QUALITY FOREST

Co-funded by the
Erasmus+ Programme
of the European Union

QUALITYFOREST

Learning and Assessment Guide

FORESTRY OPERATIONS

CONTACTS & PARTNERS

SPAIN

CONSORCIO CENTRO DE CIENCIA Y TECNOLOGÍA FORESTAL DE CATALUÑA

Rosa M. Ricart

rosa.ricart@ctfc.cat

Generalitat de Catalunya
Consorci per a la Formació Contínua de Catalunya

Esperanza Rodríguez

esperanza.rodriguez@gencat.cat

FRANCE

CENTRO FORESTIER DE LA REGIÓN PROVENZA-ALPES-COSTA AZUL

Christian Salvignol

salvignol@centre-forestier.org

BELGIUM

NATUURINVEST

Christine Verecken

christine.verecken@lne.vlaanderen.be

PORTUGAL

ASSOCIAÇÃO NACIONAL DAS EMPRESAS FLORESTAIS, AGRÍCOLAS E DO AMBIENTE

Pedro Ramos

geral@anefa.pt

BULGARIA

UNIVERSITY OF FORESTRY

Petar Antov

p.antov@ltu.bg

POLAND

SZCZECINSKA SZKOLA WYZSZA COLLEGIUM BALTICUM

Maria Bitel

m.bitel@cb.szczecin.pl

SLOVENIA

ZAVOD ZA GOZDOVE SLOVENIJE

Jurij Beguš

Jurij.Begus@zgs.si

Associated partners

Generalitat de Catalunya
Institut Català de les Qualificacions Professionals

EFESC
European forestry and environmental skills council

hazi

cifse

Centro de Formación e Experimentación Agroforestal de Lourizán
CONSELLERÍA DO MEDIO RURAL

GOBIERNO DE CANTABRIA
CONSEJERÍA DE EDUCACION
I.E.S Foramontanos
Avda. de la Constitución 51
39500 Cabezón de la Sal (Cantabria)

INSTITUTO DE FORMACIÓN AGROAMBIENTAL DE LA CAMPIÑA

JUNTA DE ANDALUCIA
CONSEJERÍA DE MEDIO AMBIENTE
Y ORDENACIÓN DEL TERRITORIO

Co-funded by the Erasmus+ Programme of the European Union

This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

ISBN 978-83-61082-54-5

INDEX

1. Introduction

1.1. Rationale for development of the Learning and Assessment Guide

The present Proposal for a Learning and Assessment Guide has been developed within the project "Proposal for a new professional qualification that includes all the competences of the European Chainsaw Certificate – Quality Forest", № 2017-1-ES-01-KA202-038677. The project is co-financed by the European Commission under the Erasmus+ Programme, Key Action KA2 "Cooperation for innovation and the exchange of good practices", Action "Strategic Partnerships".

The proposal for a learning and assessment guide is focused on the acquisition and assessment of knowledge/capacities of the new professional qualification (occupational standard) in the field of Forestry – "Forestry maintenance and conservation activity/work in natural spaces" but will also introduce innovative tools and resources from the pedagogical point of view. This Guide will be useful for those who will develop in the near future the «prescriptive guide». The prescriptive guide is the one used to prepare a course. The guide comprises the assessment system included in the European Chainsaw Certificate, where the trainer/teacher is a different person from the person who performs the assessment (assessor). This assessment system reinforces the quality and collaborations among the different vocational education and training providers, trainers and assessors. We expect that this proposal is going to be accepted by CEDEFOP-Training centres - trainers and assessors. This assessment system can be transferable to other sectors as well as the methods/tools implemented there. Inputs and feedback from trainees and industries will also be taken into consideration.

1.2. Approach to the development of the Guide

The development of the present Guide is based on the approach of continuity and acquisition of existing experience in the field of vocational education and training in all project partner countries. In this respect, the Guide contains summarized positive experience and best practices from the ŵparticipating partner countries and is aimed at providing methodological and practical support to vocational training centres and enhancing the quality of vocational education.

1.3. Objectives of the Learning and Assessment Guide

The main objective of the Guide is to improve the quality of vocational education and training in accordance with the requirements of the main strategic documents in the respective field at national and European level (the European Quality Assurance in Vocational Education and Training, European Qualifications Framework, Europass, etc.). It will help to achieve this goal by increasing the professional qualification of the teachers/trainers and assessors and through fulfilling the current demands of the Forestry sector by encouraging and promoting lifelong learning and continuous professional development throughout Europe.

The Guide provides methodological guidelines and practical information about the development, realization and assessment of the training process in accordance with the current labour market needs and quality requirements in the contemporary vocational education and training.

1.4. Target group of the Guide

The proposed learning and assessment guide is intended for the teachers/trainers and assessors in the field of vocational education and training and is aimed at improving the quality of the training process (both theoretical and practical), optimizing the performance and increasing the effectiveness of the vocational training centres as well as achieving a better balance between the quality of education and the planned training resources.

1.5. Structure and content

The Guide is structured in general and special parts. The general part contains theoretical information about contemporary theories, approaches, methods, techniques and tools for vocational education and training. The profiles of the main participants in the training process – teachers/trainers and trainees, as well as their main characteristics are also presented as a necessary prerequisite for establishing successful communication and cooperation in order to successfully complete the training process. The special part is comprised of the main stages of the training process with information, guidelines and practical examples.

2. Organization and implementation of training

The purpose of this part of the Guide is to give teachers/trainers the necessary minimum of theoretical knowledge how to organize, prepare and conduct the training process and to make them familiar with modern approaches and methods for vocational education and training. It is aimed at understanding the essence of modern rather than traditional training methods as well motivating teachers/trainers to use approaches, methods and techniques for this type of teaching.

2.1. Contemporary teaching methods

In the past, vocational education and training provided general education and prepared learners for a clearly defined trade or profession. The pace of technological development and changes in how work is organized have led to shifting the focus on innovation and lifelong learning. Having the world of global information at our fingertips, the significance of acquiring and storing huge quantities of quickly outdated, pre-selected knowledge has decreased tremendously. All these changes are transforming the way we perceive knowledge, skills and learning.

Nowadays, the emphasis is on developing action competences, i.e. on developing capacities for dealing with certain work or life situations in which the ability to apply knowledge and solve practical problems is central. Vocational education and training also aim to prepare individuals to actively shape their personal and professional lives and take part in society in a self-guided manner. People need to learn how to reflect on their experiences and on the world around them with a view to seizing new opportunities, living up to challenges and ultimately becoming responsible citizens in a sustainable development context.

The contemporary vocational education and training should be focused on fostering motivation, creativity, leadership, self-evaluation, self-guidance, reflection, critical and cross-disciplinary thinking, flexibility, digital literacy, time management, (international) team working, problem-solving and social skills. Self-directed and innovative approaches to work and learning have become key lifelong learning competences. Competences of this kind are not linked to any specific subject matter, but are, rather, cross-curricular key competences. They are essential to building action competence that go beyond the traditional perception of technically trained people exercising a certain trade or profession. All these changes are transforming the way people acquire knowledge and skills. Vocational education and training nowadays need to prepare learners for a more complex society that calls for comprehensive and broad-based professional competences and the ability to adapt to changing circumstances and deal with unknown and unanticipated situations.

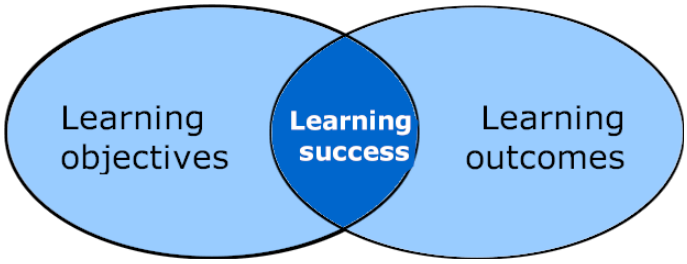
In the contemporary vocational training, formulating the 'right' learning goals (learning outcomes) and choosing the 'right' learning content is of greatest importance to fulfill the pre-defined aims of the training process. It would logically seem to be more meaningful to describe, with the help of employers, major areas of work and situations likely to be encountered by learners in their future working and social lives. This is the basis on which holistic interdisciplinary competence should be built.

The aforementioned learning outcomes, defined as 'statements of what a learner knows, understands and is able to do on completion of a learning process, which are defined as knowledge, skills and competences' are a key concept in the design of European instruments fostering transparency, comparability, transferability and recognition of qualifications between different countries and at different levels. In this definition, the form of learning is not specified: it can take place either in formal or non-formal education arrangements, or informally through experience gained in the community or at the work place.

Learning outcomes statements help to clarify programs and qualifications intentions and make it easier for the learners, teachers/trainers or assessors to work towards these expectations.

Some authors point to the risk of confusion when no difference is made between intended and achieved learning outcomes. The authors differentiate between learning objectives, learning outcomes and learning success. Learning objectives are the knowledge, skills and competences intended by the teacher, which the student should achieve through the learning process. Learning outcomes are all competences,

knowledge and skills acquired by the learner through the learning process. Learning success is the assessed overlap between these two elements, i.e. the totality of knowledge, skills and competence which was intended and achieved, excluding non-intended or non-achieved learning outcomes (see the figure below).



Source: Euler and Hahn, 2004, p. 121

There is no single way of defining and writing learning outcomes; the approach has to reflect the particular purpose and context in question. As documented by Cedefop (2016) the following purposes are common across Europe:

Qualifications frameworks

Qualifications frameworks play an increasingly important role at international, national and sectoral level. Learning-outcomes-based frameworks seek to increase transparency and allow for comparison of qualifications across institutional and national borders. The learning outcomes descriptors of qualifications frameworks are normally designed using a horizontal axis identifying learning domains (such as knowledge, skills and competence) and a vertical dimension indicating how the complexity of learning increases from level to another.

Qualification profiles and/or standards

Qualification standards define the expected outcomes of the learning process, leading to the award of a full or partial qualification. In vocational education and training, profiles or standards normally answer questions such as 'what does the student need to learn to be effective in employment' and 'what does the learner need to learn to become an active citizen, supporting basic human and democratic values?' A qualification standard is not exclusively about promoting skills relevant to the labor market but must address a broader set of competences relevant to life and society in general. It must also consider the changing nature of the labor market and society and clarify the role of transversal skills and competences, for example related to communication, social skill and problem-solving. The European credit system for VET (ECVET) has paid particular attention to the identification of units of learning outcomes; it sees these as critical for promoting transfer and accumulation of vocational skills and competences across Europe.

Occupational standards

Occupational profiles or standards are normally set outside the education and training system, by labor market stakeholders, but can have significant impact on the way learning outcomes statements are defined and written. Occupational profiles or standards specify 'the main jobs that people do', describing the professional tasks and activities as well as the competences typical for an occupation. Occupational standards show what students must be able to do in employment and can serve as the link between education and training and the needs of the labor market. An occupational standard will normally differ significantly from a qualification standard. A qualification standard needs to look beyond the specific functions of a single job or occupation and prepare learners for various jobs and occupations which inevitably will change over time.

Curricula

Curricula set the framework for planning learning experiences. Depending on the country, the type of education and training, and the institution, learning outcomes statements form an important part of curricula. They guide teachers in the teaching process, for example supporting the choice of methods, and they inform learners about what they are expected to know/do and understand after a given learning activity. Learning outcomes in curricula can differ in detail; sometimes defining outcomes of an entire program, sometimes focusing on specific outcomes of a training module.

Assessment specification and/or standards

Assessment specifications identify the methods and the criteria for assessments. These criteria, using learning outcomes statements, are often formulated as threshold levels which have to be met by the learners. Assessment standards and the criteria they use are more detailed than qualifications standards and curricula in the sense that they have to describe the requirements precisely to the learner. These requirements normally support summative assessments at the end of the learning process but can also orient formative assessments taking place throughout the learning process.

Learning outcomes are perceived as adding value to the following different purposes:

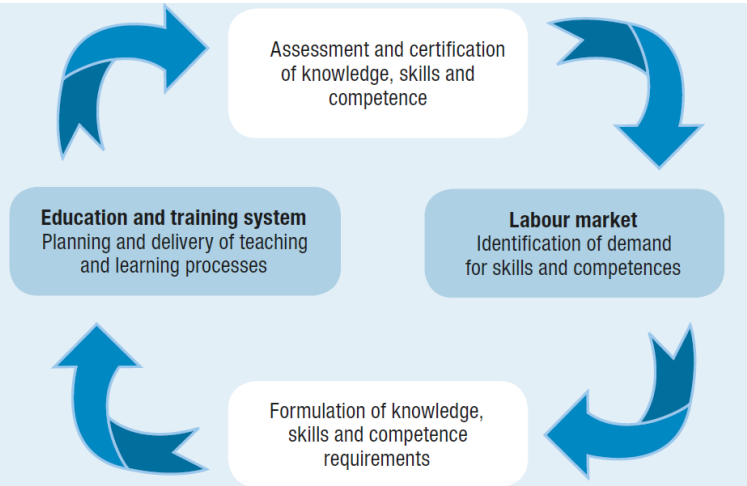
- for the learners: learning outcomes statements clarify what a learner is expected to know and be able to do and understand having completed a learning sequence, a module, a program or a qualification. They support initial choice of education, training and/or learning paths; they help to orient the learning process itself; and they clarify what to expect during assessment. In order to make any difference to learners, learning outcomes must be visible not only in qualification standards and program descriptions. Their visibility in practice, throughout the teaching and learning process as well in assessment arrangements, is of critical importance;

- for the teachers/instructors: the learning outcomes approach helps to orient teaching, to select the most appropriate methods and to support the learning process. Learning outcomes, through their focus on the requirements to learning process are crucial for promoting a more systematic reflection on assessment criteria and methods and how these interact with and support the learning process;

- for the assessors: the learning outcomes approach supports assessment by clarifying the criteria for success/failure and performance. While most frequently linked to summative assessments, learning outcomes can help with formative assessment throughout the learning process;

- for the education and training institutions: learning outcomes provide an important instrument for planning, and for internal and external dialogue. The perspective helps to determine the purpose and orientation of a course, a program or qualification and to clarify how it relates to and/or overlaps with other programs and qualifications. Learning outcomes can provide an important reference point for quality assurance; the relationship between intended and actual learning outcomes provides important input to the continuous review and development which is expected from education and training institutions;

- for society and labor market: learning outcomes provide a common language allowing different stakeholders in education and training, as well as the labor market and society at large, to clarify skills needs and to respond to these in a relevant way. If used systematically, this allows for systematic review of the quality and relevance of education and training, focusing on the relationship between intended and actually achieved learning outcomes. The continuous quality assurance of vocational education and training depends on the constant feedback between VET and the labor market - the intentions expressed by the vocational education and training system are constantly challenged by experiences from the labor market and society (see the figure below).



Source: Cedefop, 2017

Understanding the effects of vocational pedagogies, and particularly of learner-centered approaches, can help VET teachers and trainers more effectively match teaching and learning methods to the needs of their students and their contexts. The learner-centered approach encompasses methods of teaching that shift the focus of instruction from the teacher to the learner, aiming at development of learner autonomy and independence by putting responsibility for the learning path in the hands of learners. Learner-centered instruction focuses on skills and practices that enable lifelong learning and independent problem-solving. In a learner-centered environment, learners choose what they will learn, how they will learn, and how they will assess their own learning. This is in contrast to traditional education, also dubbed "teacher-centered learning", which situates the teacher as the primarily "active" role while learners take a more "passive", receptive role.

In this way the application of contemporary teaching methods can directly impact on the quality of teaching and learning and achieving the wider goals of vocational education and training.

Some of the most widely used contemporary teaching methods, incorporating learner-centered approach to the training process, are presented below.

Interdisciplinary teaching

Interdisciplinary instruction entails the use and integration of methods and analytical frameworks from more than one academic discipline to examine a theme, issue, question or topic. Interdisciplinary education makes use of disciplinary approaches to examine topics but pushes beyond by: taking insights from a variety of relevant disciplines, synthesizing their contribution to understanding, and then integrating these ideas into a more complete, and hopefully coherent, framework of analysis.

Engaging students and helping them to develop knowledge, insights, problem solving skills, self-confidence, self-efficacy, and a passion for learning are common goals that educators bring to the classroom and interdisciplinary instruction and exploration promotes realization of these objectives. Interdisciplinary teaching fosters advances in cognitive ability. The main distinct educational benefits of interdisciplinary learning include the ability to recognize bias; think critically; tolerate ambiguity; acknowledge and appreciate ethical concerns.

Interdisciplinary instruction fosters the acquisition of foundational knowledge, promotes integration of ideas from multiple disciplines and provides insight on how to apply knowledge all of which advance learners' understanding of how to learn. Moreover, it helps learners develop their cognitive abilities - brain-based skills and mental processes that are needed to carry out tasks. Interdisciplinary learning fosters a number of cognitive attributes, such as the acquisition of perspective-taking techniques (the capacity to understand multiple viewpoints on a given topic), development of structural knowledge (both declarative knowledge (factual information) and procedural knowledge (process-based information).

Interdisciplinary Team Teaching

Team teaching involves a group of instructors working purposefully, regularly, and cooperatively to help a group of students of any age learn. Teachers together set goals for a course, design a syllabus, prepare individual lesson plans, teach students, and evaluate the results. They share insights, argue with one another, and perhaps even challenge students to decide which approach is better.

There are three main types of team teaching: (1) two or more teachers loosely sharing responsibilities; (2) team planning, but individual instruction; and (3) joint planning, instruction, and evaluation of learning experiences. New teachers may be paired with veteran teachers. Innovations are encouraged, and modifications in class size, location, and time are permitted. Different personalities, voices, values, and approaches spark interest, keep attention, and prevent boredom. The team-teaching approach allows for more interaction between teachers and students. Teachers evaluate students on their achievement of the learning goals; students evaluate teachers on their teaching proficiency. Emphasis is on student and teacher/trainer development, balancing initiative and shared responsibility, specialization and broadening horizons, the clear and interesting presentation of content and student development, democratic participation and common expectations, and cognitive, affective, and behavioral outcomes. This combination of analysis, synthesis, critical thinking, and practical applications can be done at all levels of education.

Working as a team, teachers model respect for differences, interdependence, and conflict-resolution skills. Team members together set the course goals and content, select common training materials, and develop tests and final examinations for all students. They set the sequence of topics and supplemental materials. They also give their own interpretations of the materials and use their own teaching styles. The greater the agreement on common objectives and interests, the more likely that teaching will be interdependent and coordinated.

Teaching periods can be scheduled side by side or consecutively. For example, teachers of two similar classes may team up during the same or adjacent periods so that each teacher may focus on that phase of the course that he or she can best handle. Students can sometimes meet all together, sometimes in small groups supervised by individual teachers or teaching assistants, or they can work singly or together on projects in the library, laboratory, or fieldwork. Teachers can be at different sites, linked by video-conferencing, satellites, or the Internet.

Team teaching can have a highly positive impact on student learning outcomes, largely due to the increased opportunity for student participation that team teaching provides. The presence of more than one instructor in the classroom increases the occasions for student-teacher interaction. More importantly, a collaborative teaching environment invites students to take a more active role in the learning process. Because team teaching encourages a variety of perspectives on a topic, students are more likely to feel they can make valuable contributions to class discussions.

Team teaching boasts many pedagogical and intellectual advantages: it can help create a dynamic and interactive learning environment, provide instructors with a useful way of modeling thinking within or across disciplines, and also inspire new research ideas and intellectual partnerships among teachers/trainers. To experience the full benefits of team teaching, however, instructors must adjust their course planning and classroom management strategies to accommodate a collaborative approach.

Self-regulated learning

Self-regulated learning refers to student's ability to understand and control one's learning environment. Self-regulation abilities include goal setting, self-monitoring, self-instruction, and self-reinforcement. It should not be confused with a mental ability or an academic performance skill. Instead, self-regulation is a self-directive process and set of behaviors whereby learners transform their mental abilities into skills

and habits through a developmental process that emerges from guided practice and feedback. Self-regulated learning is a cyclical process, wherein the student plans for a task, monitors their performance, and then reflects on the outcome. The cycle then repeats as the student uses the reflection to adjust and prepare for the next task. The process should be tailored for individual students and for specific learning tasks.

The figure below illustrates the key phases of the process. These different steps are performed by the student, but instructors play a vital role in guiding and coaching students through each step.

Source: Sharon Zumbrunn, 2011

The successful self-regulators develop the necessary skills and habits to be effective learners, exhibiting effective learning strategies, effort, and persistence. The key for instructors is to understand how to foster and train these skills in all students. Self-regulated learning strategies help to prepare learners for lifelong learning and the important capacity to transfer skills, knowledge, and abilities from one domain or setting to another.

The self-regulated learning consists of three components: cognition, metacognition, and motivation. The cognition component includes the skills and habits that are necessary to encode, memorize, and recall information as well as think critically. Within the metacognition component are skills that enable learners to understand and monitor their cognitive processes. The motivation component surfaces the beliefs and attitudes that affect the use and development of both the cognitive and metacognitive skills.

Action-oriented and project-based learning

Action-oriented learning is a pedagogic approach that defines the role of teachers in supporting self-directed acting and experiential learning in authentic situations on the part of the learners. As a result of the action-oriented learning, learners are expected to acquire not only skills and knowledge laid down in qualifications, unit standards and skeleton curricula, but also technical, individual, methodological and social competences and attitudes.

Action-oriented learning is a concept of education emphasized on learning by doing. The learning process contains expedient objectives in the form of tasks and problems on the basis of which learners can organize their activities independently. The learners are given incentives and scope within theoretic knowledge and practical experience to develop their motivation on the basis of expected success.

Action knowledge would be better acquired by means of active problem solving in project-based learning, where in addition to technical, some methodological, social and personal competences will be acquired. Action-oriented learning needs suitable tasks for the learner to offer chances for self-responsible and self-organized learning with processes of communication and cooperation between the learners and the teacher/trainer. With the project-based learning, learners are set with the task to create a product or a service. The process is supposed to activate as much skills, knowledge and abilities as possible in order to create new competences this way. Theoretical and practical contents are equally learned and correlated. The training institution and the teacher should provide a learning environment with all necessary facilities including the tools, workshop, required theoretical training materials and the curriculum. Within the project, the learners have to gather the necessary information and acquire the knowledge needed to fulfill the task. Usually learners work and learn together as a team in the project, so that they could reflect on issues faced, and to balance the conflict between job and academic knowledge. Learning driven by making is much more attractive in comparison with passively receiving knowledge in a lecture, it promotes the motivation and enhances interests and abilities for self-regulated learning.

Case studies

Learning and teaching styles are changing and recently there has been an obvious move from lecture-based activities towards more student-centered activities. Case studies become more and more popular form of teaching and have an important role in developing skills and knowledge in learners. They bring realistic, complex and contextually rich situations and often involve a conflict, dilemma or a problem which those included in the case must negotiate and solve. They are descriptions of a real life experience related to the field of study or training, which are used to make points, raise issues and enhance the participants´ understanding and learning experience. They usually follow a realistic scenario from start to finish. As they provide practical examples of problems and solutions, challenges and strategies, they support more theoretical material and often make the "lesson" more memorable and believable for the learners.

Case studies can be used in any discipline when instructors want learners to explore how what they have learned applies to real world situations. They come in many formats, from a simple question of "What would you do in this situation?" to a detailed description of a situation with accompanying data to analyze. Most case studies tasks require learners to answer an open-ended question or develop a solution to an open-ended problem with multiple potential solutions. Requirements can range from a one-paragraph answer to a fully developed group action plan, proposal or decision.

Case studies are considered to be an effective-based method for bridging the gap between theory and practice, between the academy and the workplace, and many emphasize that they present a "best practice" in the teaching and learning process. This makes case studies very popular as part of an integrated approach used by teachers and trainers to enhance what is seen as quality of teaching tied to the development of applied knowledge based on analytical and critical thinking skills.

The rationale provided for the use of case studies in vocational education and training underlies the belief that many learners tend to learn better from examples than from logical development starting with basic principles. In addition, case studies can help reinforce concepts and understanding, develop critical and analytical skills, foster team efforts in developing solutions to problems and challenges stimulating real world situations, and make classes more interactive and memorable.

Case studies vary in length and detail, and can be used in a number of ways, depending on the case itself and on the instructor's goals: they can be short (a few paragraphs) or long (e.g. 20+ pages); they can be used in lecture-based or discussion-based classes; they can be real, with all the detail drawn from actual people and circumstances, or simply realistic; they can provide all the relevant data students need to discuss and resolve the central issue, or only some of it, requiring students to identify the missing information; they can require students to examine multiple aspects of a problem, or just a circumscribed piece; they can require students to propose a solution for the case or simply to identify the parameters of the problem.

A common characteristic of all case studies is that they are used to enhance the learning and understanding

of concepts by linking them to the real world through modelling, symbolic or realistic representation, or imagining scenarios and situations. The chosen case studies should be: relevant (they must reinforce learning and the key concepts, theories, or skills being taught), practical (they should contain elements for practical application such as real world examples or scenarios), dialogical (they should include elements fostering team work, brainstorming, participation, cooperation, and discussion), interesting (the case studies should be rich in content, providing considerable value and teachable opportunities), and appropriate (they should include enough content and be of a suitable topic to facilitate interest and achieve objectives within given time constraints).

Conclusion

Preparing learners for complex situations and the world of work poses new challenges for vocational education and training. People need broad work and social competences i.e. holistic action competence incorporating cross-disciplinary key competences. This alters the mandate for vocational education, as it is not sufficient to be trained once in a lifetime for a narrow specialization in line with functional prescriptions. Building on solid traditional foundations, the modern vocational training should give people the necessary theoretical knowledge and practical skills to reflect on the world, thick critically, seize opportunities and solve problems, especially in new, complex and unexpected work situations.

2.2. Professional profile of the teaching staff

The teaching staff has the responsibility of managing human and technical resources in the use of techniques and tools. The teacher should be able to promote critical capacity, autonomy and collaboration. To do so the teaching staff should work to recognize the following features:

- technological skills, operational skills, pedagogical skills, social and management skills.

The minimum requirements of the teaching staff (academic qualification and background, professional experience, necessary pedagogical, methodological and social competences, etc.) must be in accordance with the units of competence that are intended to be achieved and the corresponding learning modules:

Felling and tree's processing with a chainsaw

1. Command of the knowledge and techniques related to the felling and processing of trees with a chainsaw, which should be accredited in one of the following ways:

- An academic qualification as a Technical Engineer or of a similar type at higher level and related to this professional field.

- Professional experience of at least 3 years in the competences related to this learning module.

2. Accredited pedagogical competence in accordance with the relevant authority's regulations.

Clearing and processing of logging by-products

1. Command of the knowledge and techniques related to logging and the processing of forestry by-products, which should be accredited in one of the following ways:

- An academic qualification as a Technical Engineer or of a similar type at higher level and related to this professional field.

- Professional experience of at least 3 years in the competences related to this learning module.

2. Accredited pedagogical competence in accordance with the relevant authority's regulations.

Work-at-height in the trees

1. Knowledge and command of techniques related to work at height in trees, which should be accredited in one of the following ways:

- An academic qualification as a Technical Engineer or a similar type at higher level and related to this professional field.

-Professional experience of at least 3 years in the competences related to this learning module.

2. Accredited pedagogical competence in accordance with the relevant authority's regulations.

Repopulation of inland aquatic species and the conservation and improvement of their habitat

1. Knowledge and command of techniques related to the restocking of inland aquatic species and the conservation and improvement of their habitat which should be accredited in one of the following ways:

- An academic qualification as a Technical Engineer or a similar type at higher level and related to this professional field.

-Professional experience of at least 3 years in the competences related to this learning module.

2. Accredited pedagogical competence in accordance with the relevant authority's regulations.

Handling and maintenance of forestry tractors

1. Knowledge and command of techniques related to the handling and maintenance of forestry tractors, which should be accredited in one of the following ways:

- An academic qualification as a Technical Engineer or a similar type at higher level and related to this professional field.

- Professional experience of at least 3 years in the competences related to this learning module.

2. Accredited pedagogical competence in accordance with the relevant authority's regulations.

Felling and processing of trees with a forest harvester

1. Command of the knowledge and techniques related to the felling and processing of trees with a forest harvester, which should be accredited in one of the following ways:

- An academic qualification as a Technical Engineer or of a similar type at higher level and related to this professional field.

- Professional experience of at least 3 years in the competences related to this learning module.

2. Accredited pedagogical competence in accordance with the relevant authority's regulations.

Resuming, the training team must have theoretical knowledge about the subject matter and sufficient experience acquired over the years of work that allows them to be at ease in the training to be given to the trainees. At the same time, they must have pedagogical skills duly recognized by the authorities of each country. The educators are considered dual professionals in that they require current industry knowledge and expertise, as well as the skills and knowledge to facilitate learning in a variety of methodologies.

2.3. Trainees' profile

We can characterize the profile of the students in two generic categories - those who intend to follow the chosen profession, whether or not they have work experience, and those who, through their professional experience, intend to learn more or have their skills recognized, professional.

Usually the first category corresponds to the younger population, regardless of the professional choice, seek to combine the beginning of a career with the obligatory studies in each country. The second category is generally associated with professional staff, often with low level of education, where the learning was carried out in a very self-taught way.

However, the objective is similar, in both cases it is intended that the trainee reaches a level of excellence in the professional area that intends to follow. To reach this level, it is not enough to have only good

teachers, ideal facilities or the right program to achieve. It is also necessary for the trainee to be focused on the main purpose of learning.

Although there are some aspects that are similar in both categories there are however differences given not only the average age of each but also the ease in dealing with the latest technology and consequently the ease in acquiring and understanding certain concepts.

As a general trainee profile we can point as features:

- Motivation - Without motivation and will from the trainees it becomes very difficult to reach the final goal. Part of this motivation can be developed in partnership with the training team but the trainee has to want to advance in his learning. Regarding the case of professionals already working in the respective area, that is, in the second category considered, motivation is often obtained only through recognition by the employer of the efforts made by the trainee;

- Capacity for planning and time management - this characteristic is reflected differently in the two categories presented. Thus, in the first, the trainee must be able to reconcile learning and professional training with the school activity. In the second category there must be a commitment from the employer and the trainee in the use and management of time. In both cases this requires a planning effort on the part of the trainee who has to know how to manage it;

- Ability to analyze and select information - be able to identify what is most important to his/her learning path by selecting within the information provided the one that most applies to his/her difficulties. Also here the way to follow is different in both categories, since in the first there will be a tendency to the trainee to think that everything is important or select the information according to his taste. In the second category we often find some lack of holiness from the trainee, who thinks that he knows everything and is better than the training staff, regarding his professional experience. The trainee must be able to identify their difficulties and, together with the training team, find ways to overcome them;

- Communication - the trainee must have good communication skills in order to share his / her experiences and difficulties, both with colleagues and with the training team.

