

From European forestry strategies to implementing local policies: a study on public forest workers in the Tuscany region of Italy

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HIGHLIGHTS

- Forest strategies of the EU are exclusively implemented at the local level.
- In Italy, the executors of forestry policies are public forest personnel.
- Worker profile study helps to verify the implementation degree of forest policies.
- Analyzing local actions highlights the strengths and weaknesses of forestry policies.
- Monitoring of local forest management is of great importance.

SUMMARY

Even though forests represent almost half of the EU territory, the implementation of forestry strategies is delegated to local government institutions. This study proposes an overview of the main European forestry strategies, national (Italian) guidelines and local implementation instruments (in Tuscany). This approach made it possible to identify the actual executors of forestry policies, i.e., the public forest workers. The paper provides a framework of the recent dynamics of regional forestry instruments, their effects on available financial resources and their technical-operational consequences. Furthermore, Tuscan public forest worker profiles were defined through an online questionnaire. The results show that it is essential to activate constant monitoring of local actions in order to verify the effectiveness of superordinate forestry policies.

Keywords: EU forest strategies, forest policy, public forests, forest management, forest workers

Des stratégies forestières européennes à la mise en application des politiques locales: une étude des ouvriers de la forêt publique dans la Toscane italienne

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Bien que la forêt représente presque la moitié du territoire de l'Union européenne, la mise en application des stratégies forestières est généralement déléguée aux institutions gouvernementales. Cette étude propose une vue d'ensemble des principales stratégies forestières européennes, des lignes de conduites nationales (en Italie), et des instruments de mise en application locale (en Toscane). L'approche utilisée a rendu possible l'identification des exécuteurs des politiques forestières, c.à.d. les ouvriers de la forêt publique. Ce travail fournit un cadre des dynamiques des instruments récents de foresterie régionale, des leurs effets sur les ressources financières disponibles, et sur les conséquences de leurs opérations techniques. De plus, les profils des ouvriers forestiers publics toscans ont été définis à l'aide d'un questionnaire en ligne. Les acteurs impliqués dans le processus de gestion forestière sont les personnes qu'il est important de consulter, quant au contrôle du système de foresterie. Les résultats indiquent qu'il est essentiel d'activer une surveillance constante des actions locales, afin de vérifier l'efficacité des politiques forestières supérieures.

De las estrategias forestales europeas a la aplicación de políticas locales: un estudio sobre los trabajadores forestales públicos en la región de la Toscana, Italia

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Aunque los bosques representan casi la mitad del territorio de la UE, la aplicación de las estrategias forestales suele delegarse a las instituciones gubernamentales locales. Este estudio propone una sinopsis de las principales estrategias forestales europeas, de las directrices nacionales (en Italia) y de los instrumentos de aplicación local (en la Toscana). El enfoque utilizado permitió identificar a los ejecutores de las políticas forestales, es decir, a los trabajadores forestales públicos. El estudio ofrece un marco de la dinámica reciente de los instrumentos forestales regionales, sus efectos sobre los recursos financieros disponibles y sus consecuencias técnico-operativas. Además, se empleó un cuestionario en línea con el que se definieron los perfiles de los trabajadores forestales públicos de la Toscana. Los actores implicados en el proceso de gobernanza forestal representan las personas importantes que deben ser consultadas sobre el control del sistema forestal. Los resultados muestran que es esencial activar un seguimiento constante de las acciones locales para comprobar la eficacia de las políticas forestales de categoría superior.

INTRODUCTION

Forest-based strategies require a wide variety of professional profiles, both in private enterprises and in public authorities, with different and complementary competences in policies and management. Additionally, in the forest-based sector many activities carried out by public workers have a multi-functional character involving both public and private territories. In 2020, around 4.3 million workers were involved in the forestry and wood-based value chains in the United Nations Economic Commission for Europe (UNECE) region (FAO and UNECE 2020), within which Italy is estimated to be the third among European countries for the absolute number of workers in the forest sector and the second in relation to workers in the forestry subsector (FAO and UNECE 2020). The employment rate has been decreasing since the 2008 economic crisis due to reduced demand for solid wood products, pulp and paper (Robert *et al.* 2020) as well as the increase in imports of low-cost products (Osse *et al.* 2013). In addition, in the European Union (EU), from 1990 to 2010, forest cover increased by approximately 11 million hectares because of both natural growth and afforestation projects, while employment linked to these renewable resources declined (European Parliament 2021). Unfortunately, forests are not mentioned in the Treaty of Rome that went into effect in 1958 and consequently they cannot be subject to specific European policies. For this reason, despite the sector's importance, European forestry strategies are based on the principle of voluntary participation by Member States and are not defined by a legally binding shared policy. Therefore, forest policy is nationally driven and each country develops its strategies by integrating the European guidelines. Thus, the complete implementation of these European forest strategies occurs only at local level.

According to the State of Europe's Forests Report (FAO and UNECE 2020) about 53.5% of the forest area in Europe is under public ownership although the proportions of public and privately-owned forestland vary considerably among individual European countries. It is therefore evident that for many European countries, the implementation of forest policies in public forests assumes a particularly important role. In Italy public forests play a significant role (Carvalho Mendes *et al.* 2006) with 32.4% of forest area in public hands (Tabacchi *et al.* 2007).

