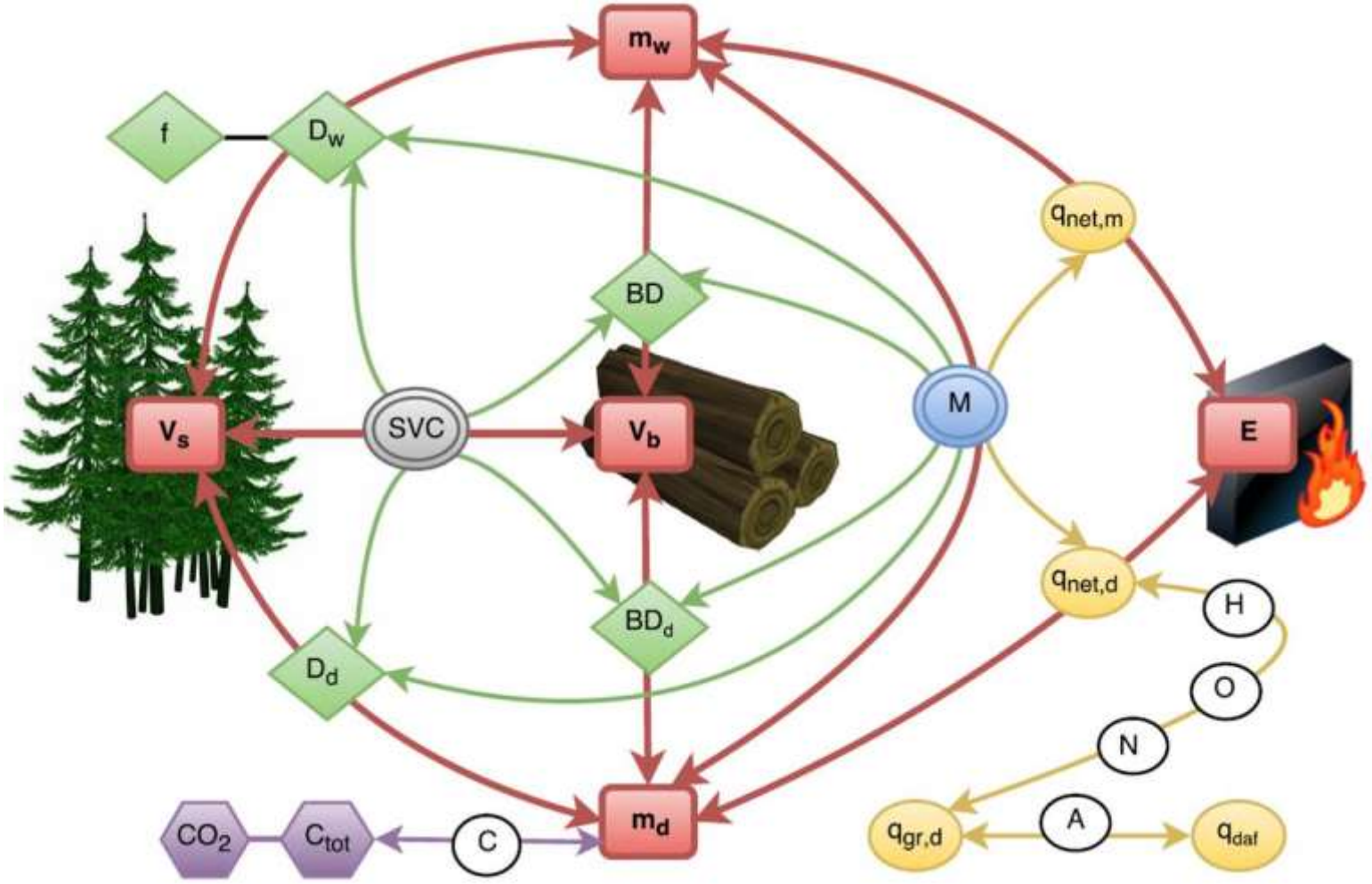
1. Systematic sample of the diametric distribution of each site
2. Measuring volumes
3. Taking destructive samples to determine tree biomass parameters:

- Dry weigh
- Moisture content
- Basic density
- Biomass Expansion Factor

➢ Results: Stands data

Site	Species	Location	Age	Stocking (trees ha^{-1})	DBH (cm)	Height (m)	Basic density (kg m^{-3})	M %	Above ground biomass expansion factor
1	*Eucalyptus delegatensis*	Kilbora, Co. Wexford	22	436	33	28.2	512	45	1.06
2	*Populus* spp.	Ballyhaise, Co. Cavan	17	352	39	25.0	311	52	1.27
3	*Eucalyptus nitens*	Cappoquin, Co. Waterford	23	841	29	30.7	388	60	1.11
4	*Populus* spp.	Kildalton, Co. Kilkenny	19	359	39	27.7	282	54	1.37

Methodology: Conversion Tool



A_d= Ash content
BD= Bulk density as received
BD_d= Bulk density dry
C= Carbon content
C_{tot}= Total Carbon
CO_2= Total CO_2 sequestrated

D_d= Basic density
D_w= Gross density
E= Energy content
f= Volume Weight Factor
H= Hydrogen content
M= Moisture Content

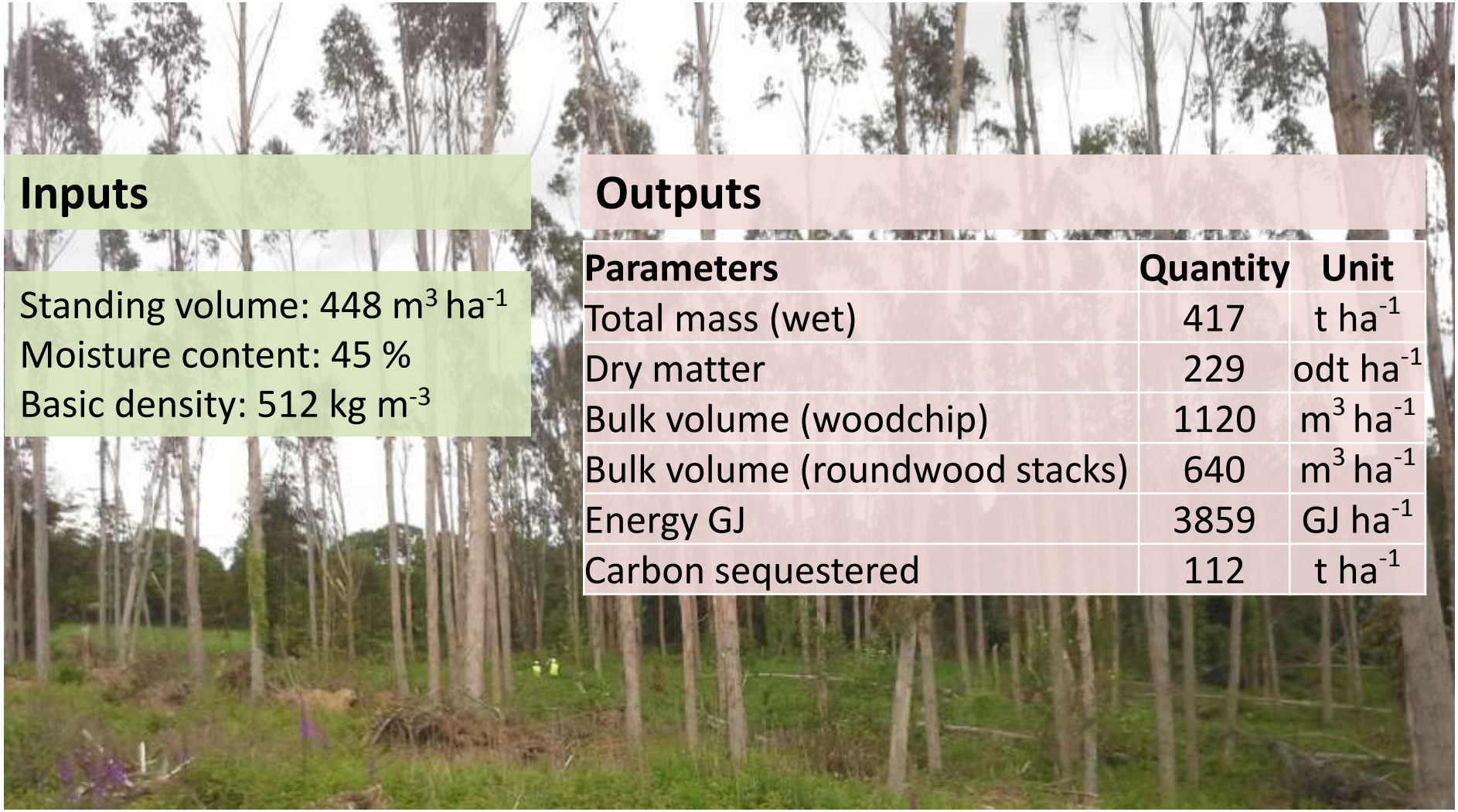
m_d=Dry matter
m_w= Total Mass
N= Nitrogen Content
O= Oxygen Content
$q_{gr,d}$= Gross calorific value dry
$q_{gr,daf}$= Gross calorific value dry ash free

