

**International Commission on Poplars and Other Fast-Growing Trees
Sustaining People and the Environment 26th Session, Rome, Italy 5 -9
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**Activities Related to the Cultivation and Utilization of Poplars, Willows
and other Fast-growing Trees 2016-2019**

Bulgaria

The cultivation of poplars and willows in Bulgaria has begun more than 60 years ago. On the territory of Bulgaria, the poplars and willows stands are located predominantly in the strip of lands between the dyke and the river bank as well as on the islands of Danube River. Most of these lands are state-owned forest territories. There are poplars and willow's stands in the plains – on agricultural lands, around dams, irrigation canals and other water bodies, mainly municipal and private ownership. Afforestations in rows along the roads and railways; in the forest shelter belts on abandoned agricultural lands, etc. are also accomplished.

I. POLICY AND LEGAL FRAMEWORK

During the period 2016-2019 amendments and additions were made to some of the legislative documents regulating the activities of forestry of the Republic of Bulgaria:

- Ordinance № 21/12.11.2012 on the terms and conditions for determination, approval, registration and withdrawal of basic material from the forest seed base, collection and extraction of forest reproductive material, testing, marketing and import; last amended and actualized in 2019
- Ordinance № 4 /15.02.2012 on terms and conditions for registration of forest nurseries and production of seedlings in forest nurseries - state property; last amended and actualized in 2019
- Ordinance № 8/05.08.2011 r. for fellings in forests; last amended and actualized in 2017
- Ordinance № 9 of 5 December 2019 on the protection of forest areas from diseases, pests and other damages
- Ordinance № 14 of 27 October 2005 on the terms and conditions for issuing permits for introduction of non-native or reintroduction of native tree, shrub and hunting species in nature and taking into account the public opinion in the area of reintroduction; last amended and actualized in 2018
- National strategy for the development of the forest sector in Republic of Bulgaria 2013-2020
- Strategic plan for the development of the forestry sector in Republic of Bulgaria 2014-2023

According to the Forest Law /Art. 88 (5)/ fast growing tree species on agricultural lands or urban plots with short rotation period, created for wood production are not managed as forest. By establishment of protective forests, the afforestation with fast growing tree species is a priority.

The Ordinance № 21 on the terms and conditions for determination, approval, registration and withdrawal of basic material from the forest seed base, collection and extraction of forest reproductive material, testing, marketing and import which introduces the provisions of EU Directive 1999/105 is in force in Bulgaria since 2012. The Ordinance is applied for reproductive materials of the tree species and their artificial hybrids, including poplars which are significant for the forestry of the Republic of Bulgaria and the other EU Member States.

The “Classification scheme of the poplar forest stands in Republic of Bulgaria” and “Instruction for establishment and mapping of the forest stands types and for the definition of the composition of dendrocenoses” is in force since 2011.

The European ecological network NATURA 2000 in Bulgaria includes a big part of poplar and willow stands along the Danube river and other rivers in the country.

II. TECHNICAL INFORMATION

1. Taxonomy, Nomenclature and Registration

The identification, registration and the species control of the poplar clones is carried out in compliance with the Ordinance № 21 by authorized official bodies. Genetic examination of the poplar clones has not been made and is not made in Bulgaria.

The testing is carried out according to “Methodology for selection of poplars and willows in Bulgaria”. Approved clones for comparative testing are I-214 for poplars and Bg 2/64 for willows.

New poplar and willow clones are not registered in Bulgaria more than 20 years. In this relation, Executive forest agency participated in the international project for testing of new poplar clones for production of biomass with Lead Partner Forest seed control station Teisendorf, Germany. The total number of genotypes tested was 37, along with a total of 13 trial sites in 8 countries representing the different environments.

The project started in 2014 and finished in 2017. 13 new poplar clones in two test-areas /south and north Bulgaria – in State forest enterprise Pazardzik and State forest enterprise Montana/ were tested. The abstract with the results from different EU countries will be submitted to the next IPC congress.

