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Research Article

Analysis of Turkish Pine Stumpage-based Auction Sales: A Case Study of İzmir Regional Directorate of Forestry

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ABSTRACT

The study analyzed all Turkish pine stumpage-based auction sales conducted by 10 forest management directorates under the İzmir Regional Directorate of Forestry between 2020-2024. The analysis included all data on Turkish pine stumpage-based auction sales carried out from March 2020—when the General Directorate of Forestry introduced the new open-access e-auction system during the Covid-19 pandemic—until June 2024. To analyze the stumpage-based auction sales of Turkish pine by the forest management directorates, the auction revenues were converted to 2020 constant prices using the Producer Price Index for forest products and related services published by TUIK. When examining the 818 Turkish pine stumpage-based auction revenues analyzed in the study, the Bergama, Akhisar, and Manisa Forest Management Directorates ranked as the top three, respectively. In terms of the number of auctions, the ranking shifted to Manisa, Gördes, and Akhisar Forest Management Directorates. Regarding the total volume (m³) of standing timber offered for auction, the Manisa, Akhisar, and Gördes Forest Management Directorates outperformed the others. Lastly, when comparing revenue per unit, Bergama, Salihli, and Akhisar Forest Management Directorates achieved a more profitable production process in the relevant years compared to other directorates.

Keywords: Stumpage-based Auction Sale, Turkish Pine, İzmir Regional Directorate of Forestry

Kızılçam Açık Artırmalı Dikili Ağaç Satışlarının Analizi: İzmir Orman Bölge Müdürlüğü

Öz

Yapılan çalışmada İzmir Orman Bölge Müdürlüğüne bağlı 10 orman işletme müdürlüğünde gerçekleştirilen Kızılçam açık artırmalı dikili satışlarının tamamı 2020-2024 yılları arası analiz edilmiştir. Orman Genel Müdürlüğü'nün Covid-19 pandemi süreciyle birlikte Mart 2020 tarihi itibarıyla açık erişimde olan yeni e-ihale sisteminden Haziran 2024 tarihine kadar gerçekleştirilen tüm kızılçam açık artırmalı dikili satış verileri analize konu olmuştur. Orman işletme müdürlüklerinin açık artırmaya konu olan kızılçam dikili satışlarının analizi için TÜİK tarafından yayınlanan Orman Ürünleri ve ilgili hizmetlerin üretici fiyat endeksine (ÜFE) göre ilgili yıllarda yapılan açık artırmalı kızılçam dikili satış gelirleri 2020 yılına sabit fiyatlandırma yöntemiyle dönüştürülmüştür. Çalışmada analize konu olan 818 açık artırmalı kızılçam satış gelirleri incelendiğinde sırasıyla Bergama, Akhisar ve Manisa orman işletme müdürlükleri ilk 3 sırada yer almıştır. İşletmelerin açık artırmalı kızılçam satışlarındaki ihale sayılarına bakıldığında ise bu sıra Manisa, Gördes ve Akhisar orman işletme müdürlükleri şeklinde olmuştur. Açık artırmalı kızılçam dikili satışlarında satışa çıkan emvalin m³ cinsinden toplam hacmine bakıldığında ise Manisa, Akhisar ve Gördes Orman işletme müdürlükleri diğer işletmelerin önünde gelmektedir. Elde edilen birim başına gelir karşılaştırıldığında ise Bergama, Salihli ve Akhisar orman işletme müdürlükleri diğer işletmelerle kıyaslandığında ilgili yıllarda daha kârlı bir üretim süreci geçirmişlerdir.

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I. INTRODUCTION

Long-term planning is essential for managing forests within the framework of sustainability principles. The plans prepared for this purpose are defined as forest management plans. These plans specify the amount and method of wood raw material production from forests. However, they often fail to fully consider the continuous needs of industrial consumers requiring wood raw materials, being formulated and implemented far from market analyses. Therefore, it is crucial to economically evaluate the marketing activities carried out by state forest enterprises, which have a significant share in forest product production and marketing, and to scientifically analyze these activities.