In accordance with the units of competence that are intended to be achieved and the corresponding learning modules there are some specific features associated with them like ability to drive machines and equipment and not having problems working at height, for example.

Regarding the basic rights and responsibilities of the trainees connected with the proposed vocational education and training can be considered:

Rights

- Training contract approval letter or Employer's copy of the training contract;
- Copy of the training plan/record;
- Records of time worked and wages paid to the trainee;
- Results of formal training undertaken by the trainee.

Responsibilities

- Be open to learn new things and enjoy the learning journey;
- Accept lawful instruction given by the training staff in regard to work, training and instruction in the workplace;
- Attend/participate in the formal training process, be it face to face sessions or online activities;
- Complete tasks, assessments, assignments, etc. that are set by the Training Staff;
- Keep and update progress report on either a copy of the training plan/record and show it to Training Staff upon request;

- Notify the Training Staff if they are going to be late or absent from work or training;
- Notify the Training Staff of any change to personal details such as address, name, etc.;
- Comply with health and safety regulations at work.

If the trainee is under 18 a parent or guardian must co-sign the training contract.

2.4. Training resources

Learners need to have access to learning resources, facilities and equipment that are relevant for each competency undertaken. The learning materials and resources are linked to the competencies in which each learner is enrolled, and all are linked to the training package/accredited course requirements.

The learning resources, necessary for the successful implementation of the training process involve the requirements to the training spaces, premises and facilities; means, tools, machinery and equipment, training materials (handbooks, manuals, etc.); work clothing and personal protective equipment etc..

Regarding the learning modules involved in this project the folowing resources were considered as fundamental to achieve the main purposes with success:

Felling and tree's processing with a chainsaw

An agricultural workshop with an area of 90 m².

Multipurpose classroom of at least 2 m² per student.

Premises: Minimum area of 10 hectares (wooded ground) (A unique space not necessarily situated in the educational center).

Chainsaws and their maintenance equipment. Equipment to support the felling and tree's processing such as wedges, metric tapes, axes, oil and gasoline, etc..

Personal protective equipment (PPE). Environmental protection equipment.

Manuals and handbooks.

Clearing and processing of logging by-products

An agricultural workshop measuring 90 m².

Multipurpose classroom of at least 2 m² per student.

Premises: Minimum area of 10 hectares (wooded ground) (A unique space not necessarily situated in the educational center).

Equipment to extract logs and harvesting residues and their maintenance equipment.

Personal protective equipment (PPE). Environmental protection equipment.

Manuals and handbooks.

Work-at-height in the trees.

Multipurpose classroom of at least 2 m² per student.

Premises: Minimum area of 10 hectares (wooded ground) (A unique space not necessarily situated in the educational center).

Store with an area of at least 120 m² (A unique space not necessarily situated in the educational center).

Chainsaws and their maintenance equipment. Equipment to support the work at height such as safety harness, climbing ropes, metric tapes, axes, oil and gasoline, etc..

Personal protective equipment (PPE). Environmental protection equipment.

Manuals and handbooks.

Repopulation of inland aquatic species and the conservation and improvement of their habitat.

A fishery (a unique space not necessarily situated in the educational center).

Multipurpose classroom of at least 2 m² per student.

Store with an area of at least 120 m² (A unique space not necessarily situated in the educational center).

Water analysis equipment, fish and crustacean collection equipment, construction equipment, etc..

Environmental protection equipment.

Manuals and handbooks.

Handling and maintenance of forestry tractors.

A 90 m² forestry repair shop.

Multipurpose classroom of at least 2 m² per student.

Premises: Minimum area of 10 hectares (wooded ground) (A unique space not necessarily situated in the educational center).

Store with an area of at least 120 m² (A unique space not necessarily situated in the educational center).

Forestry tractor or a simulator and his maintenance equipment.

Personal protective equipment (PPE). Environmental protection equipment.

Manuals and handbooks.

Felling and processing of trees with a forest harvester

A 90 m² agricultural workshop.

Multipurpose classroom of at least 2 m² per student.

Premises: Minimum area of 10 hectares (wooded ground) (A unique space not necessarily situated in the educational center).

Forest harvester or a simulator and his maintenance equipment.

Personal protective equipment (PPE). Environmental protection equipment.

Manuals and handbooks.

2.5. Safety and health requirements

Forestry work is usually associated with a large number of accidents, either due to the characteristics of the work areas or, often, due to the lack of care in the operations carried out.

That is why training is fundamental as a tool that requires a series of procedures to prevent the occurrence of accidents.

In addition to protective equipment, it is essential that the trainees understand the need to comply with legislation regarding safety and hygiene at work and that from the operational point of view understand the need to have a safety plan that must be fulfilled.

Training should take into account not only prevention but also what to do in the event of an accident. The development of a Security Plan that takes account of both aspects is essential for the students to realize their importance.

2.6. Environmental protection

Similarly, to the procedure in terms of hygiene and safety, an environmental protection procedure should be established so that the trainees understand the impact that the activities in which they propose to work can have. The Environmental Protection Plan to be implemented is a tool that aims to prevent the occurrence of environmental accidents and establish procedures if an environmental problem resulting from the activity occurs.

References

1. Andersen, E., & Schiano, B. (2014). Teaching with cases: A practical guide. Boston, MA: Harvard Business Press Books;
2. Antov, P., Pancheva, T., (2016). What is Interdisciplinary Team Teaching and Content and Language Integrated Learning, Teacher Manual, chapter 2, project "Integrated Learning of English and Forestry – Teacher Manual", available online at https://cd.oikothesis.org/media/source/Teacher%20Training/Interdisciplinary%20Teaching/Interdisciplinary%20Team%20Teaching%20and%20CLIL-formatted.pdf;
3. BU Center for Excellence and Innovation in Teaching. (2015). Using case studies to teach. Retrieved from http://www.bu.edu/ceit/teaching-resources/using-case-studies-to-teach/;
4. Butler, D. (2002). Individualizing instruction in selfregulated learning. Theory into Practice, 41, 81-92;
5. Cedefop (2009b). The shift to learning outcomes. Policies and practices in Europe. Luxembourg: Publications Office (Cedefop Reference series; 72). Available from Internet: http://www.cedefop.europa.eu/etv/Upload/Information_resources/Bookshop/525/3054_en.pdf;
6. Cedefop (2010). Learning outcomes approaches in VET curricula. A comparative analysis of nine European countries. Luxembourg: Publications Office of the European Union. Cedefop research paper No 6;
7. Cedefop (2011). When defining learning outcomes in curricula, every learner matters. Briefing Note, March/April 2011. http://www.cedefop.europa.eu/node/11758;
8. Cedefop (2015). Vocational pedagogies and benefits for learners: practices and challenges in Europe. Luxembourg: Publications Office of the European Union. Cedefop research paper No 47;
9. Cedefop (2017). Defining, writing and applying learning outcomes: a European handbook. Luxembourg: Publications Office. http://dx.doi.org/10.2801/566770;
10. Euler, Dieter; Hahn, Angela (2004). Wirtschaftsdidaktik. Bern: Haupt.;
11. Fakhouri, R.B. (2012). Case studies. University Teaching, Issue 11, July 2012. Retrieved from http://saea.uottawa.ca/cpu/images/stories/publications;
12. Hannafin, M. J., & Hannafin, K. M. (2010). Cognition and student-centered, web-based learning: Issues and implications for research and theory. In Learning and instruction in the digital age (pp. 11 23). Springer US;
13. Johnson, Eli (2013). The Student Centered Classroom: Vol 1: Social Studies and History. p. 19. ISBN 1317919491;
14. Jones, Leo. (2007). The Student-Centered Classroom. Cambridge University Press;
15. Lindeman, H.J. (2002). The principle of Action-Oriented Learning, Berlin;
16. Luptakova, J., Selesova, D., (2016). How to use case studies? Teacher Manual, chapter 5, project "Integrated Learning of English and Forestry – Teacher Manual", available online at https://cd.oikothesis.org/media/source/Teacher%20Training/How%20to%20use%20the%20Case%20Studies/How%20to%20Use%20Cases-formatted.pdf;
17. Paris, S. & Paris, A. (2001). Classroom applications of research on self-regulated learning. Educational Psychology, 36, 89-101;
18. Pedersen, S., & Liu, M. (2003). Teachers' beliefs about issues in the implementation of a student centered learning environment. Educational Technology Research and Development, 51(2), 57-76;
19. Young, Lynne E.; Paterson, Barbara L. (2007). Teaching Nursing: Developing a Student-centered Learning Environment. p. 5. ISBN 078175772X;
20. Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory into Practice, 41(2), 64-70;
21. Zimmerman, B., Bonner, S., & Kovach, R. (2002). Developing self-regulated learners: Beyond achievement to self-efficacy. Washington, DC: American Psychological Association;
22. Zumbrunn, S., Tadlock, J., Roberts, E. (2011). Encouraging Self-Regulated Learning in the Classroom: A Review of the Literature, Virginia Commonwealth University.

3. Organization and implementation of assessment

The primary purpose of the assessment is to evaluate trainees' learning, attitude and performance and provide evidence how learners are progressing according to defined standards throughout the established training period. Assessment plays a dual role: it drives trainees' learning and it provides important feedback for both learners and teachers/trainers. The nature of assessment influences what is learned and the degree of meaningful engagement by the trainees in the learning process. The quality assessment includes both the cognitive and affective domains. It should be considered during the design of the teaching and learning task and is an integral part of the teaching and learning cycle; it also provides opportunities for trainees to demonstrate the extent of their learning and reveals the strong and weak points of the proposed training through learners' development.

Assessment allows both trainers and learner to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. Formative assessment refers to tools that identify misconceptions and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster learners' abilities to take ownership of their learning when they understand that the goal is to improve learning. It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs. In contrast, summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of the training period, such as unit, training course, or programme. Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Self-assessment is a crucial skill that learners need to develop during the training process, especially when the curriculum leads to future jobs. By being able to assess their own performance, students can become self-regulated learners and continue their professional development throughout their professional careers.

3.1. Professional profile: assessors (minimum requirements) (each country details)

Assessors need to be verified. (Diploma/certificate)

- Assessors should hold an up to date First Aid at Work certificate. This Certificate should be renewed on a regular basis
- Assessor has the required knowledge and skills relevant to the qualification.
    - Required knowledge and skills to work with different machines relevant to the qualification.
    - Assessor needs to be an approved ECC 3 Assessor (minimum) related to module 01.
    - Assessors need the relevant industrial experience / occupational competence either using and/or instructing the skills as a practitioner, relevant to the qualification.
- Assessor Continuous Professional Development: assessors are keeping up to date with technical and procedural updates as required.
- Assessment and Communication skills

Clarify the point of below, example of specific skill learning module 1:

Criteria	Proof that criteria is fulfilled
First aid	Diploma or certificate that is recognised on national level
Assessor has the required knowledge and skills relevant to the qualification. Technical knowledge, practical skills and experience in chainsaw operations (min. ECC 2 to assess ECC1, ECC3 to assess ECC2)	Technical knowledge and skills in the use of chainsaws. • Proof by European Chainsaw Certificate at least module 2, • Has to be a certified assessor by a national agency of EFESC -> verifications National certificate or license to carry out assessment or Certificate of attendance delivered by the National Agency Knowledge of EFESC standards, assessment criteria,
Assessor has the required knowledge and skills relevant to the qualification. Knowledge and skills regarding the use of machines	Driver's license minimum B Required training to use the machines necessary for the qualification • Skidders • Self-loading cranes • Agricultural tractors fitted with logging equipment • Chippers • Brush cutters • forest residue bundlers • Pack and/or draught animals • Skyline cable systems
Assessment and Communication skills	Diploma or certificate that is recognized on national level Recognized experience as assessor This should relate to skills of: - judgment - clear communication in oral and written form - cooperation - social skills
Independency of assessment and training	**An Assessor should avoid assessing Candidates** • Who are instructed or trained by him/her, except in exceptional circumstances • Supervised / managed / employed by the Assessor • Related to the Assessor • Social acquaintance / friend of the Assessor • Employed by a business competitor of the Assessor, where success or failure of the Candidate may have a commercial advantage to the Assessor/ Assessor's employer.

3.2. Resources needed for good quality assessment

According to the national laws (safety and health requirements, environmental protection...).

3.2.1. Preparation

The Assessor should check the following points:

- Have the Venue, Date and Time for the assessment been arranged?
- How many Candidates are to be assessed? Is this practical in the time available?
- Will there be necessary resources and equipment on site for the number of Candidates being assessed?
- Are the Candidate(s) aware of the Date, Time and Venue of the assessment?
- Have the Candidates been provided with a contact number in case an unforeseen circumstance prevents their attendance at the specified time?
- Does the assessor have the phone numbers of the participants in case an unforeseen circumstance prevents his/her attendance at the specified time?

- Has any of the Candidates declared a particular / assessment requirement?

The Assessor should ensure that the following documents are available for each assessment:

- The correct Score Sheet for each Candidate (or digital); this must be up to date
- Relevant Site-Specific Risk Assessment / Emergency Procedure form.

3.2.2. 3Conducting the Assessment:

Pre assessment procedure:

The Assessor should arrive in good time and check that the site, facilities and equipment comply with current best practice guidelines and are suitable for the assessment to be conducted.

Meeting and briefing the Candidate:

The Assessor should:

- Greet the Candidate in a positive and friendly manner.
- Introduce himself / herself by name.
- Identify the Candidate by checking their Name, Date of Birth and Address (Further identification can be asked for by the Assessor if there is any doubt)
- Complete a written Site-Specific Risk Assessment, involving the Candidate in the process, and then ask the Candidate to sign to confirm understanding.
- Explain the format of the assessment to the Candidate and the documentation involved.
- Ask the Candidate if there are any questions, he/she wishes to ask before the assessment commences.
- Explain to the Candidate his/her rights regarding clarification of questions or instructions
- Clearly identify the start of the assessment.

Conducting the assessment:

The Assessor should:

- Ask all questions in a clear, direct and open format without leading the Candidate.
- Make all instructions clear and uncomplicated and check that the Candidate fully understands what is required before allowing him/her to proceed.
- Take a safe position with a clear view of the activity being carried out - close enough to be in control of the assessment in case of an emergency but without 'crowding' the Candidate.
- Record appropriate marks or comments on the score-sheet as the assessment of each activity is completed
- Check that all appropriate activities have been assessed before declaring the assessment completed.

Do's and Don'ts when conducting Assessment:

Do's:

- Maintain a professional appearance and manner at all times
- Turn your mobile phone to **SILENT** – please do not take or make calls whilst you are assessing, this could be very off-putting for the candidate
- Cultivate and maintain a pleasant atmosphere from the point of contact with the Candidate
- Find time to relax the Candidate during the introduction period
- Ensure that there are no undue barriers for the Candidate other than the requirement that they must be able to achieve the assessment criteria
- Maintain a positive manner even if the Candidate is not performing well
- Temper all negative feedback with some positive aspects even where a Candidates' performance was never going to be competent
- When the Candidate has not been successful, provide positive, constructive guidance on what is required to achieve the qualification at a future date
- If you suspect there is a discrepancy in that the training does not satisfy one or more of the assessment criteria, keep it to yourself. Keep an open mind and discuss your concerns with the National Agency (related to learning module 1).
- Respond positively to any criticism or complaint that the Candidate may record on the score-sheet
- If any of the activities in the standards are omitted by the candidate it is reasonable that the assessor asks that these be performed

Don'ts:

- Make any 'off the cuff' remarks that could bring disrepute to the training or assessment process
- Make derogatory remarks, sexist or racist jokes
- Continue the assessment if feeling unwell or threatened
- Show signs of disapproval such as frowning, 'tutting', looking away as in disapproval or any other action that may be off putting to the Candidate or be interpreted that they are not doing well
- Make any comment about the apparent standard of training that the Candidate has received. Remember you were not present at that training so have no way of knowing whether it was satisfactory or not
- Offer your services as either a Trainer or Assessor by handing out cards or advertising of any kind

Post assessment:

The Assessor should:

- Inform the Candidate whether a competent or not yet competent result is to be recommended.
- Complete the score-sheet and sign it making supportive written comments as appropriate.
- Provide positive feedback on the areas where the Candidate's performance was good.
- Highlight the Candidate's weaker areas and provide encouraging advice.

- Ask the Candidate for his/her comments.
- Ask the Candidate to sign the score-sheet and invite them to make a written comment. If the Candidate does not wish to make a written comment, then they should write 'NONE' in the comment section to show they were invited to comment but declined. The candidate has the opportunity to evaluate. Provide feedback to evaluation.

3.3. Examples of assessment methods

There are different ways of assessment. It is best to take the purpose of the test into account. Do we want to test knowledge or actual skills?

3.3.1. Knowledge

(1) A classical test sheet to test theoretical knowledge.

With a classical test sheet "declarative knowledge (that is, what one knows) of facts or procedures, either technical (...) or interpersonal (...), as measured by respondent test"[1].

It is possible to use multiple choice-, open - of fill in questions. These questions need to be updated frequently. There have to be enough questions to rotate so the participants can't share the questions.

It is possible to use technological advancement and let the candidate take the test digitally (online).

(2) An assignment

It is possible to give the candidates an assignment which portrays their knowledge (or skills). The completion of this assignment will be assessed.

3.3.2. Skills

(1) Practical test

The best-known example is where the candidate performs a task and is assessed during his performance. It is also possible for the assessor to take notes and evaluate the candidate during the training.

Virtual reality is a useful tool to assess the competence of the candidate. The program can contain a program to assess or an assessor can watch the online performance of the candidate.

(2) Portfolio

A candidate can be asked to show a portfolio of work they have done in the past. This is interesting if the final result is most important. The candidate can be asked to add certain relevant information such as number of accidents during the work and/or the gravity of the accidents.

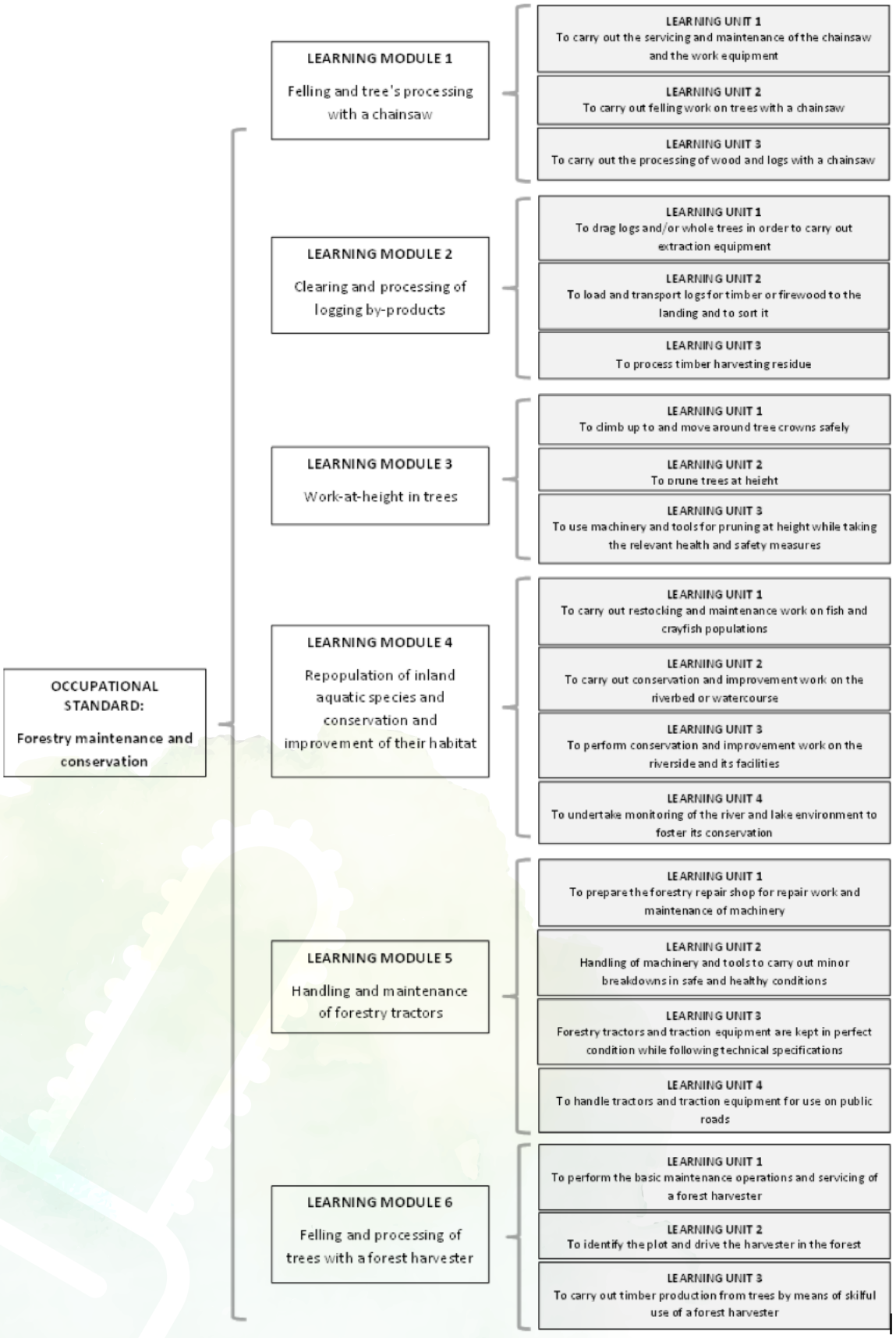
In a portfolio the candidate can be asked to make an assess his or her own achievements and progress.

1 Laurie Jo Bassi, Darlene F. Russ-Eft; Assessment, Development, and Measurement; p7; 1997.

Bibliografía

1. European forestry and environmental skill council; EFESC Handbook, Version amended 23. 11. 2017.
2. European forestry and environmental skill council; Appendix 1, ECC assessors code of practice version 2017
3. European forestry and environmental skill council; Appendix, ECC assessors guidance notes version 2017
4. Laurie Jo Bassi, Darlene F. Russ-Eft; Assessment, Development, and Measurement; p7; 1997.

4. Short preview



5. Learning module 1

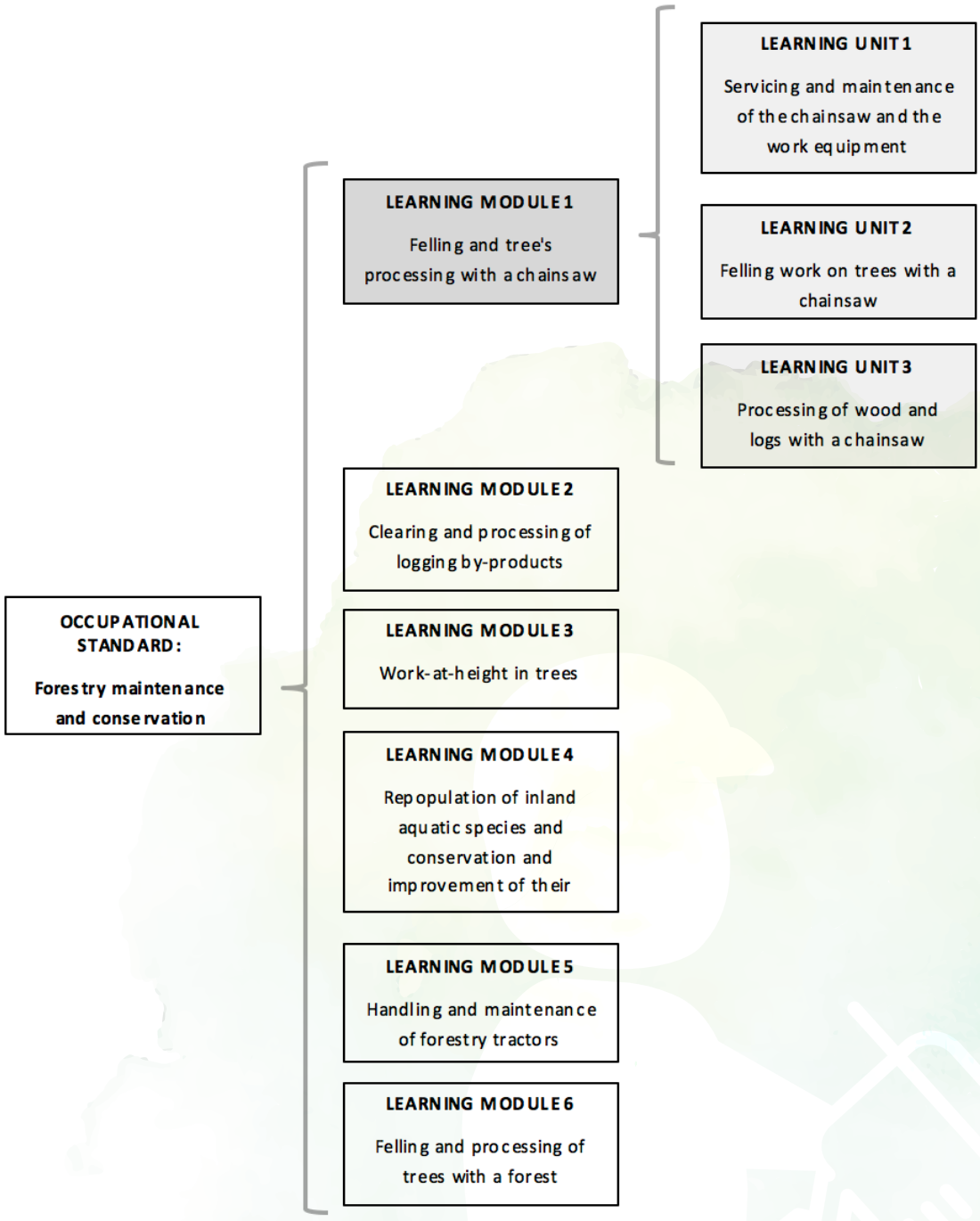
Naming: Felling and tree's processing with a chainsaw

Level: 2

Code: MF1116_2

Related to the CU: UC1116_2 - To carry out the felling and tree´s processing using a chainsaw

Duration (hours): 120



5.1. Organization and timing of the module

Learning module	Hours	Learning units	Hours	Classroom work	Practical workshops
Felling and processing of trees with a chainsaw	120	Servicing and maintenance of the chainsaw and the work equipment	24	7	17
		Felling work on trees with a chainsaw	60	18	42
		Processing of wood and logs with a chainsaw	36	10	26

5.2. Specific objectives and evaluation criteria

SPECIFIC OBJECTIVES Achievement of the following capabilities:	EVALUATION CRITERIA		CONTENTS
	KNOWLEDGE	SKILLS	
C1: To describe the features and parts of a chainsaw as well as the equipment necessary to work and maintain it.	**AC1.1** Describe the personal protective equipment for work with a chainsaw. **AC1.2** Describe chainsaw's safety features. **AC1.3** Describe ancillary and ergonomic equipment for operating work with chainsaws. **AC1.4** Explain the components and the functioning of the chainsaw, defining the different working elements, their functionality and optimum work features. **AC1.5** Describe the regular maintenance tasks performed on the chainsaw and the ancillary equipment. **AC1.6** Explain how to refuel and restart the chainsaw properly.		**1 The chainsaw and its equipment** Chainsaws: types, components, safety devices and other elements. Personal protective equipment. Ancillary work equiment. **2 Maintenance** Maintenance and repair of minor breakdowns. Refuelling and start up. Tools and means to be used. Risk assessment and preventative measures to be taken (health, safety and ergonomics).
C2: To describe tree felling techniques with a chainsaw in different situations to obtain the greatest amount of timber possible while keeping risks to a minimum.	KNOWLEDGE	SKILLS	**3 Felling** Previous safety inspection site, risk evaluation and secure agreement on the organisation of work. Felling: choice of chainsaw and/or type of blade and chain. Planning of felling: sequence of work, extraction routes, obstacles, inspection of the tree to be felled and meteorological conditions, escape routes, preparation and checking the location of co-workers for cutting. Cutting techniques: hinge, notch and felling cut, control of falling speed, different techniques according to the relation between the cutting diameter and chainsaw blade length, Special techniques: leaning and top-heavy trees, hollow trees. Particularly hazardous situations. Procedure in the event of emergency and rescue.
	AC2.1 Describe the constraints determining the natural fall direction of a tree and define the circumstances that oblige to choose it. **AC2.2** Explain how to make the directional hinge in a tree, bearing in mind the different circumstances one may be in (balance, lean, hollowness, etc.). **AC2.3** Explain the different techniques for the felling cut with respect to the tree's diameter and condition, the chainsaw blade and possible other circumstances. **AC2.4** Explain how to control tree fall speed, the main risks involved in the task and the working techniques and preventative measures to be taken. **AC2.5** When presented with forestry felling tools or equipment used in the felling and use of trees with a chainsaw, describe it and relate it to such work (wedges, felling lever, mallet, axe, etc.). **AC2.6 Present and explain** occupational risk situations before and also during tree felling and processing operations with a chainsaw and the preventative measures to avoid them.		

	KNOWLEDGE	SKILLS	
C3: To describe proper tree processing techniques with a chainsaw to facilitate their later utilisation.	**AC3.1** Determine the associated risks and explain the preventative measures to be taken during delimbing operations. **AC3.2** Explain different delimbing techniques and justify which one is recommendable in each case. **AC3.3** Explain how use auto-rewind measures tape and how mark logs to the required dimensions. **AC3.4** Determine the associated risks and explain the preventative measures to be taken during log cutting and stacking operations. **AC3.5** Explain proper cutting techniques which avoid unnecessary risks and facilitate efficient work, considering wood tension and compression.		**4 Processing** Delimbing and. Crosscutting basic techniques. Different Delimbing methods, safety positions. Pressure on top, on bottom: tension and compression of wood. Classification and Stacking. Procedure in the event of emergency and rescue. **5 Basic regulations regarding the felling and processing of trees.** Forestry legislation. Environmental regulations. Regulations on occupational risk prevention.
PERSONAL AND SOCIAL SKILLS LINKED TO PROFESSION			
· Adapt to the company's work organisation and understand the hierarchical relations within it. · Interpret instructions properly and become responsible for carrying them out. · Communicate effectively with the right interlocutor at every moment. · Follow timetables and the rhythm of work, fulfilling daily performance objectives fixed by the company. · Display interest in the company's growth forecasts. · Become involved in the company's quality plan and in the improvement of occupational health and safety. · Display a respectful attitude to colleagues, procedures and the company's internal regulations.			

