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The Red Palm Weevil in the City of Bari: A First Damage Assessment

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Abstract: *Phoenix canariensis* Chabaud (Canary Palm) is one of the most distinctive landscape elements of several coastal urban centers in Italy. However, over the past few years, international trade has increased the risk of the introduction of *Rhynchophorus ferrugineus* (Red Palm Weevil) in the country, causing the death of numerous plants. In this work we assessed the damage caused by the insect to Canary Palm in the City of Bari, Apulia Region, furnishing useful information to decision makers and communities for proper preservation measures in favor of this important urban-green resource. The findings shed light on effective and efficient spending strategies of public funds for urban green inside areas affected by the Red Palm Weevil, also based on cost-benefit approaches.

Keywords: *Rhynchophorus ferrugineus*; Coleoptera; Curculionidae; *Phoenix canariensis* Chabaud; Arecaceae; chemical pest control action; urban greeneries

1. Introduction

Over the past few years, the international trade of palms has increased the risk of introduction of *Rhynchophorus ferrugineus* (Olivier, 1790), namely the Red Palm Weevil (RPW), in Italy. The presence of RPW in the country dates back to 2004 and concerns the infestations of *Phoenix canariensis* Chabaud, the Canary Palm, in the coastal regions and islands, causing the death of a large number of trees. Nowadays this phenomenon increases the risk of extinction of Canary Palm in the urban centers, and jeopardizes a distinctive landscape characteristic of the Italian coastal areas.

Canary Palm is one of the most representative cultivated ornamental species of the world. It got a status symbol rank in South Europe starting from the mid-nineteenth century, and was often pictured and described thanks to its typical appearance by postcards, paintings, landscape historic illustrations, photographs and written records [1].

RPW entered Europe in 1993 from Spain [2] and invaded all the Mediterranean countries hosting Canary Palms. The impact of the weevil on this species in historic and cultural urban areas is well depicted by Reference [3]. Pest-plant symbiosis damages are in part due to RPW-associated bacteria [4–6], but mostly are a consequence of the ectosymbiotic bacteria contaminating the eggs during their route through median oviduct [7] and released at egg laying [8] on the egg and on the walls of the egg chamber [7]. Pest infestation starts with egg laying in tender or recently-wounded host plant tissues, and the pest completes one to three broods inside the Canary Palm before its death. The first brood is asymptomatic and first damages appear during the second brood as leaflets and midribs cuts given by grubs infesting near-meristem plant tissues. Stipe rotting and palm death is a consequence of bacteria propagated by weevil grubs [9] that entomopathogenic fungi cannot stop [10]. Time from infestation to palm collapse is about one year in European countries. RPW is also the key pest of *Phoenix dactylifera* L., the Date Palm, which the weevil still damages in respective date producing countries [11]. Luckily, European Date Palms seem to be less damaged by RPW, which instead prefers Canary Palms in the area.

With regard to the RPW outcome on palms, the interaction among this insect and its host plants mostly results in infestation, which appears different depending on the host-plant species. Infestation on Date Palm is often sprout or flower-pruning related. In Canary Palms, the preferred egg laying sites are the areas of wounds present on most tender leaves or due to leaf pruning and pruned petiole. Coconut palm RPW is mostly driven or accompanied by Rhinoceros beetle (*Oryctes rhinoceros* (Linnaeus, 1758)) action [12–15].

In order to contain the impact of RPW, suitable management and preservation measures are desirable for the urban landscape, which is a key element of individual and social welfare [16]. In this connection, RPW is subject to extraordinary measures of compulsory pest control at an EU and a national level (European Commission's decision 2007/365/CE and ministerial decree of 7 February 2011). In brief, these measures concern specific regulations for the trade of Canary Palms in the national territory, as well as interventions concerning time and intensity of pruning, pest control and sanitation, in order to contain the infestation. However, at urban scale, such actions, which require public funds, should be implemented after a cost-benefit approach, concerning the assessment of both the ornamental value of the target species and the respective treatment costs [17]. Moreover, the ornamental value is requested for accidental (climatic events, diseases, road accidents, etc.) or intentional damage (roadworks, construction of new buildings, etc.) in order to establish a fair compensation to the owner (public or private) of trees. For decision-making, these valuations can be used in broader cost-benefit analyses, providing better information about the expedience of urban green management.

