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**DETERMINATION OF EFFICIENCY OF
THE FOREST SKYLINES IN ARTVIN
FORESTRY REGION**

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Introduction

- Wood extraction is further difficult in the Black Sea Region in Turkey where most of forest is on great altitude and mountainous fields.
- While the rate of mechanization used in manufacturing wood in developed countries is around 80%, this rate is only 13% in Turkey.
- 5% of mechanization techniques used in Turkey consists of forestry skylines. Skylines are used in Artvin Region.

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- Hourly efficient of Koller K 300 and Urus M III type skylines in East Black Sea Region was determined as 3.31 m³/hour and 6.73 m³/hour respectively (Acar, 1997).
 - Eker et. al. (2001) determined the efficiency of Gantner type skyline as 4.03 m³/hour and 6.98 m³/hour for the carriage distances of 1200 m and 700 m respectively.



The Aim of This Study

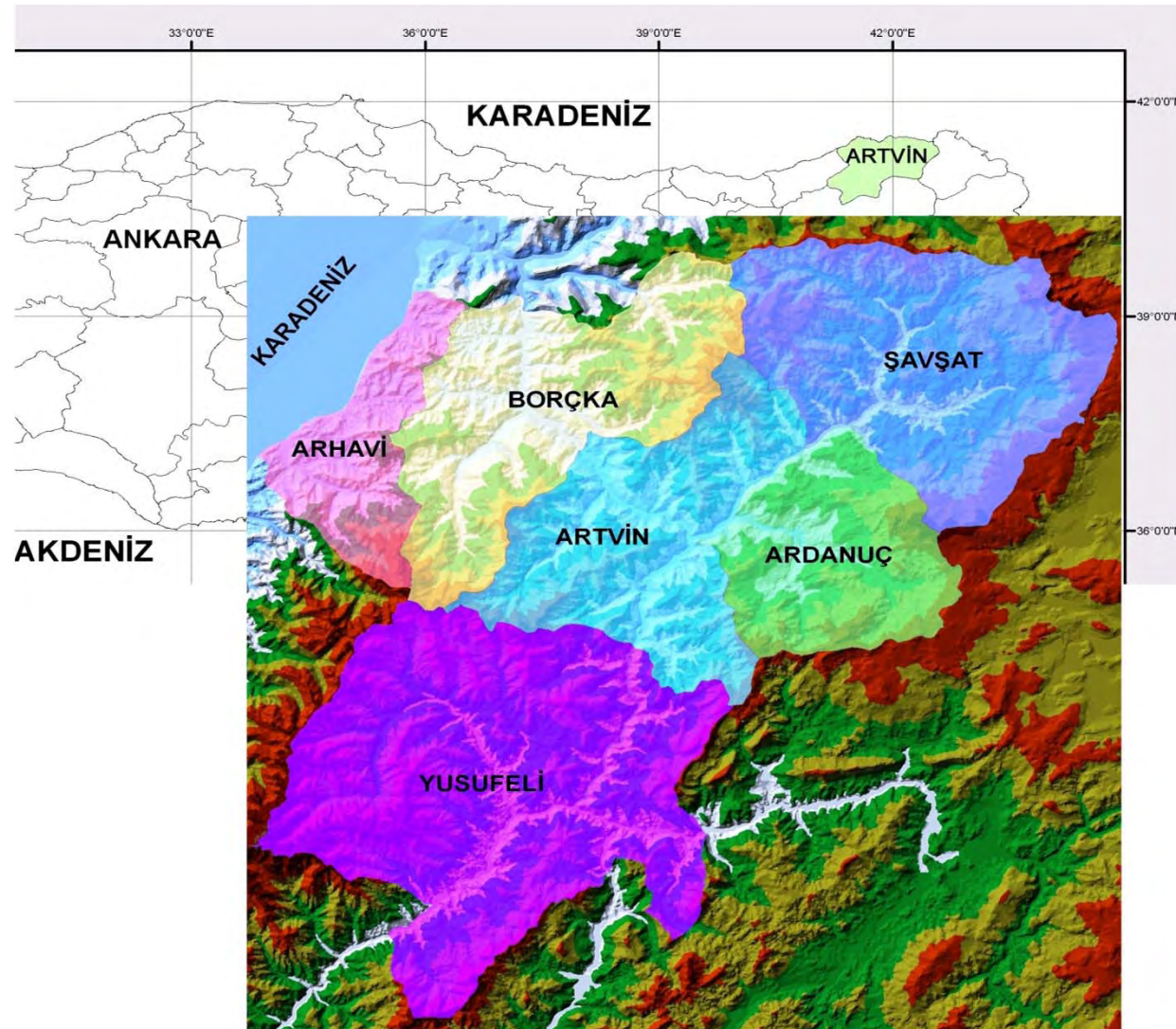
- In this work, work efficiencies of Koller K 300 (3 Units), Urus M III (2 Units) and Gantner (1 Unit) in Artvin locality at 2008, 2009 and 2010 years were examined.