2. Domestication and Conservation of Genetic Resources

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

Poplar sections: (a) Aigeiros section (b) Leuce section (c) Tacamahaca section (d) Other poplar sections

Willows

Other fast-growing tree species

Mainly due to financial reasons, the development of activities for genetic improvement of the poplars and willows in Bulgaria are limited. Introduction after testing (at least 10–15 years) of hybrid poplars from well-known world selection and genetic centers is practiced. The main production of stem cuttings from poplars and willows in Bulgaria is organized in two nurseries of national importance- in north Bulgaria – in State forest enterprise

Svishtov and in south Bulgaria – in State forest enterprise – Pazardzik. After 2016, Northeast state forest enterprise Vratsa specializes in 4 nurseries for the production of poplars and willows on the territory of State forest enterprises Pleven, Montana Oryahovo and Nikopol, in order to minimize transport costs.

To guarantee the successful production of planting stock some requirements need to be implemented: ensuring authentic materials for production of leading shoots and cuttings; establishment of stool beds for production of leading shoots and cuttings; ensuring standard size of the cuttings and production of standard plants for afforestation; ensuring the cultivar purity, etc.

3. Plant Health, Resilience to Threats and Climate Change Report on the incidence, scale and impacts of damage in poplars, willows and other fast-growing trees 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.

Following insect pests are very aggressive and cause big damages:

Chrysomela populi L., *Gypsonoma aceriana* Dup, followed by *Pavanthrene taboniformis* Rott and *Saperda populnea* L.

The most common poplar diseases, related with climate conditions in Bulgaria are: bark necrosis, caused by *Dothichza populea*, *Cytospora* sp., *Fusarium* sp.; slime flux; leaf blight on *P. euroamericana*, caused by *Marssonina brunnea*.

In order to prevent and timely implement measures for control of diseases and pests on poplars, willows and other fast-growing species, regular phytopathological examinations are carried out by the three Forest Protection Stations on the territory of the Republic of Bulgaria.

(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 abiotic agents:

In recent years, lower survival rates of poplar crops have been reported, mainly due to prolonged periods of drought in the second half of the year and extremely high summer temperatures. In Southern Bulgaria, the reason is the low water level in the rivers and the low level of groundwater.

Damages from strong winds and hail is also reported annually.

In 2019 and 2016, damaged poplar crops were reported as a result of prolonged flooding of the Danube, and in 2018 such floods were reported along the Arda and Struma rivers, and in 2016 along the rivers Maritsa and Mesta.

For modernization of the production in the poplar nurseries the biggest investments are made for water supply and construction of drip irrigation systems.

4. Sustainable Livelihoods, Land-use, Products and Bioenergy Report separately information on the application of new knowledge, technology and techniques in application of the culture of poplars, willows and other fast-growing trees 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.**

Stool beds with production capacity of more than 2 mln. cuttings, covering the needs of the whole country are established.

The production of poplar shoots is realized from constant or by way of exception from 1-year-old stool beds. The distances between rows of stools are typically 1.8 m and the density of the stools in beds is from 0.30 m up to 0.35 m, ensuring optimal conditions for production of qualitative cuttings. Between the stool beds from different clones the distance is 3.5 m. At the moment for more effective use of the area and better yield on unit area, a new stool beds scheme is implemented: 1.8 m x 0.5 m x 1.8 m. The density of the stools is 0.3 – 0.5 m. Controlled irrigation and fertilization is realized.

The vitality of the stool beds is about 20 years, achieved through their maintenance.

