

**International Poplar Commission
24th Session, Dehradun, India**

COUNTRY REPORT

Activities Related to Poplar and Willow Cultivation and Utilization

Electronic versions of national reports (including the questionnaire) should be sent to the IPC-Secretariat, E-mail IPC-Secretariat@fao.org no later than 31st March 2012.

The reporting period is 2008 to 2011 (4 years).

I. POLICY AND LEGAL FRAMEWORK

In Italy poplar and willow cultivation is traditionally considered much more related to agriculture than to forestry. The first main reason is the existence of a strict forest legislation not allowing to turn into agriculture land that has been covered by forest (national law n. 3267 of the year 1923, taken into account also by the last forest law, the decree n.227 of 2001). The relevant protective functions towards soil erosion, landslides prevention and water management carried out by forests in Italy stay behind this provision, aiming to avoid land covered by forest from being converted into other uses, for instance agricultural and urban ones: therefore poplar plantations, due to their flexible and short-term management, are still considered as an agricultural crop to not incur in such constraints. The second reason is that poplar cultivation is feasible mainly on plane, flat soils managed in an integrated way by agriculture farms, also benefiting sometimes of EU subsidies provided by the rural development regulation addressed to agricultural activities.

Laying in a sort of “limbo” between agriculture and forestry, poplars and willows’ cultivation is not regulated by any specific national policy, apart from few actions promoted mainly by the National Poplar Commission of Italy and by some interested Regions (e.g. Regione Lombardia). During last years no any significant development in national policies, laws or regulations related to poplars or willows did occur, apart from the definition of “forest” of the decree 227/2001 currently under revision. In the meantime the surface covered by traditional poplar cultivations is continuously decreasing because the competition, both in the use of soil with other more rentable agricultural crops and because cheaper poplar products coming from abroad: such surface so reached in 2005 an amount estimated around 66.000 ha and it is probably still further decreasing.

Nevertheless, many interesting developments are occurring in research and field activities, mainly in relation to innovative uses of poplars. Many centres – for instance the Research Unit of Casale Monferrato, some Universities and private forest nurseries - are currently carrying out selections and experiments on new clones having characteristics of salinity, drought and pests resistance. The interest in the use of poplars and other fast growing species (as elms) cultivated in fast growing plantations is also continuously increasing, in many cases combining the goals of bioenergy production and phytoremediation of polluted waters and soils: the surface of short rotation plantations is therefore raising, although it is not yet fully captured by official statistics.

In some cases wood products from poplars or others plantations start to be used in big plants for biorefinery (a 40 ktpa cellulosic ethanol plant is about to start its activities in Crescentino – VC and it is expected to absorb some 80% of the poplar production in Piedmont) or for processing new wood products (e.g. OSB poplar boards whose first factory is about to be completed in

Coniolo - AL), therefore likely to increase the economic competition in the use of poplars products. Also different cultivations systems - for instance a 15 years harvesting period combined with a mixed composition of poplars and others - is currently promoted in Lombardia together with a growing interest to consider in the carbon storage capacities of poplar stands. Also their possible environmental outputs, especially in urban and periurban areas, are taken into account in new forests planted for recreational purposes. Some details on such researches are given below.

II. SUMMARY STATISTICS (Questionnaire)

Complete the attached questionnaire on poplars and willows summarizing statistics of key parameters in poplar and willow resources, production, utilization, trade and future trends.

The statistical data reported in the "Questionnaire" derive from the national forest inventory INFC (INFC, 2005), available since 2007. Indigenous Poplars and Willows amount to 58.223 hectares, including mainly *P. nigra*, *P. alba* and *S. alba*. Planted poplars cover 101.430 hectares (Questionnaire tab.1) taking into account intensive plantations (66.269 ha), semi-natural forests (29.161 ha) and short rotation forestry (about 6.000 ha). Planted poplars represent 60 % of all poplar and willow categories, among which 40% are intensive plantations for the production of wood for the wood processing industry (Questionnaire tab. 2). The most cultivated clone among planted Poplars is 'I-214' (77%) (Questionnaire tab. 3).

No information is available on the productions of the 'Indigenous' category. 'Fuelwood chips' include fuelwood originating both from intensive plantations and from energy SRF (Questionnaire tab. 5).

III. TECHNICAL INFORMATION

1. Identification, registration and varietal control

Report on accomplishments on identification and on proposals made for the registration of new cultivars of poplars and willows.

During the last four years the National Poplar Commission of Italy registered definitively n. 17 poplar clones in the National Register of Forest Basic Materials (NRFBM) according to articles n.10 and n.11 of the Legislative Decree n. 386/2003 (Table 1). Most of these clones were selected at the CRA-PLF research center of Casale Monferrato (AL): 'Soligo', 'Lambro', 'Taro', 'Brenta', 'Mella', 'Timavo', 'Arno', 'Lima', 'Adda', 'Stura', 'Panaro', 'Oglio', 'Sile'. The others belong to private owners or private companies : 'Ballottino' was selected by Mr. Fabrizio Di Tella, 'Patrizia Invernizzi' by Ms. Patrizia and Maria Invernizzi (Gussola, CR), 'A4A' by Mr. Franco Alasia (Cavallermaggiore, CN).

Other n.9 clones obtained temporary (10 years) registration in the NRFBM (Table 2). Most of them – 'Sirio', 'Pegaso', 'Monviso', 'AF2', 'AF6', 'AF8' - were selected by the Alasia Franco Company; the remaining ones, 'Imola' and 'Orion', belong to the CRA-PLF. For two *P. alba* clones selected by Mr. F. Alasia for biomass purposes, 'Marte' and 'Saturno', the phase of temporary registration expired in 2011 and they will soon be registered definitively. Moreover there are n. 11 poplar clones still under test (Table 3); among these, the clones 'AF3' and

‘Baldo’ will be temporarily registered and commercialized for the period 2012-2022.

Concerning *Salix* spp., recent releases specifically targeted for biomass production are the two varieties ‘Drago’ and ‘Levante’ (seedlings from an open pollinated *S. matsudana* female)

Table 1 - Poplar clones definitively registered in the National Register of Forest Basic Materials

Clone	Registration		Sex	Species	Breeder
	request	definitive			
SOLIGO	1991	01/07/2011	M	<i>Populus</i> spp.	CRA-PLF
LAMBRO	1991	01/07/2011	M	<i>Populus</i> spp.	CRA-PLF
TARO	1991	01/07/2011	M	<i>Populus</i> spp.	CRA-PLF
BRENTA	1991	01/07/2011	F	<i>P. ×canadensis</i>	CRA-PLF
MELLA	1991	01/07/2011	F	<i>P. ×canadensis</i>	CRA-PLF
TIMAVO	1992	01/07/2011	M	<i>P. ×canadensis</i>	CRA-PLF
ARNO	1992	01/07/2011	M	<i>P. ×canadensis</i>	CRA-PLF
LIMA	1992	01/07/2011	F	<i>P. ×canadensis</i>	CRA-PLF
ADDA	1997	01/07/2011	F	<i>P. ×canadensis</i>	CRA-PLF
STURA	1997	01/07/2011	F	<i>Populus</i> spp.	CRA-PLF
SESIA	1997	01/07/2011	F	<i>P. ×canadensis</i>	CRA-PLF
PANARO	1997	01/07/2011	M	<i>P. ×canadensis</i>	CRA-PLF
OGLIO	1997	01/07/2011	M	<i>P. deltoides</i>	CRA-PLF
SILE	1997	01/07/2011	F	<i>Populus</i> spp.	CRA-PLF
A4A	1995	01/07/2011	F	<i>P. ×canadensis</i>	Alasia Company
BALLOTTINO	1995	01/07/2011	F	<i>P. ×canadensis</i>	F. Di Tella
PATRIZIA INVERNIZZI	1991	01/07/2011	F	<i>P. ×canadensis</i>	P. Invernizzi