5.3. Practice/exercise

Learning module	**1**	**Learning unit to which it responds**	**LU1**	**Duration:**	**Between 2 and 3 h**
Exercise Nº	**1**				
Servicing and maintenance of the chainsaw and the work equipment					
DESCRIPTION: · Check that all elements of personal protective equipment for maintenance are available and that they are in good working order; if not, replace them with the proper one. · Check that the machine and especially its safety features are functional. · Carry out maintenance on the safety features. · Carry out maintenance on the cutting system (blade, guide bar, chain and sprocket). · Carry out sharpening of the whole chain with the correct file. · Perform cleaning operations and replacement of filters and the spark plug. · Carry out adjustment and replacement of starting mechanism components. · Refuel the chain-saw with the correct fuel mix and chain oil. · Start up the chainsaw safely, keeping correct work positioning while checking its safe operation and taking any necessary measures in case it is not in good working order. · Complete a maintenance report, recording any observations and an estimated time for the next service. · Perform the aforementioned work while taking the necessary occupational risk prevention measures, minimising environmental impact in line with regulations in force.					
MEANS FOR ITS REALIZATION: · An agricultural workshop with an area of 90 m². · Multipurpose classroom of at least 2 m² per student. · Premises: Enough wooded area to complete exercises. The site/s is/are not necessarily situated in the formation centre. · Personal protective equipment. · Complete First aid kit.					

TRAINER'S GUIDELINES:

- Within this exercise learner should acquire theoretical and practical knowledge to perform all field maintenance required to maintain a chain saw properly and operate it safely.
- The trainees should learn and understand why and what kind of PPE is required.
- They should acquire knowledge on how to carry out daily and weekly maintenance, settings and pre-start checks as per chainsaw manufacturer´s recommendations33, how to maintain chain and guide bar, how to replace sprocket, what are the clutch components and their functions.
- The practice should take place at the appropriate venue (agricultural workshop).
- The trainer should firstly make sure that in the place where the practice is going to take place all the material and equipment specified above are available and are in perfect condition for use.
- The trainer should attentively supervise the work of the learner throughout the activity, correcting the errors or solving doubts that could arise.
- The time to carry out the practice should be limited, but the trainer should take into account the general rhythm of the group.

Learning module	**1**	**Learning unit to which it responds**	**LU2**	**Duration:**	**Between 4 and 5 h**
Exercise Nº	**2**				

Felling work on trees with a chainsaw

DESCRIPTION:

- Check that the first aid kit is still valid and has everything necessary and is ready for use.
- Check that all elements of personal protective equipment for felling trees are available and that they are in good working order; if not, replace them with the proper one.
- Carry out risk evaluation and take preventative measures prior to task commencement.
- Prepare an action plan in the event of emergency and have the necessary means available to carry it out.
- Outline the ground, setting its edges and planning the haulage work.
- Prepare an action plan in the event of emergency and have the necessary means available to carry it out.
- Check that all possible work equipment is available even in the event of possible incidents and that it is in proper working condition.
- Perform preparatory tree felling operations: clearing of the base of the tree and the escape routes, delimbing and ensuring that there is no risk to bystanders, animals or infrastructure.
- Carry out the felling of straight or slightly forward leaning trees with a cutting diameter which is inferior to blade length
- Carry out the felling of straight or slightly forward leaning trees with a cutting diameter which is superior to blade length but less than double its length.
- Carry out the felling of straight or slightly forward leaning trees with a cutting diameter which is superior to double blade length.
- Carry out the felling of trees against the natural lean.
- Solve situations in which trees are stuck, using forestry tools or winch.
- Carry out calculations in order to evaluate the work financially.
- Carry out the aforementioned work while taking occupational risk prevention measures, minimising environmental impact and following the regulations in force.

MEANS FOR ITS REALIZATION:

- An agricultural workshop with an area of 90 m².
- Multipurpose classroom of at least 2 m² per student.
- Premises: Enough wooded area to complete exercises. The site/s is/are not necessarily situated in the formation centre.
- Personal protective equipment.
- Complete First aid kit.

TRAINER'S GUIDELINES:

- The learners should learn how to develop an action plan in the event of emergency with the support of the trainer.
- Within this exercise the learners should acquire knowledge on assessment of hazards and preparation of the work area and escape route.
- The learners should visit one or more active timber harvesting sites to learn more about felling techniques of trees in different circumstances (leaning, hollow, rotten etc.).

Learning module	1	Learning unit to which it responds	LU3	Duration:	Between 2 and 3 h
Exercise Nº	3				

Processing of wood and logs with a chainsaw

DESCRIPTION:

- Carry out risk evaluation and take preventative measures prior to task commencement.
- Prepare an action plan in the event of emergency and have the necessary means available to carry it out.
- Check that all elements of personal protective equipment for maintenance are available and that they are in good working order; if not, replace them with the proper one.
- Carry out risk evaluation and take preventative measures prior to task commencement.
- Prepare an action plan in the event of emergency and have the necessary means available to carry it out.
- Check that the necessary equipment is available and that it is in proper working condition.
- Carry out delimbing and with suitable techniques.
- Timber from the fallen tree is marked to cut the logs to the required length.
- Classify logs in order to bunching and stack them by quality and facilitating their subsequent haulage.
- Leave the work area tidy and clean and if necessary, leave warning signs to prevent any accidents.
- Do efficiency calculations in order to evaluate such work financially.
- Volumes cubing of wood and calculating them into volumes of wood transport vehicles.
- Perform the aforementioned work while taking the necessary occupational risk prevention measures, minimising environmental impact in line with regulations in force.

MEANS FOR ITS REALIZATION:

- An agricultural workshop with an area of 90 m².
- Multipurpose classroom of at least 2 m² per student.
- Premises: Enough wooded surface to complete exercises. The site/s is/are not necessarily situated in the formation centre.
- Personal protective equipment.
- Complete First aid kit.

TRAINER'S GUIDELINES:

- The learners are expected to acquire the necessary knowledge and practical skills to carry out delimbing, crosscutting and stacking logs with suitable techniques.
- The learners should be familiar with the internal forces in the wood (tension and compression) and they should know the proper methods to free a trapped chainsaw.
- The learners should also acquire the basic principles of preparing (edge processing) the logs for the subsequent hauling. They should learn adequate methods to carry out this work without exceeding the permissible weight of the load lifting avoiding different injuries caused by lifting heavy loads.
- The trainer should also introduce to the learner's ways of tidying the work area and adequate location and use of warning signs.

5.4. Best training + safety practices

In spite of technological advances, forestry work continues to be one of the most dangerous activities, in particular when the workers do not have adequate formation. Accidents with chainsaws are generally very serious and harmful. Chainsaw operators should be particularly aware of the potential hazards, e.g. of being cut by the saw, hit or crushed by moving timber, the site conditions where work is to be undertaken, the weather conditions may be exposed to, noise, vibrations, and handling with other work equipment or activities on site. Relevant and defined emergency procedures, specific to the worksite, should form an integral part of the assessment process.

Chainsaw operators must follow at least five critical steps to minimise the risk:

- Site assessment
- Individual tree assessment
- Preparation of the work area and escape route
- Fell the tree using safe tree felling practices
- Retreat and observe

STEP 1 – SITE ASSESSMENT

A site assessment should be carried out at least after each chainsaw tank refill and it involves checking the felling area or zone before starting tree felling again. This allows the chainsaw operators to refresh their knowledge of the potential hazards and identify new hazards they may encounter when they start felling again.

For all work locations it must be ensured that safe working distances are applied between operators, machinery, combustible and third parties and any local infrastructure. The chainsaw operators should ensure they have implemented the traffic management plan and ensured all signage requirements are in place.

It is important to remember that tree felling is a one-person operation and a safe working distance of at least two tree lengths must be maintained, unless exceptional conditions and a comprehensive risk assessment dictate otherwise. Chainsaw operators must be aware of the following factors within two tree-lengths of the felling area:

- the general condition and predominant lean of the surrounding trees;
- hindrances to visibility;
- boundaries;
- the location of roads, fences, powerlines, people, machinery or any other potential hazards
- terrain constraints including soil conditions, type and stability, bluffs, rocks, gulleys, hills, banks, tracks;
- historical features – archaeological sites including pits, house sites, burial sites;
- environmental constraints.

Chainsaw operators must ensure all hazards and controls measures are clearly communicated to the harvesting crew. On sites where chainsaw operators need to be out of direct site of colleagues for any time and are therefore at greater risk, then regular radio or phone contact can be a good control. An agreed check in time between the chainsaw operator and designated contact on site should be established regularly. It has to be a site-based decision for when work cannot be organised to maintain visual contact. If communications are lost, then chainsaw work must stop until communications or visual contact is restored.

STEP 2 – INDIVIDUAL TREE ASSESSMENT

It is essential that chainsaw operators take the time to thoroughly assess each tree before felling. They should assess the whole tree from the crown to the stump. Where possible they should view the tree from a distance first, and then from the tree base, using different angles to make sure nothing is missed.

Each tree must be correctly assessed to:

- identify hazards;
- plan the felling cuts, and the sequence they are to be put in;
- determine if the trainee is capable of felling it safely.

This assessment is a very important step as a hazard missed may cause accidents with consequents damages. If, at any time, the candidate doesn't think they can fell the tree safely, they must call for assistance from their assessor, a more experienced operator or a machine.

Assess the general condition of the tree by:

- looking for deformation, defects, double or multi leaders;

- checking for predominant and side lean;
- assessing crown size and shape;
- identifying the heaviest and dangerous branches;
- checking ground conditions and stability of the tree;
- checking for rottenness, chancres, fungus or decays around the base that may affect tree felling.

Identify overhead tree canopy hazards by searching for:

- dead or broken branches or debris that may be dislodged during felling;
- branches interlocking with branches of other trees;
- climbing vines or ivies that may affect the direction of fall;
- checking the wind direction and strength relative to the proposed felling direction.

Having assessed the tree, the chainsaw operator must decide:

- if they're capable of felling the tree;
- whether wind strength is presenting a hazard;
- the preferred felling direction;
- the felling cuts to be used;
- the safest position to complete the felling cuts from;
- what sort of felling tools are useful rather if a winch assistance may be required.

In the process of selecting the area to fell the tree, it is important to make sure there is adequate distance for the full sweep of the felling arc. The candidate must consider any hazards in the intended line of fall which may cause the tree to kick backwards or sideways on impact e.g. spars, rocks, banks, slopes, stumps.

COMPLETING THE ASSESSMENT

After completing the individual tree assessment, the chainsaw operator must choose the appropriate felling method to safely fell the tree.

The tree felling method includes:

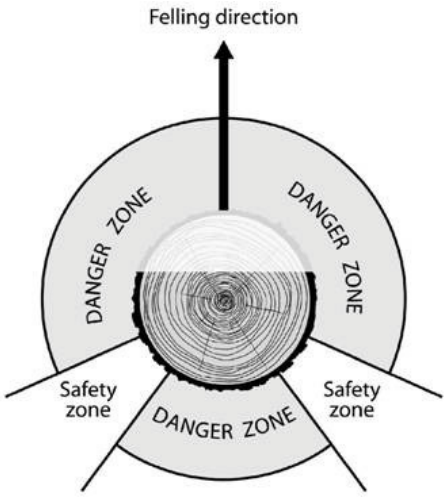
- type of felling cuts to be used;
- felling aids needed, i.e. wedge size and number;
- location of the planned escape route;
- Identification of the safest side from which to complete the felling cut.

STEP 3 – PREPARATION OF THE WORK AREA AND ESCAPE ROUTE

The chainsaw operator must make sure they have enough clear area around the tree to move freely and ensure they have a clear escape route, before starting to fell the tree.

Preparation of the work area includes removing debris from around the base of the tree and any vegetation which might obstruct the operation. The chainsaw operator should flatten any soft vegetation which

could restrict the dispersal of chainsaw exhaust fumes. When removing low branches from the tree (brashing) the chainsaw operator has to avoid the potential kick-back by keeping the guide bar out of line with the body and by using the stem as a protection.



The chainsaw operator must prepare an escape route on the same side as their final felling cut. The escape route must be angled as close to 45° from the centre of the back of the tree as practical. On steeper slopes, this angle may be increased so that the chainsaw operator is walking across the slope rather than climbing uphill. All escape routes must be cleared to allow unrestricted access to the safe position. A minimum safety distance (of 3 m) from the stump is recommended for normal conditions. This distance may need to be extended if other hazards are present.

On very steep slopes attempting to walk away from the falling tree may be more hazardous than staying closer to the stump. If this situation exists, the chainsaw operator may need to step back and brace themselves to avoid sliding down the slope with the tree. These departures from normal practice must be documented in the daily felling plan at the meeting point. The candidate must always complete the preparation work of their work area and escape route before beginning any felling cuts.

STEP 4 – FELL THE TREE USING SAFE TREE FELLING PRACTICES

Felling cuts must be precise to be effective. The relationship between the felling cut and the notch the hinge is critical because it has rule of wooden hinge on the felling tree. The function of the notch is to determine the direction in which the tree will fall, allow the tree to fall freely in the desired direction and minimise splitting or slabbing of stem. The purpose of the hinge wood is to control the tree's direction during its early stages of fall until the undercut closes and to prevent the tree from slipping, twisting, or breaking sideways or backwards.

The felling cut releases the tree, allowing it to fall. The felling cut step prevents the butt of the tree from moving back off the stump as the tree falls to the ground. Chainsaw operators must:

- make the correct amount of hinge (% in relation to diameter) and step when making the final felling cut;
- insert a wedge into the felling cut as soon as possible if necessary;
- finish the felling cut from the most secure position;
- not move in front of the tree once the felling cut has commenced;
- re-check for overhead hazards between cuts.

Chainsaw operators should continually monitor and assess the hazards. Many have been hurt because they did not see the hazards, and were hit by a falling branch.

STEP 5 – RETREAT AND OBSERVE

When the tree begins to fall, and site conditions permit, the chainsaw operator has to switch off the chainsaw and quickly move to a safe distance and into the escape route, to ensure a safe distance from the butt of the tree. Chainsaw operator has to monitor the movement of the tree, watching for falling branches and tops. She/He must also beware of the butt rebounding or the whole tree sliding when felling on a slope. The chainsaw operator must remain in the safe position until the canopy stops moving and assess the stand and the surrounding area, making sure it is safe before returning to gather wedges and any other gear.

5.5. Assessment

Candidate name:			Comentarios con la persona candidata cuando proceda y Resultado (Verde o Rojo)	G	R
Assessment Tasks & Criteria ECC1 **No critical red mistakes and max. 3 yellow errors to succeed!**					
CHAINSAW MAINTENANCE & CROSS-CUTTING: RECOMMENDED GUIDE BAR SIZE 30-38cm Pre-requisite to ECC1 assessment: none Max. Time allowed - **60min**					
ECS1-1	**Take care of yourself (PPE) and others around you at work - Candidate to wear appropriate PPE for maintenance, sign RA & show ID:**			G	R
1:01	**Safety boots**	c			
1:02	**Eye (& ear) protection as appropriate**	c			
1:03	**Personal /Squad First Aid Kit - on every work site**	r			
1:04	Gloves appropriate to task				
ECS1-2	**Routine / daily chainsaw maintenance**				
	Candidate to check function of safety features: (chainsaw off)			G	R
2A:1	**Chain brake**	c			
2A:2	Anti-vibration mounts				
2A:3	Safety chain				
2A:4	**Throttle lock**	c			
2A:5	Exhaust away from the operator				
2A:6	**Chain catcher**	r			
2A:7	Legal symbols: Head/eye/ear defender				
2A:8	Right hand guard				
2A:9	**Left hand guard**	c			
2A:10	Chain/Bar cover				
2A:11	Clearly marked on/off switch				
	Candidate to sharpen whole saw chain (ass. provides blunt chain if needed):			G	R
2B:1	Chain checked for damage and compatibility with bar and sprockets				
2B:2	**Cutters sharpened using file of correct size with handle fitted & correct top/side plate angles**	r			
2B:3	Equal length of cutters maintained				
2B:4	Filing burrs removed if needed				
2B:5	**Height and profile of depth gauges checked / set**	r			
	Candidate to maintain guide bar (assessor to provide samples if guide bar already in good condition):			G	R
2C:1	Straightness of bar checked				
2C:2	**Identify uneven/damaged/blued/cracked rails**	r			
2C:3	Burrs removed and edges chamfered/curved				
2C:4	Groove (depth checked) and oil holes cleared				
2C:5	Sprocket nose greased if applicable				
2C:6	Bar turned to reduce wear				
2D:1	Drive sprocket inspected (for damage / limits of sprocket wear)			G	R

2D:2	Chain brake cleaned & inspected (procedure undertaken if damaged):	**r**		G	R
2D:3	*Re-assemble chain, bar and side plate (Assessor to check tension & side nuts)*			G	R
2E:1/2	Air filter cleaned/inspected: Candidate to: Remove debris from around filter and clean filter protecting carburettor intake			g	R
	'Periodic / weekly Maintenance: items checked (or examples provided by assessor are checked)				
2F:1/2/3	Starter recoil cleaned/ inspected/tensioned			G	R
ECS1-3	**Take care of yourself (PPE) and others around you at work - Candidate to wear appropriate PPE for crosscutting**			G	R
3:01	**Chainsaw safety trousers**	**c**			
3:02	**Chainsaw safety boots**	**c**			
3:03	**Safety helmet if necessary**	**c**			
3:04	**Eye & ear protection**	**c**			
3:05	Gloves appropriate to task				
3:06	Non-snag outer clothing				
3:07	Whistle/Mobile/Radio				
	Planning the work including what to do in an emergency - Candidate to identify hazards relevant to the site and timber to be cut:			G	R
3:08	**RISK ASSESSMENT - walk site, METHOD STATEMENT – verbal, EMERGENCY PLANNING - check information**	**r**			
ECS1-4	**Operational safety checks (chainsaw ON) - Candidate to check chainsaw for condition/sharpness and pre-use safety:**			G	R
4:01	Cold/Warm start method (ground/'leg lock')				
4:02	Safe start distance from fuel (min.1m, no spillage, gases released)				
4:03	**Function of chain brake tested**	**c**			
4:04	Saw checked for oiling (e.g. oil throw test or oil present on drive links)				
4:05	Chain not moving when throttle released (no chain creep)				
4:06	On/off switch is working (pull choke to stop if not, then label not to be used)				
4:07	Chain tension 'warm' re-checked				
ECS1-5	**Meet legal & site environmental requirements in accordance with national standards**			G	R
5:01	Protection of fauna, flora, wildlife, waterways, site specifications etc, regards pollution/damage, selection of fuel storage:				
5:02	Use bio-oils whenever possible				
5:03	Prevent waste or dispose of it without causing further damage, in accordance with the regulations, especially according to the standard for recyclable waste				
ECS1-6	**Inspect timber and use safe crosscut methods**			G	R

	Candidate to crosscut timber under guide bar length, according to the measurements given, with some moderate tension & compression present: A minimum of 10 cross cuts need to be demonstrated to standard using both upper & lower side of the guide bar, including a minimum of 2 vertical boring cuts			
6:01	Walk site, check timber			
6:02	Safe stance (well balanced)			
6:03	Bar aligned to maintain accuracy			
6:04	**Head/neck are not allowed across of line of chain (unless checking the line of the cuts with bar tip in full view)**	**r**		
6:05	Use of throttle to cut safely and efficiently			
6:06	**Left thumb around top handle**	**r**		
6:07	Use of boring to initiate cuts where access is limited			
6:08	**Sequence of cuts is made to avoid saw becoming trapped or uncontrolled timber movement i.e. splitting**	**c**		
6:09	**Tension and compression cuts should meet**			
6:10	Chain brake used appropriately: when walking with the engine running, if the saw has to be put down while moving cut material or before taking a hand off the saw	**r**		
6:11	Safe withdrawal of saw from cut (kerf)			
6:12	Ergonomics: straight back, use of legs to control saw, bending at knees			
ECS1-7	**Select and use appropriate aid tools - Candidate to demonstrate use of appropriate aids to handle / move products**		G	R
7:01	Correct stance during lifting			
7:02	Avoiding excessive lifting by levering, sliding, rolling etc			
7:03	Site left tidy & safe			

DATE & LOCATION:

ASSESSMENT Time Start: Time stop: DURATION (min):

CANDIDATE (PRINT NAME, ID NUMBER & SIGN):

OVERALL RESULT: COMPETENT NOT yet COMPETENT **nr.of WARNINGS :**

Candidate comment on feedback and result:

ASSESSOR (PRINT NAME, ID NUMBER & SIGN):

Candidate name:		Feedback comments made to candidate as appropriate & Result (Green or Red)	G	R

Assessment Tasks & Criteria ECC2
No critical red mistakes and max. 5 yellow errors to succeed!

BASIC FELLING: RECOMMENDED GUIDE BAR SIZE 30-38cm, trees on felling height under guide bar length.
Pre-requisite to ECC2 assessment: ECC1 Max. Time allowed - **60min**

			G	R
ECS2-1	**Take care of yourself (PPE) and others around you at work** - Candidate to **wear appropriate PPE for tree felling, sign RA** & show **ID**:			
01:01	**Chainsaw safety trousers**	**c**		
01:02	**Chainsaw safety boots**	**c**		
01:03	**Safety helmet**	**c**		
01:04	**Eye & ear protection**	**c**		
01:05	Gloves appropriate to task			
01:06	Non-snag outer clothing			
01:07	**Personal /Squad First Aid Kit - on work site**	**r**		
01:08	Whistle/Mobile/Radio			
ECS2-2	**Planning the work including what to do in an emergency** - Candidate to identify hazards relevant to the site and trees to be worked on:		G	R
02:01	**Risk Assessment – walk site, look and discuss**	**r**		
02:02	Method statement – verbal			
02:03	Emergency planning - check information			
ECS2-3	**OPERATIONAL SAFETY CHECKS** - Candidate checks chainsaw for condition/sharpness etc and pre-use safety:		G	R
03:01	Cold/Warm start method (ground/'leg lock')			
03:02	Safe start distance from fuel (min.1m or greater according to national guidance, no spillage, gases released)			
03:03	**Function of chain brake tested, left hand guard and throttle lock**	**r**		
03:04	Saw checked for oiling (e.g. oil throw test or oil present on drive links)			
03:05	Chain not moving when throttle released (no chain creep)			
03:06	On/off switch is working (pull choke to stop if not, then label not to be used)			
03:07	Chain tension 'warm' re-checked			
ECS2-4	**MEET LEGAL & SITE ENVIRONMENTAL REQUIREMENTS IN ACCORDANCE WITH NATIONAL STANDARDS** - Candidate must check specifications:		G	R
04:01	**Protection of fauna, flora, wildlife, waterways, site specifications etc, regards pollution/damage:**	**r**		
04:02	Use bio-oils whenever possible			
04:03	Prevent waste or dispose of it without causing further damage, in accordance with the regulations, especially according to the standard for recyclable waste			
ECS2-5	**PREPARE THE TREE FOR FELLING BY SAFE BRASHING** - Candidate must remove low branches considering:		G	R

05:01	Correct "break-in"			
05:02	**Position of the saw in relation to the operator, bar on opposite side of stem or out of line of head/neck and body**	**c**		
05:03	**Saw body not above shoulder height**	**c**		
05:04	Operating technique			
05:05	Brashing close to the stem			
ECS2-6	**Fell a minimum of 2 trees in a safe and ergonomic way - Candidate has to fell two different types of tree: either upright or backward weighted or forward weighted. (Randomly chosen for the candidate from pre-marked trees). One tree should be hung-up. (this can be an additional tree)**			
	TREE 1, Description: (circle) Upright Backward weighted For-ward weighted		G	R
6A:1	**Trees Inspected for signs of rot or decay, loose branches & accurate evaluation of weight distribution**	**r**		
6A:2	Correct choice of felling direction made			
6A:3	**Escape routes selected and prepared**	**r**		
	Candidate to cut a sink/notch to determine felling direction using:		G	R
6B:1	Safe stance			
6B:2	Top sink cut normally between 45-60°			
6B:3	Bottom sink cut as close to ground as practicable (unless site criteria is different)			
6B:4	Cuts 20-30% into stem unless tree condition dictates otherwise			
6B:5	**Sink cuts to meet accurately (not undercut). Sink facing in the chosen direction of fall . Sink facing in the chosen direction of fall**	**r**		
6B:6	Sink facing in the chosen direction of fall			
6B:7	Chain brake as appropriate			
	Candidate to make the main felling cut/s using a safe and effective felling method (e.g. a standard cut; a 'split-level' cut; a "boring cut" technique leaving rear hold;" Danish" / 'saved corner' cut; or any other cut) appropriate to the aspect of the tree.		G	R
6C:1	**Correct felling method chosen for the particular aspect of the tree**	**r**		
6C:2	Safe stance			
6C:3	"Ears" cut to avoid tearing, where appropriate			
6C:4	**Checks site for specific safety conditions (including third parties) before the main felling cut started & shout verbal warning: no unauthorized persons within two tree lengths or directly below on steep slopes**	**c**		
6C:5	Main felling cut no more than 10% of tree diameter above level of sink			
6C:6	Felling cuts made with "pushing chain" or "pulling" chain as appropriate			
6C:7	Safe withdrawal of the saw and chain brake used as appropriate			
6C:8	**A hinge retained appropriate to the tree diameter, aspect and condition**	**c**		
6C:9	Appropriate aid tools as required to fell tree			
6C:10	**The operator fully uses a prepared escape route as soon as the tree begins to fall**	**c**		
6C:11	Look up and check for loose branches, tops etc.			
	TREE 2, Description: (circle) Upright Backward weighted For-ward weighted		G	R

6A:1	**Trees Inspected for signs of rot or decay, loose branches & accurate evaluation of weight distribution**	**r**		
6A:2	Correct choice of felling direction made			
6A:3	**Escape routes selected and prepared**	**r**		
	Candidate to cut a sink/notch to determine felling direction using:		G	R
6B:1	Safe stance			
6B:2	Top sink cut normally between 45-60°			
6B:3	Bottom sink cut as close to ground as practicable (unless site criteria is different)			
6B:4	Cuts 20-30% into stem unless tree condition dictates otherwise			
6B:5	**Sink cuts to meet accurately (not undercut). Sink facing in the chosen direction of fall . Sink facing in the chosen direction of fall**	**r**		
6B:6	Sink facing in the chosen direction of fall			
6B:7	Chain brake as appropriate			
	Candidate to make the main felling cut/s using a safe and effective felling method (e.g. a standard cut; a 'split-level' cut; a "boring cut" technique leaving rear hold; "Danish" / 'saved corner' cut; or any other cut) appropriate to the aspect of the tree.		G	R
6C:1	**Correct felling method chosen for the particular aspect of the tree**	**r**		
6C:2	Safe stance			
6C:3	"Ears" cut to avoid tearing, where appropriate			
6C:4	**Checks site for specific safety conditions (including third parties) before the main felling cut started & shout verbal warning: no unauthorized persons within two tree lengths or directly below on steep slopes**	**c**		
6C:5	Main felling cut no more than 10% of tree diameter above level of sink			
6C:6	Felling cuts made with "pushing chain" or "pulling" chain as appropriate			
6C:7	Safe withdrawal of the saw and chain brake used as appropriate			
6C:8	**A hinge retained appropriate to the tree diameter, aspect and condition**	**c**		
6C:9	Appropriate aid tools as required to fell tree			
6C:10	**The operator fully uses a prepared escape route as soon as the tree begins to fall**	**c**		
6C:11	Look up and check for loose branches, tops etc.			
ECS2-7	**REMOVE BRANCHES IN A SAFE & ERGONOMIC WAY** - Safe working practice will include:		G	R
7A:1	Correct stance and support of the saw on tree and/or right leg			
7A:2	Left thumb around the front handle			
7A:3	Neither handle released while the chain is moving			
7A:4	**Apply chain brake if reaching across bar and when negotiating obstacles**	**r**		
	Candidate must to avoid:		G	R

7A:5	Walking when saw is on same side of tree as operator			
7A:6	Reaching too far round with saw on far side of tree			
7A:7	**Cutting towards legs or body**	**r**		
7A:8	**Using kick-back zone on tip of guide bar**	**r**		
7A:9	Overreaching with chainsaw			
7A:10	Straddling the stem			
7A:11	Working on lower side of tree on side slopes			
	Candidate to demonstrate:		G	R
7B:1	Systematic sequence of cuts and position of the saw to remove branches as appropriate for the branching habit			
7B:2	All branches removed flush with the stem			
	Candidate to remove the top of the tree in accordance with site specifications:		G	R
7C:1	Cut top at appropriate diameter			
7C:2	Remove top with a safe method of cutting			
7C:3	Dispose of top according to Job Specification			
	Candidate to turn tree and remove 'under' branches:		G	R
7D:1	The stem turned using appropriate techniques &/or aid tools			
7D:2	Using the stem for protection when removing remaining branches			
7D:3	Using a safe and effective method to sever remaining branches			
7D:4	All branches removed flush with the stem			
ECS2-8	**TAKE DOWN A HUNG-UP TREE IN A SAFE & ERGONOMIC WAY (without a winch)**: Safe working practice will include:			
	Chainsaw operator must be able to partially sever the hinge of hung-up tree with the chainsaw using:		G	R
8A:1	Correct stance			
8A:2	**Safe position to side of tree**	**r**		
8A:3	Safe cutting technique for removal of the hinge, leaving part(s) of hinge attached as appropriate to take down method utilised			
	Chainsaw operator must be able to take down the tree using hand tools:		G	R
8B:1	Aid tool positioned and attached safely & effectively			
8B:2	Straight back			
8B:3	Correct pushing/pulling technique as appropriate			
8B:4	Correct grip			
8B:5	Repositioning aid tool as appropriate			
8B:6	**Method applied avoids working in danger areas and/ or with indiscriminate techniques**	**r**		
8B:7	Release of aid tool as tree falls			
8B:8	Use escape route(s) as appropriate			
8B:9	If tree does not fall through the canopy when rolled, sever last part of the hinge from a safe position & 'walk down' e.g. wooden pole, using correct lifting technique			
8B:10	Tree in a stable condition on the ground, mechanical (e.g. winch) takedown arranged, or tree clearly taped off as a hazard if necessary			
8B:11	Site left safe & tidy			

DATE & LOCATION:		
ASSESSMENT Time Start:	Time stop:	DURATION (min):
CANDIDATE (PRINT NAME, ID NUMBER & SIGN):		