The largest producer of wood raw materials in Türkiye is the General Directorate of Forestry (GDF). GDF is the dominant actor in the wood market, and wood raw material sales still constitute its primary source of income. GDF conducts wood raw material sales in two ways: by carrying out harvesting operations such as cutting, skidding, and transportation itself, or by requiring buyers to undertake these operations. The sales conducted by GDF after completing the harvesting operations are called subsequent sales, while sales where operations like cutting, skidding, and transportation are assigned to the buyer are referred to as stumpage-based sales. GDF states in its current strategic plan that it aims to increase the share of stumpage-based sales [19].

Classifying GDF's sales only by the production method—subsequent or stumpage-based sales—is insufficient. It is also possible to classify them based on how the sale price is determined, resulting in auctions, negotiated sales, and allocated sales. In auctions, whether for subsequent or stumpage-based sales, the price the buyer pays is determined at the end of the auction, under market conditions. In negotiated sales, the price is determined as a result of mutual discussions between the parties. The prices of allocated sales, on the other hand, are determined by legislation or the decisions of authorized boards.

Globally, stumpage-based sales can be evaluated in two ways: first, the sale of stands or forests designated for cutting, and the second one is the sale of specific trees marked for cutting [1]. In Türkiye, the production and sales process, starting with marking, concludes in two ways. In the first method, marked stands are cut, skidded, loaded, and transported to forest depots by forest village development cooperatives or local villagers, as stipulated in Article 40 of Forestry Law No. 6831. These products are then sold mainly through auction from the depots. This method is referred to as subsequent sales.

In the second method, trees marked within the stand are sold as stumpage-based sales in accordance with Article 30 of Forestry Law No. 6831, as amended by Law No. 2896, and Circular No. 6877. These sales can be conducted through auctions or as allocated sales, with cutting, skidding, loading, and transportation costs borne by the buyer. In this production method, after marking, all subsequent stages of the process are completed by the buyer, allowing GDF to save on operational costs such as cutting, skidding, loading, and transportation. Since 2004, GDF has expanded its stumpage-based sales, claiming significantly higher profitability compared to the traditional system. Both allocated and auction-based stumpage sales are implemented in Türkiye [19]

In allocated stumpage-based sales, prices are not determined under market conditions due to the methodology of this approach. Instead, the average prices of auction-based sales from the past two months are used to determine the allocated sale price. According to Circular No. 6877, the entities eligible for allocated stumpage sales include forest village development cooperatives or individuals registered in village populations with populations under 2,500, residing in the villages where the trees are located.

In auction-based stumpage sales, price formation is influenced by both administrative decisions and market conditions. For auction-based stumpage sales, GDF first determines an estimated sale price (reserve price). This price is calculated by considering factors such as the specific quality of stumpage, production challenges, distance to consumption centers, transportation difficulties, market conditions, and recent stumpage sale averages. The cost of stumpage, including distribution, tariff, sales, operational, and contingency expenses, forms the basis for this calculation. Adjustments to the reserve price can be made by regional or enterprise managers if deemed necessary.

Setting the reserve price too low may lead to national losses by undervaluing public assets in case of insufficient competition. Conversely, setting it too high might reduce the number of participants, resulting in low competition and unsold products. To address these challenges, decision-makers often rely on the averages of past sales prices to determine a reserve price close to the market value.

The increase in stumpage-based sales significantly impacts all stakeholders involved in forest product production. However, companies in the forest industry, which act as buyers in stumpage-based sales, also face challenges and difficulties due to these practices [2].

The aim of this study is to analyze the economic performance of the Turkish pine auction-based stumpage-based auction conducted by the 10 Forest Management Directorates under the İzmir Regional Directorate of Forestry. The study examines the revenues, quantities, timber volumes offered for sale, and income per unit of the sales conducted over specific years, with the goal of evaluating the profitability, efficiency, and regional differences of these sales. Additionally, the study analyzes the distribution of auction-based sales across different Forest Management Directorates and identifies which directorates have experienced more efficient and profitable production processes. This research can be regarded as a resource management study, evaluating the management of forest resources, income generation processes, and regional performance disparities.

