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Criteria and indicators for individual and group certification of Sustainable Poplar Plantation Management

PEFC

ITALY

STANDARD

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In the event of inconsistencies between the English and Italian versions, the English version of the standard approved by the PEFC Council shall refer.

Summary

Foreword

SFM Criteria and Guidelines and their use for certification standards for sustainable poplar cultivation management

The common frame of reference for verifying the sustainability of sustainable forest management (but also of plantations, as indicated in the spirit of their implementation by the promoters) are the Pan-European Operational Guidelines adopted at the fifth preparatory meeting at expert level of the Lisbon Conference on the Protection of Forests in Europe, 27-29 April 1998 in Geneva, Switzerland.

The Pan-European Operational Guidelines form a common framework of recommendations that can be used on a voluntary basis and as a complement to national and/or regional instruments to further promote sustainable forest management on natural (forests) and artificial (plantations) forest areas in Europe.

Brief Description of the Pan-European Criteria and Guidelines

At the Second Ministerial Conference, held in Helsinki in 1993, the ministers responsible for the forestry sector in Europe signed the internationally accepted UNCED Forest Principles, taking the concept of sustainable forest management a step further by adopting, inter alia, Resolution H1 'General Guidelines for the Sustainable Management of European Forests' and Resolution H2 'General Guidelines for the Conservation of Biodiversity of European Forests'. These general guidelines represent the political commitment of the signatory countries to the Helsinki resolution and provide a general policy direction and a long-term goal to meet European demands for the multifunctionality of forests (i.e. their ability to provide various goods and services) and plantations, in a manner consistent with their sustainable management and the conservation and enhancement of their biodiversity.

A new, common definition of 'sustainable forest management' was formulated in Resolution H1:
"the proper management and use of forests and forest land in such a form and at such a rate as to maintain their biodiversity, productivity, regeneration capacity, vitality and a potential to ensure, now and in the future, relevant ecological, economic and social functions at local, national and global levels and such that they do not lead to damage to other ecosystems".

Pan-European Criteria and Indicators were adopted for the implementation of the General Guidelines at the national level, developed by the Expert Group as part of the Follow-Up Process at the Helsinki Ministerial Conference in 1994. They are a policy tool for assessing and reporting progress towards sustainable forest management, as described in Resolution H1, in individual European countries and Europe as a whole.

The Pan-European Operational Guidelines were developed to further promote sustainable forest and plantation management in Europe by translating internationally agreed principles of forest planning and management practices. They represent a common framework of recommendations at the operational level that can be used on a voluntary basis. These guidelines are based directly on Resolutions H1 and H2 and follow the structure of the six Pan-European Criteria that have been identified as the core elements of sustainable forest management. For the sake of clarity, these guidelines have been divided into "Guidelines for Management Planning" and "Guidelines for Management Activities" and, within each Criterion, consider the basic ecological, economic and social requirements for sustainable forest and plantation management.

If the poplar plantation is associated with herbaceous crops managed with agronomic techniques, only the products directly deriving from the presence of the trees are certifiable (e.g. veneer, poles, firewood, faggots, truffles, silkworms, etc.).

The management of associated herbaceous agricultural crops within the certified area is excluded from meeting the requirements of this standard.
Measures shall be implemented to address protection of the forest plantations from unauthorised activities such as illegal logging, illegal land use, illegally initiated fires, and other illegal activities. The use of fire shall be limited to regions where fire is an essential tool in tree plantations management for regeneration, wildfire protection and habitat management or a recognized practice of indigenous peoples. In these cases adequate management and control measures shall be taken.

The standard is composed of indicators related to planning and practice. The guideline consists of a number, statement of the guideline, measurement parameter and Criticality threshold. In the event that a guideline has not stated one or more measurement parameters and/or Criticality thresholds, compliance with the guideline remains a mandatory element.
The guidelines 1.pi.a, 2.pi.a, 2.pr.a, 4.pi.a, 6.pi.a cannot be applied at the level of individual plantations and must be considered at a larger scale (group certification), identifying appropriate buffer zones and uncultivated areas with a main environmental, ecological, cultural and social function.
In order to improve the value of the ecosystem services produced by the poplar plantation, it is necessary that the size and distribution of these buffer zones and uncultivated areas be identified during the planting phase of the poplar plantation, based on social, environmental and ecological assessments as reviewed during the subsequent replanting phases.

All definitions necessary for the understanding and application of this standard are provided in the PEFC ITA 1000 Description of the PEFC Italy Sustainable Forest and Trees outside Forests Management Certification Schemes.

Attachments
PEFC technical standards for the sustainable management of poplar forests

Definitions
(number in parenthesis refers to the original numbering of Italian definition)

CRITERION 1
MAINTENANCE OR APPROPRIATE ENHANCEMENT OF POPLAR FOREST RESOURCES AND THEIR CONTRIBUTION TO THE GLOBAL CARBON CYCLE

Management planning			
n.	Guideline (GL)	Measurement parameter	Criticality threshold
1.pi.a	Management planning must aim to maintain or improve poplar plantations and related ecosystem services and maintain or improve the quality of the economic, ecological, cultural and social value of poplar plantation resources, including soil and water. This must be achieved by making full use of related services such as land use planning and conservation of the natural environment. Note: if this requirement cannot be applied at individual certification level, it must be taken into account at group certification level.	The owner/manager must: demonstrate that they take into account the requirements of EU, national and regional legislative and administrative provisions regarding sustainability, paying particular attention to soil, water and natural environment management report any subsidies/ contributions requested from the public administration for the plantation /management of the plantation set their own objectives on the above issues.	Recall of documents and/or records in the planning document (see ITA 1000).
1.pi.b	Poplar forest inventory and mapping must be defined and maintained in a manner appropriate to local and national conditions and in line with what is described in these guidelines.	The owner/manager must have an inventory and mapping of their tree plantings.	Presence of an up-to-date and complete inventory system with cadastral information and records.
1.pi.c	Management plans, or their equivalent, appropriate to the size and use of the area must be drawn up and periodically updated. They must be based on current legislation as well as on existing land use plans for the area and appropriately include the resources of the poplar	The owner/operator shall define, file, maintain, and update a document as required by ITA 1000 with reference also to GL a). Note: the inventory must be updated	Presence, completeness and continuous updating of the planning document (see ITA 1000).