The work aimed at the assessment of the ornamental value which was lost for the action of RPW to Canary Palm in the City of Bari, Apulia Region, where this plant was introduced about two centuries ago, and nowadays represents a distinctive element of the urban flora, especially in the historic area. In particular, in Bari the insect caused the death of 164 Canary Palms up to 2014, risking modifying definitively the urban landscape. However, this negative trend was interrupted through efficient preventive and protective chemical pest control actions [18], overall focused on the trees of the historic area. Noteworthy is that control effectiveness is pest-host plant dependent and related to the damage severity. The RPW infestation on coconut and date palm is not so lethal as it is on Canary Palm, because of differences in the anatomy of palm species. The devastating bacterial rotting that kills Canary Palms are not observed in coconut or date palms. Moreover, cultivated ornamental Canary Palm appears to be more susceptible to microorganism's invasion compared to other economic palms [9,19]. Moreover, based on the preservation strategy set by the regional action plan (Official bulletin n. 24 of 02.16.2012), the study assessed the costs for the preservation of the remaining Canary Palms in the city. Thereby useful information can be used on the expedience of the preservation strategy in force, since uncertainty involves a wide share of decision makers and dwellers about the expenditure of public funds for this urban tree species.

This paper contributes to the literature in two ways. First, no applied economic study has investigated the monetary damage by RPW to urban Canary Palms in general, and in Italy in particular. Second, this study adds to the growing literature that employs preservation strategies for urban landscape. Findings have implications for debates concerning the wellbeing in the urban centers of the Mediterranean areas and associated costs and benefits, checking the suitability of the conservation strategies in force and allowing the definition of ad hoc and cost-effective programs.

2. Material and Methods

The Ornamental Value of Urban Trees

For urban tree valuation, the capitalization methods take into account all the management costs of trees, and plants are considered as an investment over time [20–22]. They are the most objective and suitable methods for the assessment of total damage. However, they do not take into account the nonmonetary functions of urban trees and have the objective difficulty of choosing the most appropriate interest rate, for which small deviations can cause large variations in the assessment. In addition, these methods require the use of skilled operators. These limitations have contributed to the development of parametric methods, which are based on the quantification of several variables (species, location, condition, size, population density, accessibility, safe life expectancy, etc.), then combined with a monetary value, i.e., the unit nursery value of the plant. The most used methods are: Council of Tree and Landscape Appraisers (CTLA)—United States [23]; Standard Tree Evaluation Method (STEM)—New Zealand [24]; Helliwell—Great Britain [25,26]; Burnley—Australia [27,28]; Capital Asset Value for Amenity Trees (CAVAT)—Great Britain [29,30]; Norma Granada—Spain [31]; Swiss—Switzerland [32,33].

Simpferdorfer [34], Fabbri [35] and Caballer [36] indicate that the capitalization methods are more widely accepted within the private sector. The parametric methods, instead, are better suited within the public sector owing to their simplicity and efficiency. Furthermore, the European parametric methods underline the aesthetic, cultural and historic importance of trees, introducing the concepts of ornamental and distinctive tree [37] so that the intrinsic value of plants goes beyond their functional uses.

In order to assess the ornamental damage caused by RPW to public Canary Palms in the City of Bari, we used the modified Swiss method and the CAVAT method. As aforesaid, they introduced new concepts concerning the nonmarket amenities of urban trees, i.e., ornamental, historic and distinctive tree, in the assessment approach. These methods inspired the assessment criteria of the urban green plans for the most important Italian cities (Turin, Milan, Parma, Bologna, etc.). Furthermore, these methods are complementary on the importance given to several aspects of trees. In particular, the modified Swiss method focuses on their intrinsic characteristics, i.e., size and vegetative and health conditions, while the CAVAT method gives importance to their extrinsic characteristics, mainly location and amenities. Hence, their complementary use can ensure a wider and complete assessment of the ornamental value.