OVERALL RESULT:	COMPETENT	NOT yet COMPETENT	**nr.of WARNINGS :**
Candidate comment on feedback and result:			
ASSESSOR (PRINT NAME, ID NUMBER & SIGN):			

References

1. Albizu-Urionabarrenetxea, P. M., Tolosana-Esteban, E., Roman-Jordan, E. (2013). Safety and health in forest harvesting operations. Diagnosis and preventive actions. A review. Forest Systems, 22, 3.
2. Ball, J. Tree Felling. iGrow.org. (2016).
3. Basic chainsaw felling and manual takedown. (2018). FISA, available online at https://www.ukfisa.com/assets/files/safetyLibrary/FISA%20302%20-%20Basic%20Chainsaw%20Felling%20A4%2006-18.pdf
4. Casas, M., Masagué, F., Traval, A. Especialista en sierra mecánica. Mantenimiento y troceado – Preparación ECC1. (2017). Consorci de la Vall del Ges, Orís i Bisaura.
5. Casas, M., Masagué, F., Traval, A. Especialista en tala de árboles pequeños. Preparación ECC2. (2017). Consorci de la Vall del Ges, Orís i Bisaura.
6. Colorado Firecamp. Appendix C: Chainsaw technical report, available online at https://www.coloradofirecamp.com/s-212-chainsaws/dutch-creek-incident-glossary.html
7. EFESC. (2018). Available online at https://efesc.org/
8. Guía para el aprendizaje y la evaluación. Certificado de profesionalidad: Gestión y mantenimiento de árboles y palmeras ornamentales. (2011).
9. Treefelling. Best practice guide. (2017). Competenz: Skills for industry, available online at https://www.competenz.org.nz/assets/Uploads/16090-Competenz-tree-felling-BPG.pdf
10. Cualificación profesional : Aprovechamientos forestales. , available online at http://incual.mecd.es/documents/20195/94271/AGA343_2_RV+-+Q_Documento+publicado/19898a4e-b489-4ee5-8f68-49880319455c

6. Learning module 2

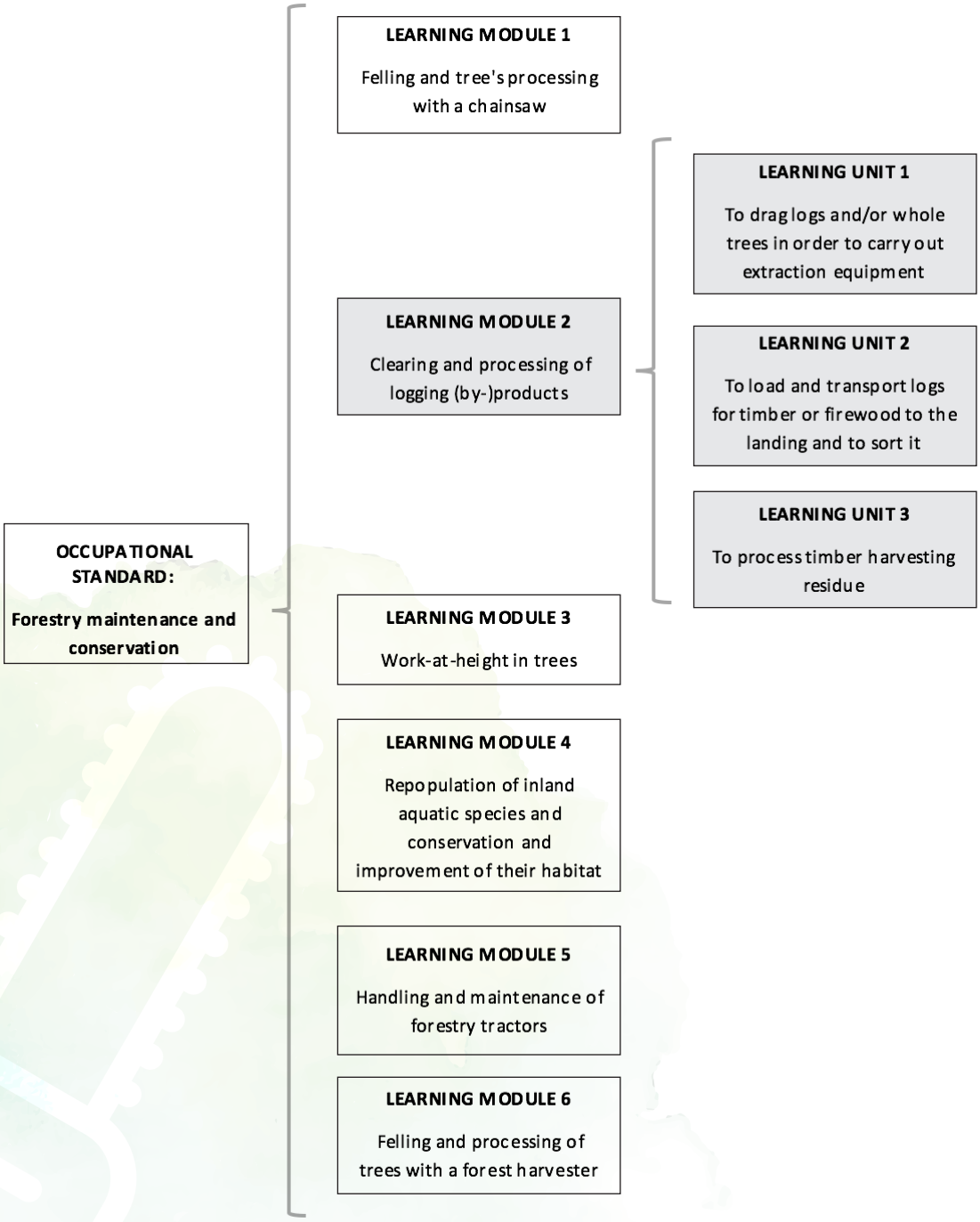
Naming: Clearing and processing of logging by-products

Level: 2

Code: MF1118_2

Related to the CU: UC1118_2 - Carry out the clearing and processing of logging by-products.

Duration (hours): 60



6.1. Organization and timing of the module

Learning module	Hours	Learning units	Hours	Classroom work	Practical workshops
Clearing and processing of logging (by-) products	60	To drag logs and/or whole trees in order to carry out extraction	30	6	24
		To load and transport logs for timber or firewood to the landing and to sort it	18	6	12
		To process timber harvesting residue	12	3	9

6.2. Specific objectives and evaluation criteria

SPECIFIC OBJECTIVES Achievement of the following capabilities:	EVALUATION CRITERIA	CONTENTS
C1: To explain the techniques involved in logging by means of ground skidding/ dragging of logs and/or whole trees and perform such techniques.	**KNOWLEDGE** / **SKILLS** **AC1.1** Explain the techniques involved in logging by means of ground skidding/ dragging of logs and/or whole trees and the means necessary to perform them **AC1.2** Describe the features of different types and models of specific machinery for logging by means of dragging available on the market. **AC1.3** Identify these machines' different safety mechanisms and devices. **AC1.4** Describe the periodical maintenance and service operations for this machinery. **AC1.5** Explain the machinery's control, handling and steering techniques. **AC1.6** Identify the occupational risks and explain the preventative measures as well as the environmental protection measures to be taken during logging operations involving the technique of dragging logs and/or whole trees.	**1 Logging by means of loading and haulage** Considerations prior to extraction. Loading techniques and methods. Machinery and equipment: Adapted agricultural tractors, self-loader forest tractors. Safety features and elements. Maintenance and servicing. Risk assessment and preventative measures to be taken (safety, health and ergonomics). Special risk situations. **2 Logging by means of skidding or trailing** Considerations prior to extraction. Skidding methods and techniques: trees or logs. Machinery and equipment. Skidders: features, operation, safety features, maintenance, servicing. Attachment systems. Risk assessment and preventative measures to be taken (safety, health and ergonomics). Special risk situations.
C2: Explain techniques for logging by means of loading and haulage of logs as far as the collection points and perform such work.	**KNOWLEDGE** / **SKILLS** **AC2.1** Explain the techniques involved in the loading and haulage of logs and the means necessary to perform them **AC2.2** Describe the features of different types and models of specific machinery for logging by means of loading and haulage of logs. **AC2.3** Identify these machines' different safety mechanisms and devices. **AC2.4** Describe the periodical maintenance and service operations for this machinery. **AC2.5** Explain the machinery's control and handling techniques. **AC2.6** Identify the occupational risks and explain the preventative measures as well as the environmental protection measures to be taken during logging operations involving loading and haulage of logs.	**3 Logging cables and other means of extraction** Logging cables: types, features and attributes. Operations with cables: cutting, fitting accessories, greasing... Work equipment: power element, skyline, carriage and mainline. Additional elements: haul-back line, boom, carriage stop, hoist line and attachment elements. Working techniques. Safety at work. Extraction by means of sliding: types and techniques. Aerial logging: with helicopters or balloons. Timber floating. Risk assessment and preventative measures to be taken (safety, health and ergonomics). Special risk situations.

	KNOWLEDGE	SKILLS	
C3: Describe forestry by-product harvesting systems and techniques and carry out the necessary work involved.	**AC3.1** Explain forestry by-product harvesting systems and the techniques and means necessary to perform them. **AC3.2** Describe the features of different types and models of the specific machinery necessary for such operations. **AC3.3** Identify these machines' different safety mechanisms and devices. **AC3.4** Describe the periodical maintenance and service operations for this machinery. **AC3.5** Explain the machinery's control and handling techniques. **AC3.6** Identify the occupational risks and explain the preventative measures as well as the environmental protection measures to be taken while harvesting forestry residues.		**4 Processing of by-products** Types of harvesting. Machinery, utensils and tools: chippers, mulchers, forest residue bundlers, etc. Features, operation, safety elements, maintenance and servicing. Risk assessment and preventative measures to be taken (safety, health and ergonomics). Special risk situations. **5 Basic regulations concerning logging and processing of by-products.** Forestry legislation. Environmental regulations. Occupational safety regulations.
PERSONAL AND SOCIAL SKILLS LINKED TO PROFESSION			
· Adapt to the company's work organisation and understand the hierarchical relations within it. · Interpret instructions properly and become responsible for carrying them out. · Communicate effectively with the right interlocutor at every moment. · Follow timetables and the rhythm of work, fulfilling daily performance objectives fixed by the company. · Display interest in the company's growth forecasts. · Become involved in the company's quality plan and in the improvement of occupational health and safety. · Display a respectful attitude to colleagues, procedures and the company's internal regulations.			

6.3. Practice/exercise

Learning module	**2**	**Learning unit to which it responds**	**LU1**	**Duration:**	**Between 2 and 3 h**
Exercise Nº	**1**				

Organising to drag out logs and/or whole trees in order to carry out extraction

DESCRIPTION:

- Identify the plot and organise extraction, establish landings and provide ancillary workers with relevant instructions.
- Select the techniques and means to be used for skidding operations.
- Ensure that the machinery and equipment are in good working order and take corrective measures if necessary.
- Complete a maintenance report, recording any observations and an estimated time for the next service.
- Carry out logging while leaving logs and/or whole trees in such a way that facilitates subsequent processing and/or loading operations.
- Perform the aforementioned work while taking the necessary occupational risk prevention measures, minimising environmental impact in line with regulations in force.
- Prepare an emergency plan and make the means available to implement it.
- Do calculations in order to evaluate logging operations financially.

MEANS FOR ITS REALIZATION:

- Multipurpose classroom of at least 2 m² per student. Minimum practice area of 10 hectares (forest) (A unique space not necessarily situated in the educational centre).
- Personal protective equipment.
- First aid kit.
- Means to take notes

TRAINER'S GUIDELINES:

- The trainees should be able to explain all the relevant features (theoretical) and perform the practical skills on a safe and efficient manner.
- The practice should take place at the appropriate venue (forest).
- The trainer should firstly make sure that in the place where the practice is going to take place all the material and equipment specified above are available and are in perfect condition for use.
- The trainer should attentively supervise the work of the learner throughout the activity, correcting the errors or solving doubts that could arise.
- The time to carry out the practice should be limited, but the trainer should take into account the general rhythm of the group.

Learning module	**2**	**Learning unit to which it responds**	**LU2**	**Duration:**	**Between 4 and 5 hours**
Exercise Nº	**2**				

Organising and carry out extracting activities using logging cables and other means of extraction

DESCRIPTION:

- Identify the plot and organise extraction, establish landings in the extraction route and provide ancillary workers with relevant instructions.
- Select the techniques and means to be used for extraction operations.
- Ensure that the machinery and equipment are in good working order and take corrective measures if necessary.
- Complete a maintenance report, recording any observations and an estimated time for the next service.
- Perform extraction while bunching logs in accordance with their destination in such a way that facilitates loading and transport to the logging industry.
- Perform the aforementioned work while taking the necessary occupational risk prevention measures, minimising environmental impact in line with regulations in force.
- Prepare an emergency plan and make the means available to implement it.
- Do calculations in order to evaluate logging operations financially.

MEANS FOR ITS REALIZATION:

- Multipurpose classroom of at least 2 m² per student. Minimum practice area of 10 hectares (forest) (A unique space not necessarily situated in the educational centre).
- Personal protective equipment.
- First aid kit.
- Means to take notes

TRAINER'S GUIDELINES:

- The trainees should be able to explain all the relevant features (theoretical) and perform the practical skills on a safe and efficient manner.
- The practice should take place at the appropriate venue (forest).
- The trainer should firstly make sure that in the place where the practice is going to take place all the material and equipment specified above are available and are in perfect condition for use.
- The trainer should attentively supervise the work of the learner throughout the activity, correcting the errors or solving doubts that could arise.
- The time to carry out the practice should be limited, but the trainer should take into account the general rhythm of the group.

Learning module	2	Learning unit to which it responds	LU3	Duration:	Between 2 and 3 hours
Exercise Nº	3				

Organising and processing timber harvesting residue

DESCRIPTION:

- Determine the techniques to be used in line with the type of harvesting intended and the means available.
- Select the techniques and means to be used for logging/ haulage operations.
- Ensure that the machinery and equipment are in good working order and take corrective measures if necessary. (chippers, mulchers, forest residue bundlers, etc.)
- Complete a maintenance report, recording any observations and an estimated time for the next service.
- Perform logging operations while leaving the forest in good condition for any subsequent work
- Perform the aforementioned work while taking the necessary occupational risk prevention measures, minimising environmental impact in line with regulations in force.
- Prepare an emergency plan and make the means available to implement it.
- Do calculations in order to evaluate logging operations financially.

MEANS FOR ITS REALIZATION:

- Multipurpose classroom of at least 2 m² per student. Minimum practice area of 10 hectares (forest) (A unique space not necessarily situated in the educational centre).
- Personal protective equipment.
- First aid kit.
- Means to take notes

TRAINER'S GUIDELINES:

- The trainees should be able to explain all the relevant features (theoretical) and perform the practical skills on a safe and efficient manner.
- The practice should take place at the appropriate venue (forest).
- The trainer should firstly make sure that in the place where the practice is going to take place all the material and equipment specified above are available and are in perfect condition for use.
- The trainer should attentively supervise the work of the learner throughout the activity, correcting the errors or solving doubts that could arise.
- The time to carry out the practice should be limited, but the trainer should take into account the general rhythm of the group.

6.4. Best training + safety practices

Theory is taught in the classroom in short blocks lasting at most 1.5 hours. The emphasis is placed on identifying dangers and risks and on essential safety measures. Then, during practical exercises, the way to deal with the machines is built up step by step: first driving exercises on easy terrain, and only later are there manoeuvres in the training forest and gradual familiarisation with the machine functions (e.g. winch, crane).

The further progress of the practical exercises is focused on gaining experience in a safe working environment. The candidates alternate on the machines, but each time they work in blocks of 1 to 2 hours on the same machine. While they are waiting, they observe the other candidates or undertake sawing work in the vicinity of the machine.

The trainer coaches the candidates according to their skills and level of experience. If necessary, appropriate communication equipment is used to enable rapid intervention in the event of risky actions.

The teaching curriculum about maintenance and safety provisions is handled in groups in the workshop. The timing of this can be flexibly adjusted, i.e. due to weather conditions.

During the test, the candidate is required to work autonomously and the actions are observed from a distance by the assessor. Where necessary, specific questions are asked in order to assess the level of knowledge.

6.5. Assessment

DEMOSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
C1: To explain the techniques involved in logging by means of ground skidding/dragging of logs and/or whole trees and perform such techniques.		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
AC1.1 Explain the techniques involved in logging by means of ground skidding/dragging of logs and/or whole trees and the means necessary to perform them	Safe working position Uprooting of complete trees or long timber Take timber or entire trees to the stacking area Drag away sawn timber with choker system Stack timber in accordance with the regulations Secure the stacking area, level tracks on forest roads	Oral explanation to the examiner during the actual work situation
AC1.2 Describe the features of different types and models of specific machinery for logging by means of dragging available on the market.	Cables, terminal connections and lifting accessories Operating a winch: mechanical, hydraulic from the cabin, electro-hydraulic remote control Towing board: protecting the machine, stacking uncut timber Basic machine: modified agricultural tractor or skidder	Oral explanation to the examiner during the actual work situation
AC1.3 Identify these machines' different safety mechanisms and devices.	Cable and lifting accessories: correct dimensioning Winch operation: dead man's handle, brake correctly adjusted Safety grill or glass in event of cable breakage ROPS/FOPS, sprung seat with safety belt, moving parts shielded, emergency stop, safety pictograms	Oral explanation to the examiner during the actual work situation

AC1.4 Describe the periodical maintenance and service operations for this machinery.	Basic machine: Check engine oil Check fuel filter Check air filter Check cooling Check transmission and hydraulic oil Replace oil filter Replace fuel filter Replace air filter Cables and terminal connections: period inspection, if necessary repair by skilled person. Replace cable if damaged Functional test of the (remote) control Check for tears or loose parts, grease hinges and moving parts	Oral explanation to the examiner during the actual work situation
AC1.5 Explain the machinery's control, handling and steering techniques.	Starting the engine Adjust the driver's seat Drive the machine in hilly terrain Choice of gear Switch on standstill protection when leaving the machine, on slopes, push additional dozer blade or towing board into the ground. Operation of the winch: extend the cable, lift the tree trunks according to the 'strangle, twist, pull' principle, drag together tree trunks or entire trees to a load conforming to the tractor's carrying capacity, drive the load to the stacking area through hilly terrain, unload load at the stacking area and stack Agree clear communications when two people work together (winch man and choker man) Use emergency stop	Oral explanation to the examiner during the actual work situation
AC1.6 Identify the occupational risks and explain the preventative measures as well as the environmental protection measures to be taken during logging operations involving the technique of dragging logs and/or whole trees.	Noise: low-noise cabin, hearing protection Falls: clean steps, sturdy shoes Crushing: safety shoes, assume safe place when dragging uncut timber or cut timber (wood snapping back!), accompany timber being dragged along the side of the hill, maintain safe distance when uncoupling at the stacking area Cuts: gloves for manipulating steel cable Moving parts: cable lashing around if broken Head wound: helmet Soil compaction: broad tires, low tire pressure, tracks Soil pollution through oil spills: biodegradable oil	Oral explanation to the examiner during the actual work situation

METHODS AND ASSESSMENT TOOLS
- Simulation of real situation on the site - Presence of a professional for advice - Scoresheet with indicators control

DEMOSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
C2: Explain techniques for logging by means of loading and haulage of logs as far as the collection points and perform such work.		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
AC2.1 Explain the techniques involved in the loading and haulage of logs and the means necessary to perform them	Driving in terrain, choice of exit routes Load timber with the crane, place logs neatly in the loading area Spread selection separately or combined Unload sawn timber with the crane Stack timber in accordance with the regulations Secure the stacking area, level tracks on forest roads	Oral explanation to the examiner during the actual work situation
AC2.2 Describe the features of different types and models of specific machinery for logging by means of loading and haulage of logs.	Forwarder or agricultural tractor with spreading vehicle Operation of the hydraulic loading crane with joysticks from the cabin	Oral explanation to the examiner during the actual work situation
AC2.3 Identify these machines' different safety mechanisms and devices.	Safety glass in event of contract with the crane or the timber ROPS/FOPS, sprung seat with safety belt, moving parts shielded, emergency stop, safety pictograms Support legs or automatic blocking between front and rear vehicle during crane work	Oral explanation to the examiner during the actual work situation
AC2.4 Describe the periodical maintenance and service operations for this machinery.	Basic machine: Check engine oil Check fuel filter Check air filter Check cooling Check transmission and hydraulic oil Replace oil filter Replace fuel filter Replace air filter Functional test of the crane, grease, inspect or sand hinge points of cracks and loose parts.	Oral explanation to the examiner during the actual work situation

AC2.5 Explain the machinery's control and handling techniques.	Starting the engine Adjust the driver's seat Drive the machine in hilly terrain Choice of gear Switch on standstill protection when leaving the machine, on slopes, push additional dozer blade into the ground. Operation of the crane: smooth movements, load sawn timber in an orderly way, load as much timber until a load is achieved in compliance with the carrying power of the driving combination, drive the load to the stacking area through hilly terrain, stack load, sorted and in an orderly manner, at the stacking area. Use emergency stop	Oral explanation to the examiner during the actual work situation
AC2.6 Identify the occupational risks and explain the preventative measures as well as the environmental protection measures to be taken during logging operations involving loading and haulage of logs	Noise: low-noise cabin, hearing protection Falls: clean steps, sturdy shoes, possibly additional measures during machine maintenance Crushing: safety shoes Cuts: gloves when manipulating metal parts Moving parts: Soil compaction: broad tires, low tire pressure, tracks Soil pollution through oil spills: biodegradable oil	Oral explanation to the examiner during the actual work situation

METHODS AND ASSESSMENT TOOLS

- Simulation of real situation on the site
- Presence of a professional for advice
- Scoresheet with indicators control

DEMOSTRATION SKILLS AND COMPETENCES

CAPABILITY

C3: Describe forestry by-product harvesting systems and techniques and carry out the necessary work involved.

ASSESSMENT CRITERIA	ACHIEVEMENT INDICATORS	ASSESSMENT SYSTEM
AC3.1 Explain forestry by-product harvesting systems and the techniques and means necessary to perform them.	Wood shredders Rotary cutters Twig bundling machines	Oral explanation to the examiner about existing machines intended for ancillary products
AC3.2 Describe the features of different types and models of the specific machinery necessary for such operations.	Shredding into biomass for combustion Shredding of branch residue and processing in the soil Bundling twigs for burning	Oral explanation to the examiner about the function of the various machines
AC3.3 Identify these machines' different safety mechanisms and devices.	emergency stop, safety at feed hopper, shielding of drive shafts, shielding of rotary cultivator, hazard pictograms	Oral explanation to the examiner about safety provisions on the various machines

AC3.4 Describe the periodical maintenance and service operations for this machinery.	Check engine oil Check fuel filter Check air filter Check cooling Check transmission and hydraulic oil Replace oil filter Replace fuel filter Replace air filter Replace oil Grease hinges	Practical implementation of the maintenance to the machine itself Oral questioning about the work that has to be done
AC3.5 Explain the machinery's control and handling techniques.	Starting the engine Adjust the driver's seat Driving with the machine Choice of gear Engaging machine drive Correspondence between drive and motor speed Use of hydraulic controls Switching off the power of the machine Use emergency stop	Oral explanation to the examiner about the operation of the various machines
AC3.6 Identify the occupational risks and explain the preventative measures as well as the environmental protection measures to be taken while harvesting forestry residues.	Noise: low-noise cabin, hearing protection Falls: clean steps, sturdy shoes Crushing: safety shoes Cuts: gloves Head wound: helmet Soil compaction: broad tires, low tire pressure, tracks Soil pollution through oil spills: biodegradable oil	Oral explanation to the examiner about the work risks and safety provisions for the various machines
METHODS AND ASSESSMENT TOOLS		
- Simulation of real situation on the site - Presence of a professional for advice - Scoresheet with indicators control		

References

1. Guía para el aprendizaje y la evaluación. Certificado de profesionalidad: Gestión y mantenimiento de árboles y palmeras ornamentales. (2011).
2. Cualificación profesional: Aprovechamientos forestales, available online at http://incual.mecd.es/documents/20195/94271/AGA343_2_RV+-+Q_Documento+publicado/19898a4e-b489-4ee5-8f68-49880319455c

7. Learning module 3

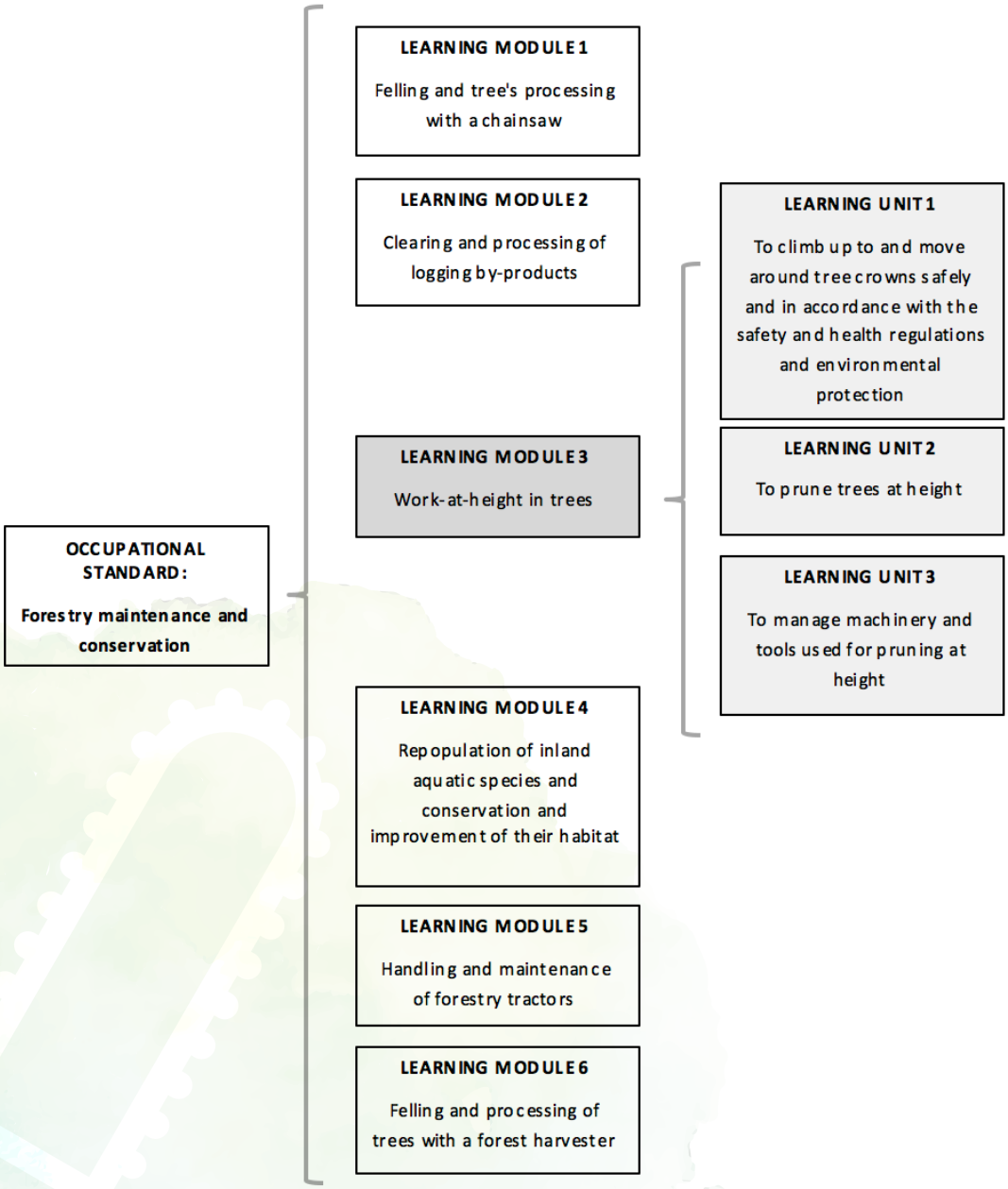
Naming: Work-at-height in the trees.

Level: 2

Code: MF1119_2

Related to the CU: UC1119_2 - To carry out works-at-height in trees.

Duration (hours): 120



7.1. Organization and timing of the module

Learning module	Hours	Learning units	Hours	Classroom work	Practical workshops
Work at height in trees	120	To climb up to and move around tree crowns safely and in accordance with the safety and health regulations and environmental protection	**70**	**21**	**49**
		To prune trees at height in order to facilitate the subsequent work, maintaining the security conditions and in accordance with the safety and health regulations and environmental protection	**35**	**7**	**28**
		To manage machinery and tools used for pruning at height, maintaining the security conditions and in accordance with the safety and health regulations and environmental protection	**15**	**4**	**11**

7.2. Specific objectives and evaluation criteria

SPECIFIC OBJECTIVES Achievement of the following capabilities:	EVALUATION CRITERIA		CONTENTS
	KNOWLEDGE	SKILLS	
C1: Apply climbing techniques and movement around trees specifying the risks.	**AC1.1** Describe the different stages of climbing a tree, pointing out the technical difficulty and the risks involved with each one. **AC1.2** Recognise the defects and signs of deterioration of material and equipment used for climbing and moving around trees. **AC1.3** Describe indications and signs associated with the presence of dangerous and/or protected animals in trees as well as defects in the wood. **AC1.4** Explain the determining factors involved in the difficulty of ascending, moving around and descending from trees. **AC1.5** Mention the main tools, materials and equipment for climbing or moving around trees, and its functions. **AC1.6** Explain the use of the crane baskets, loading platforms or cranes used in work at height used to work at height. **AC1.7** Summarize the most common occupational risk situations during the climb and the preventative measures to be taken. **AC1.8** In a practical case study of climbing a tree on the basis of given conditions and materials: - Explain the steps to be taken to ascend, move around and descend from a tree. - Check the climbing equipment. - Attach to one's body and install in the tree each part of the climbing equipment. - Climb the tree and move around in it, moving the anchors when necessary. - Descend from the tree.		**1 Climbing techniques** General principles of work at height. Techniques for working in trees. Basic climbing techniques. Sling shot launch. Ascent and its movements: Prussik knot, ascension with a foot loop or similar. Movement technique: movements around the tree crown. Anchoring methods at height. Descent: use of descending devices. Knots. Fastening and fall arrest systems. Tools and equipment: handling and upkeep. Safe climbing. Emergency plan: rescue. First aid. **2 Other means and equipment for work at height.** Cranes, baskets and loading platforms. Types: features and application. Components: hydraulic system, control system, safety systems. Most common breakdowns. Regular maintenance. Handling: control and handling mechanisms control devices, safety features, risk situations, basic medical techniques.

