

ANALYSIS OF THE POTENTIAL OF STUMPWOOD BIOMASS FOR ENERGY UTILIZATION IN THE CONDITIONS OF FORESTRY IN THE CZECH REPUBLIC

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INTRODUCTION

The current energy crisis together with global climate change requires the search for alternative sources of energy. Fulfilling the concepts circular economy for sustainable development is the cause of an increasingly noticeable societal demand for renewable resources. The share of energy biomass from logging residues is currently at its maximum available limit, further increases will likely be impossible. Attention is thus focused on utilizing other available sources of forest biomass. Research was underway to assess the potential utilization of stump and root parts of trees as a renewable source of biomass for energy purposes in the conditions of Czech forestry.

MATERIALS AND METHODS

The research aim was analyzing the historical and current state of the given issue and provide an objective and comprehensive view of the stump utilization for energy purposes, taking into consideration the legislative framework, environmental and economic aspects, including the identification of the availability of current production processes and technologies. As part of field investigations, business entities that use stumps for economic benefit or employ other processing methods were analyzed. Addressing the issue required the integration of relevant information from multiple research areas, and the study builds upon previous projects.

RESULTS AND DISCUSSION

HISTORICAL FACTS AND SITUATION ABROAD

Historically, in our territory, stumps were cleared for the purpose of preparing activities for reforesting pine stands in the Strážnice region. The stump wood was utilized no longer in any way and a practice known as "stump burial" was carried out (Fig. 1). Traditionally, stumps are energetically utilized in Scandinavian countries, primarily in Finland, where stump energy use is subsidized and politically it is a part of the renewable energy portfolio.



Figure 1 - stump burial in the Strážnice region

ECONOMIC CONSIDERATIONS

The crucial economic aspect of stump mass utilizing for energy is the price of wood chips at the buyer's end. Economic efficiency depends on a range of factors, similar to those in the utilization of logging residues, including the possibility of combination. For a more detailed view, a SWOT analysis was created (Fig. 3).

CONCLUSIONS

In domestic conditions, stumps are not intentionally harvested for energy purposes. An exception is a technical and quality requirement in Czech construction standards for preparatory work on linear structures, highways etc. and other landscape modifications including the removal of lands designated for the forest function.

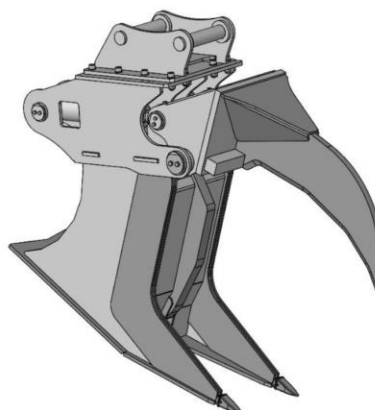


Figure 2 - Grubbing head

ACCESSIBLE TECHNOLOGIES

The design of the grubbing head (Fig. 2) for excavators was developed to cleave the extracted stump into fragments of the required size and remove unwanted impurities from the stump root system intended for energy chip production. Subsequently, it compacts, levels, and shapes the terrain. This technology is capable of extracting stumps in an environmentally friendly manner without damaging the soil or disrupting the environment.

Strengths	Weaknesses
Societal demand for sustainable forest management. Forest management production along with related wood-processing sectors. Economic utilization of wood as a production-friendly, ecological, and renewable resource. Support for the bioeconomy and circular economy. Availability of technology and techniques for felling and utilizing stump and root dendromass for energy purposes. The area of forests has gradually increased in recent history, and the wood supply in forest stands is growing. Demand, activities, current trends, and the implementation of investments in the energy use of dendromass.	Positive externalities and services provided by forests are not adequately utilized and considered in economic processes. Structural deficiencies in private forests (fragmentation and size of properties) do not support economic efficiency in forest management. The potential of wood as a renewable energy source is not sufficiently utilized; on the other hand, discussions and lobbying interests are prevalent. Compensation provision to forest owners for management restrictions due to nature conservation reasons does not function sufficiently. Administratively complex system of providing support for the use of renewable energy sources.
Opportunities	Threats
Symptoms, dynamics, and urgency of the energy crisis, resource availability. Utilization of wood potential for energy purposes in suitable locations. Possibility of electricity generation from biomass. Limitation of harmful pests within forest protection. Conditions improving natural regeneration. Benefits for the water regime of forest soils. Fire prevention effects - underground forest fires. Increase in the contribution of forests and the utilization of dendromass in the context of support for rural development.	Conflict of interest among different policies related to forest management and wood utilization. Risk of excessive biomass extraction from forests for energy purposes. Legislative determinants, including nature protection, emissions. Issues related to the structure and mix of renewable energy sources, commitments. Location and complexity of technological preparation. Limited availability of data and economic information for detailed economic analyses. Forestry determinants and conservative approaches.

Figure 3 - SWOT analysis