In 2019, the following poplar and willow stool beds and species were inventoried:

P. x eur. cv. I – 214, P. x eur. cv. I - 45/51, P. x eur. cv. BL, P. Welthaimaipapel, P. x eur. cv. Agathe F, P. x eur. cv. MC, P. deltoides I - 55/65, P. deltoides A – 194, P. x eur. cv. I - 39/61, P. x eur. cv. I - 37/61, P. x eur. cv. Bachelieri, P. x eur. cv. Panonnia(M1), P. Rodusta R – 16, P. x eur. cv. CB – 7, P. x eur. cv. NNDV, P. x eur. cv. Guardi, P. x eur. cv. Luiza Avanzo, P. x eur. cv. B 12, P. x eur. cv. Guardi, P. x eur. cv. NNDV, P. x eur. cv. Belloto, P. x eur. cv. Sima, P. x eur. cv. Simoni, P. x eur. cv. Vernirubens, P. Nigra, ex situ, Salix alba

(b) Planted Forests with emphasis on the choice of cultivars, type of plants, spacing and layout of plantations; planting and tending (fertilization, irrigation, weeding, pruning, thinning etc.); management (growth, rotation in relation to yields and industrial requirements).

The main management role of poplar and willow plantations remains unchanged – intensive production of large-sized sawn and industrial timber.

➤ Selection of cultivars

Recently the following poplar cultivars are available in Bulgaria: *Populus* × *euramericana* (*Populus nigra* × *Populus deltoides*): 'I-214', 'I-45/51', 'I-39/61', 'Triplo' ('I-37/61'), 'BL Constanzo', 'MC', 'Agate F' ('OP 223'), 'CB-7', 'San martino' ('I-72/58'), 'OP-229', 'Luiza avanzo' ('Georgione'), 'Dorskamp'; Group Robusta: 'Vernirubens', 'Bachelieri'; 'R-16' ('Hirsova');

Populus deltoides: 'Lux' ('I-69/55'), 'Onda' ('I-72/51'), 'A-194', cl. '55/65';

Populus × *interamericana* (*Populus trihocarpa* × *Populus deltoides*): 'Barn', 'Rap', ('NL 1658'), 'Beaupre' ('Unal 8', 'S 910-2'), 'Boelare', 'Donk', 'Hunnegem', 'Raspalje'; Belgian: 'Unal 7', 'S 910-1', 'S 910-8', 'S 910-10', 'S 910-12'; 'NL 1623', 'NL 1647';

Populus alba: 'Villafranca' ('I-58/57'), cv. 'C-8', cv. 'C-37', cv. 'C-58';

Populus canescens: cv. '127/V', cv. '25/VI', cv. 'Bg II-38', cv. 'Bg II-39'.

Populus tremula: 'Bg R1', 'Bg R2'.

Populus maximowiczii × *Populus trichocarpa*: 'Androscoggin', 'Meggylevelu', 'Rotchester'.

Characteristics (crown, gender, scheme, rotation period):

- large crown: I-214 (♀, 5.2x5.2), Triplo=I-37/61 (♂), San Martino (♀, 5.2x5.2 и редово), Guardi (♀, 4x4, 5x3 до 5.2x5.2), Lux (♀, 5x5 deep planting rod, suitable for south Bulgaria), Onda (♂, 5x5, 6x6, 6x5, for biomass 1x1, suitable for south Bulgaria), Androscoggin (♂, for mountain areas, incl. with short rotation), Flevo (♂, 5x5), Raspalje (♀);

- narrow crown: I-45/51 (♂, 4x4, 5x4), BL (♀, 4.5x4.5, 5x5 or 4x4 with thinning of diagonal rows), MC (♀, 4x4, 5x4, 5x3, thinning of regular rows, suitable for south Bulgaria), CB-7 (♀, 5x3, 4.5x4.5, 5x4, 5x5), Luiza avanzo (♀, 4.5x4.5, 5x5 or 4x4 with thinning of diagonal rows), Rap (♀, for biomass), Barn, Donk, Panonia (♀, 4x4, 5x4, 3.5x3.5 with thinning of diagonal rows);
- medium crown: Agathe F (♀, 5x5), OP-229 (♀, 5x5), NNDV (♀, good for matches), Beaupre (♀), Boelare (♀, incl. for short rotation), Hunnegem (♀, incl. for short rotation), Unal (♂, incl. for biomass), Meggylevelu (♂), Robusta (♂, 4x3, 4x4, 5x4, regular rows), A-194 (♂, universal, hard and dense wood), Cl. 55/65 (♀, plastic, hard wood), P. alba I-58/57 (♀, 4x4).

