

DEVELOPMENT OF PREDICTIVE MODEL FOR FUEL CONSUMPTION DURING PLOUGHING OPERATION IN AGRICULTURAL SOIL

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ABSTRACT

Fuel plays a vital role in mechanized agricultural practices more especially during tillage operations. Fuel consumption is function of draught, tractor forward speed, ploughing depth, width of cut, cone index, bulk density and moisture content. This study was on development of predictive model for fuel consumption in respect of tillage operation using Buckingham pi theorem. The study was conducted in a loamy sand soil of 5200 m² of land in Rivers State Agricultural Development Programme Farm in School to Land Authority, Port Harcourt, Nigeria. The experimental fuel consumption was determined by amount of fuel used per unit time with the aid of graduated (measuring) cylinder and stop- watch to note the time taken after each operation. The field test parameters (draught, tractor forward speed, ploughing depth, moisture content, cone index and width of cut) were measured. The field data results were used in the development of the predictive model equation. The developed equation was validated by graphical comparison, also compared with root mean square error (RMSE) and paired t Test. The results showed that there was good agreement between measured and predicted fuel consumption, with corresponding RMSE value of 5.17E-7. And the t test result showed no significant difference with 95 and 99 % confidence. This developed equation is recommended to be used for envisaging fuel consumption in ploughing operations using disc plough.

Keywords: Tillage; Loamy Sand Soil; Disc Plough; Dimensional Analysis; Buckingham pi theorem.