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Effect of Production Year on Log Sale Prices: Example in Artvin, TURKEY

Atakan ÖZTÜRK[1*], Ufuk DEMİRCİ[2], Kemal DİKİLİTAŞ[3]

[1]Artvin Çoruh University, Faculty of Forestry, Artvin, TURKEY
[2]Artvin Çoruh University, Artvin Vocational High School, Artvin, TURKEY
[3] Forest Engineer, Kütahya Regional Directorate of Forestry, Kütahya, TURKEY
[*]Corresponding author: atakanozturk@artvin.edu.tr

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Abstract

Aim of study: In this study, effect of production year on sales price of logs which are sold at auctions in Turkey, was determined.

Area of study: This study was carried out in Artvin Regional Directorate of Forestry, Turkey.

Material and method: Data of 83 third class normal length log parties (spruce, fir and yellow pine) which were produced in 2008 and 2009 by state forest enterprises in Artvin and sold in 2009 auctions, were used.

Main results: It was determined that there was a statistical difference between average sales prices of third class normal length log parties produced in different years (2008 and 2009) by Mann-Whitney U test and this difference was in favor of parties produced in 2009. As sales price of products produced in previous year is lower, it causes revenue loss. Hence there is 20% sales revenue loss in third class normal length log.

Research highlights: In order to eliminate this revenue loss, it is necessary to evaluate the market situation and prepare production and sales programs/plans by considering market demand and expectation.

Keywords: Log Sales Price, Production Year, Revenue Loss, Artvin Regional Directorate of Forestry.

Üretim Yılının Tomruk Satış Fiyatları Üzerine Etkisi: Artvin, Türkiye Örneği

Öz

Çalışmanın amacı: Bu çalışmada, Türkiye'de açık artırmalı satışlara konu edilen tomrukların satış fiyatları üzerinde üretim yılının etkisi belirlenmiştir.

Çalışma alanı: Çalışma Artvin Orman Bölge Müdürlüğü'nde gerçekleştirilmiştir.

Materyal ve yöntem: Artvin Orman Bölge Müdürlüğü'ne bağlı devlet orman işletmeleri tarafından 2008 ve 2009 yıllarında üretilen ve 2009 yılındaki açık artırmalı satışlarda satılan toplam 83 adet üçüncü sınıf normal boy tomruk (ladin, göknar ve sarıçam) partisine ait verilerden istifade edilmiştir.

Temel sonuçlar: Mann-Whitney U Testi sonuçlarına göre farklı yıllarda (2008 ve 2009) üretilen tomruk partilerinin ortalama satış fiyatları arasında 2009 yılı lehine istatistiksel açıdan anlamlı bir fark olduğu anlaşılmıştır. Bu şekilde satıldığı yıldan önceki yıl içinde üretilen ürünlerin fiyat seviyelerinin düşük gerçekleşmesi, devlet orman işletmeleri için gelir kaybı potansiyeli oluşturmaktadır. Nitekim bu kayıp üçüncü sınıf normal boy tomruk partileri için satış gelirlerinin %20'sine karşılık gelmektedir.

Araştırma vurguları: Söz konusu satış geliri kaybını ortadan kaldırmak için devlet orman işletmeleri düzeyinde piyasanın mevcut durumunun çok yönlü olarak değerlendirilmesine, üretim ve satış programlarının / planlarının piyasa talep ve beklentileri dikkate alınarak hazırlanmasına ihtiyaç vardır.

Anahtar Kelimeler: Tomruk Satış Fiyatı, Üretim Yılı, Gelir Kaybı, Artvin Orman Bölge Müdürlüğü.

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Introduction

Turkey's forest area is 22.6 million hectares and almost all of the forests belong to the state (OGM, 2018; ÇOB, 2004). General Directorate of Forestry (GDF) is the major responsible institution on behalf of the state for protection, development and management of forests. GDF has 28 Regional Directorates of Forestry (RDF) and 246 State Forest Enterprises (SFEs) in countrywide. SFEs act as main entities for fulfilling these responsibilities (URL-1; Daşdemir, 1996; Dikilitaş & Öztürk, 2010).