This study examines the principle elements of European and national (Italian) forest governance, and the consequent effects on the employment structure of forest workers at the local level, in part because investigating local actors involved in forest management can provide useful information for the superordinate governance (Paletto *et al.* 2014). First of all, the paper proposes a synthetic framework of the main European forestry strategies, national (Italian) guidelines for this sector, and the implementation policies at the local level (Tuscany). It is evident that forest management policies should be planned on the upper hierarchic levels (i.e. European and national) taking into account the feedback at the local level (Cullotta and Maetzke 2009). The forest employment issue is explored on a local level through the case study of the local

bodies delegated to manage public forests in an Italian Regional Administration (i.e. Tuscany), which represents the Level 2 in the system of hierarchical subdivision of the European territories (Eurostat 2020). Specifically, the research has involved the principal actors and executors of public forest policies, i.e., public forest workers, who oversee the territory in a stable manner and ensure the conservation of natural resources and the provision of forestry services.

The hypothesis employed is that there is currently no bottom-up system that allows validating the effectiveness of superordinate (i.e. European and national) strategies in the clear application of policies at a local scale. Thus, the objective of this study is to carry out a preliminary analysis of the current executors of European policies, so that the actions that are detected at a local scale can serve as a basis for building a tool for verifying the effectiveness of superordinate forest policies.

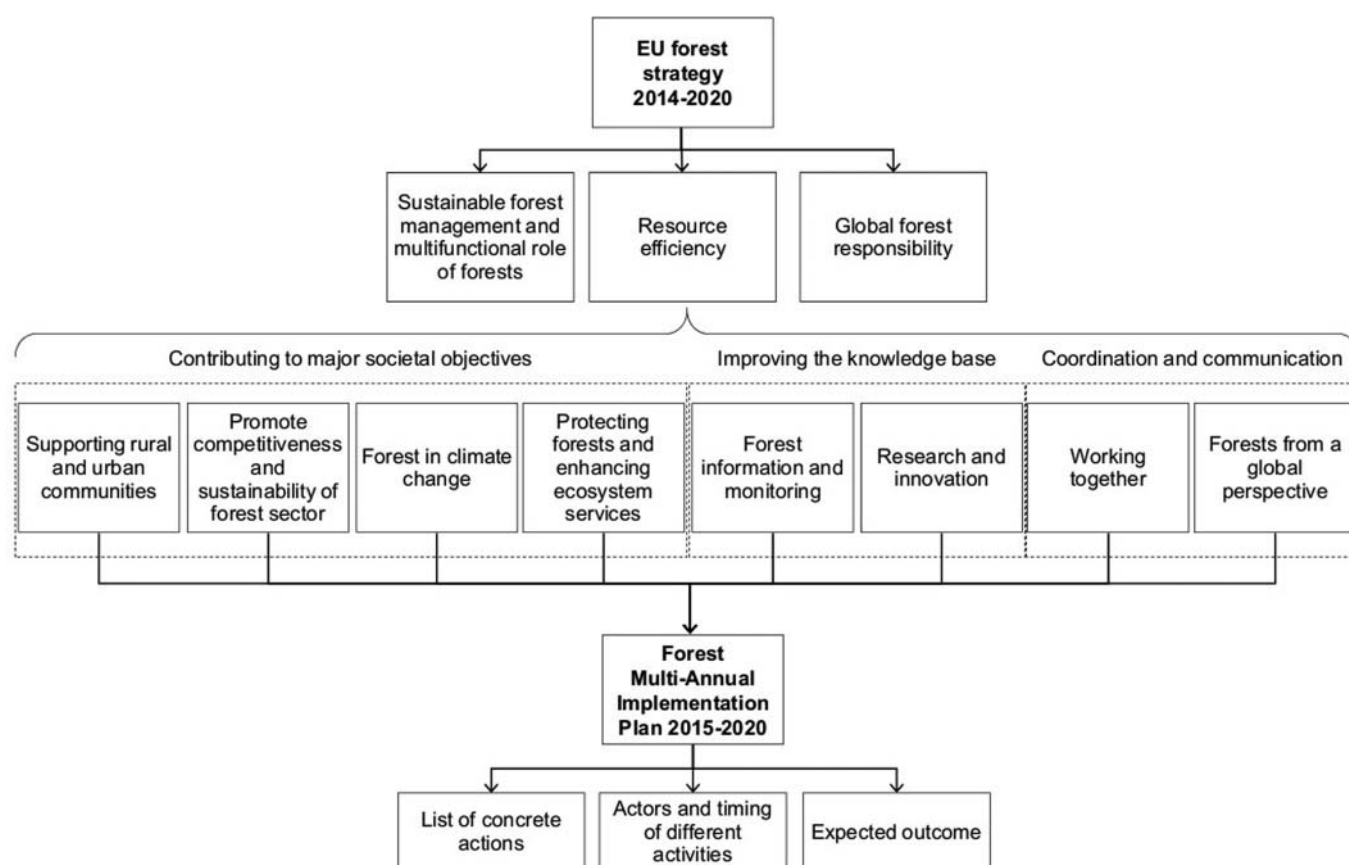
FOREST GOVERNANCE

European forest strategy

In the EU, forest governance has become highly complex because it is regulated by a multitude of sectors and actors. Forest strategy goals are influenced by many related issues such as climate change, energy production, and biodiversity conservation (Hogl *et al.* 2016, Pülzl and Hogl 2013). EU forest policies are led by the two paradigms of sustainability and multifunctionality (Winkel *et al.* 2013) which have strengthened the levels of communication but are still not effective enough to clearly define the management policies that are responsible for the implementation of specific actions at the local level. (Sotirov and Arts 2018). The last step in the process of defining a mandatory common forest policy was the 'First informal meeting under UNECE' (Geneva, 31.10. 2019) where the possibility of drafting a Legally Binding Agreement was discussed. Therefore, the legal competence of the forestry sector is still delegated to single Member States (Edwards and Kleinschmit 2013, Pülzl *et al.* 2013, Sotirov and Arts 2018). In 1998 the EU Forest Strategy was introduced and then updated in 2013. It is the first and most structured framework for forestry actions and instruments at the European level (Romano *et al.* 2012). The executive instrument of the new EU Forest Strategy is the Multi-Annual Implementation Plan (Forest MAP), which was introduced in 2006 and updated in 2015. The aim of the plan was to solve the problem of lack of coordination and coherence between forest policies at the European level (Bolognini 2019, Cullotta and Maetzke 2008, Pülzl and Hogl 2013). A scheme of the structure of the EU Forest Strategy and the Forest MAP is shown in Figure 1.