The share of P.x eur. cv.I – 214 is more than 60% and in some Forest enterprises is more than 80%. In south Bulgaria along river banks, the cottonwoods /Aigeiros section/: A – 194 и cl. I 55/65B are used. On higher altitude and along mountain rivers and on humid soils, hybrids of balsam poplars are used; P. alba cl. I – 58/57 – on sand-clay soils; P. x eur. cv. NE 367 - in coastal zone; P. x eur. cv. Agathe F – on drained terrains. The Leuce section is used mostly on dry terrains – P. alba - „C - 10”; „C - 40” and „C - 56” and P. canescens - Bg II – 38. Mostly used willow clone is Bg 2/64.

➤ Planting schemes and densities.

The recommended scheme that best performs the conditions for production of large poplar timber is described as a hexagonal shape in the planting areas. The advantages of this scheme are that it provides uniform growth space in all directions and cylindrical stems with the same density of wood are formed. On the typical poplar and drained poplar habitats along the inland rivers and drained habitats, where the goal is to extract large wood, the large-crowned poplar cultivars are planted at a scheme of 6x6 m in a square order and 6x5.20 m in a hexagonal order of the planting sites and narrow-crowned cultivars - at 5x4.33 m in a hexagonal scheme and 5x5 m in a square scheme.

In case of intermediate use, a rectangular scheme 6x3 or 5x3 m is applied and a diagonal thinning of 50% is envisaged. In this case, by the 8th year, an intermediate felling is done through a tree in the row for extraction of medium wood, after which the other individuals are for extraction of large wood.

For medium wood (of atypical poplar habitats) the suitable planting schemes are 4x4, 4x3 and 3x3 m when using narrow-crown cultivars.

In other habitats, the 5x4 and 4x3 m schemes are most often used. Crop types are only pure.

Willow crops for production of timber are created at a density of 3 x 3, 3 x 4 to 4 x 4 m., and for protective purpose at a density of 1 x 2 and 2 x 2 m.

In recent years, for various reasons we were given freedom of choice and practical changes on places. In practice, a few years ago the prevailing density in the poplar plantations was 5 x 4 m., with a wide variety of other densities ranging from 3 x 3 m. to 5 x 6 m. Schemes with interim use and careful and slower thinning of plantations were avoided. Gradually, these tendencies are changing and report positive practices about the increase of the share of the plantations in the square schemes depending on the habitus of the crown. In this respect there are practices for specialized plantations of narrow crown poplars from the type - linear and group afforestation.

➤ Types of saplings

They are defined under the Ordinance № 4 from 15.02.2012 on the terms and conditions for registration of forest nurseries and production of saplings in forest nurseries - state property.

Sorting and qualification of the saplings of poplars and willows are conducted by the manufacturer according to their height as follows:

1. Euro-American poplars:
 - a) first quality with height over 3.0 m.;
 - b) second quality with a height of 2.5 to 3.0 m.;
2. Dendriform/ tree-like willows:
 - a) first quality with a height of 2.5 to 3.0 m.
 - b) second quality with a height of 2.0 to 2.5 m.;
3. For species and clones of section Leuce and black poplar::
 - a) first quality with height over 2.0 m.;
 - b) second quality with a height of 1.5 to 2.0 m.

The main volume of afforestation with poplars is completed in autumn For the period 2016 – 2019 in Bulgaria are produced the following fast-growing species:

Fast-growing species establishment, ha				
	2016	2017	2018	2019
1. Euroamerican poplars (Populus spp.)	781,7	767,5	705,1	719,1
2. Black poplar (Populus nigra)	74,5	58,5	16,9	41,5
3. Willows (Salix spp.)	8,7	0,4		3,4
4. Silver Linden (Tilia tomentosa)	26,7	3,4	2,65	
5. Black locust (Robinia pseudoacacia)	27,92	6,58	7,28	5,49

Care for the created poplar crops.

