REPORT

Natural Fertilizers Market in Poland

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Contents:

1. Executive Summary

This report analyzes the current state and future potential of the natural fertilizer market in Poland, with particular attention to cooperation opportunities with the Netherlands. Poland produces 80–90 million tons of natural fertilizers annually, supplemented by 7–8 million tons of digestate from over 181 agricultural biogas plants. Despite this large domestic supply, the market shows demand for processed, standardized fertilizers (granules, CE-certified pellets), which present realistic import opportunities.

Regulatory developments, especially the EU Green Deal, CAP 2023–2027, and national nitrate regulations, create both challenges and incentives for the sector. Subsidy programs such as ARiMR's environmental investments and NFOŚiGW's "Energy for the Countryside" are key drivers shaping supply, storage, and logistics.

The SWOT analysis highlights Poland's strengths in agricultural scale and demand for organic matter, but also weaknesses in fragmented farm structures and infrastructure. Opportunities lie in technology transfer, regional pilot projects, and positioning Dutch products as premium, certified solutions, while threats include high logistics costs, competition from local biogas digestate, and regulatory risks.

Strategically, the report recommends focusing on processed fertilizer imports (up to 150,000 t/year potential), joint Polish-Dutch technology development in granulation and digestate management, and targeted distribution to deficit regions and organic farming sectors.

2. List of Abbreviations

ARiMR – Agency for Restructuring and Modernization of Agriculture
CAP – Common Agricultural Policy
CE – Conformité Européenne (EU conformity marking)
CMC – Component Material Category
DIY – Do It Yourself (retail/hobby market channel)
DM – Dry Matter
EC – European Commission
EEC – European Economic Community
EU – European Union
FAO – Food and Agriculture Organization of the United Nations
FFM – Fresh Farm Manure (context-specific)
FM – Fresh Matter
GNSS – Global Navigation Satellite System
GPS – Global Positioning System
GUS – Central Statistical Office of Poland
HP – Horse Power (tractor/machinery power unit)
IJHARS – Agricultural and Food Quality Inspection
ISOBUS – ISO 11783 standard for electronic communication between implements and tractors
IUNG PIB – Institute of Soil Science and Plant Cultivation – State Research Institute
KOBiZE – National Centre for Emissions Management
MRiRW – Ministry of Agriculture and Rural Development (eng. MARD)
NFOŚiGW – National Fund for Environmental Protection and Water Management
NIR – Near-Infrared Spectroscopy
NPK – Nitrogen (N), Phosphorus pentoxide (P_2O_5), Potassium oxide (K_2O)
NRN – Series of spreaders (CynkoMet NRN – farm machinery)
OECD – Organisation for Economic Co-operation and Development
PFC – Product Function Category
PIB – Państwowy Instytut Badawczy (State Research Institute)
PN – Polska Norma (Polish Standard) / product codes (context: Meprozet PN tankers)
UAA – Utilised Agricultural Area
VRA – Variable Rate Application

3. Introduction

Polish agriculture is currently undergoing a dynamic transformation under the influence of EU policy and global trends. The European Green Deal, the “Farm to Fork” strategy, and the Common Agricultural Policy (CAP 2023–2027) impose new obligations on Member States regarding emission reduction, soil quality improvement, and the limitation of mineral fertilizer use [1][2]. In this context, the importance of natural fertilizers – manure, slurry, compost, digestate – is increasing, as they may serve both as a cheaper alternative and as an element of the circular economy.

In recent years, Polish agriculture has also been strongly affected by external and crisis-related factors:

- The COVID-19 pandemic (2020–2021) disrupted supply chains, caused sharp changes in raw material prices, and limited the mobility of seasonal workers. In the fertilizer sector, it highlighted the significance of local nutrient sources (manure, digestate) as a more stable alternative to imported mineral fertilizers [3].
- Russia's invasion of Ukraine and the situation in Ukraine (from 2022) have led to instability in the energy market and a sharp increase in the prices of mineral fertilizers prices, particularly nitrogen fertilizers – closely linked to the price of natural gas. Trade restrictions with Russia and Belarus (including potash fertilizers) and disruptions in exports from Ukraine (grain, agricultural raw materials) have changed the supply structure across Central and Eastern Europe [4].
- Poland, as an EU border state with Ukraine, has become a transit hub for agricultural products and raw materials. At the same time, there is growing pressure to diversify fertilizer sources and develop domestic organic resources in agriculture [5].

The purpose of this report is to conduct a detailed analysis of the current market situation and the potential of natural fertilizers in Poland. The analysis covers market characteristics, available products, main players, pricing strategies, and opportunities for cooperation with the Netherlands – a country with a very high level of innovation in the processing of natural fertilizers.

The report was prepared on the basis of data from the Central Statistical Office (GUS), the Ministry of Agriculture and Rural Development (MRiRW), the Agency for Restructuring and Modernisation of Agriculture (ARiMR), the Institute of Soil Science and

Plant Cultivation (IUNG PIB), the National Centre for Emissions Management (KOBiZE), and market and trade sources [6][7][8][9], as well as the authors' own long-term experience.

It should be noted that some of the data are presented as heuristic values calibrated against Poland's national indicators (sometimes only compared with hard statistical data – officially reported, etc.). This was done deliberately, in order not to rely solely on complete official calculations, which are publicly available, but rather to introduce an "expert estimate" instead of hard statistical reporting. Additionally, it complements the study held by the Dutch side: report no. 2065.N.24 of April 15, 2025, entitled "Verkenning kansrijke exportmarkten voor dierlijke mest Een bureaustudie" authored by Harm Gelderblom and Romke Postma [10].

Bibliography

[1] European Commission. European Green Deal.
[2] European Commission. "Farm to Fork" Strategy.
[3] OECD/FAO (2021). Reports on the impact of the COVID-19 pandemic on agriculture and fertilizers.
[4] FAO/EC (2022–2024). Fertilizer market analyses in the context of the war in Ukraine and sanctions against Russia/Belarus.
[5] EU/EC market analyses (2023). Poland as a transit hub for agricultural products from Ukraine.
[6] Central Statistical Office (GUS).
[7] Ministry of Agriculture and Rural Development (MRiRW).
[8] Agency for Restructuring and Modernisation of Agriculture (ARiMR).
[9] Institute of Soil Science and Plant Cultivation – PIB (IUNG PIB).
[10] Gelderblom H., Postma R. (2025). Verkenning kansrijke exportmarkten voor dierlijke mest Een bureaustudie. Report no. 2065.N.24.

4. Characteristics of Basic Natural Fertilizers in Poland

In the Polish market, various definitions and descriptions of natural fertilizers are in use. For the purposes of this study, the technical characteristics used mainly by agricultural advisors and practitioners are presented. The numerical values are indicative, as in practice they strongly depend on animal species, diet, storage method, dilution, etc. – hence ranges are given rather than single values. The classification of basic natural fertilizers in Poland used for this study (imported - Table 1):

4.1. Manure (solid)

Animal excreta mixed with bedding (usually straw). Provides significant organic matter, improves soil structure and water-holding capacity; nutrients are released more slowly.

- Dry matter: 20–35%.
- Typical composition (FM): cattle ~5–7 kg N/t, 3–5 kg P_2O_5/t, 5–8 kg K_2O/t; poultry: ~10–15 kg N/t, 6–12 kg P_2O_5/t, 6–10 kg K_2O/t.
- Application: manure spreader + quick incorporation (to reduce N loss and odor). Optimal in autumn or after harvesting root crops.
- Risks/remarks: N losses if not incorporated quickly; variable composition; requirement of manure plate and effluent collection.

4.2. Slurry (liquid)

Liquid mixture of feces and urine (often with wash water) from non-bedding systems. Fast action due to ammonium N (NH_4^+).

- Dry matter: 4–10%.
- Typical composition (per m^3): pigs ~3–7 kg N (50–70% NH_4^+), 1–2 kg P_2O_5, 2–4 kg K_2O; cattle ~2–5 kg N, 0.5–1.5 kg P_2O_5, 2–4 kg K_2O.
- Application: trailing hoses / injection, immediate incorporation where possible; cool weather reduces NH_3 losses.
- Risks/remarks: high risk of NH_3 emissions if surface spread; sealed tanks required, subject to application timing regulations.

4.3. Urine/manure effluent (liquid fraction)

Very diluted effluent from manure and/or mainly urine in bedding systems; liquid fraction after drainage.

- Dry matter: <1–3%.
- Typical composition (per m³): ~0.5–2 kg N, 0.1–0.5 kg P_2O_5, 1–3 kg K_2O.
- Application: band or line application as for slurry; avoid surface splash.
- Risks/remarks: low concentrations → large logistic volumes; control of surface runoff needed.

4.4. Compost (from manure/plant material)

Aerobically fermented organic matter (manure + straw, plant residues). Stable organic matter, slow N release.

- Dry matter: 40–60%+.
- Composition: variable; N in FM usually several–dozen kg/t; P and K moderate.
- Application: pre-sowing, after-harvest cultivation; useful for reclamation and light soils.
- Risks/remarks: quality depends on feedstock and process parameters (temperature, duration, aeration).

4.5. Digestate (from biogas plants)

Residue after anaerobic digestion. Liquid fraction – fast action (NH_4^+, K), solid fraction – carrier of carbon and P.

- Liquid fraction (per m³): ~3–7 kg N, 0.5–1.5 kg P_2O_5, 3–7 kg K_2O.
- Solid fraction (per t): DM 25–35%; ~6–12 kg N, 3–8 kg P_2O_5, 4–10 kg K_2O.
- Application: liquid fraction – as slurry; solid fraction – spread and lightly incorporated.
- Risks/remarks: NH_3 emissions from the liquid fraction; composition depends on substrates; product classification issues.

4.6. Granulated manure (pellet)

Hygienized, dried, pelletized manure; standardized product (retail/B2B).

- Dry matter: >85–90%.
- Typical declaration (NPK): ~3–4% N, ~3–4% P_2O_5, ~3–4% K_2O.
- Application: spread pre-sowing or top-dressed; precise dosing possible.
- Risks/remarks: higher unit N cost than in slurry; important to buy products with declared composition and certification.

4.7. Biohumus / vermicompost

Product of earthworms (vermicompost); low NPK, strong biological effect (enzymes, microflora).

- Use: quality additive in small doses, mainly in horticulture and specialized crops.
- Risks/remarks: does not replace yield-forming N doses – should be treated as a soil improver.

Table 1 Comparison table – parameters and key features (indicative) of natural fertilizers in Poland

Fertilizer	Form	Dry matter, %	N (unit)	P_2O_5 (unit)	K_2O (unit)	Key features
Cattle manure	solid	20–35	5–7 kg/t	3–5 kg/t	5–8 kg/t	Builds humus, slow nutrient release
Poultry manure	solid	25–35	10–15 kg/t	6–12 kg/t	6–10 kg/t	High N and P content
Pig slurry	liquid	4–8	3–7 kg/m³	1–2 kg/m³	2–4 kg/m³	High NH_4^+, fast action
Cattle slurry	liquid	4–8	2–5 kg/m³	0.5–1.5 kg/m³	2–4 kg/m³	Similar to pig slurry, lower N
Manure effluent	liquid	<3	0.5–2 kg/m³	0.1–0.5 kg/m³	1–3 kg/m³	Very dilute, high K vs P

Fertilizer	Form	Dry matter	N (unit)	P_2O_5 (unit)	K_2O (unit)	Key features
Digestate – liquid fraction	liquid	2–6	3–7 kg/m³	0.5–1.5 kg/m³	3–7 kg/m³	Like slurry, high K
Digestate – solid fraction	solid	25–35	6–12 kg/t	3–8 kg/t	4–10 kg/t	Carbon + P, slower release
Granulated manure	solid	>85	~3–4%	~3–4%	~3–4%	Convenience/logistics, standardized

5. Regulatory and Institutional Framework

5.1. Key formal and legal aspects of the functioning of the natural fertilizer market in Poland

5.1.1. Basic legal framework

- EU law:

- Regulation (EU) 2019/1009 laying down rules on the making available on the market of EU fertilizing products.
- Nitrates Directive 91/676/EEC – on the protection of waters against pollution caused by nitrates from agricultural sources.

- National law:

- Act on Fertilizers and Fertilization (Journal of Laws 2007 No. 147 item 1033, as amended).
- Regulations of the Ministry of Agriculture and Rural Development (MRiRW) governing the registration and marketing of organic fertilizers, organo-mineral fertilizers, and by-products.
- Environmental Protection Law and Waste Act – regarding the treatment of certain fractions (e.g. digestate).

