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EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY



CNR-IVALSA
TREES AND TIMBER INSTITUTE

COST Action FP 1301 EuroCoppice

Report of the 2nd Training School

“Coppice harvesting and use of products as source of renewable energy”



Vallombrosa (Firenze - Italy), May 10st- 15th, 2015

Introduction

The 2nd Training School (TS) with the topic “Coppice harvesting and use of products as source of renewable energy” was held in Vallombrosa (Florence - Italy) from May 10th to 15th 2015. Local organizer of this school were the Department of Agriculture, Food and Forest Systems, University of Florence (GESAAF-UNIFI) and the Tree and Timber Institute of the National research council (CNR - IVALSIA). The State Forest Service, Biogenetic Natural Reserve of Vallombrosa, provided assistance with field activities. TS activities took place in the Field-Training Centre of the School of Agriculture, University of Florence.



Objectives and learning outcomes

The main objectives and learning outcomes of training school were:

- To promote awareness about sustainable coppice management and harvesting;
- To share knowledge about planning and optimizing harvest operations and logistics;
- To provide information about the traditional methods and the potential of modernization in coppice forests harvesting;
- To improve knowledge about the environmental impacts of forest operations and the health and safety of forest workers;
- To enable trainees to analyze and define the optimal integration of firewood production with other assortments such as wood chips, poles and small diameter timber;
- To enable trainees to analyze and classify solid biofuel sourced from coppice according to ISO standards;
- To improve knowledge on biomass combustion and boilers.

Programme

The Training School lasted six days from May 10th to 15th. The following activities were carried out:

1. Lectures in classroom - presentations by trainers
2. Field activity for solid biofuel sampling

3. Field trip of coppice harvesting operation
4. Lab-work for sample treatment and measurement
5. Processing and analysis of data
6. Presentation of the results and concluding remarks.

The first day, Sunday May 10th, was organized for the arrival of the participants and their registration as well as for introducing participants to the work plan for the coming days. On the second and fourth days, Monday May 11th and Wednesday May 13th, the following activities were carried out: I) lectures in classroom addressed to improve knowledge on coppice management, coppice harvesting and solid biofuel quality and sampling; II) sampling wood chips in the field; III) firewood and chips sample preparation, treatment and measurement. The third day, Tuesday May 12th, was earmarked for the field trip and samples preparation, treatment and measurement. In the fifth day, Thursday May 14th, the following activities were carried out: I) lectures in classroom on burning process and biomass combustion; II) measurement, data analysis and report preparation and presentation by the trainees. In the last day, Friday May 15th, the trainees gave presentations on the lab-work together with a general discussion and conclusion.

Participants

Trainees

The total number of trainees was 16 and included 6 female and 10 male. All of them showed a good knowledge background for attending the training school. Their nationality and country institution are shown in the following table:

Country	Country institution	Nationality
Albania	1	1
Croatia	3	3
Estonia	2	2
Germany	1	-
Italy	1	1
Latvia	1	1
Macedonia	1	1
Mexico	-	1
Poland	1	1
Romania	1	1
Serbia	1	1
Spain	1	2
United Kingdom	1	1
Total Country/Nationality	12	12

For carrying out the sampling and laboratory work, the trainees were divided in 3 teams of 5-6 people each, taking into consideration gender balance and nationality (people from the same country were included in different groups).

Trainers

The following seven trainers gave lectures in the classroom:

- Giacomo CERTINI, University of Florence, Italy;
- Pieter KOFMAN, Free-lance consultant wood for energy, Denmark;
- Enrico MARCHI, University of Florence, Italy;
- Pere J. NAVARRO, Forest science Centre of Catalonia, Spain;
- Raffaele SPINELLI, CNR - IVALSA, Italy;
- Eduardo TOLOSANA, Technical University of Madrid – UPM, Spain;
- Davide TRAVAGLINI, University of Florence, Italy.

The following trainers managed and worked with the trainees in the field and laboratory activity (including the field trip):

- Pieter KOFMAN, Free lance consultant wood for energy, Danmark;
- Enrico MARCHI, University of Florence, Italy;
- Raffaele SPINELLI, CNR – IVALSA, Italy;
- Eduardo TOLOSANA, Technical University of Madrid – UPM, Spain;

In particular, Pieter Kofman coordinated the laboratory activity and Enrico Marchi and Raffaele Spinelli coordinated the field trip.