-Tillage - from the first to the third year 2-4 tillages are made, and then at least one. Crops created on relatively heavy soils, as well as on dry habitats, are more often cultivated. Shallow cultivation between the rows and in the row is carried out 2-3 times during the vegetation period until the canopy cover reaches 1, after which the number of cultivations is reduced to 1-2. In autumn the processing is 18–20 cm, and in summer - 10–15 cm. For more complete processing the work is in cross directions. Inter-row cultivation in the first years can be combined with agricultural crops (corn, watermelon, peanuts). One cultivation after defoliation is recommended to accumulate dead forest litter in the soil.

- Irrigation and fertilization

Irrigation- water consumption of poplars is 800-1000 mm for vegetation period. The difference between the indicated water consumption and the annual amount of precipitation must be compensated by irrigation - 120-150 l / m² to moisten the soil to a depth of 1.5 m. The terms for the first irrigation are in the beginning of July - for Southern Bulgaria and the middle of July for Northern Bulgaria. Until the end of the vegetation period, 2-3 irrigation are needed every 20 days or a total of 250 to 450 l/m² (minimum 200l/m²).

-Fertilization - is carried out in two phases - mainly with phosphorus before ploughing and nutrition, after agrochemical analysis of the soil.

Pruning is mandatory for the extraction of large wood, and for the extraction of medium wood is recommended. It is held in late winter and early spring from the 2nd to the 8th year. In June-July of the second year, the double peaks are removed. From the 3rd to the 4th year one of the following methods is used:

- Early / progressive /removal of branches over 3 cm thick after the second vegetation period for large-crown cultivars, from which the extraction of large wood for slices is envisaged.
- Pruning of stems with a diameter of more than 10 cm - for narrow-crown cultivars and for planned yield of medium wood. It begins in the third - fourth year, during a period of 2-3 years at a height of $H = 6-8$ m.

For large wood, a clear part of branches up to a height of 8–9 m is provided, and for medium wood, it is pruned to a height of 4–5 m.

(c) Naturally regenerating forest, with emphasis on experiences and experiments concerning silvicultural treatments, harvesting, management, protection and regeneration.

In State forest enterprise Pazardzik were collected and propagated ex situ 28 indigenous cultivars of *Populus nigra* L. From them through cultivated selection, a stool bed with an area of 2 ha was created for production of propagation material – cuttings for the whole country.

The anthropogenic factor caused a strong negative impact over the indigenous plantations in the plains along the rivers. Logging and rooting out these riverside ecosystems fragmented and limited the natural distribution area of the local tree species. The deterioration of the growing environment is also a result from the corrections of the rivers, the extraction of inert materials, and the drainage of the floodplain stands.

The diversity and species composition were reduced and gradually become poorer. This circumstance put again the necessity to seek opportunities to use native tree species, which are typical for these habitats (wet zones), including *P. nigra* L; *P. alba* L; *P. canescens* Sm. and various species of willows.

- Preservation and maintenance of wild (natural) populations of *P. nigra* L

The individuals from *P. nigra*, which distribute the genetic information, are quantitatively few. It could be seen that the gene pool of this kind was reduced and became poorer. There are trees with negative phenotypic characteristics.

A mapping of the population of black poplar along the Danube River was made. Ex situ collections for conservation and description of the genetic diversity and for restoration of priority habitats in Natura 2000 were created.

Plants for in situ conservation in the area of their natural distribution were organized.

Selection and propagation of *P. nigra* from natural stands, bio groups or single trees, in connection to restoration activities, production of planting material and creation of plantations were performed.

33 number of trees of *P. nigra* L. were selected in nature, described and passported by the method clonal selection. The forest stands along the Danube River valley; valleys of Iskar River and Tundzha River and single trees or group of poplars outside river stands are used. The species diversity of *P. nigra* is much less expressed because of the small size of the bio groups and the distance between each of these groups. These circumstances significantly

restrict the activity of the panmixis which typically occurs in the range of the bio groups, and can hardly be performed between them.

