The development of agriculture in key areas of production leads to biological, technical, organizational and technological progress. These advancements maximize outputs without inducing changes in agricultural inputs, they lower production costs and increase agricultural production potential.

The aim of the proposed project will be to evaluate the agronomic, economic and energy efficiency of winter oilseed rape production in cultivation systems with various tillage and seeding methods. The five main production factors, i.e. tillage and seeding method, weed control, growth regulators, nitrogen and sulfur fertilization, will be analyzed. Every experimental factor will be tested at three levels in an experiment with an innovative 3^{5-1} fractional factorial design.

Rapid technological progress has led to the development of modern agricultural machines and equipment that differ in labor intensity, fuel consumption, operating depth, influence on root development, soil aeration and soil moisture content. The proposed project will compare a conventional plough-based system with a no-till system and an innovative strip-till system. Conventional tillage can be replaced with new soil cultivation methods that rely on progress in agricultural mechanization, increase the efficiency of agricultural operations and decrease energy inputs. Strip-till farming combines the features of conventional tillage and no-till systems. In this method, seeds are sown and fertilizers are applied in narrow strips of deep-tilled soil. Strip-till creates favorable conditions for root development, it shortens cultivation time and decreases fuel consumption because three agricultural operations (soil cultivation, fertilizer application, seeding) are performed during a single trip.

In agronomic studies, plant density is measured in fall, in spring and at harvest. The morphometric parameters of winter oilseed rape plants are determined in fall to determine the effect of fall treatments on plant development and overwintering success. The plants' cold hardiness and biometric parameters at harvest are measured to determine stand characteristics that are influenced by all experimental factors. Yield components and seed yield are determined. Weed infestation and the prevalence of infections are also evaluated in agronomic studies of winter oilseed rape. In the proposed project, seed samples will be analyzed to determine the content of total protein, crude fat, fiber (ADF and NDF), glucosinolates and the fatty acid profile.

Winter oilseed rape production technologies are evaluated not only for their agronomic efficiency, namely seed yield, but above all, for their economic efficiency. Total production costs will be calculated by summing up direct and indirect costs. Direct costs include the cost of purchasing seeds, fertilizers and plant protection agents. Indirect costs involve tractor and machine operation, including depreciation, and they will be determined based on the method proposed by the Institute for Construction, Mechanization and Electrification in Agriculture. The production of winter oilseed rape will also be evaluated based on its energy efficiency by calculating the ratio of seed yield to energy inputs. Less intensive production systems are characterized by lower production costs and lower energy inputs; therefore, despite lower yields, their economic and energy efficiency could exceed that of high-input systems.