II. LITERATURE REVIEW

In 1989, the first stumpage sales attempts began in Türkiye's Turkish pine forests. Upon the request of GDF, stumpage sales conducted in 1990 were examined, comparing contractor production with traditional state enterprise methods. The study revealed that expectations such as advancements in production techniques, profitability, production of high-market-value products, and insurance coverage for forest workers were not met [3].

By the late 1990s, stakeholders began facing various challenges related to the implementation of stumpage sales. A study examining stumpage sales through cooperatives in forest product production attempted to identify the advantages and disadvantages of this approach compared to traditional production and marketing methods [4].

In 2004, Circular No. 6350 was issued to address the challenges in stumpage sales. This circular tackled issues in the forestry production and marketing process and proposed expanding the application of stumpage sales. Recommendations included providing fresh and high-quality products to the market, preventing standardization errors, and increasing sales revenues. The circular also emphasized the need for legal regulations concerning stumpage sales and measures to be taken during the transition period [5].

Similarly, a study based on Circular No. 6350 in 2004 highlighted that stumpage sales are advantageous in terms of forest sustainability, product quality, and low production costs. However, it was noted that certain rights granted to forest villages and cooperatives under the traditional system were lost with stumpage sales, leading to resistance to this approach. Consequently, the study emphasized the need to reevaluate and revise the implementation circular [6].

A study on stumpage sales discussed the advantages and disadvantages of this method compared to previous practices and assessed its implementation in Türkiye. The study highlighted significant issues with stumpage sales and stressed the necessity for technical and scientifically grounded research to improve this method [7].

The use of contracts and stumpage sales methods for forest management was examined in terms of forestry history, offering recommendations for the future. The study underscored the importance of exploring alternative methods for wood production and marketing, cautioning against adopting stumpage sales as a single solution nationwide. Additionally, it called for an objective and scientific evaluation of the effects of over a decade of implementation and emphasized the need for collaboration between GDF and academic institutions for more effective outcomes [8].

GDF sought to resolve issues in industrial wood production through Circular No. 6521 on stumpage sales and public procurement law-based service acquisitions. However, it was noted that forestry management cannot be sustained without labor costs, and addressing social problems in the process would take time. The study highlighted that profitability should not come at the expense of qualified forestry labor and that service acquisitions would also be beneficial for determining annual cutting volumes in forest management plans [9].

A study evaluating forestry issues in the Black Sea region, based on The Central Union of Turkish Forestry Cooperatives (OR-KOOP) projects and interviews with cooperative managers, highlighted a significant decrease in the incomes of forest villagers due to the widespread adoption of stumpage sales. To address this issue, the study recommended revising stumpage sales regulations and initiating joint efforts with forest cooperatives [10].

The findings of previous research on stumpage sales in Türkiye, relevant articles of Forestry Law No. 6831, Circular No. 6521 issued in 2007, and GDF records were used to conduct a technical, economic, and social assessment of this practice [11].

In a research project titled “Opinions of Interest Groups on Stumpage Sale Practices in the Eastern Black Sea Region”, feedback was gathered from forestry organization personnel, contractors, cooperative managers, and forest villagers. The study found that while the forestry organization supported the expansion of this method, most stakeholders agreed with this stance. The problems identified focused on the process and its associated challenges, with solutions proposed for improvement [12].

Another study examined stumpage sales from the perspective of stakeholders in the Trabzon Forestry Directorate. Survey findings indicated positive effects such as reducing operational costs, alleviating social pressures, insuring forest villagers, and improving quality. However, issues such as reduced labor income, loss of cooperative rights, and inaccuracies in yield percentages were also identified, emphasizing the need for a review of the practice [13].