A small stool bed was set up and saplings for afforestation were produced.

Individuals from selected in the past poplar clones from the hybrid combination P. n. L. cv. „Shipka” x P. n. L. cv. „Italica S”, identified as P.x cv. Bg IV(Bg.IV – 3; Bg IV – 6; Bg IV – 9; Bg IV – 27; Bg IV – 26) were used.

On the gray forest soils with nearby underground water and on the fertile black soil /chernozem/ with carbonates and underground water under 1 - 1.5 m., the clones "C - 10", "C - 40" and "C - 56" are with good growth indicators. These clones can be considered as a tested offspring with known (detected) idio type. The service and taxation surveys of the forest cover in the crops in these three clones of white poplar showed comparability with "absolute plus tree". Ways for their practical propagation and afforestation in crops are sought.

➤ P. canescens Sm.

In most cases it comes superior in stem straightness and piled with thin branches crown to the other two native poplar species.

The growth and productivity results of the poplar clone P. a. t. cv. Bg 38 (II / 38) on alluvial soil and black soil - vertisol are very good. When the density is 4 x 3 m. and the trees are 19 years-old in a crop, the average diameter is 34 cm., and the average height is 24 metres. After the assortment a stock of 850 m³ standing wood per hectare and weight of about 500 mg/cm³ is obtained. The variety shows comparative resistance to the main causes of decay of the poplar's stems - Fomes fomentarius, Phellinus igniarius, Hemipholiota populnea, etc. An important biological feature of the hybrid is the stem straightness.

(d) **Agroforestry and Trees Outside Forests** with emphasis on their effects on forest and agricultural crops or livestock and diversification of the landscape.

In lowland areas of the country, mostly in Southern Bulgaria, private landowners apply rare schemes for logging of poplar crops and plant in rows sunflower, corn, beans, peanuts, herbs or technical agriculture crops.

The importance of poplars and willows in linear afforestations is undoubtedly big. They are indirectly related to agro-forestry as they perform protective and economic functions. They are planted along canals, roads, dams and small reservoirs, fields, rivers, valleys, built-up areas, etc. Although there is no accurate information on the amount of linear and group planting of poplars and willows, they are widely practiced throughout the country. This form of double-line and multiple linear planting of saplings was enforced as counteraction against the torrential floods which occurred in the country.

Modern landscape architecture covers larger areas around towns and villages. Planted are willows and poplars as they have exceptional species and form variety, rapid growth, various habitus, various coloring of the stems, bark, branches and leaves. These species are ecologically the most suitable for "landscape units". Willow trees and shrubs and pyramid poplars are best biologically adapted to the growth characteristics around water areas /"water mirrors", "cascades", etc./.

Landscaping companies use mostly poplars and willows in their operations. Pyramidal forms of poplars P. Simonni, P. cv. Italica и P. nigra Shipka, and male poplars with decorative qualities as SUDAR (B 1326); UNAL (ex Unal 7,S 910 – 1); MEGGEYLEVELU(P. 275); ANOROSCOCCIN and others are sought. Especially

valuable with their color tint are various willow shrubs as well as various forms of willow trees (*S.madtsudana*) and (*Salix babylonical*).

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

(a) Harvesting of poplars, willows and other fast-growing trees .

(b) Utilization of poplars, willows and other fast-growing trees for various wood 3 products:

(c) Utilization of poplars, willows and other fast-growing trees as a renewable source of energy (“bioenergy”).

There is a tendency in the country towards increase in the demand of poplar and willows wood. An interesting fact is the application of poplar and willow wood as massive elements in the production of furniture and linings. The demand has begun for willow sided wood for beehives, floor planking and furniture.

There is a shortage in the country of poplar wood, especially in the category “large”, which big manufacturers seek to cover from import. The cost of the extracted wood is also increased. The existing form of logging cannot secure technically and technologically the process.

Short-rotation poplar and willow plantations

In Bulgaria this production is still experimental. The collected scientific information and experimental activity allow the technological implementation for an effective production in practice. The owners of lands and forests show interest, but they feel hesitations about the processing and utilization of the harvested material (phytomass) into marketing products.