	plantation.	annually, marking any changes in cultivation.	
1.pi.d	Periodic monitoring of the poplar plantation resources and an evaluation of their management must be carried out, the results of which must contribute (as a retroactive action) to the planning process.	The owner/manager must keep the following under control: - deadlines appropriate to the size of the company - indicators, and keep - for planning purposes - records of the results of data processing from monitoring activities.	Presence of a register with precise chronological information on all interventions carried out and their evaluation.
1.pi.e	The conversion of ecologically important non-forest ecosystems and forests by planting new poplar plantations is not permitted unless in justified circumstances. In any case, the change of use must be in accordance with national and regional policy and legislation applicable at all levels for land use and forest management and must be the result of spatial planning, as defined by current regulations; must be established through a transparent decision-making process based on the active participation of the relevant stakeholders; must not have a negative impact on threatened or protected forests and non-forest ecosystems as well as culturally and socially significant areas, important habitats of threatened species or other protected areas; affecting a minority portion (not greater than 5%) of forests and ecologically important non-forest ecosystem managed by an organisation must not affect areas with significantly high carbon stocks; must contribute to the long-term conservation, economic, and social benefits. Note: Reforestation and afforestation with plantation forests		

	established in ecologically important non-forest ecosystems or forest areas after 31 December 2010 are not eligible for certification.		

Management practice			
N	Guideline	Measurement parameter	Criticality threshold
1.pr.a	Management practices must safeguard the quantity and quality of the poplar forest resources in the medium to long term and its capacity to store and sequester carbon, balancing the rate of harvesting and increment, using appropriate measures and techniques, and giving preference to those techniques that minimise direct or indirect damage to the poplar forest resources, soil and water resources. Note: if this requirement cannot be applied at the individual certification level, it must be taken into account at the group certification level.	The owner/manager must adopt cultivation techniques consistent with what is planned (see GL for planning for Criterion 1). Note: When distributing plant protection products, all possible precautions must be taken to reduce damage to the operator and the environment: comply with active ingredient dosages and water volume indications, carry out spraying in the absence of wind and during the coolest hours of the day, choose commercial products with the lowest toxicity considering their efficacy, carry out periodic maintenance on equipment, use personal protective clothing.	Presence of a registration system for pesticide treatments.
1.pr.b	Appropriate management measures must be taken to ensure the provision of available resources will increase,- or will bring it, to a level that is economically, ecologically and socially desirable.	The owner/manager, in order to maintain the increasing quality and economic level of the plantation, must adopt: adequate pruning interventions, according to the document 'PEFC Technical Standards for the Sustainable Management of Poplar	Compliance with the pruning schemes indicated in the document "PEFC Technical Standards for the Sustainable Management of Poplar Plantations" and presence of the relevant records. Presence of records

		Plantations', soil working according to the 'PEFC Technical Standards' document, an intervention plan for poplar woodland pest management according to the 'PEFC Technical Standards' document.	of soil tillage (see Documents "PEFC Technical standards for sustainable management of poplar plantations" Section 1.1, Section 2.1, Section 4, Section 5, Section 6, Section 7.1. For poplar: Presence of an improvement plan for pest management, containing proposals for the experimentation of suitable clones (see Document "PEFC Technical standards" point 2.1)
1.pr.c	Consideration should be given to converting abandoned farmland and unforested areas into forest, whenever this can increase their economic, ecological, social and/or cultural value. Note: An appropriate meaning for evidence could be a scientific evaluation by technical experts considering crop rotation periods that take into account whether the area has been a) restored; b) restored or processed: c) still degraded.	In the case of conversion of abandoned farmland and unwooded areas to plantations, the owner/manager must provide planning of the related activities and analysis of any economic, ecological, social and/or cultural impacts.	Presence of an Improvement Plan or Integrated Investment Plan with consideration of any economic, ecological, social and/or cultural impacts.
1.pr.d	Positive climate practices, such as maintaining or improving carbon absorption, reducing climate-altering gas emissions and efficient use of resources, should be implemented	Identification of positive climate practices implemented by the organisation in the management operations, such as silvicultural practices for increasing carbon absorption, reducing the emission of climate-altering gases, efficient use of resources, and evaluation of by-products resulting from	No Criticality Criticality threshold

		management (such as bark and twigs), where these are removed.	

CRITERION 2
MAINTAINING THE HEALTH AND VITALITY OF TREE ECOSYSTEMS

Management planning			
N	Guideline	Measurement parameter	Criticality threshold
2.pi.a	Management planning must aim to maintain and increase the health and vitality of ecosystems and to restore degraded tree ecosystems wherever possible Note: if this requirement cannot be applied at the individual certification level, it must be taken into account at the group certification level.	Not applicable	Not applicable
2.pi.b	The health and vitality of poplar plantations must be maintained and periodically monitored, especially in relation to biotic and abiotic factors that can potentially damage the health and vitality of forest ecosystems, such as infestation, disease, overgrazing or timber harvesting, fire and damage caused by climatic factors, air pollutants and management operations.	The owner/manager must keep under control at intervals commensurate with the size of the business the damage caused by biotic and abiotic factors and management activities with recording of results.	Presence of records of biotic (from animals and human activities related to management) and abiotic damage.
2.pi.c	Management plans or their equivalents must specify ways and means to minimise the risks of damage to ecosystems. Poplar woodland management planning must make use of policy instruments designed to support these activities.	The owner/manager must: indicate in the document - referred to in ITA 1000 - the management objectives, measures and actions to minimise damage with reference also to GL 2.pi.b), Adopt a system suitable for planning consistent with the policy and with the PEFC Technical Standards document.	Presence of planning document (ITA 1000). See "PEFC Technical Standards for the sustainable management of poplar forests" Section 1.1, Section 2.1, Section 3.1, Section 4, Section 5, Section 6, Section 7.1.