A study evaluating stumpage sales from the perspective of industrial enterprises detailed the definition of stumpage sales, volume calculations, and yield percentages. It addressed expected benefits under Circular No. 6521 and highlighted risks such as damage to residual stands during cutting. It was suggested that GDF adopt a professional firm service acquisition model, as stumpage sales were not profitable [14].

Demir (2015) indicated that interest groups encountered different challenges varying by region and forestry directorate. A case study of the Bucak Forestry Directorate under the Isparta Regional Directorate provided socio-economic analyses of stumpage sales, revealing a need for further research on issues like yield percentages. The study found that forest engineers overwhelmingly (80%) believed stumpage sales shortened the production process compared to traditional methods, reduced storage costs, and prevented quality losses due to delays. Most industrial enterprises (90%) reported advantages in producing logs of desired dimensions without compromising quality, though they also faced challenges related to intermediary cooperatives in obtaining stumpage sales [15-18].

Finally, a study in the Western Black Sea region used structural equation modeling to analyze stumpage sales, examining its technical, economic, social, legal, administrative, and environmental impacts. This detailed research aimed to provide significant contributions to the efficiency and sustainability of forestry enterprises [19].

Due to the relatively short history of standing timber sales in Türkiye, it is observed that such practices are not yet widespread. As outlined in the literature review, the limited studies on standing timber sales in Türkiye have primarily focused on "situation analyses" and often on the "relationships between stakeholder groups." Therefore, these studies are generally characterized as analyses based on production, consumption, and stakeholder relations. In contrast, standing timber sales have been extensively studied in countries like the United States, Canada, and the Scandinavian countries, with research on the topic dating back to the 1970s. Initially, these studies concentrated on demand-related issues, but over time, supply-side analyses began to emerge. In recent years, the focus has shifted to comprehensive and holistic market models.

Globally, systems based on standing timber sales are a significant topic within forestry economics. These sales are based on selling existing standing timber (with standing prices) rather than felled trees. Research has shown that many factors influence the pricing of standing timber, including market demand and supply, seasonal variations, regional characteristics, and even local factors [20-22].

A study that examines the factors influencing standing timber prices highlights how national and regional demand, production costs, and regulatory policies contribute to price variations. These factors create price discrepancies across different regions and market conditions [22]. Additionally, understanding the impact of different pricing systems (such as auctions or negotiation-based pricing) and local environmental factors on determining standing timber prices is crucial for forest owners, managers, and forestry economists [23].

Academic studies on the history of stumpage-based auction, particularly in North America and Europe, explore how standing timber prices have evolved over time and the factors influencing them. Many studies have investigated how these prices are affected by supply-demand balances, market developments, seasonal variations in wood supply, and natural disasters. Additionally, local-level sales mechanisms (such as auctions or negotiations) and factors like the distance of forest areas to factories have been found to significantly impact these prices [22, 24].

Stumpage-based auction began to gain prominence in North America around the mid-20th century. However, environmental policies of the 1980s led to increased analyses of income generated from forest management and wood production. During the 1990s, legal regulations in western U.S. forests emerged as a significant factor affecting standing timber prices [25].

Prices for standing timber can vary significantly depending on factors such as regional competition levels, forest resources, and transportation conditions. In particular, in regions with high competition, prices for the same product tend to be higher. Rainy weather conditions can limit daily production capacities for loggers, causing certain types of terrain—for example, those accessible year-round—to be sold at higher prices. These conditions contribute to price fluctuations in the forest product market [26].

Another factor affecting stumpage-based auction prices is the size of the land and its suitability for transportation. Larger and higher-quality forest areas are likely to command higher prices, as transportation and equipment costs become more efficient [26, 27]. Prices for forest products also vary depending on the type and size of the tree. For instance, larger trees are generally sold at higher prices than smaller ones [22, 26].