Despite the absence of an official European forestry policy, many studies have shown that forest governance in the EU involves many actors, associations, and organisations (Pülzl and Dominguez 2013). These actors can be grouped into five categories:

FIGURE 1 *EU Forest Strategy structure. The scheme illustrates the structure of the fundamental European document for the forest sector: the EU Forest Strategy*



- i) Public actors: European and national policymakers (e.g., the European Commission and its General Directorates and agencies, ministry, etc.),
- ii) Environmental interest groups such as Greenpeace International, WWF.
- iii) Forest sector groups: private forest owners, state forest owners, industry associations, woodworkers' associations, etc.
- iv) Forest research institutes such as IUFRO, SILVA and FTP.
- v) Other organisations: e.g. United Nations organisations (e.g., FAO, UNECE), forestry student associations (e.g. IFSA), European exchange platform (EBCD).

If we examine the structure of the interrelationships among the most important actors of forestry policy, in all EU member states we observe that the implementing body is represented only by local level actors. Furthermore, the literature includes numerous studies addressing forestry strategies on a global, European and national scale, but only a few contributions focus on the local level of implementation (Sotirov and Arts 2018).

National forestry policy in Italy

Over the past few decades, forestry policies have undergone important transformations at the national level. From a historical point of view, Italy ranks among those European countries that first defined public institutions and private associations for the management of the forest system at the beginning of the 20th century. In this context, public forest owners have played a fundamental role in the birth of the forest worker system (Carvalho Mendes *et al.* 2006). One of the most important factors of change for the forestry policies in Italy was the process of decentralization that since the early 70s¹ deprived the State of its forest-related function and assigned it to the Autonomous Provinces and to the Regions (Abrami 2017, Brocca 2019, Cullotta and Maetzke 2009, Secco *et al.* 2017, Stefani 2019). This process has created uncertainty in attributing forest functions between State, Regions, and Autonomous Provinces (Secco *et al.* 2017). Only at the beginning of 2000² was clarification on the distribution of functions between the State and the Regions. The Regions were assigned the economic-production function, hence the valorisation of forest goods, while the State was

¹ Decree of the President of the Republic D.P.R. 15.1.1972, no. 11.

² Judgement of the Constitutional Court 18.4.2008, no. 15.

recognised as having the competence in the protection of the environmental and landscape functions, the orientation and coordination of regional activity, and participation in discussions relating to international agreements and the policies of the European Union (Abrami 2017, Stefani 2019).

Another factor that deeply affected the transformation of forestry policies in Italy was the economic crisis of 2008 and successive reductions in the budgets and public funding destined for the forest sector (Secco *et al.* 2017). In this geopolitical context, the Framework Programme for the Forest Sector (*Programma Quadro per il Settore Forestale* – PQSF) was introduced, which for the first time in Italy integrated individual regional plans into a single national forest strategy (Romano 2019). Due to the financial crisis and the consequent cuts in public funds, the resources initially planned faded away and the PQSF became a mere statement of intent. It was only through the Programmes for Rural Development (*Programmi di Sviluppo Rurale* – PSR) and the relevant regional tools that the PQSF was converted into implementing policies.

In 2018 the system of national forestry policies took an important step forward with the approval of a regulation on forests and forest supply chains – Consolidated Text on Forests and Forestry Chains (*Testo Unico in materia di Foreste e Filiere forestali* – TUFF)³. According to this law, it is the State that defines the national strategic guidelines that regional planning should follow.

At national level, there are many actors involved in the forestry policy process (Secco *et al.* 2017). The analysis of these actors is therefore an essential starting point for redefining new and effective strategies. Figure 2 illustrates

