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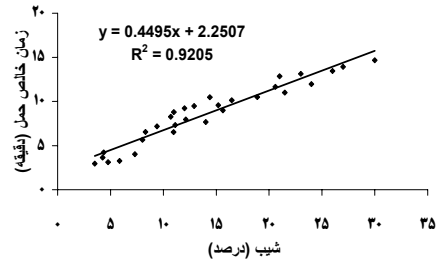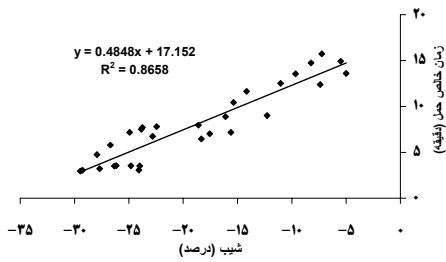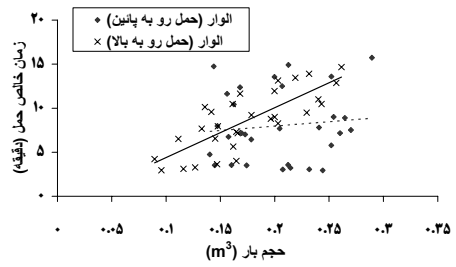$$n = \frac{t^2 \times s^2}{E^2}$$ ( )   :

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SPSS

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	Outhaul time
Normal plots	Hook time
Anderson- Darling	Inhaul time
Stepwise Regression	Unhook time

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الوار (حمل رو به پائين) ◆
الوار (حمل رو به بالا) ▲

زمان خالص حمل (دقيقه)

۲۰
۱۵
۱۰
۵
۰

۰   ۵۰   ۱۰۰ ۱۵۰ ۲۰۰ ۲۵۰ ۳۰۰ ۳۵۰ ۴۰۰

فاصله حمل بار (متر)

الوار (حمل رو به پائين) ◆
الوار (حمل رو به بالا) ×

زمان خالص حمل (دقيقه)

۲۰
۱۵
۱۰
۵
۰

۰   ۰.۰۵ ۰.۱ ۰.۱۵ ۰.۲ ۰.۲۵ ۰.۳ ۰.۳۵

حجم بار (m³)

y = 0.4848x + 17.152
R² = 0.8658

زمان خالص حمل (دقيقه)

۲۰
۱۵
۱۰
۵
۰

-۳۵ -۳۰ -۲۵ -۲۰ -۱۵ -۱۰ -۵   ۰

شيب (درصد)

y = 0.4495x + 2.2507
R² = 0.9205

زمان خالص حمل (دقيقه)

۲۰
۱۵
۱۰
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۰   ۵   ۱۰   ۱۵   ۲۰   ۲۵   ۳۰   ۳۵

شيب (درصد)

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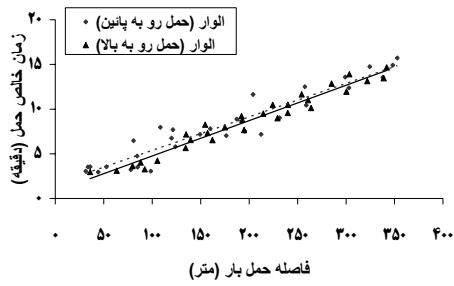
T=   ( )
D=   ( )
V=   ( )

                                                    :

T= - /   + /   D+ /   V

				$F=\frac{MSK}{MSe}$	( ) R^2	P
		/	/	/	/	/
		/	/			
		/				

T= / + / D+ / S×V   F

: $\alpha = 0/01$

( )   =T R^2 /

( )   =D   .   ( )

=SV

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				$F=\frac{MSK}{MSe}$	( ) R^2	P
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		/	/			
		/				

F

SPSS   . $\alpha = 0/01$

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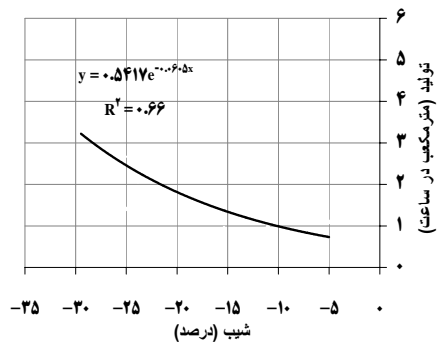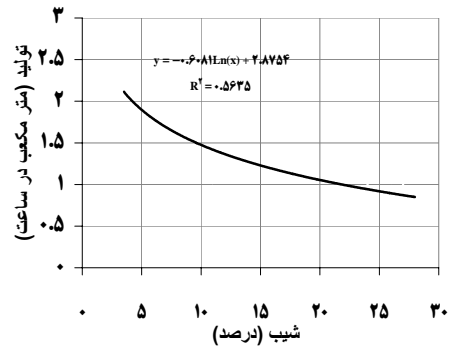
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$$\text{میزان} = \frac{(\quad \quad)\ (\quad)\ \text{حمل}}{(\quad)}$$

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الوار (حمل رو به پایین)
الوار (حمل رو به بالا)

فاصله حمل چوب (متر)

