
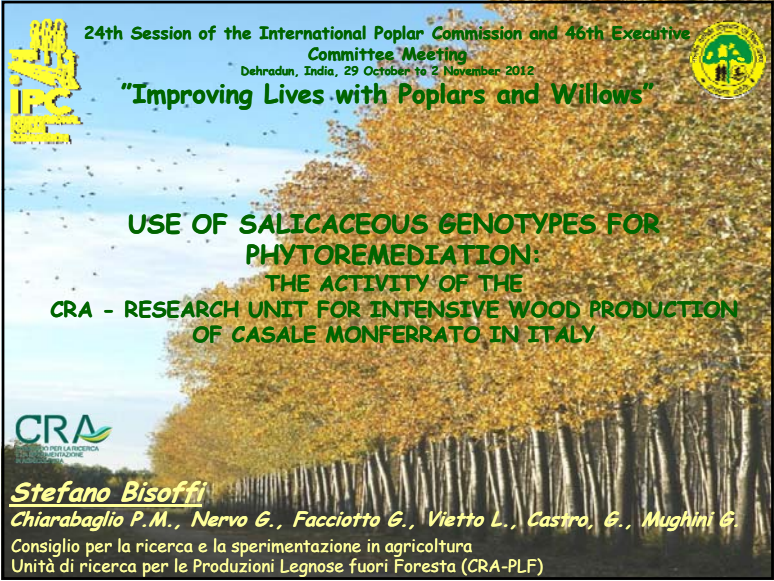



24th Session of the International Poplar Commission and 46th Executive Committee Meeting
Dehradun, India, 29 October to 2 November 2012
"Improving Lives with Poplars and Willows"



**USE OF SALICACEOUS GENOTYPES FOR PHYTOREMEDIATION:
THE ACTIVITY OF THE
CRA - RESEARCH UNIT FOR INTENSIVE WOOD PRODUCTION
OF CASALE MONFERRATO IN ITALY**


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Unità di ricerca per le Produzioni Legnose fuori Foresta (CRA-PLF)






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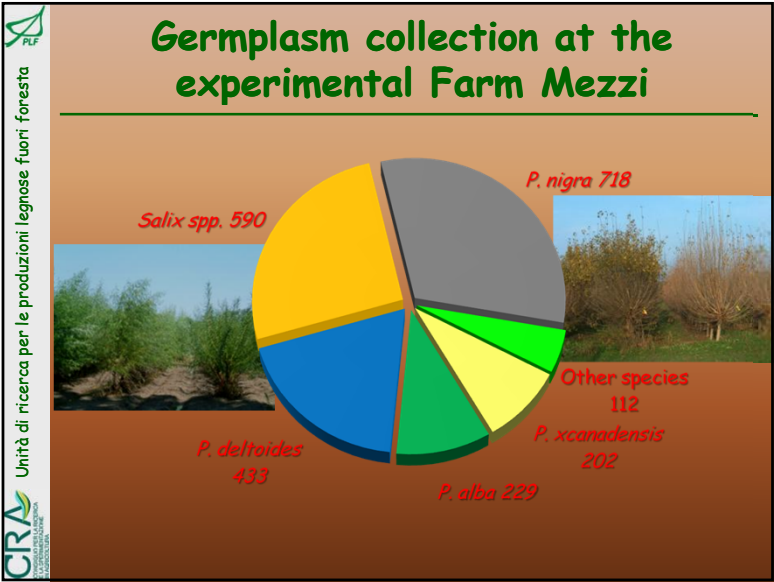
Introduction




Mission of CRA-PLF:

... develops intensive cultivation of woody plants, selects poplar and willow genotypes for environmental uses in particular for the protection of surface waters from pollution and for the rehabilitation and decontamination of soils contaminated by industrial waste (phytoremediation)








