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## Efficiency of Using Biomass from Energy Crops for Sustainable Bioenergy Development

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### Abstract:

The need to study energy crops as an alternative source of energy for providing the population and rural development is justified in the article. In the course of the study, the following methods were used: laboratory – to determine the moisture content in the phytomass, field – to determine the quantitative indicators of plants and biomass productivity, special – to determine the energy and economic efficiency of biomass production. Features of yield formation and yield of dry biomass of energy crops by quantitative indices of plants were determined. The economic and energy efficiency of biomass production, as well as the output of solid biofuel, its energy intensity and energy output have been calculated. A logistic scheme for biomass cultivation including the use and supply of biomass from biomass energy crops (from producer to consumer) has been developed. It has been found that switchgrass and giant miscanthus of the third to fifth year of vegetation form a high yield of dry biomass (up to 15.2 and 18.8 t / ha, respectively) with a maximum level of production profitability - up to 108.6% and 128.1%, provide high indicators of biofuel output (up to 18.2 and 24.0 t / ha) and energy (up to 313.0 and 396.0 GJ / ha) with an average level of energy efficiency coefficient ( $K_{ee} > 4.5$ ).

**Keywords:** switchgrass; giant miscanthus; biomass yield; profitability level; energy efficiency ratio.

**JEL Classification:** N54; Q01; Q20.

### Introduction

Currently, in Ukraine, and in developing countries, one of the priorities for the effective functioning of the national economy is to reduce energy dependence on external energy sources based on the development of the bioenergy sector. The cultivation and use of special plants for biofuel purposes is an efficient measure of the effective functioning of energy sufficient rural areas. These plants are called energy crops, they are mainly perennial, well adapted to growing conditions, able to form high biomass productivity (Kulyk 2017). Energy crops biomass is characterized by a low content of chemical elements, contains a significant amount of lignin and cellulose, in some plants - sugar and starch, and is an excellent feedstock for the production of energy-intensive biofuels (Roik *et al.* 2015).