

# EuroCoppice Final Conference

**Coppice Forests in Europe: a traditional natural resource with great potential**

Limoges – June 21<sup>st</sup>, 2017



UNIVERSITÀ  
DEGLI STUDI  
FIRENZE

DEPARTMENT OF  
AGRICULTURAL, FOOD AND  
FORESTRY SYSTEMS



## ***Forest Operations Sustainability: an overview on traditional coppices***

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# The actual challenges on Forest Operations: wood production adaptation to modern needs

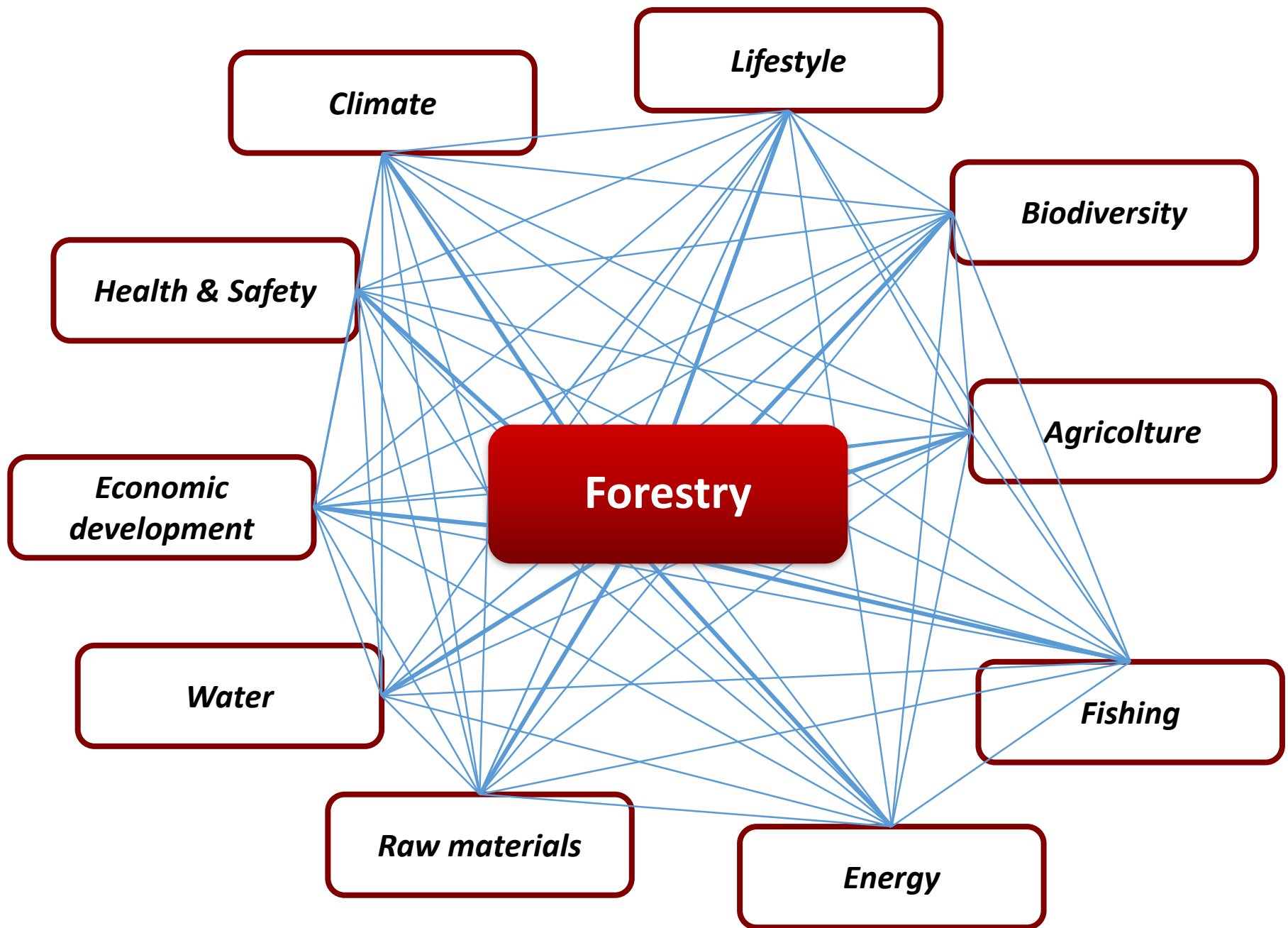
**Forest operation** - scientific and problem-oriented discipline - to **provide solutions for the emerging problems** (Heinimann, 2007)