The method developed in Switzerland [32] and implemented in France [38], is based on the following indices:

1. aesthetic-health index (I_a): it regards the aesthetic, vegetative and health characteristics of the tree, as well as its position compared to other plants (isolated tree, row or group trees, etc.); it varies between 1 and 10;
2. position index (I_p): it affects the location of the plant (downtown, suburban areas, rural areas, etc.). It varies between 6 and 10;
3. size index (I_s): it is related to the circumference of trunk measured at one meter above the ground and expresses both the increase in value depending on the age of the tree and the reduced chance of survival for the older plants;
4. price (P): it is 1/10 of the market price of a plant with a trunk circumference of 10–12 cm measured at one meter from the ground for broad-leaved trees, height of 150–175 cm for conifers or height of 120 cm for shrubs. It refers to economic, ornamental, botanic and agronomic features (rarity of species, difficulty in growing, etc.).

The product of the above indices gives the ornamental value of the tree, namely:

$$V = I_a \cdot I_p \cdot I_s \cdot P \quad (1)$$

The Swiss method, due to its convenience, has been widely adopted in several European countries. However, Pirani and Fabbri [33] developed a variant of the model, more suitable to the tree species of the Italian urban areas. This version, initially tested on the damaged plants in the public parks of Milan City and now included in the regulations for the public and private green of numerous Italian cities, is based on different rating scales for the aesthetic-health index (I_a) and the position index (I_p). In the first case, it accentuates the smaller importance of plants with little or no vigor and assigns a higher value to the trees in row. For the second aspect, the Italian version weights better the location of plants inside and outside urban centers. Furthermore, it considers the increase of the tree-planting and maintenance costs from suburban to historic areas.

The CAVAT method [29,30] calculates a unit value for each cm^2 of stem from the cost of a new standard tree. This value is then adjusted by location, accessibility, social value and appropriateness, functionality (based on the crown size and biological conditions) and life expectancy. The adjustments, which can be appreciations or depreciations, measure the impact of the factors contributing to the public benefits. The CAVAT method consists of five steps:

1. Basic value (*Bv*): it is the product between the size of the trunk area and the unit value factor (UVF); the UVF represents the ratio between the full cost of a new planted tree and its trunk area, and has two components: The nursery price (or unit area cost) expressed in cost per square centimeter of stem, and the planting cost, which includes transport, materials, first care and management costs;
2. CTI value/location/accessibility (*CTIv*): it adjusts the basic value by a Community Tree Index (CTI), which is based on the population density of the territory in which the tree is located (0%–250%); hence the CTI value is further discounted up to 60% depending on the public accessibility or visibility of the tree;
3. Functional value (*Fv*): it is obtained reducing the CTI value/location/accessibility according to the functionality of the tree (0–1); it requests expert judgements about the biological performance of the tree by comparison with a hypothetical and well-grown healthy tree of the same species, thickness and location;
4. Amenity value (*Av*): the functional value is adjusted by special amenity factors (positive) or if the tree is seriously inappropriate for its location (negative). This combined adjustment can be up to ±40% (10% for each amenity factor, other than veteran/ancient trees: 30%). Suggested categories of amenity factors are: Townscape and visual importance (e.g., integral part of a landscape), national or local importance (e.g., a commemorative tree or tree in a conservation area), species characteristics (e.g., rare or unusual species, shape, etc.) and nature conservation (e.g., wildlife importance, veteran/ancient tree). The inappropriateness of the tree, instead, could be related to obstruction of spaces, production of squashy fruits, damage to footpath, etc.;
5. Safe Life Expectancy value (*SLEv*): it is estimated by adjusting the amenity value on the basis of the Safe Life Expectancy (SLE), trees with a SLE greater than 80 years retain 100% of their adjusted value, whereas those with a SLE of less than five years lose 90% of their adjusted value.

In summary, the final formula is:

$$V = Bv \cdot CTIv \cdot Fv \cdot Av \cdot SLEv \quad (2)$$

Obviously, in case of removing, it is necessary to add further costs, namely:

(a) costs for the uprooting and removal of stumps and radical residues;
(b) costs for buying and planting new trees;
(c) costs for irrigation systems and first maintenance;
(d) costs for the restoration of constructions and street furniture.