III. MATERIAL AND METHOD

A. MATERIAL

There are 10 forest management directorates under the İzmir Forest Regional Directorate. Among these, Demirci, Akhisar, Gördes, Soma, and Manisa forest management directorates are located within the borders of Manisa province. İzmir, Bayındır, Gaziemir, and Bergama forest management directorates, on the other hand, are located within the borders of İzmir province. Demirci forest management has 8 district offices, Akhisar has 10, Gördes has 7, Soma has 7, Manisa has 11, Salihli has 10, İzmir has 10, Bayındır has 12, Gaziemir has 11, and Bergama has 14 district offices.

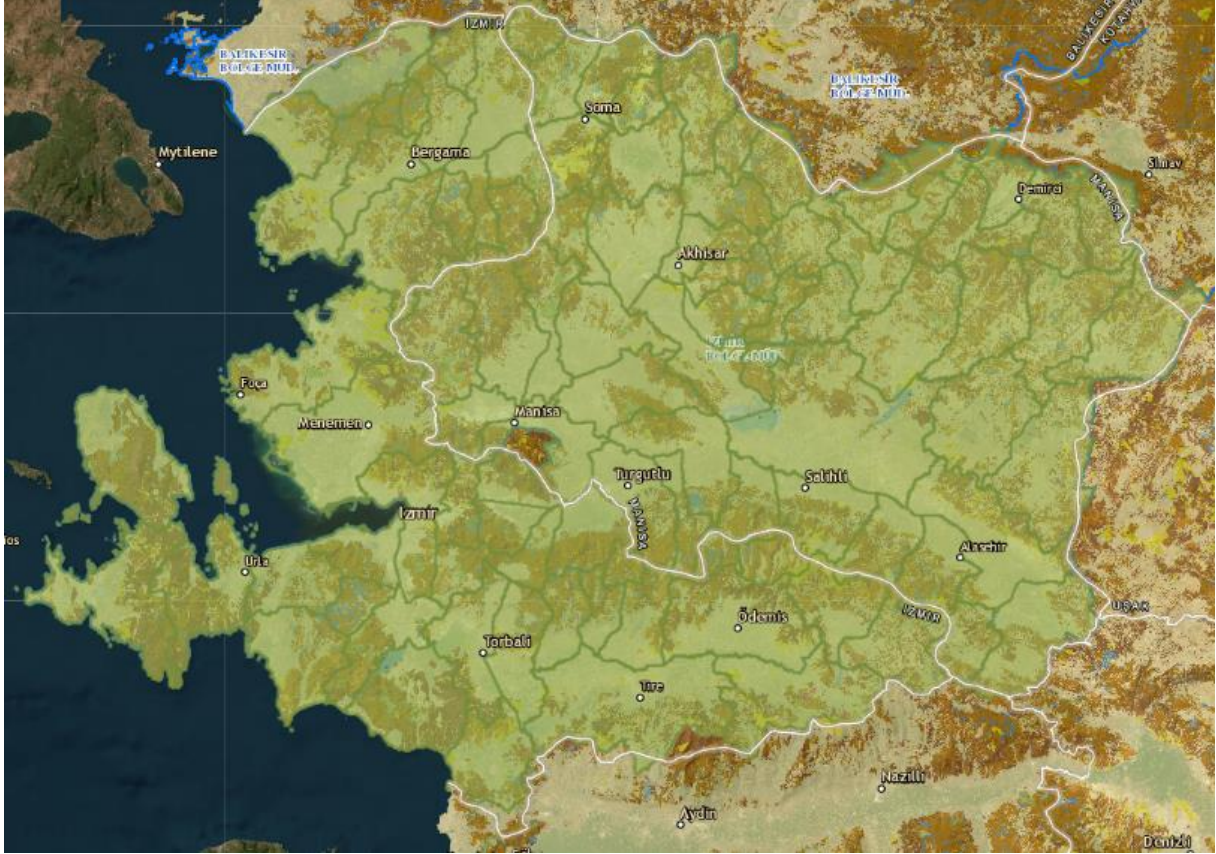


Figure 1. Study Area

The Demirci Forest Management Directorate is located in the northwest of Manisa province, at the intersection of the Aegean and Central Anatolia regions. The directorate, about 160 kilometers away from the provincial capital of Manisa, covers a region rich in forest resources. The Gördes Forest Management Directorate is located in the east of Manisa province, in the inner parts of the Aegean Region. It is about 110 kilometers from the city center of Manisa and occupies an important position in terms of forest resources. The Salihli Forest Management Directorate is located in the east of Manisa province, in the Gediz Basin of the Aegean Region. The directorate is approximately 70 kilometers away from the city center of Manisa and is situated in an area where forest resources and agricultural activities intersect. The Soma Forest Management Directorate is located in the northwest of Manisa province, in an area rich in natural resources in the Aegean Region. It is about 90 kilometers away from the provincial capital of Manisa. The Akhisar Forest Management Directorate is located in the northern part of Manisa province, between the fertile plains and forested areas of the Aegean Region. The directorate is approximately 50 kilometers away from the city center of Manisa. The Manisa Forest Management Directorate is located in the heart of the Aegean Region, encompassing the rich forest ecosystems around Spil Mountain and its surroundings. The directorate is strategically positioned near the region's

agricultural and industrial center. The Bergama Forest Management Directorate is located in the northern part of İzmir province, in a region surrounded by historical and natural wealth in the Aegean Region. The directorate is about 100 kilometers from the provincial capital of İzmir. The Bayındır Forest Management Directorate is located in the east of İzmir province, in the Küçük Menderes Basin. About 80 kilometers from İzmir's city center, Bayındır is known for its rich vegetation and agricultural activities. The Gaziemir Forest Management Directorate is located in the southeastern part of İzmir province, very close to the city center. About 20 kilometers from the city center of İzmir, Gaziemir has forest ecosystems that are intertwined with urban areas.