$q_{net,d}$= Net calorific value dry
$q_{net,m}$= Net calorific value ar
SVC= Solid Volume Factor
V_b= Bulk volume
V_s= Solid Volume

Results: Conversion Tool

Example of use of the conversion tool

Site 1.Eucalyptus delegatensis, 22 years old. Kilbora, Co. Wexford



Inputs

Standing volume: 448 m^3 ha^{-1}
Moisture content: 45 %
Basic density: 512 kg m^{-3}

Outputs

Parameters	Quantity	Unit
Total mass (wet)	417	t ha^{-1}
Dry matter	229	odt ha^{-1}
Bulk volume (woodchip)	1120	m^3 ha^{-1}
Bulk volume (roundwood stacks)	640	m^3 ha^{-1}
Energy GJ	3859	GJ ha^{-1}
Carbon sequestered	112	t ha^{-1}

Methodology: Market survey

Sampling frame: Scope

- Wood energy: Firewood and woodchip for energy
- Panel board: Medium Density Fibre Board (MDF) and Orientated Strand Board (OSB)
- Sawmill: Fencing and pallet

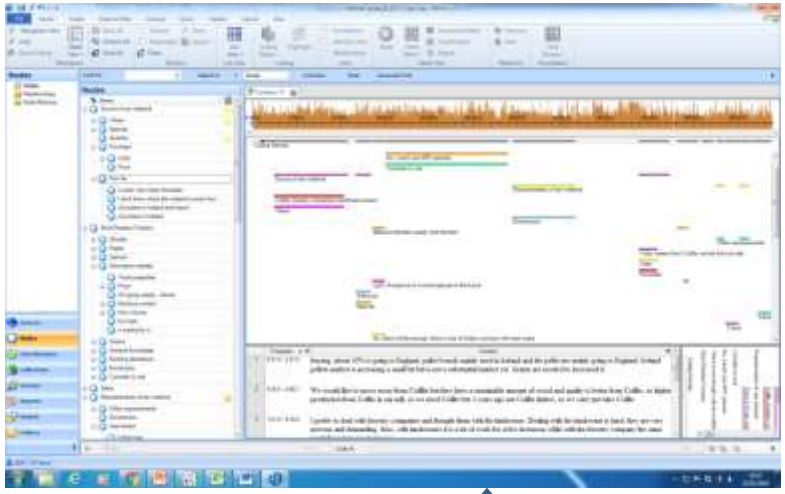
Sample of SRF potential user companies interviewed (30)





Interviews and analysis

- Semi-structured interview, face to face
- Questions:
  1. Awareness, perceptions and information wanted on SRF
  2. Source of raw material
  3. Requirements of raw material
  4. Purchase
  5. Supply-demand



- Responses analysis: spreadsheet and qualitative management data software NVivo 10

de Miguel, A., Sottocornola, M., Cronin, B. and Kent, T. 2016. Exploring market opportunities for Short Rotation Forestry in the current Irish wood processing and solid biofuel sectors. *Irish Forestry* 73: 141-160.

