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Editors

Assoc. Prof. Dr. Adem Yavuz SÖNMEZ

Assoc. Prof. Dr. Soner BİLEN

Assist. Prof. Dr. Ertuğrul TERZİ

Assist. Prof. Dr. Ali Eslem KADAK

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ORAL PRESENTATIONS

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Predicting Draft Power and Specific Energy Requirement of Cylindroid Mouldboard Plough

İlknur DURSUN, Ergin DURSUN*
Ankara University, Faculty of Agriculture, Department of Agricultural Machinery and Technologies Engineering, Ankara-TURKEY
***Corresponding Author:** edursun@agri.ankara.edu.tr*

Abstract: Mouldboard plough is primary tillage implement used in conventional tillage. It is one of the equipment that needs high draft power and specific energy. Predicting the draft power and specific energy requirement of mouldboard ploughs depending on technical properties of the plough, the physico-mechanical properties of the soil and the working conditions before the soil tillage will be useful in terms of energy saving. This study aimed at predicting draft power and specific energy requirement of cylindroid mouldboard ploughs in medium heavy soil conditions. For this purpose prediction equations were developed to calculate draft power and spesific energy requirement of mouldboard plough. The prediction equations were developed based on dependent variables such as soil parameters including penetrometer resistance, bulk density and moisture content, working witdh, working depth, forward speed and field capacity. Equation 1 for predicting the draft power in medium heavy soil conditions and Equation 2 for predicting of the penetrometer resistance of medium heavy soil working with cylindroid mouldboard ploughs were used. The draft power obtained from Equation 3 was rated to the field capacity to predict specific energy requirement of mouldboard plough. As a result, a basic Equation 4 for predicting the specific energy requirement of the mouldboard plough was obtained. To test the reliability of the developed prediction equations, the regression coefficients between the results from prediction equations and some other research results were determined. The study showed that draft power and specific energy requirement could be successfully predicted by the prediction equations with good accuracy when working in medium heavy soil condition with cylindroid mouldboard ploughs. The regression coefficients of relationship between predicted and measured draft power of mouldboard ploughs were varied from 0.948 to 0.996. The regression coefficient of relationship between predicted and measured specific energy requirement of mouldboard ploughs was 0.924.

Keywords: Cylindroid mouldboard plough, soil tillage, draft power, specific energy, prediction equations

1.INTRODUCTION

Soil tillage is one of the most important operations in crop production. The mouldboard ploughs are the most common primary tillage implement in agriculture and widely used for conventional tillage all over the world. They cut off strips of soil called furrow slices, invert and crush them on the active surface consisting of the share and mouldboard in horizontal and vertical planes. As a result of being inverted, furrow slices are displaced and lied against the previous turned furrow slice (Bernacki et al., 1972; Dursun, 2015). There are many different types of mouldboards and the effects to the soil change depending on their types.

Mouldboard ploughs may produce undesirable effects such as increasing soil erosion, loss of soil moisture content, worsening of soil structure due to compaction, and increasing carbon dioxide (CO_2) release into the atmosphere from soil in case of unconscious use. However, despite all these undesirable effects it is recommended that the soil tillage with a mouldboard plough every 4 or 5 years even in no-till method (Dursun, 2015).

Mouldboard ploughs are widely used in conventional tillage in Turkey. According to the statistics of the year 2017, total number of mouldboard ploughs is 1071553 in Turkey (TÜİK, 2018). The number of mouldboard ploughs per tractor is 0.82. However, mouldboard ploughs are one of the highest energy consuming primary tillage implements (Boydaş and Uygan, 2010).

Many studies have been conducted to compare the draft power and energy requirement of different types of mouldboard ploughs as well as the other tillage implements under various conditions. Kheiralla et al. (2003) explained that the specific energy requirements of mouldboard plough, disc plough, rotary tiller and disk harrow were 157.68 MJ ha^{-1}, 151.56 MJ ha^{-1}, and 105.12 MJ ha^{-1} and 66.60 MJ ha^{-1}, respectively at condition of 10-12 cm working depth in sandy clay loam soil condition. The specific energy of the mouldboard plough and the disc plough were higher than that of the rotary tiller 50 and 44%, respectively (Kheiralla et al., 2003).