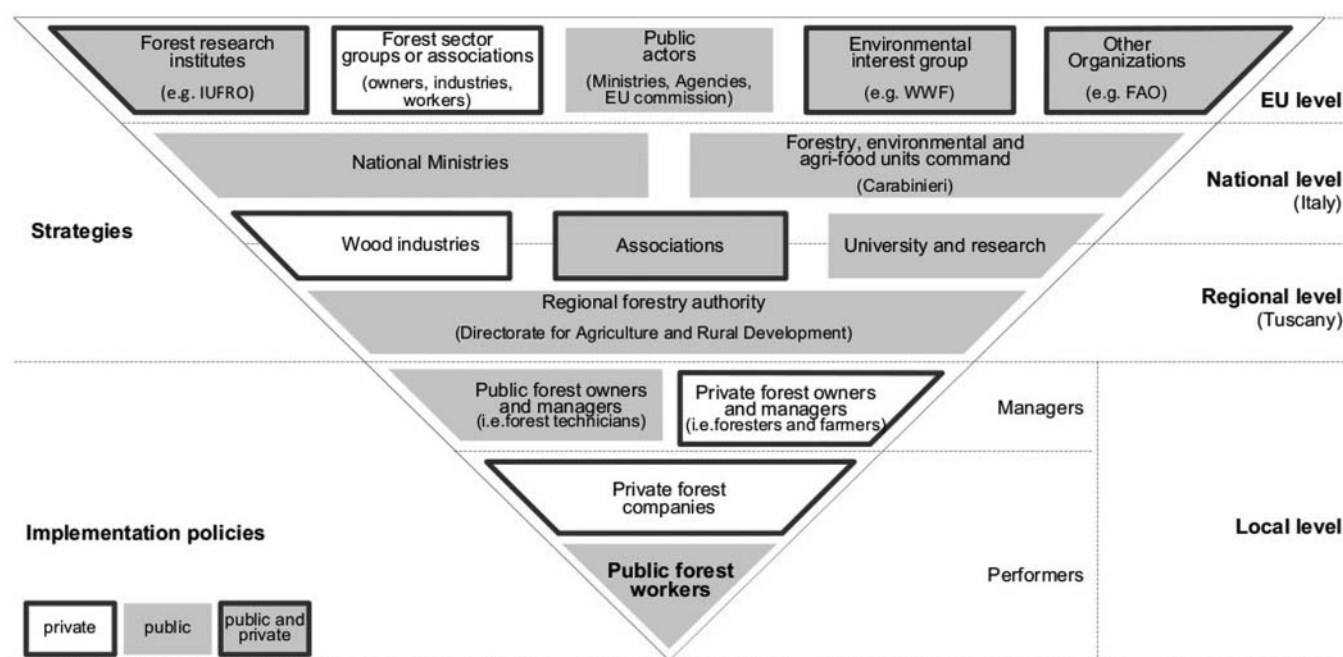
the scheme of the hierarchical relationships and the competences of all the actors involved in forest policies, from the European Union to the local bodies delegated to implement forest policies.

CASE STUDY: THE EVOLUTION OF FOREST REGIONAL REGULATIONS IN TUSCANY

Tuscany is the Italian region with the greatest forest cover (RafITALIA 2019). More than half of the region's territory is covered with woods (52%) with an overall forest area of 1.2 M ha (RafITALIA 2019). Of this area, 109 785 ha forms the Regional Forest and Agriculture Heritage (*Patrimonio Agricolo Forestale Regionale* – PAFR), of which about 90% is occupied by forest areas and less than 10% is represented by agricultural surfaces, pastures and other uses (RaFT 2019). The PAFR is divided into 52 Forest Complexes which are managed by 23 public bodies named Local or Delegated Agencies. The management of these contexts is entrusted to forest technicians and workers, whose staff have undergone significant cuts over the past few decades – from 1400 workers in the 1990s to 448 workers in 2018 (Figure 3). Public forest staff of Local Agencies are employed in the management, surveillance and protection of the entire regional agro-forestry territory. They are engaged in a number of fundamental activities which affect both public and private areas such as controlling and extinguishing forest fires and restoring forest roads.

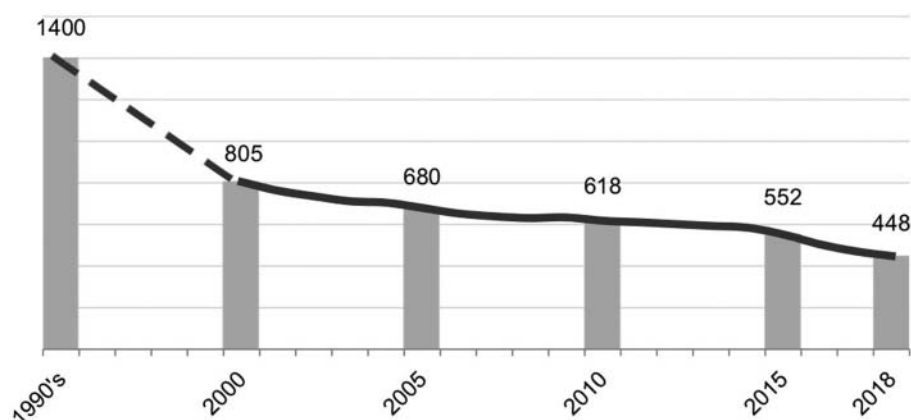
In the case study, we have analysed the impact that the evolution of regional regulations has had on the existing

FIGURE 2 Forestry policymakers and actors: from the EU to the local level. The scheme illustrates the hierarchy and the competences of all the actors involved in the forest policies, from the European to the local level



³ Legislative Decree (D.Lgs.) 3.4.2018, no. 34.

FIGURE 3 Dynamics of public forest workers in Tuscany from the 1990s to today



human capital (forest workers) in the Local Agencies, in terms of numbers and tasks carried out. The forest policy of Tuscany has always transposed to the Community guidelines and the national strategies of the sector by promoting the management and development of both public and private woods.

Among the latest instruments introduced in the forestry planning of Tuscany are:

- i) The Guidelines for the Forestry Sector and for the Management of the Regional Forests and Agriculture Heritage was financed in the 1995–2000 period, which provided for the allocation of resources based on parameters linked with the territorial characteristics and the forest activities performed. For the activities that generated receipts (e.g. sale of wood products, farm activities, etc.) and were carried out by public forest workers, the regulations provided that the Local Agency could withhold a share equal to 30% of these receipts (De Meo and Pagni 2005) while the remaining 70% was to be paid to the Regional Administration. In the late 1990s, the forest workers corps numbered some 1400 staff members.
- ii) With the institution of LR 39/2000 for the 2001–2005 Regional Forest Programme the law provided that each Local Agency could withhold a share equal to 50% of the receipts generated by activities carried out by its own direct labour. The new programme defined through territorial parameters 700 as the optimum total number of forest workers for the Tuscany Region.
- iii) The 2007–2011 Regional Forest Programme modified the parameters to estimate the ideal number of regional forest workers dropping to 622 individuals. The Regional Administration undertook to finance approximately 70% of the average annual cost for only 622 optimal workers (€21 944/year/per person).
- iv) The Regional Agriculture and Forest Plan (*Piano Regionale Agricolo Forestale* – PRAF) 2012–2015 is currently in force. The law eliminated the parameters used to define the optimum number of forest workers. Regional funding no longer provides funds based on the number of workers hired by Local Agencies which can withhold 100% of the proceeds obtained from direct-labour activities.

