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Economic and Life Cycle Assessment of integrated wood and chips harvesting from hybrid poplar plantations in the Genil Valley (Spain). Comparison with chips harvesting from Poplar SRCs

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INTRODUCTION

- Fast growing rate, resistance to frost, re-sprouting capacity (buscar datos europeos)
- Roundwood combined with chips production is currently a sustainable activity. 90 thousands ha poplar plantations
- Could poplar SRC be a profitable alternative in abandoned farm-land?
- SRC is still a “promise” (all SRC for bioenergy are a promise in Spain), subsidies cutback, investment barriers, electricity consumptions decreasing, ¿heat production?

INTRODUCTION
Integrated plantations Vs Short Rotation Coppice

- Stake holders

Environmental impact	Economic analysis
• Everybody • Policy makers • Scientist	• Landowner • Logging companies • Scientist

INTRODUCTION

- Goals
  - ➢To identify phases to improve according results of LCA and economic analysis
  - ➢To compare chips production from integrated and SRC alternative

Methodology

Life cycle assesment	Simapro Recipe	Funcional unit: hectare
Economic analysis	NPV and IRR	“Funcional unit: €/ha”

Methodology

LOCATION

Data from a time study, local landowners and logging companies.

Methodology System boundaries

Integrated system	Poplar SRC
• Wood & Chips • 10 year • Yield (tops and branches 3,6 o.d.t /ha year) • From plantation to mill	• Chips • 3+3+3+3 years • 17,9 o.d.t /year ha • From plantation to mill

METHODOLOGY SYSTEM BOUNDARIES

Harvesting description

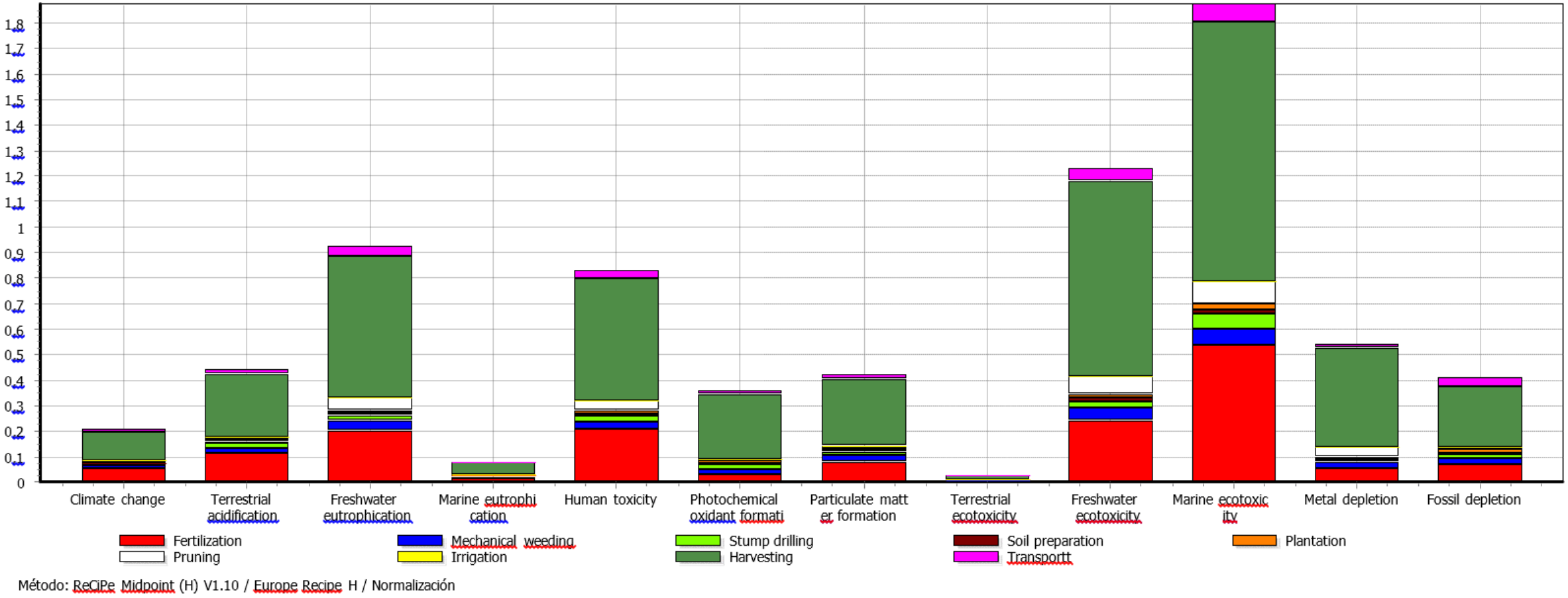
Integrated	SRC
• Chainsaw+light backhoe excavator with processing head	• Claas Jaguar chip forager

