Corrado Cremonini[1], Francesco Negro[1], Manuela Romagnoli[2], Roberto Zanuttini[1]

Assessment of "Uso Fiume" Larch Beams Production in the Sawmilling Industry of Aosta Valley Region – Northwestern Italy

Procjena proizvodnje greda *Uso fiume* od arišovine u pilanskoj industriji regije Aosta Valley - Sjeverozapadna Italija

Professional paper • Stručni rad
Received – prispjelo: 24. 9. 2013.
Accepted – prihvaćeno: 20. 5. 2015.
*UDK: 630*833.121; 630*832.1; 674.032.475.3*
doi:10.5552/drind.2015.1353

ABSTRACT • *"Uso Fiume" (UF) beams are a traditional peculiarity of the Italian wooden carpentry. They are produced by parallel sawing of the log on four faces, which results in wanes on their whole length, while their cross section is constant from end to end.*
Structural timber is subjected to the dispositions of the European Construction Products Regulation (CPR) and since January 2012 it can be placed on the market only if CE marked; structural timber with irregular section, such as UF beams, shall be graded on the basis of a specific procedure named European Technical Assessment (ETA). In particular, UF beams made of larch (Larix decidua Mill.) wood can be CE marked according to ETA – 11/0219. This is a relevant factor for the enterprises of some Italian Regions, such as Aosta Valley, where larch is widespread and commonly used for producing structural assortments.
In this context the present work aims to assess the characteristics of UF larch beams production in the above geographical site. To this purpose a survey was addressed at regional sawmills producing these assortments. The inquiry was also designed in order to investigate different aspects such as enterprises dimensions, origin of round wood and production methods.
The survey gave a picture of this production reality and can provide useful considerations for similar cases in other Italian or European Regions.

Key words: *Structural timber, larch, CE marking, Uso Fiume beams, sawmills, Aosta Valley*

SAŽETAK • *Uso Fiume (UF) grede tradicionalna su posebnost talijanske drvene građe. Proizvode se paralelnim piljenjem trupca u četiri plohe, što rezultira nepravilnim rubovima cijelom duljinom dok im je presjek ujednačen.*

[1] Authors are research associate, assistant and associate professor at University of Torino, Department of Agricultural, Forestry and Food Sciences (DISAFA), Grugliasco (TO), Italy. [2]Author is associate professor at University of Tuscia, Department of Science and Technology of Agriculture, Forestry, Nature and Energy (DAFNE), Viterbo, Italy.
[1] Autori su znanstveni suradnik, asistent i izvanredni profesor Sveučilišta u Torinu, Odjel za agronomske, šumarske i prehrambene znanosti, Grugliasco (TO), Italija. [2]Autor je izvanredni profesor Sveučilišta u Tusciji, Odjel znanosti i tehnologije u polju agronomije, šumarstva, prirode i energije, Viterbo, Italija.

Strukturna građa mora biti u skladu s Europskom uredbom o građevinskim proizvodima (CPR), a od siječnja 2012. može biti na tržištu samo ako ima oznaku CE. Strukturna građa nepravilnih dijelova kao što su UF grede mora se klasificirati na temelju određenog postupka koji se naziva europskom tehničkom procjenom (ETA). Konkretno, UF grede izrađene od drva ariša (Larix decidua Mill.) mogu biti označene CE oznakom u skladu s ETA - 11/0219. To je relevantan čimbenik za poduzeća u nekim talijanskim regijama kao što su Aosta Valley, gdje je ariš rasprostranjen i često se upotrebljava za izradu strukturnih proizvoda.
U tom kontekstu, cilj je ovog rada procijeniti obilježja proizvodnje UF greda od arišovine u regiji Aosta Valley. Za tu svrhu provedena je anketa u pilanama regije koje proizvode UF grede. Anketni je upitnik izrađen tako da bi se mogli istražiti različiti aspekti proizvodnje kao što su dimenzije pilane, podrijetlo trupaca te proizvodne metode. Istraživanje je omogućilo da se stvori slika stvarne produktivnosti, koja može dati korisne podatke i zaključke za slične primjere u drugim talijanskim ili europskim regijama.