Management practice			
n	Guideline	Measurement parameter	Criticality threshold
2.pr.a	Management practices must make	The owner/manager	Compliance with the

	best use of natural structures and processes and take preventive biological measures, where and when economically feasible, to maintain and improve forest health and vitality. Adequate genetic diversity, both species and structural, must also be encouraged (and/or maintained) to improve the stability, viability and resilience of plantations against adverse environmental factors and to reinforce natural self-regulating mechanisms. Note: If this requirement cannot be applied at the individual certification level, it must be taken into account at the group certification level.	must: Adopt integrated pest management techniques in accordance with the PEFC Technical Standards document; contain mineral fertiliser inputs under favourable site conditions according to the 'PEFC Technical Standards' document; Limit the establishment of monoclonal plantations in accordance with the PEFC Technical Standards document.	'PEFC Technical Standards for the Sustainable Management of Poplar Plantations' document poplar plantations: the adoption of certified clones with adoption criteria dictated in Appendix 1 - PEFC Technical Standards for Sustainable Poplar Plantation Management; limits to monoclonal planting: Chapters 2 and 3 of the document "PEFC Technical Standards for Sustainable Poplar Plantation Management"; for integrated pest management: Chapter 10 of the 'PEFC Technical Standards for Sustainable Poplar Plantation Management' documents; for fertilisers: Chapter 5 of the document "PEFC Technical Standards for Sustainable Poplar Plantation Management"
2.pr.b	Appropriate management practices must be applied with species and provenances suited to the conditions or the use of cultivation, harvesting and transport techniques that minimise	Compatible with the site characteristics, the owner/manager must: adopt cultivation measures and techniques (e.g.	Availability of records See: Ch. 4, Ch. 6 and Ch. 7 of the "PEFC Technical Standards"

	damage to trees and/or soil. Spillage during management operations and indiscriminate accumulation of waste must be strictly avoided. Setting emergency procedures for the minimisation of risk of environmental harm arising from the accidental spillage and the need of avoiding indiscriminate disposal of waste on forest land.	planting layout, pruning, soil tillage); use of vehicles for logging and transport suited to the soil conditions, use biodegradable lubricants, avoid waste (scrap) of non-wood origin. If harvesting work is contracted out to third parties in the contract of tender or contract of sale, the owner/manager must state the obligation to use biodegradable disposable oil, the use of means appropriate to the soil conditions and the prohibition of leaving non-wood waste.	document use of vehicles for extraction and transport suited to the soil conditions; presence of records on product characteristics used; no waste.
2.pr.c	The use of herbicides and pesticides must be minimised by considering appropriate silvicultural alternatives and other biological measures. In any case, those listed in Tables 1A and 1B of the WHO, and those whose derivatives remain biologically active and accumulate in the food chain, and any pesticides banned by international agreements should be excluded. GMO trees, shall not be used.	The owner/manager must: Indicate the active ingredients used, the date (period) and purpose of their use, the quantity used; Document "PEFC Technical Standards"; archive and store the purchase records of the commercial products used. If treatment is contracted out to a third party, the contract must contain the intervention indications provided for in the planning and 'PEFC Technical Standards' document.	See Chapter 8 and Chapter 10 of the document "PEFC Technical Standards for Sustainable Poplar Plantation Management". Presence of recordings.

2.pr.d	If fertilisers are to be used, they must be applied in a controlled manner and with appropriate care for their environmental impact. Fertilizer use shall not be an alternative to appropriate soil nutrient management.	MEASUREMENT PARAMETER The owner/manager must: specify the fertilisers used, the date (period) and purpose of their use, the quantity used - Document "PEFC Technical Standards"; archive and store the purchase records of the commercial products used. If fertilisation is contracted out to a third party, the contract must contain the intervention indications as set out in the planning and the 'PEFC Technical Standards' document.	Chapter 5 of the document 'PEFC Technical Standards for Sustainable Poplar Plantation Management'; Presence of recordings.

CRITERION 3
MAINTENANCE AND DEVELOPMENT OF PRODUCTIVE FUNCTIONS IN TREE MANAGEMENT (WOOD AND NON-WOOD PRODUCTS)

Management planning			
n	Guideline	Measurement parameter	Criticality threshold
3.pi.a	Management planning shall aim to maintain the ability of the poplar plantation to produce a range of wood and non-wood products and/or ecosystem services on a sustainable basis.	The owner/operator must identify in the planning stage the assortments that can be withdrawn.	Presence of planning document (see section 3.2 of ITA 1000).
3.pi.b	Management planning must achieve sound economic performance, taking into consideration the possibility of new markets and economic activities related to all the goods and services that can be derived from the poplar plantation.	The owner/operator must identify potential outlet markets for the retractable assortments at the planning stage.	Presence of planning document (see section 3.2 of ITA 1000).
3.pi.c	Management plans or their equivalents must consider the different uses or functions of the area concerned. Management planning must make use of policy instruments developed to support the production of marketable and non-marketable goods and services.	The owner/manager must identify at the planning stage the potential sources - regional, national and EU - of subsidies for the activities and assortments that can be derived from the plantations.	Presence of planning document (see section 3.2 of ITA 1000).

Management practice			
N	Guideline	Measurement parameter	Criticality threshold
3.pr.a	The quality of management activities must be ensured in order to maintain and improve poplar forest resources and encourage diversified production of goods and services in the long term.	At the time of use, the owner/manager must identify the assortments obtained. In the case of a standing sale (most frequent case of sale) indicate only the quantities obtained without distinction in assortments.	Presence of registration of wood and non-wood assortments obtained (type and quantity).
3.pr.b	Cultivation, regeneration, harvesting and transport operations must be carried out on time and in such a way as not to reduce the productive capacity of the site, avoiding damage to the residual stand, both in terms of trees and soil, using appropriate working systems and techniques.	The owner/operator shall adopt planting arrangements consistent with the PEFC Technical Standards Document and Criterion 2.pr.b).	See Criterion 2.pr.b + para. 4.3 of the "PEFC Technical Standards for the Sustainable Management of Poplar Plantations".
3.pr.c	Harvesting levels of both wood and non-wood products shall not exceed the rate that can be sustained over the long term, and the best possible use shall be made of harvested products, with due consideration for the removal of nutrients.	Not applicable	Not applicable
3.pr.d	Adequate infrastructure, such as roads, logging tracks or bridges, must be planned, implemented and maintained to ensure efficient distribution of goods and services while minimising negative impacts on the environment.	Not applicable	Not applicable

CRITERION 4
MAINTENANCE, CONSERVATION AND APPROPRIATE ENHANCEMENT OF BIOLOGICAL DIVERSITY IN TREE ECOSYSTEMS

Management planning			
n	Guideline	Measurement parameter	Criticality threshold
4.pi.a	Management planning must aim to conserve and improve the biodiversity of the ecosystem, both in terms of species and at the genetic level, and where appropriate, also at the spatial level. Note: if this requirement cannot be applied at the individual certification level, it must be taken into account at the group certification level.	The owner/manager has to identify clones that are suitable for the plantation's conditions.	Presence of planning document (see section 3.2 of ITA 1000).
4.pi.b	Poplar woodland management planning, field inventories and resource mapping must identify, protect or conserve ecologically important biotopes, taking into account the presence of any protected, rare, sensitive or representative ecosystems such as riparian areas and wetland biotopes, areas hosting endemic species and habitats of threatened species (as defined in recognised reference lists), as well as protected or endangered in situ genetic resources. Note: This guideline must be taken into account with particular consideration during the planting phase of the poplar plantation and, if necessary, by identifying appropriate buffer zones and uncultivated areas with a primary environmental, ecological, cultural and social function.	The owner/manager must supplement GL 1.pi.b with indications of protected areas bordering poplar plantations and insisting in the municipalities in which they are located.	Presence, completeness and continuous updating of documentation and/or records.

