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Administration of forest resources: Improvement, protection and responsible utilization of trees and wood (Wood supply prospects of fibre and particle board industries in Turkey)

Neslihan Demirel[1], Ali Sencer Birler[2,*]

[1] ORMA – Wood Products Integrated Industry & Trade Inc. (Managing Director)
[2] ORKAV – Plantation Forestry & Trade Inc.
[*] Corresponding author: sencerali@mynet.com

Abstract: The "Forest Products and Wood Processing Sector (excluding pulp and paper plants)" in Turkey employs (including associated transportation and marketing services) approximately one million people and the sector's enterprise value is about 12 billion USD. There is a shortage in the supply of chip wood as a raw material. Furthermore, the chip wood prices in the local markets are higher than the international markets. This paper aims at putting forward proposals which can help to increase wood production output from local forests and to reduce chip wood prices in the local markets.
The proposals to increase wood production from state forests can be summarized under three main headings which are;

✓ Increasing the Rate of Allowable Annual Cut
✓ Extending Commercial Thinning Programmes, and
✓ Establishing Industrial Forest Plantations

The volume of wood growth occurred within a vegetation period in a forest stand is defined in terms of "Current Annual Increment" (CAI). The Directorate General of Forestry (DGF) has a long-standing forestry policy for optimising the structure of forests in Turkey. In this context, nearly half (approximately 45%) of the CAI is taken for assessing the quantity of "Allowable Annual Cut" (AAC), in accordance with the DGF's guidelines. According to the DGF estimates, the total quantity of standing forest volume was estimated "935.512.150" m^3 in the year 1973, whereas it reached up to "1.611.774.193" m^3 in 2015. These figures indicate that the total quantity of standing forest volume has increased by 72% in the period of last 42 years in Turkey. As a result, an accumulation of standing wood volume is achieved in the forests and a greater quantity of increase in the CAI is ensured for the successive years. A portion of the increased wood demand could be met by increasing the ratio to assess the quantity of AAC in suitable forest sites gradually. In this context, more than half (approximately 55%) of the CAI could be assessed as AAC, and the remaining quantity (approximately 45% of the CAI) could be left as standing trees in the stand to accumulate further volume growth in forests. As expressed above, an increase of about 10% in the rate of AAC/CAI may result in an increase of about 4 to 5 million m^3/year in the quantity of AAC. The first commercial thinning in a pine stand is usually performed when the trees reach chip wood size, about 15 to 20 cm in diameter. In a plantation, the trees are generally between 12 and 18 years old when they reach this size. In a natural stand, the trees will probably reach this size in 20 to 30 years. Experiments indicate that the implementation of regular thinning programmes may result in an additional chip wood production of at least 2 million m^3/year only from the stands of *Pinus brutia* in Turkey. It is obvious that wood production could increase further if the thinning programmes are extended to the stands of other tree species. A scenario of industrial forest plantation programme was arranged for Turkey using the data obtained from a series of experimental field trials. The scenario envisages to conduct an establishment of industrial forest plantations for a rotation period of 25 years on an area totalling to 40.000 ha/year. The scenario recommends use of *Pinus brutia* seedlings for plantations to be established in the Mediterranean and Aegean regions, and *Pinus pinaster* seedlings from Corsican origin for plantations to be established in the Marmara and Western Black Sea regions. At the end of the 25-year rotation period, the establishment of industrial forest plantations will be completed in an area totalling one million hectares which will produce 15 million m^3 of industrial wood annually. It should be noted that, according to this scenario, the total size of plantation land to be established (1 million ha) will amount to only 4,5% of the total forest area, whereas total wood production from these plantations will amount to 68% of the total wood production from natural forests. Chip wood prices in Turkey are twice more expensive compared to those in the European countries and three times more expensive than those countries in the Continental America. The reasons for expensive chip wood prices are mainly due to higher overhead costs and value added tax as explained below. The current price of coniferous chip wood is 73 TL/metric cordwood, of which 52% of this cost (38 TL/cordwood) is made up of the first three input costs (the bulk is wood production cost) and the remaining 48% (35 TL/cordwood) of this cost represents overheads. It is obvious that share of overheads (of which a proportion is not born strictly from forestry activities) doubles the chip wood prices and creates problems for fibre and particle board producers. Therefore, some components of the overheads should be removed from the DGF Working Capital Budget, and should be transferred out to other budget items or probably to general budget. In many countries, where Turkish producers of fibre and particle board are competing against, the Value Added Tax (VAT) rates for chip wood are around 6% and 8% of the purchase price. In Turkey, the VAT rate for chip wood is 18% of the purchase price, which is much higher than those countries Turkish manufacturers are competing against. Therefore, a proposal is put forward herewith to reduce the VAT rate on the raw material chip wood from 18% to 8% of the purchase price, in line with the international competition.
Keywords: Wood supply,

