Research to improve the harvesting of forest biomass from mountain areas in Italy

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CNR – Ivalsa

Italy

CNR-IVALSA

- Public Research Organization
- Research, Development, Transfer

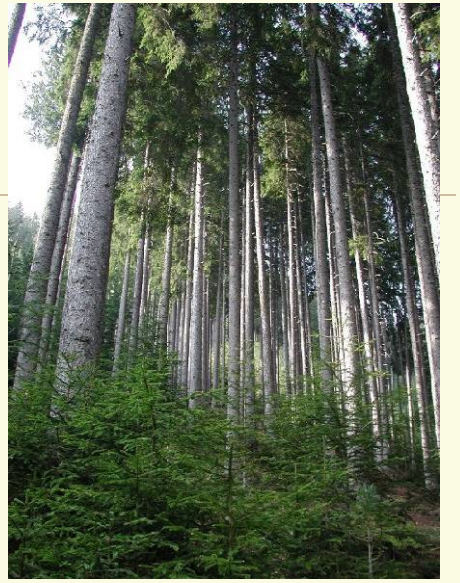
- IVALSA

- Forest Engineering since 1970

Forests in Italy

- ca. 10 * 10^6 ha
- 35 % National territory
- > 2/3 Mountain areas
- 1 bill. m^3 growing stock
- 9 mill. m^3 harvest

Silviculture



- 70 % hardwood – beech & oaks
- Coppice
- 30 % conifer - spruce, fir, pine
- Close-to-nature –natural regeneration
- No large (> 1 ha) clearcuts
- Selection, shelterwood etc.
- ca. 60% NIPF

Price

Timber = 80 to 120 US$/$m^3$ at landing

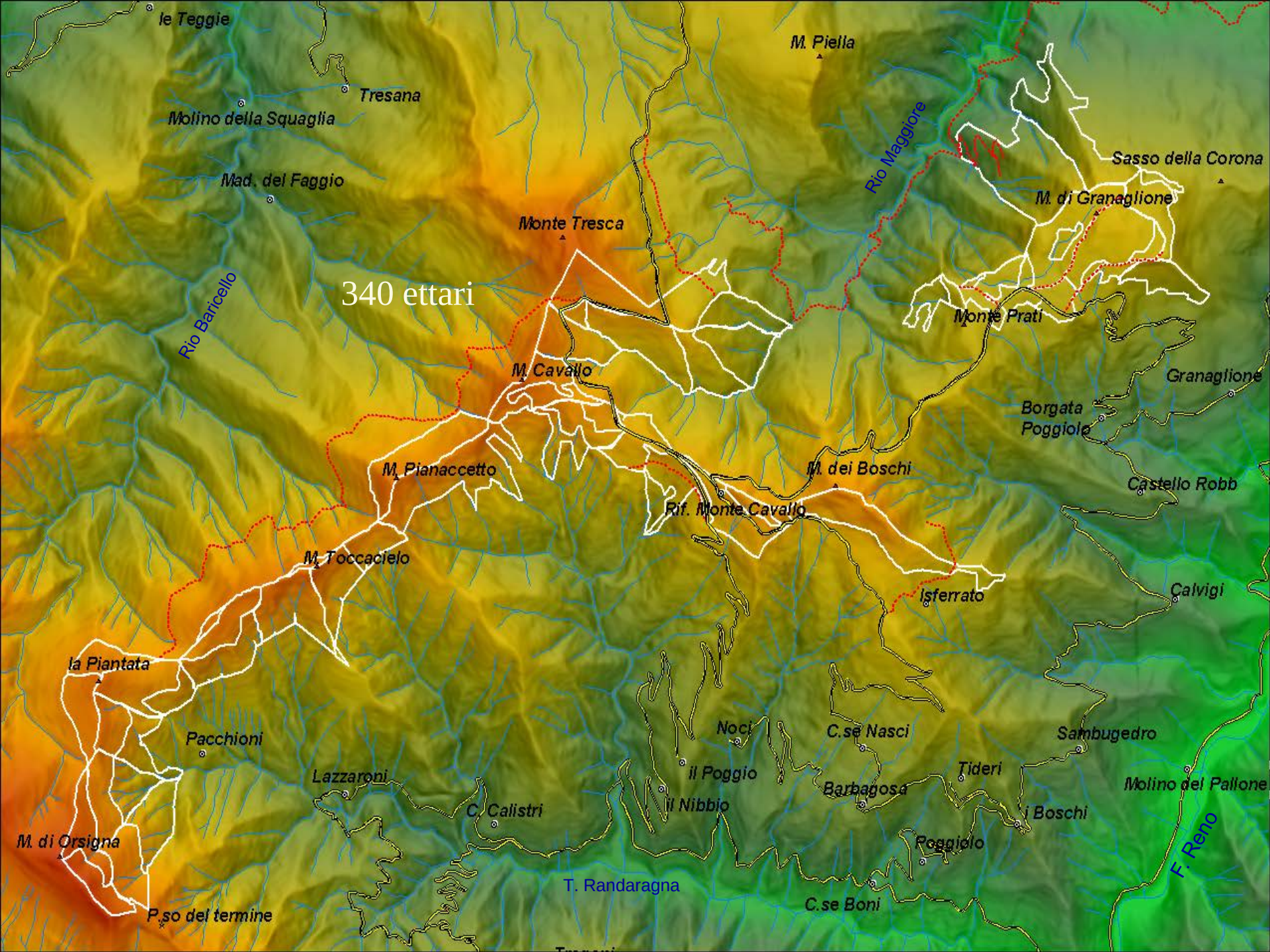
Firewood = 70 to 90 US$/$m^3$ at landing