MATERIALS AND METHODS

Considering the absence of a single official instrument for the quantitative and qualitative analysis of the forest activities at both regional and local level in Tuscany, a survey was conducted via questionnaires. The survey was designed to determine a profile of forest workers and of their activities in the regional territory. The questionnaires were administered to all 448 forest workers currently working at the Local Agencies of Tuscany.

The study was carried out using on-line questionnaires in order to reach the maximum number of forest workers rather than a limited sample selected a priori. The open source software (Google Forms) used to process the questionnaire resulted in the production of different layouts that facilitated the interviewees' understanding of the questions asked (Manfreda *et al.* 2006). To facilitate and accelerate the questionnaire completion, we mostly employed single or multiple closed-end questions, in which it was possible to select one or more answers among those listed. This type of question makes it possible to obtain a higher percentage of answers compared to open-ended questions (Reja *et al.* 2003), and facilitates processing the final results in terms of statistical analysis (Slattery *et al.* 2011). In this way, it has been possible to collect both quantitative information (e.g. age, number of professional training courses attended, etc.) and qualitative information (e.g. gender and educational qualification).

A series of focus groups were organised with: forest technicians engaged by the Delegated Agencies, civil servants of the forest sector of the Regional Administration of Tuscany, and experts of the study group to which this research had been entrusted. Additionally, 13 meetings involving technicians and forest workers were organised at seven of the 23 Tuscan Local Agencies. The meetings were directed at defining the various typologies of forest territory in Tuscany, at identifying the activities performed by forest workers in public and private forests and at an assessment of the strengths and weaknesses due to the recent trend of reduction in the number of public forest workers as a result of the evolution of regional forestry instruments. The questionnaire opened with a request for information about personal and professional profiles (e.g.

professional qualification, workplace, activities carried out). Subsequently, a couple of sections investigated the relationship between the tasks currently performed and the activities that forestry operators would prefer to carry out on their own territory. The interviewees, considered to be good interpreters of the needs of the situation, were asked to express these preferences in relation to their qualifications and the needs of the territory. Then, followed a survey on the machinery and equipment provided for carrying out forestry activities and on the participation and satisfaction of the vocational training courses offered by the Regional Administration of Tuscany. The final section contained the only open question of the questionnaire which had the purpose of soliciting suggestions and proposals for a better management of forest workers and territories.

Based on research and a preliminary inspection, the forest activities (Table 1) covered by the survey conducted via

online questionnaires were determined. These included not only the activities provided for in the regulations in force (principal activities), but also those practiced in different local contexts which are under no normative constraint, such as the support to tourism activities or the protection and valorisation of underwood products. This latter type of activities will subsequently be referred to as multifunctional activities (Table 1).

As we were taking into consideration a very extensive work period it was not possible to establish the precise number of hours dedicated to each single activity. Therefore, a quality scale was used, which enabled the individual interviewees to express the frequency of different types of forest activity. A conversion operation (Clarke *et al.* 1992, Hamm 1991, Mosteller and Youtz 1990, O'Brien 1989) was used to translate the linguistic expressions into numerical quantifiers of frequency.

TABLE 1 *Types of activities in which public forest workers are employed*

Category	Activities	Examples	Public interest	Private Interest
Principal Activities	Forest Water Management	Consolidation of slopes, directing flow of streams	X	X
	Reforestation	On areas that have been burned or struck by pathogens	X	
	Roads and Pathways	Ordinary maintenance, cutting new tracks, maintaining roads, AIB	X	X
	Forest Management	Silvicultural operations (e.g., cutting woods); interventions aimed at defence of health (e.g. cutting and care of crops)	X	
	Phytosanitary Protection	Fighting pathogens	X	X
	Forest Nursery Management	Cultivation and distribution of forest seedlings	X	X
	Forest Firefighting Service (AIB)	Firefighting patrol, actively fighting fires and reclamation operations	X	X
Multifunctional Activities	Collaboration in scientific research activities	Inspections, censuses, and monitoring	X	X
	Collaboration in topographical surveying activities	Inspections to draft technical maps	X	X
	Support to tourism-hiking activities	Signs, cutting paths, accompanying groups	X	X
	Maintenance of urban green areas	Trimming trees in public green areas	X	X
	Support in developing the wood supply chain	Processing, transporting and sale of forest products	X	X
	Support in developing the fuelwood supply chain	Collection, processing, transport, and sale of forest biomasses	X	X
	Support in animal farming, agricultural or nursery activities	Raising breeds in danger of extinction, cultivating farmland belonging to the public heritage	X	X
	Support in activities that transform animal farming, agricultural or nursery products	Production and sale of milk or by-products or typical local farm products	X	
	Recovery of forest topsoil damaged by atmospheric events	Recovery of woody material from the ground, reforestation	X	X
	Protection and valorisation of underwood products	Census and safeguarding natural truffle grounds	X	X

Before submitting the questionnaires to all the Delegated Agencies it was found useful to evaluate the adequacy of the instrument devised, subjecting it as a pilot test to the group of forest sector experts and to a sample of individuals employed by several Local Agencies. The results of this check made it possible to validate the questionnaire, verifying the correctness of the contents and the comprehensibility of the questions (Van Teijlingen and Hundley 2002). The questionnaire data was collected in the span of three months (from 10.10.2018 to 02.02.2019).