5.1.2. Definitions and classification of natural fertilizers

- Manure, urine, slurry – treated as natural fertilizers, whose use is subject to detailed regulations.
- Digestate from biogas plants – classified depending on composition: as an organic fertilizer after registration with MRiRW, or as waste.
- Compost and other organic products – require entry into the fertilizer register maintained by MRiRW if they are to be marketed.

5.1.3. Registration and placing on the market

- Natural fertilizers used on the farmer's own holding are not subject to registration.
- Products intended for sale (e.g. packaged or granulated manure) must undergo a registration process with MRiRW.
- Requirements include tests of quality, nutrient content, and safety (heavy metals, pathogens, residues of veterinary medicines).

5.1.4. Environmental and practical restrictions

- Since 2021, the entire territory of Poland has been covered by the Action Program under the Nitrates Directive.
- Nitrogen application limits: 170 kg N/ha from natural fertilizers.
- Bans on application during specified periods (winter application breaks).
- Obligations to store fertilizers in sealed tanks and on manure pads.
- Large livestock farms must prepare fertilization plans and may sell a maximum of 30% of manure outside the farm.

5.1.5. Control and supervision

- Supervision of fertilizer marketing: IJHARS (Agricultural and Food Quality Inspection) and the Environmental Protection Inspectorate.
- On-farm inspections: ARiMR (Agency for Restructuring and Modernisation of Agriculture) as part of cross-compliance.

5.1.6. Practical consequences for investors and exporters

- Administrative barriers: product registration may take 6–12 months.
- Cross-border transport: veterinary and phytosanitary requirements.
- Market preferences: farmers seek processed fertilizers (granules, pellets).

5.1.7. Trends and directions of change

- Implementation of the Green Deal and “Farm to Fork” strategy.
- Development of agricultural biogas plants – digestate as a key fertilizer raw material.
- Digitalization and monitoring – fertilizer record-keeping systems (e.g. eDWIN, eWniosekPlus).

5.2. Placing on the market

In legal terms, “EU fertilizing product” is regulated by Regulation (EU) 2019/1009, which also covers biostimulants (PFC6) and opens the single market for organic and organo-mineral fertilizers (EU 2019/1009).

In Poland, the basis is the Act on Fertilizers and Fertilization, which defines fertilizers and the principles of placing them on the market (MRiRW authorization or CE marking). For the purpose of this analysis, the market is divided into:

- organic fertilizers of animal/plant origin (e.g. granulated manure, biohumus, compost),
- organo-mineral fertilizers,
- digestate products from biogas plants (liquid and separated digestate),
- biostimulants (in the sense of EU PFC6).

5.2.1. Scheme of the fertilizer registration process in MRiRW

1) Submission of an application to MRiRW for entry into the fertilizer register.
2) Submission of documentation: description of technology, laboratory tests, producer’s declaration.
3) Formal and substantive verification of documentation by MRiRW.
4) Opinion of the Institute of Soil Science and Plant Cultivation (IUNG) in Puławy.
5) Administrative decision of the Minister of Agriculture on registration.
6) Publication of the product on the list of approved fertilizers and authorization for market placement.

When analyzing Polish guidelines, attention should be paid to possible consequences arising from differences between Polish and Dutch legislation (Table 2).

Table 2 Comparison of natural fertilizer regulations: Poland vs. the Netherlands

Aspect	Poland	Netherlands	Practical implications for Dutch companies
Nitrogen application limit	170 kg N/ha	170 kg N/ha	as per Nitrates Directive
Fertilizer registration*	MRiRW, testing requirements and IUNG opinion	-	The registration process in Poland is lengthy (6–12 months), requiring strategic planning of market entry.
Digestate from biogas plants**	May be classified as fertilizer (after registration) or as waste	Recognized as a fertilizer product (when the incoming products (manure and by-products) are listed in Annex Aa of the Fertilizer Act Implementing Regulation. Otherwise, or as waste)	Potential for Dutch firms in digestate processing technologies and certification.
Control and supervision*	IJHARS, ARiMR, Environmental Protection Inspectorate	NVWA (Dutch Food and Consumer Product Safety Authority)	Dutch firms must be prepared for multi-level inspections in Poland, including compliance with environmental and veterinary requirements.
Market trend	Growing importance of granulated fertilizers and digestate	Advanced circular economy practices, high specialization of products	Opportunity for export of processed organic fertilizers (granules, pellets) and transfer of circular economy know-how.

** a) Manure, liquid manure, and slurry – these natural fertilizers are not subject to registration with the Ministry of Agriculture and Rural Development – they are permitted by law (Ustawa z dnia 10 lipca 2007 r. o nawozach i nawożeniu). Farmers can use them without being listed on the Ministry of Agriculture and Rural Development's fertilizer list.*

b) Processed products – if manure/slurry is processed industrially (e.g., dried, granulated, mixed with additives, sold as a commercial product), it must undergo registration and be included on the Ministry of Agriculture and Rural Development's list of fertilizers approved for marketing. Marketing of such fertilizers is based on Article 4 of the aforementioned Act, i.e., a permit from the Minister responsible for agriculture, and their production requires veterinary supervision.
c) The Ministry of Agriculture and Rural Development maintains a Register of fertilizers and plant growth enhancers approved for marketing. Commercial products (e.g., granulated manure, chicken pellets, digestate in the form of organic fertilizer) must be listed there. However, regular farmyard manure/slurry is not registered – it is treated as "natural fertilizer" and used according to the nitrate program rules.
d) Alternatively, the CE marking procedure can be used, and then registration with the Ministry of Agriculture and Rural Development is no longer required.
*** If it has the status of an "organic fertilizer," it must be entered into the Ministry of Agriculture and Rural Development's list. In the documentation, the manufacturer must indicate the raw materials used and present tests. The raw materials must comply with feed, sanitary, and waste laws. If the digestate comes from waste that cannot be used in fertilizer production (e.g., certain industrial waste, category 1 ABP), it is also treated as waste in Poland, not fertilizer.*

5.2.2. CE Marking Procedure for Natural Fertilizers – Product Classification and Registration

1) Product classification

First, the following must be determined:

- **PFC (Product Function Category) – EU fertilizing product functional category:**
  a) PFC 1(A) – macronutrient fertilizers,
  b) PFC 1(B) – micronutrient fertilizers,
  c) PFC 1(C) – compound fertilizers,
  d) PFC 2 – liming materials,
  e) PFC 3 – soil improvers (e.g. compost, digestate),
  f) PFC 4 – plant biostimulants,
  g) PFC 7 – blends.

For natural fertilizers, most commonly applied are PFC 1 (organic fertilizers) and PFC 3 (composts, digestate).

- **CMC (Component Material Category) – allowed material categories:**
  a) CMC 1 – virgin material (e.g. mineral products),
  b) CMC 3 – compost,
  c) CMC 4 – digestate,
  d) CMC 10 – agricultural by-products,
  e) CMC 11 – by-products of the agri-food industry,
  f) CMC 13 – biomass ash.

For natural fertilizers, the key categories are CMC 3, CMC 4, CMC 10, and CMC 11.

2) CE conformity procedure

- Identification of PFC and CMC – assign the product to the appropriate categories.
- Testing and technical documentation:

3) Chemical composition (N, P, K, micronutrients),
4) Safety (heavy metals, Salmonella, E. coli, residues of pharmaceuticals).

- Conformity assessment – usually Module A (internal production control), i.e. manufacturer's self-declaration (notified body not required, except e.g. for biostimulants).
- Preparation of the EU declaration of conformity.
- CE marking on the packaging (including composition, nutrient content, PFC/CMC category).
- Placing on the EU market – no registration with MRiRW is required, but the product is subject to inspection by national authorities (IJHARS, PIORiN, Environmental Protection Inspectorate).

5) Key practical points

- CE marking provides access to the entire EU market – without the need for national registration.
- The manufacturer takes full responsibility for compliance with the requirements of Regulation 2019/1009.

6) Challenge

- Natural products (manure, slurry) in raw form often do not fall within the allowed CMC categories. Therefore, processing (e.g. composting, anaerobic digestion, drying) is required to meet CMC 3/4/10 criteria.
- Products not eligible for CE must follow the national route (MRiRW).

The process of CE registration and marking for natural fertilizers can also be presented schematically, following the sequence of steps and taking into account functional (PFC) and material (CMC) categories – see Figure 1.

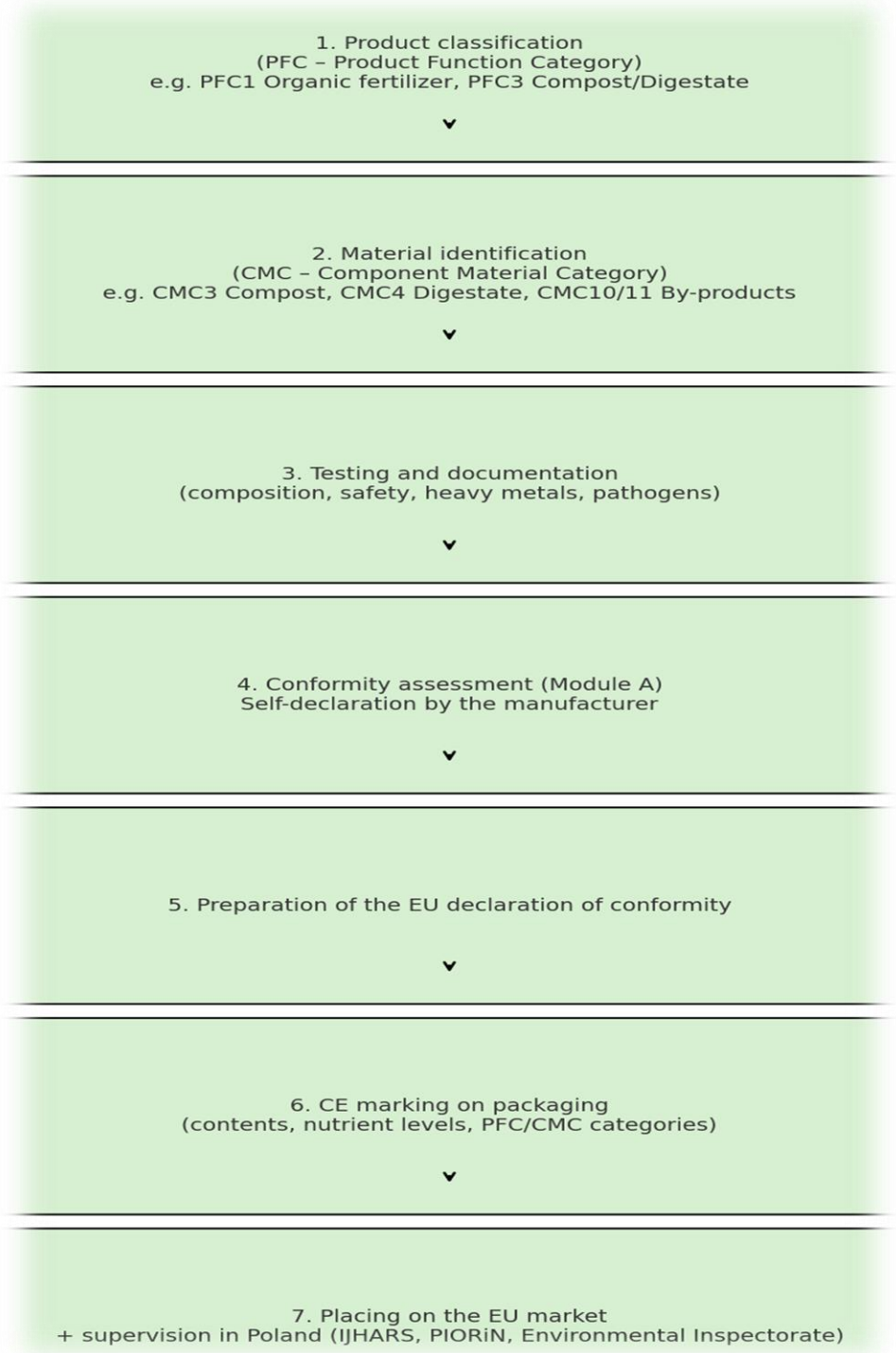

Figure 1 EU CE procedure diagram for natural fertilizers

5.2.3. Key differences compared to the classical national procedure (MRiRW)

- The CE procedure eliminates the need for time-consuming registration with MRiRW.
- The manufacturer bears full responsibility for compliance with EU requirements.
- CE provides automatic access to the entire EU market, which is advantageous for exporters.
- Fertilizers not eligible for the CE procedure (e.g. certain local by-products) must still follow the national registration route.

