



**Rome, 23<sup>rd</sup> June 2011**  
**Parallel Session**

Present and future role of forest resources in the socio-economic development of rural areas

## **Parallel Session 2**

*Forests, agroforestry and bioenergy.*

# ***Manual and mechanized thinning of walnut plantations***

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# THE ITALIAN CONTEXT



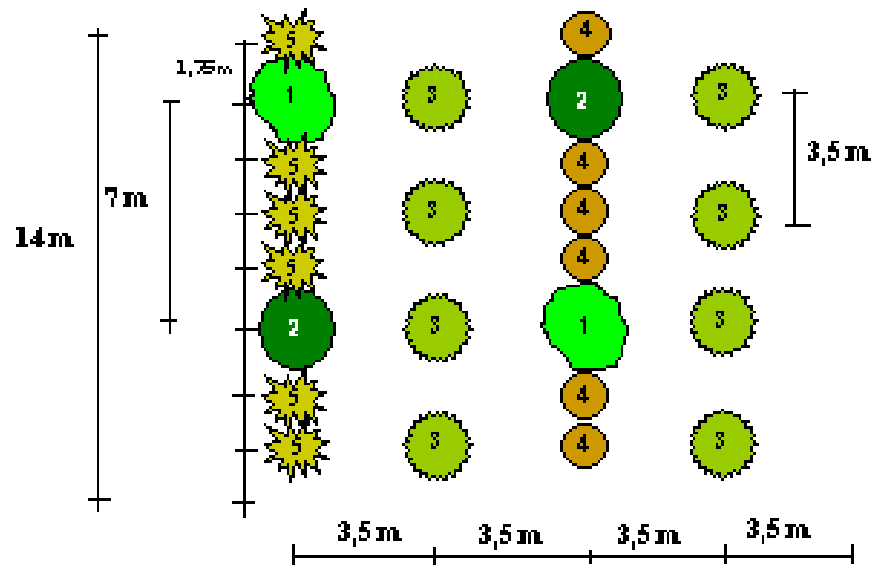
Walnut agroforestry plantations, established on ex-arable land, are widespread all across Europe, financed under the provisions of EU Directive 2080/1992, and of regional grant schemes.

In Italy, between the second half of the 1990s and the beginning of 2000s, farmers established over **140,000 ha** of forest tree plantations on former agricultural land.

# THINNING OF NURSE TREES

- ❖ Firewood?
- ❖ Chips?
- ❖ Which harvesting system?
- ❖ What about damage (valuable trees, soil)?





	<u>Stand 1</u>	<u>Stand 2</u>
<b>Surface (ha)</b>	1.73	1.29
<b>Main species</b>	Juglans regia	Juglans regia
<b>Nurse species</b>	Alnus cordata	Alnus cordata
<b>Age (years)</b>	10	9
<b>Avg. DBH (cm)</b>	14.8	12.5
<b>Biomass removed (g t ha<sup>-1</sup>)</b>	50	25
<b>m. c. (% wet base)</b>	47.8	53.2

# SCHEME OF THE OPERATIONAL

	WTH System (stand 1)		SWS System (stand 2)	
	Manual	Mechanized	Manual	Mechanized
Operators n.	3	1	1	1
Felling	Chainsaw	Felling head + excavator	Chainsaw	Felling head + excavator
Extraction	Farm tractor + winch	Farm tractor + log grapple	Farm tractor + forestry trailer	Farm tractor + forestry trailer
Output	chips	chips	firewood	firewood
Processing	-	-	Chainsaw	Felling head + excavator
Chipping	Trailer-mounted chipper	Truck-mounted chipper	-	-

# METHODS

- Codes on trees
- Hand-held computers
- Single-entry tariff tables
- Soil samples
- Damage assessment
- Data analysis



DBH (cm)	WTH (kg tree <sup>-1</sup> )	SWS (kg tree <sup>-1</sup> )	WTH/SWS Δ (%)
7	17.2	10.2	+68
8	23.1	14.6	+58
9	30.2	20.1	+51
10	38.6	26.6	+45
11	48.3	34.3	+41
12	59.3	43.3	+37
13	71.9	53.7	+34
14	86.0	65.5	+31
15	101.8	78.8	+29
16	119.3	93.7	+27
17	138.7	110.2	+26
18	159.9	128.5	+24
19	183.1	148.5	+23
20	208.3	170.4	+22
21	235.6	194.2	+21