Case study: SRF market assessment in Oregon

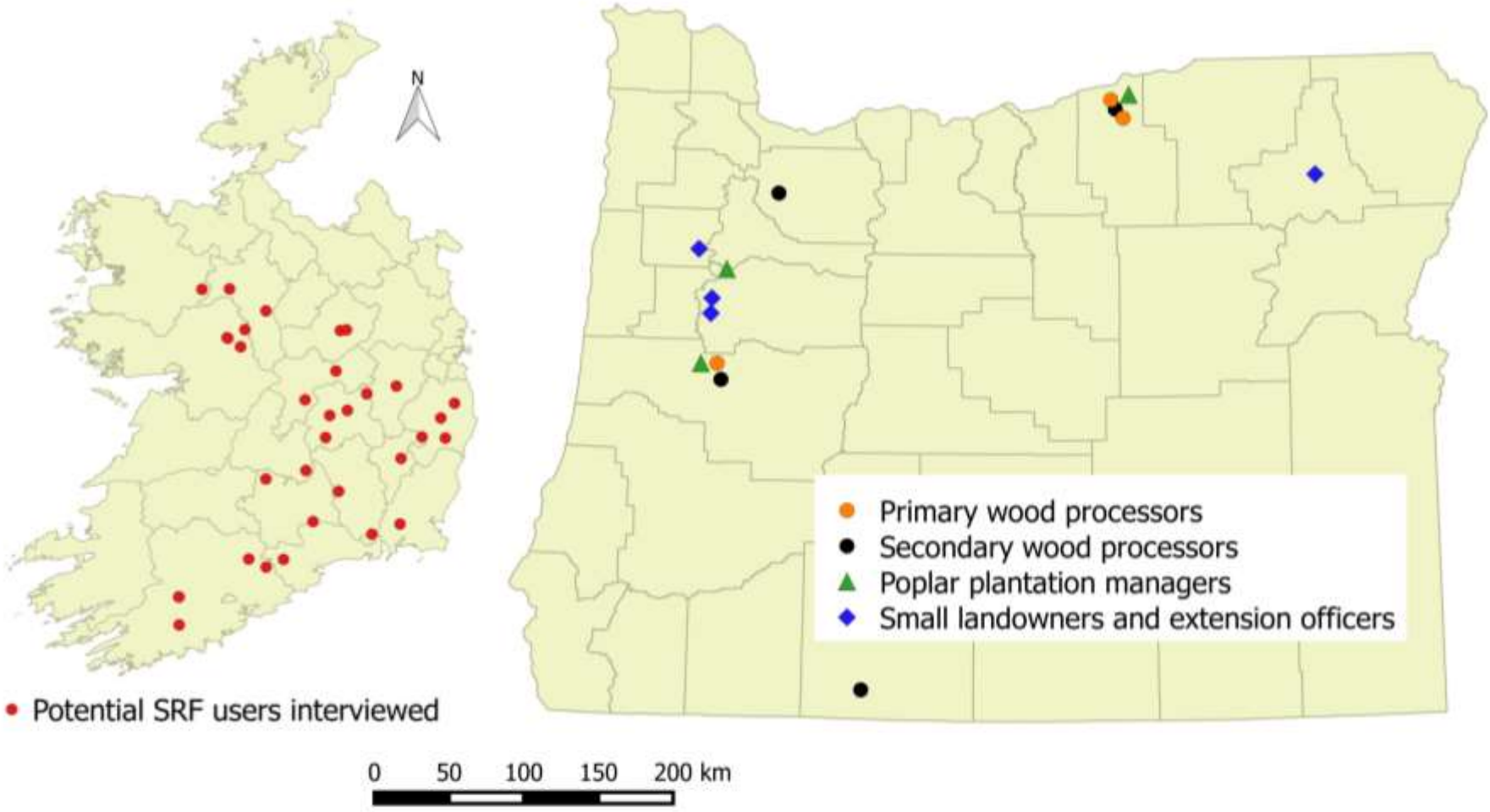
Identification of parameters and conditions that facilitated market development in Oregon

