

The summary of the doctoral thesis

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Multicriterial assessment of machine works technology on permanent grassland

Summary

The subject of the research were variants of cultivation permanent grassland technology for haylage and hay. The research problem is related to the impact of use production technologies on three-point links to the efficiency of management, economic and technical and the impact of mechanization on the environment. The research problem concerns the reduction of the cumulative energy inputs, costs production and greenhouse gas emissions to the atmosphere generated during cultivation. An analysis of the interdependence of selected factors was conducted. It was selected and indicated which technologies used for growing permanent grassland are the most advantageous from the point of view of energy expenditure, costs and environmental impact. Recommendations were made for farms with different area of three-point system in the field of applied technologies.

The research problem was formulated as follows: what is the impact of the technical measures used, technological operations carried out (different variants of technology for permanent grassland cultivation) on: costs, cumulative energy inputs and greenhouse gas emissions into the atmosphere? The main objective of the research was to conduct a multi-criteria assessment of machine works performed on permanent grasslands. The evaluation was based on theoretical considerations, surveys and statistical analyzes. The parameters analyzed should constitute the basic criteria for the selection of technical measures for technological operations performed on permanent grasslands (technical-economic and environmental). The largest variation in the obtained results occurs in groups of farms with a smaller area of three-point system, which is the vast majority in the country. High variation in the average level

of oil consumption for particular technology groups has been demonstrated, for I $157.2 \text{ dm}^3 \cdot \text{ha}^{-1}$, for II $138.1 \text{ dm}^3 \cdot \text{ha}^{-1}$, for III $96.0 \text{ dm}^3 \cdot \text{ha}^{-1}$. In the case of the Group I, 2.9 dm^3 , II 3.9 dm^3 , in the case of the third group, $1.15 \cdot \text{dm}^3$, together with the increase in area by one hectare, respectively. The greatest decrease in labor intensity was observed in group I, by $1.75 \text{ ha} \cdot \text{ha}^{-1}$, with the area increasing by one hectare. In II and III of the studied groups, the decrease was 0.6 hours as the area increased by one hectare, with an average level of labor inputs of approx. 25, 15 and $20 \text{ h} \cdot \text{ha}^{-1}$, respectively.

Average technology costs were at the level of 3.5 thousand. $\text{zł} \cdot \text{ha}^{-1}$ in the first group, 2.8 thous. $\text{zł} \cdot \text{ha}^{-1}$ in group II and 3.2 thous $\text{zł} \cdot \text{ha}^{-1}$ in group III. The average value of cumulated energy expenditure in the scale of all technologies amounted to approx. $26 \text{ GJ} \cdot \text{ha}^{-1}$. In turn, average GHG emissions expressed in $\text{eq CO}_2 \cdot \text{ha}^{-1}$ were at the level of $3.6 \text{ tonnes eq CO}_2 \cdot \text{ha}^{-1}$.

Technological operations applied in technologies of permanent grassland cultivation are characterized by a large discrepancy in cumulated energy expenditure, costs and the amount of greenhouse gas emissions to the atmosphere. Proper work organization and the use of appropriate tools, machines and agricultural tractors can significantly reduce both cumulated energy inputs, general costs and implementation of technological operations, as well as greenhouse gas emissions to the atmosphere