Management practice

N	Guideline	Measurement parameter	Criticality threshold
4.pr.a	Natural regeneration should be preferred, provided that conditions are suitable to ensure the quantity and quality of the resources and that the origin of the propagation material is qualitatively suitable for the site	Not applicable	Not applicable
4.pr.b	Clones that are well adapted to the conditions of the site shall be preferred. Only clones registered in the Registries of Introduced EU Countries whose impacts on the ecosystem, genetic integrity of native species and local provenance have been assessed and whose possible negative impacts can be avoided or minimised shall be used. Plantation forests, reforestation and other tree planting activities that contribute to the improvement and restoration of ecological connectivity shall be implemented.	The owner/manager should prefer species of local origin and provenance that are well adapted to the conditions of the site. The owner/manager must use poplar plants and clones that are suitable for the site conditions for all types of poplar plantations.	Use of species of local origin and provenance. Ch. 2 and Sec. 3.1 of the documents "PEFC Technical Standards for Sustainable Poplar plantation Management" GL 2.pr.a
4.pr.c	Management practices, when possible, shall promote structural diversification both vertically and horizontally, as in uneven-aged stands, and species mixing, as in mixed stands. When possible, these practices shall also aim to maintain or restore landscape diversity.	This guideline is fulfilled through the identification of appropriate buffer zones and uncultivated areas with main environmental, ecological, cultural and social functions.	Recall of documents and/or records in the planning document
4.pr.d	Traditional management systems that have resulted in appreciable ecosystems at suitable site shall be supported when economically possible.	This guideline is fulfilled through the identification of appropriate buffer zones and uncultivated areas with main environmental, ecological, cultural and social functions.	Recall of documents and/or records in the planning document
4.pr.e	Crop care and harvesting operations must be conducted in such a way that they do not cause permanent damage to ecosystems.	Fertilisation, pruning, soil management, weed control and the use and choice of plant	Chapters 5, 6, 7, 8, 9, 10 of the document 'PEFC

	Wherever possible, practical measures must be taken to improve or maintain biological diversity.	protection products. The owner/manager of a poplar-growing area of more than 20 hectares must implement clonal diversification within a crop cycle. See also GL 2.pr.b, 2.pr.c, 2.pr.d Note: the main clone may reach a maximum of 80 per cent of the company or group poplar area.	Technical Standards for the Sustainable Management of Poplar plantations. Compliance with the 10% minimum Criticality threshold. See also GL 2.pr.b, 2.pr.c, 2.pr.d
4.pr.f	Infrastructures must be planned and constructed in such a way as to minimise damage to ecosystems, especially rare, sensitive, representative ecosystems and genetic reserves, so as to take into account threatened or other species of special importance (and in particular their migratory pathways)	Not applicable	Not applicable
4.pr.g	With reference to the management objectives, measures must be taken to balance the pressure of animal population and grazing on regeneration, growth and biodiversity.	Not applicable	Not applicable
4.pr.h	Standing dead and stunted trees, hollow trees, over 100-year-old trees and those of particularly rare species must be released and conserved in the quantity and distribution necessary to safeguard biological diversity, taking into consideration the potential effects on the health and stability of forests and surrounding ecosystems.	Not applicable	Not applicable
4.pr.i	Particularly significant biotopes such as water springs, wetlands, rocky outcrops and gorges present must be protected or, where necessary, restored if damaged by management interventions.	See also GL 2.pr.b, 2.pr.c, 2.pr.d	See also GL 2.pr.b, 2.pr.c, 2.pr.d

CRITERION 5
MAINTENANCE AND APPROPRIATE IMPROVEMENT OF THE PROTECTIVE FUNCTIONS OF TREE MANAGEMENT (WITH SPECIFIC ATTENTION TO SOIL PROTECTION AND WATER REGULATION)

Management planning			
n	Guideline	Measurement parameter	Criticality threshold
5.pi.a	Management planning must aim to maintain and increase the protective functions of the poplar plantation vis-à-vis the community, such as infrastructure protection, protection against soil erosion and protection of water resources, and must safeguard against other adverse hydrogeological phenomena such as flooding or avalanches.	With regard to areas historically affected by flooding with damage to persons and property, the owner/manager must identify measures and actions that allow plantation management to contain soil erosion phenomena and limit damage to other crops and infrastructure.	Presence of planning document (ITA 1000).
5.pi.b	Areas that fulfil specific and recognised protective functions for the community must be recorded and surveyed on maps, and management plans, or their equivalent, must take these sites into adequate consideration.	Presence of planning document (ITA 1000).	Presence, completeness and continuous updating of documentation and/or records.

Management practice			
n	Guideline	Measurement parameter	Criticality threshold
5.pr.a	Particular attention must be paid to operations on sensitive soils and erosion-prone areas as well as areas where operations could lead to excessive soil erosion in watercourses. Inappropriate techniques such as deep soil working and the use of unsuitable machinery should be avoided in such areas. Special measures must also be taken to minimise the pressure of the animal population on poplar plantations.	The owner/operator must, in relation to the period of the shift: define the frequency of cultivation operations related to soil tillage, and/or identify the characteristics of the machines used for cultivation operations Note: Tillage methods	SeeChapter 7 'PEFC Technical Standards for Sustainable Poplar plantations Management'. Presence, completeness and continuous updating of documentation and/or records of work performed.