Recommendations for actions to develop market in Ireland





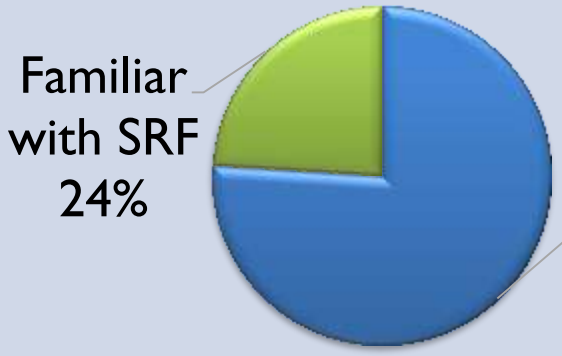
➢ Methodology: Comparison market survey Ireland-Oregon



(In review). de Miguel, A., Sottocornola, M. and Kent, T. 2017. A comparison of market opportunities for Short Rotation Forestry in Ireland and Oregon. *Irish Forestry.*

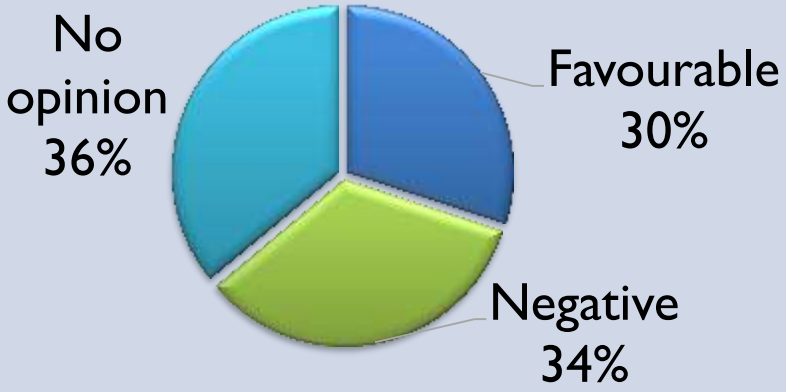
➢ Results: Comparison market survey Ireland-Oregon

Knowledge on SRF

Ireland	Oregon
	• Initial lack of knowledge  
• SRF information and education needs identified by 70%	• University and/or own research by 100%
• Information gaps in: - wood and fuel properties - drying rate - scale of supply	• Most useful information: - wood properties - grading - scale of supply

Results: Comparison market survey Ireland-Oregon

Willingness to use SRF

Ireland	Oregon
	• **100% would like to continue using poplar**
• The **wood energy** sector was the most favourable	• **High value products** were needed to develop SRF
• Past experiences concerns (*Miscanthus*)	• Past experiences concerns (Poplar for paper production)

Results: Comparison market survey Ireland-Oregon

Requirements of the material

Ireland	Oregon
• Preferred source not from small landowners	→ Large scale plantation
• **Supply consistency** • **Competitive price** • **Particular appearance** • **Certification**	→ Advantages
• Straightness • Low moisture content	→ Challenges: Technology and breeding research
• Particular species	→ Marketing: Pacific albus

➢ Methodology. Log yield products and value optimisation

- **Stem level** (individual tree)
- Best situation for the **forest owner**
- **Dynamic programming** algorithm