Training activities

Lectures

The lectures in the classroom aimed to introduce students to the basic concepts of coppice management, harvesting and products. Lectures were also developed to give students the basis for further field and laboratory work. The trainees made several questions during and after the end of each presentation, and valuable discussions with the active participation of students and trainers were developed.

The following lectures were presented:

- “Coppice management systems”.
- “Quercus pyrenaica coppice management: Scientific facts with silvicultural implications, from crowns to roots”
- “Coppices and "Dehesa" forests biomass harvesting in Spain: motor-manual and mechanized alternatives, implications, productivity and cost”
- “Solid biofuels standardization”
- “Solid biofuel quality and sampling”
- “Mechanization of coppice harvesting operations”
- “Efficiency measurement of harvesting alternatives through Work Studies”.
- “What’s a (healthy) forest soil”
- “Potential impacts of forest harvesting on soil and mitigating/recovering practices”
- “Solid biofuels classification (ISO standards, analysis, etc.)”

- “Burning process”.
- “Biomass combustion and treatments (fireplaces, stoves, boilers)”



Field trip

During the field trip three sites were visited. The first site was characterized by the harvesting of a chestnut coppice, clearcut with the release of standards (50 per hectare). Work technique was a classic whole tree harvesting. Shoots were felled by chainsaw and extracted by cable yarder. Delimiting and cross-cutting were performed at the landing, using an excavator-base processor. The second site was a mixed coppice of beech, chestnut and oak, also clearcut with the release of standards. In this site harvesting also developed along the lines of the classic whole tree system. Shoots were felled by chainsaw and extracted by cable yarder. At the landing, selection and cross-cutting was performed using a light excavator equipped with a grapple-saw. Different assortments were obtained (firewood, post, chips and small quantities of saw-timber).

During the visits, intense discussion addressed the working systems, the machines used, the assortments obtained and the efficiency and sustainability. Health and safety aspects were also included in the analysis and debate.

The third site was a biomass trade centre, managed by a family-owned company involved in firewood processing and in solid-biofuel marketing. Firewood cross-cutting and splitting were carried out with an automatic firewood processor. The system was analysed and compared with traditional work chains. A lively discussion on the market of firewood and pellet, and related issues, was also developed.



Sampling

In relation with the solid biofuel quality, a sampling activity was carried out by each of the three groups of trainees, on two different piles of wood chips, following the methods described in the classroom presentations. In detail, each group collected three samples with 10 increments per each sample into paper bags and 1 sample into a 70 litres plastic bag. The wood chips piles were different in terms of size distribution, species, origin raw material (small logs, branches), and moisture.



Laboratory work

The laboratory works included treatment, measurement and classification of firewood and chips.

Firewood

Each group chose two firewood piles to use for the laboratory work. Two pieces of firewood were selected for determining the moisture content and the moisture dynamics after drying. The work was developed on the basis of the following phases: I) scaling the samples; II) splitting the samples; III) scaling split samples; IV) drying split samples using a drying cabinet at 103°C for 24 hours; V) scaling dried samples; VI) calculation of moisture content and moisture dynamic (moisture reacquisition 1 and 2 days after drying).

All the pieces of the firewood pile were then measured and the pile was classified according to the ISO standards.



Chips

The work made on the three samples collected in the paper bags included the following phases:

I) scaling the samples; II) drying the samples using a drying cabinet at 103°C for 24 hours; III) scaling the dried samples and the ten empty paper bags; IV) calculation of moisture content.

The work made on the sample collected in the 70 liters plastic bag included the following phases: I) natural drying for 48 hours; II) Woodchips sieving for separating them within particle size classes; III) scaling the chips in each size class; IV) classifying the woodchips according to the ISO standard.



Data Analysis and reporting

At the end of the laboratory work, each group carried out the data analysis and prepared both a report of the activity and its results and a powerpoint presentation. In the last day of the Training school a component of each group described the activity and the results of the group's work. A general discussion was made at the end of each presentation, involving both trainers and trainees.