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Activity

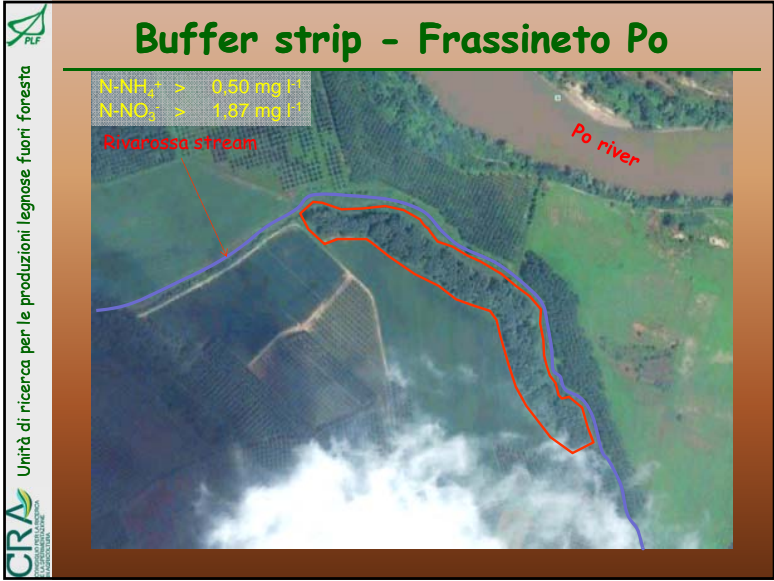
Type	Number of experiments ongoing (n. presented)	Surface interested [ha]
Buffer zones	20 (2)	150
Mycorrhization	1 (1)	1
Waste water use	1 (1)	1
Saltiness	1 (1)	1
Phytoremediation	4 (4)	3

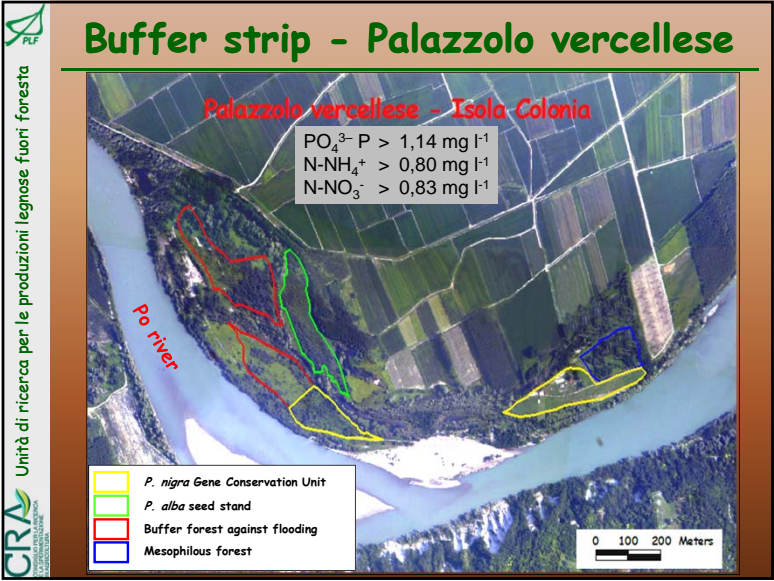


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Buffer zones					
Site	Planting year	Species	Planting density (trees ha ⁻¹)	Area (ha)	Objective
Frassineto Po AL	1996	<i>Populus nigra</i> , <i>Populus alba</i> , <i>Salix alba</i>	1100	2,5	reduce Nitrogen in maize soil
Palazzolo vercellese VC	2005-2008	<i>Populus nigra</i> , <i>Populus alba</i>	285	15	reduce Nitrogen in rice soil





Mycorrhization

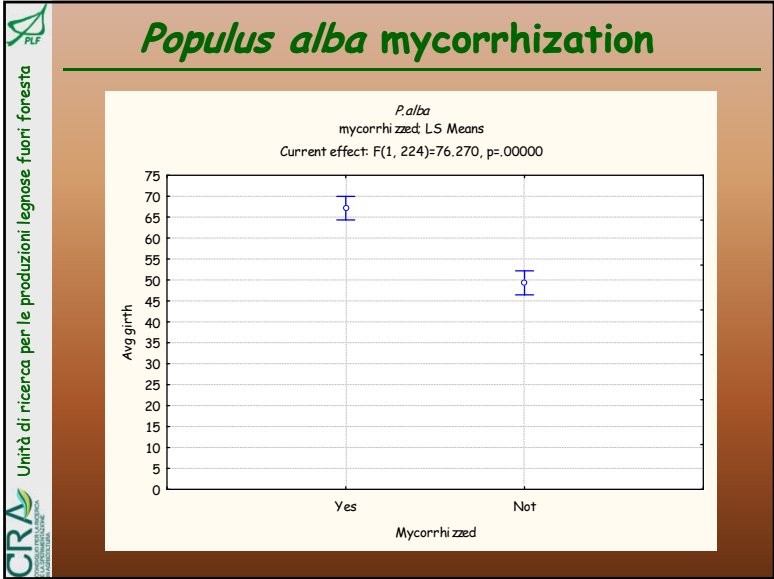
Site	Planting year	Species	Planting density (trees ha ⁻¹)	Area (ha)	Objective
Caramagna Piemonte CN Farm. Merlino	2009	<i>P. alba</i> (60 genotypes)	1600	1,3 ha	evaluate the effects of root mycorrhization against drought stress