Table 2 - Poplar clones temporarily registered in the National Register of Forest Basic Materials

Clone	Registration		Sex	Species	Breeder
	request	temporary			
IMOLA	2002	01/07/2011	F	<i>P. ×canadensis</i>	CRA-PLF
ORION	2002	01/07/2011	M	<i>P. ×canadensis</i>	CRA-PLF
SIRIO	2003	01/07/2011	M	<i>P. ×canadensis</i>	Alasia Company
MONVISO	2003	01/07/2011	F	<i>P. ×canadensis</i>	Alasia Company
PEGASO	2000	01/07/2011	M	<i>Populus</i> spp.	Alasia Company
AF2	2003	01/07/2011	M	<i>P. ×canadensis</i>	Alasia Company
AF6	2005	01/07/2011	F	<i>Populus</i> spp.	Alasia Company
AF7	2005	01/07/2011	M	<i>Populus</i> spp.	Alasia Company

AF8	2005	01/07/2011	F	<i>Populus</i> spp.	Alasia Company
MARTE	1999	30/03/2001	M	<i>Populus alba</i>	Alasia Company
SATURNO	1999	30/03/2001	M	<i>Populus alba</i>	Alasia Company

Table 3 - Poplar clones submitted to the National Poplar Commission

Clone	Date of request	Status	Sex	Species	Breeder
AF3	2005	testing	F/M	<i>Populus</i> spp.	Alasia Company
AF4	2005	testing	F	<i>P. ×canadensis</i>	Alasia Company
AF9	2005	testing	?	<i>Populus</i> spp.	Alasia Company
DIVA (83.002.031)	2005	testing	F	<i>P. ×canadensis</i>	CRA-PLF
ALERAMO (83.141.020)	2002	testing	M	<i>P. ×canadensis</i>	CRA-PLF
TUCANO (84.260.003)	2002	testing	M	<i>P. ×canadensis</i>	CRA-PLF
83.002.011	2002	testing	F	<i>P. ×canadensis</i>	CRA-PLF
83.141.017	2002	testing	M	<i>P. ×canadensis</i>	CRA-PLF
83.190.012	2002	testing	M	<i>P. ×canadensis</i>	CRA-PLF
84.048.032	2002	testing	M	<i>P. ×canadensis</i>	CRA-PLF
BALDO (85.036)	2011	testing	M	<i>P. deltoides</i>	CRA-PLF

2. Production Systems and Cultivation

Report separately information on the application of new knowledge, technology and techniques in application of poplar and willow culture for different purposes, including production, protection or conservation:

- (a) *Nursery practices and propagation techniques including applications of biotechnology - particularly plant propagation, reproductive materials, use of GMOs etc.*

In the last four years the Research Unit for Intensive Wood Production of the CRA in Casale Monferrato has been working on adapting the cultural model to the new clones recently registered in the National Register of Basic Forest Materials. In particular pruning trials are in progress, which are conducted in the nursery at the beginning of the second year, to reduce the dimensions of knots and the tapering shape of the poles.

New plant densities have been tested in the stoolbed for the production of cuttings of the new clones - 67.000 plants per hectare instead of 55.000 - to try and reduce above all the dimensions of the whips and the number of silleptic branches after each coppicing.

Technical advice has been provided to private nurserymen for the introduction of drip irrigation as an alternative to sprinklers to reduce water consumption in nurseries.

- (b) *Planted Forests with emphasis on the experiences and experiments concerning the purpose, choice and preparation of site, the choice of cultivars, type of plants, spacing and layout of plantations; planting and tending (fertilization,*

irrigation, weeding, pruning, etc.); management (growth, rotation in relation to yields and industrial requirements, thinning techniques if practised, etc).

The area of traditional poplar cultivation, based on ten-year cycles, for the production of plywood, is steadily decreasing. The tendency is also continuing towards a farming model based on increased distances between plants, with a density of about 240 plants per hectare instead of the 280-330 previously used to produce logs of higher quality and to have greater flexibility in the length of the cycle.

Poplar cultivation is probably undergoing a differentiation process towards a number of diverse cultural models, each specific to a group of products or environmental services (e.g. phytoremediation, especially in combination with SRF, and landscape restoration). In the short run the demand for poplar wood by pallet, paper and energy industries is likely to increase. Such demand will no longer be satisfied only by the sub-products of traditional poplar cultivation, therefore dedicated cultivations will become necessary.

Research activities on these topics have been supported by ministerial funding with the goal to obtain technical and economic information, to increase dry matter production per hectare and to achieve the objectives defined in the national strategy for rural biomass energy development. In this framework, 60 experimental plantations have been established all over the Country under different environmental conditions applying either the “Very high density model” (5700-10000 plants per hectare) or the “High density model” (1100-1600 plants per hectare) and using poplar, willow, and other fast growing species.

The new poplar varieties ‘Orion’, ‘Imola’, ‘Baldo’ selected at the CRA-PLF and ‘Monviso’, ‘AF2’, ‘Sirio’, ‘Pegaso’, ‘AF8’ selected by the Alasia Franco Company, characterized by good growth rate, disease and pest tolerance and better sprouting ability after repeated coppicing, have determined an increase of productions while reducing the economic and energetic costs. Site characteristic (soil fertility, climatic condition) and water availability (precipitation and irrigation) are the main limiting factors to productivity. The clones/provenances utilized in SRC trials have showed yields up to 25 Oven Dry tons (O.D.t.) ha⁻¹year⁻¹; the yields in commercial plantations, where fertilization and irrigation are rarely applied by farmers, have been lower (average ranging from 6 to 12 O.D.t ha⁻¹year⁻¹).

In the “very high planting density” trials the coppice cycle is generally short (2-3 years); the quality of the wood biomass produced is low owing to a high bark percentage (15-20%) and it is mostly used as chips for bio-energy power plants or for co-firing in thermo-electric plants and incinerators. In the case of “high planting density” the cycle is longer (5-6 years) and usually the yields obtained are within the range of 8 to 20 O.D.t ha⁻¹year⁻¹; in this case the quality of the raw material is good, having a lower bark percentage, and it is preferably used for other industrial products or for pellet production.

According to these preliminary results recently planted SRC show to be a good renewable energy source, although further research could improve the cultivation of dedicated woody crops. Further developments of woody bio-energy crops will be connected to the implementation of the 5-6 years rotation model, along with improved cultivation techniques, or

associated with phytoremediation, as well as to enlarging the choice of clone/species suitable to different site conditions, especially in central and southern parts of the Country.

- (c) *Indigenous Forests, with emphasis on experiences and experiments concerning silvicultural treatments, harvesting, management, protection and regenerating of natural forests.*

Within a research project funded by the Po River Fluvial Park, environmental analyses were carried out in the northern plains of Italy to characterize suitable sites to be converted into semi-natural forests. An old poplar plantation and an old natural plain forest located in a typical flooding area, 16 hectares wide, nearby Casale Monferrato were chosen to the purpose.