The İzmir Forest Management Directorate covers a wide geographic area, managing the forested areas of İzmir, one of the largest and most important cities in the Aegean Region. İzmir's city center is located along the coastline, extending from the southern shores to the northern mountains, encompassing a variety of climate types and vegetation.

B. METHOD

In this study, the Turkish pine stumpage-based auction conducted by 10 forest management directorates under the İzmir Regional Forest Directorate were analyzed for the respective years. The data includes all Turkish pine stumpage-based auction conducted via the new e-auction system made publicly accessible by the GDF from March 2020, during the COVID-19 pandemic, to June 2024. Turkish pine is a primary forest tree species in the relevant management units and was analyzed as it constitutes the bulk of sales conducted by these directorates. Additionally, Turkish pine is historically significant as it was the first tree species in Türkiye to be subject to stumpage-based auction.

For the analysis of Turkish pine stumpage-based auction conducted through auctions by the forest management directorates, revenues from 818 Turkish pine auctions over the years were adjusted to constant prices based on the 2020 Producer Price Index (PPI) for Forest Products and Related Services, published by the Turkish Statistical Institute (TÜİK). This adjustment was performed to eliminate the effects of inflation and enable comparative analyses across the management directorates.

Constant prices adjusted for inflation represent real prices derived by eliminating the inflationary effects on nominal prices. They are typically used to convert a series of prices to the level of a specific base year. To obtain real prices for the analysis of price relationships, the PPI values for Forest Products and Related Services (PPI, 2020=100) were used. Revenues from respective years were calculated and converted to 2020 prices using the formula: $(\text{Nominal Price} / \text{Price Index}) \times 100$ [28, 29].

IV. RESULTS AND DISCUSSION

The stumpage-based sales revenues, the share of sales revenues, and the number of auctions held in the 10 Forest Management Directorates involved in the study are shown in Table 1. The Forest Management Directorates with the highest revenues are ranked as follows: Bergama, Akhisar, Manisa, Soma, Salihli, İzmir, Gördes, Bayındır, Gaziemir, and finally, Demirci Forest Management Directorate.