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Populus alba mycorrhization

A mycorrhization mixture sprinkled on the roots containing:

- arbuscular mycorrhizal *Glomus*,
- Pseudomonas* and *Bacillus* bacteria,
- Actinomyces* genus *Streptomyces*,
- Saprophytes* genus *Trichoderma*



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Waste water use

Site	Planting year	Species	Planting density (trees ha ⁻¹)	Area (ha)	Objective
Mussomeli CL	2008	<i>Populus</i> spp., <i>Robinia</i> <i>pseudacacia</i> , <i>Eucalyptus</i> <i>camaldulensis</i> <i>E. globulus</i> , <i>Acacia saligna</i>	6600	0,5 ha	evaluate site suitability in southern Italy to cultivate biomass for energy using drip irrigation with water coming from a sewage treatment plant

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Waste water - Mussomeli

Avg shoot number per stump (Sn), diameter mm (D130), total height cm (Ht), biomass Oven dry tons ha⁻¹ (DB) per species at the 2° year and per year (DBy)

Species	Sn	D130	Ht	DB	DBy
<i>A. saligna</i>	2,5	30	321	24,8	12,4
<i>E. camaldulensis</i>	1,7	30	298	10,6	5,3
<i>E. globulus</i>	1,1	31	331	7,8	3,9
<i>Populus</i>	1,4	22	272	5,8	2,9
<i>Robinia</i>	1,6	17	227	2,9	1,4

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Salinity stress

Site	Planting year	Species	Planting density (trees ha ⁻¹)	Area (ha)	Objective
Lentini SR Farm San Giovanni Arcimusa	2012	<i>P. xcanadensis</i> (10 clones)	1100	0,5 ha	evaluate salinity stress by irrigating with water with high sodium chloride concentrations

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Poplar plantation - Lentini



Irrigation water with Sodium Adsorption Ratio = 4.5

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Phytoremediation

Site	Planting year	Species	Planting density (trees ha ⁻¹)	Area (ha)	Objective
Rocca Massima LT	2004	<i>Populus nigra</i> var. <i>italica</i>	1300	0,12 ha	evaluate the phytoremediation ability of poplar on olive mill wastewater
Scarlino GR	2006	<i>Populus</i> spp. (5 clones), <i>Salix</i> spp. (5 clones), <i>Eucalyptus</i> spp. (16 clones)	-	pot	evaluate the phytoextraction of Arsenic by leaves
Scarlino GR	2010	<i>P. xcanadensis</i> (2 clones Orion, Imola)	1100	0,2 ha	evaluate the phytoremediation ability of poplar on contaminated soil - ongoing experiment
Alessandria	2012	<i>P. xcanadensis</i> (35 clones) <i>Salix</i> spp. (10 clones)	9000	0,02 ha	evaluate the phytoremediation ability of poplar and willow on contaminated soil - ongoing experiment


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Phytoremediation - Rocca Massima