5.2.4. Analysis of subsidy systems in Poland for the production, processing, and use of natural fertilizers

The analysis covers financial and regulatory support instruments promoting the production, processing, and use of natural fertilizers (manure, urine/slurry, compost, digestate) in Poland. The study includes mechanisms such as:

- CAP eco-schemes (practice-based subsidies),
- ARiMR investment grants,
- NFOŚiGW programs (“Energy for the Countryside,” “Agroenergy”).

Programmatic frameworks such as the “Nitrates Program” and the CE pathway (EU 2019/1009) are also highlighted as factors influencing business models, although they do not constitute classical subsidies (Tables 3 and 4). It should be noted that while some calls for applications are currently ending, they are cyclical in nature and at least some of them will continue in the coming years. Therefore, the last columns of the tables indicate the estimated impact on the digestate/manure market in the perspective of the next two years.

Table 3 Map of financial support instruments for natural fertilizers

Program / Institution	Objective / Scope	Beneficiaries	Form and level of support	Example eligible costs	Status / call 2025	Source
Eco-scheme "Carbon farming and nutrient management" (CAP)	Payment for practices improving C balance and N management (e.g. fertilization plan, liming, grasslands, catch crops).	Farmers meeting eco-scheme criteria.	Point-based payment: ~22.47 EUR/ha per 1 point; minimum number of points required.	Fertilization plan, liming, catch crops; documentation of natural fertilizer use.	Active mechanism in the 2025 campaign (according to MRiRW/ARiMR).	gov.pl – MRiRW/ARiMR (eco-scheme).
ARiMR – I.10.4 "Investments contributing to environmental and climate protection"	Environmental investments in farms (fertilizer infrastructure, application equipment).	Farmers, farmer groups (according to call regulations).	Grants as per regulations; increased budget from 15.07.2025.	Manure pads, slurry/manure tanks, slurry tankers, soil applicators (per investment list).	Regulations of 15.07.2025; earlier calls in 2024, further according to ARiMR.	gov.pl – ARiMR (Regulation I.10.4 and intervention page).
NFOŚiGW – "Energy for the Countryside"	Construction of agricultural biogas plants (CHP), energy storage, RES supporting farms/clusters.	Farmers, energy cooperatives, municipalities, etc. (per program).	Grants up to ~65% of eligible costs, loans up to 100%.	Agricultural biogas installations (high-efficiency cogeneration), energy storage; related management of substrates and digestate.	Call 03.02–19.12.2025 or until budget exhaustion.	gov.pl – NFOŚiGW (program page and 2025 call).
NFOŚiGW – "Agroenergy"	Support for RES in farms (including biogas, PV, storage).	Individual farmers (per program).	Grants up to ~40% of costs, loans up to 100%	RES installations, including on-farm biogas; accompanying elements.	Program continued in 2025 – further editions/calls.	gov.pl – NFOŚiGW (program description).

Table 4 Project paths for natural fertilizers – "from investment to program"

Project type	Relevant program	Key requirements	Points of attention (risks)	Source document
Manure pad / slurry tank	ARiMR I.10.4 (fertilizer infrastructure)	Compliance with the Nitrates Program: tightness, capacity min. 5–6 months; location.	Selection criteria, cost limits; requirement of complete technical documentation.	Regulation I.10.4; Nitrates Program Q&A.
Slurry tanker + soil applicator	ARiMR I.10.4	Compliance with technical requirements (precise application, reduction of ammonia emissions).	Eligibility of equipment; principle of competitiveness/market evidence.	Regulation I.10.4; ARiMR intervention page.
Agricultural biogas plant (with digestate management)	NFOŚiGW "Energy for the Countryside" (+ possibly "Agroenergy" for smaller plants)	High-efficiency cogeneration, meeting environmental criteria; digestate management (possible CE product – PFC/CMC).	Combination of grants and loans; state aid requirements; call schedule.	Program "Energy for the Countryside" webpage; "Agroenergy" description; EUR-Lex 2019/1009.
Composting / manure granulation line	ARiMR I.10.4 (partly), possible regional/RES support (case by case)	Compliance with sanitary and quality requirements; possible CE pathway (PFC 3/CMC 3 or PFC 1 + CMC 10/11).	Risk of eligibility of specific machinery; availability of calls.	Regulation I.10.4; EUR-Lex 2019/1009.
Implementation of fertilization plan, liming, catch crops	Eco-scheme "Carbon farming…"	Implementation of practices and achieving minimum points; documentation.	Variability of conversion rates per point; surface area limits.	MRiRW/ARiMR – eco-scheme description.

5.2.5. Analysis of the impact of subsidy systems on the natural fertilizer market (2025–2027)

To illustrate the interactions between individual measures, a so-called heatmap (Fig. 2) was created, showing the estimated impact of support programs on the natural fertilizer market in Poland in the years 2025–2027. Four criteria were taken into account: supply of manure, supply of digestate, market stabilization, and import potential.

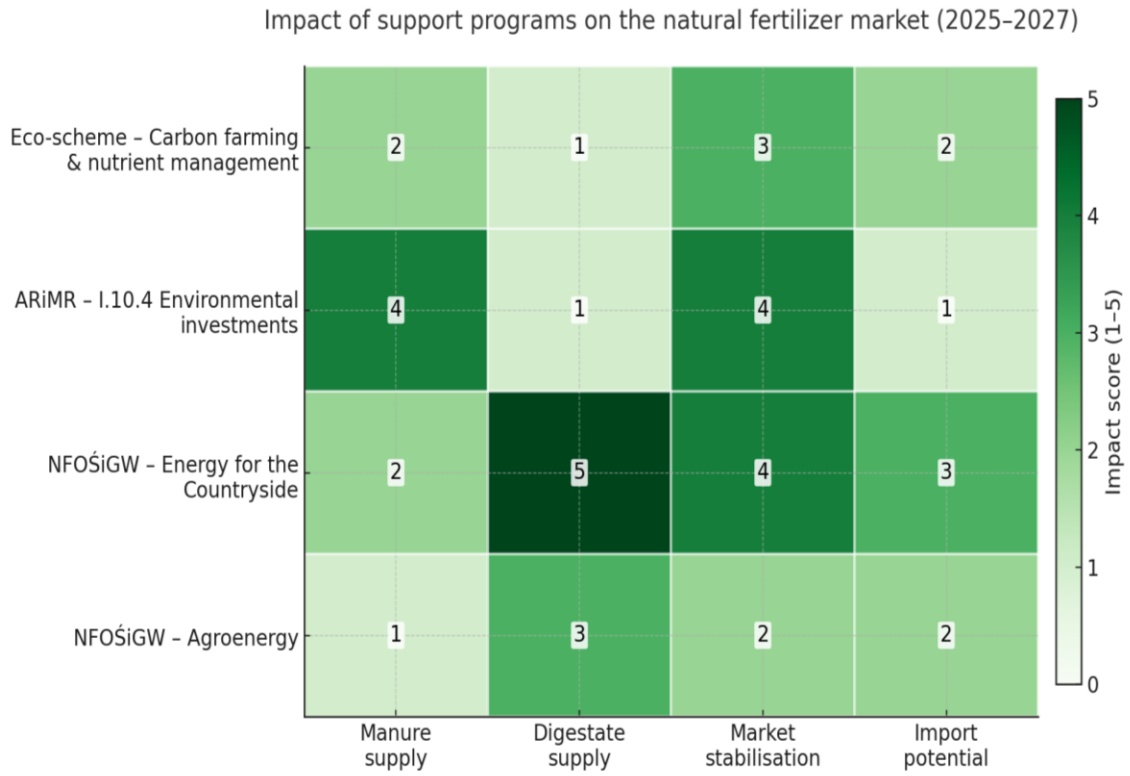

Figure 2 Impact of activities on the natural fertilizer market (scale 1–5, where 5 = very high impact, 1 = minimal)

Characteristics of individual activities:

1) Eco-scheme “Carbon farming and nutrient management”

- Supply of manure/digestate: low impact (2/1). The eco-scheme does not generate new volumes of fertilizers but only stimulates better use through the obligation of planning and documentation [1].

- Market stabilization: moderate (3). Record-keeping and planning reduce uncertainty in trading [1].
- Export potential: negligible (1). A purely domestic instrument, with no impact on trade [1].

Conclusion: the eco-scheme supports demand (use, planning), not supply. Its effect is indirect – improving the culture of nutrient management.

2) ARiMR – I.10.4 “Investments contributing to environmental and climate protection”

- Supply of manure: high (4). Construction of manure pads and slurry tanks enables greater storage and sale of surpluses [2].
- Supply of digestate: marginal (1). The program does not cover biogas installations [2].
- Market stabilization: very strong (4). Better logistics for storage and application make the market more predictable [2].
- Export potential: limited (2). Mainly improves the domestic market, although manure granulation may support product mobility [2].

Conclusion: a key program for increasing supply and stabilizing the domestic manure/slurry market.

3) NFOŚiGW – “Energy for the Countryside”

- Supply of manure: moderate (2). The program does not directly increase manure, but part of the substrates no longer go to the field in raw form [3].
- Supply of digestate: very high (5). Biogas plants generate a stable, processed fertilizer, easy to certify under CE [3].
- Market stabilization: high (4). Digestate is available year-round, easier in logistics than manure [3].
- Export potential: very high (5). Digestate meeting CE (PFC/CMC) requirements may be traded on the EU market [3].

Conclusion: the strongest driver of digestate market development and potential export.

4) NFOŚiGW – “Agroenergy”

- Supply of manure: minimal (1). No component for manure storage or processing [4].
- Supply of digestate: moderate (3). The program supports small on-farm biogas plants, which generate digestate but in smaller volumes [4].
- Market stabilization: limited (2). A dispersed effect, depending on location and scale [4].
- Export potential: low (2). Small installations rarely generate surpluses suitable for CE certification and export [4].

Conclusion: local and dispersed impact, rather improving the nutrient balance within farms than creating a trading market.

5.2.6. General conclusions and regulatory frameworks relevant to subsidies

1. The Nitrates Program (implementation of Directive 91/676/EEC) sets minimum requirements e.g. for the storage of natural fertilizers (typically 6 months for liquid and 5 months for solid), which is often a condition for obtaining subsidies/investment support [5].
2. Regulation (EU) 2019/1009 (CE) allows the placing on the EU market of processed fertilizing products (e.g. compost, digestate) without national registration, if PFC/CMC criteria are met – this affects the profitability of processing projects [6].
3. The program “Energy for the Countryside” has the greatest strategic importance for the market – it generates the largest increase in the supply of processed fertilizers (digestate) and creates conditions for export within CE [3].
4. ARiMR I.10.4 is key for the manure and slurry market – it improves storage and transport capacity, stabilizing supply and prices [2].
5. Eco-schemes act more on demand and nutrient management culture than on supply – the effect is more indirect [1].
6. Agroenergy plays a niche role, with local impact – strengthening farm self-sufficiency but not creating market surpluses [4].
7. From an import perspective, the most relevant are: eco-schemes (quality requirements) and Energy for the Countryside (substrates, balancing) [1][3].

Bibliography

[1] MRiRW/ARiMR – Eco-scheme “Carbon farming and nutrient management”, gov.pl.

[2] ARiMR – Regulation I.10.4 on environmental and climate investments, gov.pl.

[3] NFOŚiGW – Program “Energy for the Countryside”, gov.pl.

[4] NFOŚiGW – Program “Agroenergy”, gov.pl.

[5] Directive 91/676/EEC (Nitrates Directive).

[6] Regulation (EU) 2019/1009 of the European Parliament and of the Council laying down rules on EU fertilizing products (CE).

6. Agronomic Practices and Applications

6.1. Solid Manure

6.1.1. Agronomic aspect

Solid manure, produced in bedding systems, is a natural fertilizer of great importance in nutrient management. It supplies not only the main macronutrients (N, P, K) but also significant amounts of organic matter, which increases humus content and improves the physical and biological properties of soil. Due to the slow mineralization of nutrients, the fertilizing effect is spread over time and lasts for several years. The best results are observed in crops with high nutrient demands, such as potato, sugar beet, maize, oilseed rape, and field vegetables.

6.1.2. Application timing

Solid manure is applied mainly in autumn, which allows it to be evenly ploughed under during winter ploughing. Application in this period reduces nitrogen losses and initiates mineralization processes before the growing season. Spring application is possible but limited to late-sown or late-planted crops, such as maize or potato. According to current regulations, manure application is permitted from March 1 to the end of November. Application on frozen, flooded, or snow-covered soils is prohibited.

6.1.3. Application methods

The most common method is uniform spreading with a manure spreader, followed by rapid incorporation into the soil with ploughing or reduced tillage. In modern farms, strip application is also practiced, enabling localized placement of manure in the root zone.