Methodology system boundaries: Harvesting description

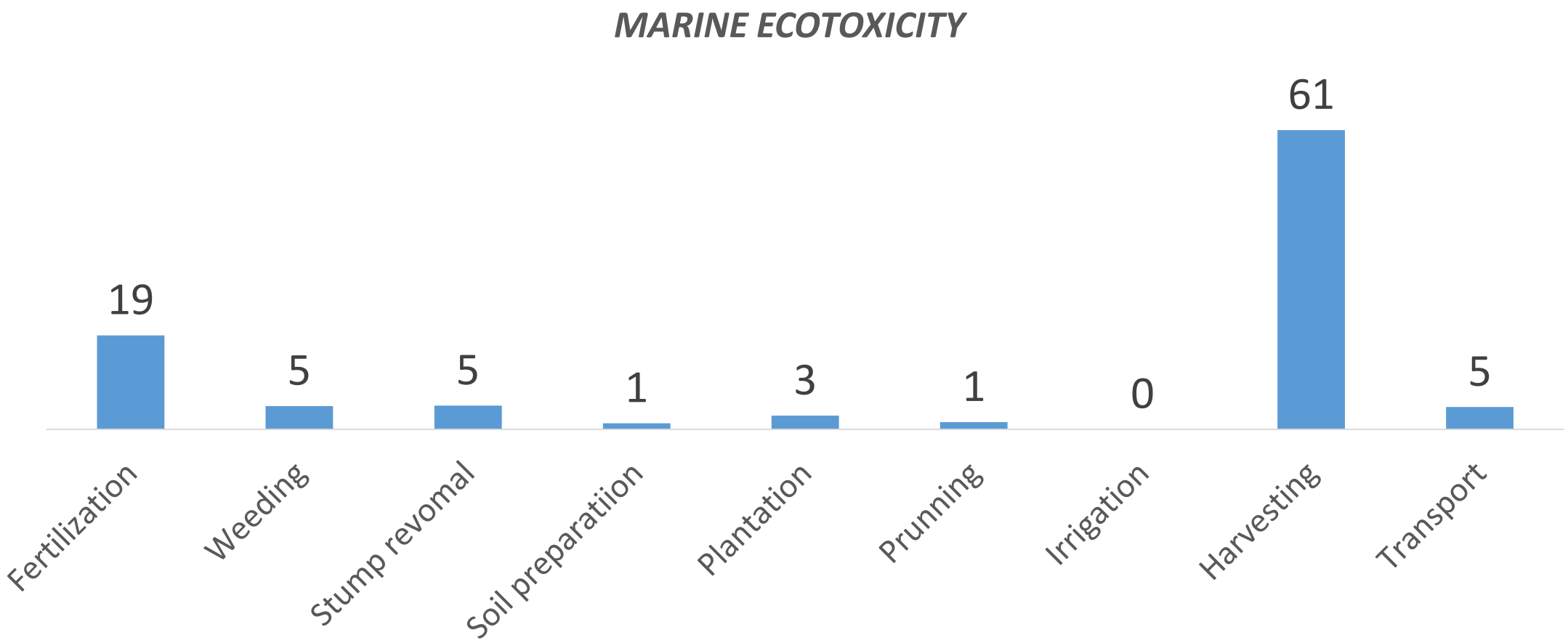
Integrated	SRC
• Telescopic boom loader for piling • Chipper attached to tractor Pezzolato PTH 480/660 • Loading and transport 25 km semi-trailer truck	• Unloading over a tráiler + farm tractor • Loading and transport 25 km semi-trailer truck

