

## ABSTRACT

The present study was undertaken to develop a draft prediction model for commonly used tillage implements in sandy clay loam soil of India. Laboratory experiments were conducted with scale models of moldboard plow, cultivator tine and offset disc harrow. Draft requirements of these tillage implements having different widths of cut or number of tools were measured at four levels of depth and four levels of speed of operation in three different soil compaction levels in a soil bin at an average soil moisture content of 9-10%. Experimental design was based on CRD. An appropriate ANOVA model was selected for analysis of variance using the SAS statistical software package. All the variables under study and their interactions significantly affected draft ( $P < 0.001$ ). The draft of tillage tools increased with cone index, width of cut, depth and speed of operation. The effect of depth was found to be more significant on the draft of moldboard plow and offset disc harrow, whereas number of tynes was the most significant factor for cultivator. Rate of increase of draft with respect to depth was higher as compared to that with respect to speed of operation, cone index and width of cut for all the implements tested. Draft values predicted by ASABE model were compared with those obtained from soil bin tests at three compaction levels separately. The measured draft values at some times were about 2.9, 1.7 and 1.65 times more than the ASABE predicted values for moldboard plow, cultivator and offset disk harrow, respectively. A simple equation similar to the ASABE model incorporating cone index was developed using stepwise regression analyses to model the draft of tillage implements for the range of soil and operating condition tested. Field tests with commercial models of these implements were conducted to acquire data for draft by developing appropriate instrumentation to validate the developed draft equation. The average absolute variations between the predicted and measured values of draft were found to be 5.5%, 11.6% and 10.5%, for moldboard plow, cultivator and offset disk harrow, respectively. The smaller difference between observed and predicted values of draft of tillage implements validated the developed draft prediction equation.

**Key words:** soil bin, draft prediction equation, soil cone index, ASABE model, stepwise regression analysis