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*IMPACT OF THE DIGESTATE FROM AGRICULTURAL BIOGAS FACILITIES ON  
THE EFFICIENCY OF AGRICULTURAL PRODUCTION*

**SUMMARY**

The dissertation deals with the use of digestate as a natural fertiliser. Agricultural biogas plants fit in well in Poland due to the easy availability of substrates (crops, grass, organic waste, and slurry). Integrating livestock production with an agricultural biogas plant could benefit small and medium-sized farms. It would enable the use of animal waste, which is often an additional economic and environmental burden on the farm. The digestate, which contains organic matter and essential mineral compounds, is not only an alternative to mineral fertilisers, but can also compete with natural fertilisers. A positive aspect of anaerobic digestion in forming digestate is that it reduces pathogens, kills viruses, fungi, *Listeria*, *Salmonella*, and *Escherichia coli* bacteria, and inactivates plant seeds. Fermented slurry has a less unpleasant odour, a more favourable consistency for further processing, and better properties than slurry. During fermentation, there is no nitrogen loss; only a reduction to ammonium nitrogen, which is more assimilable for plants, occurs.

The research began with a review of the current state of knowledge regarding using digestate from agricultural biogas plants as a natural fertiliser. The knowledge acquired and information obtained from owners of agricultural biogas plants located in the Podlaskie Voivodeship made it possible to formulate the research problem and the aim and scope of the study. Two agricultural biogas plants with the exact technological solutions were selected for substrate testing. Studies on the chemical composition of substrates occurring in the analysed biogas plants (slurry, maize silage with manure, and digest) were conducted over two years. A total of 15 samples of each substrate were analysed.

In most cases, the chemical composition of the digestate was similar to that of the substrates supplied to the digester, meaning that there was no apparent loss of elements necessary for proper plant growth during the digestion process. The second stage of the work was to test the effects of different fertilisation methods on plant growth and condition. To this end, tests were first carried out on the chemical composition of the digestate, later used to fertilise the test plots. It was followed by a two-year study of the effects of the digestate on the development of maize of the Vistula variety and a comparison with other fertilisation methods. Each year, field trials were carried out on five research plots in triplicate. A comparison of the results of the field trials with the use of different maize fertilisation and, after soil analysis, shows that the applied digestate has a fairly optimal composition. The results obtained from the trials and the analysis made it possible to answer the questions describing the research problem set out earlier.