***Ključne riječi*:** *strukturna građa, ariš, oznaka CE, greda Uso Fiume, pilana, Aosta Valley*

1 INTRODUCTION
1. UVOD

The EU Regulation No. 305/2011 (CPR, acronym for Construction Products Regulation) lays down harmonized conditions for marketing of construction products within the European Union. Structural timber is subjected to CPR's dispositions and since January 2012 it can be placed on the market only if it is CE marked (Negro *et al.,* 2013).

According to CPR, structural timber with rectangular cross section shall be classified in conformity with EN 14081-1 and assigned to a strength class included in the EN 338. Structural timber with irregular cross section is not considered neither by the EN 14081-1 nor by other harmonized standards. In this case the CPR envisages the possibility of placing the CE marking only if a European Technical Assessment (ETA) has been released for the specific product.

"Uso Fiume" (UF) beams belong to the category of structural timber with irregular section and represent a peculiarity of the Italian wooden carpentry (Figure 1). Uso Fiume larch beams are traditionally used by the Aosta Valley sawmilling industry for producing wooden carpentry). Their cost is lower compared to that of larch beams with regular sections, particularly due to higher transformation yields.

Figure 1 Uso Fiume larch beams are traditionally used by the Aosta Valley sawmilling industry for producing wooden carpentry
Slika 1. Grede *Uso Fiume* od drva ariša tradicionalno se upotrebljavaju u pilanskoj industriji regije Aosta Valley za proizvodnju drvne stolarije

Their cross section is constant from end to end and they are produced by parallel sawing of the log on four faces, which results in wanes on their whole length. Recently some Italian associations carried out, together with National Research Bodies, a wide sampling and testing on UF beams. As a result, the *Consortium Uso Fiume/Uso Trieste beams* obtained the ETA – 11/0219 that allows the enterprises part of the group to CE mark their UF beams made of spruce, silver fir or larch. Similarly, the *Consortium Wood Cork – Technical Committee Chestnut Uso Fiume* obtained the ETA 12/0540 for CE marking these assortments. Inclusion of larch wood in ETA – 11/0219 is a relevant factor for sawmills located in the Aosta Valley, where this wood species is widespread: larch stands cover 44.528 ha and constitute 45 % of the regional forest surface (INFC, 2005).

In this context the present work aims to analyze the characteristics of UF larch beams production in the above Region of Northwestern Italy. To this purpose, a survey was addressed to sawmills producing UF larch assortments. The inquiry was designed for investigating different aspects such as enterprises dimensions, origin of the round wood and production methods. Collected data were elaborated in order to obtain updated information on the examined sector and to understand the peculiarities and issues that characterize the regional production.

The survey gave a picture of this production reality; considerations for similar cases in other Italian or European Regions can also be drawn from the outcomes of the study.

2 MATERIALS AND METHODS
2. MATERIJAL I METODE

The Chamber of Commerce of Aosta Valley was contacted in order to individuate the regional sawmills that currently produce UF larch beams. In particular, the list of enterprises belonging to the following categories[1] was required:

[1] Derived from the statistical classification of economic activities in the European Communities (NACE) by the National Institute of Statistic (ISTAT, 2007).

- code 16.10: sawmilling and planning of wood;
- code 16.23: manufacture of other builders' carpentry and joinery.

The list included 238 regional enterprises and reported general descriptive information such as the number of employees or the main production activity for each of them. The latter parameter was used for shortening the list: for instance, all enterprises marked as "Production of furniture" were excluded. Through this selection, 56 enterprises were individuated as possible producers of UF larch beams in the area of study. Each of them was directly contacted, which enabled identifying the 9 enterprises that currently produce UF beams in the Region. The remaining 47 enterprises, instead, resulted to be mainly involved in timber commerce and in any case are not UF beams producers.

Taking as a reference other surveys describing the productive realities of sawmilling industries (Knowles *et al*., 2008; Crespell *et al*., 2006), a questionnaire addressed to the owners of the 9 shortlisted sawmills was formulated. Its development was aimed at assessing the main characteristics of UF larch beams production in Aosta Valley. The questionnaire was designed to be completed within 20 minutes and was structured in two segments: trade flows (1) and beams characteristics (2). Six questions were expressed; three in segment 1 (origin of round timber, annual production, selling destinations) and three in segment 2 (sections and lengths produced, production methods, grading procedures). A draft was submitted for revision to experts in structural timber both in academia and industry; limited changes were made according to comments received. The questionnaire was then subjected to sawmill owners by direct visiting *in loco*. Answers were registered in spreadsheets subsequently used for data elaboration and statistical analysis.