# RESULTS

- The whole-tree chipping offers an additional harvest between 21 and 68%

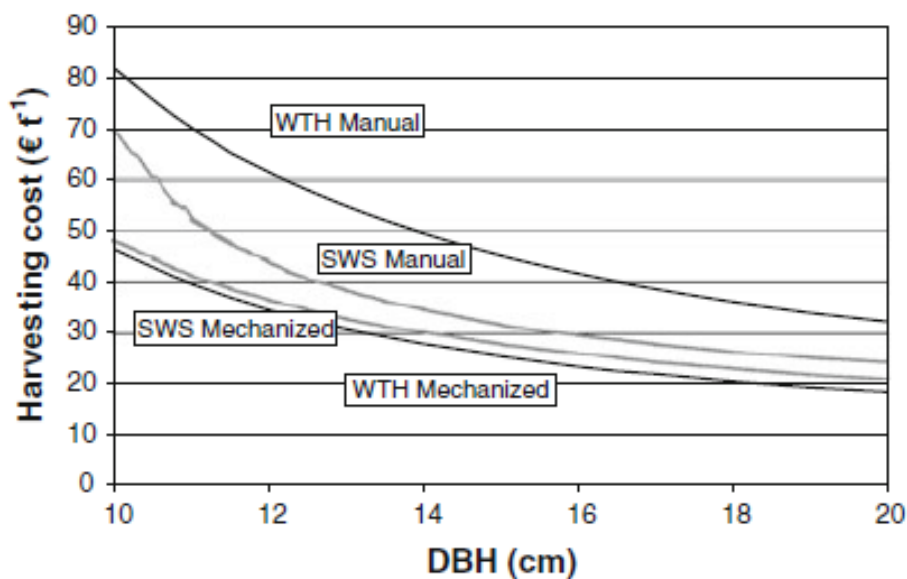
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# RESULTS

- Mechanized harvesting is much more productive and significantly less expensive than manual harvesting

		WTH		SWS	
		Manual	Mechanized	Manual	Mechanized
DBH felling	cm	13.6	15.1	11.5	12.0
	t SMH <sup>-1</sup>	6.62	12.79	0.58	4.42
	€ h <sup>-1</sup>	38.3	78.2	20.3	98.8
	€ t <sup>-1</sup>	5.8	6.1	34.9	22.4
Extraction	m	186	164	401	405
	kg turn <sup>-1</sup>	388	497	4269	2602
	t SMH <sup>-1</sup>	1.58	4.68	4.26	3.52
	€ h <sup>-1</sup>	51.1	51.1	65.7	46.3
	€ t <sup>-1</sup>	32.3	10.9	15.4	13.2
Chipping	t SMH <sup>-1</sup>	7.75	22.13	–	–
	€ h <sup>-1</sup>	111.4	188.6	–	–
	€ t <sup>-1</sup>	14.4	8.5	–	–
Total	€ t <sup>-1</sup>	52.4	25.6	50.4	35.5

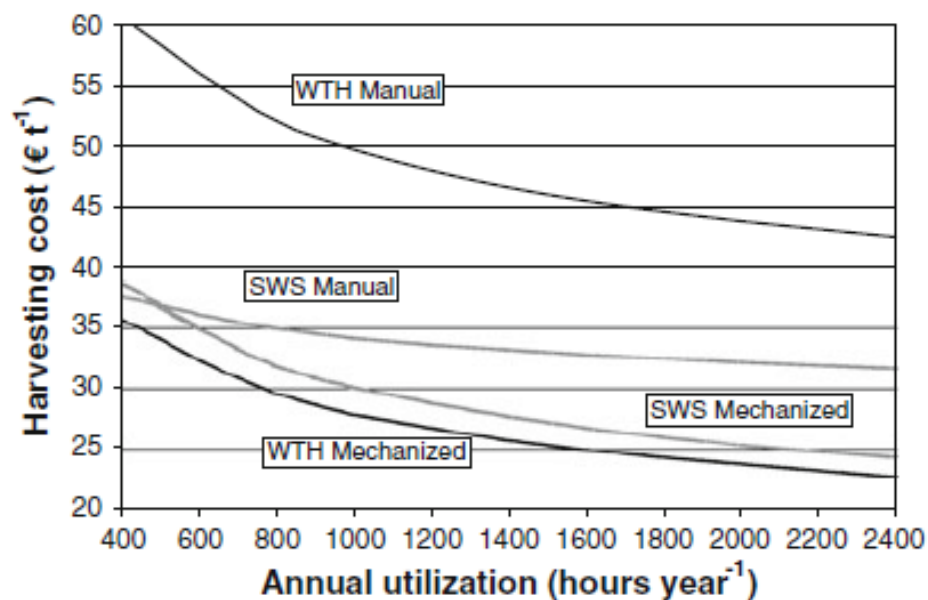
# RESULTS



- Harvesting cost decreases by about 60% if the average tree diameter goes from 10 to 20 cm, and that for all treatments

# RESULTS

■ Annual utilization has a strong impact on harvesting costs, but it does not change the relative balance, except for the SWS system and for very low utilization levels, under 600 h year<sup>-1</sup>



# CONCLUSIONS

The removal of nurse alder from walnut plantations is economically sustainable, and ***it can also offers some revenue*** if the stand and market conditions are favorable

The average DBH of removal trees ***should not be smaller than 12 cm***

***Best results*** are obtained with mechanized harvesting, which does not seem to cause heavier stand and soil damage than manual harvesting

**THANKS FOR YOUR ATTENTION!**