Results and discussion

Normalized analysis of the environmental performance of poplar plantation for wood and chips

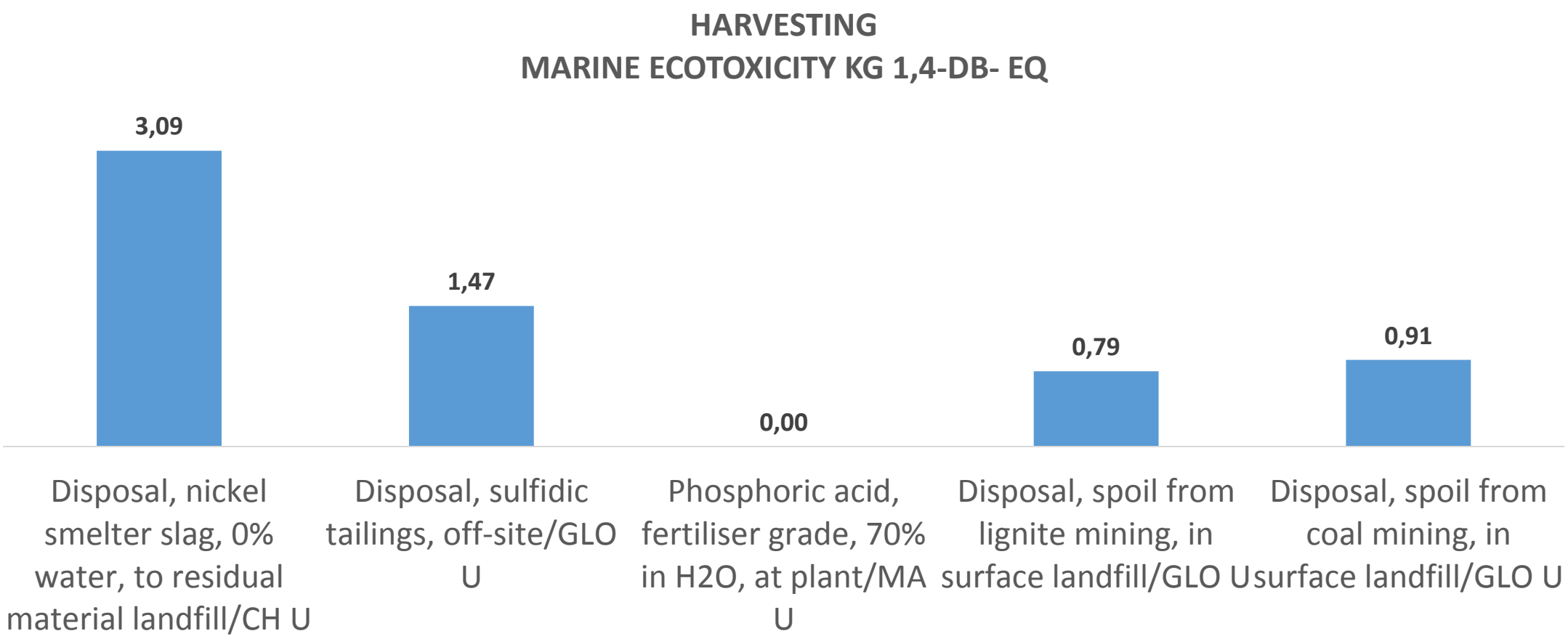