<table>
<tr><td rowspan="2">C2: Explain pruning techniques and the grounds for them.</td><td colspan="2">KNOWLEDGE</td><td>SKILLS</td><td rowspan="2">3 Pruning techniques at height

Basics of plant anatomy, and the mechanical properties of wood physiology. Pruning seasons. Functions and aims of tree pruning: basics. Technical, aesthetic, urbanistic and sanitary grounds for pruning.

Types of pruning: formative pruning and maintenance in trees; formative pruning and maintenance in ornamental trees.

Tree pruning techniques. Techniques for the complete elimination of branches. Crown raising. Branch cutting techniques. Proper and improper cuts. Treatment of cuts, wounds, blows and bark tearing in trees. Pruning machinery and tools: use of the chainsaw at height. Guided descent of branches by means of ropes. Mechanical assistance. Signposting of work areas. Debris: treatment. Yield estimation. Preparation of small estimates.</td></tr>
<tr><td colspan="3">AC2.1 Describe the anatomical, physiological and mechanical basics of wood which determine tree pruning work.
AC2.2 Mention and select signposting techniques for work areas.
AC2.3 Distinguish between formative pruning, maintenance and crown reduction while specifying the aims and particularities of each one.
AC2.4 Explain pruning techniques and procedures which facilitate the clean cutting of branches without bark tearing or contagion to other trees.
AC2.5 Identify techniques for the treatment of pruning wounds.
AC2.6 Explain branch cutting techniques: crown cleaning, thinning and reduction, specifying when each one is used.
AC2.7 Explain the transfer of the chainsaw and other tools aloft the tree, including any technical or safety particularities.
AC2.8 Describe the tools, materials, machinery and equipment used in pruning work.
AC2.9 Present the most common occupational risk situations during pruning, and preventative measures to avoid them.</td></tr>
<tr><td rowspan="2">C3: Apply pruning techniques with a chainsaw or other tools at height from the treetop, a crane basket or crane loading platform</td><td colspan="2">KNOWLEDGE</td><td>SKILLS</td><td></td></tr>
<tr><td colspan="3">AC3.1 In a practical case study, on the basis of given conditions:
-Signpost work areas.
- Observe the tree and identify pruning needs in accordance with aims.
-Climb the tree, move around the crown and establish an anchor in the work position safely.
-Handle the loading platform, crane basket or crane in accordance with safety regulations.
-Select the branches to be pruned in accordance with aims.
- Prune branches with a chainsaw or other tools selecting possible cutting points and applying techniques according to the tension of branches.
-Treat wounds and cuts to avoid possible infections.</td><td>4 Basic regulations regarding work at height in trees.
Regulations on occupational risk prevention.
Environmental regulations.</td></tr>
<tr><td colspan="5">PERSONAL AND SOCIAL SKILLS LINKED TO PROFESSION</td></tr>
<tr><td colspan="5">· Adapt to the specific organisation of the company and participate in its technical/professional relations.
· Understand and carry out instructions and be responsible for one's own work, communicating effectively with the right person in each case.
· Become used to the company's work rhythms and fulfilling the daily performance objectives of the organisation.
· Display a respectful attitude to colleagues, procedures and the company's internal regulations.</td></tr>
</table>

7.3. Practice/exercise

Learning module	3	Learning unit to which it responds	C1	Duration:	Time estimated by the assessor (estimation 1h30 minimum)
Exercise Nº	1				

Realize a marked path on the tree using the compatible methods, aiming at verifying the candidate's capacity to climb, moving through the tree crown and descending safely.

DESCRIPTION:

- Explain the steps to be taken to ascend, move around and descend from a tree.
- Check the climbing equipment.
- Attach to one's body and install in the tree each part of the climbing equipment.
- Climb the tree and move around in it, moving the anchors when necessary.
- Descend from the tree.
- Carry out the aforementioned work taking the necessary occupational risk prevention measures, while minimising environmental impact and complying with regulations in force.

MEANS FOR ITS REALIZATION:

Tree chosen by the assessor: minimum height 10 meters and a tree crown needing a reflexion on the choice of the anchor point

- Climbing equipment.
- Personal protective equipment.
- Securing work site equipment.
- First aid kit.

ASSESSOR'S GUIDELINES:

You will observe the tree chosen by the assessor and its environment.

You will organize the safety of the work site and of the exercise that you have to execute.

You will prepare your equipment justifying your choice.

Within the respect of safety rules, you will access to the tree to choose your main anchor point.

You will justify your choice.

You will execute your movements at the different identified points chronologically, coherently, efficiently and in an operational way.

You will descent the tree recovering the equipment used on the tree.

You will realize a self-evaluation of your exercise identifying the positive points of your course and the complications you met.

Learning module	3	Learning unit to which it responds	C2	Duration:	30 minutes of observation for the candidate. 20 minutes of development: choice of the intervention and explanation.
Exercise Nº	2				

Define an intervention strategy on a defined tree justifying these choices.

DESCRIPTION:

- Identify the tree and its characteristics
- Describe the environment of the tree, its location
- Diagnose the state of being of the tree
- Define a choice of maintenance or pruning
- Draw an adapted signalisation plan
- Estimate the needed tools adapted to the intervention.

MEANS FOR ITS REALIZATION:

The assessor chose the tree to be analysed: characteristics needing a reflexion on the type of maintenance and the issued methods of intervention

- Tree identification keys
- Binoculars
- Block note

ASSESSOR'S GUIDELINES:
You will observe the tree chosen by the assessor and its environment
You will identify health, biological or mechanical risks
You will classify the tree according to its mechanical and physiological state of being.
You will use an appropriate and professional vocabulary.
You will draw the information gathered about the tree.
You will count the environmental constraints and the provided solutions.
You will estimate the duration of the work.

Learning module	**3**	**Learning unit to which it responds**	**C3**	**Duration:**	**Between 2 and 3 hours, depending on the demands of the assessor on the work site.**
Exercise N°	**3**				

Realize a tree pruning with a mobile elevating work platform (basket)

Description :

- Secure the working area
- Observe the tree and identify the pruning in accordance with the objectives.
- Choose the right cutting tools
- Perform standard and regulatory checks on the basket
- Position the basket.
- Handle the loading platform, crane basket or crane in accordance with safety instructions.
- Select the branches to be trimmed according to the objectives.
- Cut branches with a chainsaw or other tools by selecting possible cutting points and depending on the tension of the branches.
- Treat wounds and cuts to prevent possible infections.
- Manage the organization of persistent workers and coordination with ground workers.

MEANS FOR ITS REALIZATION:

- Typical working site adapted to the use of the basket.
- Basket or lift platform
- Compliance of authorization documents for the intervention
- Cutting tools.
- Personal protective equipment.
- First aid kit.

ASSESSOR'S GUIDELINES:
By relying on the mission statements, you will carry out pruning operations.
You will take into account the environment by taking into account the constraints related to the use of the basket.
You will work within the appropriate safety rules.
You will organize the working site in a coherent and methodical manner to complete the work within the given time.

7.4. Best training + safety practices

7.4.1. Working and training at height: an aggravating risk factor

No tolerance for mistakes.

If "*error is human*" (French expression), it can also be fatal in pruning activities.

This is one of the contradictions of training in this sector. We often consider that in order to learn well, the learner or the trainee must make mistakes to understand them and learn from them. However, this approach is not always applicable when we talk about working at heights.

What steps should be taken to ensure that the trainee has fully and definitively integrated good practices and appropriate security measures?

How do we develop a "Safety Culture" inside our learners and teach them how to manage ongoing

and permanent risk?

The implementation of a method and the use of tools can help the trainer and the evaluator in this process.

7.4.2. Methodology

- ***Implementing a progressive, methodical and appropriate training.***

  Example:

  1.Learning the name of the knot

  2.Learning to tie the knot

  3.Learning the different uses of the knot

  4.Using the knot in the right situation

  Situation at risk:

  - I can't tie the knot; I can't use the knot in the right situation

  - I'm confusing the Bowline knot with a figure-eight knot, I'm in danger

  - If I tie the knot upside down, I may fall

  It is therefore necessary to implement a step-by-step training enabling the trainee to integrate knowledge, know-how and skills in a progressive and methodical manner.

- ***Ensure supervision to allow systematic control of the trainee.***

  Good coaching or reinforced coaching allows the learner to be better supported and to reduce risks.

7.4.3. Tools and means

- ***Work Site Risk Assessment Sheet (Annex 7.1)***

  Allows to check whether the learner has correctly identified the risks related to the work sites and the environment.

  An identified risk is a danger addressed by the operator.

- ***The tree access protocol or checklist of the points to be checked by the evaluator (Annex 7.2)***

  This list allows to check point by point and chronologically all the steps that the trainee has to follow and execute to climb the tree, without making any omission or error.

- ***The whistle or headset radio:***

  Communication between the trainee and the trainer is essential. In the event of an error, the trainer must be able to inform the learner quickly and clearly or stop him.

7.4.4. Annexes

In case of accident contact 112
In case of difficulty, danger, accident – call the training centre (telephone number)

RISK ASSESSMENT SHEET

Sheet prepared by: **Group** **Dated :**

AID

Name of the work site o wner:

Phone:

Address / Parcel City

GPS access

Road

Directions / Instructions

Nature of the intervention No. days

The two people in charge of first aid

1)

2)

Weather

Lot Features- City - Forest - Garden

Special features

Road border work Sidewalk / crosswalk

Marketplace / parking / schoolyards

Power lines	Telephone line	Optical fiber
Water Pipe	Septic tank	Hydraulic
Gas tank	Landscaped area	fences / barbed Wires

Health status of settlement *presence of defects, pathogens, predetermined breaking points, cassia probability etc.*

Biological risks *Pine processionary, wasps etc.*

In case of accident contact 112
In case of difficulty, danger, accident – call the training centre (telephone number)

ATTENDANCE SHEET

All signatories people took knowledge of the risks of the work site and inform the trainer in case of changes.

Class / Group

NAME	J1	J2	J3	J4	J5

Pruning: Wear of personal protective equipment conform to regulation (lively colored helmet unexpired, bibs or fluorescent shirt, gloves, goggles or visor, cut resistant clothing, safety shoes, earplugs, safety kit available on the site and whose content is checked regularly + hemostatic pad). Sufficient water supply.

Do not light fires, smoking is forbidden in the forest, a fire extinguisher in working condition and controlled is present. Vehicles are parked in starting position.

Using a chainsaw approved and included in the waiver request of the training centre. Compliance with the general instructions of the single document of the risk assessment of the training centre.

Protocol of access to the tree

Actions chronologically executed YES/NO (If NOT, this causes halting the progression of phases)			
	Phase 1 -The launched small bag	**YES**	**NO**
1	-Having a storage bag for the launch cord and ensure that it is ready to use (no cord tangled!)		
2	-Attach the small bag. Make an overhand noose easy to remove (nine braided knot, cow hitch)		
3	-Throw the small bag in order to achieve a reliable highest point possible in the tree		
4	- Exploit the momentum depending on the chosen access method (reliability and regulations)		
	Phase 2 -Setting up of an access rope		
5	-Correctly attach the access rope with the yarn launched	**YES**	**NO**
6	-Put up the access rope		
7	-Secure the rope (stopper knots checked)		
8	-Test the rope with 2 people		
	Phase 3 -Access using the foot lock method		
9	- Personal protective equipment conform to regulation and complete, worn correctly	**YES**	**NO**
10	- Self-locking knots realized correctly on the access rope		
11	-The recall is ready to be used on top of the climbing with a foot-lock (self-locking already connected to the bridge, stopper knot present)		
12	-The trainee put the carabiner on the 2 self-locking knots on its bridge and starts the climb		
13	-After 2 m climb 1 angler's loop is performed on each rope strand		
	Phase 4 -End of foot-lock, passage on its working rope		
14	-Arrived at the top point of the access rope the climber stabilizes and attaches himself/herself to the trunk with a pole belt (reliable axis)	**YES**	**NO**
15	-The trainee installs his/her climbing rope (to support the insertion of a branch or a fork) around the trunk and connects the splice on its bridge		
16	-Before detaching himself/herself, the trainee gives some slack on his/her pole belt to switch to tension on his/her climbing rope (verification of the reliability of the new anchor point)		
17	-He/she recovers 2 self-locking knots on the access rope		
	Phase 5 -Alternating rope and pole belt to settle on the top point (Traditional climb)		
18	-The climber's climbing rope is long enough to stay in contact with the ground throughout the end of progression to the highest point	**YES**	**NO**
19	-The climber in tension on its climbing rope climbs up to the level of the new anchor point (never pass above), attaches himself/herself with a pole belt along the trunk and switches the tension on his/her pole belt.		
20	-He/she gives slack on his/her climbing rope and unties the slice, then the trainee launches his/her rope higher to find a new anchor point that will enable the trainee to continue his/her progress towards the selected top point		
21	-He/She reconnects the splice on the bridge, gives some slack on his/her pole belt to check his/her new anchor point, and detaches him-herself with the pole belt to continue the climb		
22	-The operation will be repeated as many times as necessary until the highest point		
	Phase 6 -Installing the cambium saver		
23	-Arrived at the top, the climber attaches himself/herself again with the pole belt to the cable and performs an observation of the health status of the selected anchor point	**YES**	**NO**
24	-The trainee proceeds to the installation of the cambium saver in accordance with the regulations (depending on the configuration of the tree and the available material)		
	Phase 7 -Test reliability of the anchor point		
25	-The climber gives slack on his/her rope and switches the tension to the climbing rope which has now become the main anchor point (check the reliability of the anchor point)	**YES**	**NO**
	Phase 8 -Installation of the security rope		
26	- The groundsman attaches a strand of the access rope on the climber's work rope in order to let the climber get it back.	**YES**	**NO**
27	-The climber installs the safety rope in order to meet several criteria: 1: high enough for a rescuer to reach the climber wherever over the tree 2: reliable anchor for supporting the weight of 2 people 3: Practice for the rescuer to perform a foot-lock 4: the rope cannot be lost		

7.5. Assessment

DEMOSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
LU 1 - To climb up to and move around tree crowns safely		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
Access to the tree: Using a work platform (basket)	Consistent and complete equipment Correct position of the work platform (basket) Safe manoeuvres Coherent and fluid manoeuvre Timeline respected Respect of the tree Respected distances	Practical evaluation Real-work situation Interview with the candidate questions on the work realised.
Access to the tree: Using ropes *Applicant enters his job with safety ropes*	Presence of the rescue rope The anchor points are safe Consistent choice of the anchor point, effective and guaranteeing the safety of the climber Presence of Stop Node	Practical evaluation Real-work situation Interview with the candidate questions on the work realised.
Movements in the tree: balance management *The candidate moves in the tree with ease*	Agility in movements consistent movements / No unnecessary movements Moving on all parts of the tree Respect the tree No positioning error	Practical evaluation Real-work situation Interview with the candidate questions on the work realised.
Safe movements	Realization of nodes adapted to the situation Correct use of the dual anchor point No fault of anchor or handling ropes Repositioning the false reduced fork	Practical evaluation Real-work situation Interview with the candidate questions on the work realised.
METHODS AND ASSESSMENT TOOLS		
- Simulation of real situation on the site - Presence of a professional for advice - Scoresheet with indicators control Photos or film for identification and proof of fault (optional)		

DEMOSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
LU 2 - Pruning trees at height		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
Analysis of the tree and its environment	- Analyses methodically - Uses determination tools (identification of the tree, pruning time, etc ...) - Characterizes the condition of the shaft (physiological and mechanical) - Identifies tree weak points	Real-work situation and observation on the working site - Notes - Pictures

Determination of maintenance or pruning choice	- Justified and consistent choice - Relevance of reasoning - Solid and professional arguments	Written presentation on the analysis of the tree situation and explanation of the strategy of intervention on the tree, according to the environment.
Intervention Strategy *The candidate chooses the right intervention method*	- Knowledge of regulations - Diagram of the place of intervention is clear and well-defined constraints (power lines, traffic lane) - Clear legend - Consideration and highlighting all the risks associated with the working site - Estimated duration of the work	Oral presentation, interview with the trainee: simulation of the possible conversion that may occur with the client. Explanation of the reasons of the trainee's choice of intervention.

METHODS AND ASSESSMENT TOOLS

- Practical assessment with implementation on the ground
- Presentation on paper
- Oral explanation of the reasons of the intervention.

DEMOSTRATION SKILLS AND COMPETENCES

CAPABILITY

LU 3 - To manage machinery and tools used for pruning at height

ASSESSMENT CRITERIA	ACHIEVEMENT INDICATORS	ASSESSMENT SYSTEM
Use of the basket	- Verification of compliance documents and proper implementation of safety rules - Good control of security parts. - Good positioning of the basket - Ensure safety according to the environment - Handling with ease and smoothly the basket - Good space management (trees, roof ...)	Practical evaluation Real-work situation Interview with the candidate questions on the work realised.
Use of cutting tools	- Clothing and suitable protective equipment - Checking the security parts. (Sharpening and verification of refueling) - Ensuring safety - Positioning and proper tool use	Practical evaluation Real-work situation Interview with the candidate questions on the work realised.
Cut	- Health precautions and cleaning tools. - Following instructions and respect of the vegetation - Identifying and cutting the right branch - Chronology and consistent progress - Not forgetting steps or tasks - General control of the architecture of the tree and return if necessary.	Practical evaluation Real-work situation Interview with the candidate questions on the work realised.

METHODS AND ASSESSMENT TOOLS

- Practical assessment with implementation on the ground
- Presence of a professional for advice
- Score sheets with indicators control

Pictures or videos for identification and fault proof (not mandatory)

References

1. Référentiel du Certificat de spécialisation “arboriste - élagueur”, Ministère de l’Agriculture et de l’Alimentation, Référentiel du Certificat de spécialisation de niveau IV « Diagnostic et taille des arbres » créé par arrêté du 6 juillet 2017 et modifié par arrêté du 5 novembre 2018.; https://chlorofil.fr/fileadmin/user_upload/02-diplomes/referentiels/secondaire/cs/paysage/cs-aboristeElagueur-refDec2018.pdf.
2. Guía para el aprendizaje y la evaluación. Certificado de profesionalidad: Gestión y mantenimiento de árboles y palmeras ornamentales. (2011).
3. Cualificación profesional: Aprovechamientos forestales, available online at http://incual.mecd.es/documents/20195/94271/AGA343_2_RV+-+Q_Documento+publicado/19898a4e-b489-4ee5-8f68-49880319455c
4. Cualificación profesional: Gestión y mantenimiento de árboles y palmeras ornamentales, available online at http://incual.mecd.es/documents/20195/94271/AGA348_3_RV+-+Q_Documento+publicado/1365d9f8-b24b-451a-8da4-a32f2573cffd

8. Learning module 4

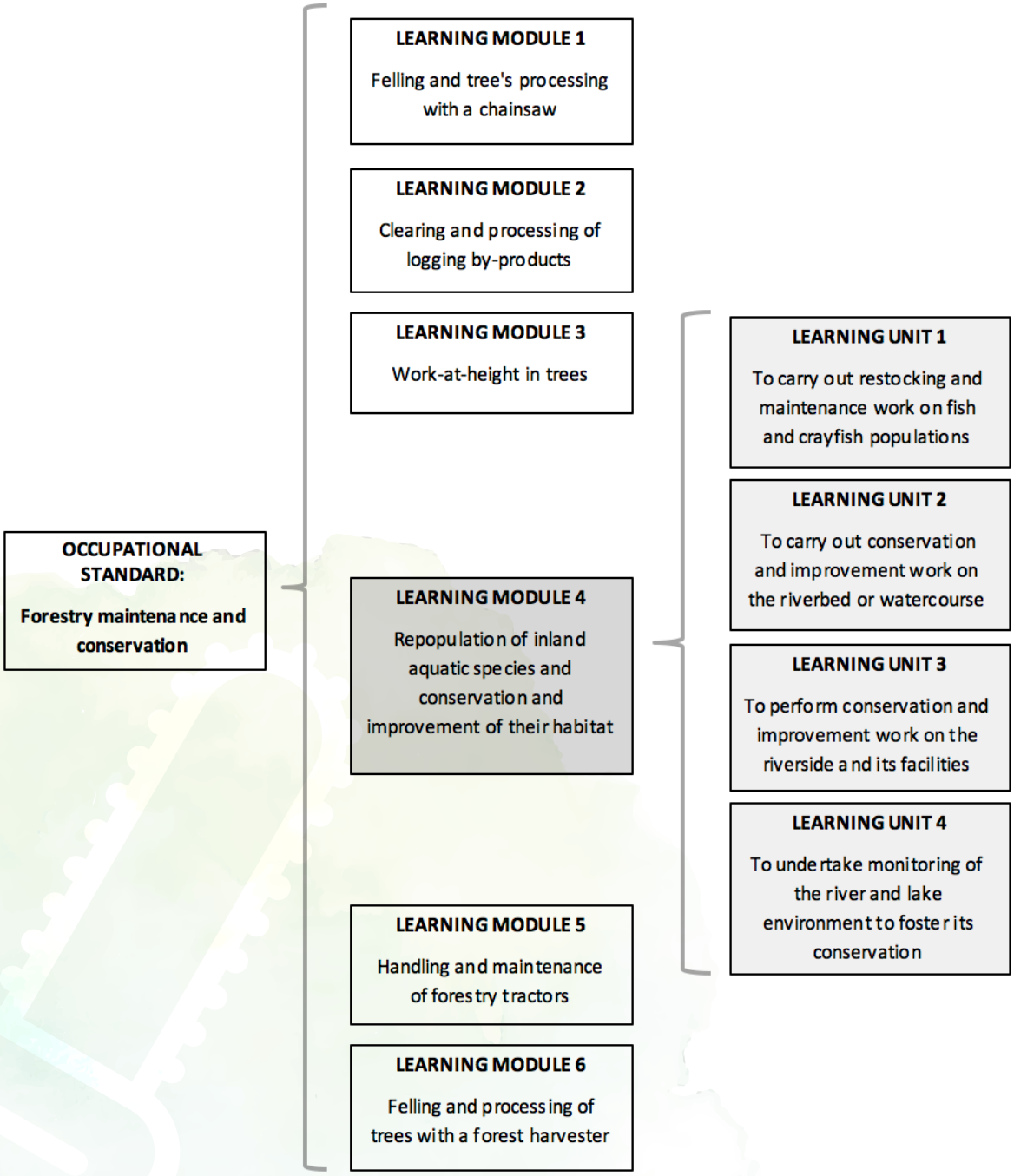
Naming: Repopulation of inland aquatic species and the conservation and improvement of their habitat

Level: 2

Code: MF1473_2

Related to the CU: UC1473_2 - To carry out repopulation work on inland aquatic species and the conservation and improvement of their habitat.

Duration (hours): 120



8.1. Organization and timing of the module

Learning module	Hours	Learning units	Hours	Classroom work	Practical workshops
Repopulation of inland aquatic species and conservation and improvement of their habitat	120	To carry out restocking and maintenance work on fish and crayfish populations	50	30	20
		To carry out conservation and improvement work on the riverbed or watercourse	20	12	8
		To perform conservation and improvement work on the riverside and its facilities	20	8	12
		To undertake monitoring of the river and lake environment to foster its conservation	30	20	10

8.2. Specific objectives and evaluation criteria

SPECIFIC OBJECTIVES Achievement of the following capabilities:	**EVALUATION CRITERIA**		**CONTENTS**
	KNOWLEDGE	**SKILLS**	
C1: Work on the restocking and upkeep of inland aquatic populations while following established procedures and applying suitable techniques in line with each species and release place.	**AC1.1** Describe the main river and lake ecosystems and their differential features. **AC1.2** Describe the features of fish and crustacean species existent in inland waters and particularly in fish farms and crayfish farms. **AC1.3** Explain the process, basics and techniques for electric fishing and other harvesting techniques as well as handling and resuscitation techniques of live specimens which are caught in such a way. **AC1.4** List the techniques and protocols for the selection, harvesting and transport of fish and crustaceans from the fish or crayfish farm. **AC1.5** Explain the main procedures and protocols for the release of fish/crustaceans in order to obtain the best adaptation to the receiving environment. **AC1.6** Describe the procedures and protocols to locate the source of mass fish death in the inland aquatic habitat and the taking of samples of water and dead individuals with a view to carrying out their removal and elimination. **AC1.7** Describe the means, equipment, machinery and tools necessary for the restocking and upkeep of inland aquatic populations. **AC1.8** Describe the regulations in force and the occupational risk prevention plan, adhere quality and profitability criteria, respecting the environment, the specific regulations regarding the activities to be carried out, while attempting to avoid causing stress or harm to animals during the restocking and upkeep of inland aquatic populations.		**1 Restocking and upkeep of inland aquatic species** Main fish stocks and crayfish stocks of inland waters. Biology and ecology of inland aquatic species. Electric fishing and other capture techniques in fish farms, crayfish farms and in the inland aquatic habitat. Methods of transport from the fish farm/crayfish farm. Release methods. Causes of mortality of inland aquatic species. Water and animal tissue sampling techniques. Techniques for the management of animal remains. Equipment, means, machinery and tools used in restocking and upkeep of inland aquatic populations. Personal protective equipment (PPE).

	KNOWLEDGE	SKILLS	
C2: Apply conservation and improvement techniques to the riverbed and watercourse, using appropriate methods for the river stretch or the body of inland water's features.	**AC2.1** Describe the reproduction processes of the main inland aquatic species. **AC2.2** Describe the factors which determine the potentiality of a particular river stretch from the point of view of its use for reproduction, pointing out the main problems which may prevent it (remains caused by floods, illegal effluents, spills and suchlike). **AC2.3** Recognise the plant species of each watercourse and how they affect the life of inland aquatic fauna and invasive or harmful species **AC2.4** Explain techniques for pruning and cutting vegetation in the watercourse and removal or control of invasive fauna. **AC2.5** Enumerate the main types of fish ladders, fishways and fish counters as well as safety features for aquatic fauna (such as grids, grates and similar), the grounds for their functioning, conservation and upkeep, and the circumstances which may limit their effectiveness or put at risk the lives of species which use them. **AC2.6** Describe processes of formwork and formwork removal, building of frameworks, mixing ratio, placing and curing of concrete, metal soldering, riveting and other building techniques with metal structures. **AC2.7** Describe the simple procedures for the determination of circular flow in a watercourse and the evaluation of flow rate by means of flow meters. **AC2.8** Describe the equipment, means, machinery and tools necessary for work on the conservation of the riverbed and watercourse. **AC2.9** Describe regulations in force and the occupational risk prevention plan while following criteria for quality and profitability as well as respecting the environment and the specific regulations regarding the work to be undertaken, while attempting not to cause undue stress and/or harm to animals during conservation and improvement work on riverbeds and watercourses.		**2 Conservation and improvement of the watercourse.** Reproduction of inland aquatic species. Potentiality of rivers and inland bodies of water: determining factors and features. Watercourse vegetation. Invasive plant species. Silviculture treatments: techniques clearing, pruning and treatment of aquatic vegetation. Techniques for the control of invasive flora. Fish ladders, fishways and fish counters as well as safety features for aquatic fauna. Determination of flows and retention volume. Soldering and riveting techniques. Equipment, means, machinery and tools used in the conservation and improvement of the waterway or riverbed. Personal protective equipment (PPE).

	KNOWLEDGE / SKILLS	
C3: Apply conservation and improvement techniques on riversides and their facilities, using the most suitable methods for the features of each river stretch or body of inland water and its use.	**AC3.1** Distinguish between the different tree and bush species in the riverside flora as well as invasive plants which may alter the environment. **AC3.2** Explain work related to waterside vegetation management (pruning, cutting, bush thinning, elimination of invasive species, safe removal of debris and suchlike) and criteria for such activities. **AC3.3** Describe different procedures for the planting of vegetation on riversides and other inland watersides through the use of cuttings, stakes and canes as well as spacing, bare root planting or with the root ball method, upkeep and repopulation, including replanting. **AC3.4** Describe the characteristics of infrastructure projects related to the adaptation of the environment for fishing, walking, user safety and reviewer programmes for the functionality and upkeep of such facilities. **AC3.5** Enumerate the signage necessary for angling and the safety of fishing stretches as well as their maintenance and revision. **AC3.6** Describe processes of formwork and formwork removal, building of frameworks, mixing, placing and curing of concrete, metal soldering, riveting and other building techniques with metal structures as well as the construction of enclosures and other small wooden buildings. **AC3.7** Describe the equipment, means, machinery and tools necessary for conservation and improvement work on watersides and their facilities. **AC3.8** Describe regulations in force and the occupational risk prevention plan while following criteria for quality and profitability as well as respecting the environment and the specific regulations regarding the work to be undertaken, while attempting not to cause undue stress and/or harm to animals during conservation and improvement work on riverbeds, watercourses and their facilities.	**3 Conservation and improvement of the waterside and its facilities.** Riparian flora. Invasive plant species. Silviculture treatments: techniques for clearing, pruning and treatment of vegetation. Techniques for controlling invasive flora. Repopulation of waterside species. Repopulation techniques: spacing, bare root planting or with the root ball method and so on. Paths and anglers' pathways. The waterside's infrastructure and facilities: walkways, huts, etc. Signposting. Soldering and riveting techniques. Equipment, means, machinery and tools used for conservation and improvement of the waterside and its facilities. Personal protection equipment (PPE).
C4: Carry out monitoring of rivers and lakes, provide its users with advice and ensure an orderly use of its resources.	**AC4.1** Enumerate and distinguish between the different types of fishing, applicable procedures, parts of personal fishing equipment and sport fishing. **AC4.2** Distinguish between the different types of bait used for angling. **AC4.3** Differentiate and describe the potential quality of fishing spots in a river or body of water in line with directly observable physical qualities such as rapidity and depth of water, presence or absence of fishing huts and presence or absence of vegetation or suchlike. **AC4.4** Enumerate the different risk situations (variations in flow, storms, landslides and so on). **AC4.5** Enumerate the different individual safety measures to be taken while practising fishing for sport. **AC4.6** Explain the different reviewer guidelines and procedures for rivers, other bodies of water and their resources and facilities. **AC4.7** Describe the equipment, means, machinery and tools for river and lake environment monitoring. **AC4.8** Describe the regulations in force and the occupational risk prevention plan, adhere to criteria for quality and profitability as well as respecting the environment, the specific regulations regarding the activities to be carried out, while attempting to avoid causing stress or harm to animals during the monitoring of river and lake environments.	**4 Practice of inland fishing** Types of fishing. Sport fishing styles. Natural bait and artificial lures. Fishing equipment. Handling of inland aquatic species. Physiography of rivers applied to fishing. Safety measures in the natural environment. Personal protection equipment (PPE). **5 Basic regulations regarding restocking of fish populations and conservation and improvement of the inland aquatic habitat.** Water regulations and spill control. Regulations regarding inland fishing. Regulations for the protection of flora and fauna species and in the inland aquatic habitat. Occupational risk prevention regulations. Environmental regulations. Regulations on environmental impact. Quality regulations.

