

## Abstract

Intensive agricultural activity leads to soil degradation caused by excessive soil compaction, especially in the subsoil layer. Recently, the problem of plough pan incidence has become particularly important due to the widespread water shortage.

The main aim of this study was to assess the effects of additionally applied working elements of a modernised plough on plough pan and to determine energy requirements of particular variants of the modernised construction in comparison with ploughing with a traditional moldboard plough.

Modernisation consisted in equipping the reversible mounted moldboard plough with an additional loosener of the subsoil layer. Different sets of working elements were used interchangeably, i.e. heart coulters, straight coulters or duckfoot shares.

The energy parameters were determined using a stand for complex evaluation of work parameters of agricultural machines aggregated with a tractor via three-point linkage. It allows measuring horizontal and vertical forces during work with mounted machines. On this basis, the requirement for drawbar power and fuel consumption related to the area were calculated. During work of the modernised plough, the highest requirement for drawbar power occurred of a work piece in form of a duckfoot share with working depth 0,15 m. Applied forward speed  $v_3 = 5,70 \text{ km} \cdot \text{h}^{-1}$  it was 27,9 kW, with an average fuel consumption of  $35,4 \text{ l} \cdot \text{ha}^{-1}$ .

The improvement of soil physical properties in the subsoil layer was determined by the following parameters: bulk density, porosity, cone index and cross-sectional area of the created furrow. All tested coulters, working at the depth of 0,15 m, caused effective destruction of the plough pan, reducing the bulk density below the limit value, i.e.  $1,65 \text{ g} \cdot \text{cm}^{-3}$ . The lowest bulk density was found for the work of duckfoot shares. However, these coulters caused negative secondary soil compaction below the depth of their work.