3 RESULTS AND DISCUSSION
3. REZULTATI I RASPRAVA

Figure 2 shows the number of employees for each of the nine regional enterprises that currently produce UF larch beams.

All of them have less than 10 employees (while the activity of sawmills # 2 and 3 is entirely carried out by the owner) and fall into the category of Small Medium Enterprises, sub-category Microenterprises[2]. They are generally family owned, which indicates a sector still constituted by small productions fractioned in the regional area.

The above sawmills buy round wood and timber for producing UF larch beams from several provenances: Aosta Valley, Piedmont Region (still in Italy and close to the above), Austria, France, Germany and Switzerland. As shown in Figure 3, each sawmill counts on two or more provenances, with the exception of sawmill # 3 that satisfies its limited needs by buying round wood of local origin only.

Figure 4 reports the percentage distribution of logs provenances considering the collected data. The main part of round wood and timber comes from Aosta Valley (36 %) and France (28 %); relevant amounts are also imported from Switzerland (12 %), Austria (11 %) and Germany (10 %), while the remaining 3 % comes from Piedmont. From these data, it emerges that, despite the large presence of larch stands at local level, the main part of round wood (61 %) is imported from foreign countries. Sawmills owners indicated two main

[2] According to the Recommendation of the European Commission of May 6th 2003, a microenterprise is defined as "*an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed 2 million €*".

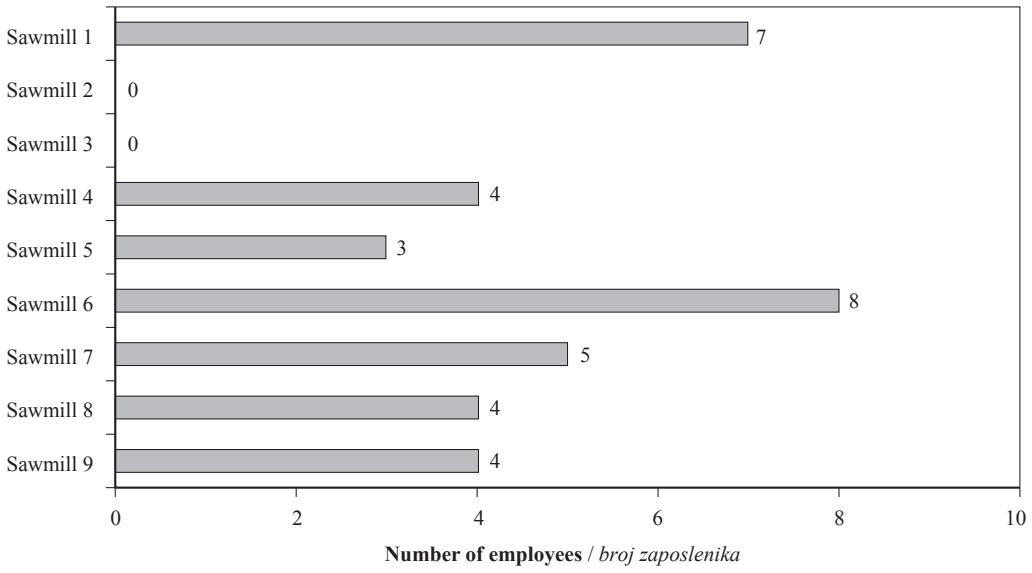

Figure 2 Number of employees for each inquired enterprise
Slika 2. Broj zaposlenika u ispitivanim pilanama