Fuel

Fuel

Whole tree Fuel

Fibre boards

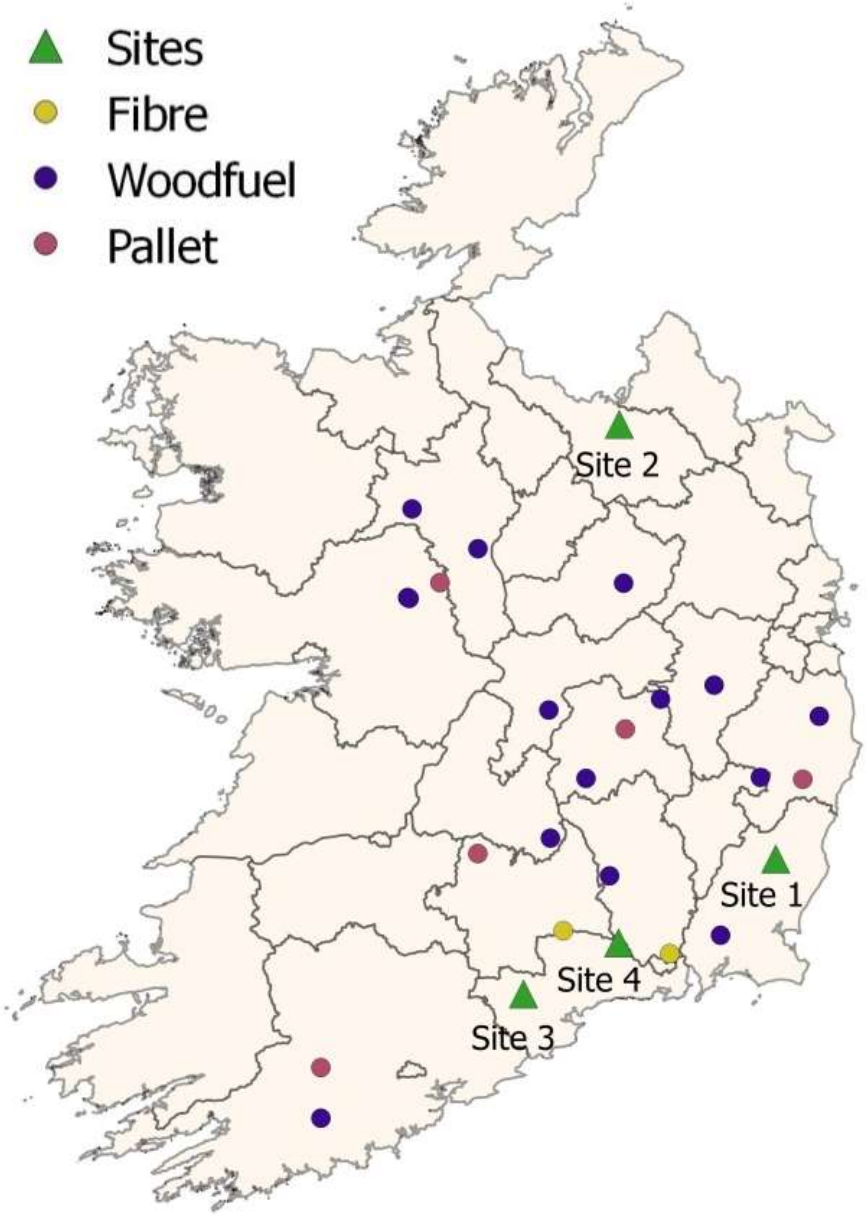
Fibre boards

Pallet

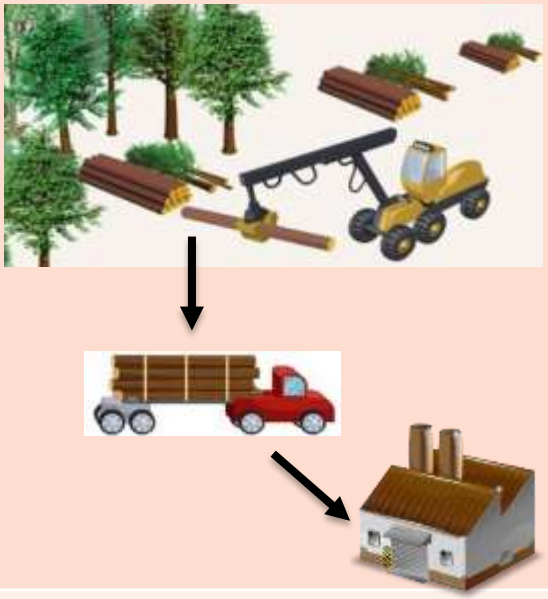
Value optimisation with VALMAX*

*Murphy *et al.* 2010. Management tools for optimal allocation of wood fiber to conventional log and bio-energy markets in Ireland: a case study. *European Journal of Forest Research*.