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$y = \cdot \Delta f \mid V e^{-\cdot \cdot \mathcal{P} \cdot \Delta x}$

$R^{\mathsf{Y}} = \cdot \mathcal{P} \mathcal{P}$

شیب (درصد)

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$y = -\cdot \mathcal{P} \cdot \lambda \mathcal{L} Ln(x) + \mathsf{Y} \cdot \lambda \mathsf{Y} \Delta f$

$R^{\mathsf{Y}} = \cdot \Delta \mathcal{P} \mathsf{Y} \Delta$

شیب (درصد)

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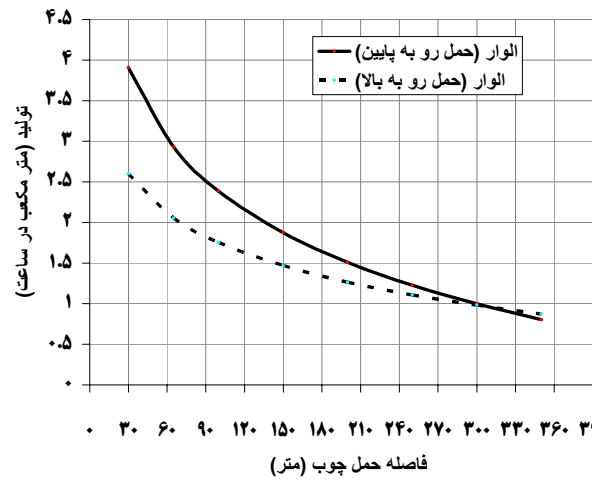
$$\frac{\text{هزینه سیستم(ریال / ساعت)}}{\text{میزان تولید(متر مکعب / ساعت)}}$$

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Mule hauling cost   Animal Rate

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C=   +   /   D

C=   +   /   D

* D=   C=

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هزینه واحد تولید (ریال بر متر مکعب)

الوار (حمل رو به پایین)
الوار (حمل رو به بالا)

۱۰
۹
۸
۷
۶
۵
۴
۳
۲
۱

۰   ۵۰ ۱۰۰ ۱۵۰ ۲۰۰ ۲۵۰ ۳۰۰ ۳۵۰ ۴۰۰

فاصله حمل بار (متر)

زمان (درصد)

الوار (شیب منفی)
الوار (شیب مثبت)

۴۰
۳۵
۳۰
۲۵
۲۰
۱۵
۱۰
۵

حرکت خالی بارگیری حرکت با بار تخلیه تاخیر

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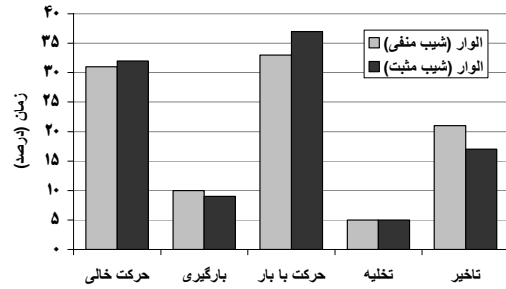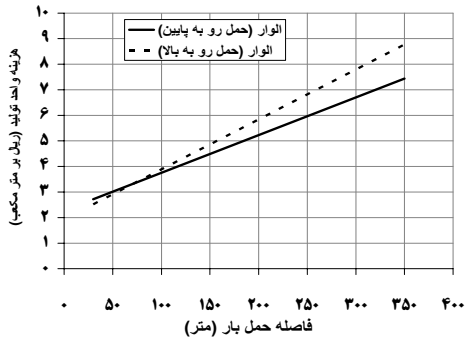
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(skidding)

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Evaluation of production and costs of mule logging in down and up slopes (Case study: Kheirood forest)

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Abstract

In north of Iran, the animal logging in Hyrcanian forest is a traditional method over past decades. Recently, with increasing environmental interest, concentration on environmentally sound timber extraction and small scale tree harvesting, the proportion of mule logging was increased in Caspian forest. The objective of this study is to develop a standard unified method of data collection to be used to improve the efficiency of mule logging operations and improve the quality of hauling cost and productivity information available for use in forest management plans and decisions. An environmentally sound timber extraction technique for small tree harvesting, particularly for thinning operations, were presented and introduced in this paper. The research was carried out in 213 compartment of Namkhaneh district, in Kheirood forest. Two types mule logging crews working in Kheirood during the study period were selected as the sample for this study: 1) Mules for lumber hauling in downhill, 2) Mules for lumber hauling in uphill. Time per turn for hauling of lumber in down and up slopes averaged 8 and 8.6 minutes, respectively. Regression models were developed for production-related elements with variance analysis using SPSS software. The hourly production of hauling with mule (m^3/h) with delay time, for hauling of lumber in uphill and downhill were 1.00 & 1.2 m^3/h, respectively and without delay time were 1.21 & 1.5 m^3/h, respectively. The result showed that production of lumber in down slope was greater than production of lumber in uphill. In addition, mule rate or hourly cost of mule hauling system in productive mule hour was 57982 Rials/h. As a consequence, the changes of hauling costs showed that increasing hauling distances variable on lumber hauling caused to linear increase in cost.

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