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Factors Influencing Enterprise Profit among Agribusiness Green Technology Adopters in Ibadan, Oyo State, Nigeria

Abstract. The increasing promotion of green technologies in agriculture is often justified on environmental grounds, yet empirical evidence on their economic implications for agribusiness enterprises in Nigeria remains limited. This study was therefore justified by the need to understand whether and under what conditions green technology adoption translates into improved enterprise profitability. The purpose of the study was to examine the selected factors influencing the profitability of agribusiness enterprises in Ibadan, Oyo State, Nigeria that have adopted green technology. A descriptive survey design was adopted, and primary data were collected from 120 agribusiness green technology adopters using a structured questionnaire. Data were analysed using descriptive statistics and multiple linear regression. The results revealed that age and work experience significantly and positively influenced enterprise profit, while household size and educational status were not significant. Among adoption-related factors, government support and market access positively affected profitability, whereas high technology cost, inadequate resources, and ineffective access to information constrained profit. The model explained about 42% of the variation in enterprise profit. The study concludes that green technology adoption alone does not guarantee higher profitability; rather, supportive institutional frameworks, affordable technologies, adequate resources, and market linkages are critical for translating environmental innovations into economic gains. Policy interventions should therefore integrate financial, informational, and market-support mechanisms to enhance both the profitability and sustainability of agribusinesses.

Keywords: green technology adoption, agribusiness profitability, socio-economic factors, institutional factors, sustainability, Nigeria

JEL Classification: Q12, Q16, Q56, O13

Introduction

The agricultural sector in Nigeria plays a pivotal role in national development, particularly in terms of food security, employment generation, and economic diversification (Ndiomaluke et al., 2025). In recent years, the environmental implications of conventional agricultural practices have prompted a global shift toward sustainable and climate-smart agricultural methods (Hussain et al., 2024). While the global shift toward environmentally sustainable agriculture has encouraged the development of green technologies, it is important to recognise that the adoption of such technologies does not automatically translate into reduced environmental degradation or higher productivity. Their effectiveness depends on the scale of adoption, user capability, and contextual factors such as resource availability and policy support (Adolph et al., 2021; Singh et al., 2025). Some technologies may yield limited or mixed results when agrarians face technical, financial, or institutional constraints (Fadeyi et al., 2022). Therefore, the role of green technologies should be understood within these limitations rather than assumed as universally beneficial.

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In urban and peri-urban areas such as Ibadan, Oyo State, agribusiness operators have increasingly embraced these technologies (Popoola, 2022). However, while their environmental benefits are widely acknowledged, there remains a paucity of empirical evidence on the economic implications of green technology adoption, specifically in relation to enterprise profitability (Tijani, 2022). This study seeks to bridge this gap by investigating the socio-economic characteristics of adopters, the motivations and challenges associated with adoption, and the factors influencing enterprise profit among green technology adopters in agribusiness.

Despite policy efforts and increasing awareness surrounding sustainable agriculture, green technology adoption remains uneven across Nigeria's agribusiness landscape (Ikuemonisan, 2024). More importantly, the impact of such adoption on enterprise profitability is underexplored, particularly within urban agricultural systems (Oyewole & Oyewole, 2023). While previous studies (Olawale et al., 2021; Zeng et al., 2022; Fadeyi et al., 2022; Khurshid et al., 2024) have highlighted factors such as access to information, cost of technology, and market access as influencing adoption, there is limited analysis of how these variables translate into economic performance. Without empirical insights into the factors influencing enterprise profit, stakeholders, including policymakers, practitioners, and researchers, are constrained in designing effective strategies to promote sustainable agricultural practices. This study addresses this critical knowledge gap by evaluating the drivers of profitability among green technology adopters in agribusinesses within Ibadan, Oyo State.

