



“Gheorghe Asachi” Technical University of Iasi, Romania



IMPACT OF AGRICULTURAL, ENVIRONMENTAL AND POPULATION FACTORS ON CANCER INCIDENCE

Jerzy Mirosław Kupiec^{1*}, Dariusz Jerzy Góra^{2,3}

¹*Department of Ecology and Environmental Protection of the Poznań University of Life Sciences, Piątkowska Street 94C, 60-649 Poznań, Poland*

²*Faculty of Health Sciences of the Medical University of Gdańsk, Tuwima Street 15, 80-210 Gdańsk, Poland*

³*Regional Teacher Training Center “WOM” in Bielsko-Biala, Legionów Street 25, 43-300 Bielsko Biala, Poland*

Abstract

The aim of the study was to assess the impact of agricultural and environmental pressure on the incidence of selected malignant cancers (C16, C17, C18, C34, C50, C56, C61) in four Polish voivodeships (Silesian, Greater Poland, West Pomeranian, and Kuyavian-Pomeranian) between 2015 and 2022. The analyses utilized data from Statistics Poland (GUS), the National Centre for Emissions Management (KOBiZE), and the National Cancer Registry. Eighteen agricultural indicators, seven air pollutants, and population factors were considered. The applied analytical methods included Pearson correlation analysis, R^2 decomposition, and predictive models (Random Forest and MLP). The strongest associations with incidence were demonstrated for population variables (age, sex). Agricultural factors, especially those related to intensive livestock farming and agricultural chemicalisation (LSU – Livestock Standard Unit, L_{pig} – pig density, L_{ptr} – poultry density, WIC – Chemical Input Effectiveness), showed significant correlations with selected cancers of the digestive and genitourinary systems. Air pollutants had a smaller, yet noticeable significance for cancers of the respiratory and digestive systems. The Random Forest model achieved very high R^2 values (0.75–0.96), confirming its effectiveness for epidemiological analysis. Demography has a dominant influence on the variability of cancer incidence; however, agricultural and environmental pressure may play a significant role in specific disease entities and regions. Further local analyses considering exposure factors and the spatial differentiation of environmental pressure are necessary.

Key words: agricultural pressure, air pollution, cancer incidence, population factors

Received: February, 2026; Revised final: June, 2026; Accepted: July, 2026

* Author to whom all correspondence should be addressed: E-mail: jerzy.kupiec@up.poznan.pl; Phone: +48 618466524; Fax: +48 618466510