PERSONAL AND SOCIAL SKILLS LINKED TO PROFESSION
· Adapt to the company's work organisation and understand the hierarchical relations within it. · Interpret instructions properly and become responsible for carrying them out. · Communicate effectively with the right interlocutor at every moment. · Follow timetables and the rhythm of work, fulfilling daily performance objectives fixed by the company. · Display interest in the company's growth forecasts. · Become involved in the company's quality plan and in the improvement of occupational health and safety. · Display a respectful attitude to colleagues, procedures and the company's internal regulations.

8.3. Practice/exercise

Learning module	4	Learning unit to which it responds	LU1	Duration:	10
Exercise Nº	1				

DESCRIPTION:

- Identify the different species and gender, age bracket and/or egg stage of fish or crustaceans cultivated in a fish or crayfish farm.
- Put into practice the process of electric fishing and other methods while following established safety and operating protocols handling techniques or where necessary, resuscitation techniques.
- Select optimum specimens in both quality and quantity in fish farms.
- Sort and transport the selected animals.
- Select a place for their release and carry out the process while applying protocols of adaptation to the environment which guarantee the greatest success.
- Carry out the release process.
- File a report on the characteristics of caught individuals.
- Find outbreaks of mass fish deaths.
- Select, handle and maintain equipment, means, machinery and tools.
- Perform all operations in line with regulations in force and the occupational risk prevention plan, while following criteria for quality and profitability as well as respecting the environment and the specific regulations regarding the work to be undertaken.

MEANS FOR ITS REALIZATION:

- A fishery (a unique space not necessarily situated in the educational centre).
- Multipurpose classroom of at least 2 m² per student.
- Store with an area of at least 120 m² (a unique space not necessarily situated in the educational centre).

TRAINER'S GUIDELINES:

- With this exercise, students are expected to be able to recognize the different species of fish and crustaceans that are most common in the rivers and streams of their country, as well as the different phases of their life.
- The student should be able to recognize specimens in good condition, at the right age, capable of withstanding a restocking operation.
- The student must be able to prepare a restocking operation, in all its phases - aquaculture species collection, packaging, transportation, preparation of the ideal conditions of discharge and release.
- The learner should be able to capture, characterize and report individual specimens.
- The student must know the different protocols to be followed, considering the risk and the prevention in order to avoid environmental disasters.
- The learner should be able to identify outbreaks leading to the massive death of species.

Learning module	4	Learning unit to which it responds	LU2	Duration:	8
Exercise Nº	2				

DESCRIPTION:

- Carry out work on the localisation and conservation of spawning grounds as well as installation of equipment to prevent poaching.
- Perform waterflow cleaning operations and treatment of its vegetation.
- Do building work and the verification of functioning and upkeep of fish ladders, fishways and security systems previously studied.
- Mix concrete onsite to a particular mixing ratio.
- Develop work to assess flow rate, the localisation of effluent entry points and water flow extraction points.
- Select, handle and maintain equipment, means, machinery and tools.
- Perform the work in line with regulations in force and the occupational risk prevention plan, while following criteria for quality and profitability as well as respecting the environment and the specific regulations regarding the work to be undertaken.

MEANS FOR ITS REALIZATION:

- A fishery (a unique space not necessarily situated in the educational centre).
- Multipurpose classroom of at least 2 m² per student.
- Store with an area of at least 120 m² (a unique space not necessarily situated in the educational centre).

TRAINER'S GUIDELINES:

- The student must recognize the preferred spawning sites and be able to define a site protection plan against poaching.
- The learner must be able to define the sites where to collect water samples and to know the sampling procedures for the water analysis. Must know how to carry out a plan to clean the water flow and to treat existing vegetation.
- The student should know how to keep ladders and other fish passage systems, as well as safety systems. The student must be able to execute mixtures of concrete and handle equipment and material used in these constructions.
- The learner must know the dynamics of the water flow, identifying the access to the flow, locating the effluents and water extraction points.
- The student must recognize what equipment he needs and know how to handle and maintain them.
- The learner must know the different protocols to follow, considering the risk and the prevention in order to avoid environmental disasters.

Learning module	4	Learning unit to which it responds	LU3	Duration:	10
Exercise Nº	3				

DESCRIPTION:

- Carry out treatment on existing riparian vegetation
- Select and remove cuttings and stem cuttings from chosen specimens and carry out repopulation work with suitable riparian species and established techniques.
- Install a safety fence and other infrastructure which assist the safety and security of fish farming and crayfish farming.
- Facilitate a stretch of pathway with special emphasis on the upkeep of its infrastructure.
- Install compulsory signposting on a stretch of waterside.
- Mix concrete onsite to a particular mixing ratio.
- Select, handle and maintain the equipment, means, machinery and tools.
- Carry out work in accordance with regulations in force and the occupational risk prevention plan while following criteria for quality and profitability as well as respecting the environment and the specific regulations regarding the work to be undertaken.

MEANS FOR ITS REALIZATION:

- A fishery (a unique space not necessarily situated in the educational centre).
- Multipurpose classroom of at least 2 m² per student.
- Store with an area of at least 120 m² (a unique space not necessarily situated in the educational centre).

TRAINER'S GUIDELINES:

- The learner must know the riparian species of his country and its biology.
- The student must be able to produce cuttings and other techniques of reproductive material.
- The learner also must know how to carry out repopulations from cuttings and stem cuttings or other techniques.
- The student must be able to plan an area to produce fish or crustaceans, with appropriate access and appropriate signs.
- The learner must be able to install a fence or other system that isolates a fish or crustacean production zone. The student must be able to perform concrete mixtures and handle the equipment and material used in these constructions.
- The student must know the different protocols to follow, considering the risk and the prevention in order to avoid environmental disasters.

Learning module	**4**	**Learning unit to which it responds**	**LU4**	**Duration:**	**8**
Exercise Nº	**4**				

DESCRIPTION:

- Perform sampling and collection techniques.
- Conduct climate and water analyses. Prepare the equipment and containers to use in harvest Proceed to harvesting sample. Prepares the samples of water for handling and transport. Check and notes the parameters of control of quality.
- Carry out maintenance and calibration of portable meters and other equipment.
- Carry out analytical determinations both *in situ* and in the laboratory.
- Carry out the water balance of a region, identifying situations of deficit or surplus.
- Identify situations of water pollution, selecting the most appropriate indicators and naming their sources and effects.
- Select, handle and maintain the equipment, means, machinery and tools.
- Carry out work in accordance with regulations in force and the occupational risk prevention plan while following criteria for quality and profitability as well as respecting the environment and the specific regulations regarding the work to be undertaken.

MEANS FOR ITS REALIZATION:

- A fishery (a unique space not necessarily situated in the educational centre).
- Multipurpose classroom of at least 2 m² per student with laboratory conditions.
- Store with an area of at least 120 m² (a unique space not necessarily situated in the educational centre).

TRAINER'S GUIDELINES:

- The student should recognize the river basin as the unit of management of water resources.
- The trainee should recognize the importance of water analysis in any environmental study on water resources and identify the legislative framework applicable to water quality.
- The student should identify the main analytical methods of water quality and draw up sampling plans.
- The learner should relate the superficial and / or underground water availability with the biophysical variables and the occupation from soil.
- The trainee should interpret results and classify the quality of a water according to the legal regulations.

8.4. Best training + safety practices

Defining the best training system for this module is not easy since it has a strong underlying theoretical component. However, in the first phase it is important that the trainee know how to define the boundaries of a river basin and understand the relationships that may exist within it, such as soil, water supply, land use, biodiversity and riparian fauna.

Therefore at this stage the trainee must have knowledge that allows interpreting elements such as maps, aerial photographs, orthophotomaps or even performing GPS surveys. The best way to do this is to carry out practical work that requires the characterization of the river basins in all its components:

- network of water lines;

- characterization of the water table;

- soil characterization;

- characterization of local vegetation;

- characterization of local fauna;

- characterization of human activities around the respective basin.

The second phase will be more associated with knowledge of existing aquatic specimens and their life cycle. This is very important as local knowledge, which in a quick way helps to identify the most recurrent species. The trainee then has to apply the theoretical knowledge in identifying the most important sites along the river basin for each species, in each life cycle. Again, the best way to do this is through hands-on field work, identifying these sites throughout the year and confirming their existence and importance for each species. At this stage the trainee should also train restocking actions by introducing specimens produced in nurseries or collected in locations where populations are larger. It is therefore necessary to practice the collection of each specimen, the preparation of conditions of transport and unloading in the places previously marked.

The third stage of the training consists of characterizing the environment along the river basin, both with regard to the characteristics the existing riparian species and the fauna, as well as the factors resulting from the human behaviour of the existing structures around the hydrographic basin. Furthermore, it is of great importance that the student understands the different relationships throughout the year between all these elements so as to be able to realize the impact of certain activities on the balance of the existing ecosystem around the watershed. All this can only be achieved through a good characterization of it, which must be trained locally.

The last phase of the training program is related to monitoring the evolution of ecosystem behaviour. This means that the trainee must first be trained in laboratory techniques related to the collection, handling and transport of samples and then apply this knowledge in a practical way on the ground. Particular care should also be taken with learning in the preparation of follow-up reports, which ensure practical information that is easy to interpret and relevant to the different entities involved.

With regard to safety care, the risks depend heavily on the location of the workplace. Special care must be taken with the existing fauna, the equipment and clothing used to collect samples and the means of transport used.

From the point of view of environmental risks, all training should take into account the risks of contamination and prepare the trainee for its prevention.

8.5. Assessment

DEMONSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
To carry out restocking and maintenance work on fish and crayfish populations		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
To recognize the different species of fish and crustaceans, their habitats and their life cycle	- identify the different species of fish in the different stages of life in the region; - identify the different species of crustaceans in the different stages of life in the region; - recognize and characterize the habitats of each species of fish and crustacean in the region concerned;	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.

Capture and transport specimens of fish and crustaceans	- choosing and preparing the collection and transport equipment; - identify the specimens to be transported; - install transport conditions; - catch the species to be transported; - packing the species in the transport vehicle.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Release specimens collected at appropriate and previously identified locations	- identifying in the river basin the appropriate sites for the release of each species; - choose the time of release of each species; - choose the equipment necessary for their release; - releasing each species in an appropriate manner.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Monitoring the state and evolution of fish and crustacean populations	- definition of the monitoring plan; - choice of sampling method; - selection and preparation of sampling equipment; - definition of sampling sites; - collection and treatment of samples; - preparation of the monitoring report.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised. Presentation of monitoring report.
METHODS AND ASSESSMENT TOOLS		
Simulation of the situation in a river basin and aquaculture facility, in the presence of a professional to avoid the death of specimens. Control chart of tasks associated with indicators. Presentation of monitoring plan and control report on paper. Elaboration of a film of the whole process developed.		

DEMONSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
To carry out conservation and improvement work on the riverbed or watercourse		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
Identification and delimitation of the river basin.	- choosing and identifying different types of cartography; - choose the way and equipment to survey the area; - survey the area corresponding to the river basin.	Delimitation and / or creation of cartography. Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Characterize the watershed.	- classify the different watercourses that supply the river basin in terms of their importance; - measure the water flow and depth of the beds of the different water lines at different times; - operationally characterize the litter in the region.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Improve water retention along the river basin	- identify sensitive sites in the river basin; - identify complementary structures in water retention in the river basin; - improve and build complementary retention structures in the river basin with different materials previously chosen.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.

Carry out maintenance actions in the river basin.	- draw up a maintenance and conservation plan for the river basin; - choose the equipment to support maintenance; - carry out the tasks set out in the maintenance and conservation plan.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised. Presentation of maintenance plan.
METHODS AND ASSESSMENT TOOLS		
Simulation of the situation in a river basin. Control chart of tasks associated with indicators. Presentation of maintenance and conservation plan on paper. Elaboration of a film of the whole process developed.		

DEMONSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
To perform conservation and improvement work on the riverside and its facilities		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
Identification and delimitation of the riverside and characterization of the facilities.	- choosing and identifying different types of cartography; - choose the way and equipment to survey the area; - survey the area corresponding to the riverside.	Delimitation and / or creation of cartography. Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Characterize the riverside.	- classify the different areas around the river basin; - to characterize these areas as to their occupation and orographic characteristics; - characterize the state of maintenance of these areas; - identify the species of flora and fauna in these areas.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Carry out maintenance actions in the riverside and his facilities.	- draw up a maintenance and conservation plan for the riverside and his facilities; - choose the equipment to support maintenance; - carries out planting and maintenance of the existing flora; - carry out the tasks set out in the maintenance and conservation plan.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised. Presentation of maintenance plan.
METHODS AND ASSESSMENT TOOLS		
Simulation of the situation in a riverside and nursery facilities. Control chart of tasks associated with indicators. Presentation of maintenance and conservation plan on paper. Elaboration of a film of the whole process developed.		

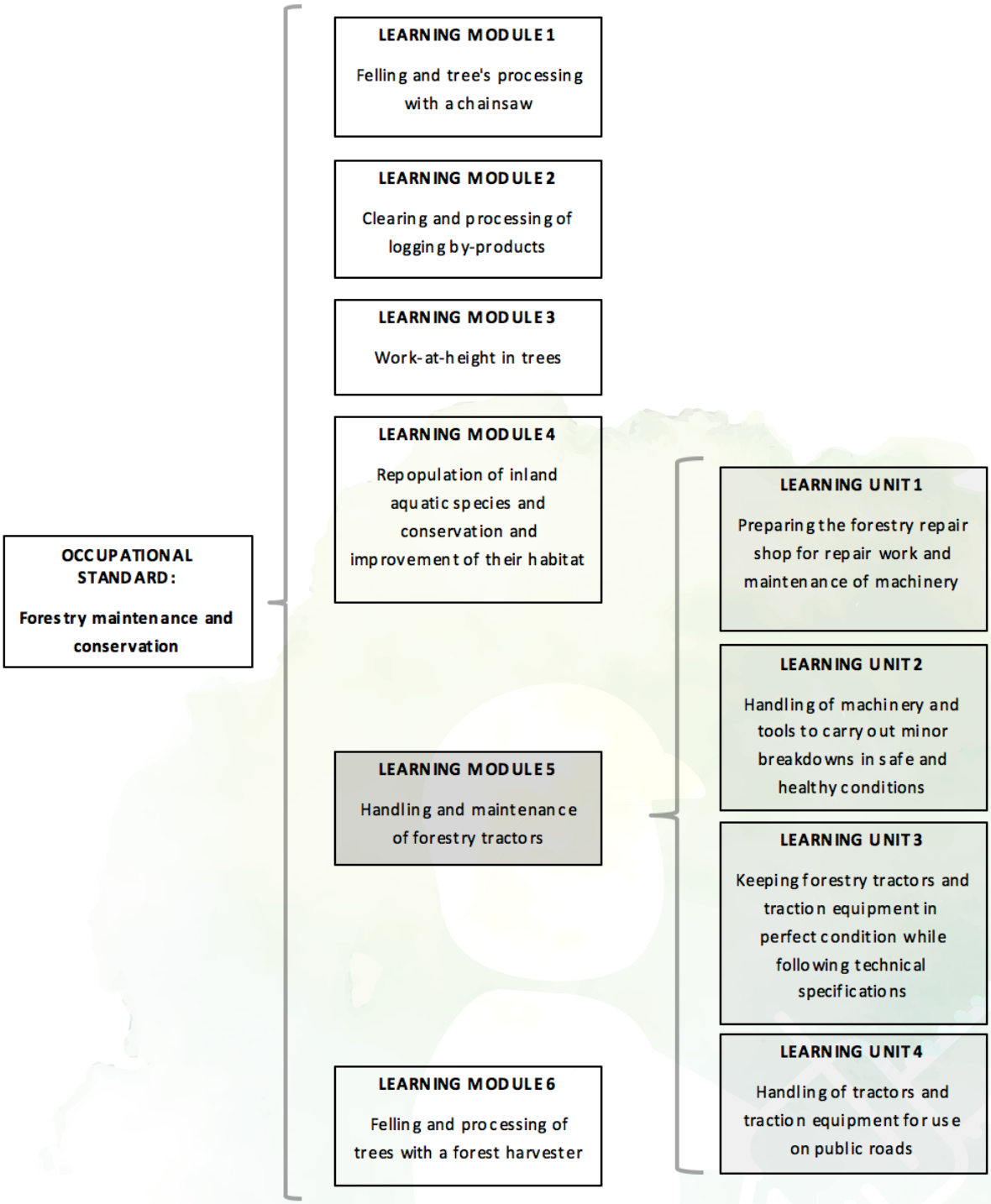
DEMONSTRATION SKILLS AND COMPETENCES		
CAPABILITY		
To undertake monitoring of the river and lake environment to foster its conservation		
ASSESSMENT CRITERIA	**ACHIEVEMENT INDICATORS**	**ASSESSMENT SYSTEM**
Characterization of the ecosystem around the river basin, the soil occupation and the human activities	- description of existing land occupation and human activities that influence the behaviour of the river basin; - identification, mapping and characterization of sensitive areas.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Perform sampling	- definition of the characteristics to be sampled; - choice of sampling method; - choice of work methodology and definition of the necessary equipment; - definition of sampling procedures, packaging and transport of samples; - collect the samples according to the defined procedures.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised.
Develop monitoring plan	- identification and geo-referencing of sensitive areas; - definition of monitoring schedule; - preparation of a monitoring and control report.	Practical evaluation - Real-work situation on a river basins Interview with the candidate questions on the work realised. Presentation of monitoring report.
METHODS AND ASSESSMENT TOOLS		
Simulation of the situation in a river basins. Control chart of tasks associated with indicators. Presentation of monitoring plan and report on paper. Elaboration of a film of the whole process developed.		

References

1. Guía para el aprendizaje y la evaluación. Certificado de profesionalidad: Gestión y mantenimiento de árboles y palmeras ornamentales. (2011).
2. Referencial de Formação **850357 Técnico/a de Gestão do Ambiente, Catálogo Nacional de Qualificações. ANQEP (2019).**
3. Cualificación profesional: Mantenimiento y mejora del hábitat cinegético-piscícola, available online at http://incual.mecd.es/documents/20195/94271/AGA458_2+-+Q_Documento+publicado/514bc1c3-293c-4f26-9fdb-a51cbfb49fc4
4. Habitat recovery and restoration in aquatic ecosystems: current progress and future challenges. Juergen Geist and Stephen J. Hawkins (2016).
5. Effects of Conservation Practices on Aquatic Habitats and Fauna. Scott S. Knight and Kathryn L. Boyer (2007).

9. Learning module 5

Naming: Handling and maintenance of forestry tractors
Level: 2
Code: MF1121_2
Related to the CU: UC1121_2 - To handle forest tractors and to do their maintenance
Duration (hours): 120



9.1. Organization and timing of the module

Learning module	Hours	Learning units	Hours	Classroom work	Practical workshops
Handling and maintenance of forestry tractors	120	Preparing the forestry repair shop for repair work and maintenance of machinery	8	2	6
		Handling of machinery and tools to carry out minor breakdowns in safe and healthy conditions	88	8	80
		Keeping forestry tractors and traction equipment in perfect condition while following technical specifications	16	4	12
		Handling of tractors and traction equipment for use on public roads	8	2	6

9.2. Specific objectives and evaluation criteria

SPECIFIC OBJECTIVES Achievement of the following capabilities:	EVALUATION CRITERIA		CONTENTS
	KNOWLEDGE	SKILLS	**1 The forestry repair shop** Spaces and necessary furnishing. Organisation. Tools. Measuring devices and equipment. Vice. Greasing equipment. Riveter. Emery cloth. Drill. Grinder. Saws. Sander. Part cleaning machinery. Soldering machines and equipment. Pneumatic air compressor and equipment. Preparation of equipment maintenance. Spare and replacement parts. Waste and scrap disposal. Signage. Individual equipment. Procedure in the event of fire. Health and safety measures. Environmental and specific regulations.
C1: Describe the parts of the repair shop, and in a practical case study, put it in good working condition	**AC1.1** Describe the most typically used machinery and tools in forestry repair shops. **AC1.2** Relate tools and machinery to the operations in which they are used. **AC1.3** Explain the features of the different types of materials used.		
C2: Explain the handling of machinery and tools in the workshop and in a practical case study, handling them with the required skill to repair minor breakdowns or faults, while following measures regarding health and safety.	KNOWLEDGE	SKILLS	
	AC2.1 Describe the personal protective equipment necessary to work with the different machinery and equipment. **AC2.2** Identify the safety features of each machine in the repair shop. **AC2.3** Explain how each machine works and describe work quality criteria.		
C3: Explain how engines work and in a practical case study, disassemble and assemble them.	KNOWLEDGE	SKILLS	**2 Engines** Features and operation. Parts. Adjustment. Power system. Cooling system. Greasing system. Ignition system. Air filters. Consumption. Power.
	AC3.1 Explain the workings of the different types of engines used in forestry tractors. **AC3.2** Describe engine parts. **AC3.3** Explain the features of different engines. **AC3.4** Explain the different engine settings and how they are done for good performance.		

<table>
<tr><td rowspan="2">C4: Describe the regular maintenance operations necessary for tractors and in a practical case study, perform them in line with the user manual's instructions.</td><td>KNOWLEDGE</td><td>SKILLS</td><td rowspan="4">3 Tractors
Types: features and applications. Components: chassis, transmission, hydraulic system, electrical system, steering, brakes, wheels, chains, control panel. Most common breakdowns. Regular maintenance. Service life. Hourly labour costs. Handling: attachment of equipment or machinery, control and handling devices, safety elements, risk situations, basic sanitary techniques.</td></tr>
<tr><td colspan="2">AC4.1 Explain the different components and working of the power system.
AC4.2 Explain the different parts and working of the cooling system.
AC4.3 Point out the tractor's greasing points and how to carry out greasing.
AC4.4 Explain the working and the components of the tractor's electrical system.
AC4.5 Describe the air filter systems.
AC4.6 Describe the tractor's transmission system.
AC4.7 Explain how the hydraulic system works.
AC4.8 Describe the different features of wheeled tractors and crawler tractors.</td></tr>
<tr><td rowspan="2">C5: Explain the control features and tractor handling techniques and in a practical case study, handle them.</td><td>KNOWLEDGE</td><td>SKILLS</td></tr>
<tr><td colspan="2">AC5.1 Describe a tractor's control features and indicators.
AC5.2 Explain the various adjustment procedures.
AC5.3 Explain tractor handling techniques.
AC5.4 Explain the specific highway code for driving forestry tractors.
AC5.5 Describe the different attachment methods for implements and/or machinery.
AC5.6 Explain different first aid techniques to be applied in the event of an accident.</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td colspan="4">PERSONAL AND SOCIAL SKILLS LINKED TO PROFESSION</td></tr>
<tr><td colspan="4">· Adapt to the company's work organisation and understand the hierarchical relations within it.
· Interpret instructions properly and become responsible for carrying them out.
· Communicate effectively with the right interlocutor at every moment.
· Follow timetables and the rhythm of work, fulfilling daily performance objectives fixed by the company.
· Display interest in the company's growth forecasts.
· Become involved in the company's quality plan and in the improvement of occupational health and safety.
· Display a respectful attitude to colleagues, procedures and the company's internal regulations.</td></tr>
</table>

9.3. Practice/exercise

Learning module	5	Learning unit to which it responds	LU1	Duration:	6
Exercise Nº	1				

Preparing the forestry repair shop for repair work and maintenance of machinery

DESCRIPTION:

- Check that repair shop is tidy and if not, put it in order.
- Check that tools and machinery are in good working condition and if not, carry out the necessary maintenance work.
- Detect the need for spare parts.
- Carry out the aforementioned work while taking measures regarding occupational risk prevention, while minimising environmental impact and complying with regulations in force.

MEANS FOR ITS REALIZATION:

- A 90 m² forestry repair shop.
- Multipurpose classroom of at least 2 m² per student.
- Premises: Minimum area of 1,000 ares (wooded ground). (A unique space not necessarily situated in the educational centre.)
- Store with an area of at least 120 m². (A unique space not necessarily situated in the educational centre.)

TRAINER'S GUIDELINES:

- The learners should acquire knowledge and skills on appropriate organization of the repair shop and maintenance of tools.
- The practice should take place at the appropriate forestry repair shop.
- The trainer should firstly make sure that in the place where the practice is going to take place all the material and equipment specified above are available and are in perfect condition for use.

Learning module	5	Learning unit to which it responds	LU2	Duration:	80
Exercise Nº	2				

Handling of machinery and tools to carry out minor breakdowns in safe and healthy conditions

DESCRIPTION:

- Check that the personal equipment necessary to work with the machinery to be used is in a good state and should it not be, discard it.
- Check that the safety features of the machinery are in a perfect state.
- Handle the machinery and tools with sufficient skill to produce quality work.
- Do the aforementioned work in line with occupational risk prevention measures while minimising environmental impact and following regulations in force.

MEANS FOR ITS REALIZATION:

- A 90 m² forestry repair shop.
- Multipurpose classroom of at least 2 m² per student.
- Premises: Minimum area of 1,000 ares (wooded ground). (A unique space not necessarily situated in the educational centre.)
- Store with an area of at least 120 m². (A unique space not necessarily situated in the educational centre.)

TRAINER'S GUIDELINES:

- The learners are expected to increase their knowledge and experience with handling the machinery and its maintenance and to perform quality work.

Learning module	5	Learning unit to which it responds	LU3	Duration:	12
Exercise Nº	3				

Keeping forestry tractors and traction equipment in perfect condition while following technical specifications

DESCRIPTION:

Explain how engines work and in a practical case study, disassemble and assemble them:

- Determine its features.
- Identify its parts.
- Disassemble it with suitable tools and place the parts in an orderly manner.
- Clean the parts which need cleaning.
- Assemble the engine in the right order and with the required screw tightness.
- Make the necessary checks and adjustments in line with the manufacturer's guidelines.
- Do the aforementioned work in line with occupational risk prevention measures while minimising environmental impact and following regulations in force.

In a perfectly described practical case study about a forestry tractor which requires regular maintenance:

- Understand the tractor's maintenance manual.
- Situate the tractor where it is going to operate.
- Select the necessary tools and/or machinery.
- Remove worn elements or parts.
- Solve the problem and replace the elements or parts with new ones.
- Reassemble the parts or assemble their replacements.
- When it is necessary to top up liquids, do it to the recommended levels.
- Check that everything is working properly.
- Deal with the resulting waste and by-products in accordance with regulations.
- Do a maintenance report, detailing the work carried out and record any incidences observed.
- Do the aforementioned work in line with occupational risk prevention measures while minimising environmental impact and following regulations in force.

MEANS FOR ITS REALIZATION:

- A 90 m² forestry repair shop.
- Multipurpose classroom of at least 2 m² per student.
- Premises: Minimum area of 1,000 ares (wooded ground). (A unique space not necessarily situated in the educational centre.)
- Store with an area of at least 120 m². (A unique space not necessarily situated in the educational centre.)

TRAINER'S GUIDELINES:

- Within this exercise the learners should acquire knowledge and skills on disassembling and assembling the engine.
- Learners are expected to learn how to replace worn elements, top up liquids and deal with resulting waste.

Learning module	**5**	**Learning unit to which it responds**	**LU4**	**Duration:**	**6**
Exercise N°	**4**				

Handling of tractors and traction equipment for use on public roads

DESCRIPTION:

- Check that the tractor is in a good working condition.
- Attach an implement or machine which is suitable for the work to be carried out.
- Prepare the equipment to be driven on a public road in line with the highway code.
- Check the controls and make the necessary adjustments to perform the work at hand.
- Manoeuvre with the skill necessary to obtain a high quality outcome.
- Do the aforementioned work in line with occupational risk prevention measures while minimising environmental impact and following regulations in force.

MEANS FOR ITS REALIZATION:

- Multipurpose classroom of at least 2 m² per student.
- An appropriate forestry repair shop/ workshop.
- Premises: An appropriate forest area with cutted logs in and skid trails. (A unique space not necessarily situated in the educational centre.)
- Store with an area of at least 120 m². (A unique space not necessarily situated in the educational centre.)

TRAINER'S GUIDELINES:

- The learners should develop the basic tractor operator skills.
- The learners should visit one or more active timber harvesting sites to see how to predict direction of movement of the load, to learn how to know and perform how to tie the load different ways, to learn recognizing all the dangers caused by extracting logs and to pick a safe spot to stand at while extraction and to respect the characteristics of forestry tractors, their equipment and extraction routes.
- The importance of putting the working area back to normal conditions by removing the leftovers from the forest roads, extraction routes, milestones, waterholes and farming grounds, removing any artificial leftovers and garbage, putting the drainage back into good condition and recording trees that were badly harmed while extraction should also be presented to the learners.
- Within this exercise the learners should also be introduced to pros and cons of different ground and soil types and other conditions affecting the extraction with forestry tractor.

9.4. Best training + safety practices

Acquiring the license for forestry tractor operator in Slovenia

National vocational qualification (NVQ) is officially recognized competence to pursue a particular profession. A candidate which successfully passes all the tests is given a valid public certificate "National vocational qualification". The legal basis for the implementation of the National vocational qualification is the Act about National vocational qualifications, valid since 30th September 2000.

To obtain a specific certificate, a candidate has to show good knowledge, all written in a catalogue of skills and knowledge. Candidate has an opportunity to attend an extra course, in a range from 32 to 120 hours.

Verification is done by qualified institutions which meet all the material and personnel conditions for confirming particular professional qualifications:

Material conditions:

- PPE – personal protective equipment,
- suitable forestry tractor with additional equipment and tools,
- modern professional chainsaw,
- forestry worksite for training and testing skills.

Personnel conditions:

Testing and confirming of the certificate for National vocational qualification is done by four members of commission, randomly selected for each exam. President and three members are required to have a valid licence by National Examinations Centre that needs to be renewed every four years.

Way of testing professional knowledge and skills: theoretical and practical tests.