Table 1. Inflation-Adjusted Stumpage-Based Sales Revenues by the Forest Management Directorates

Forest Management Directorates	Total Revenue in TRY (2020 Open Auction Stumpage Price)	The Share of Turkish Pine Open Auction Stumpage Sales Revenue of Forest Enterprises in the Total Turkish Pine Open Auction Sales Revenue (%)	Number of Turkish Pine Open Auction Stumpage Sale Tenders
Demirci	14.917.214	3,7	66
Gördes	21.428.405	5,4	108
Salihli	35.795.937	8,9	40
Soma	36.671.238	9,2	82

Akhisar	64.303.380	16,1	105
Manisa	62.498.699	15,6	174
Bergama	98.984.561	24,7	95
Bayındır	17.610.866	4,4	47
Gaziemir	15.269.017	3,8	35
İzmir	32.781.765	8,2	66
Total	400.261.082	100	818

In Table 1, when examining the number of tenders that generated the open auction stumpage sales revenue for the forest management directorates, it is observed that the rankings of the forest management units are as follows: Manisa, Gördes, Akhisar, Bergama, Soma, İzmir, Demirci, Bayındır, Salihli, and lastly, Gaziemir Forest Management Directorate.

Table 2 presents the total volume of timber sold in open auction stumpage sales, the share of each sold item within the total, and the income per unit. The regions with the largest volumes of stumpage sales are listed in the following order: Manisa, Akhisar, Gördes, Bergama, Soma, İzmir, Gaziemir, Demirci, Bayındır, and lastly, Salihli Forest Management Directorate.

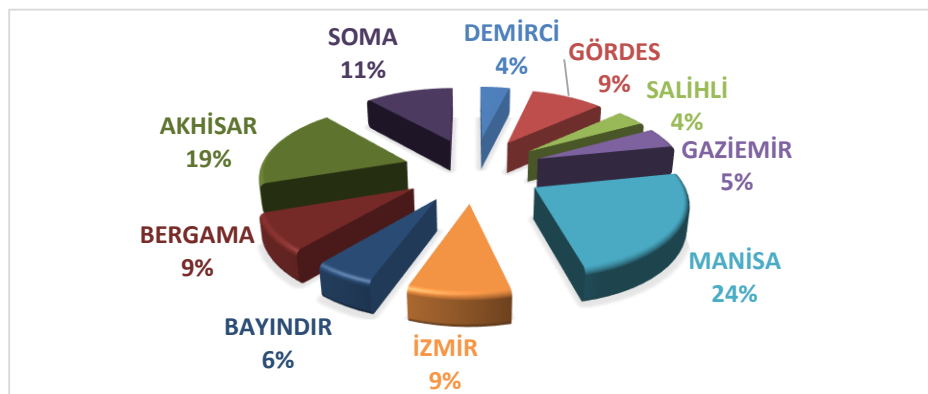
Table 2. The Cubic Meter Values (m³) of Timber Sold by the Forest Management Directorates

Forest Management Directorates	Cubic Meter Value of the Timber Sold (m ³)	Share of the Timber Sold in the Total Cubic Meters (%)	Revenue Per Unit (m ³) Ratio (%)
Demirci	70.923	5,3	6,7
Gördes	153.884	11,5	4,5
Salihli	61.478	4,6	18,7
Soma	139.198	10,4	8,4
Akhisar	211.112	15,7	9,8
Manisa	299.167	22,3	6,7
Bergama	149.397	11,1	21,2
Bayındır	67.278	5,0	8,4
Gaziemir	76.319	5,7	6,4
İzmir	113.514	8,5	9,3
Total	1.342.270	100	100,00

In Table 2, when the revenue per unit (m³) is ranked for the forest management offices' open auction stumpage sales, the leading directorates are as follows: Bergama, Salihli, Akhisar, İzmir, Soma, Bayındır, Demirci, Manisa, Gaziemir, and finally, Gördes.