6.1.4. Technologies

Recent years have seen the introduction of solutions that increase the efficiency of manure use. Spreaders can be equipped with GPS systems and variable-rate technology (VRA), allowing precise adjustment of the application rate to soil fertility. In

organic and vegetable farms, manure composting is practiced to improve uniformity, reduce nitrogen losses, and eliminate weed seeds and pathogens. Increasingly, manure is also directed to biogas plants, where digestate becomes a fertilizer with different chemical properties and greater nutrient availability.

6.1.5. Application technique

Modern manure spreaders allow uniform distribution of fertilizer using vertical or horizontal beaters. Equipment with weighing systems and electronic flow control enables precise dosing. A standard practice is rapid incorporation into the soil—no later than 12 hours after application—which minimizes ammonia losses and reduces odor nuisance.

6.2. Liquid Manure (Slurry)

6.2.1. Agronomic aspect

Slurry, produced in non-bedding systems, is characterized by a high content of ammonium nitrogen, which determines its rapid and intensive fertilizing effect. It is particularly useful for spring-sown crops with high nitrogen demands, such as maize, as well as for grassland. Unlike solid manure, slurry has little effect on humus balance and soil structure, and its action is comparable to mineral fertilizers.

6.2.2. Application timing

The most favorable time for slurry application is spring, when crops begin intensive growth. Summer application is possible after the harvest of cereals and oilseed rape, provided that crop residues are quickly incorporated. Autumn application is restricted by regulations and allowed only until mid or late October, depending on the region. Application is prohibited from mid-November to the end of February.

6.2.3. Application methods

In Poland, surface spreading with splash plates or trailing hoses is still practiced. This method, although simple, causes high nitrogen losses and odor nuisance. Therefore,

soil-injection techniques are increasingly used, applying slurry at depths of several to a dozen centimeters. This significantly reduces ammonia emissions and the risk of water contamination. Strip application technologies are also developing, particularly in maize cultivation, where fertilization is combined with soil tillage.

6.2.4. Technologies

Technological progress in slurry fertilization includes, among others, separation into solid and liquid fractions. The solid fraction, rich in phosphorus and organic matter, can be used as a slow-release fertilizer, while the liquid fraction serves as a quick source of nitrogen and potassium. Modern slurry tankers are equipped with flow meters, NIR sensors (near-infrared spectroscopy), and GPS systems that enable real-time monitoring of nutrient content and adjustment of the dose to site-specific needs. Increasing importance is also given to urease and nitrification inhibitors, which reduce nitrogen losses and greenhouse gas emissions.

6.2.5. Application technique

Modern slurry tankers allow various application methods: surface, band, and injection. Trailing-hose booms, disc injectors, and tine applicators are increasingly used. Combined with nutrient sensors and variable-rate systems, they ensure precise fertilization in line with environmental requirements. In large farms, it is also standard practice to keep digital fertilization records based on GNSS data, which allows accurate control of doses and compliance with the 170 kg $N \cdot ha^{-1} \cdot year^{-1}$ limit from organic sources.

6.3. Machinery and Equipment for Organic Fertilization Used on Polish Farms

6.3.1. Manure Spreaders

Between 2021 and 2025, the Polish market has been dominated by spreaders with a load capacity of 6–14 tons (single-axle) and 16–18 tons (tandem or tridem). Typical box volumes range from 7.7 to 15.1 m^3 for the 6–14 t segment and 17–19 m^3 for the 16–18 t segment. Examples include **Metal-Fach N276** (6–14 t) and **N277** (16–18 t). The **Pronar NV161** offers 8.6–14.4 m^3, while the **Joskin Tornado3** series ranges from 8.6 to 22.4 m^3.

Among Polish producers, in addition to Metal-Fach and Pronar, CynkoMet has gained importance with galvanized constructions (NRN series 8–10 t). Market data show that under the 2014–2020 RDP, the largest shares of spreader deliveries were held by Unia (20%) and Metal-Fach (18.8%).

Modern spreaders are equipped with vertical and horizontal beaters, hydraulic conveyor control, weighing systems, and GPS-integrated VRA technology. In higher specifications, enhanced anti-corrosion protection is also becoming standard.

6.3.2. Slurry Tankers and Applicators

In slurry application, the majority of the market is covered by tankers with capacities of 8,000–20,000 liters, with increasing interest in machines above 20,000 liters, especially in large farms and contracting services. The most frequently sold versions are tandem and tridem models with hydraulic suspension, suction arms, and optional NIR/ISOBUS systems. Examples include **Meprozet PN-140** (14,000 l), **PN-200** (20,000 l), and **PN-260** (26,000 l, tridem, requiring >260 HP). In Poland, tankers are also produced by Pomot and Joskin (plant in Trzcianka).

Market-standard equipment includes trailing-hose booms and shoe, slot, and disc applicators with working widths from 7.5 to 24 m, and up to 30 m in the case of **Vogelsang BlackBird**. Lightweight applicators such as **Schleppfix** (approx. 9 m, 680 kg) allow retrofitting of older tankers.

Modern slurry tankers are increasingly equipped with flow meters, NIR sensors, and ISOBUS systems, which enable real-time analysis of slurry composition and precise dose adjustment according to N, P, and K content.

6.3.3. Spreaders & Slurry Tankers Market Parameter Overview

Spreaders in the 6–10 t (7.7–11.7 m^3) segment are most often used on farms of 50–150 ha and are available in single-axle versions with vertical beaters and basic control systems. The 12–14 t (13.4–15.1 m^3) segment serves medium-sized farms (150–300 ha) and increasingly offers precision farming technologies. Spreaders of 16–18 t (17–19 m^3) are mainly purchased by large farms and service companies.

Slurry tankers with capacities of 8,000–12,000 liters are popular on grassland and in smaller farms. Capacities of 14,000–20,000 liters are standard in farms over 150 ha

and are equipped with applicators of 12–24 m. The largest models, up to 26,000–30,000 liters, are purchased by contractors and farms supplying biogas plants, where high filling rates and tractor power of 200–260 HP are required.

6.3.4. Spreaders & Slurry Tankers Market and Technical Conclusions

The market analysis highlights three main trends (tab. 5):

- First, in the manure spreader segment, there is a shift toward more durable and precise machines equipped with weighing systems and VRA technology. The 6–14 t range remains the most popular, while the 16–18 t models are chosen mainly by larger farms and contractors
- Second, in slurry fertilization, tankers with capacities of 14,000–20,000 l and 12–24 m band or slot applicators are becoming the standard. NIR/ISOBUS systems are increasingly an element of competitive advantage
- Third, PIGMiUR registration statistics confirm demand variability: after a decline in trailer registrations in the first half of 2024, a marked rebound was observed in 2025, suggesting renewed investment in slurry tankers and manure spreaders.

Table 5 Selection of Manure and Slurry Application Machinery Available on the Polish Market (Selected Companies, 2021–2025)

Fertilizer type	Machine type	Load capacity / volume	Axle configuration	Typical width / beaters	Example models	Source
Solid manure	Metal-Fach N276 spreader	6–14 t (7.7–15.1 m³)	Single axle	Vertical/horizontal beaters	N276/3, N276/5	Metal-Fach, 2023
Solid manure	Metal-Fach N277 spreader	16–18 t (17.1–19 m³)	Tandem	Vertical/horizontal beaters	N277/5	Metal-Fach, 2023
Solid manure	Pronar NV161 spreader	6–14 t (8.6–14.4 m³)	Single axle	Vertical/horizontal beater	NV161/1	Profi, 2021
Solid manure	Joskin Tornado3 spreader	8–22 t (8.6–22.4 m³)	Single / tandem	Vertical / Horizon horizontal	Tornado3 T5513–T6019	Profi, 2021
Slurry	Meprozet PN-140 tanker	14,000 l	Tandem	Trailing hoses 9–12 m	PN-140 Maxi	AgroProfil, 2022
Slurry	Meprozet PN-200 tanker	20,000 l	Tandem	Trailing hoses / disc applicator 12–18 m	PN-200 Maxi Plus	AgroProfil, 2022
Slurry	Meprozet PN-260 tanker	26,000 l	Tridem	Applicators 15–24 m, >260 HP	PN-260	Top Agrar, 2023
Slurry	Joskin Modulo / Volumetra tanker	8,000–20,000 l	Single / tandem	Booms 7.5–24 m, NIR/ISOBUS	Modulo2 8000–12000; Volumetra 16000–20000	Profi, 2022
Slurry	Vogelsang BlackBird applicator	–	–	12–30 m	BlackBird 24–30 m	Profi, 2022

7. Analysis of the current market situation and the potential of natural fertilizers in Poland

7.1. Characteristics of the natural fertilizer market in Poland

7.1.1. Characteristics of the manure market

The natural fertilizer market in Poland reflects the specific nature of the country's agriculture – a large area of agricultural land, a diversified farm structure, and a high level of animal production (Table 6). Poland has 14.7–14.9 million hectares of agricultural land (UAA), which constitutes approximately half of the country's area [1]. In 2024, the average farm area was 11.6 hectares, although small family farms (less than 10 hectares) predominate, accounting for over 70% of the total [2].

Table 6 Structure of agricultural land in Poland (2024)

Type of land use	Share [%]
Arable land	60%
Meadows and pastures	23%
Orchards and permanent crops	6%
Other	11%

The production of natural fertilizers depends on the livestock population. In Poland, at the end of 2024, approximately 6 million cattle, 9 million pigs, and almost 200 million poultry were kept [1, 2] (Table 7). This generates 80–90 million tons of natural fertilizers per year, mainly in the form of manure, slurry, and liquid manure. The average annual production of natural fertilizers is therefore approximately 5.4–6.1 t of fresh matter/ha of UAA (corresponding to ~0.45–0.60 t of dry matter/ha of UAA, assuming 8–10% of DM on a national scale), which roughly corresponds to the reported Polish statistics, which state that the average production corresponds to 450–500 kg dm3/ha of UAA, which places Poland among the EU countries with high intensity of organic fertilization [1][3].

Table 7 Livestock population in Poland (2024)

Species	Number of animals
Cattle	6.2 million
Pigs	9.1 million
Poultry	195.1 million

The geographic structure of the market is clearly diversified. Western and central voivodeships, especially Greater Poland (approx. 20 million tons) and Kuyavian-Pomeranian (15 million tons), dominate the production of natural fertilizers. The Masovian Voivodeship supplies approximately 10 million tons, while eastern voivodeships, such as the Lublin and Podkarpackie voivodeships, generate approximately 5 and 3 million tons, respectively [2][4]. These differences result from the concentration of animal breeding – intensive pig and poultry farming in the west versus smaller, scattered farms in the east (Fig. 3 and 4).

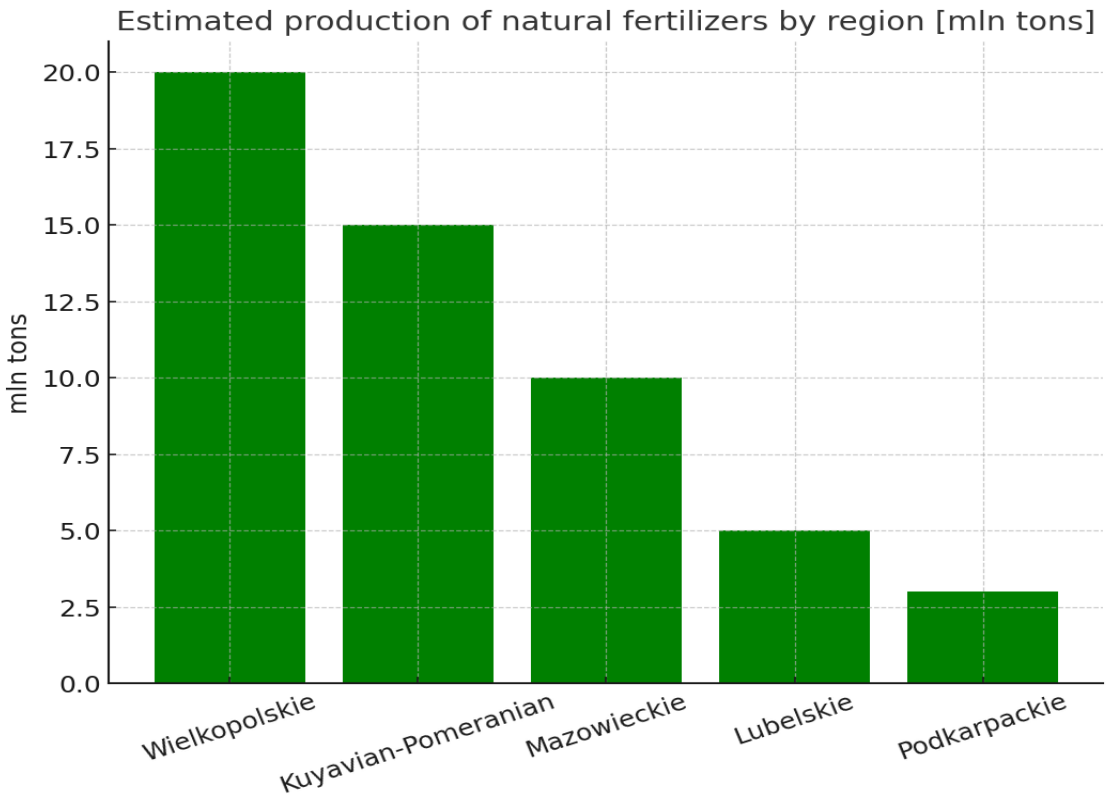

Figure 3 Structure of natural fertilizer production in Poland in selected voivodeships (2024)

Figure 4 Structure of natural fertilizer production in various regions in Poland (2024)

Uneven production of natural fertilizers creates significant logistical and environmental challenges. In regions with surpluses (Greater Poland, Kujawy), farmers struggle to manage the excess, leading to problems with nitrogen and phosphorus management. Meanwhile, in the east of the country, deficits limit the potential for improving the soil organic matter balance [5][6].