The study used the data of the Urban Forestry Department of the City of Bari and the Bari Multiservizi, this last the public/private company managing public greeneries in the city. In particular, the parameters considered by the two methods were measured by technicians in charge of the urban green monitoring. Noteworthy is the insignificance of the period of data collection concerning the affected trees. For the infestation staging steps, the pest biology and damage phenology, palm surgery is an expensive and quite urgent and difficult-to-perform-action. Therefore, independently from the year, time of year and approximate time per tree, such an information is unnecessary for the RPW behavior and the cryptic first two broods inside the palm stipe.

In general, the measurement of most of these parameters does not cause specific difficulties, as based on the tabular coefficients furnished by the methods themselves. However, a certain degree of subjectivity can involve the quantification of some parameters, as affected by the personal experience and opinion of the technician. This is the case of the aesthetic-health index for the modified Swiss method, and the Functional, Amenity and Safe Life Expectancy values, as well as location/accessibility adjustments, for the CAVAT method. On the contrary, other parameters do not generate troubles, i.e., the position (directly identified on the urban map) and size (i.e., the tree girth directly measured on plant) indexes for the modified Swiss method, and the CTI index (calculated through the urban demographic data) for the CAVAT method.

Canary Palm in the City of Bari is characterized by considerable differences among the districts in terms of size, age, life expectancy, but also level of infestation and intensity of the prevention strategy used. Therefore, the assessment of the ornamental value was carried out per district, in order to point out the heterogeneity of this species in terms of value, infection and damage in the city of Bari, and helping the municipal authorities for future targeted interventions.

Uncertainty in the assessment performance of the ornamental value could arise for these methods. As aforesaid, they could be characterized by high subjectivity in the choice of proper coefficients for several parameters. In addition, noteworthy is the price variable for both the methods, since the spread of the infestation during the investigated period caused a considerable variation of the market value of Canary Palm at nurseries. For these reasons, a Monte Carlo analysis was applied in order to avoid the determinism of the coefficients assigned to each characteristic. In particular, variation ranges of $\pm$25% for the price (defined by a survey market during the three years considered) and $\pm$10% for the other variables were set. The Monte Carlo analysis was applied by generating 1000 sets of ornamental values using a normal distribution for each district of Bari, with mean and standard deviation obtained from the sample data. Finally, the averages for each method were calculated from the 1000 sets generated, per district.

3. Results

3.1. Canary Palms and RPW in the City of Bari

Over an area of 100.6 hectares of public urban green, the most widespread species is *Pinus pinea*, with over 2000 plants, followed by *Quercus ilex*, *Pinus halepensis*, *Platanus acerifolia*, *Chamaerops humilis*. (Figure 1). In all nine city districts, *Quercus ilex* is the most widespread species, followed by *Platanus acerifolia*, *Pinus pinea* and *Pinus halepensis* (seven out of nine). Among the Arecaceae family, *Phoenix canariensis* and *Chamaerops humilis* are present in six of the nine districts, confirming their importance for the urban landscape.

Until 2014, there were 649 Canary Palms (Figure 2a,b), mainly concentrated in districts 9 (the historic urban center) and 4, but less numerous in suburban districts 5 and 1. In dimension terms, the higher trees are mostly concentrated in district 9, characterized by the presence of squares and public buildings with high historic and cultural importance, and 8, where Canary Palm is mainly used for its aesthetic value along the sea front. Overall, this species is an important element of the urban landscape in the City of Bari. It is present in almost all districts, and especially in the areas of historic, cultural and architectural prominence.

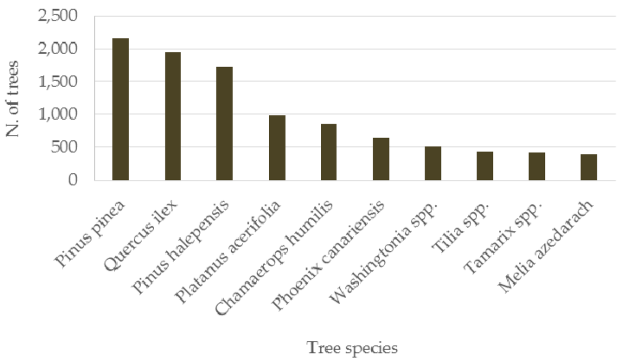

Figure 1. Main ornamental tree species in the City of Bari. Source: Urban Forestry Department—City of Bari, 2014 (Our data processing).