1. Introduction

The "Forest Products and Wood Processing Sector (excluding pulp and paper plants)" in Turkey employs (including associated transportation and marketing services) approximately one million people and the sector's enterprise value is about 12 billion USD. The forest products and wood processing sector constitutes mainly two sub-sectors: a) furniture and decoration industries, and b) fibre and particle board industries. The output products from the fibre and particle industries are the main intermediate products consumed by the furniture and decoration sector. In recent decades, fibre and particle board industries have made considerable investments in modern technologies, achieving a significant share of the world production capacity. The annual capacities for production and chip wood consumption of the fibre and particle board sector are stated below (Source: Association of Fibre and Particle Board Producers):

Production capacity:	
Fibre board	5.622.400 m^3/year
Particle Board	5.350.000 m^3/year
Total	10.972.400 m^3/year

Chip wood consumption capacity:	
Fibre board	7.530.000 tons/year
Particle Board	6.150.000 tons/year
Total	13.680.000 tons/year

Although the wood consumption capacity of the established processing facilities in the sector is determined as 13.680.000 tons/year, the quantity of wood raw material that the sector could supply was only 9.500.000 tons last year, as stated below:

The sources and the quantities of chip wood supplied by the sector;	
State forests	3.700.000 tons/year
Wood residues	900.000 tons/year
Private plantations (poplar)	400.000 tons/year
Private stands	1.500.000 tons/year
Imported wood	3.000.000 tons/year
Total	9.500.000 tons/year

As indicated above, the fibre and particle board production sector in Turkey is supplied with 9,5 million tons of raw material chip wood annually; whereas the established processing capacity for chip wood is 13,7 million tons/year. These figures indicate that there is a shortage in the supply of chip wood as a raw material. Furthermore, the chip wood prices in the local markets are higher than the international markets, partly due to shortfall in supply to meet the demand, and partly due to high Value Added Tax (VAT) and high levels of overhead costs allocated by the state. Consequently, this situation stifles investment in the forest and wood product sector, and reduces its competitiveness both in domestic and international markets. This paper aims at putting forward proposals which can help to increase wood production output from local forests and to reduce chip wood prices in the local markets.

2. Proposals to increase local wood production

Nearly all of the forests in Turkey are state owned and administered by the Directorate General of Forestry ("DGF") in line with the sustainability principles. Wood production from local forests can be increased if some implementations are carried out regularly by the DGF. The proposals to increase wood production from state forests can be summarized under three main headings which are;

- ✓ Increasing the Rate of Allowable Annual Cut
- ✓ Extending Commercial Thinning Programmes, and
- ✓ Establishing Industrial Forest Plantations

2.1. Increasing the rate of allowable annual cut

The volume of wood growth which occurs within a vegetation period in a forest stand is defined in terms of "Current Annual Increment" (CAI). The DGF has a long-standing forestry policy for optimising the structure of forests in Turkey. In this context, nearly half (approximately 45%) of the CAI is taken for assessing the quantity of "Allowable Annual Cut" ("AAC"), in accordance with the DGF's guidelines. Therefore, less than half of the quantity of the current annual increment is removed from forests by harvesting and the remaining quantity (about 55% of the CAI) is left as standing trees in the stand for further growth.

According to the DGF estimates, the total quantity of standing forest volume was estimated "935.512.150" m^3 in the year 1973, whereas it reached up to "1.611.774.193" m^3 in 2015. These figures indicate that the total quantity of standing forest volume has increased by 72% in the period of last 42 years in Turkey. As a result, an accumulation of standing wood volume is achieved in the forests and a greater quantity of increase in the CAI is ensured for the successive years.

At present, total demand for wood has increased considerably due to increase in population and improvements in social and economic conditions in Turkey. Therefore, a greater quantity of wood material is required to be supplied from the local markets. A portion of the increased wood demand could be met by increasing the ratio to assess the quantity of AAC in suitable forest sites gradually. In this context, more than half (approximately 55%) of the CAI could be assessed as AAC, and the remaining quantity (approximately 45% of the CAI) could be left as standing trees in the stand to accumulate further volume growth in forests.

