

## The Situation and Evaluation of Forest Harvesting Methods in Turkey

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**Abstract:** The present study summarize and evaluate major problems of timber harvesting in Turkey and the future principles and objectives have been defined. Timber harvesting in Turkey is still carried out by manual methods due to economical, social and environmental constraints. Almost 80% of harvesting activities are mechanized in many developed countries while this value is only 5% in Turkey. Overall ratio of mechanization is relatively low. Approximately percentage of man power, animal power, machine power and skyline harvesting are 72, 15, 8 and 5%, respectively. The need for forest roads in total in Turkey was 201810 km and that 133693 km portion on which, corresponding to 66.25% was constructed by end of 2003.

**Key words:** Harvesting, Transportation, Logging, Turkey

### INTRODUCTION

Forests, which are renewable natural assets, are formed by gathering of a large number of living and non-living creatures. However, this formation is not a random mass, but whole, a system. When making use of the forest ecosystem for various purposes, care must be taken not to spoil the forest structure. The term "harvesting" which is defined in the dictionaries as "all of the activities that help to create a new good or service" correspond in forestry transportation to activities such as cutting the raw material of wood, hauling, transporting and stacking it. In order to perform this harvesting rationally, requirements such as conformance to rules, safety and affordability, which make up the basis of engineering discipline, must be met. In order to make full use of modern technology, forest trees which, for long years carry along the efforts of nature and human beings to reach the time for being cut, must be transported from the place they have been cut to the main transportation (secondary transport) near the forest road keeping its original volume and quality intact and without harming the other trees, youth, the forest soil, in short the forest ecosystem. At that stage, with each step towards mechanization, labor loss will be prevented, hauling costs shall be reduced, natural balance and forest soil will be preserved, while obtained more products with higher quality. In this study, the harvesting methods used in Turkey have been assessed and discussed and the future principles and objectives have been defined.

### MATERIALS AND METHODS

Turkey, with 97% of its land in Asia and 3% in Europe continents, is located between 42° 06'-35° 51' N latitude and 25° 40'-44° 48' E longitudes. Turkey is surrounded with the Mediterranean, the Black Sea, the Marmara

and the Aegean Sea, has an area of 77945200 ha and coasts of 8333 km long. This width along with large distances of over 1600 km in East-West and changing 475-650 km between North-South directions, as well properties such as location, relief and climate have caused the formation of different geographical regions within the country boundaries [1, 2].

As of the end of 2003, the total forest area in Turkey is 20703122 ha. This figure is 26.6% of Turkey's area. High quality forests and coppice forests spread over 10547987 ha account for 50.9% of the total forest area, coppice forests spread over 10155135 ha account for 49.1% of the total forest area. According to 2003 figures, the percent of coniferous forest in the total forest area is 53.9 and that of deciduous forest is 46.1. Production capacities are approximately 12039718 m<sup>3</sup>/year in high quality forests and 8837705 m<sup>3</sup>/year in coppice forests, respectively [3, 4].

### RESULTS AND DISCUSSION

Until recently, the forests in Turkey have encountered excessive interventions at diverse levels and densities in order to meet the country's needs for firewood. These detrimental interventions started generally in forest lands which provided easy access or transportation and continued for long causing damage to some parts of the natural structure of our forests. Forest roads are the most important infrastructure for forestry operations. But, if does not good plan; they caused technical, economical and environmental problems. Though the construction of forest roads has been subject to certain regulations under Forest Act, which was first introduced in 1937 in Turkey, the forest road construction operations have resulted in non-systematic forest roads since these construction operations were based only on obtaining firewood easily, economically and rapidly until 1963 which was the beginning of the

planned period. For this reason, the forest road construction operations in Turkey should be evaluated in two categories: planned period and unplanned period. The forest roads constructed in Turkey prior to the planned period were, as mentioned above, were constructed at random on easily accessible forest lands in order to rapidly transport cut woods and to meet daily needs, thus there appeared a substantial tendency to construct roads rapidly, easily and economically. So, there have been many forest roads constructed failing to be compliant with the standards in relation to forest road declivity and location and also failing to ensure that forest is managed properly. The planning of systematic forest roads network after the unplanned period was commenced in 1964 in Turkey and completed in 1974. Also in this period, a total road of 144425 km was planned by taking into account only fertile forest lands in Turkey. However, the developments in forestry science and practices and the production technologies and techniques as well as the results obtained from rational forestry and plan implementation requirements entailed revision of such plans. Basing on a plan prepared in accordance with that new understanding, the need for forest roads in total in Turkey was 201810 km and that 133693 km portion of which, corresponding to 66.25%, was constructed by the end of 2003. It is aimed that the construction of the planned forest roads and the completion of forest road structures of all forest roads will be achieved within 20 years. As a result, today, a substantial part of the forests of Turkey have been provided with forest roads constructed basing on a plan and transportation by truck on such roads has almost been the one and only choice [3, 5, 6, 7].