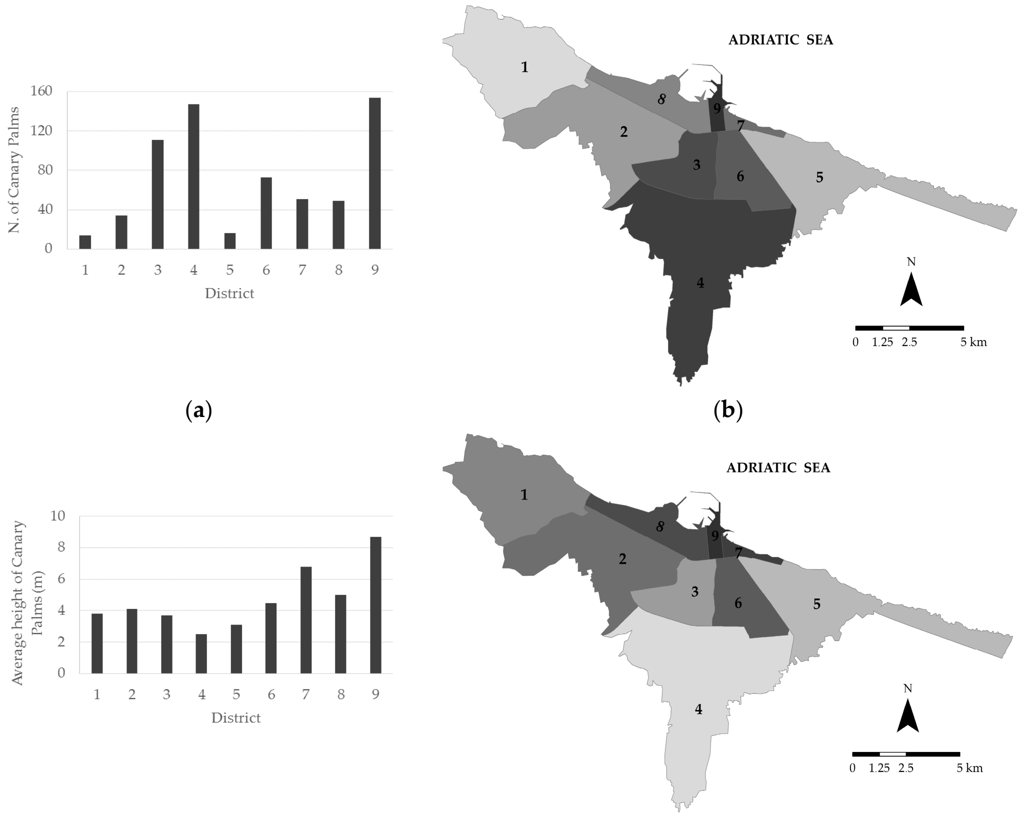

Figure 2. Number of Canary Palms, per district (**a**), and their spatial distribution in the City of Bari (**b**). Average height of Canary Palms, per district (**c**), and spatial distribution in the City of Bari (**d**). Source: Urban forestry Department—City of Bari, 2014 (Our data processing).

3.2. Damage Assessment

In the period 2011–2013 (Table 1), RPW has seriously jeopardized the survival of the Canary Palms, causing the death of 164 trees (25% of the total). In general, districts 2, 5, 6 and 8 were the most affected. District 8, i.e., the port and sea front zone, was the first one in which the infestation occurred, probably due to the arrival of the insect in the city through the maritime trade. On the contrary, in the historic district, 9, the trees survived for the suitable pest control carried out by the municipal authorities, which decided to focus the preservation strategy in the historic urban area.

Table 1. Ornamental values in the City of Bari for the removed and the remaining Canary Palms, per district (in thousands of Euros).