Pulpwood = 30 to 45 US$/$m^3$ at landing

Chips = 55 to 85 US$/$m^3$ delivered

Labor = 12 to 25 US$/h

Diesel = 8.5 US$/gallon


le Teggie
M. Piella
Tresana
Molino della Squaglia
Rio Maggiore
Sasso della Corona
Mad. del Faggio
M. di Granaglione
Monte Tresca
340 ettari
Rio Baricello
Monte Prati
M. Cavallo
Granaglione
Borgata Poggiolo
M. Pianaccetto
M. dei Boschi
Castello Robb
Rif. Monte Cavallo
M. Toccacielo
Calvigi
Isferrato
la Piantata
Pacchioni
Noci
C.se Nasci
Sambugedro
Lazzaroni
il Poggio
Tideri
Barbagosa
Molino del Pallone
C. Calistri
il Nibbio
i Boschi
M. di Orsigna
Poggiolo
F. Reno
T. Randaragna
P.so del termine
C.se Boni

Landings

Steep terrain CTL?

Yarder + Processor!

Managing the residue

- Loose transport (☹ payload)
- Chipping (☹ space)
- Bundling (☹ cost)

Does bundling pay?

Balancing the cost of bundling: scenario analysis

Scenario	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Bundler Productivity	Average (3.4 ODT SMH^{-1})				Max. (4.4 ODT SMH^{-1})			
Bundles on road train	No	No	Yes	Yes	No	No	Yes	Yes
Storage cost = cost of roof	No	Yes	No	Yes	No	Yes	No	Yes
Bundling (€ ODT^{-1})	31.4	31.4	31.4	31.4	24.2	24.2	24.2	24.2
Saving on transport (€ ODT^{-1})*	1.0	1.0	8.0	8.0	1.0	1.0	8.0	8.0
Saving on storage (€ ODT^{-1})	12.1	3.8	12.1	3.8	12.1	3.8	12.1	3.8
Saving on comminution (€ ODT^{-1})	16.4	16.4	16.4	16.4	16.4	16.4	16.4	16.4
Balance (€ ODT^{-1})	1.8	10.2	**-5.1**	3.2	**-5.3**	3.1	**-12.3**	**-3.9**
% bundling cost covered	94	67	**116**	90	**122**	87	**151**	**116**

Notes: * calculated for an assumed one-way transportation distance of 35 km

Chipper trucks

Long-range full-suspension

Storage

Descriptive Statistics
Split By: TIPO

	Mean	Std. Dev.	Std. Error	Count	Minimum	Maximum	# Missing
%, Total	35,973	10,844	1,565	48	18,267	58,739	0
%, C	32,822	10,550	2,302	21	18,267	56,888	0
%, SC	40,873	10,013	2,585	15	24,686	58,739	0

Results for totals may not agree with results for individual cells because of missing values for split variables.

Unpaired t-test for %
Grouping Variable: TIPO
Hypothesized Difference = 0

	Mean Diff.	DF	t-Value	P-Value
C, SC	-8,051	34	-2,305	,0274

Small scale operators

- Miniyarders
- Miniprocessors

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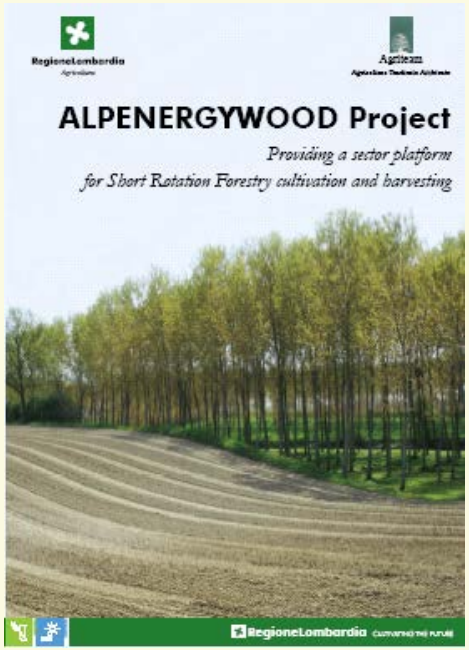

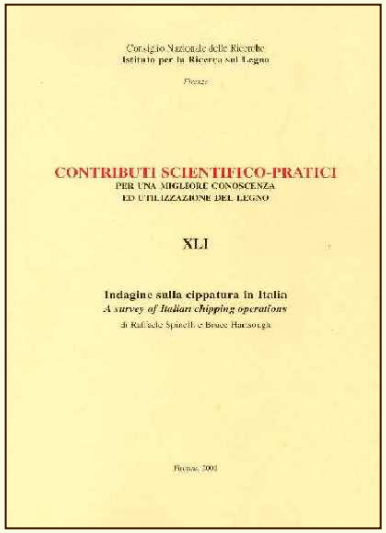

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