RESULTS

The questionnaire survey, together with the results achieved with the focus group conducted with forest experts and technicians, proved to be an effective method to reconstruct a picture of the forest policies implemented at local level through the efforts of public forest workers. The questionnaires (202) collected the answers of 45.1% of the forest workers which can be considered a representative sample of the group that was analysed (data provided by the Forest Workers Fund-Cassa Forestale Regionale which indicated 448 forest workers on 31 December 2018). The replies to the questionnaires came from 19 of the 24 management Local Agencies present in Tuscany. The questionnaire is provided at the following link: <https://forms.gle/L5i7QEzTFhXnr1vq5> (Italian version).

Personal Information

The results point out that the average age of the forest workers is 50 years and more than 22% of them will retire over the next 5 years. Ninety-two percent of the workers have carried out their activity in the forest sector for more than 10 years. This means that these workers have a high level of experience and knowledge of the territory, which is essential to train new workers and ensure a sound defence of the agro-forestry territory (Table 2).

Current activities and expectations from forest work

To better understand what activities were performed as direct-labour operations and what their corresponding annual commitment had been, participants were asked to indicate the frequency with which the principal and the multifunctional activities were practiced. Based on the statements collected, and transforming the qualitative evaluation into a numerical value (Clarke *et al.* 1992, Hamm 1991, Mosteller and Youtz 1990, O'Brien 1989), it emerged that the principal activities were forest water management, forest firefighting service, maintenance of the forest road network, and forest management, while the distribution proved more homogeneous for the multifunctional activities (Table 3). The priority of the time available (more than 60%) is dedicated to those functions that the Regional Agriculture and Forest Plan assigns to the Local Agencies through the work of public forest workers.

TABLE 2 *Personal Information of forest workers*

Years to retirement	Percentual of workers	Years employed in the forest sector	Percentual of workers
More than 10 years	46.6%	Less than 10 years	8.0%
From 5 to 10 years	31.1%	From 10 to 20 years	46.0%
Less than 5 years	22.3%	From 20 to 30 years	19.3%
		More than 30 years	26.7%

TABLE 3 *Frequency of time currently devoted and time that workers would like to devote to principal and multifunctional activities*

Principal Activities	Devoted time	Time for the Future	Multifunctional Activities	Devoted time	Time for the Future
AIB Services, extinguishing fires	13.8%	8.1%	Animal, agricultural, and nursery activities	1.9%	2.6%
Forest management	10.9%	8.6%	Damage due to atmospheric events	8.7%	6.6%
Forest water management	13.6%	7.6%	Fuelwood supply chain	4.8%	5.1%
Management of forest nurseries	2.4%	4.0%	Maintenance of urban green areas	5.0%	4.2%
Phytosanitary protection	2.3%	3.1%	Products from the underwood	2.4%	5.3%
Reforestation	4.5%	4.5%	Scientific research	3.4%	6.6%
Roads and paths' networks	12.8%	11.1%	Topographical surveying	2.8%	5.3%
			Tourism-hiking activities	4.8%	9.4%
			Transformation of products	1.0%	2.0%
			Wood supply chain	4.9%	5.9%
Total frequency of time	60.3%	47.0%	Total frequency of time	39.7%	53.0%

On the other hand, a significant importance (about 40% of the time) is attributed to the category of multifunctional activities. In fact, given the significant reduction in public funds available for the forest sector, the Delegated Agencies were forced to activate multifunctional income-generating activities, such as the sale of forest products or local farm products, and guided hikes (Table 1).

Examining Table 3, it is possible to notice that the interviewees would prefer to dedicate much more time to the multifunctional activities than what their job currently involves. Based on what emerged during the talks with the personnel of the Delegated Agencies, it seems clear that the expectations expressed by the interviewees were conditioned by the fact that the activities most closely tied to the forestry delegation “do not produce income for the Delegated Agency” (as many interviewees stated) and effectively become unsustainable from the financial viewpoint. In other cases, the scarce supply of vehicles and equipment influences the decisions of the interviewees and prevents carrying out several activities.

The analysis of regulatory instruments has stressed that until the end of the ‘90s the Delegated Agencies had the possibility of retaining only 30% of the income made, against a conspicuous availability of public resources. With the updating of the legislation, first in 2001 and then ten years later in 2011, the percentage of retainable income rose to 50% and 100% respectively, while at the same time the public funds available radically decreased. In fact, the results of the survey show that multifunctional forestry activities, which are the only ones to bring income, will take more and more space following the trend already traced by the evolution of the legislation.

Mechanization level and vocational training courses

Figure 4 reports the presence of vehicles and equipment within each Agency under analysis. The results point out that apart from the widespread presence of several machines

essential to perform basic forest work (e.g., chain saw, hedge trimmer), there is a scarce supply of more professional machinery, such as harvesters, yarders, and skidders. The current low level of mechanization is one of the most significant consequences of the scarcity of funds made available to the Delegated Agencies. This implies that in some cases, e.g. forest maintenance activities, it is necessary to resort to private companies which usually have a greater availability of expensive and technologically advanced machinery. However, entrusting the management of public functions to private enterprises is often imprudent, since the objective of private income prevails over that of public interest (De Meo and Pagni 2005).