GDF, is a state institution working as a public utility, it oversees marketing forest products produced from state forests. About 90% of GDF revenue is obtained from wood raw material sales (Dikilitaş & Öztürk, 2010; OGM, 2013). The amount of production in the state forest enterprises is determined by management plans. The most important feature of these plans is that they take into account the physical continuity of the growing stock in the forest rather than the market demand. In other words, these plans neglect the economic and social dimension. It is accepted that the demand of the market can be met with annual production amounts determined by the management plans. However, in some years, there may be more product supply than market demand (Geray, 1998; İlter & Ok, 2012).

There are two types of sales in marketing of wood based forest products. These are standing sale and sales from timber depots (İlter & Ok, 2012). Currently, 80% of forest products are sold through sales from timber depots (OGM, 2015). In this method, products (log, mine pole, industrial roundwood, etc.) which are harvested by SFEs, are transported to timber depots and marketed from there.

GDF uses auction sales method in forest products marketing according to the 30th article of forest law no. 6831. This sales method has been evaluated as more advantageous and efficient as the unit sales price is determined by a free competition market (Türker, 2000; Daşdemir, 2003; Türker, 2008; OGM, 2009). Also auction sales are important for financing and sustainability of economical, ecological and social forestry activities carried out by SFEs (Başar, Tosunoğlu & Kılıçaslan, 2009).

In order to carry out goods and services production and ensure production continuity, it is necessary for SFEs, as being a main decision maker and executer in realizing forestry activities, to make operating cycle income meet the expenses of the same period (Türker, 1995).

Price level in the wake of auction sales affects the revenue and economic success of forest enterprises. There are many controllable and uncontrollable factors such as the general economic situation, domestic and outside market conditions, supply-demand situation, seasons, product range, and quality, which have effect on the price level. Hence it is important to determine factors affecting price in forest products sale and establish marketing policy for economic success and sustainability of enterprises (Daşdemir, 2003; Daşdemir, 2004; Dikilitaş & Öztürk, 2010).

SFEs have to establish production based on market demand and conform to standards, realize production at a scheduled time, and transport to customers within the shortest time, in order to sell products at a better price and generate more income. Thus SFEs can assure sustainability of forestry activities (Dikilitaş & Öztürk, 2010). Forest products (logs), which could not be sold in the harvested year, are sold at auction in the following year together with logs harvested in that year. In this case, it is possible that the production year can affect the sales price of logs.

There are numerous studies in literature that determine factors affecting auction sales price of logs of different tree species (Sendak, 1991; Türker & Yazıcı, 1997; Mehmood & Dahal, 2005; Dahal & Mehmood, 2005; Knoke, Stang, Remler & Seifert, 2006; Demirel, 2006; Daşdemir, 2008; Antonoaie & Antonoaie, 2012; Jayawardhane, Amarasekera, Perera & Lokupitiya, 2012; Farnia, Frayret, Lebel & Beaudry, 2015).

For example, Öztürk, Kayacan and Dikilitaş (2011) investigated the effect of destructive insects on the spruce log sales prices by using a linear price model. They determined that insect damage had serious

negative effects on log prices. There have been also some local studies that have dealt with the effect of season or month on timber sales prices. According to these studies, April affects log price positively (Daşdemir, 2003). Spring and summer also affect log prices positively while autumn and winter showed negative effects (Şen & Güngör, 2018). However the effect of production on sales price of logs which are sold from timber depots was not investigated in these studies.

In the current study, the aim is to determine if there is a considerable difference between the average sales price of logs produced in two different years (2008-2009) and sold in the same year (2009). In other words, production year's effect on sales price of logs, which are sold by auctions, is investigated.

Scope of the Research

This study, aiming to determine production year's effect on auction sales was conducted in Artvin RDF, one of 28 RDFs under GDF in Turkey. A major part of sales amount and sales revenue of Artvin RDF is obtained from log auction sales. In 2009, 74% of industrial roundwood production was from logs. Yet in the same year, 73% of auction sales revenue was obtained from third class normal length (TCNL) log (Anonymous, 2009).