In this study, enterprise profitability is defined as the monetary gain generated by an agribusiness over a specified period, measured as the average quarterly enterprise profit reported by respondents. This variable reflects net income after deducting production and operating costs. Profit refers to the net income derived from agribusiness operations after deducting variable and fixed costs. This operational definition is consistent with agribusiness profitability assessments used in previous studies (Mensah et al., 2021; Oyewole & Oyewole, 2023). The general objective of this study was to assess the factors influencing enterprise profit among agribusiness green technology adopters in Ibadan, Oyo State, Nigeria. In recent years, the adoption of green technologies has gained prominence as a sustainable approach to enhancing productivity while minimising environmental degradation. However, understanding the factors that influenced enterprise profitability among adopters remains crucial for guiding policy decisions and improving business outcomes in the agricultural sector.

Specifically, the study sought to describe the socio-economic characteristics of agribusiness owners who had adopted green technologies. This included variables such as age, work experience, average quarterly enterprise profit, household size, sex, educational status, and type of agribusiness enterprise. These characteristics played significant roles in shaping adoption behaviour and profitability outcomes. The study also aimed to identify the types of green technologies adopted, such as renewable energy systems, organic farming practices, eco-friendly packaging, water-efficient irrigation, and the motivational factors that drove their use.

Furthermore, the research evaluated the key perceived factors that influenced the adoption of green technologies among agribusinesses in Ibadan. These factors included accessibility to information, cost of technology, availability of resources, government support, and market access. The study also examined the perceived benefits and challenges experienced after adoption, providing insights into how these technologies affected

operational efficiency, cost savings, and environmental performance, as well as the constraints that limited their full potential.

In addition, the study assessed the perceived impact of green technology adoption on enterprise productivity and sustainability. This analysis explored how environmentally friendly innovations contributed to improved yields, reduced waste, and long-term business resilience. Finally, the study determined the socio-economic and technological factors that influenced enterprise profit among adopters. By identifying the most significant socio-economic and adoption-related factors associated with the profitability of enterprises that use green technologies in Ibadan, Oyo State, the research provides valuable recommendations for policymakers, entrepreneurs, and development agencies aiming to promote sustainable agribusiness growth in Oyo State and beyond.

The aim of this study is to examine how selected socio-economic and adoption-related factors are associated with the profitability of enterprises that use green technologies in Ibadan, Oyo State. The study does not seek to explain all factors influencing profitability but focuses on a limited set of variables relevant to the study context.

Thus, the specific objectives are to:

1. Describe the socio-economic characteristics of agribusiness operators who use green technologies in Ibadan.
2. Identify the types of green technologies adopted and the motivations for their adoption.
3. Examine respondents' perceptions of factors influencing green technology uptake.
4. Assess the perceived benefits and challenges of green technology use.
5. Analyse how selected socio-economic and adoption-related factors are associated with enterprise profit among green technology adopters.

The following null hypotheses were tested in the course of this study:

H_{01}: There is no significant association between the selected socio-economic characteristics (age, household size, education and work experience) of agribusiness green technology adopters and their enterprise profit.

H_{02}: There is no significant association between specific green technology–related adoption factors (access to information, cost of technology, availability of resources, government support, and market access) and enterprise profit.

Thus, this study is timely and relevant in the context of growing global concerns about environmental degradation, climate change, and the sustainability of agricultural systems. The insights derived from this research contribute to the empirical literature on green technology adoption by linking it to enterprise-level economic outcomes. Identifying the factors influencing the enterprise profit among green technology adopters provides a basis for evidence-driven interventions aimed at enhancing the viability of green practices in agribusiness.

Furthermore, the findings have practical implications for a wide range of stakeholders. For policymakers, the results offer guidance on how to support green technology uptake through targeted subsidies, training programmes, and infrastructure development. For agribusiness entrepreneurs, the study highlights profitable pathways to sustainable practice. Lastly, for researchers and development practitioners, it establishes a framework for further investigations into the socio-economic and environmental benefits of green technologies in Nigeria and similar contexts.