Another important aspect is the monitoring of the participation frequency of forest workers in training courses which allows us to assess the professional expertise they have acquired. The survey revealed that more than 70% of workers participated in more than 10 vocational courses since they were hired in the forest sector. It is important to stress that the continuing education of workers allows them to operate with a high degree of competence, efficiency, and above all in safe conditions at forest worksites. Indeed, it has been demonstrated that in Italy public workers have shown a significantly lower level of unsafe behaviour in forest sites and a low rate of fatal injuries, thanks also to effective professional training and a high level of experience in the sector (FAO and UNECE, 2020). In particular, the survey points out that more than 40% of participants took part in vocational training courses connected with the principal activities provided by the forest Agencies, with participation rates higher than 58% for courses on driving forest firefighting vehicles, core tasks for worksites, workplace safety (Table 4).

In order to structure an efficient vocational training program, it would be useful to deepen the preferences expressed by the workers with respect to the various forestry activities (Table 3). In fact, on the one hand this data expresses personal skills and attitudes of the workers and on the other the needs

FIGURE 4 Availability of vehicles/equipment at Local Agencies. Percentage of Local Agencies where the vehicles/equipment are present

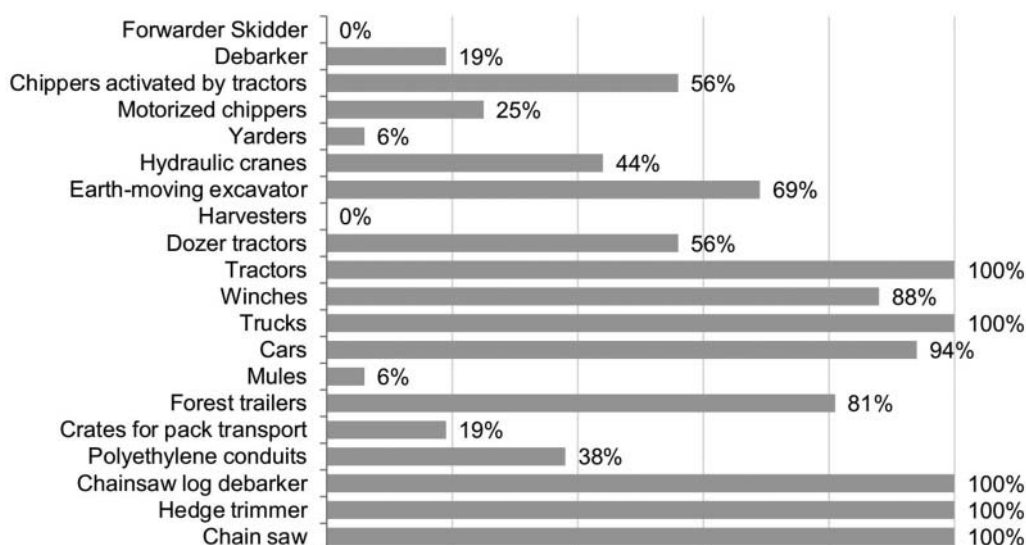


TABLE 4 *Participation in the different typologies of vocational training courses*

Course Typology	% of Participants	Public and Private interest
Driving courses for AIB vehicles	78%	X
Course of basic tasks at worksites	66%	
Course on workplace safety	58%	
Basic course for forest and volunteer workers	49%	
Course of advanced tasks at worksites	40%	
Prescribed burn course	37%	X
Course on the use of the chain saw in AIB environment	31%	X
Course for group manager	25%	
Course on coordination assignment	22%	
Course on work orientation	21%	
Basic course for director of AIB operations	16%	X
Course for strategy analyst in AIB firefighting	5%	X
Basic course for look-outs and operations room staff	5%	X
Course for environmental-hiking guide	3%	X

identified in the local area of which the workers themselves are excellent connoisseurs.

Suggestions for a better management of forest workers

In the final section of the questionnaire, workers were asked to indicate their opinion about possible interventions to improve the management of the agro-forestry territory and of the forest workers themselves. The following suggestions of the forest workers largely coincide with those obtained from the focus groups:

- i) increase the turnover process in order to renew the class of forest workers;
- ii) not outsource public interest activities (such as forest management or road maintenance) to private companies;
- iii) allow the continuous updating of practices and technologies employed in the sector with a constant offer of vocational training courses guaranteed by the Public Administration;
- iv) renew and increase the number and quality of vehicles and equipment for forest operations.

DISCUSSION

After a careful review of EU forest strategies, this paper examines the evolution of regulatory instruments which are implemented at national and regional level. The objective of the decentralization process that took place in Italy during the 1970s was to enhance the principle of subsidiarity. According to this principle, the closer the relevant authority and the area to be managed, the greater the effectiveness of the action undertaken (Secco *et al.* 2017). However, this territorial

principle has entailed a number of problems due primarily to the lack of coordination that characterises the forestry policy sector starting with the highest European level (Winkel *et al.* 2013) which led to a gap in the bottom-up verification of forestry strategies. In fact, there is no established tool that, starting from local implementation instruments, provides feedback on the validity of higher-level management policies.

The profound changes in regional policy decisions have led, over the past decades, to the complete autonomy of the Local Agencies about the way of implementing forestry delegation. Therefore, it is important to gain an overview of the organisational structure of public forest workers, considering their qualification and vocational training, the functions they perform, the work environment and the available equipment. According to Falcone *et al.* (2020), there are two main elements undermining the Italian forestry sector: on the one hand, the inconsistencies of the national and regional political framework, disconnected from the local governance; on the other, the reduction in the number of forestry workers.