Some mathematical models have been developed to predict draft force, draft power and specific energy requirement of mouldboard ploughs. The draft power and specific energy requirement of mouldboard ploughs is affected by many factors, such as working depth, working witdh, the type and shape of plough body, the sharpness of the share, the overall adjustment of the plough, forward speed, soil type and soil parameters consisted of moisture content, bulk density and penetrometer resistance. Prediction of the draft power and specific energy requirement for mouldboard ploughs could be

useful in terms of proper selection of tractors and ploughs, working at optimum operating conditions and increasing field capacity. Thus, energy inputs and costs for tillage operation could be minimized.
This study aimed at predicting draft power and specific energy requirement of cylindroid mouldboard ploughs in medium heavy soil condition.

2.MATERIALS AND METHODS

In this study the prediction equations were developed based on dependent variables such as soil parameters including penetrometer resistance, bulk density and moisture content, working witdh, working depth, forward speed and field capacity, medium heavy soil conditions. These prediction equations will be used to calculate draft power and spesific energy requirement of mouldboard plough.

Equation 1 is used for predicting the draft power of cylindroidal mouldboard (Göknur, 1995) and Equation 2 is used for predicting of the penetrometer resistance in medium heavy soil condition (Göknur Dursun and Dursun, 2000).

$$P = [[(71.78) \cdot CI] - (37.20)] \cdot a \cdot b \cdot n \cdot v^{1.5} \quad (1)$$

In equation;
P: Draft power (kW),
CI: Soil penetrometer resistance (MPa),
a: Working depth (m),
b: Working witdh (m),
n: Number of bottoms,
v: Forward speed (m s^{-1}).

$$CI = [a_{ö} \cdot P_b \cdot [(2.45) - [(0.71) / (a_{ö}^3 \cdot P_b)] - [(0.14) / a_{ö}]] + [(6.60) \cdot W_b] + (822.51)] / 10^{+3} \quad (2)$$

Where;
CI: Soil penetrometer resistance (MPa),
$a_{ö}$: Measurement depth (m),
P_b: Soil bulk density (daN m^{-3}),
W_b: Soil moisture content (%).
Göknur (1995) determined that regression coefficient of relationship between calculated draft power from Equation 1 and measured draft power was 0.978. Göknur Dursun and Dursun (2000) determined that regression coefficient of relationship between calculated from Equation 2 and measured penetrometer resistance was 0.904.
In order to estimate the draft power, Equation 2 was written instead of penetrometer resistance in Equation 1. Thus, Equation 3 was obtained. This approach will make easier to measure the penetrometer resistance of soil when the penetrometre is not available. In Equation 3, it was assumed that the working depth (a) of the mouldboard plough is equal to the measurement depth ($a_{ö}$) of the penetrometre.

$$P = [[(71,78) \cdot [[a \cdot P_b \cdot [(2.45) - [(0.71) / (a^3 \cdot P_b)] - [(0.14) / a]] + [(6.60) \cdot W_b] + (822.51)] / 10^{+3}]] - (37.20)] \cdot a \cdot b \cdot n \cdot v^{1.5} \quad (3)$$

In equation;
P: Draft power (kW),
a: Working depth (m),
b: Working witdh (m),
n: Number of bottoms,
v: Forward speed (m s^{-1}),
P_b: Soil bulk density (daN m^{-3}),
W_b: Soil moisture content (%).
The draft power predicted from Equation 3 was rated to the field capacity (S) of plough. As a result, Equation 4 was obtained for predicting the specific energy requirement (E_S) of the mouldboard plough.

$$E_s = [[[(71.78) \cdot [[a \cdot P_b \cdot [(2.45) - [(0.71) / (a^3 \cdot P_b)] - [(0.14) / a]] + [(6.60) \cdot W_b] + (822.51)] / 10^3]] - (37.20)] \cdot a \cdot b \cdot n \cdot v^{1.5}] / [S / (3.60)] \quad (4)$$

In equation;
E_s: Specific energy requirement of mouldboard plough (MJ ha^{-1}),
a: Working depth (m),

P_b: Soil bulk density (daN m^{-3}),
W_b: Soil moisture content (%),
b: Working witdh (m),
n: Number of bottoms,
v: Forward speed (m s^{-1}),
S: Field capacity (ha h^{-1}).

To test the reliability of the developed prediction equations, the regression coefficients of relationships between the results from prediction equations and some results obtained by other researchers.