In order to evaluate the ecological conditions and to choose both the silvicultural practices to be carried out on the indigenous forest and the composition and the layout of the area to be converted into a semi-natural forest, the Soil Quality Index, based on the arthropods present in the top soil, was calculated. Such index ranges from 0 to about 300, where 0 indicates the worse quality soil whilst the maximum value corresponds to the best quality soil, typical of natural forest. The soil was alluvial with sandy or coarse sandy texture. The area to be turned into a semi-natural forest was covered by an over-mature artificial poplar stand with many defective trees. The natural forest surrounding this plantation mainly consisted of *Populus nigra*, *Populus alba*, *Salix alba*, *Quercus robur*, *Crataegus monogyna*, all of which quite degraded due to the presence of *Robinia pseudacacia*. The Soil Quality Index reached the highest value (206) in the old poplar plantation where the tree crowns were totally closed; in the natural forest it was 180, while in the poplar plantation where many trees were missing it only reached 122.

To convert the artificial plantation as rapidly as possible, with only few cultural operations, the old stand was felled and a semi-natural plantation was established using *Populus nigra* and *Populus alba* as pioneer species, beside other forest species like *Quercus robur* and *Crataegus monogyna*.

As for poplars, the planting material was provided by the nursery of the CRA-PLF experimental farm, where over 170 genotypes collected from the northern regions of Italy are produced for environmental purposes. Poplars were planted at 8 m x 8 m spacings, with the other species in between, with a semicircular layout following the old river meander. Hydrogel (*Potassium polyacrylamide*) was mixed with the soil in the holes before planting to ensure water availability during the drought period. Weed control was carried out twice a year with a shredder.

This activity resulted in a dynamic poplar stand, which was an *in situ* genetic conservation unit able to assure adaptation to climate changes and to facilitate natural dissemination and river banks re-colonization.

- (d) *Agroforestry and Trees Outside Forests with emphasis on the experiences, studies and experiments in different growing mechanisms for trees outside forests and agroforestry systems and their effects on forest and agricultural crops or livestock and diversification of the landscape.*

Poplars and willows are typical features of the Italian rural landscape, mainly in Northern Italy (Po

Valley). They are present as forest plantations, tree rows, riparian strips and in some agroforestry systems.

In the latter case poplar trees (200-333 trees/ha) are grown in combination with herbaceous crops (corn, soy, horticultural and fodder crops) during the first 2-3 years of a 10 year rotation. In the past, poplars were often grown in association with cereal crops (wheat and barley), in Piedmont. This practice is advantageous with heavy soils, where in spring the water consumption of herbaceous crops improves the soil aeration and the development of poplar roots; on the contrary, on loose soils or in dry years this intercropping could hinder the development of poplar seedlings. More generally, agroforestry systems can reduce the contamination of groundwater by nitrate leaching. Poplar roots, in fact, which are deeper than herbaceous ones, play a complementary role in nitrate adsorption.

Poplars and willows are also present as Trees Outside Forest, generally as tree rows and riparian strips (called hedgerows in the following), mostly represented by *Populus nigra*, *P. alba*, *P. x canadensis* and *Salix spp.* Although specific research projects, integrated with the 2nd Italian forest inventory (INFC), provided national estimates of the area and of some qualitative attributes of hedgerows, an estimate of the area covered by poplar and willow hedgerows is not available at national level. However, based on several local studies and INFC statistics on hygrophilous forests, their area, at national level, was assessed to be equal to some 30.000 ha.

Poplar and willow hedgerows perform many important environmental (soil and water protection, carbon sink), ecological (ecological corridors and biodiversity reservoirs) and socio-economic functions (fuelwood production, fencing, cultural, historic and scenic value). The identity of the Po Valley landscape is also tied to the tree rows of poplars and willows and is connected with the traditional use of these species as a support for the vineyard cultivation (*piantata padana*) and almost disappeared in the last half century due to the intensification of agriculture. From this point of view, the rows of poplars and willows in the lowlands are one of the few remaining elements of the traditional agricultural landscape.

3. Genetics, Conservation and Improvement

Report research and applications of technology in genetics, conservation and tree improvement achieved by the following categories:

- (a) *Aigeiros section*
- (b) *Leuce section*
- (c) *Tacamahaca section*
- (d) *Other sections*
- (d) *Willows*

The 'Research Unit for Intensive Wood Production' (CRA-PLF) still leads *Populus* and *Salix* domestication programs in four programmatic areas:

- conservation and evaluation of genetic resources;
- controlled hybridization and development of varieties able to meet the requirements of

the main industrial applications or which can be used for phytoremediation and production of woody biomass for energy;

- production of genetically modified plants by the insertion of useful characters of agronomic and environmental interest;
- clone identification and assisted selection within conventional breeding programmes using molecular markers (SSR; AFLP).

Conservation programs of *Salicaceae* are still active in order to maintain a broad genetic base to support both long and short term breeding strategies and to select groups of fast growing clones with a diversified genetic background. The genetic variability of the material cultivated is extremely important to avoid epidemiological risks both in traditional plantations (wood production for the plywood industry) and in the case of dedicated energy crops (biomass plantations for the production of energy).

Conservation involves both *in situ* efforts (identification, cataloguing, assessment, and protection of native populations) and *ex situ* (long-term storage of seed and pollen and the preservation of wild collections in cultivated archives and arboreta). The CRA-PLF is presently maintaining wide collections of poplar (around 1700 accessions) and willow (around 600 accessions). In particular the conservation of native *Populus* genetic resources (*P. nigra*, *P. alba*) is extremely important as it ensures the ability of the species to adapt to future changes in climate, pathogens, and hydrologic conditions. Moreover, stocks of these *species* can be successfully used for phytoremediation and restoration of degraded sites and fluvial areas.

Collections of seed lots and vegetative materials have been established recently in order to enlarge the germplasm banks of the native species; screenings and assessment are underway. The construction of levees, dams, and revetments along many of the major rivers has reduced the natural cycle of flooding, essential to the regeneration of *Populus nigra* and, with a consequent reduction of genetic resources. For this Eurasian species the preservation of its genetic diversity is a priority throughout Europe and a core-network dynamic gene conservation units is being established within the Phase IV (2010-2014) of the EUFORGEN programme (<http://www.euforgen.org/>.)

Inter-specific hybridization of the *P. ×canadensis* taxon and recurrent breeding of parental species *P. deltoides* and *P. nigra* are central to the CRA-PLF breeding program. The *P. deltoides* and *P. nigra* parents of highest general combining ability identified in the early 1990s are currently used in a short-period specific commercial breeding program. Emphasis has been placed on suitability for both energy biomass plantations as well as veneer plantations.

7 elite *P. ×canadensis* clones selected within the F1 populations obtained in the first stage of the breeding program (polycross and common tester mating design carried out in the mid 1980s with *P. deltoides* and *P. nigra* genotypes) and already submitted to the National Poplar Commission for testing, will be proposed for temporarily registration in the National Register of Basic Forest Materials in 2012. These materials were also tested for adaptability to different European environmental conditions: Application for Community Plant Variety Rights has been filed for n. 5 clones: ‘Diva’, ‘Aleramo’, ‘Tucano’, ‘Imola’, ‘Orion’; the last two, which are

very suitable for biomass production, in 2011 obtained from the NPC the authorization to be temporarily commercialized for the next 10 years.