As expressed above, an increase of about 10% in the rate of AAC/CAI may result in an increase of about 4 to 5 million m^3/year in the quantity of AAC. It is obvious that an increase in standing forest volume results in greater quantity of CAI. Higher levels of CAI in forests could encourage the DGF to assess greater quantity of AAC, which results in an increase of wood supply to the market.

2.2. Extending commercial thinning programmes

The first commercial thinning in a pine stand is usually performed when the trees reach chip wood size, about 15 to 20 cm in diameter. In a plantation, the trees are generally between 12 and 18 years old when they reach this size. In a natural stand, the trees will probably reach this size in 20 to 30 years.

Within a few years, after the diseased, damaged, poorly formed, and weak trees are removed by thinning, the branches and roots of the remaining trees will grow to fill in the gaps in some sites. Inevitably, as time elapses, the same crowded condition that existed before thinning will redevelop. Therefore, it is important to repeat the thinning process again, before the trees get over crowded, slowing down their growth.

Thinning is an important silvicultural practice that redistributes the growth potential of the site for the best trees. Diameter growth rates are maintained or increased in remaining trees after thinning, which increases the return on investment from higher-value trees. Biologically, thinning accelerates stand development by favouring the tallest, best-formed trees over those that are diseased, overtopped, crooked, forked, or otherwise undesirable and likely to die if they were left in the stand long enough. In addition, thinning raises periodic income, improves access for equipment, provides recreation and hunting grounds, and creates a generally healthier stand.

The dominant tree species in the ORMA Hinterland (south-west Turkey) is ***Pinus brutia*** which naturally generates even aged and dense stands following clear cut and forest fires. A considerable proportion of *Pinus brutia* stands is accumulated in the younger age classes in the *Pinus brutia* zone in the southern and western Turkey. The majority of such *Pinus brutia* stands needs thinning to accelerate the reduced growth rate. Total size of forests in need of thinning may exceed a million hectares and therefore, regular thinning programmes are urgently needed to be actioned by the DGF.

Experiments indicate that the implementation of regular thinning programmes may result in an additional chip wood production of at least 2 million m^3/year only from the stands of *Pinus brutia* in Turkey. It is obvious that wood production could increase further if the thinning programmes are extended to the stands of other tree species.

2.3. Establishing industrial forest plantations

Natural forests play a very important role in maintaining the ecological balance in the world. The demand for wood has been growing continuously, as the population grows, and the world economy develops. As a result, it is envisaged that the global demand for wood may reach up to circa 5,5 billion m^3/year by 2020. Currently, the worldwide wood production capacity from natural forests is around 3,5 billion m^3/year. Hence, the global wood demand can no longer be met solely from natural forests. Therefore, the protection and maintenance of world natural forests have gained greater importance. As a consequence, additional wood production from industrial plantations with fast growing forest tree species appears to be the most rational way to meet demand. It should be noted that some countries have already established industrial forest plantations on extensive areas and almost 2 billion m^3 of industrial wood is produced annually to meet the excessive demand for wood in the world.

Poplar plantations are considered to be a fast growing industrial plantations for wood production. The poplar clones used in industrial plantations are among the most important fast growing tree species due to their relative high growth rate within a shorter period of rotation, and their ability to adapt to a wide range of site conditions around the world.

In Turkey, a great majority of poplar plantations are established by farmers on their small scale private land using the clones of indigenous poplars (*Populus nigra* L) and exotic poplars (*Euramericana* hybrids and *Populus deltoides*). The quantities of annual wood production obtained from plantations of indigenous and exotic poplar clones are estimated approximately 1,5 million m^3/year and 2,0 million m^3/year, respectively, which altogether make a total poplar wood production of about 3,5 million m^3/year in Turkey. It should be noted that a proportion of the growing wood demand is met by the wood produced from poplar plantations, which mitigates the demand pressure over natural forest resources to a certain extent.

In Turkey, large scale corporate investments for industrial plantation investments are not yet widespread. At present, there are only two examples for such corporate plantation investments, which are “ORKAV–Plantation Forestry and Agricultural Intercropping & Trade Inc.” established by Mr Şevket Demirel and “ENAT–Industrial Forest Plantations & Trade Inc.” established by Mr Nihat Gökyiğit.

Widespread extension of corporate investments for large scale industrial plantations can help to produce wood in considerable quantities to meet the growing demand for wood in Turkey. It is important to point out that plantation land of adequate size with suitable natural conditions and other financial and technical facilities are available to establish such

industrial forest plantations in Turkey. State forestry sector's initiative is considered to be essential in establishing large scale industrial forest plantation investments. Large scale plantations at adequate extension could be established by the state sector, creating the bulk of a locomotive power for private entrepreneurs to follow up large scale industrial forest plantation investments.