**R&D objective** - To analyse the present, looking forward the future

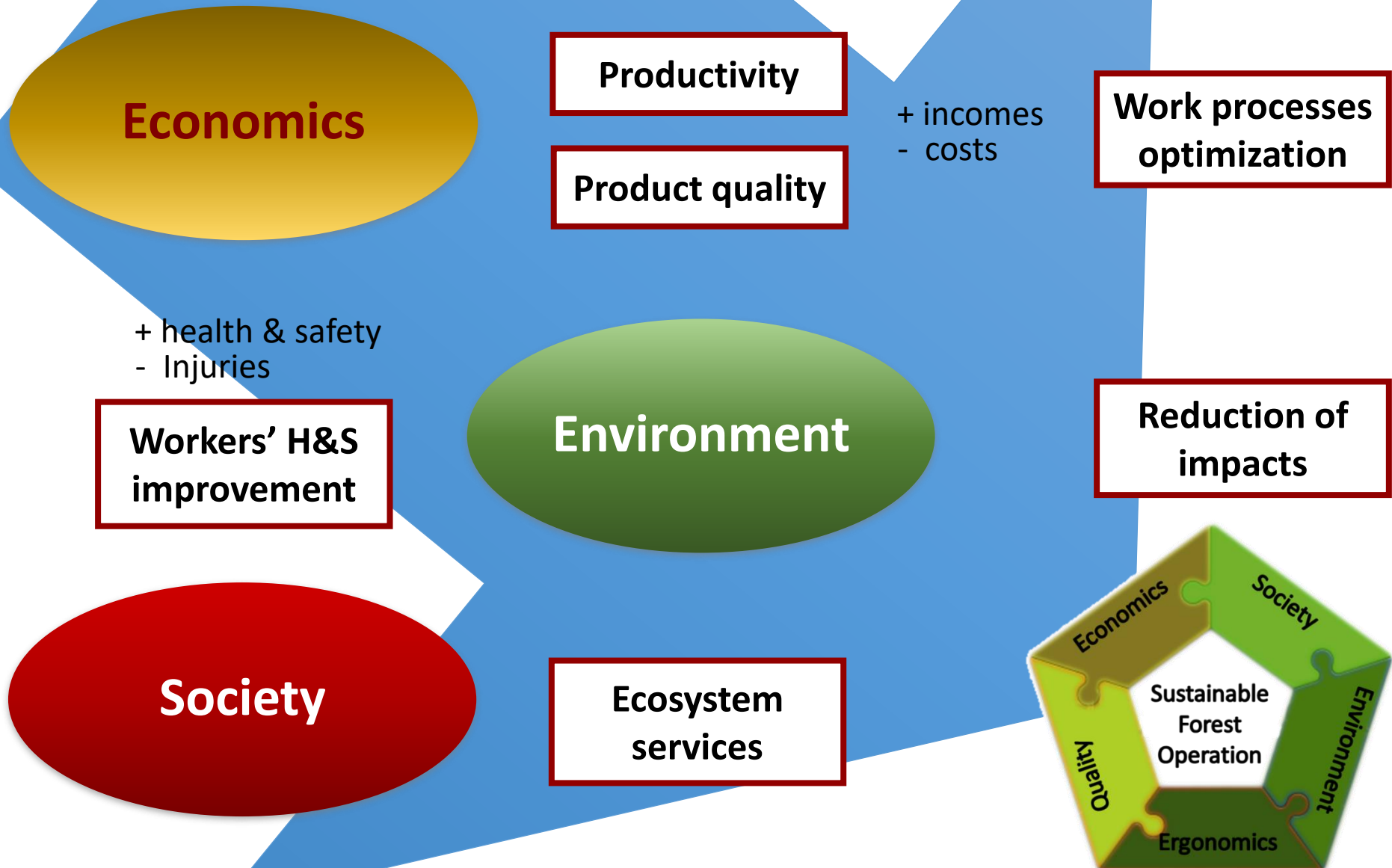


*Development that meets the needs of the present without compromising the ability of future generations to meet their own needs*