Table 8 (values in kg/ha of UAA) presents heuristically calculated data calibrated to a national average of approximately 5.8 t/ha (assuming a total of ~80–90 million t of FFM per year on 14.7 million ha of UAA).

Table 8 Manure production in voivodeships (heuristic approach)

Voivodeship	Total	Manure	Slurry	Urine effluent	Shares (%)
Subcarpathian	4,200	2,520	1,260	420	60/30/10
Lubusz	4,300	1,720	2,150	430	40/50/10
West Pomeranian	4,600	1,840	2,300	460	40/50/10
Lublin	4,800	2,640	1,680	480	55/35/10
Lesser Poland	5,000	3,000	1,500	500	60/30/10
Świętokrzyskie	5,200	2,860	1,820	520	55/35/10
Lower Silesian	5,500	2,200	2,750	550	40/50/10
Warmian-Masurian	5,800	2,610	2,610	580	45/45/10
Pomeranian	6,000	2,400	3,000	600	40/50/10
Łódź	6,500	2,275	3,900	325	35/60/5
Opole	6,500	2,600	3,575	325	40/55/5
Mazovian	7,000	2,800	3,500	700	40/50/10
Silesian	7,000	2,800	3,500	700	40/50/10
Podlaskie	7,500	3,375	3,375	750	45/45/10
Kuyavian-Pomeranian	8,000	2,800	4,800	400	35/60/5
Greater Poland	9,500	3,325	5,700	475	35/60/5

Table 9 (values in kg/ha UAA) presents "hard" data (calculated directly from official data and statistics), but it is then necessary to subjectively select appropriate ranges for characteristic animal groups - here, those with the greatest impact were assumed.

Table 9 Manure production in voivodeships (statistical presentation)

Voivodeship	Cattle class (heads/100 ha UAA)	Pig class (heads/100 ha UAA)	Manure (kg/ha UAA)	Urine effluent (t≈m³/ha UAA)	Slurry (t≈m³/ha UAA)	Total (kg/ha UAA)
Lower Silesian	20.8–28.8	28.1–48.2	1,810	942	3,377	6,128
Kuyavian-Pomeranian	35.6–48.5	48.3–79.1	3,067	1,596	5,709	10,372
Lublin	35.6–48.5	28.1–48.2	3,035	1,571	5,280	9,886
Lubusz	12.0–20.7	13.3–17.9	1,181	611	2,066	3,858
Mazovian	48.6–98.8	48.3–79.1	5,315	2,750	9,202	17,266
Lesser Poland	28.9–35.5	18.0–28.0	2,316	1,197	3,939	7,452
Opole	20.8–28.8	18.0–28.0	1,790	927	3,123	5,840
Subcarpathian	20.8–28.8	13.3–17.9	1,781	920	2,998	5,699
Podlaskie	48.6–98.8	18.0–28.0	5,263	2,710	8,519	16,491
Pomeranian	28.9–35.5	28.1–48.2	2,335	1,212	4,193	7,740
Warmian-Masurian	28.9–35.5	18.0–28.0	2,316	1,197	3,939	7,452
Greater Poland	35.6–48.5	79.2–167.3	3,143	1,654	6,708	11,505
West Pomeranian	12.0–20.7	13.3–17.9	1,181	611	2,066	3,858
Łódź	35.6–48.5	28.1–48.2	3,035	1,571	5,280	9,886
Silesian	20.8–28.8	18.0–28.0	1,790	927	3,123	5,840
Świętokrzyskie	28.9–35.5	18.0–28.0	2,316	1,197	3,939	7,452

The current distribution of natural fertilizer production is unlikely to change significantly in the coming years, but there will most likely be a shift towards processed natural fertilizers, primarily for environmental reasons (gas emissions).

From a climate perspective, ammonia and nitrous oxide emissions associated with the use of natural fertilizers are a key challenge. According to KOBiZE, agriculture is responsible for 96% of ammonia emissions in Poland [3]. The development of the natural

fertilizer market must be closely linked to the implementation of emission-reducing technologies (drag hoses, soil application, tank roofs, etc.).

Bibliografia

[1] GUS, Rocznik Statystyczny Rolnictwa 2024 – https://stat.gov.pl
[2] ARiMR, Dane o pogłowiu zwierząt gospodarskich 2024 – https://www.arimr.gov.pl
[3] KOBiZE, Krajowy bilans emisji 2025 – https://www.kobize.pl
[4] MRiRW, Program azotanowy 2024 – https://www.gov.pl/web/rolnictwo/program-azotanowy
[5] Państwowe Gospodarstwo Wodne Wody Polskie, Raporty nt. jakości wód – https://wody.gov.pl
[6] IUNG-PIB, Żyzność gleb w Polsce – https://iung.pl
[7] Journal of Soil Science and Plant Nutrition, 2022 – https://www.springer.com/journal/42729
[8] Polska Grupa Biogazowa – raport roczny 2024 – https://www.pgb.com.pl

7.1.2. Characteristics of the digestate market

The biogas market is beginning to play a significant role in the natural fertilizer market. There are over 181 agricultural biogas plants in Poland, producing digestate – approximately 7–8 million tons annually. It mainly goes to local farms, which enter into agreements with biogas plant operators. Digestate can partially replace traditional natural fertilizers and is a valuable source of nitrogen and potassium. Agricultural biogas plants in Poland constitute an important element of the circular economy, contributing to the management of agricultural waste, including manure, slurry, and manure effluent . Unfortunately, publicly available information does not allow for a full determination of which installations use manure, to what extent, and in what form. An example description of an installation that can be found in publicly available materials is the Dłoń Microbiogas Plant (Agricultural Experimental Farm, Poznań University of Life Sciences), Poznań Voivodeship. Wielkopolskie Voivodeship, cattle manure, experimental biogas plant or Szklarka Myślniewska Biogas Plant, Wielkopolskie Voivodeship, chicken manure, pig slurry, partially cattle manure.

The supply characteristics of digestate are presented in Figure 5. It should be noted that this does not represent the actual number of agricultural biogas plants or an accurate inventory of the market. This is a heuristic distribution (larger districts where there are typically higher animal density and historically more installations), and the numbers within the districts (e.g., 9, 7, 6...) are symbolic. The purpose of this interpretation was to support the logistics component (where digestate is potentially close and plentiful), not to provide a record-keeping report.

Figure 5 Digestate supply map – heuristic model

7.2. Conclusions from the analysis of the digestate market in relation to manure imports

1) Significant domestic supply of organic raw materials (digestate)

a) Poland already operates more than 181 agricultural biogas plants, generating 7–8 million tons of digestate annually.
b) This means that the local market is increasingly supplied with a substitute for manure and slurry.
c) The import of raw manure from the Netherlands could face a demand barrier – in many regions, cheaper local digestate is available.

2) The biogas market is characterized by local supply

a) Digestate is delivered mainly to farms within a radius of several to a dozen or so kilometers from the biogas plant.
b) This indicates that the organic fertilizer market in Poland is highly local and strongly linked to logistics.
c) The import of manure would have to be directed to deficit regions (e.g. north-eastern Poland), rather than to regions with high livestock density.

3) Lack of data on substrates and manure acceptance in biogas plants

a) Publicly available information does not allow for a clear determination of which installations accept manure and to what extent.
b) This means that the Netherlands would have to base its export strategy on detailed due diligence and local research – not on general statistical data.

4) Digestate as a substitute for manure reduces the attractiveness of raw fertilizer imports

a) Since digestate is available in large quantities and contains nitrogen and potassium, its growing role reduces the economic justification for importing fresh manure.
b) The import potential relates rather to processed products (granules, CE pellets), which are easier to handle logistically, standardized, and can be sold in the premium segment.

5) Heuristic nature of the supply map indicates the need for field research

a) Current data are indicative and do not show exact volumes or locations.
b) An import strategy would require identifying real supply gaps, e.g. regions with a low concentration of biogas plants but high demand for organic matter.

7.3. Competitors and key players in the natural fertilizer market in Poland

The organic and organo-mineral fertilizer market in Poland remains highly fragmented, with a clear division between the commercial agriculture segment (bulk products: granulated manure, digestate, composts, biostimulants) and the hobby and gardening segment (retail brands). On the supply side, a significant role is played by local producers of vermicompost, granulated manure, and composts (e.g., Ekodarpol, Agrecol, FERTIGO), international companies offering biostimulants and specialized fertilizers (Timac Agro, Intermag), and biogas plant operators developing digestate sales (Polska Grupa Biogazowa, Axpo). In the retail channel, horticultural brands (Florovit/Grupa Inco, Substral/Evergreen, Target) are strong, having introduced "natural" lines. In the coming years, demand will be driven by high energy prices, EU regulations (2019/1009) and soil regeneration support programmes, while challenges include quality standardisation, logistics and seasonality of digestate supply.

7.4. Segmentation and the Value Chain

The agricultural segment includes commercial farms and B2B distributors (chains: Chemirol, Ampol Merol, NaturalCrop), and the retail segment includes garden centers, e-commerce, and DIY chains (brands: Florovit Pro Natura, Target Natural, Substral Naturen) [1][2][3][4][5][6]. The key links in the value chain are:

1) raw material acquisition (manure, droppings, plant biomass, food waste, digestate),
2) processing (composting, granulation, digestate separation/concentration, biostimulant formulation),
3) certification/approval (MRiRW/CE),
4) distribution and consulting,
5) after-sales service and quality monitoring.

7.5. Supply: Product Types and Example Producers

a) Granulated manure and composts

This category includes producers who process raw natural fertilizers into a form that is easy to handle and apply (granules). Examples include: FERTIGO (granulated cattle/chicken manure; conversion of 10–15 tons of raw manure to 1 ton of granules) [7]; Florovit Pro Natura lines (granulated manures of various types) [4].

b) Biohumus and humic products

This segment includes products produced with Californian earthworms and humic compositions. Example manufacturers include: Ekodarpol (BIOHUMUS EXTRA, HUMUS ACTIVE) [8]; Agrecol (Biohumus, Agrecol Natura series) [9][10].

c) Biostimulants and Specialty Fertilizers (PFC6)

Intermag (biostimulants, including TYTANIT®, Aminoprim – products of organic/extract origin) and Timac Agro (biostimulants and fertilizers with algae extract complexes, including the Seactiv/Astéllis/EUROFERTIL lines) [11][12][13][14] have a strong position in this segment. It's worth noting that domestic distributors such as Chemirol and Ampol Merol are developing portfolios of biostimulants and biopreparations (e.g., Agravita, Synergia Split) [1][15][16].

d) Digestate (digestate) from biogas plants

Biogas plant operators sell digestate as organic fertilizer – in liquid form or after separation (solid fraction). The Polish Biogas Group (PGB) sells digestate; the industry is growing rapidly (new investments and capital transactions in 2024–2025), including Axpo's entry into the Polish biogas market (acquisition of assets, with announcements about the production of digestate fertilizer) [17][18][19]. Industry media also provide typical digestate volumes from a 1 MW installation (around ~20,000 m³/year) and point out the agronomic advantages (pH 7–8.4; NPK + micro) [20][21][22].

7.6. Demand: Growth Drivers and Barriers

Various internal and external factors influence the development of the natural fertilizer market in Poland.

a) Demand is driven by:

- energy and mineral fertilizer costs (significant price fluctuations after 2022),
- regulatory pressure and subsidies/eco-schemes encouraging humus development and improving the soil carbon balance,
- the growing importance of soil quality and stress resistance.

b) Barriers include:

- lack of standardization and variability in the composition of many organic products,
- logistics costs (volume),
- seasonality of digestate supply,
- need for advice on dose selection (especially PFC6 biostimulants).