Currently the possibility to obtain an F2 population using *P. ×canadensis* selected F1 genotypes grouped in sub-populations according to their characteristics of resistance and growth-rate is being investigated and, according to schedule, also a second cycle of intra-specific *P. deltoides* and *P. nigra* breeding using a multiple population structure will be carried out.

The breeding program on willow that started in the Nineties (controlled crosses with *Salix alba* × *Salix alba* and open pollination of *S. alba*, *S. jessoensis* and *S. matsudana*) is still underway; new crosses using as parental the best clones of *S. alba* selected within the progenies have been started: growth-rate, tree form, tolerance to diseases and pests (*Asymmetrasca decedens*) and physical features (fiber length, cellulose content) are considered in selection for biomass production and for biofuel crops. Several plantations with different planting densities (European model and American model) have been established in different pedo-climatic conditions and are still being monitored.

Seedlot collections started from some gene conservation units established in the last decade on the Po river with a pool of *P. nigra* genotypes selected within the Italian *P. nigra* reserves (provenance region, rooting, adaptability, tree form and growth rate); according to the EU Directive 1999/105/EC on the marketing of forest reproductive material (FRM), these materials could be classified as “source identified”. According to the experimental data recorded in several pilot trials carried out on the Po river since 2000, a restricted pool of *P. nigra* genotypes characterized by growth performances similar to those of I-214 has been selected for cultivation in fluvial areas with restrictions on intensive agriculture and on use of poplar hybrids; a list of native *P. nigra* to be homologated for restoration activities has been furthermore identified.

The main achievements in Italian poplar biotechnologies have been registered in the framework of the Popit. Project. The production and selection of new poplar clones is achieved by means of innovative breeding programs that allow to increase the frequency of useful genes and groups of genes in parental populations. Most characters of economic interest (resistance to adversities, rapid growth, stem and crown shape) can be improved with a careful use of parents in breeding programs and by clonal selection of superior individuals. To this aim the availability of genetic and genomic maps represents a wealth of knowledge to be exploited in advanced breeding programs. With the genus *Populus* the genetic maps have been used with a QTL approach to identify the genomic regions containing genes that control monogenic and polygenic characters. Molecular markers which are closely associated with important adaptive and agronomic traits could be used in breeding for early marker-assisted selection (MAS) (Mohan *et al.*, 1997; Collard *et al.*, 2005).

A number of programs of genetic mapping have been conducted on the genus *Populus* and have led to the realization of more than 20 maps (Cervera *et al.*, 2004; Gaudet *et al.*, 2007; Markussen *et al.*, 2007; Woolbright *et al.*, 2008). The availability of the complete DNA sequence of *Populus trichocarpa* makes it possible to align the genetic maps with the genomic

sequence using SSR and SNP markers as a bridge. QTL mapping is the first step towards identifying the regions of the genome that control the phenotypic expression of quantitative traits. Knowledge about the genetic control of the main characters behind productivity in plants is still limited compared to that on the physiology of these processes. Molecular-marker assisted selection (MAS) is currently seen as an important resource to be applied to traditional programs of hybridization of tree species aimed at improving the quantity and quality of productions (Boerjan 2005).

The Research Unit for Intensive Wood Production (CRA-PLF) of Casale Monferrato (formerly Poplar Research Institute - ISP) carries out research on poplars and willows, aimed at obtaining fast-growing clones, adapted to different cultivation environments resistant to adversities, which are capable of producing good quality wood. The breeding activity has hitherto led to the creation of several poplar (68) and willow (4) clones of high technological value, tolerant to the most common adversities and particularly suitable for cultivation in different environmental conditions, some of which have also been protected by breeder's right at European level,

To improve the efficiency of poplar and willow breeding programs, new biotechnological approaches have been adopted and new laboratories have been set up for activities that include, beside *in vitro* cultivation techniques and genetic transformation, the use of methods of molecular analysis. The activity carried out so far has already made it possible to develop effective protocols for the characterization and molecular identification of different poplar species and clones, while genetic transformation has been successfully applied to some *Populus nigra*, *P. alba* and *P. xcanadensis* clones with the insertion of exogenous genes for resistance to insects and broad-spectrum herbicides. In addition, a genotype of *Populus deltoides* and one of *Populus nigra* showing differential behavior towards rusts, *Marssonina* spp. and to the wholly aphid, were used as parents to obtain a new progeny. From such progeny a population was selected for obtaining a genetic map of *P. x canadensis* using of SSR markers.

The Dipartimento di Scienze dell'Ambiente Forestale e delle sue Risorse - DISAFRI (*Department of Forest Environment and Resources*) of Viterbo University has gained considerable experience in studying the genetics of natural populations of European native poplar (*P. nigra*, *P. alba*) and in describing, phenotyping and in the genetic analysis of poplar pedigree. A research program was started in the late eighties on the genetic evaluation of native poplar germplasm. At presents DISAFRI's collections comprise several genotypes of white poplar from all over the country and about 1000 black poplar genotypes of Italian and European provenance. In the collection, moreover, are maintained F1 and F2 crosses, and backcrosses, constituted with parents of 'contrasting' origin, and intended for the study of morphological and phenological characters in order to investigate the determinants at the base of biomass productivity. DISAFRI has produced the genetic maps of white poplar and of black poplar and is presently working at finding the QTLs (Quantitative Trait Loci) that code for characters involved in biomass productivity. As regards abiotic stress work has been undertaken on the study of tolerance to salt stress in poplar.

4. Forest Protection

Report on the incidence, scale and impacts of damage in poplars and willows by biotic and abiotic agents:

(a) *Biotic factors including insects, diseases and other animal pests and outline economic aspects and success of control measures undertaken and damage prevention in the future.*

- **Insects**
- ***Situation***

The poplar and willow borer (*Cryptorhynchus lapathi* L.) is confirmed as the most important pest in Italian poplar cultivation, as each year an expense of about 1 million Euros (30 % of the total cost of poplar protection) is made in order to prevent damages in young plantations and in nurseries. This pest is highly injurious in SRF biomass stands too, where chemical control is not technically feasible and economically sustainable.

Other «key» poplar pests in Italy are the large poplar borer (*Saperda carcharias* L.) and the goat moth (*Cossus cossus* L.), which ruin 8 % of poplar trees with considerable economical losses, since injured wood is not appreciated by the plywood industry.

An important threat to poplar cultivation in Italy is represented by the recent introduction, in a restricted area of Central Italy (Caserta Province), of the American pest *Megaplatypus mutatus* (Chapuis), which is able to attack a large number of broadleaf trees (including some valuable productive species such as walnut, apple, hazel, poplar) causing severe damage to the trunks. In fact, adults bore a lot of tunnels into the trunk where eggs are laid and young larvae live feeding on a specific Ambrosia fungus. *M. mutatus* has not spread yet to other Italian districts. However, investigations are ongoing to determine suitable control strategies (including the use of semiochemicals) in order to reduce damage in the affected areas and to reduce the risk of spreading.

Buprestid beetles, particularly *Agrilus suvorovi populnaeus* Schaefer and *Melanophila picta* Pallas, attack young trees suffering from transplant stress or drought, causing weakening or stem breakage. As usual, these pests caused severe damage to 1 year-old plantations during the hot and dry summers of the period concerned. The poplar clear-wing moth (*Paranthrene tabaniformis* Rott.) affected not only poplar nurseries (which is normal), but also young poplar stands in the Central Po Valley. The Poplar twig borer (*Gypsonoma aceriana* Duponchel) is always present at high population levels throughout the whole cultivation area and causes severe damage to young trees in nurseries.