A further fundamental step in understanding the evolutionary dynamics affecting the Italian forestry sector is the 2008 economic crisis (Secco *et al.* 2017). The drastic reduction in public funding in all sectors was the immediate consequence of the crisis which resulted in a low level of mechanization and consequently to the need to resort to private companies for the execution of public functions. In fact, private companies tend to make large initial investments to improve their technological competitiveness. However, as emerged from the focus groups comprising forestry experts and technicians involved in the research, almost all private forestry companies employed in Tuscany come from territorial contexts that are often dissimilar or even outside the Region. Therefore, knowledge and supervision of the territory offered by public forest workers becomes essential to ensuring a quality service. This public-private compromise could be an effective option.

Among the possible solutions, Italy has adopted the Forestry Consortia, which are mixed companies in which public forest owners and private cooperatives collaborate (Carvalho Mendes *et al.* 2006). Nevertheless, ensuring the public function would require greater supervision by public workers and a subsequent increase in the number of public sector employees. Indeed, the current critical condition is a consequence of the reduction in the number of public forest workers who, in Tuscany for example, have gone from 1400 workers in the 1990s to less than 450 currently. For these reasons, Delegated Agencies are confronted with administrative and management problems in identifying the most effective and financially sound means to carry out the work foreseen in their delegation.

There are, however, several activities that cannot be outsourced and must necessarily remain under the control of public authorities, while affecting both public and private areas. An example is the forest firefighting service for which the interest of public protection must prevail over that of profit, which is an intrinsic characteristic of private companies. In addition, the results of this study have also shed light on the importance of recognising public forest workers as civil servants and of the implicit danger of losing professional skills in the forestry sector. This occurs especially when, faced with a considerable number of outsourced operations, public forest workers are directed towards less qualified jobs that are not closely related to forest management but merely linked to the budgetary balance. Another problem is the limited availability of vehicles and equipment and their progressive deterioration that cannot ensure efficient forest worksites. For these reasons, Local Agencies are increasingly compelled to outsource the activities that require high mechanization, so that they can engage in more profitable activities that require only basic vehicles and equipment; these include tourism or selling of wood products, which divert Local Agencies from the main forest activities prescribed by the regulations in force.

An in-depth analysis of regional regulations revealed that public resources allocated to Local Agencies have undergone a significant reduction over the years, while an increasingly higher percentage of the income collected can be retained by the Agencies themselves. This obviously induces Agencies

to concentrate more resources, in terms of public workers, mechanical means and time, on more profitable jobs. However, it is nevertheless also true that these multifunctional activities are useful for the purpose of enhancing the territory and the forest sector.

CONCLUSION

In Italy, the implementation of European forest strategies involves public forest workers to a large extent. The present study is an effort to build a picture of the structure of public forest employment in order to identify its strengths and weaknesses upon which to focus action (Table 5). Indeed, the entire Italian territory is characterised by regional systems which rely not only on private companies, but also on public forest workers for the implementation of those forestry functions more connected to public utility, such as safety and protection of the territory. Therefore, the case study of Tuscany presented in this study provides a rough indication of the possible dynamics that are also occurring in other Italian regions.

A key emerging priority which applies both to other Italian regions and to different European contexts, is the absence of a monitoring system to verify the effectiveness of forestry policies at local level. The study undertaken has a mainly descriptive validity; in fact it aims to analyse an evolution currently underway that concerns the main executors of forestry policies, i.e., public forest workers. The investigation targeted at these subjects aims to provide information that can be used to analyse the causes of the phenomenon and its possible consequences. A possible evolution of the research could be the creation of a monitoring tool based on the information collected. In this way it will be possible to analyse and predict the possible scenarios that will be generated by current forestry policies with a view to enhancing the available resources.

Yet this study has some structural shortcomings that could be solved by future research insights. First, the case study analyzed necessarily reflects the peculiarities of the history and territory of Tuscany. Therefore, although the structure of the analysis proposed at the local level remains valid, the

TABLE 5 *Forestry strategy implementation at local level linked to public forest working staff. Assessment of the strengths and weaknesses of Local Agencies with respect to forestry strategies*

Strengths	Availability of forest working staff with high knowledge of the territory
	Availability of forestry personnel with a high level of professional training
	Involvement of public operators also in the management of private territories
	Increasing trend in multifunctional activities both public and private territories
Weaknesses	Limited availability of financial resources
	Negative trend in the number of forest workers
	Low level of mechanization of Local Agencies
	Need to outsource the main activities related to public contexts
	Need to make income in order to ensure the economic sustainability of the Local Agency

results collected refer to the particular case under consideration, although it cannot be excluded that some dynamics may recur in similar territorial situations. Therefore, such an analysis should be extended to very different regional realities in order to have a useful and in-depth national framework on the current condition of Italian public forest workers. In addition, a more in-depth investigation could concern the exact number of hours devoted to each individual activity carried out by public forest workers. Furthermore, a deeper knowledge of the subject would be possible by involving other stakeholders in the monitoring of the forestry sector, including public technicians and private companies. Finally, it would be useful to further investigate both the evolutionary dynamics of public funds invested in the forestry sector, in relation to the trend in the number of workers, and the effectiveness of the activities undertaken by each Local Agency through a system of expenditure and efficiency indicators.

In conclusion, the outcomes provides core information for a first analysis on the status of management of forest territories at the local scale. The proposed study constitutes a starting point for the definition of a permanent monitoring system that allows constant verification of the correct implementation of European forestry strategies and national policies. In fact, only by analysing the effectiveness of the specific forestry activities carried out at the local level, is it possible to report suggestions and proposals for a better definition of forestry strategies and policy at a higher level, first national and then European. Among the actors involved in the forest governance process (Figure 2) particular attention should be given to public forest workers, who should be consulted for the constant monitoring of the forest system. The reconstructed framework constitutes the natural support for the development of a decision-making model aimed at promoting the management optimisation of the forest heritage and the human and financial resources invested.

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