General conclusion - the review of prices and market trends in 2024–2025 confirms high volatility [23][24].

7.7. Overview of competitors and brands

Although the Polish market is relatively new compared to Europe (especially Western Europe), it is becoming more and more diverse and competition is increasing among both domestic and foreign producers (Table 10).

Table 10 Overview of selected competitors and brands (own study based on sources indicated in the bibliography)

Entity/Brand	Category	Client Segment	Example Lines	Capital	Year Founded*	Channel	Source (abbreviation)
Ekodarpol	Biohumus, humus, natural agents	Horticulture + small farms	BIOHUMUS EXTRA, HUMUS ACTIVE	PL private	1993	Horticultural distribution, e-commerce	Ekodarpol-O
Agrecol	Horticultural fertilizers, biohumus, Natura series	Horticulture + hobby	Agrecol Natura, Biohumus	PL private	1988	Retail + DIY + e-commerce	Agrecol-O/Agrecol-Natura
FERTIGO	Granulated manure (cattle, chicken)	Agriculture + hobby	Granulated manure, chicken manure	PL private	—	B2B/B2C (granules)	FERTIGO
Intermag	Biostimulants, specialty fertilizers	Professional agriculture	TYTANIT, Aminoprim	PL private	1988	Agricultural distribution networks	Intermag-Strona/Tytanit
Timac Agro Polska	Biostimulants, organo-mineral fertilizers	Professional agriculture	EUROFERTIL, Seactiv	FR (Roullier Group)	1959*	Field advisors + distribution	Timac-Biostym/Produkty
PGB (Polish Biogas Group)	Digestate	Local agriculture around facilities	Digestate mass	PL (with foreign capital participation)	2007	Local sales (tanks/transport)	PGB-Poferment/PGB-News

Entity/Brand	Category	Client Segment	Example Lines	Capital	Year Founded*	Channel	Source (abbreviation)
Axpo Polska (biogas)	Digestate (from facility acquisition)	Local agriculture	Digestate	CH (Axpo)	2024 PL entry	Local contracts	Axpo-2024
Grupa Inco – Florovit	Organo-mineral, manures	Horticulture + hobby	Florovit Pro Natura	PL (Inco S.A.)	—	Retail + DIY	Florovit-PN
Target S.A.	Natural (plant-based) fertilizers, biohumus	Horticulture + hobby	Target Natural	PL private	1992	Retail + e-commerce	Target-Natural
Substral (Evergreen)	Naturen line (organic)	Horticulture + hobby	Naturen (organic + humus)	GB (Evergreen)	2017*	Retail + e-commerce	Substral-Naturen

It should be noted that the summary (Table 10) is analytical in nature; the list of market players is exemplary (not exhaustive). Market segments in the retail segment are based on public product data sheets and manufacturer websites.

7.8. Competitive dynamics and competitive advantages

In recent years, the Polish market has seen a rise in specialization and marketing policies among fertilizer producers, driven by specific initiatives, such as:

- Producers of biohumus/compost compete on access to raw materials and retail brand recognition; the advantages include "100% natural" labeling, certifications, and wide availability [8][10].
- In biostimulants, the decisive advantage lies in proprietary technological platforms (algae extracts, chelates, patented molecules), supported by a network of advisors and experimental results (Intermag, Timac) [11][13].
- Digestate suppliers compete locally on logistics costs, compositional stability, and legal compliance (product status, special biogas act) [17][22].
- Retail brands compete with eco-friendly marketing and innovations (PCR packaging, certifications), with the growing role of e-commerce (Substral Naturen, Target) [6][5].

A selected list of natural fertilizer producers ranked highly in online sources (Fig. 6).

Figure 6 List of natural fertilizer producers highly positioned in online sources

Description of selected manufacturers and brands with a broad marketing scope:

- Intermag (biostimulants, specialty fertilizers)

Profile: Polish manufacturer with a strong position in biostimulation (including TYTANIT®, amino acid lines) and specialty fertilizers for commercial agriculture. Advantages: in-house R&D resources, extensive field experience, and a network of technical advisors. Channel: agricultural distribution + field advisors. Price list: premium products; prices are usually higher nominally, but they address specific issues (abiotic stress, nutrient efficiency). Comparative note: biostimulants are not a direct substitute for granulated manure or digestate, therefore "zł/kg N" comparisons are limited.

- Timac Agro Polska (biostimulants, organo-mineral fertilizers)

Profile: branch of the international Roullier Group; offerings range from granulated fertilizers to biostimulants (algae extracts). Advantages: biostimulant complex technologies and integration with consulting services. Channel: Sales through our own advisors and networks. Price list: varied; organic mineral and biostimulant products positioned above the market average.

- Ekodarpol (biohumus, humic)

Profile: Producer of biohumus and humic preparations; strong presence in retail and horticulture. Advantages: Brand recognition and wide availability; products address soil health and microflora. Price list: higher per unit (PLN/L) for low NPK concentrations – useful in horticulture, less so for large-scale yield-enhancing fertilization.

- Agrecol (horticulture, biohumus, Natura)

Profile: Well-known producer of garden fertilizers; "Natura" and biohumus lines. Channel: DIY/market, e-commerce. Price list: varied; frequent seasonal promotions. Note: In B2B evaluations, the "delivered" price and packaging/waste costs are taken into account.

- FERTIGO (granulated manure)

Profile: Specializing in granulated manure (cattle/chicken) for farmers and hobbyists. Advantages: Product simplicity, easy logistics (bags/big bags), clear NPK declarations. Price list: 25 kg at the retail market level: PLN 50–60; in B2B, big bags/pallets – significantly cheaper per ton, depending on volume and route.

- Inco (Florovit, Azofoska)

Profile: Polish manufacturer of mineral and horticultural fertilizers; recognizable brands (Florovit®, Azofoska®). Advantages: Strong brand, wide availability in supermarkets and e-commerce, extensive universal and specialized portfolio. Channel: Retail (DIY, gardening, online stores), smaller farms. Price list: Mid-market; Azofoska as the market standard, Florovit positioned higher. Note: Mineral products compete with biohumus and organic fertilizers in retail, not with manure or digestate in B2B.

- Polska Grupa Biogazowa (digestate)

Profile: Biogas plant operator; offers liquid digestate and digestate separated locally around the plant. Advantages: low nominal price per m^3, agronomic value (N in ammonium form, K). Success criteria: logistics, application windows, formal compliance; cost per m^3/km is key. Price list: PLN 10–20/m^3 (approximate), often with a separate transport price.

To illustrate the competitive advantages of selected fertilizer producers, heuristic matrices were created – market share in market segments (Fig. 7).

The segmentation chart shows that the agricultural B2B channel has the largest share (approx. 45%), indicating its key importance for producers. DIY/market and garden e-commerce each account for smaller but significant shares (approx. 20–25%), while direct distribution from biogas plants remains marginal (<10%) (Fig. 8). This suggests that, although consumer and niche channels are growing, large-scale agricultural sales continue to dominate the market.

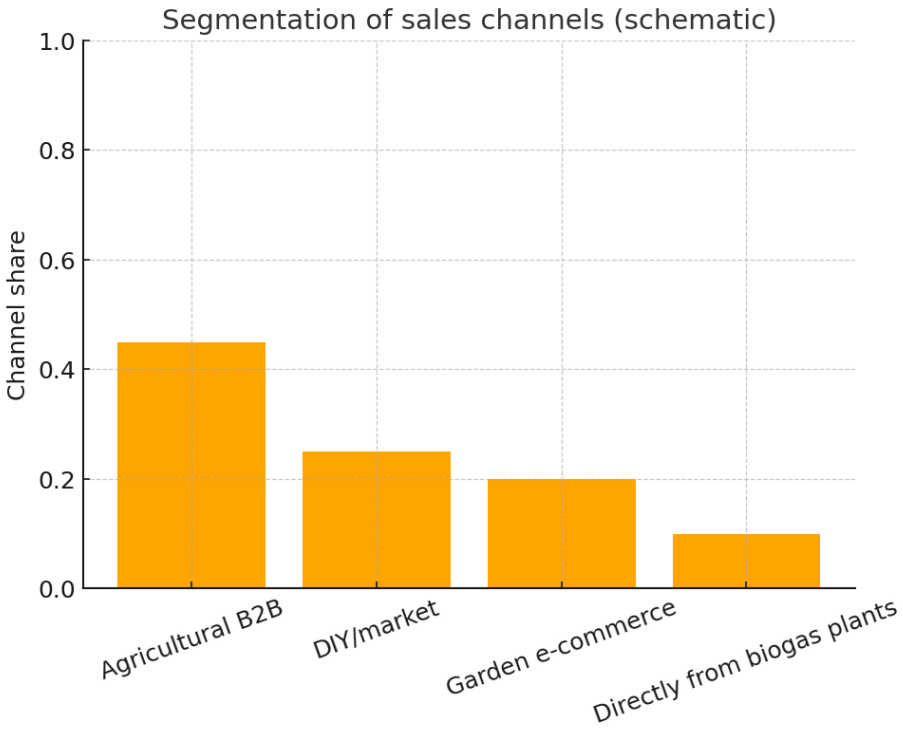

Figure 7 Segmentation of sales channels of natural fertilizer producers

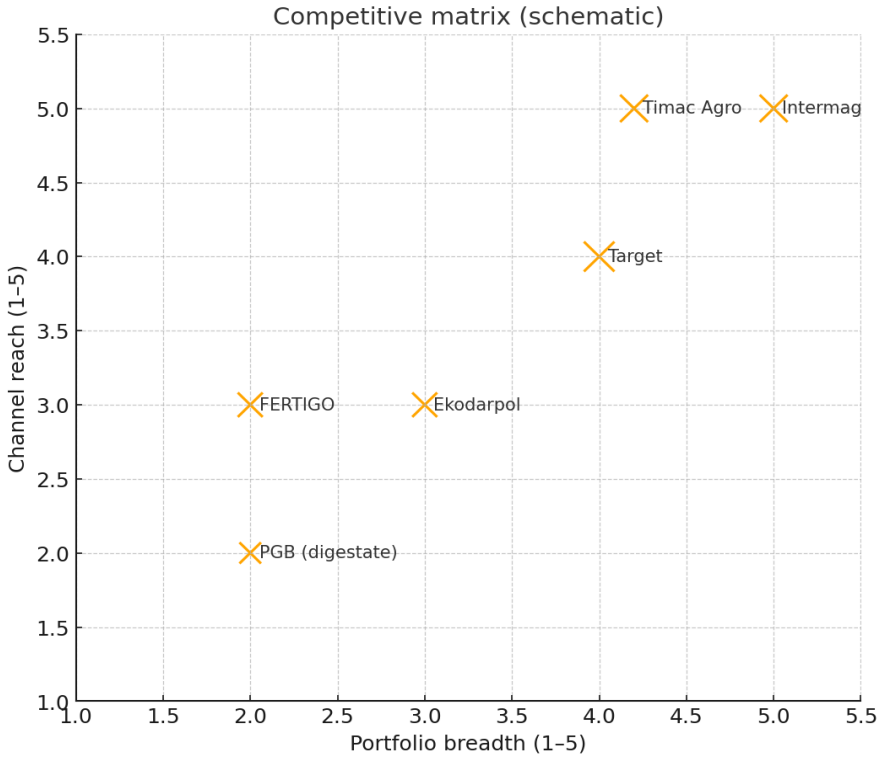

Figure 8 Competitive matrix of natural fertilizer producers

The competitive matrix positions producers by portfolio breadth (x-axis, 1–5 scale) and channel reach (y-axis, 1–5 scale). Intermag and Timac Agro stand out with both wide portfolios and broad channel coverage, making them leaders in the premium and specialized segments. Target also occupies a strong position, though with slightly narrower portfolio. Fertigo and Ekodarpol are mid-range players with moderate portfolios and channel presence. The Polish Biogas Group (PBG) is positioned lower, reflecting its narrow product focus (digestate) and limited channel scope. The analysis confirms that competitive advantage is built both on portfolio diversification and access to multiple sales channels.

Conclusions:

- Agricultural B2B remains the dominant channel for natural fertilizer distribution.
- Intermag and Timac Agro achieve the strongest competitive positions due to both portfolio breadth and channel reach.
- Mid-sized producers (Fertigo, Ekodarpol) focus on specific niches with limited expansion.
- Direct sales from biogas plants remain marginal due to logistical and regulatory constraints.