Measures of assessment:

Zone of assessment	Measures of assessment	Percentage %
1. Planning	Preparing the way of service	15
	Choosing the appropriate equipment	
2. Performance	Preparation for work (suitable personal protective equipment, preparation of place, machines, equipment and tools)	55
	Rationality and correct use of tools and equipment, compliance of correct steps of working process	
	Compliance of safety and health regulations, environmental and forestry regulations	
	Quality of performance (precision while working, quality of service)	
3. Theoretical part	Presentation of the performance	30
	Theoretical test of knowledge	
SUMMARY		100

To participate at a National vocational qualification certificate testing, a candidate has to **submit the application** to a qualified institution.

Candidate must meet few conditions that may accede to the exam **for NVQ license - Forestry tractor operator:**

- Minimum age: 18 years.
- Medical certificate for ability to work as a forestry tractor operator.
- Accomplished primary education.
- Driving license – category F (tractor and tractor's attachments).

Content of application

- Application form for the forestry tractor operator NVQ certificate.
- CV.

Skills that have to be shown by a candidate:

- to plan, prepare, perform and control his own work
- rational use of energy, material and time
- health and environmental care
- communication with representatives of professional services and clients
- to prepare terrain for timber extraction and to carry out ride with a non-loaded tractor
- to perform extraction using a forestry winch
- to perform haulage of the logs
- to manage working process at a storage place
- to tidy up the working site
- to work in special situations
- to work in an emergency situation

Validation of NVQ certificate: Permanent

9.5. Assessment

Candidate name:				
Assessment Tasks & Criteria		Feedback comments made to candidate as appropriate & Result (Green or Red)	G	R
HANDLING AND MAINTENANCE OF FORESTRY TRACTORS Max. Time allowed - 60min				
EWOC	**Use of gloves, helmet, shoes, clothes**		G	R
1:01	**Helmet**			
1:02	**Safety boots**			
EWOC	**Preparation of the equipment and candidate's preparation**		G	R
2:01	To perform a daily inspection of the forestry tractor (to describe and to show)			
2:02	To insert chains into sliders (incorrect side or length between slider and hook of the chain – less than 1 meter – is a minor mistake)			
2:03	To show the first and the last slider			
2:04	To tie one log			
2:05	To tie logs in a shape of number 8			
2:06	To tie a chain (correctly inverted hook) to the tree, when felling a tree using a forestry winch (when tractor is standing downside/upside to a tree)			
2:07	To describe an anchor belt (load capacity and different ways of usage)			
2:08	To pull the steel rope out of the winch (carrying the chains)			
2:09	To show options of increasing power of the winch using the pulley (pulley attached to a log)			
2:10	To explain chain features (thickness, length, shape) To explain steel rope features (thickness, knitting, properties)			

EWOC	Basic working rules and driving unloaded tractor	G	R
3:01	Driving unloaded tractor into the forest, Mark: too fast too slow		
3:02	Use of differential lock		
3:03	Turning the tractor in the forest		
3:04	Stopping and anchoring the tractor		
3:05	Basic tractor's stand when pulling out the steel rope – depending on the load's position		
EWOC	**Procedures and elements of work**	G	R
4:01	Pulling the steel rope out of the winch – ergonomics		
4:02	Correct order of the sliders (first to the last)		
4:03	Tying the load		
4:04	Tying logs in a number 8 shape		
4:05	Checks surroundings before starting extraction		
4:06	Candidate's stand while extracting		
4:07	Synchronous use of the remote control (clutch, brake, gas)		
4:08	Solving the jammed load		
4:09	Using the pulley as a directional wheel		
4:10	Using the pulley to increase pulling power of the winch		
4:11	Standing in a dangerous triangle while using the pulley		
4:12	Using both drums of the winch		
ECS2-5	**Driving loaded tractor**	G	R
5:01	Load – distance between load and a backside board		
5:02	Using the brakes for steering the tractor		
5:03	Too heavy load and re-extracting the logs		
5:04	Too heavy load and re-extracting the load		
5:05	Candidate makes a 20 cm deep wheeled pit due to a too heavy load		
EWOC	**Sorting and managing logs at storage place**	G	R
06:01:00	Tractor is at least 2 meters away from the load when untying the load		
06:02:00	Untying the load		
06:03:00	Candidate's stand while extracting – sorting logs		
06:04:00	Sorting load in accordance to work order		
06:05:00	Repairs the damaged road surface		
06:06:00	Parking and stopping the tractor		

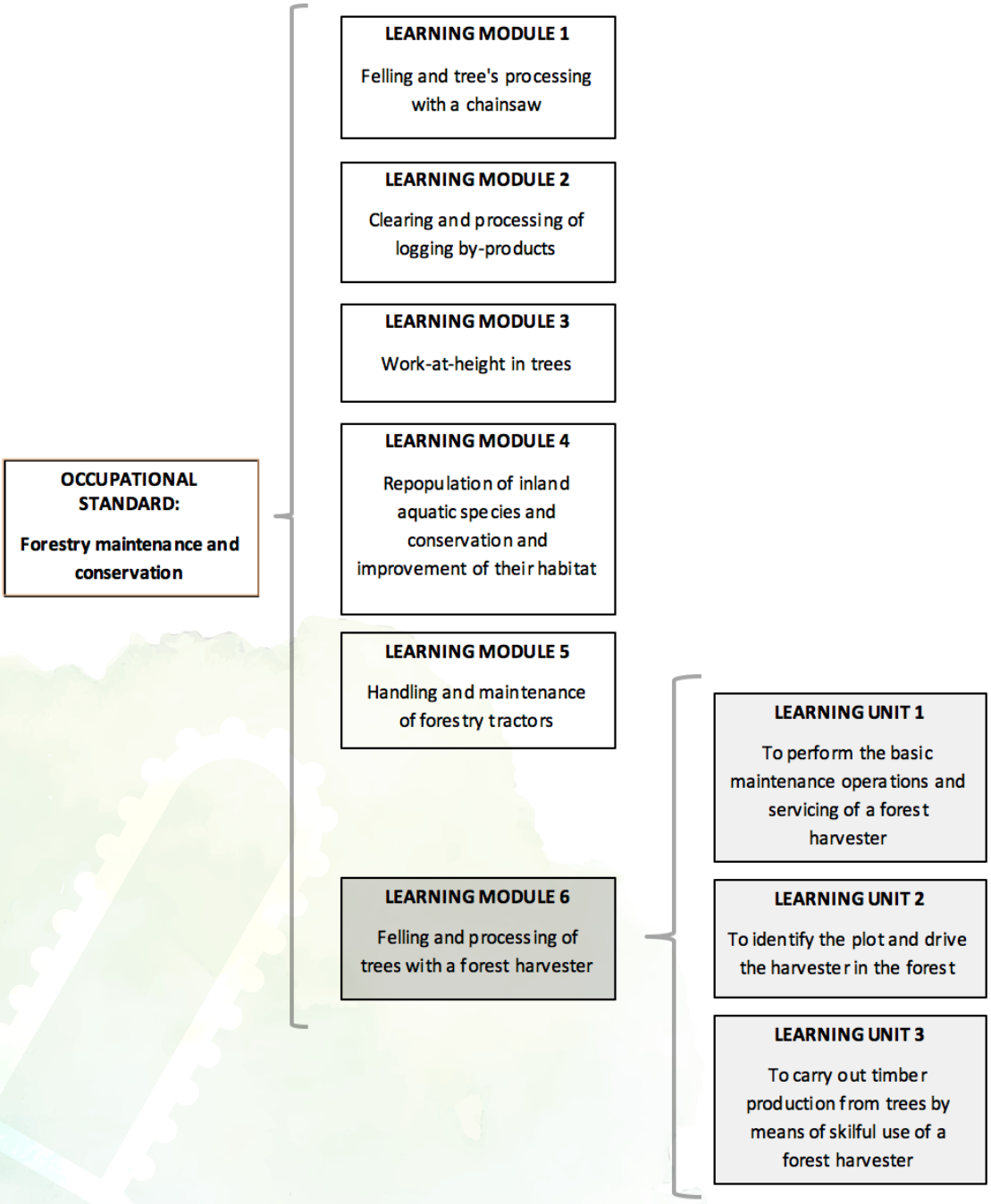
DATE & LOCATION:		
ASSESSMENT Time Start:	Time stop:	DURATION (min):
CANDIDATE (PRINT NAME, ID NUMBER & SIGN):		
OVERALL RESULT: COMPETENT	Not yet COMPETENT	**nr.of WARNINGS :**
Candidate comment on feedback and result:		
ASSESSOR (PRINT NAME, ID NUMBER & SIGN):		

References

1. Furlan, F., Košir, B.: Varno delo pri spravilu s traktorji, Safe work with forest tractor/skidder, ZGDS, Ljubljana, 1998, http://www.zgs.si/fileadmin/zgs/main/img/PDF/zgibanke/Knjige/VarnoDeloTraktorji.pdf
2. Ščuka, T.: Taktor v gozdu (za spravilo lesa) / Forest tractor Ministrstvo za šolstvo in šport Republike Slovenije, Ljubljana, 2012, http://www.mizs.gov.si/fileadmin/mizs.gov.si/pageuploads/podrocje/Strukturni_skladi/Gradiva/BIOTEHNOLOGIJA_GOZDRASTVO/BT_PODROCJA_131GOZDARSTVO_SCUKA.pdf
3. Primeri vprašanj za zagovor nalog pri NPK TRAKTORIST, Ljubljana 2015, Example of questions of exmas for national vocational qualifications, forestry tractor http://www.ric.si/kvalifikacije/certifikat/primeri_vprasanj/
4. Katalog strokovnih znanj in spretnosti, gozdarski traktorist / Catalog of professional skills and knowledge, forestry tractor, http://www.nrpslo.org/baze-podatkov/katalogi-znanj.aspx
5. Državni izpitni center -RIC. General information about NPK-National vocational qualitications. https://www.ric.si/national_vocational_qualifications/general_information/
6. Guía para el aprendizaje y la evaluación. Certificado de profesionalidad: Gestión y mantenimiento de árboles y palmeras ornamentales. (2011).
7. Cualificación profesional: Aprovechamientos forestales, available online at http://incual.mecd.es/documents/20195/94271/AGA343_2_RV+-+Q_Documento+publicado/19898a4e-b489-4ee5-8f68-49880319455c
8. Safety and health in forestry work, an ILO code of practice https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---safework/documents/normativeinstrument/wcms_107793.pdf

10. Learning module 6

Name: Felling and processing of trees with a forest harvester
Level: 4
Code: MF1117_2
Related to the CU: UC1117_2 - To carry out tree felling and processing with a forest harvester
Duration (hours): 120



10.1. Organization and timing of the module

Learning module	Hours	Learning units	Hours	Classroom work	Practical workshops
Felling and processing of trees with a forest harvester	120	To perform the basic maintenance operations and servicing of a forest harvester	30	10	20
		To identify the plot and drive the harvester in the forest	30	10	20
		To carry out timber production from trees by means of skilful use of a forest harvester	60	20	40

10.2. Specific objectives and evaluation criteria

SPECIFIC OBJECTIVES Achievement of the following capabilities:	EVALUATION CRITERIA		CONTENTS
	KNOWLEDGE	SKILLS	
C1: To describe the features of a forest harvester and the equipment necessary to work and maintain it.	**AC1.1** Describe the features of different types and models of forest harvesters available on the market. **AC1.2** Identify the safety features and components of a forest harvester. **AC1.3** Analyse the main components and operation of a forest harvester. **AC1.4** Explain the regular maintenance tasks performed on the machine. **AC1.5** Explain how to tune and programme the machine and its different mechanical and computer-based systems.		**1 Forest harvesters** Types of harvesters and processors, main technical and operative techniques (basic criteria for the selection of a machine). Safety features. **2 Maintenance** Elements to be serviced and service intervals. Frequent breakdowns and their causes. The necessary tools, equipment and replacement parts. Servicing. Incident reports.
	KNOWLEDGE	SKILLS	
C2: To identify the plot and operate the machine in the forest in order to carry out safe and environmentally friendly work.	**AC2.1** Determine the risks involved and the preventative measures to be taken. **AC2.2** Explain the factors which may limit the machine's mobility and stability. **AC2.3** Explain how work will be organised within the plot: starting and finishing points and the machine's movements. **AC2.4** Explain how the machine should move around the plot: parking in accordance with its physical features and the work to be performed.		**3 Driving and operation of the machine** Identification of the plot. Identification of the limiting factors for driving and parking the machine safely. Driving techniques in a forest. Criteria for work organisation. Risk assessment and preventative measures to be taken.

	KNOWLEDGE	SKILLS	
C3: To describe the different cutting and processing techniques with a forest harvester in order to obtain a good yield and to facilitate logging production.	**AC3.1** Describe the risks and preventative measures to be taken. **AC3.2** Describe how to proceed when performing directional felling. **AC3.3** Explain how to cut and process trees which are split, have been toppled by the wind or tangled up with others. **AC3.4** Explain how to cut and process forked or bent trees. **AC3.5** Explain how trees are delimbed and how branches and logs are cut then piled up or stacked.		**4 Harvesting** Risk assessment and preventative measures to be taken; procedure in the event of computer system failure. Directional tree felling techniques. Specific techniques for harvesting trees which are split, tangled or have been toppled by the wind. Specific techniques for harvesting forked or bent trees. Points to be considered about stacking logs and felling residue. **5 Working with a harvester** Safety types, components, devices and elements. Basic precautions while working. Special risk situations. Ergonomics and hygiene. Prior considerations before felling: signposting, warnings, observation of obstacles, inspection of the tree to be felled and weather conditions. Programming, regulation and handling of the machine. Yield quantification. Risk assessment and preventative measures to be taken (safety, health and ergonomics). **6 Basic regulations regarding the felling and processing of trees.** Forestry legislation. Environmental regulations.

PERSONAL AND SOCIAL SKILLS LINKED TO PROFESSION

- Adapt to the company's work organisation and understand the hierarchical relations within it.
- Interpret instructions properly and become responsible for carrying them out.
- Communicate effectively with the right interlocutor at every moment.
- Follow timetables and the rhythm of work, fulfilling daily performance objectives fixed by the company.
- Display interest in the company's growth forecasts.
- Become involved in the company's quality plan and in the improvement of occupational health and safety.
- Display a respectful attitude to colleagues, procedures and the company's internal regulations.

10.3. Practice/exercise

With increasing safety, environmental and efficiency demands on timber harvesting operations, forest machine operators require a comprehensive range of skills and knowledge to work safely, productively and in an environmentally sensitive manner within the forest harvesting sector. Learners will be provided with practical knowledge and training that will readily transfer to the real working environment. The training programme is heavily focused on practical, on the job training.

Learning module	6	Learning unit to which it responds	LU1	Duration:	30
Exercise Nº	1				

DESCRIPTION:

- Check all its safety elements.
- Check all the machines working parts
- Carry out regular maintenance tasks and the repair of minor breakdowns.
- Fill out the corresponding incident reports.
- Service and programme the machine in line with the company's requirements and the intended outcomes.
- Perform the aforementioned work while taking the necessary occupational risk prevention measures, minimising environmental impact in line with regulations in force.

MEANS FOR ITS REALIZATION:

- A 90 m² agricultural workshop.
- Multipurpose classroom of at least 2 m² per student. Premises: Minimum area of 10 hectares (wooded ground). (A unique space not necessarily situated in the educational centre).

TRAINER'S GUIDELINES:

Within this exercise learner should acquire theoretical knowledge and practical skills, related to the management of health & safety on timber harvesting sites. They should visit one or more active timber harvesting sites to learn more about how to manage health and safety correctly. Under the supervision of trainer, learners will prepare a Hazard Identification & Risk Assessment, specific to the visited harvesting site(s). Furthermore, learners should understand forest machine ergonomics and the importance of minimising operators' occupational stresses. They should also be able to check compliance with prescribed harvesting site health & safety requirements (signage, etc.).

Learners should acquire basic knowledge of machinery components in the context of modern harvesters, with particular emphasis on harvester heads, their control and measurement systems and their calibration requirements. This should be fulfilled by observing and carrying out routine machine maintenance and basic repairs to harvesters at the workshop. By assigning various maintenance tasks and demonstrating how they should be carried out, the learners should increase their understanding of machine safety and safety guidelines related to working on forestry machines; understand the cost of harvesters and the cost of harvester spare parts; observe and assist with a typical pre-delivery harvester service inspection carried out at a forest harvesting machinery workshop; observe and assist with some routine harvester head system maintenance, calibration and basic repairs; understand a typical harvester service schedule (e.g. 10 hour, 50 hour, 250 hour, 1000 hour, 2000 hour).

Learning module	**6**	**Learning unit to which it responds**	**LU2**	**Duration:**	**30**
Exercise Nº	**2**				

DESCRIPTION:

- Identify operational risks and the preventative measures to be taken.
- Identify the plot and determine the limits to work areas.
- Drive the machine around the plot, manoeuvring it on different types of slopes.
- Park the machine where it can access the largest amount of trees possible.
- Perform the aforementioned work while taking the necessary occupational risk prevention measures, minimising environmental impact in line with regulations in force.

MEANS FOR ITS REALIZATION:

- A 90 m² agricultural workshop.
- Multipurpose classroom of at least 2 m² per student. Premises: Minimum area of 10 hectares (wooded ground). (A unique space not necessarily situated in the educational centre.)

TRAINER'S GUIDELINES:

The learners should acquire the basic principles of forest management, tree species knowledge (timber properties and principle uses) and forest yield theory in order to appreciate the impact of the harvesting operations on the environment. They should be made familiar with the forest protection issues and relevant legislation related to timber harvesting operations, as well as with the main principles of sustainable forest management and forest certification.

The learners should visit an active harvesting site and acquire theoretical knowledge and strong practical skills on how forest harvesting operations are planned and managed and how day-to-day log production is monitored. With the help of the trainer learners should develop a Harvest Site Plan and discuss the various components of the plan, including health & safety, environmental and operational planning elements. They should also get some experience reading maps and mapping various harvest site plan features.

The learners should also acquire basic driving techniques on different terrains (up and down steep slopes, forest roads, ground with low carrying capacity, harvesting near overhead power or telephone lines, etc.).

Learning module	6	Learning unit to which it responds	LU3	Duration:	60
Exercise Nº	3				

DESCRIPTION:

- Assess possible occupational risks and take the necessary preventative measures.
- Programme the machine in order to obtain the desired outcomes.
- Harvest timber from trees, while obtaining the expected outcomes.
- Harvest timber from trees which are split, tangled up with others or have been toppled by the wind.
- Harvest timber from forked or bent trees.
- Stack logs and pile up branches.
- Obtain results from the measurements taken of work carried out.
- In the event of computer system failure, take the necessary preventative measures to guarantee safety.
- Do calculations in order to evaluate the work financially.
- Carry out the aforementioned work while taking occupational risk prevention measures, minimising environmental impact and following the regulations in force.

MEANS FOR ITS REALIZATION:

- A 90 m² agricultural workshop.
- Multipurpose classroom of at least 2 m² per student. Premises: Minimum area of 10 hectares (wooded ground). (A unique space not necessarily situated in the educational centre.)

TRAINER'S GUIDELINES:

Learners are expected to increase their knowledge and experience related to log harvesting specifications and log quality issues. They should visit one or more active timber harvesting sites to implement log product quality control and assessment procedures and carry out some roadside stock assessments. They should observe a range of log products being harvested on an active timber harvesting site as well as live production information reports on a harvesting machine.

Learners should acquire the necessary knowledge and practical skills for timber harvesting operations (both simulator and on-site training) - preparing a harvester for work, including working with harvester head computer controls to configure the machine for site specific felling operations; how to operate a harvester and fell trees in accordance with the predetermined log specifications and harvest plan; how to calibrate harvester head measurement systems and carry out periodic log quality field checks. Learners should develop the basic harvester operator skills including safe and efficient crane movement, harvester head control, felling small trees, felling big trees, clearfelling and thinning operations, techniques for avoiding cutting cracks, stacking and sorting timber, etc.

Learners should also acquire the basic principles of forest thinning operations as well as develop practical thinning skills in the forest by implementing thinning control operations at a prescribed intensity.

10.4. Best training + safety practices

Forestry is a high hazard industry that may incur significant risk. Management issues involved in various forest operations, getting timber to roadside and transporting it to the end-users, are complex. Timber growers; purchasers; contractors; sub-contractors and employees all have an integral part to play in making sure health and safety is not compromised.

Many of the risks associated with working in the forest environment may be controlled by the use of timber harvesters. However, as in manual tree felling, mechanized harvesting operations can be affected by many factors - weather and wind conditions; environmental factors; skills and experience of harvesting operators; equipment condition and capability, etc. Extraction and loading activities taking place nearby can sometimes add to the difficulty of planning and carrying out a safe harvesting operation.

In this respect, all aspects of the harvesting operation should be planned and organized very carefully. Planning and carrying out commercial forestry operations involves a number of health and safety tasks that have to be managed, such as: selecting suitable equipment; completing risk assessments; protecting

the health and safety of the public; establishing safe working procedures; ensuring operators are adequately trained; selecting skilled and experienced contractors who are competent; and supervising work.

Successful management of health and safety in forestry and associated haulage, requires co-ordination of activities, and communication of information between all related parties – landowner, forestry work manager, contractor and/or sub-contractors.

Workers and others in the area of harvesting operations must be kept free from risks to their health and safety and therefore, before harvesting starts, employers must apply appropriate risk assessment and management steps to all factors related to the harvesting activities.

The table below provides examples of the areas where hazards might be identified and of factors which need to be assessed as possibly contributing to the degree of risk and suggests ways to control these risks.

Areas for hazard identification	Factors to consider when assessing the occupational risks	Examples of risk preventive measures
Working environment and conditions	- Wind speed and direction; - Identification and assessment of dangerous trees (e.g. hung up branches, unreliable fall direction, etc.); - Methods of felling corresponding to harvesting site conditions; - Ability of harvester to operate safely on the terrain; - Slope and terrain variation for safe entry and exit of operator from the cabin; - Visibility and lighting.	- Safe work procedures covering conditions when it is safe or unsafe to continue; - Identify unsuitable trees for mechanical felling prior to operation and on ongoing basis, and determine course of action; - Appropriate training and supervision of harvester operators; - Operation according to instructions from manufacturer and supplier; - Appropriate training; - Visual check of ground before exiting the cabin; - Use of handrails/hand holds; - Use three points of contact; - Adequate lighting for all work locations at all hours of work.
Workers nearby the harvester	- Possibility of tree falling in work area of other harvesting team; - Work area close to access routes; - Coordination of activities with ground workers and with other machine operators	- Establishment of exclusion zones appropriate to tree density and terrain; - Safety instruction for site visitors; - Use of warning signs; - Systems and methods for oral, visual and/or radio communication; - High visibility clothing.
Communication with other workers	- Coordination of ground workers with machine operators; - Methods of communication between ground workers; - Workers in isolated areas.	- Effective use of equipment and methods of communication including radio, oral and visual; - Safe work procedures; - Appropriate training.
Work equipment	- Competence of operators; - Safety during operation, including safety devices, condition of equipment, etc. - Operational capability of the equipment; - Exposure to hazardous substances	- Appropriate training and supervision; - Fitted roll-over protective structures and falling-object protective structures, operator protective guards, seat restraints (e.g. seat belts, etc.); - Regular inspection and maintenance; - Suitable hand rails/hand holds; - Follow manufacturer/supplier information; appropriate training; - Follow recommended procedures in Material Safety Data Sheets.

Operator safety	The possible effects of the following hazards should be considered: - Slips, trips and falls; - Environmental hazards e.g. poor visibility and noise; - Unrestrained objects in cabin; - Operator fitness/fatigue.	- Suitable footwear; - Use of handrails/hand holds; - Use of seat belts/restraints; - 3 points of contact; - Wearing of personal protective equipment including hearing protection and high visibility clothing; - Ensuring all objects in the cabin are securely stored or fastened; - Rotation of tasks; - Rest breaks; - Physical exercise e.g. stretching and/or warm ups.
Emergency procedures and evacuation	Consideration of factors such as: - Methods of communication; - Access to and from the harvesting site; - Timeframes for medical assistance.	- Safe work procedures; - Appropriate training including first aid - training - Consultation with providers of emergency assistance, including designation of emergency meeting point.

Basic principles of harvester heads

Harvester heads are designed to fell, delimb, measure, cross-cut and stack logs during a mechanical harvesting operation. They are highly specialized tools which require careful maintenance. A typical harvester head consists of the following elements: a hydraulically powered chain saw to cut the tree at its base and to cross-cut it into log lengths; two or more curved delimbing knives which reach around the trunk to remove branches; two or four feed rollers to grasp the tree. The wheels pivot apart to allow the tree to be embraced by the harvester head, and pivot together to grab the tree tightly. The wheels are hydraulically driven to force the cut tree stem through the delimbing knives; dimeter sensors and length measuring wheel to measure the dimensions and calculate the volume of harvested logs as they are fed through the harvester head.

Harvester heads are designed for use within a recommended operational range. Some heads are suited to small diameter timber with light branching. They are smaller and less powerful but are more manoeuvrable and more agile and are more suited for use in thinning operations. Some heads are suited to larger diameter timber and timber with heavier branching. They are larger and more powerful but are less manoeuvrable and are more suited for use in clear fell operations.

It is important that harvesters and harvester heads are correctly matched to the harvest site-type and tree type. Incorrect matching can result in dangerous working conditions, increased machine wear, increased down-time and sub-optimal productivity.

Harvester maintenance and repair

Machinery breakdowns are expensive and greatly reduce the productivity and profitability of forest harvesting operations. Therefore, understanding how to safely carry out routine machine maintenance and basic repairs is an important part of being a competent and efficient forest machine operator. Following routine maintenance schedules in accordance with manufacturer's guidelines will help to avoid unnecessary machine breakdowns and prolong the useful life of the machines you will be operating.

A fundamental rule is that the operator should never perform any maintenance or repair works on the

machine when its motor is running. The following good practice and safety rules should also be observed:

- Ensure the head is maintained according to the manufacturer's handbook, which should be available;
- Keep a record of all maintenance and repair activities;
- Only trained and authorised personnel should carry out repair and maintenance procedures;
- Before maintenance or cleaning (e.g. removal of brash), park all operational parts of the machine so they are accessible and switch off the engine. Never work under any suspended, unpropped piece of equipment;
- Ensure all hydraulic pressure in the systems to be maintained or repaired is released before work starts;
- Where this it is not possible, ease residual pressure by careful slackening of joints;
- Do not use your hand to check for hydraulic fuel leaks - use a piece of paper or cardboard. Hydraulic fluid under pressure can penetrate the skin. If such contamination occurs seek medical attention at once;
- Stand at a safe distance from the head during evaluation of the fault;
- Isolate as many as possible of the other functions not under investigation;
- Avoid working on the head with the engine running. The only task that requires the engine to be running should be hydraulic pressure setting and testing – this requires specialist training and must be undertaken with great care;
- If carrying out hydraulic pressure testing, remove the saw bar and chain;
- Guard exposed cutting edges, i.e. the saw;
- During repair and/or fault diagnosis, use any restraints or scotches supplied with the machine according to the manufacturer's instructions;
- Remove and inspect the cutting equipment at least daily for excessive wear damage. Check particularly for cracked chain parts. Renew the chain as necessary;
- Ensure all parts of the cutting equipment are properly aligned;
- Maintain the saw chain, including depth regulators, to the manufacturer's recommendations;
- Ensure the chain lubrication is effective;
- When parking the harvesting head ensure it is in a stable position, the chainsaw is in a guarded position and the knives are closed.

Harvester control and information systems

Modern timber harvesting machines are equipped with a range of computer software systems to provide a number of important functions relating to machine control, harvesting operation data capture and machine diagnostics. Some of the most common features integrated into modern harvester computer systems are as follows:

- Machine control systems - controlling and monitoring machine settings including engine settings, hydraulic system settings and harvester head settings;

- Geographic information systems (GIS) and mapping systems - in-cab display of forest harvesting site maps and harvest site planning information (health & safety, environmental, production etc.). Real time GPS tracking of machinery during harvesting operations and linking of production data to harvest site location;

- Machine production and diagnostic systems - detailed monitoring of machine and operator performance (e.g. machine operating times, harvested log production, fuel consumption, machine down time, etc.;

- Online machine service & spare part support - remote machine service support provided by manufacturers. Machine diagnostics experts can access machine diagnostics data remotely and can advise on machine performance problems and assist with trouble shooting and servicing advice. This can minimize costly service call outs to harvest sites and can minimize breakdown times. Spare parts can also be ordered on-line from the machine cab;

- Harvesting operation planning and monitoring systems - the range of required log specifications are programmed into the machine control system and can inform an automated log cross-cutting process. Planned and actual log production can be monitored and reported;

- Harvesting fleet management systems - machine production and diagnostics data from a number of machines operating on different harvesting sites can be fed back to a central fleet management system which provides detailed live information on each machine's performance.

Emergency procedures

- Ensure a designated and responsible person knows the daily work programme and agree with them a suitable emergency contact procedure. Where reasonably practicable use a mobile phone or radio and a pre-arranged call-in system;

- Ensure the operators can provide the emergency services with enough detail for them to be found if there is an accident, e.g. the grid reference, the distance from the main road, the type of access (suitable for car/four-wheel drive/emergency service vehicles). In urban areas street names are essential;

- Know the location details before they are needed in an emergency.

Driving

- Plan the work so that brash and tops from processed trees assist travel over the harvesting site;

- Ensure the harvesting head and boom are parked in the correct transport position before driving off;

- When planning the work, avoid as far as possible, the need to drive the machine along a slope;

- Where side slopes are unavoidable, extend the harvester boom to the uphill side to maintain stability. Ensure the boom does not come into contact with any obstruction;

- In case of roll-over the operator must not try to jump out of the cab, but stay inside with the seat belt fastened;

- Avoid driving across felled trees and other timber;

- On and in the near vicinity of worksites, only cross under energized overhead power lines at the designated crossing point(s) that are clearly marked;

- Safe driving distances from energized overhead power lines should be clearly identified by barriers. In many cases, marked trees will form a suitable barrier, as long as there is no opening which would allow vehicular access. Consult the electricity company about the use and positioning of barriers and the relevant safety distance;

- Any machine driven across areas with poor or variable carrying capacity must be equipped with a roof hatch. This applies particularly for machines that are used in winter and/or driven unwooded land, e.g. swamps.