3.RESULTS AND DISCUSSION

The study showed that draft power and specific energy requirement could be successfully predicted by the prediction equations with good accuracy when working with cylindroid mouldboard ploughs in medium heavy soil condition. The regression coefficients of relationship between measured draft powers and predicted draft powers (Equation 3) of ploughs were varied from 0.948 to 0.996 (Table 1 and Table 2). The regression coefficient of relationship between measured and predicted (Equation 4) specific energy requirement of plough was 0.924 (Table 3).

Table 1. The relationships between the results from prediction Equation 3 and the results from field experiments

Type of plough	Forward speed[1] (m s^{-1})	Draft power[1] (kW)	Draft power[2] (kW)
Mouldboard plough	1.11	8.17	7.96
	1.67	13.92	14.76
Reversible mouldboard plough	1.10	8.16	7.46
	1.67	15.14	13.92
The regression coefficients (R^2)		0.948	

[1]From field experiment (Erol et al., 1996), [2]From prediction Equation 3.

Table 2. The relationships between the results from prediction Equation 3 and the results from field experiments

Forward speed (m s^{-1})	Draft power[1] (kW)	Draft power[2] (kW)
0.83	6.50	6.23
1.11	9.80	9.63
1.39	15.30	13.50
1.67	20.70	17.80
The regression coefficient (R^2)	0.996	

[1]From field experiment (Kheiralla et al., 2003), [2] From prediction Equation 3.

Table 3. The results from prediction Equation 4 and field experiments

Type of plough	Forward speed[1] (m s^{-1})	Field capasity[1] (ha h^{-1})	Specific energy[1] (MJ ha^{-1})	Specific energy[3] (MJ ha^{-1})
Mouldboard plough	1.11	0.255	115.34	112.39
	1.67	0.386	129.82	137.63
Reversible mouldboard plough	1.10	0.234	115.27	114.77
	1.67	0.354	141.16	141.55
The regression coefficients (R^2)			0.924	

[1]From field experiment (Erol et al., 1996), [2]From prediction Equation 3, [3]From prediction Equation 4.

It is thought that the specific energy requirement of the mouldboard plough can be predicted with great accuracy as regression coefficient of relationship between the measured and predicted draft power from Equation 3 was quite high.

4.CONCLUSION

As a result of this research, draft power and specific energy requirement cylindroid mouldboard ploughs could be successfully predicted by the prediction equations with good accuracy in medium heavy soil condition. The most important advantage of predicting the draft power and specific energy requiremet of mouldboard ploughs depending on technical properties of the plough, the physico-mechanical properties of the soil and the working conditions before the soil tillage will be useful in terms of energy saving.

REFERENCES

Bernacki, H., Haman, J. and Kanafojski, Cz., 1972. Agricultural Machines, Theory and Construction. US. Dept. of Commerce, National Technical Information Service, Virginia.

Boydaş, M. G. and Uygan, F., 2010. Kulaklı pullukta çeki kuvvetine etki eden faktörler. 26. Tarımsal Mekanizasyon Ulusal Kongresi: 22-23 Eylül, Hatay.

Dursun, İ., 2015. Toprak İşleme Alet ve Makinaları. Ankara Üniversitesi Basımevi, Ankara Üniversitesi Ziraat Fakültesi, Yayın No: 1618, Ders Kitabı: 570, Ankara.

Erol, M. A., Göknur Dursun, İ. and Dursun, E., 1996. Kaydırmalı Pulluk Geliştirilmesi. Tarım Orman ve Gıda Teknolojileri Araştırma Grubu, Proje No: TOAG-1044, Proje Sonuç Raporu, Ankara.

Göknur, İ., 1995. Kulaklı Pulluklarla Toprak İşlemede Koni İndeksine Bağlı Olarak Çeki Gücünün Tahmini İçin Bir Yöntem. Tarımsal Mekanizasyon 16. Ulusal Kongresi Bildiri Kitabı: 353-361, Bursa.

Göknur Dursun, İ. and Dursun, E., 2000. Orta ağır toprak koşulunda koni indeksi tahmin modelinin boyut analizi ile geliştirilmesi. Tarım Bilimleri Dergisi 6 (3): 37-41.

Kheiralla, A. F., Yahya, A., Zohadie, M. and Ishak, W., 2003. Modelling of power and energy requirements for tillage implements operating in Serdang sandy clay loam, Malaysia. Soil & Tillage Research 78(2004): 21-34.

TÜİK, 2018. Tarımsal Alet ve Makine Sayısı, 1998-2015. Retrieved in Mars, 29, 2018 from http://www.tuik.gov.tr/VeriBilgi.do?alt_id=1006.