Bibliography

[1] Chemirol – Biostimulants. https://chemirol.com.pl/produkty/biostymulatory/
[2] Ampol Merol – organic fertilizers. https://ampol-merol.pl/kategorie/44/nawozy-organiczne
[3] NaturalCrop Poland – store (biostimulants, conditioners, biopreparations). https://sklep.naturalcrop.com/
[4] Florovit Pro Natura – manures (Grupa Inco). https://florovit.pl/hobby/produkty/florovit-pro-natura-bydlecy-granulowany
[5] Target – natural fertilizers. https://www.target.com.pl/produkty/naturalne/nawozy/
[6] Substral Naturen – LoveTheGarden. https://www.lovethegarden.com/pl-pl/produkt/substral-naturen-organiczny-nawoz-w-plynie-do-roslin-ozdobnych-1l
[7] FERTIGO – granulated manure. https://www.obornikgranulowany.pl/
[8] Ekodarpol – producer of biohumus and humic products. https://ekodarpol.pl/
[9] Agrecol – fertilizers, biohumus. https://agrecol.pl/

[10] Agrecol Natura – product line. https://agrecol.pl/produkty/agrecol-natura/
[11] Intermag – company website. https://intermag.pl/
[12] Intermag – TYTANIT® product page. https://intermag.pl/produkt/tytanit/
[13] Timac Agro Polska – biostimulants. https://pl.timacagro.com/produkty/odzywianie-roslin/nawozy-biostymulujace/
[14] Timac Agro Polska – products. https://pl.timacagro.com/produkty/
[15] CentrumNawozow.pl – Agravita Galaxy foliar products. https://centrumnawozow.pl/blog/posts/nawozy-dolistne-serii-agravita-r-czesc-i-nawozy-stymulujace
[16] Top agrar – Ampol Merol recommends biology & varieties. https://www.topagrar.pl/uprawa/nawozy/ampol-merol-poleca-biologie-i-odmiany-2512809
[17] Polska Grupa Biogazowa – sale of digestate. https://polskagrupabiogazowa.pl/oferta/sprzedaz-masy-pofermentacyjnej/
[18] Axpo – entry into the Polish biogas market (2024). https://www.axpo.com/pl/pl/newsroom/media-releases/2024/axpo-enters-polish-biogas-market-with-acquisition-of-first-asset.html
[19] IOŚ-PIB BioInitium – new PGB biogas plants (2025). https://bioinitium.ios.edu.pl/nowe-biogazownie-wybudowane-przez-pgb-s-a/
[20] Teraz-Środowisko – digestate: c. 20,000 m³/year per 1 MW. https://www.teraz-srodowisko.pl/aktualnosci/poferment-biogazownia-odpad-produkt-uboczny-nawoz-7797.html
[21] Magazyn Biomasa – digestate properties (pH 7–8.4). https://magazynbiomasa.pl/mozliwosci-zagospodarowania-i-sprzedazy-pofermentu/
[22] Magazyn Biomasa – digestate in trade, new law. https://magazynbiomasa.pl/poferment-w-obrocie-jak-sie-sprawdza-nowe-prawo/
[23] WRP.pl. Market summary 2024/2025 – fertilizers. https://www.wrp.pl/podsumowanie-rynku-nawozow-2024-jakie-prognozy-na-2025-rok/
[24] CDR. Analysis of the mineral fertilizer market and prices (Dec 2024). https://www.cdr.gov.pl/images/Brwinow/aktualnosci/Analiza_Rynku/2024.12/Analiza_rynku_nawozow_mineralnych_oraz_cen_nawozow_w_grudniu_2024.doc

7.9. Identifying organic fertilizer prices (including manure) – competitors, B2B and logistics

This section attempts to identify the positioning of individual competitors in the natural fertilizer market, including sample prices and volumes of products supplied at retail and wholesale levels. The market exhibits a wide price range between the retail and B2B channels.

Calculated per key component (N), digestate is nominally the cheapest (approximately PLN 4–7/kg N at PLN 10–18.5/m³ and ~2.5 kg N/m³), while granulated manure in 25 kg bags costs PLN 48–68/piece, corresponding to PLN 48–59/kg N for the 4 3 3 formulation (N = 4%). Actual purchasing decisions should take into account logistics (m³·km), application technology, DM content, and nutrient release rate.

7.9.1. Methodology and data sources

Publicly available offers (retail, marketplace, manufacturer websites) were collected and a parameterizable B2B model was prepared (requires telephone confirmation). Conversions were standardized to PLN/kg of product and, where possible, to PLN/kg N.

7.9.2. Price benchmarks (retail)

Calculation Methodology and Technical Notes for table 11:

- "Normalization PLN/kg product": Unit price [PLN] ÷ product mass [kg]. For L and m³, a density of ≈1 kg/L and 1000 kg/m³ (fresh mass) was assumed.
- "Conversion to PLN/kg N" (when %N is known): First, "kg N in unit" = product mass [kg] × (N%/100) was calculated. Then, "PLN/kg N" = unit price [PLN] ÷ kg N in unit was calculated. For digestate, "2.5 kg N/m³" was assumed.
- "Delivered Price (Model)": "PLN/t_delivered = EXW_PLN/t + (rate_PLN/t/km × distance_km)". Distances were standardized relative to the conventional central hub; in practice, actual locations and carrier rates should be entered.
- "Technological differences": Comparing "PLN/kg N" does not imply agronomic substitution (different release rates and DM content). When making purchasing

decisions, consider application technique, weather windows, nitrate program requirements, and nutrient balance.

Calculation Methodology and Technical Notes for table 12 (Reference Model):

- "EXW = PLN 2,200/t
- "Transport = PLN 0.25/t/km"
- Estimated B2B vs. retail discount: 15% per kg
- Individual values are approximate – detailed information is provided based on a commercial price inquiry.

A comparison of sample costs (PLN/kg N) for selected industry representatives is illustrated in Figure 9.

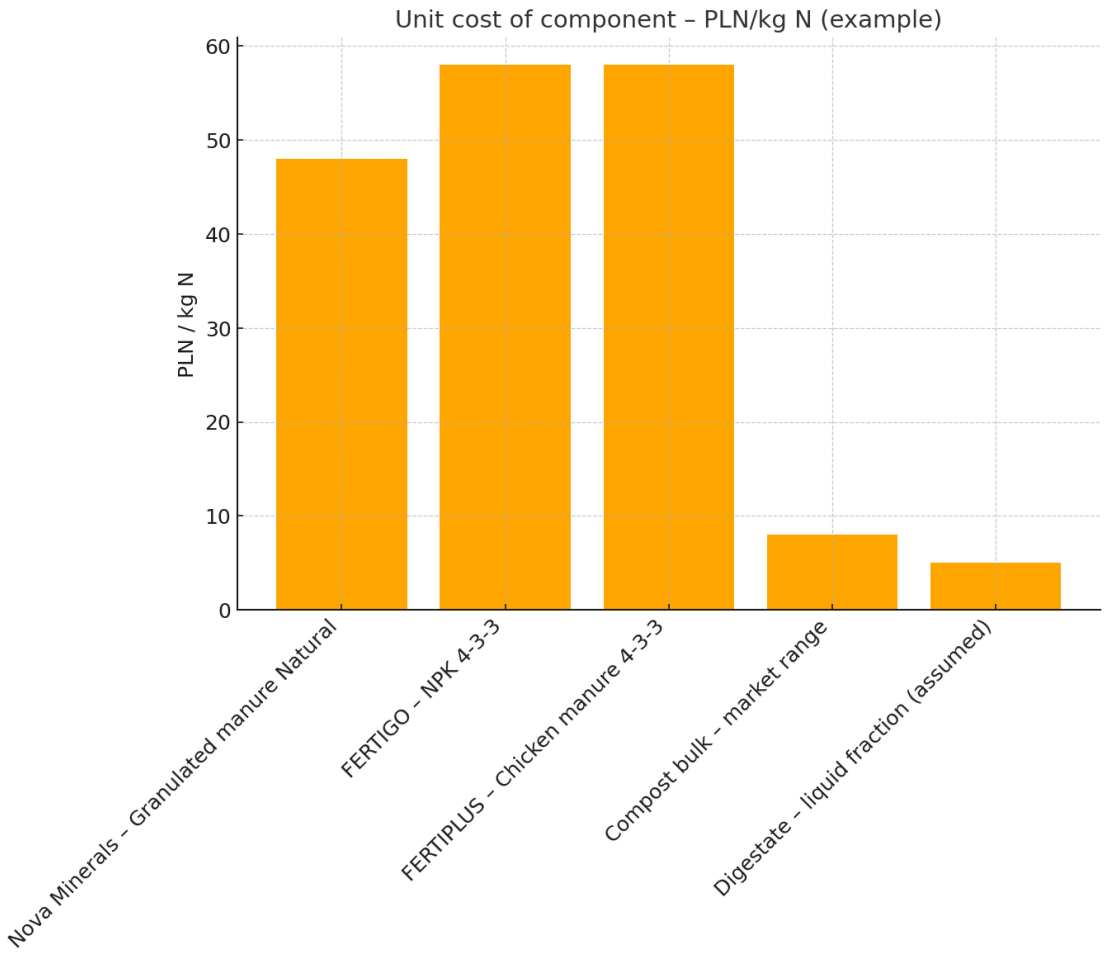

Figure 9 Selected fertilizer costs converted in PLN/kg N

Table 11 Selected retail price benchmarking of natural fertilizers

Category	Product	Unit	Amount_unit	Price_PLN	PLN_per_kg_product	kg_N_in_unit	PLN_per_kg_N	Source*
Granulated manure	Nova Minerals – Granulated Natural Manure	kg	25	48.5	1.94	1.0	48.5	Nova-25kg
Granulated manure	FERTIGO – NPK 4-3-3	kg	25	57.24	2.2896	1.0	57.24	Farma-Mal-25kg
Granulated manure	FERTIPLUS – chicken manure 4-3-3	kg	25	59.0	2.36	1.0	59.0	Agro24-Fertiplus
Granulated manure	Florovit Pro Natura – granules	L	10	50.0	5.0			Ceneo-Florovit
Biohumus	EkoDarpol – BIOHUMUS EXTRA	L	5	51.99	10.398			Ekodarpol-5L
Compost	Bulk compost – market range	t	1000	90.0	0.09	10.0	9.0	Dzialkowiec-Kompost
Digestate	Digestate – liquid fraction (assumptions)	m^3	1	15.0	0.015	2.5	6.0	BiogazPartner-Poferment
Organo-mineral	NaturalCrop 3G Action (net)	kg	25	165.74	6.6296			NaturalCrop-3G

**[Nova-25kg] https://novaminerals.pl/p/obornik-granulowany-naturalny-25-kg-40-l/*

[Farma-Mal-25kg] https://www.farma-malecki.pl/obornik-granulowany-npk-4-3-31mgo9cao-25kg-p-52.html

[Agro24-Fertiplus] https://agro24.pl/pl/hobby/1151-nawoz-mineralno-organiczny-do-trawy-culterra-1648-25-kg.html

[Ceneo-Florovit] https://www.ceneo.pl/52099598

[Ekodarpol-5L] https://allegro.pl/listing?string=biohumus%20ekodarpol%205l

[Sklep-Dzialkowiec-Kompost] https://sklep-dzialkowiec.pl/gdzie-kupic-kompost-na-tony-sprawdz-najlepsze-oferty-i-ceny

[BiogazPartner-Poferment] https://biogaz-partner.pl/poferment/

[NaturalCrop-3G] https://sklep.naturalcrop.com/3g-action-25kg.html

7.9.3. B2B version (big bag/pallet) – assumptions and verification

Table 12 Selected price benchmarking of natural fertilizers in the B2B model

Supplier	Product	Format	Unit_price (PLN)	EXW_price_PLN_per_t	Min_volume_t	Transport_rate_PLN_per_t_km
FERTIGO	Granulated manure 4-3-3 (big-bag 600 kg)	bb600		2200.0	10	0.25
Producer X	Granulated manure 4-3-3 (pallet 1 t)	Pallet 1t		2156.0	10	0.25
PGB / biogas plant operator	Digestate liquid fraction (tanker)	m^3	1.0	15	30	0.25

Estimated prices at local fertilizer sales centers, assuming a logistics hub in Rzepin (Lubuskie Voivodeship), taking into account carrier rates and granular fertilizer, are presented in Table 13 and Figure 10.