Forest management

Harvester operators play an important role in the management of forests, particularly when carrying out thinning operations which have a significant impact on the development of the forest. It is important that forest machine operators understand some of the basic principles of forest management in order to appreciate the impact of the harvesting operations that you will be carrying out. A good forest machine operator should understand some of the basic principles of forest management, such as:

- concepts of forest crop rotations and yields;

- knowledge about the most common forest crop parameters, used to assess the development stage of a forest crop, to assess whether a crop is ready for harvesting and to monitor the quality of harvesting operations. These parameters include stocking (number of trees), tree height, tree diameter (DBH), basal area per hectare and volume per hectare;

- identification of the main tree species managed in the respective commercial forests;

- knowledge of the legislation related to timber harvesting operations;

- principles of sustainable forest management and forest certification schemes (FSC, PEFC, etc).

Harvester production control, monitoring and reporting

The forest machine operator should understand and appreciate the benefits of the many technology features used to control, monitor and report on timber harvesting operations that are in-built in modern harvesters – how to use the harvester computer system for machine function set-up, diagnostics and troubleshooting (e.g. setting harvester head feed speeds, setting function speeds, controlling operator specific settings, etc.). In addition to this, harvester computer system is used to control and monitor all aspects of log production. A harvester is like a compact factory, with trees entering as the raw material and logs exiting as the finished product. Harvester computer system is the quality control and production monitoring department of your factory and it is important that you understand how this works and that you can get the most from the on-board technology.

Large amounts of useful information relating to machine productivity is being continually compiled and stored on the harvester computer system. This information includes detailed data on each tree that is felled and processed and on each log that is cross-cut.

Harvester production data is used for many purposes including:

- Monitoring harvest site production and comparing planned production output schedules with actual volumes forwarded;

- Managing supply to sawmills and panel board mills;

- Calculating what volume of timber is ready for forwarding;

- Providing information to forwarder operators as to the location of harvested material;

- Calculating harvesting contractor payments;
- Monitoring operational output of harvester operators for wage or contract payment purposes.

Felling and processing

- Any risk zone specified by the manufacturer must be clearly and prominently marked on the machine;
- Harvesting machines which apply stump treatment must have appropriate warning signs fixed to the storage tank;
- Adequate field lighting must be fitted if working in poor light;
- Do not operate a harvesting unit if wind conditions are such that control over felling direction could be lost;
- Operate the machine using the techniques and within the limits specified by the manufacturer's handbook, which should be available;
- Always choose the appropriate machinery for the respective harvesting operations – this will ensure the optimal work quality and cost-efficiency;
- Warning signs should always be placed along any road where timber harvesting is being carried out;
- Where appropriate, ensure the parking brake is on, and it is released before moving;
- Where possible when working on sloping ground, position the machine straight up and down the slope;
- Make sure the chain is sharp and the bar is in good condition (straight). Harvesting with a dull chain will cause cutting cracks and lower harvester performance. If you touch the ground surface with the chain it should immediately be changed;
- Ensure proper chain lubrication – it will prolong the life of both chain and bar;
- Sometimes the wind may blow in the same directions as the trails have been planned. In that case, choose the driving direction so that you have 'the wind at your back'. This will minimize the risk of accidentally felling a tree over the machine;
- When the stand contains both large and small trees, the small ones should be harvested first;
- If there are forked trees, you should always fell them first thus avoiding the risk of accidentally felling a tree into the fork where it will get stuck;
- When the harvesting site does not border a road, a main trail must be planned and cut out to the harvesting site. A man trail or secondary trails can be prepared or improved by making a brash mat;
- Do not operate the chainsaw towards the machine cab. Do not point the chainsaw towards any person within any distance necessary to maintain their safety;
- Under normal operating conditions, stop work as soon as any person or machine enters the risk zone specified for your machine, or comes closer than two tree lengths plus the length of any boom, whichever is the greater;
- Do not fell or process trees likely to overload the machine;

- Do not damage the environment outside the harvesting site! Always fell the trees in the outer margins of the harvesting site towards its centre;

- Leave processed timber in a safe and stable position (well-sorted, in sufficiently large, flattened stacks) with easy and safe access for the extraction machinery (forwarder). On soil with poor carrying capacity you have to make sure that the distance between wood rows is large enough to allow the forwarder operator to split the trails;

In order to optimize timber harvesting and forwarding in terms of productivity and quality, the pace of the harvester and forwarder work should match. The optimal gap between harvesting and forwarding the timber to a pile beside a road is approximately two days.

Timber harvesting on steep slopes

When harvesting on steep slopes, the obligatory risk assessment process should be similar to any conventional harvesting site, but the increase in slope will mean that there will be more effort needed while planning how the work will be carried out including: choosing which machine to use, who should operate the machines, and deciding how to supervise the work and take account of changing conditions.

To work safely on steep ground you will need to think about the entire harvesting operation and not just the harvester or forwarder alone. This will mean that everyone involved in the work will need to be in regular contact with each other. Managers, contractors and operators must meet before the work starts to discuss the limits of any machinery used during the operation. Specific plans should be made to regularly review how the work is being carried out throughout the operation. Reviews of how the work is being carried out should also be made as necessary whenever circumstances change on site. Record how you plan to do this in your risk assessment and site safety rules where the person, responsible for communications and provision of instructions on how the work should be carried out, is identified. They should also include details of any lone working arrangements and emergency procedures.

Slope alone is often not the controlling factor on any worksite – the soil condition, moisture content, depth and underlying material must be considered as well as the roughness of the terrain, including boulders and stump size.

When planning how the work should be carried out on a specific site, you should consider: the terrain classification, e.g. slope measurements, soil/ground condition, ground roughness, erodible soils, boulders, etc.; operational factors, e.g. size and type of tree, type of tree/ brash quality, potential stump height, cutting specification; environmental conditions, e.g. weather conditions, water on site, possibility of flash floods, siltation, pollution, visibility; identifying alternative work areas; recovery arrangements including dealing with oil spills; the possibilities of modifying the site by constructing tracks or ramps.

Before starting work, carry out an assessment to identify the suitability of the machine in relation to the site and the task to be undertaken. The equipment to be used must be fit for the purpose of harvesting timber on steep ground.

Forestry work on steep slopes will involve a risk of the machinery overturning. Therefore, all machinery used on slopes must have suitable roll-over protection structures (ROPS) fitted. Purpose-built wheeled forestry harvesters and purpose-built tracked harvesters have ROPS. ROPS will only protect operators if they wear the seat restraint provided. Seat restraints must be provided where ROPS are fitted.

The manufacturers' recommendations should be clearly understood and followed regarding maximum slope limitations and methods of operation.

The configuration of wheels, bogies, rigid or floating tracks must be considered and must be appropriate for the conditions in which the machinery will be working.

Wheel chains and bandtracks will be needed on most steep sites and must be in good condition. Tires must also be in good condition and inflated to the recommended pressure.

It is also important to understand the effects of weight distribution and changes in centre of gravity when considering variations in both the steepness of slope and other ground and environmental conditions.

All machines used on steep ground must be in suitable working condition and maintained to the highest possible standard. The track condition must be inspected regularly and maintenance records must be kept.

Harvesters with tilting cabs allow improved operator ergonomics while working on steep ground. The operator must be aware of the overall angle of the machine, which can be difficult when working in a tilting cab. Remember that forwarders following such harvesters are unlikely to be fitted with tilting cabs and will have a much higher centre of gravity when loaded.

Everyone operating machinery on steep ground must have received the appropriate training and have the sufficient experience to carry out this type of timber harvesting operations. Operators must work within their own capabilities and play a key part in communicating with those managing the operations as the site progresses. Operators should never be instructed to work on slopes that they feel are outside their capabilities or the capabilities of their machines.

Wherever possible the direction of harvesting will change with the slope to select the lowest gradient for the machines to operate on. As a general rule swathe width will reduce with steepness of slope for harvesters on a fixed base, i.e. those without tilting base mechanisms.

Harvester operators should be aware of weight transfer when slewing larger trees at any distance from the machine. Operating technique should be modified according to the conditions, for example drawing the tree in towards the machine or felling at 45º to the slope.

The harvester may be able to work where a forwarder cannot, so material must be placed where it can be safely reached by the forwarder. Other methods of extraction may need to be considered, for example using a cable crane to extract timber.

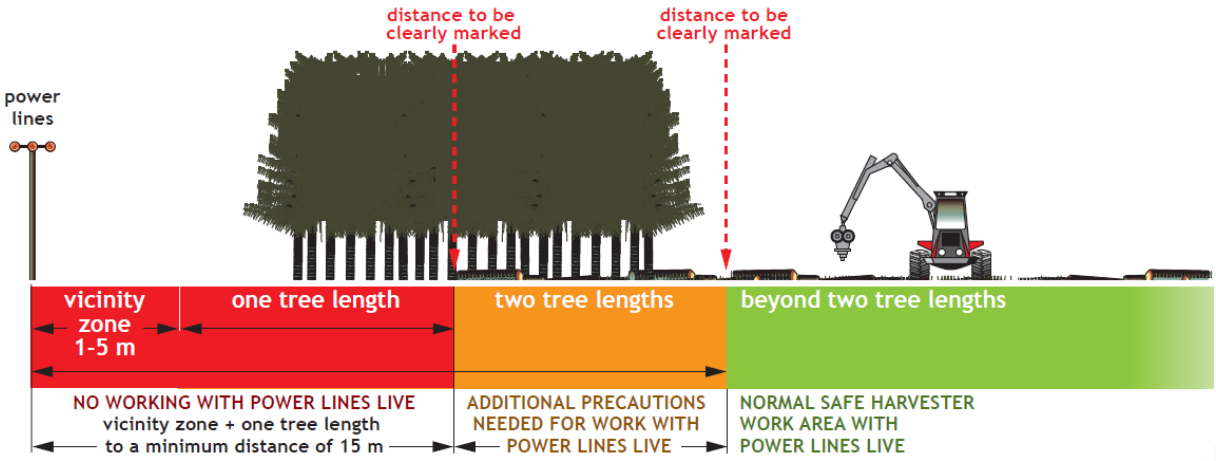
Correct brash mat construction is essential for working safely on slopes: use residue to fill natural hollows and plough furrows; place oversize and twisted residue in the timber zone; avoid laying long, slippery (debarked) lengths of material in the brash mat; cut stumps as low as possible and avoid wheels or tracks running over stumps where possible; consider felling to left and right of the harvester to produce an even depth of brash mat; reduce the stepped effect of obstacles by using brash to create a uniform surface; note that brash mats can be disturbed by machine travel, exposing other hazards such as rock, shale and rutting from wheel/traction aid digging.

Timber harvesting near overhead power and/or telephone lines

- Do not fell trees that are within two tree lengths of an energized overhead power line without consulting the electricity company and agreeing a safe working procedure which incorporates the following precaution measures:
- Do not fell any trees if any part of the harvester or the tree can come within one tree length + the vicinity zone (down to a minimum distance of 15 m) of an energized overhead power line. The vicinity zone will vary between 1 and 5m depending on the line voltages;
- Only fell trees parallel to or away from energized lines;
- Ensure you use only trained and competent operator with a Forestry Machine Operator Certificate of competence and electrical awareness training from the electricity company;
- Assess the weather conditions and ensure the wind direction does not affect control of the felling direction;
- Agree and instigate a suitable emergency procedure with the electricity company in case of

accidental contact or damage to the power lines;

- Do not leave the cabin if the machine comes in contact with a power line;
- Clearly mark the limit of normal working (two tree lengths) and the limit of work with the power lines energized (one tree length + the vicinity zone). Marked trees, high-visibility tape or another suitable marking method should be used as well as organized felling and extraction routes (see the figure below).



Source: FISA Safety Guide 603 Mechanical harvesting

Harvester training using simulators

Harvester simulators offer a safe and cost-saving method for studying the basics of harvester controls, data systems and working techniques and play an increasingly important role in the education of new harvester operators. Simulators are effective for quantitative training before you start operating real machines in the forest.

For experienced operators, simulator training offers an opportunity to test new methods that can result in increased efficiency and productivity.

Whether novice or expert, simulator operation should mirror real-life operation as far as possible. In harvester simulators, the machines perform the same way as they do in the forest. This includes, for example, how the head behaves when set against a tree and how the logs move during forwarding. What is more, the forest can resemble the real condition of the forest since you can choose the terrain, landscape, tree species and forest density.

When driving a modern forest machine, the driver must have good coordination and the ability to handle computer systems and technology. In almost all forest machine simulators special attention has been paid so that practicing can be tailored according to the student's skills level. The purpose of the different thematic exercises is to achieve specific learning outcomes. They restrict some functions or include additional training features. Most simulators come with training packages that start with simple basic exercises and increase the level of difficulty as the learner begins to develop the necessary skills. Teachers/ trainers can also modify the thematic exercises or create entirely new ones for a specific student or a group of students in accordance with the adopted training curriculum. The simulator exercises usually have a scoring system for measuring the student performance, similar to computer gaming.

The training programme in the simulator guides the operator through basic training to full operation in the forest and the trainer can easily follow progress from their own workstation and provide feedback on student's performance. Versatile feedback reports with modifiable grading systems help the teacher/ trainer to give personalized, wide-ranging feedback in which attention can be paid to matters that are crucial for the student's development.

Some of the most advanced forest simulators include virtual reality option which makes the training environment even more realistic.

10.5. Assessment

Assessment is a process by which it is confirmed that the learner is competent in the unit(s) within the qualification to which the assessment relates. It is the process of collecting evidence about learner's capabilities and judging whether that evidence is sufficient to attribute competence.

Safe Practice:

- Assessors must hold a current 'First Aid at Work' certificate;
- All forest machines used in the assessments must comply with the relevant European safety directives and must be equipped for all assessment activities to be carried out. Where a ROPs structure is fitted, an operator seat restraint must be present and functional;
- Learners should be familiar with the machine that they are going to operate;
- Appropriate Personal Protective Equipment (PPE) must be worn at all times;
- A first aid kit meeting current regulations, of the appropriate size for the number of persons on site, must be available;
- the assessor must ensure a risk assessment is carried out, and sufficient preventive measures are implemented;
- Any necessary permissions must have been granted, and notifications made as appropriate (forest enterprise, private owners, etc);
- Information may be sought from the relevant operator manuals or any other appropriate training or safety publication;
- the risk of environmental pollution must be avoided and adequate control measures must be implemented;
- whenever the learner leaves the machine, the parking brake must be applied;
- the harvester must be operated in such a way that the learner, assessor, other persons or equipment are not endangered;
- All ancillary equipment, when detached must be left in a safe and stable condition;
- a breach of health and safety regulations that puts any person at risk during the assessment process should result in immediate termination of the assessment.

DEMONSTRATION SKILLS AND COMPETENCES

CAPABILITY

Learners should have and demonstrate the following knowledge, skills and competences:

- explain the principles of internal combustion engines, vehicle electrical systems, hydraulic systems and harvester heads including diesel engines, electrical systems and hydraulic system components and controls; indicate the steps in harvester hydraulic system service to include change of hydraulic oil and filters, inspection of hoses and joints, and identify replacement parts and part numbers from a maintenance manual;
- develop a harvest plan taking into account the environmental protection, economic output, efficiency, safety, timber assortment and specification;
- explain forestry management taking account the principles of sustainable forestry management, environmental protection, economic activity and timber stage management;
- recognise grades of standing timber to include classification into industry sizes;
- interpret and communicate emergency action plans, harvest plans, specifications and management of cut timber;
- carry out service inspections on harvester including daily and scheduled inspections according to manufacturer's instructions;
- carry out service maintenance tasks including engine oil and filters change, hydraulic oil and hydraulic system inspection;
- prepare a harvester for work including programming to optimise output, set up harvester head timber measurement system, harvest communications technologies and configure harvester to optimise output;
- carry out risk assessment to include pre-operation, continual monitoring during operation and post operation assessment;
- operate harvester in different terrain conditions in a clearfell or thinning situation according to a harvesting plan and required specifications including timber measurement, communication and organisation of harvesting operation with forwarder operator.

ASSESSMENT CRITERIA	ACHIEVEMENT INDICATORS	ASSESSMENT SYSTEM
Identify the hazards and risks associated with the working area and the proposed harvesting operation	The learners should state the main hazards and risks relevant to the work area and the machine	Skills demonstration - 60% Written/oral examination - 40%
Plan work and the harvesting site to maintain safe working areas while operating the timber harvester	Learners should know and follow the industry good practice (prevention of environmental damages, use of additional safeguards, etc.)	Skills demonstration - 60% Written/oral examination - 40%
Use appropriate tools, equipment and Personal Protective Equipment	Learners should know and use the appropriate tools, equipment and PPE are used in accordance to industry good practice and the risk assessment procedure	Skills demonstration - 60% Written/oral examination - 40%
Explain the importance of communication and team work within the working environment	Learners should demonstrate knowledge of the importance of good harvesting team communication (site planning, health and safety, etc.)	Skills demonstration - 60% Written/oral examination - 40%
Describe the basic principles of sustainable forest management, forest certification, characteristics and application of the most common tree species, impact of the harvesting operations on the environment and relevant legislation related to timber harvesting	Learners should demonstrate knowledge and skills related to the basic principles of forest management (silviculture) and forest certification schemes, proper identification of the main tree species in the commercial forests; legislation related to timber harvesting operations	Skills demonstration - 60% Written/oral examination - 40%

State the health and safety requirements, routine and functional checks required for machine and operator protection; carry out service inspections and service maintenance tasks to test all operating functions of the machine	Learners should state the main health and safety requirements and perform basic service inspections/maintenance tasks in accordance with the health and safety requirements, using the appropriate tools/ equipment	Skills demonstration - 60% Written/oral examination - 40%
Describe and demonstrate safe driving techniques on different terrain conditions	Learners should explain the main factors to consider in route planning (terrain characteristics; ground, season and weather conditions, etc.) and should be able to drive and manoeuvre a harvester in different terrain conditions in a safe and effective way	Skills demonstration - 60% Written/oral examination - 40%
Describe how to assess trees to determine the most appropriate felling method; fell trees in accordance with the job specification and harvest plan	Learners should demonstrate knowledge and skills related to most common tree species, their characteristics and correct felling sequence (tree selection); learners should directionally fell a minimum of five trees requiring a single/multiple felling cuts in accordance with the health and safety requirements	Skills demonstration - 60% Written/oral examination - 40%

METHODS AND ASSESSMENT TOOLS

In order to demonstrate that they have reached the standards of knowledge, skill and competence identified in all the learning outcomes, learners are required to complete the assessment. The professional qualification can only be assessed by an assessor who is suitably qualified and meets the requirements of the awarding body. The assessor must be independent and cannot have been involved with the training of the learners. The assessor is responsible for devising assessment instruments (e.g. project and assignment briefs, examination papers), assessment criteria and mark sheets.

The learners should be notified of the place and time of assessment and when formal assessment commences and ceases. All learning outcomes must be assessed against the specified assessment criteria. Assessment should be carried out by direct observation (practical skills demonstration) and by written and/or oral examination of learners.

- Skills demonstration - it is used to assess a wide range of practical learning outcomes including practical skills and knowledge. A skills demonstration will require the learner to complete a task or series of tasks that demonstrate a range of skills;
- Written/oral examination - it provides a means of assessing a learner's ability to recall and apply knowledge, skills and understanding within a set period of time and under clearly specified conditions.

Grading of learners should be performed as follows: pass (50 – 64%); average (65 – 79%); very good/excellent (80 – 100%).

References

1. Component Specification NFQ Level 6 - Harvester Operations Clearfell 6N3412, available online at https://www.qqi.ie//sites/docs/AwardsLibraryPdf/6N3412_AwardSpecifications_English.pdf
2. Felling and Reforestation Policy (2017), Forest Service, Department of Agriculture, Food & the Marine, Ireland;
3. Forest Service Felling Decision Tool, available online at http://www.agriculture.gov.ie/forestservice/forestservicegeneralinformation/foreststatisticsandmapping/fellingdecisiontool/;
4. FSC Website, available at https://www.fsc.org/;
5. Guidance on Managing Health and Safety in Forestry (2014). FISA, available online at https://www.ukfisa.com/assets/files/safetyLibrary/MHSF-2014.pdf;
6. Hamilton, G. J. Forest Mensuration Handbook (1988), available online at https://goo.gl/AWgWD5;
7. Health and Safety Executive, Steep ground working, available at http://www.hse.gov.uk/treework/safety-topics/steep-ground.htm;
8. Innovawood Harvesthead – European Training Module for Harvester Head Technology, available online at http://77.74.50.56/Innovawood/DesktopDefault.aspx?tabindex=2&tabid=177;
9. John Deere Harvester & Harvester Head Range, available at https://www.deere.co.uk/en_GB/products/equipment/wheeled_harvesters/wheeled_harvesters.page;
10. John Deere Harvester Control & Information Systems, available online at https://www.deere.co.uk/en_GB/products/equipment/measuring_and_control_systems/measuring_and_control_systems.page;
11. John Deere Harvester Head Operator Instructions, available online at https://goo.gl/6eowGN;
12. John Deere Introduction to Mechanised Timber Harvesting, available online at https://goo.gl/vktHXc;
13. Komatsu forest machine training, available online at https://www.komatsuforest.com/services/training;
14. Komatsu Harvester & Harvester Head Range, available online at http://www.komatsuforest.com/default.aspx?id=1453&productId=&rootID=1475;
15. Komatsu Harvester Control & Information Systems, available online at http://www.komatsuforest.com/default.aspx?id=2138&productId=&rootID=1475;
16. Matthews, R.W., Jenkins, T.A.R., Mackie, E.D. and Dick, E.C. (2016). Forest Yield: A handbook on forest growth and yield tables for British forestry, Forestry Commission, E Forest Service Felling Decision Tool;
17. Mechanical Harvesting, FISA Safety Guide 603, available online at https://www.ukfisa.com/safety-information/safety-library/fisa-safety-guides/fisa-mechanical-harvesting.html;
18. Ovaskainen, H. (2005). Comparison of harvester work in forest and simulator environments. Silva Fennica 39(1): 89–101, available online at https://www.researchgate.net/publication/228944773_Comparison_of_harvester_work_in_forest_and_simulator_environments;
19. PEFC Website, available at https://www.pefc.org/;
20. Persson, Per-Erik (2011). Working in Harvesting Teams - Practical Production, CO Print EU;
21. Persson, Per-Erik (2013). Working in Harvesting Teams - Basic Knowledge, ISBN 978-91-980418-7-3, CO Print EU;
22. Ponsse Harvester Control & Information Systems, available online at http://www.ponsse.com/products/information-systems;
23. Ponsse simulator training, available online at https://www.ponsse.com/products/simulator;
24. Safety in Forest Harvesting Operations: Code of Practice (2002). ISBN 1 920730 22 2, available online at https://www.safework.nsw.gov.au/__data/assets/pdf_file/0004/52879/Safety-in-forest-harvesting-operations-Code-of-practice.pdf;
25. Steep Slope Working in Forestry, FISA Safety Guide 705, available online at https://www.ukfisa.com/assets/files/safetyLibrary/FISA%20705%20Steep%20slope%20working.pdf;
26. Timber measurement manual (1999), available online at https://goo.gl/QrSmo7;
27. UK Forest Industry Safety Accord Website, available online at http://www.ukfisa.com/safety-information/safety-library/fisa-safety-guides.html
28. Guía para el aprendizaje y la evaluación. Certificado de profesionalidad: Gestión y mantenimiento de árboles y palmeras ornamentales. (2011).
29. Cualificación profesional: Aprovechamientos forestales, available online at http://incual.mecd.es/documents/20195/94271/AGA343_2_RV+-+Q_Documento+publicado/19898a4e-b489-4ee5-8f68-49880319455c

11. Authors & organisations

- **Forest Science and Technology Centre of Catalonia (CTFC):**

Rosa M. Ricart. Responsable de la Agencia Nacional EFESC (European Forestry and Environmental Skills Council)

Carles Lorca. Agencia Nacional EFESC

Arnau Picó. Agencia Nacional EFESC

With special thanks to Eva Ulčnik from University of Ljubljana (Faculty of Arts, department of Geography) for her feedbacks.

- **Consorci per a la Formació Contínua de Catalunya:**

Áurea Domínguez Fernández. Head of Programme Management

Esperanza Rodríguez Rodríguez. Department of qualification initiatives

Mònica Agustí Garrigó. Technician of Programmes Management

- **Centre Forestier de la région Provence-Alpes-Côte d'Azur**

Philippe BERTAUT, Training manager

Craig VINDIN, Arborist Trainer

Evelina CASTELLANA, Project manager

- **ANEFA - Associação Nacional de Empresas Florestais, Agrícolas e do Ambiente**

Pedro SERRA RAMOS – Project and Training Manager

Eulália BOTELHO – Trainer

- **University of Forestry – Sofía**

Assoc. Prof. Petar Antov, PhD - project manager, teacher/trainer

- **ZGS Zavod za gozdove Slovenije / Slovenia Forest Service**

  Stanko Kunej, Trainer

  Jure Legat, Trainer

  Andrej Grum, occupational safety manager, trainer

  Jurij Beguš, Project manager, trainer

- **Szczecińska Szkoła Wyższa Collegium Balticum**

  Maria Bitel, Project manager

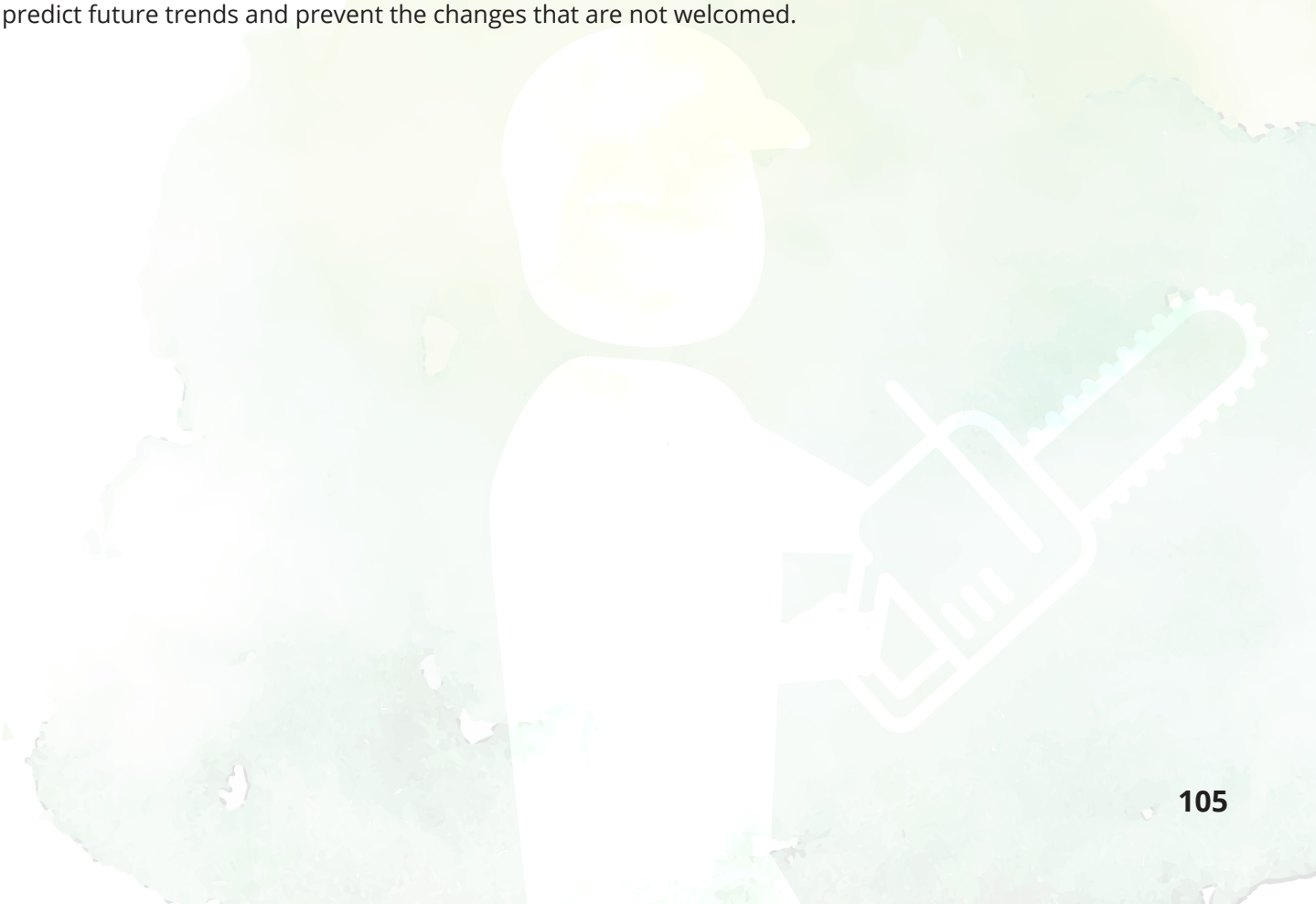
  Łukasz Szmagulski, Trainer

12. Conclusion

Sustainable development of forestry sector requires not only technical knowledge and particular competences to perform different tasks but also a broader perspective. On the one hand, forest is no longer subject only to basic economical laws; over the few recent decades it became much more than just a place of obtaining wood and further trading with it. Economical laws still set the priorities in forest management, however among the most important directions of the development in the sector there are also environmental education and environmental protection, both very close to each other and both imposing on some professions necessity of revising their skills and putting long life learning approach in practice. On the other hand, new professions appear and they require formal description and official validation and certification, consequently it evokes the need of elaboration and distribution or dissemination of such documents as this guide.

High standards provided by the proposed qualifications, if implemented in practice, should be a guarantee of safer work place and general health of employees. However, over time everyday routine at work may blunt the standards as people tend to take shortcuts rather than follow the sharp procedures that always takes time, hence it is important to pay special attention to keeping the standards as high as originally developed during the training. Exams should not be an artificial situation but must be organised as close as possible to real working condition and as similar as possible to everyday practice. Safety standards should be realistic, logical and practical, only in this way there is a chance that they will be consequently followed even after many years after completion of the training.

The authors of this guide believe that unification of standards on European level and promoting best practice in forestry training will contribute to a more effective forestry management and more sustainable development of the forestry sector in general. Increased mobility of workers is also an important goal especially in the era of severe climate change leading to unexpected natural phenomena appearing in regions that are not prepared to face them. International cooperation sets foundation for developing higher flexibility and satisfying efficiency in reacting to challenges and solving problems. It also helps to predict future trends and prevent the changes that are not welcomed.



QUALITY FOREST

Co-funded by the Erasmus+ Programme of the European Union

FOR MORE INFORMATION

http://www.eduforest.eu/

SOCIAL NETWORKS #qualityforest