5. Environmental and Ecosystem Services

Report on the application of new knowledge, technologies and techniques for cultivation of poplars and willows; and brief reports on other fast-growing species 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).

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

Despite the large number of rivers, streams, dams and lakes in our country there is an adverse water balance and the natural vegetation along the biggest river valleys, coastal areas, sea coast and small rivers is insufficient and in poor condition.

It is known that only 12% of the area of the lowlands in the country is covered by forests and they are the least forested terrain in the country. But there are placed the richest agricultural areas which are "cut" by numerous river valleys, small rivers and streams. This requires rational measures for purposeful afforestation in order to mitigate the watercourse, protection of the soil along the coast, control of wind erosion, etc. Here is the place of the poplars and willows to regulate the ecological balance in many of these regions.

Along the Danube river and on the dike and along the banks of inland rivers a willow strip with a width of 10-15 m. is kept. Its purpose is to control landslides on river banks and dikes and to protect the created poplar plantations. The model "Environmental management of the dike-bank zone and island territories" defines the lowest part of the north coast to

the level of the river at a height of 1m above average level of the Danube River, to be filled with willow crops planted at a density of 1 x 1m.

Logging is carried out twice and consecutively, in every 3-4 years or more on narrow strips along the river in order to preserve the integrity of the protective plantations.

The environmental applications of poplars and willows are related to their water and soil protective functions. Poplar and willow plantations play an important sanitary and microclimate regulation role. Planted in rows, strips or groups around farmyards and industrial enterprises they serve as dust collectors and protection against climatic changes. When stabilization of the banks and meliorating afforestations are performed, soil preparation of 30-40 cm is made and one-year-old willow saplings are planted at a depth of 80 cm. Two-year-old saplings are planted on sandy soils at depth of 100 cm.

In recent years a common practice is the well known method of planting on the steep slopes of the Danube River and some major internal rivers by using one- or two-year-old roofing poles. The poles are planted as deep as possible (more than 1m depth) on heavy soils.

Although the extreme drought tolerance of some species of willows from section Daphnoides and their role for strengthening the shifting sands, for planting on sandy deserted places and other abandoned places, their practical application in this regard during the period is negligible.

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

Recently there is no National poplar commission in Bulgaria

- 2. Literature** List here publications on poplars, willows and other fast-growing trees issued in the period under review, (2016-2019) including technical papers presented at meetings, congresses, etc.
 - Bencheva S., Belyova N., 2017. Distribution of necrosis agents on poplar bark in Bulgaria, Forest science magazine № 2, p. 69-80.
 - Belyova N., Bencheva S., Todorova A., 2018, Study of the pathogenic potential of causing necrosis fungi on the poplar bark; Management and sustainable development 73 (6): 114-120
 - Gyuleva V., Zhiyanski M., Stankova T., Glushkova M., Andonova Ek., 2018, Clone differences in the root biometry of hybrid black poplar, scientific report, International Scientific Conference “90 Years Forest Research Institute -for the Society and Nature“
 - Oliviera N., Bobeva A., Pandeva D., Paligorov Yord. et. all, 2020, Exploring new poplar plant materials to contribute to the bioeconomy in Europe, in press

- 3. Relations with other countries** Include here information also on the international exchange of cuttings and plants of poplars, willows and other fast-growing trees, training etc.

With regard to the need for cooperation in the field of poplar clonal selection in order to spread the results of breeding activities to the benefit of growers and users, the exchange of poplar clones at European level was intended within the project EUPOP. The project was coordinated by the Bavarian Office for Forest Seeding and Planting (ASP) in behalf of the Bavarian Ministry for Nutrition, Agriculture and Forestry. Executive forest agency was a partner organization and 13 poplar clones were tested in two test areas in the country for production of biomass. The project was realized in the period 2014-2017.

- 4. Innovations not included in other sections** List here any new developments not included elsewhere.