Primary transportation is moving timber from the harvesting site to the landing area. Cutting, bucking, skidding, landing and unloading are some of the major activities of primary transportation. Based on the results of several studies, non-mechanized (manual) cutting and skidding are relatively inefficient and more expensive than that of mechanized techniques. Primary transportation is generally 25-50% of total cost of the harvesting activities [8, 9]. In Turkish forestry, the timber logging expenditures capture the majority of the total forestry expenditures after general administrative expenditures. Taken into consideration the timber production per unit costs (with current price); 16% of total unit costs is harvesting costs (cutting/felling etc.), 31% of them is extraction cost (bunching/skidding etc.) and 30% of them is transportation cost (loading/hauling etc.) [3,10]. Therefore, application of mechanization of skidding such as introduction of grapple skidder or using feller-buncher in cutting phase of harvesting will not only reduce total cost but also increase productivity. In Turkey, forest products are hauled in three different ways:

**Hauling with Man-power:** The method of hauling forest products using manpower is done in the flat areas and in areas with slight slope in Turkey. Hauling consists of throwing the forest products down the mountain slopes, sliding them and handling them.

**Hauling with Animal-power:** In Turkey, the method of hauling forest products using animal power makes wide use of draft animals (horse, cow, water buffalo and mule, etc.). Forest products are hauled by skidding directly over the ground using animal power.

**Hauling with Machine-power:** The method of hauling forest products using machine power is applied under difficult conditions where manpower and animal power are not sufficient. Forest products are hauled by skidding directly over the ground using forestry and agricultural tractors and special forestry tractors. Besides, forest products are hauled by short, middle and long skylines types. These skyline types are Koller K300, URUS MIII and Gantner. These skylines are using especially East Blacksea Region in Turkey. The average slope of Turkey's forests is 50-60% and overall ratio of mechanization is relatively low. Approximate percentages of man power, animal power, machine power and skyline harvesting are 72, 15, 8 and 5%, respectively (Fig. 1) [11].

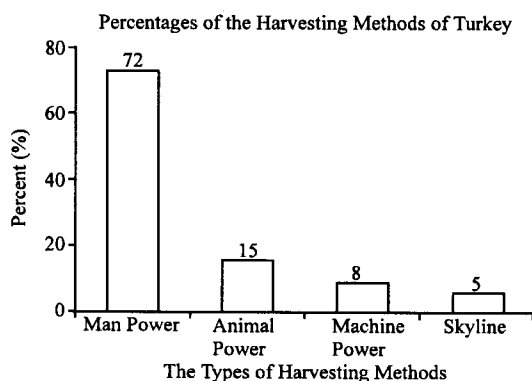


Fig. 1: Approximate Percentages of the Harvesting Methods in Turkey [11]

Mechanization on harvesting has begun with use long distance winch skylines in our country in 1949. Wyssen, Baco and Hintereger marked 21 set skylines widely used in the northeast forests of Turkey. Furthermore, attain to standard of production in developed countries has been going on in Turkey. It is believed that mechanization of timber harvesting will be improving in near future in Turkey [12, 13]. Mechanical park has been improved from the point of view type and amount. These amount has reached to 27 mobile skylines, 43 skidding winches, 85 forklifts, 55 loaders 152 tractors and 71 trucks as of 1982. Park at

the production machinery has also improved having 35 tractors (4x4 and assembled shovel), 286 skidding winches, 6 tractors with equipment of snow cleaner, 63 forklifts, 53 loaders, 47 skylines, 260 agricultural tractors, 12 agricultural tractors with shovel, 11 barking machines and 7 chippers as of 1998. Mechanical park amount has been reduced to 19 tractors (4x4 and assembled shovel), 169 skidding winches, 6 tractors with equipment of snow cleaner, 46 forklifts, 26 loaders, 32 skylines, 65 agricultural tractors, 4 agricultural tractors with shovel, 2 barking machines as of 2003 as illustrated in Table 1 and Fig. 2. In spite of

existence of substantial number of harvesters, the amount of modern harvesting processor in Turkey is not sufficient. Different type and marked machine hasn't taken into consideration to improve mechanization and a poor standardization in harvesting is another problem in Turkey. Besides, these production machine generally uses subjective and out of aim because of technical inexperience. Also closing of repair shops due to suffer harm effected situation of production machine. To repair, to maintenance and to obtain spare part of these machine are forced [14].