Among sap-sucking insect pests, the poplar woolly aphid (*Phloeomyzus passerinii* Signoret) was the most injurious one, causing bark damage and death of trees when attacks were heavy and prolonged. Infestations were recurrently recorded, mainly in moist areas along rivers of the Central Po Valley. The incidence of this pest is markedly enhanced by the extensive cultivation of highly susceptible clones in Italy. Intense attacks of the polyphagous leafhopper

Asimmetrasca decedens Paoli were recorded in poplar and willow nurseries in Northern Italy, and heavy damage was particularly suffered by *Salix alba* clones. The risk of virus or phytoplasma transmission by the pest has to be investigated more thoroughly.

In the reported period, some outbreaks of defoliators occurred causing damage in poplar stands, which underwent growth losses and general weakening. Massive attacks of *Byctiscus populi* L. occurred in the Po Valley and general high population levels of *Chrysomela populi* L. were recorded throughout the period.

- ***Present control strategies and future perspectives.***

Cryptorhynchus lapathi is effectively controlled by stem spraying in 1-3 year-old poplar stands during sprouting (end of March-beginning of April) or during winter dormancy. The treatment is directed to kill young larvae living in the bark. Pyrethroid insecticides are very effective both in winter and in spring sprayings, whilst organophosphates are more active in spring. Heavy infestations are unlikely to occur when healthy nursery stock is used for transplanting.

Saperda carcharias is generally controlled by chemical spraying against young larvae (end of May) only in young stands, as an alternative to localised treatments by insecticide injection into the gallery. The latter is most commonly adopted in older stands. It is really useful to favour predation by the great spotted woodpecker (*Picoides major* L.), which is an important natural enemy of the pest, preventing the elimination of dead or broken trunks which are used by the woodpecker for nesting.

At present, *Megaplatypus mutatus* is monitored in the colonized area. Mass trapping by synthetic pheromones is highly desirable in a near future, but at present this is still under experimentation. *Phloeomyzus passerinii* is controlled, at the beginning of infestation, by mineral oil sprayings, added with organophosphate insecticides when colonies have already spread over a large part of the trunk. In areas where the attacks of the pest are recurrent, resistant clones are strongly recommended. Within the CRA-PLF genetic improvement program of poplars, clonal resistance is tested in laboratory by artificial inoculation of cuttings.

Also parental (*Populus nigra* and *P. deltoides*) genotypes are tested, in view of a finalised hybrid production program. A study on the chemical basis of resistance is currently being carried out, that could lead to the settlement of a new resistance test methodology. Defoliators can be controlled by *Bacillus thuringiensis* or IGR (Insect Growth Regulator) insecticides, but non-selective chemicals are still widely sprayed in poplar stands. Transgenic poplars encoding proteinase inhibitors or *B. thuringiensis* toxins, behaving as resistant towards defoliators, have been produced. Protection of nurseries against *C. lapathi*, *P. tabaniformis* and *Gypsonoma aceriana* Dup. is currently achieved by periodical organophosphate sprayings (at 15 days intervals) in June-July.

Diseases

- ***Situation; Present control strategies and future perspectives***

As in the previous years, the climate conditions greatly influenced the phytosanitary situation of Italian poplar plantations in the period 2008-2011 (Fig. 1). As in the periods 2000-2003 and 2004-2007, conspicuous droughts occurred, though this time much before the vegetative season (i.e. March in 2008, May and June in 2009, April and May in 2011). This was associated with a very irregular distribution of rainfall, far from the equinoctial pattern typical of the Po Valley, especially in 2009 and 2011. In particular, in 2009 lack of rainfall in May and June was recorded, which was only partially counterbalanced by a peak during the high summer; in 2011 such lack of rainfall occurred even earlier (April and May) and was followed by another similar period which substantially lasted from July to October, interposed by an anomalous very high peak in June. In fact, in 2011 the total rainfall was highly under the annual average (about 660 mm versus 750 mm), contrary to 2010 when the total rainfall was much above the average (about 1030 mm).

Consequently, particularly in 2009 and 2011 large mortality occurred in young plantations, while the dry summer conditions induced typical symptoms, with drastic thinning of the crown and consequent reduction of the annual growth, difficulty of lignification of the young shoots and reduction of reserve substances for the period of dormancy.

Weak attacks of *Phomopsis* spp., *Cytospora* spp. and *Discosporium populeum*, inducing bark necroses, were observed on stressed plants soon after transplant. The incidence of *Discosporium populeum*, a cortical parasite of endemic weakness in the Po areas, able to cause the death of already weakened young plants, was still very low, in contrast with the high levels recorded ten years ago. In the adult plantations stressed by water deficit, cortical necroses were observed with a relatively low spread but with localized high severity. This physiological disorder, also known as “trunk brown spot”, can considerably reduce the quality of wood. In 2009, possibly alarming isolations of *Fusarium avenaceum* were obtained from bark necroses occurred in adult plantations of several clones (e.g. ‘BL Costanzo’, ‘I-214’, ‘Onda’, ‘Triplo’) in the middle Po Valley, since this fungus is known as primary pathogen.

The incidence of the leaf spot blight caused by *Marssonina brunnea*, up to now a widespread foliar disease connected with severe phylloptosis and loss of production, was remarkably reduced during the last four years in spite of the assessed susceptibility of ‘I-214’, the most cultivated clone in Italy (more than 80 % of poplar stands). In 2011, in particular, its incidence rose to levels able to induce defoliation only at the end of September. This unusual trend may have been related to the prolonged drought occurred just at the beginning of sprouting, which had probably damaged conidial viability, and more generally to the repeated drought events occurred in the last vegetative seasons that may have gradually reduced the inoculum density.

For several years the spring defoliation caused by *Pollaccia elegans* had not caused any economical damage due to the limited spread of the so called “Canadian clones”. The disease is present only in some small areas of the Po valley, where it maintains an endemic character. Recently, some attempts at reintroducing some very productive “Canadian clones” (e.g. ‘302 San Giacomo’, ‘Adige’, ‘Boccalari’) in big farms are being successful, in spite of their well known susceptibility to *P. elegans*, since they have been planted in small groups, widely spaced, and separated by plantations made of resistant clones. Probably, in this specific context the incidence of *P. elegans* remains at tolerable levels owing to the scattered inoculum target.

As regards leaf rusts by *Melampsora* spp. (i.e. *M. larici-populina* and, to a lesser extent, *M. allii-populina*), by now in Italy all the recognized groups of pathotypes, better known as physiological races have been observed— except for race E2 – with a persisting predominance of race E3 and the recorded introduction of races E4 and E5. Rusts are still a limiting factor typical in nurseries rather than in plantations, since summer defoliations in nurseries cause an impaired sprouting of nursery stock after transplant and a stronger predisposition versus weakness parasites (e.g. *D. populeum*, *Cytospora* spp. and *Phomopsis* spp. among fungi and *Melanophila picta*, *Agrilus suvorovi* among pests). Instead, the damage caused by rusts on Short Rotation Forestry must be seen more in terms of stump survival and, in the long period, of integrity of the coppice stand rather than in terms of quantitative losses of dry matter. Among all recurring diseases, rusts are the most challenging ones versus clonal selection and thus represent a limiting factor of genetic renewal.