		must be consistent with the PEFC Technical Standards Documents.	
5.pr.b	Particular attention must be paid to management activities on areas with a water protection function in order to avoid negative effects on water quality and quantity. The inappropriate use of chemicals and other harmful substances or incorrect silvicultural practices that could have a detrimental effect on water quality must also be avoided.	The owner/manager must, in relation to the period of the shift, define the frequency of cultivation operations concerning soil tillage, use of chemicals. Note: Par. 10.1 of the document "PEFC Technical Standards for the Sustainable Management of Poplar Plantations" and Table 8 annexed thereto must be complied with.	See Chapter 7 'PEFC Technical Standards for Sustainable Poplar plantations Management'. Presence, completeness and continuous updating of documentation and/or records of interventions carried out and chemicals used; see also GL 2.pr.b, 2.pr.c, 2.pr.d
5.pr.c	The construction of roads, bridges and other infrastructure must be carried out in such a way as to minimise the exposure of bare soil to weathering, to avoid soil input into watercourses, and to preserve the natural level and function of watercourses and riverbeds. Roads must be provided with appropriate drainage systems, subject to adequate maintenance.	Not applicable	Not applicable

CRITERION 6
MAINTENANCE OF OTHER FUNCTIONS AND SOCIO-ECONOMIC CONDITIONS

Management planning			
n	Guideline	Measurement parameter	Criticality threshold
6.pi.a	The planning of poplar plantation management must aim to respect the socio-economic functions of the plantations in relation to the community, considering the role of the poplar sector in rural development and the local economy, and taking into account the new training and employment opportunities linked to the socio-economic functions and the creation of sustainable supply chains. Note: if this requirement cannot be applied at the individual certification level, it must be taken into account at the group certification level.		
6.pi.b	Property rights and land tenure agreements must be clearly defined, documented and established for the relevant areas. Similarly, legal, customary and traditional rights must be clarified, recognised and respected.	The owner/manager has to prove the ownership/possession status of the plantation and any insistent constraints.	Presence, completeness and continuous updating of documentation and/or records.
6.pi.c	Adequate public access for recreational purposes must be ensured, respecting property rights and those of others, the effects on forest resources and ecosystems, and the compatibility with other functions.	Not applicable	Not applicable
6.pi.d	Sites of recognised and special historical, cultural or spiritual significance must be protected and managed in a manner that takes due account of the importance of the site.	Not applicable	Not applicable
6.pi.e	Plantation managers, contractors, operators and owners must be sufficiently informed and encouraged to keep up-to-date through continuous training courses on sustainable poplar plantation	The owner/manager and farm operators must demonstrate that they are informed and up-to-date on developments in	Presence, completeness and continuous updating of documentation and/or records.

	management issues.	Sustainable Poplar Plantation Management.	

Management practice			
N	Guideline	Measurement parameter	Criticality threshold
6.pr.a	Poplar plantation management practices must make the best use of local experience and knowledge in relation to the area, such as that of local communities, landowners, non-governmental organisations and locals.	The owner/manager must demonstrate that the cultivation practices employed have been validated both by operational experience in the area where the plantation is located and by research activities.	Presence of sources of information and/or documentary references.
6.pr.b	Working conditions must be safe and provision must be made for the provision of guides and appropriate training on the subject of safety at work.	Compatible with the size of the business, the owner/operator must demonstrate: the safety measures and actions taken with regard to management activities in the plantation; participation in safety courses for refresher purposes.	Presence of safety-compliant equipment, machinery, ancillary materials Presence of sources of information and/or documentary references.
6.pr.c	Management operations must take into account all socio-economic functions, and especially the recreational function and aesthetic values, e.g. maintaining diversified structures, favouring the most attractive trees, collectives and other characteristic aspects such as colours, flowers and fruit. However, this must be pursued in a manner and to an extent that does not lead to negative effects on resources and the land.	Not applicable	Not applicable
6.pr.d	Local experience and knowledge shall be evaluated, as well as innovations and good practices promoted by		

	owners and managers, civil society organisations and local communities. The benefits of applying this knowledge shall be fairly distributed.		

Annex 1
PEFC Technical Standards for Sustainable Poplar Plantation Management

The proposed Technical Standards for Sustainable Poplar Forest Management (SPM) are mainly aimed at obtaining a high quality product for the wood industry (plywood, OSB, packaging, shredding wood) and carbon credits. These standards are the result of an analysis of the most significant direct environmental impacts caused by poplar cultivation, and are aimed at an ecologically disciplined management of poplar cultivation.
These indications are compatible with current legislation and identify sustainable management indicators for Italian poplar forests.

Suitability

The soil

Floodplain areas and sites with soils characterised by good fertility and water availability are the most suitable sites for poplar cultivation; poplar cultivation is, on the contrary, not recommended in soils with low water availability, hydromorphic, with a high presence of active limestone or on slopes (marginal soils), in which all cultivation operations, including phytosanitary interventions, are inefficient and unprofitable.

For poplar cultivation, deep (at least 50 cm), permeable soils with good water availability (the water table level is considered optimal at a depth of 100-150 cm), characterised by a sandy-loam and sandy-clay texture, not excessively loose or compact, with a uniform profile and a sub-acid to moderately alkaline pH are preferred. Under such conditions it is possible to limit stress induced by many primary pests (*Marssonina, Melampsora*), prevent damage caused by weakening pests (*Discosporiumpopuleum*, Melanophila, Agrilo) or the appearance of physiopathologies ('brown spots'). On the contrary, soils with a high active lime content (above 10%) and salty soils should be avoided: concentrations of sodium chloride as low as one per thousand are capable of causing phytotoxicity phenomena on most cultivated clones, especially during the rooting phase of poplars.

Climate

Cultivated poplar species are heliophilous and hygrophilous; although they are able to adapt to different growing environments, they require an average annual rainfall of over 700 mm or emergency irrigation in the summer; only black and white poplars are able to withstand short periods of drought. The average annual temperatures must be between 8.5 °C and 17 °C.

Poplar-environment relationship

Compatibility of poplar cultivation with the environment

Although it is a wood species with a clear industrial use, from an environmental point of view poplar cultivation can be considered to all intents and purposes an agronomic crop, given the cultivation techniques and the relatively short rotation.

The reasons for this premise are basically highlighted in two points:

poplar can be defined as a renewable raw material source, given the rapid and total renewal of plants;

Given the specific characteristics required of the material produced, the techniques needed to obtain it are agronomic in nature (preparation of the soil for planting, use of selected genetic material, phytosanitary care, possible fertilisation, pruning, etc.).