Results and discussion



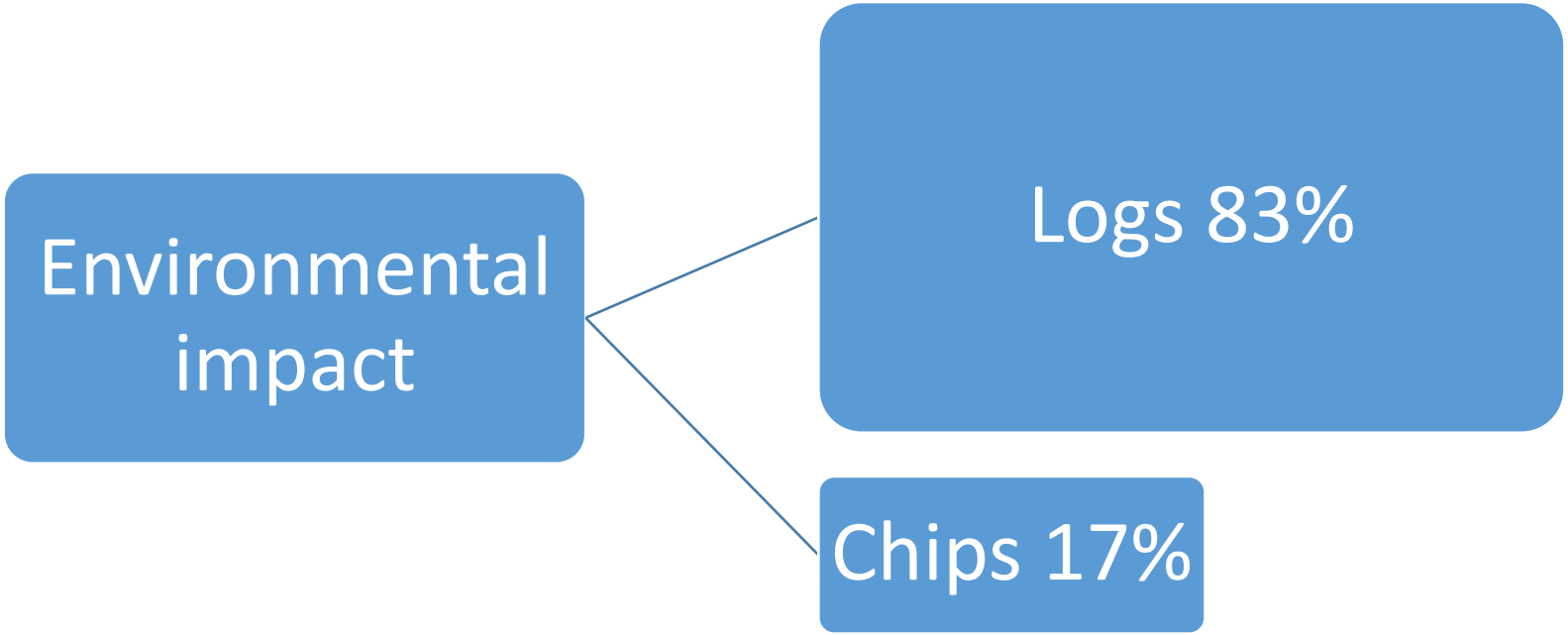
Simapro 3.0 Model: USES-LCA 2.0 (Huijbregts et al., 2005)