The cortical necroses likely associated with bacterial infections (*Erwinia* s.l.) are still sporadically observed in nurseries constituted with “Luisa Avanzo” (*P. ×canadensis*), “Raspalije”, “Beauprè” or “Boelare” (*P. ×generosa*). The limited use of these clones in plantations allow a negligible incidence of this adversity. The presence of the Poplar Mosaic Virus remains very low, also considering the low amount (3% of the cultivated surface) of *P. deltoides* or susceptible hybrids in nurseries and plantations. Eradication in the nursery, with a rapid elimination of symptomatic plants, is the only method to prevent PMV epidemics.

The incidence of root rots by *Rosellinia necatrix* has not changed in the last four years, remaining limited to already affected stands.

- (b) *Abiotic factors including winds, floods, droughts, pollution and others, and outline economic aspects and success of control measures undertaken and damage prevention in the future. (SEE ABOVE)*

5. Harvesting and Utilization

Report on the application of new knowledge, technologies and techniques in:

- (a) *Harvesting of poplars and willows.*

In any poplar logging the working system usually adopted is the Short Wood System. The main operations executed are: felling, processing and loading of the material. Generally bunching and extraction are not necessary while processing of the trees (which includes sorting logs for different end uses) and loading for subsequent transport to factories take place on the felling site. Extraction of whole trees, with or without branches, can also be done, with consequent processing of commercial logs at the landing.

In relation to the implementation of the several field activities, three levels of mechanization can be identified: traditional, advanced and fully mechanized. The first one is characterized by low mechanization: use of chainsaws for felling and of agricultural tractors for processing. The second type is defined by intermediate mechanization, it foresees the use of equipment that can carry out various operations, for example a feller-buncher for felling, bunching and for the alignment of trees. The third level implies even higher mechanization with combined machines, for example a

harvester with feller-buncher-delimber-cross cutter which can perform all the operations necessary for producing the final assortments. In yards of the last two types forwarders and skidders are also very often used for the extraction and loading of material as well as big chippers for chipping top ends and branchwood.

Currently the traditional method is the one most frequently used, although the adoption of advanced and fully mechanized working methods has spread in recent years. The possible further expansion of an advanced mechanization depends on the availability of highly professional operators for fully exploiting the potentialities of the machines, and on the presence of well-organized and well administered enterprises able to quickly react to any sudden poplar wood market variation.

(b) *Utilization of poplars and willows for various wood products:*

Several new poplar clones (*Populus nigra* × *P. deltoides* hybrids), not yet registered, were studied as to their physical characteristics and rotary cutting attitude, to identify the best ones suitable to undergo further selection and to be proposed for registration. Each clone was tested choosing the butt log for rotary cutting trials; when cross cutting the log, some wood samples were collected at different tree heights to test basic density and total shrinkage. For each clone plywood panels were produced and subjected to mechanical testing.

Testing (both physical and mechanical) was also done to evaluate the influence of the site on the rotary cutting attitude of some clones. To this purpose, trees of the same six clones were taken from two different poplar stands located in very different sites.

A large industrial group has recently decided to establish in Italy an OSB (Oriented Strand Board) production line; this will be the first one of this kind in Italy and the first expressly set up to use only poplar wood. The production should start before the end of 2012.

Some preliminary investigation was done to evaluate the possibility of obtaining an innovative “poplar-brick” to realize wood walls. Tests are currently under way.

(c) *Utilization of poplars and willows as a renewable source of energy (“bioenergy”).*

The Agricultural Engineering Research Unit of the Agriculture Research Council (CRA-ING), between 2008 and 2011 focused its research activity toward the development of technological innovations in relation to harvest mechanization, storage improvement and logistic issues for collecting and conferring the biomass to conversion plants. The harvesting phase might cover 50 % of production costs of poplar (*Populus* spp.) for energy plantation (Short-Rotation-Coppices – SRC). Chip quality is crucial from the viewpoint of energy yield, storage, type of power plant and market price formation. Good wood chips dimensional distribution and low moisture are the key parameters for the proper combustion in apposite boilers.

Two different approaches are currently adopted: harvesting and chipping in one step or cutting and chipping in two separated stages (stick harvest). In the first case, self-propelled forage harvesters equipped with heads able to execute sequentially cutting, chipping and product upload on tractor trailers are used. Early trials showed that, using the Claas Jaguar harvesters, a reduced size of wood chips was obtained which produced unfavorable effects on storage. Seeing this, CRA-ING designed and realized a new type of rotor, changing the number of

knives and their cutting angle. The modifications allowed on the one hand to increase by 22 % the operative working capacity and, on the other hand, to improve wood chip quality with an increased percentage of chips of the higher size classes (+13.80% for the 12.5 - 25 mm class) and a diminished percentage of chips of the lower, less valuable, class (-17.80% of wood chips shorter than 12.5 mm).

Concerning the whole-plant harvesting system, where cutting and chipping are done at separate stages, CRA ING set up an innovative system consisting of two machines: the first one is a cut-windrower which, during the physiological dormant phase of the plants, cuts and releases the trees along a windrow (parallel to the forward direction of the tractor), the second one is a wood-chipper endowed with a pick up system for harvesting and chipping the windrowed trees, which is done between the end of April and the first days of June, in the Italian climate. With this solution plants are less affected by the biological processes of degradation (implying a reduction of dry matter losses). The natural dehydration process during the storage phase allows to obtain, in the subsequent step of chipping, a more stable product, less prone to fermentation risks and with less soil compaction problems. Furthermore, confining storage to the windrow and the use of forage harvester endowed with pick up system consent to harvest the product directly in the interrow saving the problem of moving the biomass before chipping and of keeping part of the field unproductive for storage use. Finally, the chance to delay the work of heavier machines to a drier season appreciably reduces soil compaction.

Once the biomass has been harvested, one of the main problems is to adequately match biomass supply and the demand of bio-energy plants through an appropriate storage strategy. To this end, several experiments were conducted aimed to identify the suitable conditions for natural storage in the open air in order to define the parameters of efficiency, economy and functionality ensuring the supply of biofuel to farms in a continuous manner and with the proper moisture content.

The third pillar of the bioenergy chain concerns the logistics of biomass supply to conversion plants, a link connecting the agricultural production to the processing industry. Since also in this sector mechanization plays an important role, from both an economic and an environmental point of view, CRA-ING has carried out activities focused on the solution of practical problems taking into account the evolution of agricultural policies. The OCM sugar reform and the plans of agricultural conversion towards agro-energies undergone by the sugar beet sector have allowed, for the first time in Italy, to follow and monitor the entire process of industrial restructuring.

One of the companies involved in this process is going to build a 30 MW power plant to be supplied with biomass produced from 7,000 ha of short rotation poplar plantations. CRA-ING, in collaboration with the Powercrop company, within the National Research Project SUSPACE (Scientific Support to Convert farmers into energy) collected the data concerning the characteristics of plants in order to dimension the mechanization of harvesting and the distribution of energy crops cultivations destined to supply the plant. The data collected were entered into a database linked to the application "SW_SUSPACE_01". The application allowed to manage the logistics of harvesting and transportation of the product to the plant taking into account the characteristics of machines, soil and climate and the agronomic

parameters at harvesting.