➢ Methodology: Log yield products and value optimisation



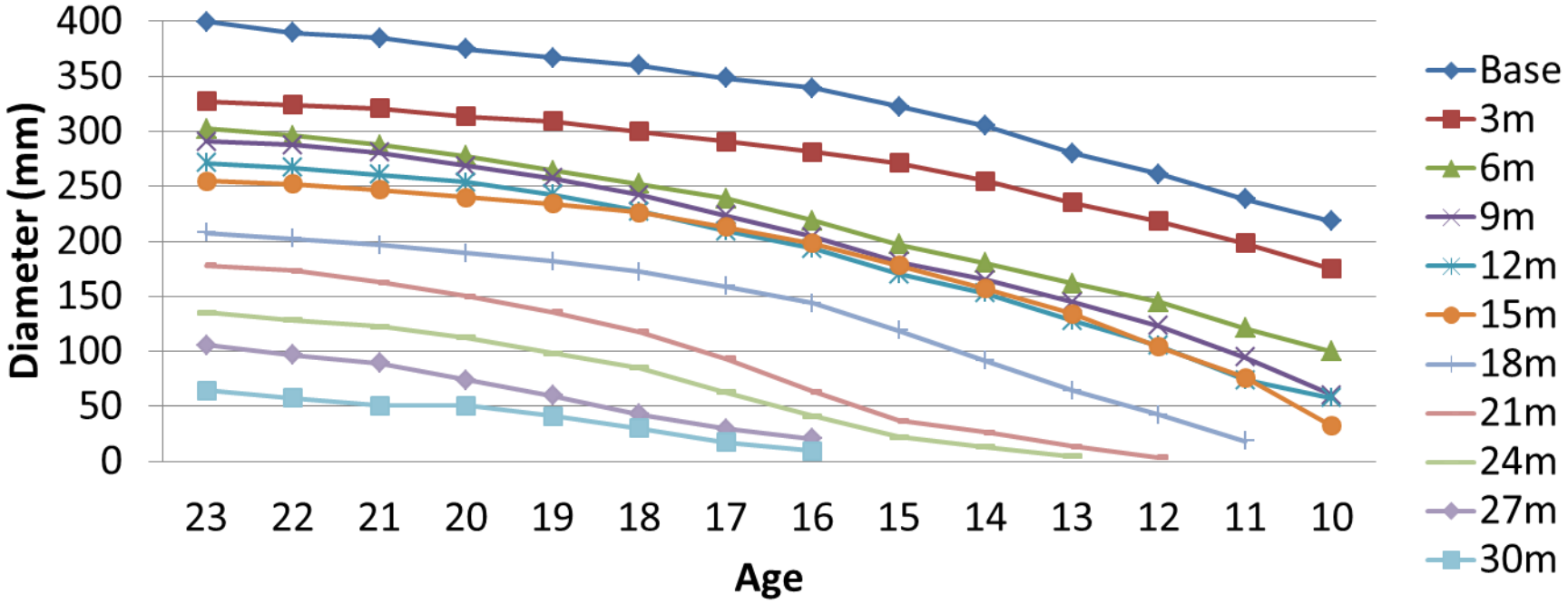
➢ Methodology: Log yield products and value optimisation. Inputs

4 SRF stands	30 potential users	11 supply chains
	 	
• 44 stem profiles • Stocking • BEF • Wood density	• Logs dimensions • Log pricing (at mill gate)	Costs *(Coates 2017)*: • Harvesting • Extraction • Chipping • Haulage

➢ Methodology: Log yield products and value optimisation. Inputs

- Rings growth analysis of 2 stands
  - *Eucalyptus nitens* (Cappoquin)
  - *Populus* spp. (Kildalton)
- Stems profiles 10 to 20 years old