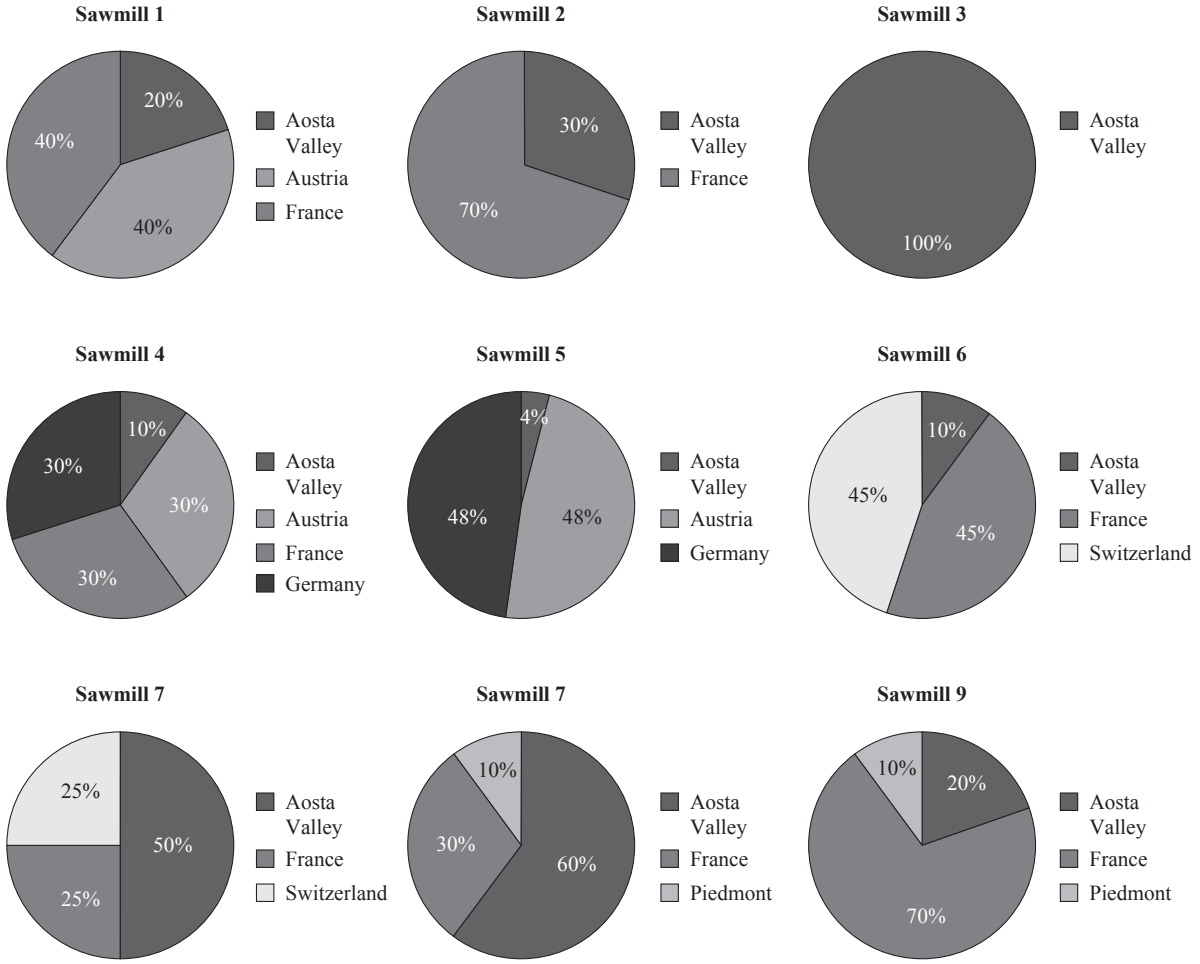

Figure 3 Provenance of round wood and timber used for producing UF beams
Slika 3. Podrijetlo oblovine za proizvodnju UF greda

reasons for that: firstly, in their opinion the regional harvesting polices are too restrictive and not enough oriented to the productive function, and secondly the quality of regional round wood is not always able to satisfy the market requirements.

As for dimensions of UF larch beams, their most common sections range from 18x18 cm and 20x25 cm, used for producing rafters, and from 30x30 cm to 35x35 cm, used for ridgepoles. Most frequent lengths vary within a broad range from 400 to 13.000 cm. On the whole, the main combinations are 20x20 cm x 6-10 m, 20x25 cm x 6-8 m, 30x30 cm x 6-8 m.