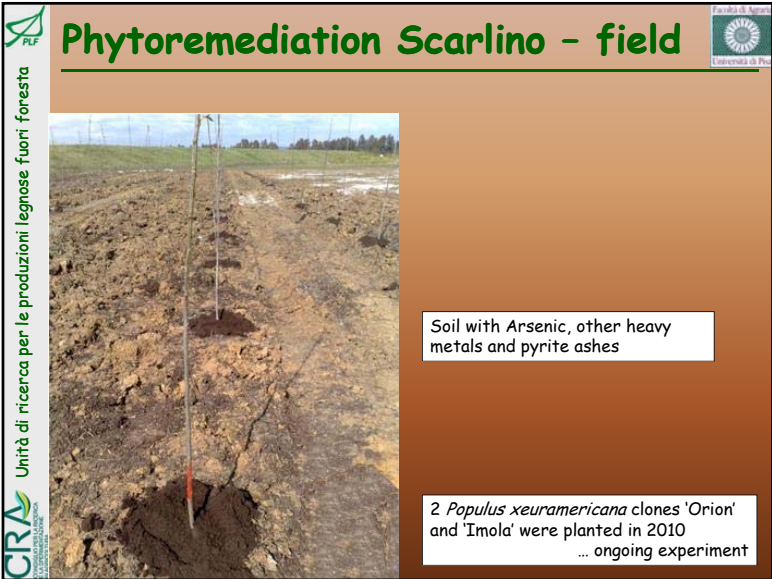
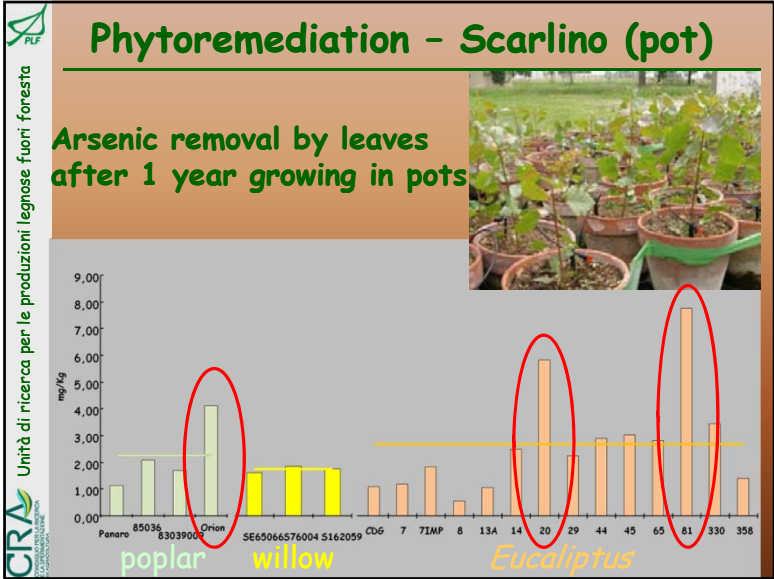
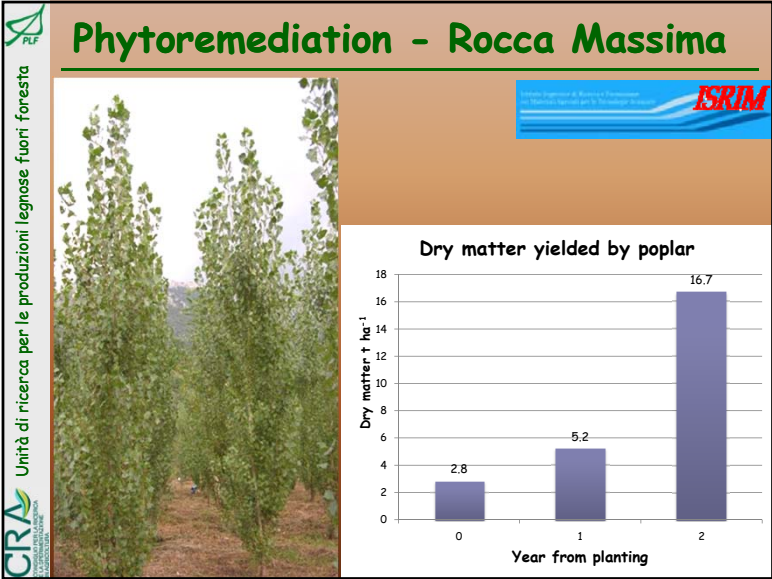



In cooperation with ISRIM, owners of the patented phytoremediation system



Chemical and physics variation in olive mill wastewater sampled at the second year in the phytoremediation plant.



	dec-05	mar-06	jul-06
pH	4.7	6.7	7.6
Conductivity (mS/cm)	10	7.7	3.7
COD (mg/l)	37700	14600	550
BOD ₅ (mg/l O ₂)	10800	3400	270
Total phenols (mg/g)	249	147	5





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Phytoremediation Alessandria

Soil polluted by heavy metals

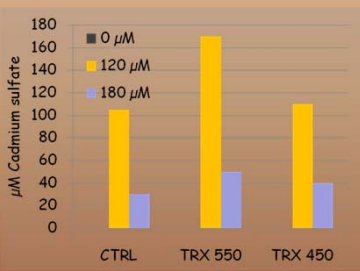


35 *Populus xeuramericana* clones and 10 *Salix spp.* clones were planted in 2012
... ongoing experiment

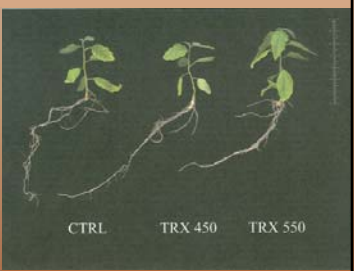

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Poplar transgenic trees



Concentration (µM)	CTRL (µM)	TRX 550 (µM)	TRX 450 (µM)
0	0	0	0
120	~160	~50	~110
180	~40	~40	~40



Transgenic plants (TRX450, TRX 550) and non-transformed (CTRL) after 6 weeks' culture on a medium containing 0, 120 and 180 µM Cadmium sulfate


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