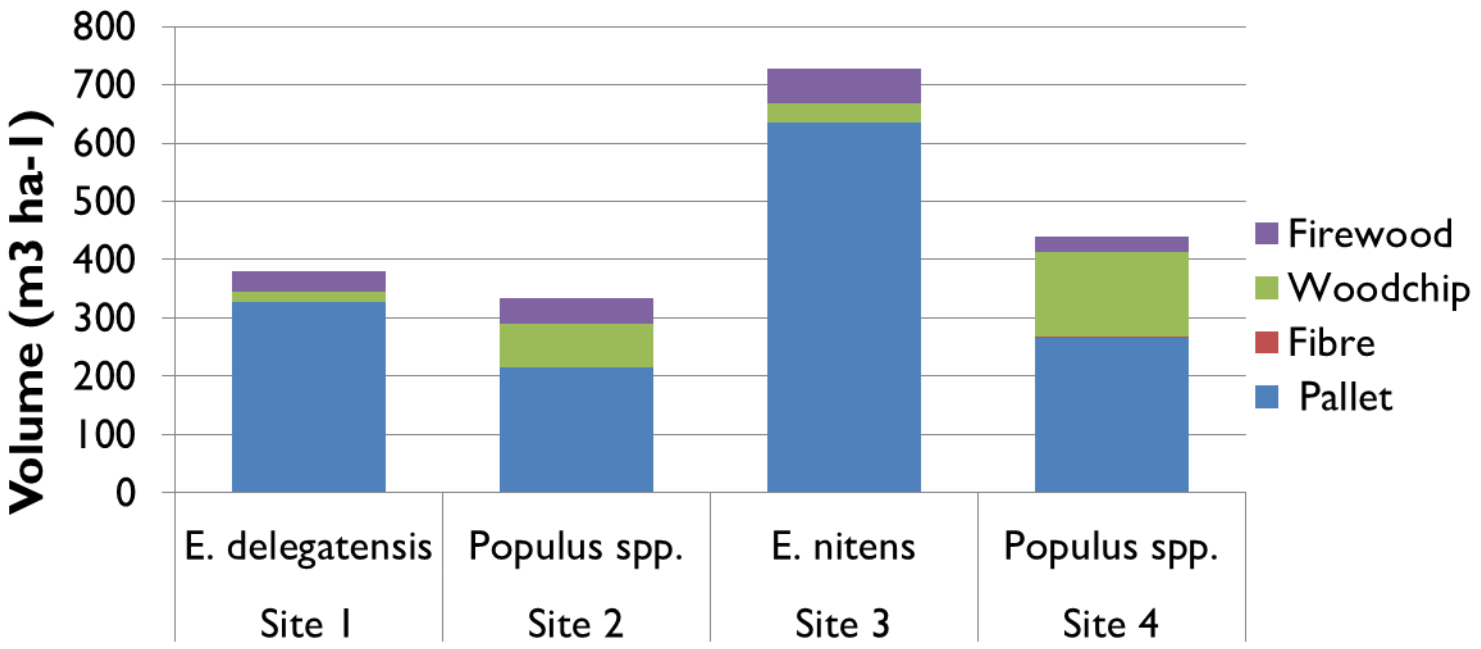
Example of rings growth of a *Eucalyptus nitens*



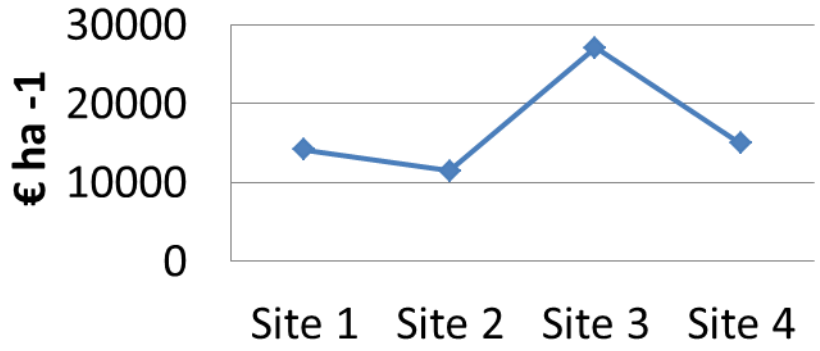
➢ Preliminary results: Log yield products and value optimisation.

e.g. Supply chain 1: Cut to length sawlog and pulp. Current age.

Log yield products



Standing value (€ ha^{-1})



	Standing Value (€ ha^{-1})
Site 1	14,119
Site 2	11,444
Site 3	27,054
Site 4	14,943

Conclusions

- There is a **potential market** for SRF
- **Research and dissemination** need
- **Supply consistency** and **local supply**
- **Wood energy or high value products?**

Thank you!