6. Environmental Applications

Report on the application of new knowledge, technologies and techniques for cultivation of poplars and willows for:

- (a) *Site and landscape improvement (bank stabilisation, combating desertification and salinization, shelterbelts and windbreaks, soil rehabilitation, urban and peri-urban forestry for climate modification etc).*

The Kyoto Protocol promotes afforestation and reforestation in order to foster sustainable development and recognizes to forests an important role as carbon sinks. River restoration projects aiming at restoring riparian habitats can be considered as part of reforestation activities. The CRA-PLF together with the Po River Fluvial Park and other river parks carried out several pilot trials (on about 150 hectares) to convert areas dedicated to conventional crops or intensive poplar cultivation into floodplain forests, and to recover degraded areas on the upper part of the Po River basin.

The main aim of these projects was to restore floodplain forests for recreational purposes and to actively contribute to the conservation of native poplar genetic resources, black poplar in particular, by creating a network of artificial *in-situ* gene conservation units to support a dynamic evolutionary process in a short time. For each trial, plantings and maintenance practices were recorded, under the supervision of the CRA-PLF. Two cases set up in 1996 were compared: one (the Lanca di Rivarossa case) was located along an old meander to recover a gravel quarry and to create a conservation buffer strip in an agricultural landscape; the other one (the Bosco di Musolino case) was meant to create an open parkland for recreational activities and touristic exploitation and to improve the environmental value of a densely populated area subject to flooding. The two plantations were characterized respectively by a major reduction of cultivation practices and, in the second case, by the application of intensive cultivation techniques. A simplified CO₂ balance was calculated comparing the emissions generated during the cultural practices and the C fixed in the biomass yielded to evaluate the sustainability of plantations.

The stands were established on sites with homogeneous soil characteristics: in both cases growth and mortality were very similar. A little difference on the CO₂ stored was caused by a different species compositions that influenced the dry weight. The CO₂ released due to cultural practices only partially affected the total balance: in the Lanca di Rivarossa case few operations released 2.23 t/ha equal to 3.5 % of the total CO₂ stored; in the Bosco di Musolino case, where to date weed control is necessary (due to the recreational activities connected to the near town), the CO₂ released reached 8.06 t/ha equal to 12.5 % of the total CO₂ stored. In any case these two stands resulted sustainable from the point of view of the CO₂ balance.

- (b) *Phyto-remediation of polluted soil and water (buffer zones, contaminated sites, waste water management/treatment etc).*

Phytoremediation is a cleanup technology suitable for a variety of organic and inorganic pollutants. Poplar and willow are the most important woody species utilized in phytoremediation and several experiments and field applications have demonstrated the effectiveness of these trees in our Country.

Poplars have been found to be able to take up several heavy metals including cadmium copper (Borghi *et al.* 2008), chromium (Gatti *et al.*, 2011), and zinc (Di Baccio *et al.*, 2009). Poplars have been reported to be able of performing a bio-accumulation of cadmium almost double as compared to willow clones tested in the same experiment. However, cadmium appeared mostly confined to the root system (Zacchini *et al.*, 2009). Detailed studies on localization of xenobiotics in plant tissues (Cocozza, *et al.*, 2008), can be of help in optimizing phytoremediation decision making and practices.

An early screening of clones more suitable for phytoremediation purposes can increase the potential of a successful phytoremediation. Biodiversity provide a wide choice of genotypes to test and evaluate for remediation capacity. Cadmium tolerance and distribution in plant organs was investigated in ten poplar clones obtained from different species, hybrids and genotypes (Pietrini *et al.*, 2010). The experiment recorded variability of cadmium distribution among leaves, stem, and roots of the different clones, providing preliminary indications of candidate poplars clones suitable for specific phytoremediation processes. Zacchini *et al.* (2009) compared a total of 16 poplar and willow clones for phytoremediation capability, through a hydroponic screening for cadmium tolerance, accumulation and translocation.

In studies conducted on numerous poplar clones, *P. alba* AL35, resulted the one best combining a high metal-accumulating capacity and a significantly higher concentration of free and conjugated putrescine. This indicates the possibility of identifying physiological markers associated with metal accumulation capacity (Castiglione *et al.* 2009).

The interaction between microflora and plant roots should always be seen as an important element for a successful phytoremediation. The microbiological analysis of the soil during remediation provides information on ecosystem stability. De Paolis *et al.* (2010) observed differences in bacterial populations in plots planted with *Populus* and *Salix* spp. as compared to herbaceous control plots. Authors interpreted this signal as an index of ecosystem stability, indicating that fast growing trees, are more effective than other vegetation coverage not only for direct heavy metal contaminated lands remediation but also from an ecological point of view.

The use of mycorrhization can be of help in supporting poplar phytoremediation of polluted soils. Poplar can carry out *ex planta* phytoremediation as a result of extensive root systems development and flourishing microbial association. Plant host response depends on the fungal species. Lingua *et al.* (2008) studied the phytoextraction capacity of willow and poplar associated with AM fungi.

Genetic manipulation of poplars such as *P. alba* and hybrids has been reported for strengthening the remediative mechanisms through genetic manipulation and transgene

expression. PSMTA1 (metallothioneins) gene inserted in poplar can reduce DNA damage caused by exposure to copper (Balestrazzi *et al.*, 2009).

IV. GENERAL INFORMATION

1. Administration and Operation of the National Poplar Commission or equivalent Organization

- (a) *Indicate here any changes in the composition of the Commission, amendments to its statutes, changes of address, etc.*

The National Poplar Commission of Italy (NPC) was established by the national law n.1799 of 3rd December 1962 ratifying the international Convention placing the IPC inside the FAO organisation. It is based in the Ministry of Agriculture in Rome and its Secretariat is traditionally hosted by the Italian State Forest Service (Corpo forestale dello Stato). It is a mixed body between public and private organisations and it is renovated in composition each three years: currently the list of its members for the period 2012-2014 is under finalisation. The last version of its statute was adopted on 21st January 2010 and brought the number of the members of its Executive Committee up to 9. The address, composition and main outcome of the work of the NPC is displayed on its website, currently available only in Italian: <http://www.populus.it/CNP/>

- (b) *Report briefly on meetings, congresses and study tours, and on other activities of a general nature organized by the Commission at the national level.*

The National Poplar Commission of Italy is currently organising and hosting a big, national workshop per year where some key lectures are given on a certain focus and the main actors of the poplar sector are invited (public institutions, research centres, poplar farmers and their associations, wood processing industry, Universities, forest nurseries, etc). Until the year 2011 such annual meeting has been hosted in Cremona, in the agricultural fair called “Vegetalia”. Below dates and titles of such meetings are given.

22nd February 2008: “Quale politica per il pioppo?” (Which policy for the poplar?);

30th January 2009: “La pioppicoltura in Europa: prospettiva e strategie della filiera nel mercato globale” (Poplar cultivation in Europe: future and strategy of the whole chain in the global market);

19th March 2010: “Pioppo-Europa: il rilancio della pioppicoltura nel quadro delle azioni dell’Unione europea” (Poplar-Europe: the support to poplar cultivation in the frame work of the EU actions);

18th March 2011: “Pioppicoltura per l’architettura ed architettura della pioppicoltura” (Poplar cultivation for architecture and architecture for the poplar cultivation).