# Sustainable Forest Operation: which challenges for coppice?





# Traditional coppices in Tuscany



1.151.000 ha of forests

63% coppices





# Sustainable Forest Operation: which challenges for coppice?

Coppices produce several products, not always used

Wood is a renewable material, but its production implies impacts

Several criticalities affect work conditions of forest workers



*Inputs*

*Ouputs*

# Assortments' optimization in coppice



Optimize harvesting processes in order to obtain different products

**Maximize  
incomes**



**Firewood**

**Poles / fences**

**Chips**

....

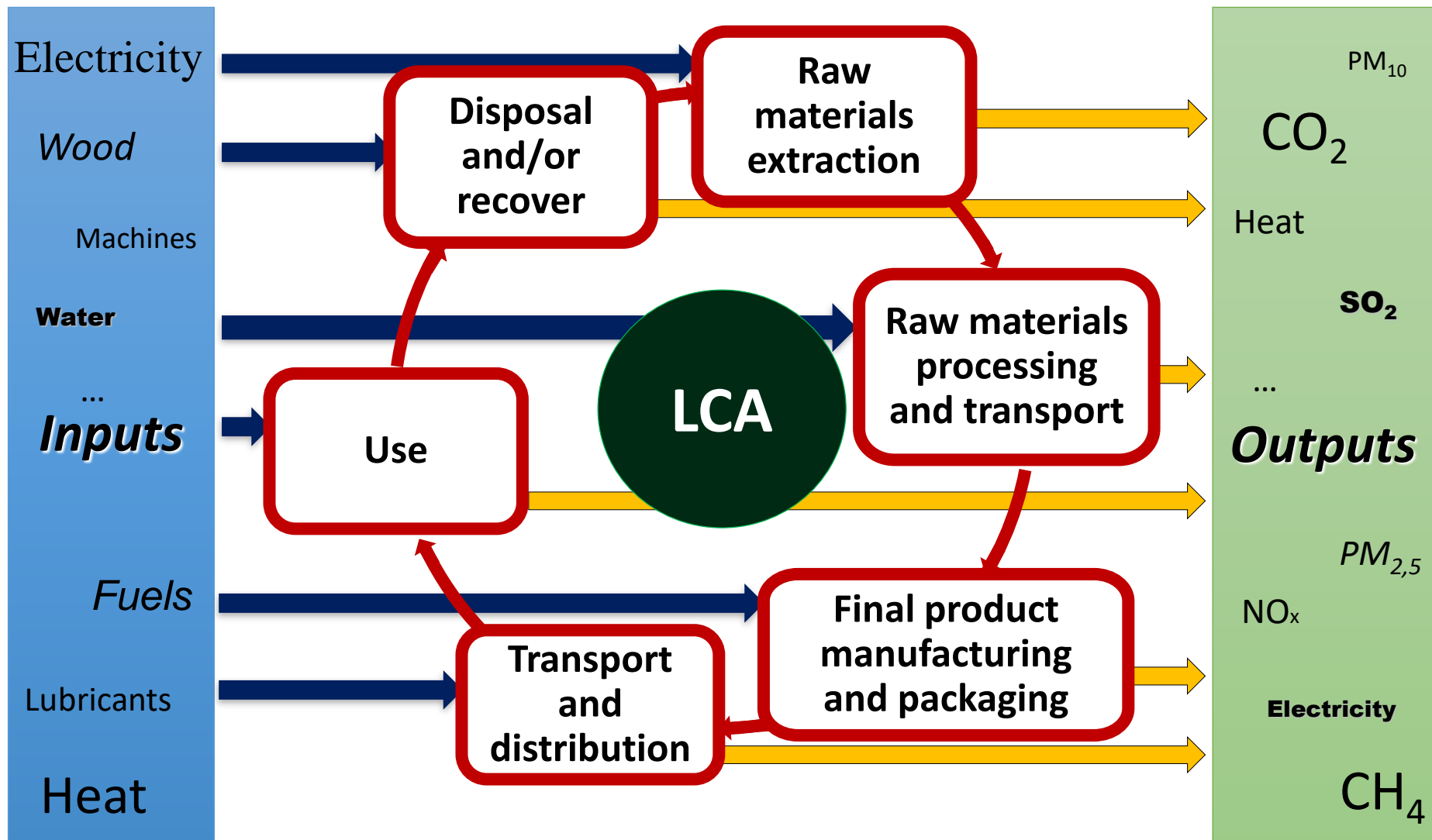
**Higher power on  
market**

**More wood from  
less forest  
surface**





# Environmental and productive performance assessment

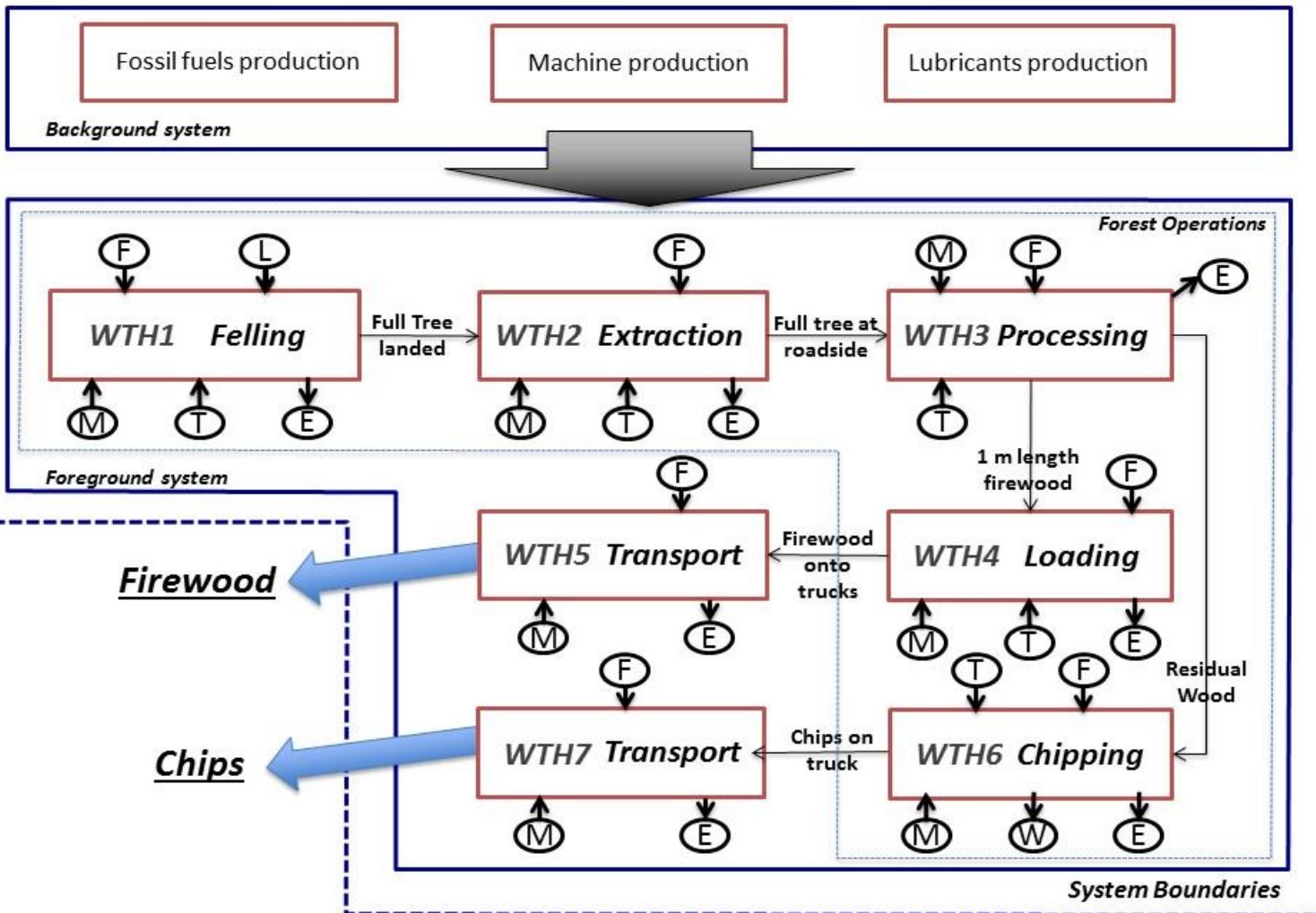


UNI ISO 14040



# System boundaries – WTH on “steep / very steep terrain”

*Aerial extraction of whole tree on ‘steep/very steep’ terrain by cable-yarder (WTH)*



- (M)** Machines
- (F)** Fuels
- (T)** Transport of workers
- (L)** Chain oil
- (E)** Emissions

Avg slope: 51% - 98.3 t/ha of fresh wood:

75.6 t firewood  
22.7 t chips

# Soil compaction due to forest operations

Changes in soil-atmosphere exchanges:

- Losses in  $\text{CH}_4$  absorption
  - Emission of  $\text{N}_2\text{O}$
- (Tepee et al., 2004)



**Compacted surface**

SWS: 30% - WTH: 13,5% (Lucci, 1987)  
SWS: 32% - WTH: 19% (Picchio, 2016)

$\text{CH}_4$

(IPCC, 2001)

$\text{N}_2\text{O}$

SWS1: +10%  $\text{CO}_{2\text{eq}}$   
SWS2: +15%  $\text{CO}_{2\text{eq}}$

WTH1: +3%  $\text{CO}_{2\text{eq}}$   
WTH2: +9%  $\text{CO}_{2\text{eq}}$



# Health & Safety for forest workers

## Education



## Research



## Training





# SAFETY AND ERGONOMICS



## Pollutant exposure of forest workers during cutting ( $\pm$ SE)

(Piegai et al., 2014) Esposizione a polveri di legno e gas di scarico di motoseghe degli operatori durante le operazioni di utilizzazioni forestali. Regione Toscana - Relazione di Progetto



Treatment	Work time CS on	DUST	Benzene	Carcinogenic PAH	N.
	min	mg m <sup>-3</sup>	µg m <sup>-3</sup>	µg m <sup>-3</sup>	
Sanitary cut	196.54 <sup>a</sup> ( $\pm$ 6.97)	1.10 <sup>b</sup> ( $\pm$ 0.13)	43.92 ( $\pm$ 15.57)	0.011 ( $\pm$ 0.005)	11