A scenario of industrial forest plantation programme was arranged for Turkey using the data obtained from a series of experimental field trials. The scenario envisages to conduct an establishment of industrial forest plantations for a rotation period of 25 years on an area totalling to 40.000 ha/year. The scenario recommends use of *Pinus brutia* seedlings for plantations to be established in the Mediterranean and Aegean regions, and *Pinus pinaster* seedlings from Corsican origin for plantations to be established in the Marmara and Western Black Sea regions. At the end of the 25-year rotation period, the establishment of industrial forest plantations will be completed in an area totalling one million hectares which will produce 15 million m^3 of industrial wood annually. The total forest area in Turkey covers 22.342.935 hectares of land and a total annual allowable cut was estimated as 22 million m^3 in 2017. It should be noted that, according to this scenario, the total size of plantation land to be established (1 million ha) will amount to only 4,5% of the total forest area, whereas total wood production from these plantations will amount to 68% of the total wood production from natural forests.

3. Proposals to reduce chip wood prices

Chip wood prices in the local markets are much higher compared to those in the international markets. Chip wood prices in Turkey are twice more expensive compared to those in the European countries and three times more expensive than those countries in the Continental America. Consequently, the share of the raw wood material amounts to 45 – 50% in the total cost of fibre and particle board production, reducing the competitiveness of the Turkish Fibre and Particle Board Sector in the international markets significantly. Therefore, the chip wood prices need to be reduced to in order to improve the competitiveness of the Turkish producers in the international markets.

The reasons for expensive chip wood prices are mainly due to higher overhead costs and value added tax as explained below.

3.1. Exemption of overheads from DGF working capital

There are four main input costs for the chip wood prices which are; wood production costs, tariff costs, marketing costs and overheads. The level of first three cost components are similar to those in the international markets, and hence, do not cause any distortions to international competitiveness. The fourth cost component "overheads and general expenditure" is a major cost item, included in the "Working Capital Budget" of the Turkish Forestry Service (DGF), allocating numerous indirect costs and different activities carried out by the DGF. For example, the forest roads are build and maintained for performing various forestry activities, but in many cases forest roads are used to a great extend for public transport purposes. Infect roads for public transport should be financed by the Government's General Budget but not by the Working Capital Budget of the DGF. The forest fire fighting infrastructure and activities are another example which are carried out to protect not only the state forests but also all sorts of public property in and around the forests. Therefore, some components of the Overheads should be excluded from the DGF's Working Capital Budget.

The current price of coniferous chip wood is 73 TL/metric cordwood, of which 52% of this cost (38 TL/cordwood) is made up of the first three input costs (the bulk is wood production cost) and the remaining 48% (35 TL/cordwood) of this cost represents overheads. It is obvious that share of overheads (of which a proportion is not born strictly from forestry activities) doubles the chip wood prices and creates problems for fibre and particle board producers. Therefore, some components of the overheads should be removed from the DGF Working Capital Budget, and should be transferred out to other budget items or probably to general budget.

3.2. Reduction of the rate of VAT in chip wood purchases

Wood is a raw material which is required to be processed in several steps by numerous organizations before the final goods are sold to consumers. Each wood processing step and organization creates considerable capacity of employment which is an added value.

In many countries, where Turkish producers of fibre and particle board are competing against, the Value Added Tax (VAT) rates for chip wood are around 6% and 8% of the purchase price. In Turkey, the VAT rate for chip wood is 18% of the purchase price, which is much higher than those countries Turkish manufacturers are competing against.

High raw material prices (partly due to high VAT and high overhead cost allocation) discourage further investment in the wood production sector to improve its production capacity at lower cost. Consequently, high raw material prices have an adverse knock on impact on the downstream industries (furniture and decoration sector, fibre and particle board industries) that rely on cheap supply of raw material and intermediary products. Thus, the output of the downstream industries is reduced further, limiting employment, and adversely impacting its competitiveness.

Therefore, a proposal is put forward herewith to reduce the VAT rate on the raw material chip wood from 18% to 8% of the purchase price, in line with the international competition. Such a reduction in VAT would increase the competitiveness, output and employment of the downstream industries that rely on wood as a raw material, generating higher tax revenues for the government, unlike a static calculation would otherwise suggest.