Agenda, presentations and proceedings of such meetings are available here:

http://www.populus.it/CNP/convegni.php?lingua=IT&opz_menu=13

Apart from such specific, annual meetings the members of the NPC also usually take part and contribute to other relevant, national events related to poplars, for instance the workshop held in Casale Monferrato on 24th September 2011 called “Dal bosco alla Green Economy” (From the forest to the Green Economy): http://www.populus.it/CNP/convegno_green_economy.php

(c) *Indicate also the difficulties encountered by the Commission in the course of its work and any lessons learned*

The main difficulty encountered so far by the NPC of Italy is the lack of a permanent funding system, therefore making this body based on voluntary or in-kind contributions and not continue donations coming from different Institutions, private groups or foundations and able to slow down its activities when funds are scarce. Another problem for the NPC is represented by the permanent risk of being cancelled in the framework of the ongoing process of simplification/reduction of Ministerial commissions: however the competent office of the Italian State Forest Service is always stressing that this is an unique public-private agroforestry policy body whose existence is mandatory according to the international Convention ratified by Italy and doesn't represent a simple Ministerial committee or working group.

2. Literature

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3. Relations with other countries

Include here information also on the international exchange of cuttings and plants of poplars and willows, training etc.

The international exchanges of germoplasm referring to the period 2008-2011 are listed below

a) The following vegetative propagation material was sent abroad.

Year 2008

COUNTRY, City	Scientist	Institution	Germplasm
FRANCE, Charrey sur Saône, France	Berthelot A.	FCBA, Station Nord-Est	<i>Populus xcanadensis</i> <i>Populus deltoides</i>
SERBIA, Novi Sad	Orlovic S.	Institute of Lowland Forestry and Environment	<i>Populus nigra</i> (EUFORGEN core collection)
POLAND, Kwidzyn	Rakestraw J.	International Paper Company	<i>Populus xcanadensis</i> <i>Populus deltoides</i>
GERMANY, Hann Münden	Gebhardt K.	NW-FVA - Die Nordwestdeutsche Forstliche Versuchsanstalt	<i>Populus xcanadensis</i>
SPAIN, Palencia	Hidalgo E.	ETS, Universidad de Valladolid	<i>Populus</i> spp.

Year 2009

AUSTRIA, Wien	Heinze B.	BFW - Federal Research Centre for Forests, Natural Hazards and Landscape	<i>Populus simonii</i> <i>Populus maximowiczii</i>
SPAIN, Zaragoza	Maestro C.T.	Unidad de Recursos Forestales SIA-DGA	<i>Populus nigra</i> <i>Populus xcanadensis</i>

Year 2010

GEORGIA, Tbilisi	Piretta F.	AGRIGEORGIA LLC	<i>Populus nigra</i>
GERMANY, Teisendorf	Tubes M.	Bavarian Institute for seeding and planting	<i>Populus xcanadensis</i>

Year 2011

USA, Duluth	Mc Mahon B.	Natural Resources Research Institute	<i>Populus nigra</i>
GEORGIA, Tbilisi	Piretta F.	AGRIGEORGIA LLC	<i>Populus nigra</i>
BELGIUM, Geraardsbergen	Steenackers M.	INBO – Institute for Forestry and Game Management	<i>Populus nigra</i> , <i>P. deltoides</i> <i>Populus xcanadensis</i>
SPAIN, Palencia	Hidalgo E.	ETS, Universidad de Valladolid	<i>Populus xcanadensis</i>

Apart from the international exchanges of germoplasm listed above, during last years the National Poplar Commission of Italy has also **increased its policy and strategic cooperation with other countries and international organisations**, in particular during the following events:

- 26-30th October 2008:** Participation in the 23rd session of the International Poplar Commission “Poplars, willows and people’s wellbeing” and in the 44th Session of the Executive Committee of the IPC held in Beijing, China: <http://www.fao.org/forestry/ipc2008/en/>
- 27-31st July 2009:** cooperation in the project funded by FAO-Italy GCP/INT/059/ITA and participation in the international workshop “Improving the contribution of poplars and willows in meeting sustainable livelihoods and land-use in selected Mediterranean and Central Asian countries” held at the Poplar and Fast Growing Trees Research Institute (PFGTRI) in Izmit, Turkey: <http://www.fao.org/forestry/ipc/69628/en/>
- 13-17th April 2010:** organization, together with FAO, of a technical field trip through Italy for a high level poplar delegation coming from the Chinese county of Syiang: http://www.populus.it/CNP/documenti_upload/relazione_visita_da_Siyang.pdf
- 18-19th May 2010:** participation in the first meeting of the European poplar growers, organised by USSE (Union of forest growers in Southern Europe) and held in Valladolid, Spain: http://www.populus.it/CNP/convegni_upload/agenda_encuentro_de_populicultura.pdf
- 28-30th May 2010:** participation in an international mission, organised together with FAO and other Italian institutions, to take part into the "3rd Chinese Poplar Festival", held in Syiang, Jiangsu Province, China: <http://www.fao.org/forestry/64060/en/>
- 7th July 2010:** Presentation on poplar opportunities and challenges existing in Europe to the 155th meeting of the EU Standing Forestry Committee held in Brussels: http://www.populus.it/CNP/documenti_upload/Item_11b_poplars_colletti.pdf
- 19th September 2010:** Participation and contribution to the organisation of the 45th Session of the Executive Committee of the IPC held in Porano, Italy: <http://www.fao.org/docrep/013/ma007e/ma007e00.pdf>
- 20-25th September 2010:** Support in the realization of the fifth international IUFRO poplar symposium on “Poplars and willows: from research models to multipurpose trees for a biobased society” held in Orvieto (Italy) from 20-25 September 2010 and organisation of its final technical field trip through Italy: <http://ocs.entecra.it/index.php/IPS/5>
- 2010-2011:** Support to the FAO-Italian project GCP/INT/059/ITA and its follow up GCP/RAB/013/ITA on the “Use of treated waste water in forestry and agroforestry” carried out in countries of Northern Africa: <http://www.fao.org:80/forestry/66627/en/>
- 8-9th June 2011:** contribution to the organisation and implementation of the second meeting of the European poplar growers, held in Mantua and arranged by the Association of Italian Poplar Farmers (API): <http://www.confagricolturalombardia.it/pagina.asp?id=273>

4. *Innovations not included in other sections*

List here any new developments not included elsewhere.

The technical guidelines for sustainable management of poplar cultivation, worked out by CRA-PLF, resulting from the activity of a large working group, allowed to start the application of two forest certification schemes for poplar cultivation in Italy: the FSC (www.fsc.org) scheme and the PEFC (www.pefc.org) scheme, both of which are based on internationally-recognised requirements. These certification systems use an evaluation approach that takes place at the level of single companies (each forest company is inspected by a certifier on at least an annual basis), but in order to provide the possibility of cost-effective certification also to private smallholders, the instrument of group certification has been developed (Coaloe and Vietto 2008).

Since 2007, about 4.600 hectares of poplar plantations have been certified in Piedmont, Friuli Venezia Giulia and Lombardy, in about 150 farms, 95% of which belong to certification groups. In 85 % of cases the PEFC scheme was applied while FSC was applied in the remaining 15 %. On the whole less than 10 % of Italian poplar plantations were certified, while the demand for certified wood in the plywood industry reaches 15 % of the total poplar wood consumption in the plywood industry (900 m³ of poplar roundwood).

NOTE: A synthesis of all country reports will be prepared by the IPC-Secretariat and made available at the 24th Session of the IPC to all participants.