Table 1: Amount of Harvesting Equipment Used in Primary Transportation in Turkey (2003 Year)

Administration of forest	4X4 Tractors					4X4 Tractor Mounted Shovel		Skidders					Stackers					
	Mb Trac 800	Mb Trac 900	Mb Trac 1000	Mb Trac 1100	Fiat 1180	Mb Trac 900	Mb Trac 1000	Mb Trac 1100	Mb Trac 800	Mb Trac 900	4x2 Tractor	Unimog	Rotatif Mb 900	Kar Bicak Mb 900	Caterpil 920	Kocaklar	Uyan Mb 800	Volvo
Merkez (Center)																		
Adana																		3
Adapazari															1	1		
Amasya	1					1			2					2		1		
Ankara			1	2		1	1								1			
Antalya						1			6	10				3			1	
Artvin									2	3				1				
Balikesir										7								
Bolu	1								1	11		1	1	1			4	
Bursa									2	5					1			
Canakkale	1	2	1			1			2	6				1				
Denizli										1				1				
Elazig																		
Erzurum										1								
Eskisehir			2							1								
Giresun				1					6	9				4				
Isparta										5								
Istanbul										2				2	1			
Izmir						1		1	6	1								
K.Maras										3								
Kastamonu									5	11			2	2	4	3	2	
Konya										1					1			
Kutahya										2								
Mersin							1	1	2						1			
Mugla										7				1	1			
Sinop									1	5				3				
Trabzon									2	5				2				
Zonguldak										9				2	1			
Total	1	4	1	3	3	1	4	2	32	136	1	1	3	3	31	11	3	1
General Total	12					7		169					46					

Table 1: Continued

Administration of Forest	Forklift		Skyline							4X2 Tractors					4X2 Tractor Mounted Shovel		Barking Machine		Truck	Total				
	Liebherr	Granab 9000	Hiap 560	Uyan	Zere	4X2 Tractor	URUS M I-II-III	Baco-Gatner	Koller K300	Koller Romork	Steyr	Ford	Fordson	M. Ferrinson	Tumosan	Universal	Steyr	Ford			Universal	Zere	CambiovalmET	
Merkez (Center)																						2	2	
Adana																							2	5
Adapazari										2													3	13
Amasya		1								5	1					1							5	29
Ankara	2									4	2												6	26
Antalya						1		1		3	3								1				2	32
Artvin	2					4	3	3															3	21
Balikesir																							3	12
Bolu										3				1			1				1		5	31
Bursa	1							2	2	3	1												3	20
Canakkale								1		5	1												8	29
Denizli										1													2	5
Elazig										3													4	7
Erzurum										1	3		2										1	8
Eskisehir										1													2	8
Giresun	1	2		1	1	2		1															4	32
Isparta	1									1													2	9
Istanbul	1		1							2													3	12
Izmir										3	3												4	18
K.Maras																							2	5
Kastamonu	1	2				1		1		2	2												5	43
Konya																							2	4
Kutahya									1														2	5
Mersin										1	1						1						3	11
Mugla						1		2		1													3	16
Sinop	1	2			1	1	1	1		2	1												2	22
Trabzon		4				1																	3	17
Zonguldak								1			1												2	16
Total	10	11	1	1	2	1	11	3	15	3	43	19	0	2	1	0	1	2	1	1	1	1	88	457
Gen. Total	26					32					65					4			2				88	457

Within the scope of this brief study, the following remarks can be concluded about applications of mechanized timber harvesting techniques in Turkey. First of all, harvesting plans should be analyzed based on today's forest conditions before any solid decisions are made. Turkey is a developing country; it may look as efficient way to use manual harvesting methods at the time. However, it is important that consider long term-harvesting plans which will require mechanization so that total harvesting cost will be reduced in long term. Therefore, initial investments should be

considered for mechanization. Road conditions must be improved with regard topographic and silvicultural factors. Slope of primary and secondary roads should be clearly analyzed and combined with harvesting area and final destinations. Forest main repair shops should be opened over again in Turkey. Level of mechanization should be determined for all of the country and then machine park should be standardized. Forest villagers should be included in logging plan and their involvement may play important in long form in mechanized harvesting. Government should arrange

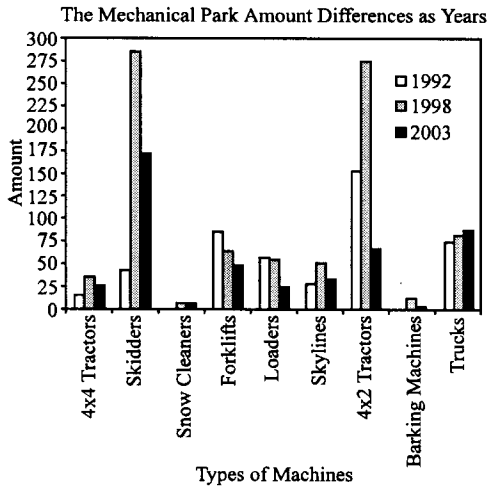


Fig. 2: The Mechanical Park Amount Differences as Years of Turkey

credit to finance initial cost of mechanized harvest equipment owned by local forest villagers. Training of villager should be achieved in the form of short workshop.

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