Distr.	Removed Canary Palms						Remaining Canary Palms					
	N.		Mod. Swiss (€)	Mod. Swiss (€) MC	CAVAT (€)	CAVAT (€) MC	N.		Mod. Swiss (€)	Mod. Swiss (€) MC	CAVAT (€)	CAVAT (€) MC
1	7	***	44.4	41.8	84.1	78.3	14	***	75.0	84.6	143.8	133.7
2	29	***	168.5	167.9	265.2	265.0	34	***	213.6	193.4	397.6	445.8
3	14	***	185.0	193.1	217.3	224.9	111	***	1387.3	1427.5	1583.0	1626.0
4	13	***	115.3	126.2	182.6	191.7	147	***	1492.0	1532.9	1897.4	1653.3
5	27	***	231.8	225,8	313.0	310.2	16	***	115.0	132.6	146.0	131.0
6	33	**	550.2	568.3	606.0	607.8	73	***	1435.9	1483.2	1559.2	1382.7
7	3	**	49.1	56.7	47.4	46.0	51	**	956.3	910.7	905.8	1173.2
8	38	***	678.4	667.5	821.0	827.0	49	***	711.7	764.4	1003.2	935.4
9	0		-	-	-	-	154	**	2822.0	2635.4	3653.0	3284.7
Total	164	***	2022.5	2047.3	2536.8	2551.0	649	***	9209.0	9164.9	11,289.1	10,765.8

MC: Results from the Monte Carlo analysis. ***: sign. 1%; **: sign. 5%. This concerns the differences between the means through the comparisons Mod. Swiss-CAVAT and Mod. Swiss MC-CAVAT MC.

Hence, the ornamental value that the City of Bari lost for the death of 164 Canary Palms in the period 2011–2013 was between two and two and a half million Euros (Table 1). Furthermore, the *t*-test confirmed a significant difference between the means (mainly at 1% and 5%). The Monte Carlo analysis gave a similar indication of the damage, showing coefficients of variation close to zero for each method (ranging from −0.0175 to 0.0283), and highlighting the suitability of the means used for the models' fitting, with a small difference between the methods. The results showed that district 8 was the most affected, probably for the absence of timely measures carried out by the municipal authorities (Figure 3). On the contrary, the Canary Palms in district 9 were infested but not killed by the weevil thanks to the implementation of effective and seasonable chemical pest control actions.

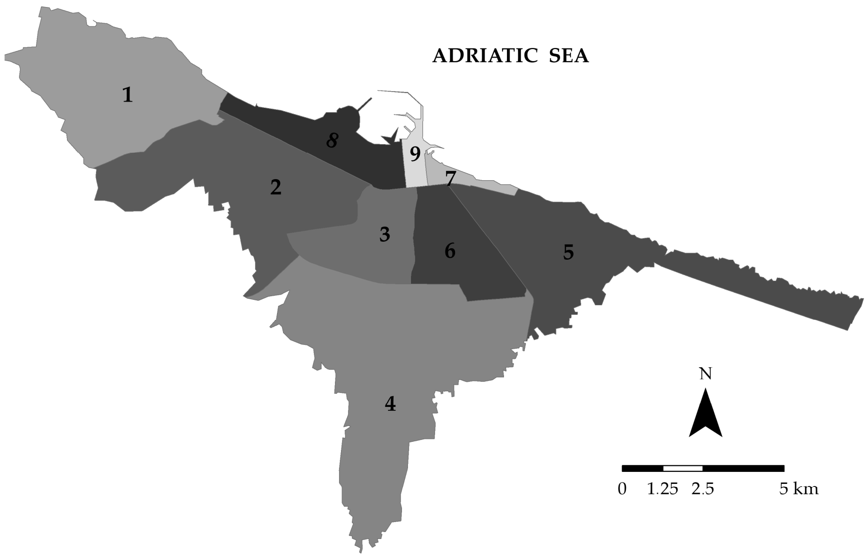

Figure 3. Lost ornamental value in the City of Bari for the infections of RPW to Canary Palms. The shades of grey concern the average ornamental values between the two methods, and from the Monte Carlo analysis (Numbers on the map refer to the urban districts).

Subsequently, the removal and disposal costs for dead trees were calculated and discounted (Table 2). In this connection, it is noteworthy that the removed plants were not replaced with new trees, thus excluding the related planting, irrigation and maintenance costs. Hence, the total costs were between 2.1 and 2.6 million Euros (Table 3). Considering a total ornamental value of the remaining Canary Palms (649) between nine and eleven million Euros, and a total annual maintenance cost (pruning and pest control) of about one hundred and fifty thousand Euros (Table 2), a proper preservation strategy implemented by local authorities is justified and desirable.