Coppice *	138.43 <sup>b</sup> ( $\pm$ 7.00)	2.37 <sup>a</sup> ( $\pm$ 0.30)	88.99 ( $\pm$ 18.68)	0.008 ( $\pm$ 0.004)	14
Pruning *	223.55 <sup>a</sup> ( $\pm$ 10.57)	2.05 <sup>ab</sup> ( $\pm$ 0.34)	101.59 ( $\pm$ 21.84)	0.029 ( $\pm$ 0.018)	18
Thinning	233.77 <sup>a</sup> ( $\pm$ 14.92)	1.81 <sup>ab</sup> ( $\pm$ 0.26)	77.76 ( $\pm$ 18.14)	0.006 ( $\pm$ 0.002)	13
p value	<0.001	0.043	>0.05	>0.05	

# CONCLUSIONS

**Coppices under traditional management** have a key-role in Italian forest sector

**Maximize  
benefits**

**SFO  
Research**

**Minimize  
impacts**

**Economics → mechanization improvement, efficiency, optimization**

**Environment → life-cycle approach, FO effects on air, soil and stumps**

**Ergonomics, Health & Safety → work conditions improvement**

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*Thank you for your attention*

**Andrea Laschi<sup>1</sup>, Francesco Neri<sup>1</sup>, Rodolfo Picchio<sup>2</sup>, Martina Cambi<sup>1</sup>, Enrico Marchi<sup>1</sup>**

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