In Figure 2, the ratio of participants in the open auction Turkish Pine stumpage sales for the relevant years is shown within the total number of participants. The total number of participants in the auctions is 5139. Manisa Forest Management Office leads with 1252 participants, accounting for 24% of the total, followed by Akhisar Forest Management Office, with 962 participants (19%), and Soma Forest Management Office, with 593 participants (11%).

Figure 2. The Percentages of Participants in the Total Stumpage-Based Turkish Pine Auctions by Forest Management Directorates



The lowest participation in terms of the number of participants in the auctions was recorded as follows: 244 participants (5%) in 35 stumpage-based Turkish Pine auctions by Gaziemir, 194 participants (4%) in 40 auctions by Salihli, and 196 participants (4%) in 66 auctions by Demirci Forest Management Directorate.

The analysis of the tables prepared using research data from stumpage-based auction sales of Turkish pine conducted by the relevant forest directorates is supported by several prominent studies in the literature. Moreover, there is a continued need for more in-depth research on this subject. Yılmaz et al. (2020) indicated that certain factors influence bidders' participation in specific sales lots during auction sales, and similar variables may also affect the number of participants in stumpage-based auction sales of logs [30]. Athey and Levin (2001) observed that an increase in the number of participants generally enhances sales revenues, while information asymmetry in low-competition auctions can reduce revenue. Their findings suggest that making open information structures (e.g., site conditions and quality data) more transparent can help increase government income [31]. Ok (1997) proposed that diversification of auction timing by forestry enterprises may positively influence revenue. He emphasized that the ability of the General Directorate of Forestry to obtain high income from the marketing of forest products depends on the strategic planning of factors such as the scheduling of auctions by forest directorates, the status of forest industry enterprises, and seasonal variations affecting prices [32]. Athey, Levin, and Seira (2011) compared open and sealed-bid auctions, demonstrating that open auctions tend to generate higher revenues through increased competition, especially when reserve prices are accurately determined [33].

V. CONCLUSION

When evaluating the data in Table 1 for the forest management directorates, it is observed that the forest management directorates generating the most revenue are, in order, Bergama, Akhisar, Manisa, Soma, Salihli, İzmir, Gördes, Bayındır, Gaziemir, and finally, Demirci Forest Management Office. Looking at the number of auctions in the same table, it is seen that forest management directorates such as Manisa, Gördes, and Akhisar have held more auctions. This shows that revenue and the number of auctions are not always directly proportional. According to the rankings in Table 2 for the volume of timber sold and the income per unit, forest management directorates such as Manisa, Akhisar, and Gördes have the largest quantity of timber put up for auction, while Bergama, Salihli, and Akhisar rank higher in terms of income per unit. This indicates that some forest management directorates achieve higher sales but lower income per unit, while others achieve higher income with fewer sales.

Furthermore, according to the data in Figure 2, Manisa, Akhisar, and Soma are the forest management directorates with the highest participation, while Gaziemir, Salihli, and Demirci have the lowest number of participants. Forest management directorates with higher participant numbers generally achieve higher revenues and conduct more auctions. These data suggest that forest management offices need to develop more effective sales and participant strategies to increase their sales revenue. Particularly, the low sales and participation rates in forest management directorates such as Demirci and Gaziemir may negatively affect their efficiency.

The sales and participation rates of the business offices can be related to their distance from provincial centers. Distance from the provincial center may have an impact on participant numbers and, consequently, sales. Participation in auctions is directly related to factors such as logistical ease, transportation opportunities, and effective promotion. Forest management directorates closer to provincial centers may have higher participation rates as they offer easier access to participants. This could increase interest in the auctions and, in turn, increase the revenue generated.

Specifically, among the areas subject to open auction, Demirci, Manisa, and İzmir are located in regions distant from major cities and provincial centers. This distance can make it difficult for potential participants to attend auctions in these areas. Transportation challenges may reduce the number of participants, leading to less competitive sales and, therefore, lower revenue. Moreover, forest

managemet directorates located closer to provincial centers have more marketing opportunities, which gives them an advantage over more remote locations.

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