Thesis title: Assessing the Impact of Tillage Methods on Soybean Production.

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Soybeans (*Glycine max (L.) Merr*.) are a versatile and nutritious crop that provides protein and other essential nutrients for human and animal use. Their versatility and wide variety of applications make them vital to the global food supply system.

This study examined how tillage methods affected soil penetration resistance, moisture content, carbon dioxide levels, clod percentage, crumb percentage, and dust percentage. These characteristics were examined for their yield implications on soybean production. The field experiment was placed in Szárítópuszta, a village in Gödöllő, Hungary.

The study found a significant difference ($p<0.05$) in yield among the three treatments. Ploughing yielded 593.24 g/h, compared to 409.62 and 401.49 for direct drilling and disking, respectively. The study found that soil penetration resistance increased from the upper layer (0-15 cm) to the deeper layer (30-50 cm), with direct drilling in the 30-50 cm layer having a maximum resistance of 6.16 MPa.

Soil moisture analysis shows slightly higher moisture content in the 15-30 cm deep range. The direct drilling method has the highest moisture content at this depth, with 10.21 m/m%. Regarding carbon dioxide, the findings reveal that ploughing tillage operations result in the release of a considerable quantity of carbon dioxide, particularly 0.23 g/m^2/h.

In terms of clod percentage outcomes, it has been noted that disking tillage presents a considerably higher percentage of 29.9%. The percentage of crumb structure was found to be approximately comparable across all treatments, including disking tillage (22.54%), direct drilling (22.72%), and ploughing tillage (22.28%). Disking tillage resulted in a remarkably high percentage of 8.54% for dust content.

As the results reveal, ploughing tillage offers a larger maximum yield as compared to other tillage methods, but it also produces more carbon dioxide than other tillage methods. This shows

that ploughing tillage may be more productive in terms of agricultural yield, but it also has a bigger environmental impact because of increased carbon dioxide emissions. It is vital to consider these trade-offs while deciding on the best-suited tillage strategy for sustainable agriculture practices.