Based on this information, the scope of the research was limited as TCNL log auctions occurred in 2009 in Artvin RDF. Logs sold in different years before and after the economic crisis were not included in the scope of the study. Therefore, the impact of the economic crisis in 2008 and 2009 on the log sales prices in different years was not investigated. In order to determine production year's effect, out of the 2009 auctions, bids including log parties produced in 2008 and 2009 together were detected. Analysis and evaluations were carried out for 83 TCNL log parties sold for the year 2009 in Artvin RDF. Some characteristics of log parties due to their production years are given in Table 1.

Table 1. Some characteristics of log parties sold in 2009

Production year	TCNL Log Parties				
	Number of parties	Average		Total	
		Volume (m^3)	Sales price (TL/m^3)	Volume (m^3)	Sales price (TL)
2008	21	28.03	138.5	588	81438
2009	62	31.70	165.5	1964	325042
Total	83	-	-	2552	406480
Average	-	30.76	158.7	-	-

Source: Anonymous, 2009. Artvin RDF Division of Forest Production and Marketing Records, Artvin

Materials and Methods

Data Collection

In the study, beside production year, other variables which can affect sales price were determined by considering similar research (Türker, 1996; Daşdemir, 2003; Öztürk et al., 2011). Each of the variables was obtained from log parties sold in auctions in different auction dates. As sale parties are composed of relatively homogenous logs with similar diameter, length, quality, volume, and characteristics, etc., variables which can affect sales price were determined for parties. Data for the variables were obtained from pre-sale and sales information tables for the year 2009 prepared by Artvin RDF. Variables include:

- *Party Sales Price (PSP):* stands for TCNL log party sales price (TL/m^3) in a bid
- *Total Volume of Parties in the Bid (TVP):* stands for total volume (m^3) of TCNL log party in a bid

- *Year After Harvest (YAH):* stands for the elapsed time (as year) between harvest year of TCNL log party and its auction year. In the study, it is taken as 0 years for the timber harvested in the year (2009) auction to take place and 1 year for the timber harvested in the year (2008) prior to the auction
- *Number of Bidders (NoB):* stands for number of bidders (participants) in an auction
- *Appraised Value of Each Party (AV):* stands for starting price (TL/m^3) of log parties

Analysis of Data

To carry out statistical analysis, parametric and non-parametric tests were used via IBM SPSS Statistics 19 program. Correlation analysis was used to examine the direction and degree of the linear relationship between sales price and variables, which can affect sales price (Kalaycı, 2009).

Then following hypotheses were developed to examine whether there is statistically significant difference between average sales price of TCNL log parties produced in 2008 and 2009:

- H_0 : There is not statistically significant difference between average sales price of TCNL log parties produced in 2008 and 2009.
- H_1 : There is statistically significant difference between average sales price of TCNL log parties produced in 2008 and 2009.

Mann-Whitney U Test, which is the non-parametric alternative of independent two sample t-test, was used to examine these hypotheses (Kalaycı, 2009).

In the study, multivariate regression analysis, which focuses on the relationship between a dependent variable and one or more independent variable, was also used (Altunışık, Coşkun, Bayraktaroğlu & Yıldırım, 2005). In regression model, PSP is the dependent variable and TVP, YAH, NoB and AV are independent variables.

Total volume of TCNL log parties in each auction is the total product quantity supplied of related product type. As there is negative relation between quantity supplied and sales price, in the model negative correlation was expected between TVP and PSP.

Wood products that are not sold immediately and stay in timber depots for a length of time are exposed to damage due to climate conditions. Therefore, these products are in less demand by customers. From this viewpoint, in the model negative correlation was expected between YAH and PSP (Öztürk et al., 2011).

As number of bidders in auctions and their interests on sales will lead to increase in competition in auctions, a positive correlation was expected between NoB and PSP and AV (Dunn & Dubois 1999; Dahal & Mehmood, 2005; Öztürk et al., 2011).

The variable of appraised value shows the beginning sales price level in auction. Hence, sales price will always be higher than appraised value. Appraised value changes based on product features and supply and demand conditions and most part of this price is comprised of the appraised value (Türker, 1996; Türker, 2008). So, a linear relationship was expected between AV and PSP.