Results and discussion



Piling and chipping 47% of contribution

Results and discussion



Mass criteria allocation

Results and discussion

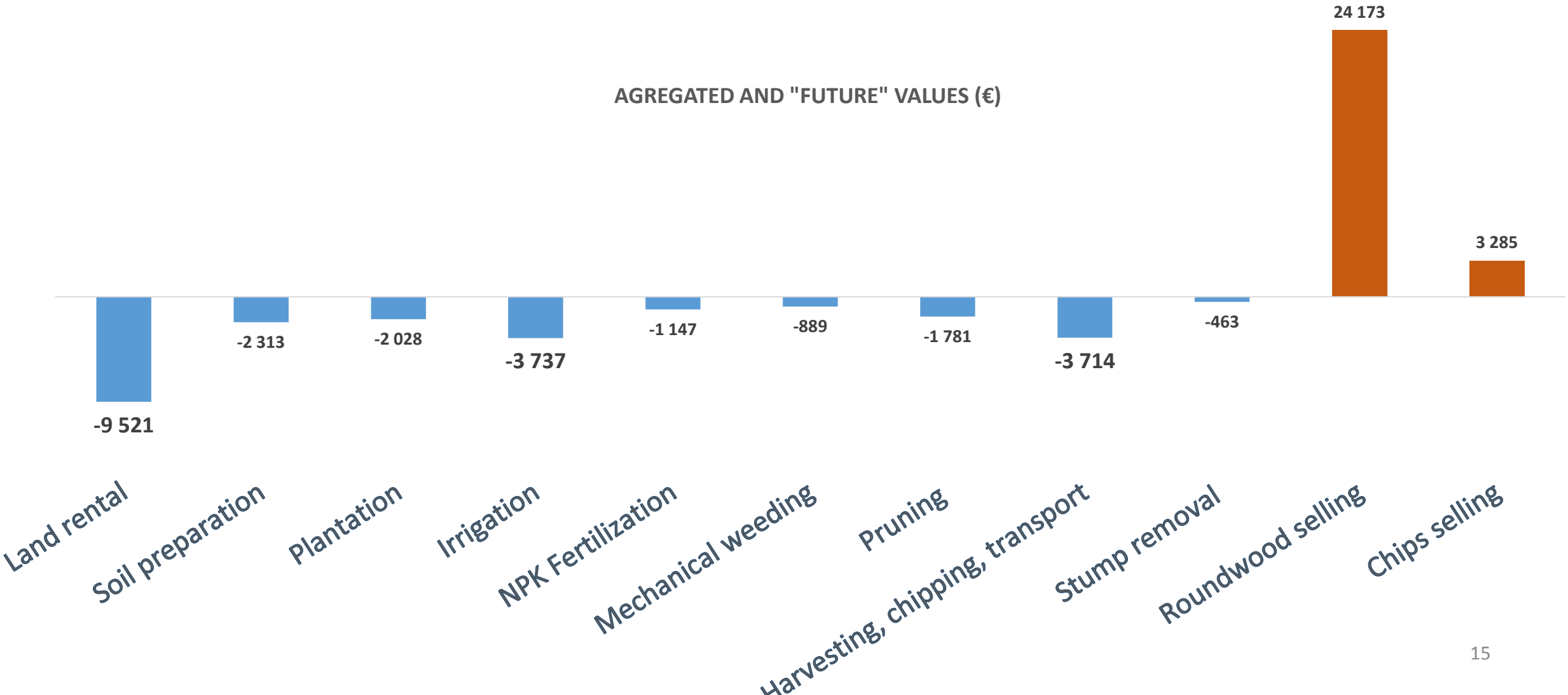
Environmental comparision *Integrated Vs SRC*

Functional unit: dried tonnes

	Ratio SRC/Integrated
Climate change	2,2
Terrestrial acidification	5,0
Freshwater eutrophication	3,0
Marine eutrophication	20,3
Human toxicity	2,0
Photochemical oxidant formation	1,4
Particulate matter formation	2,6
Terrestrial ecotoxicity	4,0
Freshwater ecotoxicity	2,7
Marine ecotoxicity	1,2
Water depletion	4,0
Metal depletion	0,8
Fossil depletion	2,9

Results and discussion

Economic analysis



Results and discussion

Economic comparison

Units: €

	Integrated	SRC
Operational cost	-23,569	-29,860
Roundwood selling	24.173,50	0
Chips selling	3.285	18.098,60
Annualized NPV (€·ha^{-1}·year^{-1})	271	-719
IRR (%)	7,30%	Negative

Harvesting&Transport	Integrated	SRC
	3.714	8.399

CONCLUSIONS

- It is important to remark than “fertilization” showed strong influence in environmental issues but does not in economic balance.
- Irrigation phase has strong contribution to environmental and economic performance and it is a difference with northern European countries.
- Harvesting phase is the most important one for environmental impact and the third one in economic analysis. Hence, the process optimization efforts should be addressed to the harvesting operations, which mechanization degree is low.
- Integrated roundwood and woodchips harvesting show less environmental impacts and better economic results that poplar energy crops.

THANKS FOR YOUR ATTENTION

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