The peculiar growing conditions in Italy and the experience gained give the Italian poplar such qualitative characteristics that make it particularly suitable for the plywood industry. Therefore, tradition and the market require the almost exclusive use of selected clones.

Choice of clone

The poplar clone to be cultivated must be chosen according to the prevailing final destination of the wood product (plywood, packaging, panels, etc.), the cultivation environment (pedo-climatic characteristics of the planting site) and any environmental and landscape constraints.

The choice can be made among clones registered in the National Registers of Basic Materials (RNMB) of EU countries, giving preference to those able to provide quality wood resistant to the main biotic adversities. The Italian Registry (RNMB) was established by Ministerial Decree no. 9403879 of 30 December 2020 and is fed by the list of poplar clones definitively enrolled prior to the EU and national regulations concerning the RNMB and subject to subsequent integrations in the 'controlled' category as new clones selected by breeders are requested and evaluated by the National Poplar Observatory.

The use of selected clones that are characterised by greater environmental plasticity and resistance to the main adversities makes it possible to develop models that minimise cultivation and pest control interventions and enable ecologically disciplined poplar cultivation.
Clones included in the RNMB with more environmentally sustainable characteristics due to pathogen resistance resulting in the absence of phytosanitary treatments are declared MSA clones.
Furthermore, in the case of plant diseases of a parasitic nature, true epiphytic diseases can be prevented by limiting the establishment of monoclonal plantations. Therefore, holdings (or groups of holdings) that have a poplar-growing surface area of more than 10 hectares must implement clonal diversification within the time span corresponding to one crop cycle: the main clone may reach a maximum of 80% of the company or group poplar-growing surface area, where at least 1 clone must be a Greater Environmental Sustainability (MSA) clone, characterised by high resistance to biotic adversities, as defined in Appendix A bis of the Decree of the Ministry of Agricultural Food and Forestry Policies no. 9404688 of 31 December 2020. Alternatively, the main clone may reach 90% of the surface area with 10% MSA clones, if in addition to the poplar plantation there is a certified woodland or tree plantation area contiguous to the poplar plantation equal to at least 10% of the surface area of the poplar plantation.

Nursery materials

Quality requirements for nursery material

New plants may only be established with nursery material certified in accordance with Legislative Decree 386/2003 (certificate "C" of Annex VIII of the same Legislative Decree).
The poplars or aspens must be lignified, correct in shape, and free of pests and lesions.

Distances and planting densities

Tree Spacing and planting layout

The choice of spacing must be made taking into account the characteristics of the site (climate, soil) and the clone; it conditions the duration of the shift, which increases with increasing planting distance.
In poplar plantations aimed at obtaining logs suitable for veneer production, the number of plants per hectare may vary from a minimum of 200 (50 m^2 /plant) to a maximum of 330 (30 m^2 /plant).
Planting densities of 250-280 plants per hectare and square, rectangle or septonce (seven angles) planting patterns are recommended, which, in addition to encouraging good diametrical growth, allow ovalisation and bending of the trunk to be minimised.
In poplar plantations for the production of logs for other uses (OSB, pulp), the density can vary from 600 to 1700 plants per hectare. Square or rectangular planting patterns with sufficiently wide spacing between rows to allow mechanised interventions are recommended.

Planting periods in relation to clone characteristics

New plantations must be established with poplars in dormant condition, avoiding the most intense periods of frost, which can hinder the opening and proper closing of the holes. Where the use of Euro-American clones is envisaged, which are generally characterised by high rooting and establishment capacities, plantations must be established in mid-winter (November-February). On the other hand, the use of clones of the *P. deltoideso* species that are phenotypically similar to it, such as 'Carolinians', makes it indispensable to plant later (February-March), because they are more difficult to root and take root than the previous hybrids and dehydrate more easily.
In the latter case, in order to make it easier for the plants to take root and to obtain a more regular crown conformation, instead of topping two-year-old poplars from the nursery, it is preferable to use one-year-old poplars from the nursery, obtained directly from cuttings or, even better, from coppice.
In any case, it is good practice to minimise the period between uprooting and planting the plants. Prior to planting, it is advisable to soak the poplars or asters (total or the basal portions to be buried) in water for at least ten days.

Planting in relation to site characteristics

For the planting of poplar plantations, careful soil preparation is indispensable; ploughing up to 30-50 cm is permissible, possibly combined with subsoiling up to 70-120 cm in deep soils and in situations where the transport of soil layers with unfavourable chemical or physical characteristics to the surface must be avoided.

For loamy-clayey soils, it is mandatory that the soil be prepared in a temperate state preferably by the end of October prior to planting the poplar plantation.

The planting of poplars is recommended to be done at a depth of one fifth of their height (at least 70 cm for one-year poplars and 120 cm for two-year poplars); the diameter of the hole should normally be around 30 cm. In soils with a coarse texture and low water capacity, drills with smaller diameters (up to 10 cm) can be used, and the planting depth can be increased to the permanent water table (maximum 300 cm). In soils with a fine or moderately fine texture, in order to favour the rooting and expansion of the root system, it is useful to open holes more than 30 cm in diameter. These should also be opened in the November-December period to allow the weather to break up the surface of the side wall compacted by the action of the drill.

The planting of vegetative material, in the case of asters, can be done with a mechanical row transplanter to a depth of approximately 50 cm.

Fertilisation

Fertilisation guidelines in poplar plantations

In sensitive areas with good water availability and frequently characterised by loose, deep, cool soils, it is possible to achieve good wood production by limiting the input of mineral fertilisers. In any case, organic fertilisation with manure or green manure of leguminous plants is recommended. A chemical analysis of the soil is recommended for the establishment of new plantations larger than 1 hectare, and only when basic fertilisation is envisaged.

Background fertilisation, where envisaged, should not include nitrogen except from organic fertilisers (manure or compost is recommended). Only the administration of phosphorous ($P\ O_{25}$) and potassium ($K_2\ O$) is allowed, which may not exceed 125 kg/ha and 175 kg/ha respectively (higher doses are allowed in the case of special requirements supported by chemical analyses issued by accredited laboratories).

The distribution of nitrogen in coverage can be carried out in localised applications in the projection of the foliage during the 2nd, 3rd and 4th year after planting with maximum doses of 50, 75 and 100 nitrogen units per hectare respectively. Nitrogen fertilisation may also be carried out in subsequent years only in the case of special requirements supported by analysis issued by accredited laboratories and in the presence of very shallow soils (<70 cm).