Trainees evaluation

The last day of the training school, an evaluation form was distributed to the trainees in order to collect their feedback on the activity carried out. The result obtained analysing the forms are synthetized in the following tables:

Query		%
How did you hear about the Florence Training School? (Please tick all that applies)	Action website	29
	National COST Delegate	35
	Mentor	12
	Friend or Colleague	41
	Other	18

Query		%
Please, specify the main reason for attending the school? (Please tick all that applies)	Content	94
	Networking	53
	Recommended by supervisor	23
	Other	6

Queries	Yes %	No %
Have you attended a course about similar topics before?	23.5	76.5
Have you worked on coppice harvesting or solid biofuel before?	88.2	11.8
Do you regularly conduct research on coppice harvesting and/or solid biofuels?	76.5	23.5
Do you think you will do research activity on coppice harvesting or solid biofuels in the near future?	100	0
Do you think you will be able to do a better job after attending the TS?	94.1	5.9

Query	Course subjects	%
Within the course subjects, where did you obtain most new knowledge (Tick all that applies)?	Coppice management and silviculture	70.6
	Coppice biomass harvesting	70.6
	Work studies	29.4
	Impacts of forest harvesting	35.3
	Solid biofuel quality	64.7
	Biomass combustion and treatments	35.3

Query	Classroom Lessons	Average	SD
Please indicate your satisfaction with the quality of the classroom lessons (ranking 1 to 5, five being satisfied and one being dissatisfied)	Coppice management systems	4.8	0.4
	Quercus pyrenaica coppice management: Scientific facts with silvicultural implications, from crowns to roots	4.4	0.7
	Coppices and "Dehesa" forests biomass harvesting in Spain: motor-manual and mechanized alternatives, implications, productivity and cost	4.2	0.8
	Solid biofuels quality and sampling	4.6	0.8
	Mechanization of coppice harvesting operations	4.8	0.4
	Efficiency measurement of harvesting alternatives through Work Studies	4.6	0.6
	What's a (healthy) forest soil	4.7	0.6
	Potential impacts of forest harvesting on soil and mitigating/recovering practices	4.8	0.4
	Solid biofuels standardization	4.2	0.8
	Solid biofuels classification	4.3	0.9
	Burning process	4.4	0.7
	Biomass combustion and treatments	3.8	0.9

Query	Issue	Average	SD
Please indicate your satisfaction with the (ranking 1 to 4, four being satisfied and one being dissatisfied)	Field trip	3.8	0.5
	Venue	3.8	0.5
	Accommodation	3.8	0.4
	Meals	3.6	0.6
	Overall satisfaction	3.9	0.3

Overview from local organiser

Based on both the experience we gained conducting the training school and the analysis of the evaluation from trainees, It is possible to make the following observations:

1. Communication, collaboration and understanding between trainers and trainees reached a high level. Both the accommodation, in the same building, and the location, within the forest

of Vallombrosa, helped in improving communication among all participants, even outside the planned working hours.

2. Trainees showed a good background on the topic treated during the TS, and this was very useful for developing fruitful and successful activities. In fact, they did not show any particular problems in following the lectures and participating in the activities.
3. The characteristic of the 16 trainees (in terms of country institution, nationality and gender) represents a very heterogeneous group with a variety of skills in the field covered by the training school. This heterogeneity allowed a fruitful exchange of information related to the TS topics, thus enriching debate and discussion.
4. The analysis of the evaluation forms showed in general a good satisfaction from all trainees. Even though many of them already worked on coppice harvesting or solid biofuels before joining the TS (88.2%), 94.1% recognized that they will be able to do a better job after attending the TS, which is especially valuable because all trainees plan to develop research activities on coppice harvesting or solid biofuels in the near future.
5. At the end of the training school, a certificate of attendance was released to each trainee, together with a training school certificate supplement. The certificate supplement describes the objectives and learning outcomes of the TS, the knowledge, competence and skills acquired, and the programme. The certificate supplement states that the activities carried out within the TS correspond to three ECTS credits at the University of Florence.

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