Table 13 Estimated prices in local sales centers of natural fertilizers from Hubu Rzepin

Voivodeship	Distance (km) – Rzepin	Delivered Price (PLN/t)
Dolnośląskie	270	2267
Kujawsko-Pomorskie	260	2265
Lubelskie	680	2370
Lubuskie	80	2220
Mazowieckie	480	2320
Małopolskie	550	2337
Opolskie	320	2280
Podkarpackie	720	2380
Podlaskie	650	2362
Pomorskie	420	2305
Warmińsko-Mazurskie	500	2325
Wielkopolskie	190	2247
Zachodniopomorskie	200	2250
Łódzkie	370	2292
Śląskie	390	2297
Świętokrzyskie	490	2322

Figure 10 Estimated prices in local sales centers of natural fertilizers from Hub Rzepin, by Polish voivodeships

8. Cooperation Potential and SWOT analysis

8.1. The demand of Polish soils in NPK

This subchapter presents an estimate of the nutrient supply from natural fertilizers in Poland and the soil demand for N, P_2O_5, and K_2O for an agricultural area of 14.7–14.9 million hectares. The calculations were based on analyses from a Dutch report (Report no. 2065.N.24. entitled "Export Market Survey for Dierlijke Mest Een bureaustudie" by Harm Gelderblom and Romke Postma, 2025) and typical agronomic standards for intensive production.

1) Methodological Assumptions

- Agricultural area: 14.7, 14.8, and 14.9 million hectares (area variants).
- Demand (kg/ha): N = 120/140/160; P_2O_5 = 50/60/70; K_2O = 80/100/120 (variants: low/medium/high).
- Supply from natural fertilizers (Mt/year): N = 0.80–1.00; P_2O_5 = 0.40–0.50; K_2O = 0.70–0.90.
- Additional nitrogen from digestate: 7–8 million m^3 × 2.5 kg N/m^3 ≈ 0.0175–0.020 Mt N/year.
- 1 Mt = 10^6 tons
- Results rounded to 0.001 Mt.

2) Soil demand – variants (Mt/year), table 14.

Table 14 Soil demand in NPK depending on the variant

UAA [mln ha]	Scenario	N [Mt]	P_2O_5 [Mt]	K_2O [Mt]	Sum of N+P_2O_5+K_2O [Mt]
14.7	low	1.764	0.735	1.176	3.675
14.7	mid	2.058	0.882	1.470	4.410
14.7	high	2.352	1.029	1.764	5.145
14.8	low	1.776	0.740	1.184	3.700
14.8	mid	2.072	0.888	1.480	4.440

UAA [mln ha]	Scenario	N [Mt]	P_2O_5 [Mt]	K_2O [Mt]	Sum of N+P_2O_5+K_2O [Mt]
14.8	high	2.368	1.036	1.776	5.180
14.9	low	1.788	0.745	1.192	3.725
14.9	mid	2.086	0.894	1.490	4.470
14.9	high	2.384	1.043	1.788	5.215

3) Coverage of needs with natural fertilizers (14.8 million ha variant, "medium" scenario)

- Demand (14.8 million ha; N/P_2O_5/K_2O = 140/60/100 kg/ha): N = 2.072 Mt; P_2O_5 = 0.888 Mt; K_2O = 1.480 Mt.
- Supply from natural fertilizers (range): N = 0.800–1.000 Mt (+ digestate 0.018–0.020 Mt); P_2O_5 = 0.400–0.500 Mt; K_2O = 0.700–0.900 Mt.

4) Coverage (min–max) and deficits for the "medium" scenario:

Table 15 Coverage or deficit in soil demand in NPK for the medium variant

Component	Coverage min–max [%]	Deficit (min) [Mt]	Deficit (max) [Mt]	Note
N	39.5–49.2	1.052	1.255	N supply includes digestate: 0.818–1.020 Mt
P_2O_5	45.0–56.3	0.388	0.488	—
K_2O	47.3–60.8	0.580	0.780	—

- **Agronomic norms adopted:** Typical ranges for intensive crops (N 120–160; P_2O_5 50–70; K_2O 80–120 kg/ha).
- In the "average" scenario, natural fertilizers cover approximately half of the soil's NPK needs; the remaining part must be supplemented with mineral fertilizers or organic products with a higher concentration of nutrients.
- **Nitrogen:** Even when including digestate, there remains a significant nitrogen deficit—on the order of ~1 Mt N/year (for ~14.8 million ha and 140 kg N/ha).
- **Phosphorus and potassium:** Deficits amount to hundreds of thousands of tons of P_2O_5 and K_2O per year, depending on the scenario and the adopted indicators.

- **Results are sensitive to:** (i) the actual distribution of yields and fertilization intensity in the regions, (ii) the fraction of natural fertilizers directed to biogas/digestate, (iii) the composition parameters of manure/litter.

8.2. Cooperation Potential

The potential for importing manure from the Netherlands to Poland is based on several key premises:

1) Forms with the greatest import potential:

- **Granulated manure (pellets, big-bag, CE)**
  - Standardized composition (NPK 4-3-3), easy logistics (big-bags, bags).
  - Realistic for import to Poland, especially for quality niches and organic farming.
  - B2B prices according to the report: ~PLN 2150–2200/t EXW.
  - 1 t of granules is the result of processing approx. 10–15 t of raw manure - importing in this form is many times more logistically profitable than the raw material.
- **CE products (granules/pellets, possibly digestate concentrates)**
  - The CE procedure (PFC 1, PFC 3; CMC 3, 4, 10, 11) allows the product to be placed on the market without registration at the MRiRW.
  - They can be sold throughout the EU → a competitive advantage for the Netherlands.

2) Quantities – estimated ranges:

- **Import of raw manure** – highly unrealistic:
  - Poland produces 80–90 million tons of natural fertilizers annually (5.4–6.1 t/ha UAA).
  - Additionally, there are 181 biogas plants in operation, generating 7–8 million tons of digestate annually.
  - In many regions there is an oversupply → importing the raw material will not find a wide market.

- **Import of granules** – potential of 50–150 thousand tons per year:
    - This corresponds to processing approx. 0.5–1.5 million tons of raw manure in the Netherlands.
    - It can cover quality niches (e.g., organic farms, deficit regions such as Podlasie, Lubelskie).
    - For comparison – 100 thousand tons of granules provide approx. 4 thousand tons of nitrogen (N=4%).
- **Import of premium products (e.g., chicken pellets, CE-certified pellets)** – a dozen thousand tons/year, mainly for the hobby/retail segment (DIY chains, horticulture).

3) Where to direct import:

- **Deficit regions** (low production of natural fertilizers): Lubelskie, Podkarpackie, and partly Podlaskie.
- **Organic farming** and high-commodity farms that want a precise, certified fertilizer.
- **Retail/hobby channel** (gardens, fruit growing, DIY stores) – marketing potential is greater than volume potential.

Summary:

- **Import of raw manure** from the Netherlands to Poland – practically unprofitable.
- **Import of granulated manure/CE pellets** – a realistic market potential of 150 thousand tons per year.
- A niche but stable market in the premium and eco segment.
- The greatest added value is the **transfer of technology** (granulation, pasteurization, separation) and the import of standardized CE products.

8.3. SWOT analysis

The purpose of this chapter is to assess the potential import of manure—both raw and processed (granulates, CE pellets)—from the Netherlands to the Polish market. The analysis was based on available statistical data, EU regulations, socio-economic factors, and the geopolitical and environmental context.

8.3.1. Strengths of the Polish Market

- **Large-scale agriculture and significant agricultural land area**: Poland has one of the largest agricultural land areas in the EU (~14.6 million ha), which creates significant potential for absorbing natural fertilizers.
- **Growing demand for organic matter**: Polish soils are characterized by a low humus content (<2% in a large part of the country), which increases the need to enrich them with organic fertilizers.
- **Strong development direction for organic and sustainable agriculture**: In the new CAP 2023–2027 eco-schemes, farmers are rewarded for using natural fertilizers.
- **Openness to foreign technologies**: Poland already imports fertilizer components (e.g., fertilizer lime, specialty fertilizers), which facilitates the introduction of Dutch products.
- **The Netherlands' position as an innovation leader**: Dutch granules and CE pellets can be seen as a product of high quality with predictable parameters.

8.3.2. Weaknesses of the Polish Market

- **Fragmented agricultural structure**: This makes distribution difficult and creates high logistics costs for deliveries.
- **Insufficient infrastructure for storage and application**: Some farmers do not have the equipment to optimally use organic fertilizers imported in loose or granulated form.
- **Dominance of own manure and slurry sources**: Some producers see imports as competition for the domestic supply.

- **Lack of widespread awareness of the quality of processed fertilizers**: Some farmers still prefer "traditional" raw manure.
- **Restrictions resulting from the nitrogen program**: Time and quantity restrictions may limit the potential use of additional natural fertilizers.

8.3.3. Opportunities for Import from the Netherlands

- **Import of processed fertilizers (granules, CE pellets)**: They are easy to store and transport, are regulatory-compliant, and can be introduced into retail sales (bags, big-bags).
- **Supplementing deficiencies in deficit regions**: For example, in north-eastern Poland, where the concentration of animal husbandry is lower.
- **Support for eco-schemes and organic farming**: Imported natural fertilizers can fit into new subsidy paths.
- **Transfer of know-how**: The Netherlands can export not only the product but also technologies: granulation, pasteurization, and fraction separation.
- **Positioning as a premium product**: The stable parameters of processed fertilizers can be an advantage over the non-standard quality of domestic manure.

8.3.4. Threats to Import from the Netherlands

- **Transport costs**: Transporting raw manure over long distances is unprofitable; imports only make sense mainly in processed form.
- **Social and political resistance**: Some farmers' organizations may criticize imports as "duplicating" their own resources.
- **Competition from local biogas plants and farms**: The development of digestate in Poland may limit the space for foreign products.
- **Regulatory risk**: Potential further tightening of EU regulations regarding organic fertilizers (e.g., restrictions on cross-border trade in non-pasteurized products).
- **Geopolitical uncertainty**: The war in Ukraine and changes in European logistics may affect the costs and prioritization of agricultural transport.

A typical SWOT matrix in a shortened form, characterizing the accessibility of the Polish natural fertilizer market in relation to imported manure and products made from it, is presented in Table 16.

Table 16 Typical SWOT matrix of fertilizer market vs. import

Strengths	**Weaknesses**
Large-scale agriculture, agricultural land area	Fragmented agriculture
Demand for organic matter	Poor infrastructure
Support for eco-schemes	Competition from domestic manure
Openness to technology	Low quality awareness
Dutch innovations – CE granules	Nitrogen restrictions
Opportunities	**Threats**
Import of processed fertilizers	Transport costs
Supplementing deficits	Social/political resistance
Organic farming	Competition from biogas plants
Know-how transfer from NL	Regulatory risk
Premium product – CE	Geopolitical instability

9. Strategic conclusions and recommendations for Polish-Dutch cooperation

In general, the import of **raw manure** from the Netherlands to Poland makes limited sense, as the market is saturated with local natural fertilizers, such as manure and digestate, which serve a similar agronomic role. The opportunities for the Netherlands lie in **processed products** (granules/CE pellets) and in the transfer of biogas and fertilizer technologies. Imports should be directed to niche, deficit regions rather than to areas with a high concentration of animal production.

9.1. Key Conclusions

1. **The greatest potential lies in processed products:** The largest market opportunities are in the import of granulated fertilizers and CE pellets, not raw manure.
2. **Qualitative, not quantitative deficits:** The Polish market needs standardized, pasteurized, and predictable products, which the Netherlands can supply.
3. **The most promising channels:** The most promising channels are deficit regions and organic farming, where the demand for certified organic fertilizers will grow.
4. **Technological cooperation is more important than import itself:** Dutch know-how in processing and logistics can increase the market's acceptance and scale.
5. **The communication strategy should focus on "added value":** Better quality, hygiene, CE compliance, and support for climate goals should be emphasized to avoid the narrative of "flooding Poland with foreign manure."
6. **Potential market volume:** The import of granulated manure/CE pellets from the Netherlands has a market potential of up to 150,000 tons per year.

9.2. Recommended Actions

1. **Technology transfer:** Focus on transferring technology for pasteurizing and concentrating digestate, low-emission drying, and emission reduction systems for application.
2. **Regional pilot projects:** Establish biogas plant–farmer cooperative clusters with digestate logistics (framework agreements, exchange platforms). Utilize the Netherlands' experience in nitrogen and phosphorus balancing.

3. **Standards and monitoring:** Launch joint research projects to standardize organic fertilizer parameters (DM, Nmin/Norg, P, K, micro), as well as to implement labeling and batch tracking.
4. **Capital and R&D:** Create Polish-Dutch seed/growth funds for companies in the Original Equipment Manufacturer (granulation, biohumus), biostimulation, and digital advisory segments.

10. List of figures

11. List of tables