Phosphate and potassium fertilisation as an alternative to ground fertilisation is permitted in the first four years with maximum doses in the period of 125 kg/ha and 175 kg/ha respectively: this quantity is also to be considered as including the supply of fertiliser distributed in the phase of preparing the soil for planting (ground fertilisation).

For the first four years, fertilisers may only be distributed in the period from the second half of April to the first half of June. Foliar fertilisation is permitted in compliance with the dosages already indicated. The distribution, with subsequent burial, of organic matter from livestock farms and digestates is permitted for the entire duration of the rotation, with the exception of the August-September period and the winter months.

Pruning

Breeding and stem cleaning pruning

Pruning of plants for the production of wood for the plywood industry is aimed at obtaining knot-free tops. The pruning height is proportional to the planting density and the expected shift length; for medium

spacing and shifts, it is sufficient to prune up to a maximum of 7 metres in height in order to achieve satisfactory quality assortments. In general, the branches that must be removed are mainly those that form on the stem part of the planted poplar tree, and only to a lesser extent those that differentiate on the part of the trunk that corresponds to the height increments of the first and second year after planting. In order to achieve the highest technological wood quality, the most compromising branches, i.e. those around the apex, must be removed. In the first two years of cultivation, the double tops and ascending shoots must be removed in good time (correction and training pruning); in the following years, lateral branches up to 5-7 m above the ground must be gradually removed (stem cleaning pruning).
Pruning operations should normally be carried out during the vegetative rest period, unless specific and documented technical choices are made.

Pruning scheme to be adopted during the dormant period in poplar plantations consisting of one-year-old nursery poplars for the production of logs for veneer, in particular for clone 'I-214.

Year 1 Remove double tops, the most vigorous shoots and all branches up to a height of 1.5 metres above the ground (the latter can also be cut during the growing season).
Year 2 Cut off the most vigorous shoots of the second whorl and thin out those of the first whorl by removing the larger ones; also remove all branches up to a height of about 2 metres above the ground.
Year 3 Thin out the shoots of the second whorl by removing the largest ones and all those below the first whorl to a height of about 3 metres above the ground.
Year 4 Thin out the branches of the second whorl by removing the largest and most dominant ones.
Year 5 Remove all remaining branches of the second whorl and all those present up to a height of about 6-7 metres.

Pruning scheme to be adopted during the dormant period in poplar plantations consisting of two-year-old nursery poplars for the production of logs for veneer, in particular for clone 'I-214.

Year 1 Remove the double tops, the most vigorous shoots and clean the stem up to a height of 2 metres from the ground (these can also be cut during the growing season).
Year 2 and 3 Thin out the branches of the first whorl by removing the larger ones and all branches up to a height of 3.5 metres above the ground. If the second whorl has formed beyond 7 metres there is no need to intervene, otherwise the tip must be corrected.
Year 4 and 5 Remove all branches up to a height of about 6-7 metres or, in any case, up to the portion of the stem with a diameter of 12-13 cm.

Pruning scheme to be adopted during the dormant period in poplar plantations for the production of logs for OSB panels, pulp.

Year1 If necessary, remove shoots along the stem with manual intervention up to 1.5 m from the ground if poplars are used, no intervention in the case of astons.
In subsequent years, for reasons related to the greater density of the plants and the characteristics of the final material obtainable, no special pruning is required. Mechanical pruning is permitted up to 2-2.5 m from the ground to eliminate branches that may obstruct the passage of operating machinery.

Soil Management

Intervention plans for working the soil in poplar plantations
In the first half of the shift, in order to improve the structure and permeability of the active layer of soil and for weed control, working the soil with disc harrows is of fundamental importance. In heavy soils, a maximum of two subsoil ploughings are permitted. Drainage ploughing towards the centre of the inter-row, which is necessary to avoid waterlogging, must be carried out in the autumn. It is advisable to

include green manure to limit the use of cover fertilisers.
In the second half of the shift there are no positive effects of tillage on plant growth, so it can be reduced in number or replaced by 1-2 mowing or shredding of spontaneous vegetation, avoiding operations in the month of May (period of reproduction of wildlife). Grassing, controlled with mowing or shredding, is recommended compared to traditional harrowing, especially in the presence of heavy and humid soils, to avoid the formation of tillage soles.
For plants with a higher density, soil tillage is advisable and practicable only in the first two years with mechanical intervention by harrowing or mowing.

Pest control
The containment of spontaneous vegetation must be carried out with agronomic interventions (with mowing, chopping, etc.) and/or tillage in the first half of the shift.
The containment of spontaneous vegetation can also be achieved by means of herbicide interventions in the case of a high presence of perennial weeds, in any case in the first half of the turn. In the case of high infestation potential, which is frequent in previously uncultivated land, it is possible to resort to the use of antigerminellum active ingredients to be distributed in pre-emergence of the weeds.
In any case, the use must be carried out along the row and on a surface area that does not exceed 15% of the cultivated area, respecting all the prescriptions envisaged for the use of plant protection products (National Action Plan for Integrated Pest Management). In sensitive areas, a maximum of 2 interventions per year is allowed, limited to the first 3 years of the rotation.
For plants with a density of more than 600 plants/hour, the containment of spontaneous vegetation must be carried out mechanically (by mowing, disc harrowing or chopping); this intervention is advisable and practicable only in the first two years, after which the complete covering of the foliage naturally inhibits the weed vegetation.

Irrigation
Poplar water requirements at different stages of the production cycle
In order to avoid slowing down or stopping growth during the period of most intense vegetative activity, it is very important to ensure the plant's water supply, especially during the summer period. In the event that the water table cannot be reached by the roots or in situations of prolonged drought, it is necessary to intervene with relief irrigation, possibly by run-off.
High or low soil permeability are unfavourable factors when assessing the suitability of a soil for irrigation.

Use and choice of plant protection products

Guidelines for phytosanitary discipline compatible with integrated pest management
Chemical control is only justified when it is associated with cultivation practices, in young plantations or when the plants' production potential is high.
Only the active ingredients contained in commercial products that include the category 'poplar' on the label may be used, limited to the indicated adversities, unless specific derogations are issued by the competent territorial offices (e.g. the Regional Phytosanitary Services or the Plant Disease Observatories), which may also authorise, if necessary, interventions against unforeseen pests.
The plant protection products that can be used are not among those listed in WHO 'Type 1A and 1B' and do not belong to the lists of pesticides banned by the international agreements of the 2009 Stockholm Convention.