As a result, we proposed the following linear model to estimate the TCNL log sales price:

$$PSP=\beta_0 + \beta_1 TVP + \beta_2 YAH + \beta_3 NoB + \beta_4 AV + u_i$$

βs represent the coefficients of the corresponding variables (TVP, YAH, NoB and AV) and u_i is the error term.

Results and Discussion

Coefficients of Correlations between Sales Price and Other Variables

Coefficients of correlations showing the direction and degree of relationship among five variables (YAH, AV, PSP, NoB and TVP) of TCNL parties are given in Table 2.

Four of these relations are statistically significant (p=0.000) and two of these are between PSP and other variables.

There is a significant and negative correlation between YAH and PSP variables (Spearman's rho=-0.495; p=0.000) and there is a weak and negative correlation between YAH and NoB variables (Spearman's rho =-0.484; p=0.000).

These correlations show that if TCNL log parties can be sold at auctions in the same year they are harvested, sales price (PSP) and number of bidders (NoB) will be higher. In other words, logs were more demanded by customers if logs (TCNL log harvested in 2009), which were harvested and transported to timber depots by forest enterprises, were put up for sale in their harvested year. In addition, their sales price was more than TCNL log harvested in 2008. Customers do not know the exact elapsed time (from production to sales) of TCNL logs in timber depots given in months or days. They only know the production year of these parties from the pre-sales information tables published by forest enterprises. Therefore, if wood products cannot be sold in their harvested year, it is perceived that these parties wait in timber depots for a long time. This wrong perception by customers effects demand and sales price negatively. Therefore, if customers buy logs within the shortest time after the harvest, sales price will be higher. These results are similar to results of Mehmood and Dahal (2005)'s study. In that study, results indicated that industrial forests were more likely to obtain higher bids when contact length was shorter (from production to sales).

On the other hand, there is a weak and positive correlation between AV and TVP variables (Spearman's rho =0.370; p=0.001) and also there is a positive correlation between AV and NoB, but this is not significant (Spearman's rho =0.037; p=0.737).

Appraised value showing the beginning sales price level in auction is under the influence of various factors. Especially in auctions, a competitive environment, sales price will always be higher than appraised value and the most part of this price is comprised of the appraised value (Türker, 2008). Positive correlation between AV and NoB conforms to what we expected and similar correlation between log sales price and appraised value have been obtained in Öztürk et al. (2011)'s study.

As with determining AV, product features, product quality, and market demand is effective; products having higher AV will have more customers. Since the logs with high AV will be demanded by more customers, the enterprise will sell larger total volume of parties in a bid. Thus a linear relationship was expected between AV and NoB and TVP.

Table 2. Correlations among variables identified for spruce log sales

			YAH	AV	PSP	NoB	TVP
Spearman's rho	YAH	Correlation Coefficient	1.000	-0.109	-0.495**	-0.484**	-0.272*
		Sig. (2-tailed)	.	0.326	0.000	0.000	0.013
		N	83	83	83	83	83
	AV	Correlation Coefficient	-0.109	1.000	0.241*	0.037	0.370**
		Sig. (2-tailed)	0.326	.	0.028	0.737	0.001
		N	83	83	83	83	83
	PSP	Correlation Coefficient	-0.495**	0.241*	1.000	0.661**	0.199
		Sig. (2-tailed)	0.000	0.028	.	0.000	0.071
		N	83	83	83	83	83
	NoB	Correlation Coefficient	-0.484**	0.037	0.661**	1.000	0.164
		Sig. (2-tailed)	0.000	0.737	0.000	.	0.139
		N	83	83	83	83	83
	TVP	Correlation Coefficient	-0.272*	0.370**	0.199	0.164	1.000
		Sig. (2-tailed)	0.013	0.001	0.071	0.139	.
		N	83	83	83	83	83

*. Correlation is significant at the 0.05 level
**. Correlation is significant at the 0.01 level (2-tailed).

A weak and positive correlation between AV and TVP was found in the study (Spearman's rho =0.370; p=0.000). This positive correlation shows that relatively more quality log parties having higher AV are presented to the market in each auction.

Lastly, there is a strong and positive correlation between PSP and NoB (Spearman's rho=0.841; p=0.000). Increase in the number of bidders in auction leads to increase in demand for log parties and this strong demand results in higher sales price. In Türker (1996)'s study about TCNL spruce log sales, it was found that there was a strong statistically significant correlation (0.897) between demand to sales parties and appraised value increment rate.