Table 2. Costs (in thousands of Euros) for the damaged and healthy Canary Palms (years 2011, 2012, 2013).

Cost items (€)	Year		
	2011	2012	2013
Removal costs	13.7	18.7	4.6
Disposal costs	10.2	16.6	2.8
Pruning costs	98.0	98.0	98.0
Pest control costs	50.0	50.0	50.0

Source: Bari Multiservizi S.p.a., 2014.

Table 3. Costs for the infections by RPW to Canary Palms in the City of Bari (in thousands of Euros).

Community Costs (€) (for 164 Canary Palms in the Period 2011–2013)	Swiss Method	CAVAT Method
Ornamental damage	2047.3	2551.0
Removal costs	39.2	39.2
Disposal costs	31.4	31.4
Total costs	2117.9	2621.6

4. Discussion and Conclusions

Invasive species are an important cause of ecological change on a global scale, with significant negative impacts on economic welfare, exacerbated by globalization [39–41]. Literature points out that total damages and control costs generated by invasive species could exceed $100 billion per year [40], but the true societal costs are likely several times higher [42].

The economics on invasive species management can concern the assessments on the optimal prevention of potential invaders and the optimal control of extant invaders [43–46]. In the first case, a policy (trade tariffs, import inspections, etc.) which maximizes the present value of expected welfare over time is selected, while the optimal control of extant invasive species minimizes the net present value of damages and control costs over time. Hence, pest management, for public or private sectors, needs to alway know its economic soundness in order to assess economic impact, improve its transparency and strengthen the justification for measures [47].

In agriculture, economic threshold is based on an optimal-control rule, is dynamic, and depends on the marginal price of pesticides, the opportunity cost (i.e., crop prices) and the population density of pests, the marginal effect of chemical control and time [48]. However, in the case of public urban green, economic threshold should be based on both a wider concept of benefits, including aesthetic, environmental and sociocultural elements, and social costs (direct expenses for pesticide disposal, costs for workers, etc.), so that effective and efficient pest management decision-making can be implemented. Indeed, urban green, with its multifunctional concepts, is one of the most important elements that influence the life quality in cities. For this reason, in recent years, there has been a growing interest about its valuation, both for the quantification of possible damages and for the implementation of policies aimed at its preservation and management.

In this study, a damage (loss of ornamental value) of over two million Euros was assessed by the modified Swiss and the CAVAT methods. In general, the latter highlighted higher ornamental values, except in district 7 for the removed trees, but also 5 and 6 for the remaining trees (Table 1). Figure 4 shows that, in suburban districts 1 and 2, both for the removed and remaining Canary Palms, the differences between the ornamental values estimated by the two methods are sizeable (between 58% and 130%). This aspect, though less accentuated, also emerges for the other suburban districts, i.e., 4 and 5. In this regard, it should be noted that a higher ornamental value assessed by the English method reflects the presence of modest trees inside urban spaces with high landscape, historic and cultural value. On the contrary, a higher estimate by the Swiss method shows the presence of high, health and vigorous trees inside modest urban spaces. Therefore, the analysis highlighted that, in the City of Bari, a great share of the ornamental value concerning the removed and remaining Canary Palms was due to landscape, historic and cultural aspects (i.e., extrinsic characteristics). This is true especially for districts 1 and 2, in which the Canary Palms were planted for the coastal areas and the suburban spaces with high cultural importance. In more detail, the Canary Palms removed in district 1 had a greater landscape importance, while in district 2 this aspect mainly concerned the remaining ones. In addition, in district 4 the removed Canary Palms were more important for the surrounding urban spaces than for their dimension and vigor, while, in districts 3, 8 and 9, the extrinsic components of the ornamental value were attenuated, both between the methods and the removed/remaining trees. That means that high, vigorous and healthy Canary Palms were inside spaces with high landscape, historical and cultural value, such as squares, historic sites, monuments, etc., and vice versa. On the contrary, for districts 5, 6 and 7, the dimensional, vegetative and health components of the ornamental value prevailed, albeit slightly (i.e., for the remaining trees in districts 5 and 6, and for the removed trees in district 7), so that tall, vigorous and healthy trees were inside modest urban spaces. In conclusion, the Red Palm Weevil caused a sizeable damage in the City of Bari through the death of important Canary Palms for their dimensional characteristics, but especially for their presence inside urban spaces with historic and cultural importance.