From the analysis of the annual production of UF larch beams per sawmill, it emerges that volumes are generally limited (Figure 5).

Grouping the above data in volume classes shows that five sawmills out of nine have a production equal or minor to 100 m^3 per year, while the others reach a larger productions, which in any case is not higher than 200 m^3 per year (Figure 6).

This distribution indicates that production of UF beams represents a niche market and constitutes a marginal part of the whole activity of the inquired enterprises, as also stated by their owners.

Figure 7 reports the modalities used by enterprises for producing UF beams. According to the standard UNI 11035-3[3] Uso Fiume beams shall be "*obtained from a trunk by mechanical sawing, continuously and parallel from end to end on four faces with constant thickness"*. Four sawmills declared to produce UF beams using the above method, while one sawmill de-

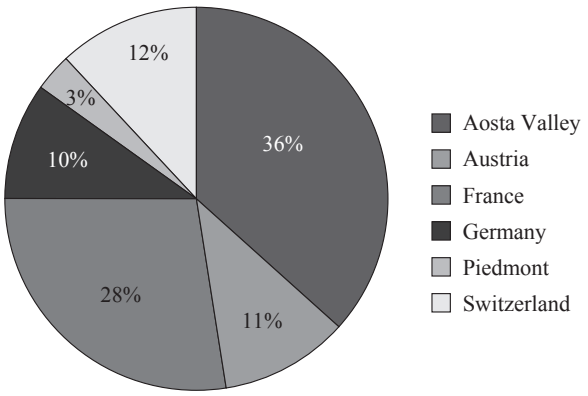

Figure 4 Provenance of round wood and timber considering the grouped data
Slika 4. Podrijetlo oblovine prema podacima za sve ispitivane pilane

[3] This standard regards UF beams made of spruce and silver fire but can be taken as a valid guide for many aspects of UF larch beam production.

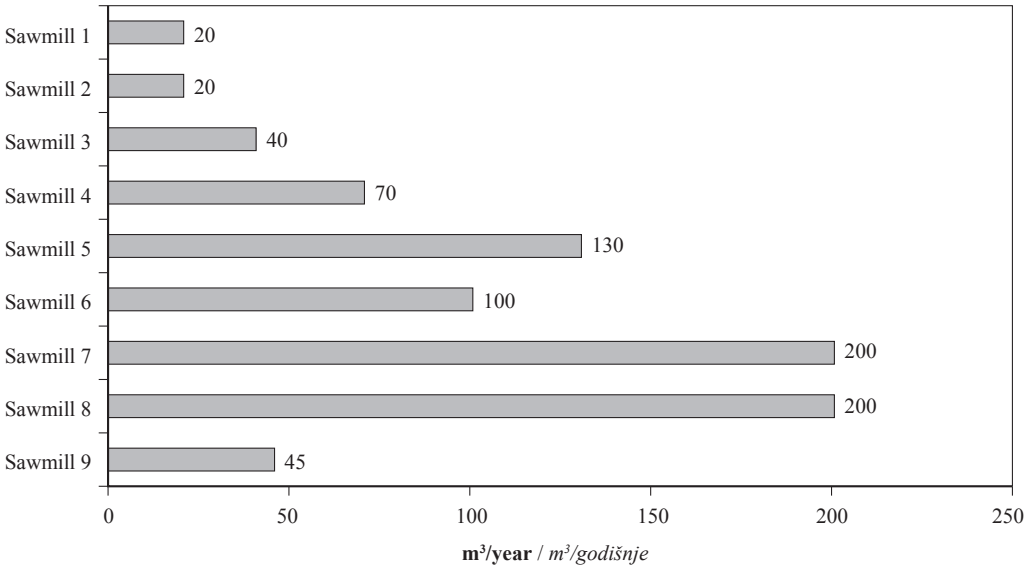

Figure 5 Annual production of UF beams for each sawmill
Slika 5. Godišnja proizvodnja UF greda za svaku ispitivanu pilanu