Material and Method

- Research area is geographically located between $40^{\circ} 31' 32.55''$ and $41^{\circ} 33' 46.58''$ north latitudes and $41^{\circ} 08' 42.10''$ and $42^{\circ} 38' 12.01''$ east longitudes.
- Average height from the sea of forests in Artvin locality is 1500m and more.
- Average gradient is 60% and more.

General appearance of research area




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- Dominant tree types are **spruce** [*Picea orientalis*], **fir** [*Abies nordmanniana*], **Scots pine** [*Pinus sylvestris*] and **beech** [*Fagus orientalis*].
 - There is brown forestry soil without clay at the great amount in terms of soil type.
 - Climate of the region varies; in interior parts, continental climate dominates, whereas in coastal line.

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- Koller K 300 short distanced, Urus M III middle distanced and Gantner long distanced skylines are used in extracting wood raw material with thick diameter in working area.



Koller K 300

Specifications	Koller K 300	Urus M III	Gantner
Carriage distance (m)	300	600	1400
Mast height (m)	4	6	-
Carriage capacity (kg)	1000-1500	1000-2500	2000
Diameter of rope (mm)	16	22-24	22-24
Length of rope (m)	350	700	1400
Diameter of pulling rope (mm)	9-14	9-14	9-14
Length of pulling rope (m)	300	600	1400
Diameter of back-movement rope (mm)	-	9-14	-
Length of back-movement rope (m)	-	1200	-
Number of safety rope (piece)	3	4	2
Diameter of safety rope (mm)	14-20	14-20	14-20
Length of safety rope (m)	20-40	40-60	-
Number of drum (piece)	2	8	1
Maximum side pulling distance (m)	50	50	50
Truck model	-	Mercedes Benz Unimog U1500	Fiat 1180 Tractor


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- Usage rate of each model according to usage of total skylines within the year was calculated with equality [1].


$$KO = \frac{d_x}{D} \times 100$$

- KO, usage rate of vehicle within year (%);
- d_x , the number of the working day of each model skyline within one year (day);
- D, total number of working days that all the skylines within one year.

Results and Discussion

Year		Koller K300	Urus M III	Gantner	Total
2008	Number of day worked	142	188	71	401
	Number of hour worked	759	1440	295	2494
	Carried wood (m ³)	2460	4255	1011	8026
	Hourly efficiency (m ³ /h)	3.24	3.16	3.43	-
	Daily efficiency (m ³ /day)	17.32	24.23	14.24	-
	Usage rate (%)	35.41	46.88	17.71	-
2009	Number of day worked	208	140	63	411
	Number of hour worked	1332	1133	237	2702
	Carried wood (m ³)	3080	2687	1121	6888
	Hourly efficiency (m ³ /h)	2.31	2.37	4.73	-
	Daily efficiency (m ³ /day)	14.81	19.19	17.79	-
	Usage rate (%)	50.61	34.06	15.33	-
2010	Number of day worked	298	154	105	557
	Number of hour worked	1144	1285	422	2851
	Carried wood (m ³)	2762	4015	1779	8556
	Hourly efficiency (m ³ /h)	2.41	3.12	4.22	-
	Daily efficiency (m ³ /day)	9.27	26.07	16.94	-
	Usage rate (%)	53.50	27.65	18.85	-


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- By benefiting from such data, average efficiency of mechanization vehicles was calculated as m^3/hour and m^3/day .
 - Results obtained from the study were found to be similar to the work made by Acar (1998)
 - While Urus M III model skyline was used mostly in 2008, Koller K 300 was mostly used in the other years.


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- Skyline with the highest hourly efficiency for three years was Gantner, whereas skyline with the highest daily efficiency was Urus M III model.
 - The season when skylines were mostly used for three years was between June and November. The most wood in 2009 was carried with Koller K 300, whereas the most wood in the other years was carried by Urus M III model skylines.



Conclusions and Recommendations

- It is necessary to control each part of forest skylines which take time to be established on the ground and which are adversely influenced by open air conditions before they are mounted according to manufacturing plans.
- In addition, in order to prevent efficiency loss by keeping it waiting without doing anything on the ground, skylines should be applied on the ground after the products to be carried reach to certain amount.

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- It will be good to use Koller K 300 for carrying light products and Urus M III for carrying heavy products.
 - Efficient use of mechanization vehicles are in direct correlation with the information, skills and professionalism of operators.
 - For this reason, operators should be kept subject to good training and enabled to have certificates.

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- Before skylines are established on the field, good field study should be made and the shortest and the most suitable routine through which the product can be transported close to road should be determined and skylines should be mounted accordingly.



Thanks for your attention