All regulations and any restrictions on use laid down in current legislation must be observed.
When distributing phytosanitary products, all possible precautions must be taken to reduce damage to the operator and the environment: respect the dosages of the active ingredients and the indications regarding water volumes, carry out spraying in the absence of wind and during the coolest hours of the

day, choose commercial products with the lowest toxicity and not dangerous for the environment in view of their efficacy, carry out periodic maintenance on equipment and use personal protective clothing.

Tab. 1 - Integrated poplar protection

Adversity	Criteria	Restrictions on use and notes
Bronze (1) (*Marssonina brunnea*)	<u>Agronomic activities</u> Use of resistant clones	-
	Use of chemical Chemical control is only justified when it is associated with cultivation practices, in young plantations or when the plants' production potential is high Use volumes of water proportionate to the size of plants. The addition of adhesives to promote persistence and anti-drift is recommended.	A maximum of 2 treatments are allowed during the year, except in the case of locally justified derogations by the public phytosanitary services.
Spring defoliation (*Venturia populina*)	<u>Agronomic activities</u> Use of resistant clones In the case of infection, removal of pruning residues by chopping.	
	Use of chemical Chemical control is not feasible for technical agronomic reasons.	No treatments are allowed.
Rusts (*Melampsoraspp.*)	<u>Agronomic activities</u> Use of tolerant clones	
	Use of chemical Chemical control is only justified when it is associated with cultivation practices, in young plantations or when the plants' production potential is high. Use volumes of water proportionate to the size of the plants. We recommend the addition of adhesives to promote persistence and anti-drip agents	Use of chemical may only be carried out in plantations between 3-6 years, unless exempted locally justified by the territorial phytosanitary services. The addition of insecticides is prohibited.

Cortical necrosis (*Discosporiumpopuleum*)	Agronomic activities Maintain plants in good vegetative condition with rational cultivation practices. Hydration of poplars before transplanting. Use of chemical	 No treatments are allowed.
Virosis (PoplarMosaic Virus)	Agronomic activities Use of asymptomatic material Use of resistant clones	
Root rot (Rosellinianecatrixe Armillaria mellea)	Agronomic activities Scaling of plants showing leaf yellowing to expose infected root portions. Removal of stump residues. Avoid replanting for at least two years, allocating the land to herbaceous crops, preferably green manure.	
	Use of chemical	No treatments are allowed.
Ice Pick (Cryptorrhynchuslapathi)	Use of chemical Carry out the treatment on sprouting plants. It is necessary to operate on dry plants by wetting the stem of the poplar trees until it drips. Alternatively, the treatment can be carried out during the vegetative rest period. This intervention allows a very high selectivity towards useful entomofauna.	In the planting phase, the use of pre-treated poplar trees in nurseries or while in pile is mandatory. At least 10 days must elapse between the treatment and any immersion of the poplars in natural watercourses. Field treatment is only permitted in the 2nd and 3rd year of the rotation, subject to derogations for plants established with the San Martino clone. A maximum of 1 intervention per year is permitted It is mandatory to remove flowering weeds before insecticide treatment.
Chrysomela (Melasomapopuli)	Use of chemical	Only one insecticide intervention is permitted in case of infestation for the Protection of sprouting of newly transplanted poplars

Cigar Maker (Byctiscuspopuli)	Use of chemical	Only one insecticide intervention is permitted in case of infestation for the Protection of sprouting of newly transplanted poplars
Tarlovespa	Use of chemical	The following are not allowed
(Paranthrene tabaniformis)	Use of chemical	insecticide treatments
Gemmaiola Gypsonomaaceriana	Use of chemical	Insecticide treatments are not permitted
Saperda major (*Saperda carcharias*)	Use of chemical Intervene in the period between the end of May and mid-June. It is necessary to operate on dry plants and wet the stem until it drips. Alternatively, a localised treatment can be carried out, tunnel by tunnel, in the period between mid-June and mid-July. The most favourable time for execution begins when the tunnels are evident	One treatment per year is permitted Plant monitoring is compulsory; generalised intervention is permitted in young plantations between 2 and 5 years of age (only the basal portion of the trunk must be treated), when the percentage of infested plants is 15% or more Brushing the entrance hole and the initial part of the tunnel using the same products used for general treatment
	Agronomic activities Adoption of cultivation practices that encourage vigorous plant growth The elimination of weeds at the base of the trunks (see chapter on weed control), which create a favourable environment for the insect's ovideposition activity, allows adequate wetting of the bark in the case of subsequent activities Conservation in the poplar plantation of dead or broken plants to encourage the nesting of the Red Woodpecker, an active predator of xylophagous insect larvae	

Laniger aphid (Phloeomyzuspas serinii)	Use of chemical Treatment of infested plants when the first colonies appear	To achieve a satisfactory level of effectiveness, it is important to intervene when the development of the aphid is still limited, and the colonies are not yet completely covered by the waxy secretion. Treatment is only permitted with infestations in place
	Agronomic activities Use of resistant clones	To safeguard beneficial insects and natural aphid limiters, flowering weeds must be removed before treatment
Lepidoptera and other defoliators (*Hyphantria, Clostera*)	Microbiological interventions Intervene in the summer with crown treatments	In the case of Ifantria infestations, intervention is only permitted in plantations consisting of Euro-American clones and only against the 2nd[a] generation larvae (August-September). Carry out treatments in the evening hours: photodegradation phenomena caused by UV rays can reduce the effectiveness of *Bacillusthuringiensis* products.

Harvesting

The harvesting of the material is to be carried out with the felling of all the plants in the plantation by specialised harvesting companies that are obliged to operate in accordance with the legal regulations in force.

In the case of plantations dedicated to the production of logs suitable for the production of veneers and packaging, cutting is carried out with traditional mechanised yards (low mechanisation, e.g. chainsaws and traditional, non-specialised agricultural tractors), advanced yards (high mechanisation, with equipment suitable for carrying out complex operations, e.g. special felling heads) and/or pushed yards (using combined machines, e.g. *harvesters*). Subsequently, the soil must also be restored for agricultural use by shredding or removal of the root system.

In the case of plantations dedicated to the production of logs for other uses (OSB, pulp), cutting can be performed with different types of yards, sometimes with high mechanisation. After harvesting, the stumps can be reared for further production cycles. When the viability of the stumps is exhausted, the root systems must be removed and the soil restored for agricultural use.