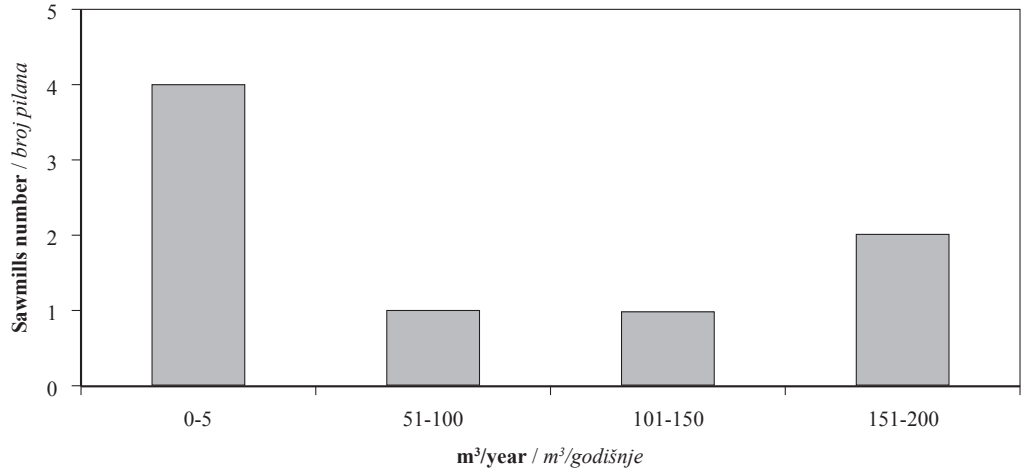

Figure 6 Annual production per volume classes
Slika 6. Godišnja proizvodnja prema volumnim klasama

clared to produce these assortments by milling the edges of rectangular beams, therefore artificially obtaining the wanes along the beam. The remaining four declared to use both methods.

The difference between these methods is not only formal: beams milled along edges do not present, in correspondence of their wanes, the continuity of wooden tissues that is an added value of UF assortments.

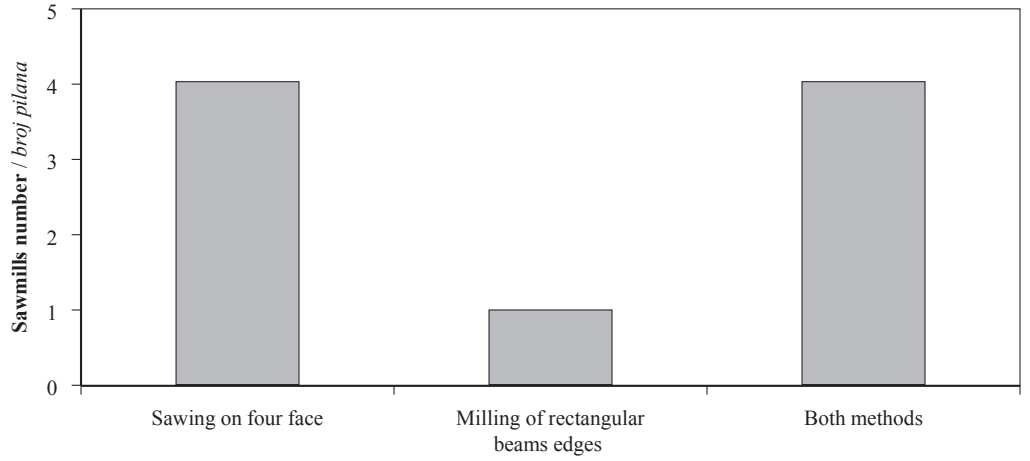

Figure 7 Methods used for producing UF assortments
Slika 7. Metode proizvodnje UF greda

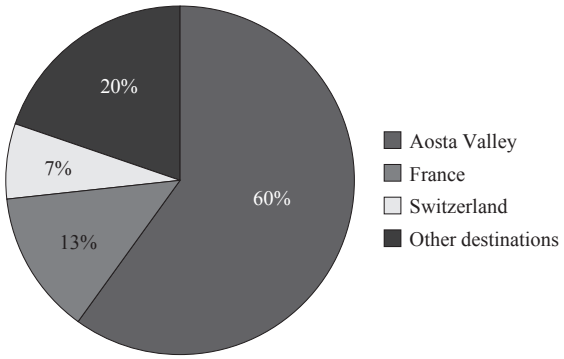

Figure 8 Selling destinations of UF larch beams
Slika 8. Destinacije prodaje UF greda

Therefore, it is recommendable for producers to exclusively use the mechanical squaring.