Correlation between Sales Price and Production Year

As seen in Table 3, there was a statistical difference between average sales prices of TCNL log parties produced in 2008 and 2009 and this difference was in favor of parties produced in 2009 (Z = -4.484; p = 0.000). Logs produced in 2009 and sold in the same year were sold at higher prices than previous year products.

When we compare average sales price of these two groups (Table 1), we see that average sales price of logs produced in 2009 was 31.7 TL/m^3 more than the 2008 products. This means more sales revenue.

This result showing the effect of production year on the average sales price of TCNL log parties supports the negative correlation between YAH and PSP (Table 2). Thus, we can say that as a result of auctions, average sales price of TCNL log parties in Artvin RDF is affected by production year.

As the difference between production and sales year of TCNL log parties increases, average sales prices decrease and this leads to revenue loss. In this study, as there is 27 TL/m^3 price difference (165.5-138.5) for the 588 m^3 TCNL log parties produced in 2008 and sold in 2009 (Table 1), total revenue loss is 15,876 TL (10,317 USD). This amount is approximately 20% of the total sales revenue (81,438 TL – 53,224 USD) of log parties produced in 2008 and sold in 2009.

Table 3. Mann-Whitney U test result of spruce log sales prices

Production year	n	Mean rank	Sum of ranks	M-Whitney U	Z	*p*
2008	21	21.62	454.00			
2009	62	48.90	3032.00	223.00	-4.484	0.000
Total	21	21.62	454.00			

Regression Model to Estimate Sales Price

In this study, beside correlation analysis that was used to determine sales price of TCNL log parties and variables which can affect sales price, a regression model was developed to estimate sales price.

Based on the regression model, 80.4% (R^2=0.804) of change in the sales price of TCNL log parties could be explained by four independent variables (YAH, NoB, AV and TVP). Other variables that were not in the model explained the remaining 19.6%. While YAH, NoB and AV variables were statistically significant at 99% confidence level, TVP was not (Table 4).

According to this, while other independent variables were constant, YAH, NoB and AV were statistically significant variables of the model. In other words, while other variables were constant, 1 unit increase in the year after harvesting will decrease sale price by 8.392 TL, and 1 unit increase in the number of bidders will increase sales price of TCNL log by 2.913 TL and 1 unit increase in the appraised value will increase sales price by 1.089 TL. Therefore, based on this research, the most important contribution came from the YAH variable.

Table 4. Multiple regression analysis of sales price estimation

Regression coefficient	B	t	*p*	R^2	F	*p*
	-1.622	-0.131	0.896			
YAH	-8.392	-2.701	0.008			
NoB	2.913	7.050	0.000	0.804	80.213	0.000
AV	1.089	11.936	0.000			
TVP	-0.001	-0.062	0.951			

Conclusion

It was found that average sales price of TCNL log parties in Artvin RDF is affected by production year. If log parties were sold in the year after production (waited in timber depots) their average sales price were affected negatively. Sales prices of products produced in previous years were lower, causing revenue loss for state forest enterprises. While other factors are constant, this revenue loss was approximately 20% of the total sales revenue of TCNL log parties.

In order to prevent sales of products produced in previous year at lower prices and eliminate revenue loss in state forest enterprises in Artvin RDF, the market situation should be evaluated carefully. It is especially important to prepare production and sales programs/plans by considering market demand and expectations.

In this study we only examined the average sales price differences of TCNL log parties produced in different years and its potential effect on revenue loss. Stock cost that is likely to occur as wood products wait in timber depots can be a future research subject. By conducting comprehensive studies, it is necessary to determine optimal stock level for state forest enterprises. Under the guidance and coordination of GDF, a stock management system has to be developed at the state forest enterprise level.

Alternatively, in order to minimize sales revenue loss, extending the standing sale method, which is one of the objetives of GDF strategic plan (2019-2023) and also practiced by GDF in recent years, can be considered. But advantages and disadvantages of this sales method should be researched by taking into account conditions such as the region, tree species and market conditions.

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