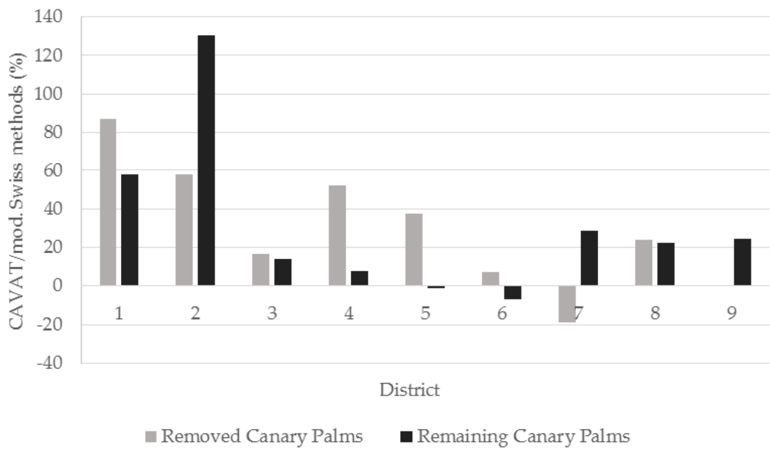

Figure 4. Percentage differences of the ornamental value, by the Monte Carlo analysis, between the modified Swiss and the CAVAT methods, per district.

However, it should be pointed out that the analysis regarded just the public urban Canary Palms, but excluded the private ones, which could be characterized by similar spread, quality and infestation. Therefore, the results permitted to appreciate the seriousness of the damage suffered by the City of Bari, but also the sizeable benefits related to the remaining Canary Palms, and consequently the suitability to continue, and even to improve, the annual pest-control strategy implemented for the preservation of this species. These findings appear crucial for a city in which urban green area per dweller is lower than 9 m^2, so that Bari is one of the Italian provincial capitals with the smallest urban green extent [49]. Therefore, these first results can help to improve the sensibility of inhabitants and local decision makers for Canary Palms, so that favorable conditions for improving community welfare could be set.

The methods used in this study include several wider and holistic concepts of benefits, in particular dimensional and aesthetic for the Swiss method, and sociocultural for the CAVAT method. However, and this is a general weakness concerning all the parametric methods, the tabular values assigned to the characteristics of trees can be affected by a considerable degree of subjectivity, both by the authors of the methods, and the estimators. In order to reduce the negative impact of this drawback, the Monte Carlo analysis can ensure more objective results. More complex approaches could be carried out, also to set policies aimed at the management of this environmental good. In particular, the choice experiment method [50–53], through the analysis of community's preferences about several characteristics of preservation policies, could contribute to a more effective and efficient action plan against RPW. Understanding if the community is in favor of such a preservation policy is very useful in order to detect possible spending solutions of public funds. Moreover, as pointed out by the European Landscape Convention [16] and the Millennium Ecosystem Assessment [54], this approach fosters bottom-up, transparent and fair decision-making by involving the main beneficiary of this public resource, i.e., the dwellers. Research on these further aspects, and applied to urban green, is desirable, also for urban development policy [55,56].

Finally, the study analyzed two alternatives of intervention, i.e., the protection of Canary Palms by pest control or their dereliction, which over time drives to their death and consequent removal. Indeed, this strategy is at present used by the authorities in the City of Bari, while replacement options for the dead trees is not considered. Hence, also for this first assessment of the ornamental value, the replacement option was discarded. Indeed, for the great importance of Canary Palms in the City of Bari [57], the first goal should consist in their possible preservation through suitable action plans which are based on public funds. For this reason, a preliminary cost-benefit analysis is desirable, providing information on the expedience of the preservation strategy scheduled. Nevertheless, in case of unfavorable results, a replacement option can then be considered based on some substitutive species able to generate a sizeable ornamental value.

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