Finally, Figure 8 shows destinations towards which enterprises sale their UF larch beams. The higher amount (60 %) is sold within Aosta Valley, confirming that this reality is limited but relevant at local level.

Volumes sold to different destinations, mainly other Italian Regions and in particular the near Piedmont and Lombardia, are 20 % of the total. The remaining part is exported to France (13 %) and Switzerland (7 %).

4 CONCLUSIONS
4. ZAKLJUČCI

Introduction of CE marking obligation for construction products is a demanding challenge for enterprises of Aosta Valley that produce UF larch beams. These are, in fact, microenterprises often family owned and their organization is not always properly structured. On the other side, the new standard requirements offer the opportunity for valorizing the regional structural timber. This can determine positive effects both on sawmills and local wood sector. This aspect is particularly relevant since in the last years the entire forest-wood-chain has been weakened at regional and national level by several factors, namely the competition of engineered wood-based products such as glue laminated wood, the adverse economic period and the delocalization of production processes.

The survey showed how, today, the production of Uso Fiume larch beams in Aosta Valley is a niche reality characterized by small volumes. Still, this is a heritage of the Italian wooden carpentry that should be valorized and, where possible, supported in increasing the productive and commercial potential. The use of larch wood for structural timber is, in fact, a valid alternative to spruce and silver fir, in particular when the purpose is to exploit and valorize the durability, the major mechanical properties and the aesthetic appearance of larch wood or to promote the use of a local timber. It is, therefore, worth considering further research aimed at investigating the technical and economical performance of sawmills producing these assortments.

In any case, the essential pre-requisite for valorizing the available wooden resources is to be able to guarantee a full compliance of products and processes to the in-force technical and legislative dispositions. Therefore, sawmills should make an effort, also supported by associations, to fully comply with the current normative framework. In this context, CE marking of UF larch beams, together with an adequate promotion on the market, can give a relevant impulse to the sector. This can help the regional enterprises to acquire more updated, modern and efficient production methods.

Acknowledgements - Zahvala

The authors would like to thank Andrea Gialdi for his contribution, performed within his graduation thesis, in collecting the owner's answers and elaborating the resulting data.

5 REFERENCES
5. LITERATURA

1. EU Commission Recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises.
2. Crespell, P.; Knowles, C.; Hansen, E., 2006: Innovativeness in the North American softwood sawmilling industry. Forest Science 52 (5): 568-578.
3. EN 338:2009 Structural timber - Strength classes.
4. EN 14081-1:2005+A1:2011 Timber structures - Strength graded structural timber with rectangular cross section - Part 1: General requirements.
5. Knowles, C.; Hansen, E.; Shook, S. R., 2008: Assessing innovativeness in the North American softwood sawmilling industry using three methods. Canadian Journal of Forest Research 38 (2): 363-375. http://dx.doi.org/10.1139/X07-140
6. Negro, F.; Cremonini, C.; Zanuttini, R., 2013: CE marking of structural timber: the European standardization framework and its effects on Italian manufacturers. Drvna industrija 64 (1): 55-62. http://dx.doi.org/10.5552/drind.2013.1214
7. Regulation (EU) No 305/2011 of 9 March 2011 laying down harmonized conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.
8. UNI 11035-3:2010 Legno strutturale - Classificazione a vista dei legnami secondo la resistenza meccanica – Parte 3: Travi Uso Fiume e Uso Trieste.
9. *** 2007: National Forest and Carbon Sink Inventory (in Italian). http://www.sian.it/inventarioforestale/ (Accessed Dec. 3, 2014).
10. *** 2007: ISTAT, ATECO 2007 – Classification of economic activities (in Italian). http://www.istat.it/it/archivio/17888 (Accessed Dec. 3, 2014)

Corresponding address:

NEGRO FRANCESCO, Ph.D.

Department of Agricultural, Forestry and Food Sciences (DISAFA)
University of Torino
Via Leonardo da Vinci 44
10095 Grugliasco (TO), ITALY
e-mail: francesco.negro@unito.it