Literature review

The concept of green technology adoption in agriculture has gained increasing attention as a response to global environmental challenges and the demand for sustainable food systems. Green technologies, such as organic fertilisers, renewable energy systems, drip irrigation, and biogas digesters, are designed to enhance productivity while minimising ecological footprints (Singh et al., 2025). According to Adolph et al. (2021), the adoption of these technologies represents a strategic shift toward sustainable intensification, which balances productivity gains with resource conservation. In Nigeria, where agriculture remains the backbone of the economy, green innovation is viewed as an essential pathway for achieving both environmental resilience and economic efficiency (Agbana, 2023). However, the adoption process is influenced by multiple socio-economic and institutional factors, including access to credit, education, training, and policy support (Ahmed & Ahmed, 2023). These influencing factors give emphasis to the interconnectedness between innovation capacity, environmental awareness, and agribusiness performance.

Empirical studies across Africa have shown that socio-economic characteristics play a pivotal role in the adoption and profitability of green technologies. For instance, Rizzo et al. (2024) found that age, farming experience, and education significantly affect farmers' willingness and ability to adopt sustainable innovations, as older and more experienced operators tend to perceive lower risks and make informed decisions. Similarly, Mendes et al. (2024) reported that farmers with higher education levels and better access to information channels exhibit greater adoption intensity and achieve higher profitability levels. Household size and gender dynamics also influence adoption behaviour, with male-headed households often having greater access to resources and decision-making autonomy (Mpiira et al., 2024). Nonetheless, recent evidence suggests a gradual increase in female participation in sustainable agribusiness, driven by empowerment initiatives and access to microcredit (Pal & Gupta, 2023). These socio-economic variables thus provide a foundation for understanding variations in profitability outcomes among adopters.

Beyond individual characteristics, institutional and market-related factors have been identified as key drivers of successful green technology adoption. Ndekwa et al. (2023) and Jayne et al. (2022) emphasised the role of information accessibility, cost of technology, and market demand in shaping adoption patterns among smallholder and medium-scale agribusinesses. Studies by Ahmadi-Gh & Bello-Pintado (2022) and Afum et al. (2023) further noted that adoption decisions are often motivated by the perceived benefits of environmental sustainability, productivity gains, and improved market competitiveness. However, the high initial investment cost, inadequate policy support, and technical complexity of some technologies remain significant barriers. According to Ukwuaba et al. (2025), the lack of structured financial incentives and poor extension service delivery in Nigeria have slowed the diffusion of eco-friendly innovations. Hence, while awareness of sustainable practices is growing, the economic viability and institutional support structures largely determine the extent to which agribusinesses can integrate green technologies into their operations.

The profitability outcomes of green technology adoption have been the subject of growing empirical investigation. Studies such as those by Ma et al. (2024) and Soomro et al. (2024) have shown that adopters experience improved yields, reduced input costs, and enhanced market access, translating into higher enterprise profitability and sustainability. Conversely, other scholars, including Akash et al. (2024), have cautioned that profitability gains are not automatic, as they depend on contextual factors such as the scale of adoption,

enterprise type, and the efficiency of technology utilisation. Mensah et al. (2021) and Abdulai (2023) observed that profitability tends to increase when adopters receive consistent training, technical guidance, and access to reliable markets. In Nigeria's evolving agribusiness landscape, the intersection between socio-economic variables, technological readiness, and institutional frameworks determines the success of green technology adoption. Therefore, understanding the factors influencing enterprise profit among green technology adopters not only provides empirical grounding for sustainable agricultural transformation but also offers actionable insights for designing targeted policies that align environmental sustainability with economic resilience.

Thus, the analytical framework of this study is based on the assumption that enterprise profitability is shaped by both the personal attributes of agribusiness operators and the conditions that enable or constrain the use of green technologies. Accordingly, the socio-economic characteristics and the green technology adoption factors included in this study have been clearly defined and applied consistently throughout the analysis to avoid ambiguity and ensure methodological coherence.

Methodology

The study was conducted in Ibadan, the capital of Oyo State in southwestern Nigeria. Ibadan is located between latitudes 7°20′ and 7°40′ N and longitudes 3°50′ and 4°10′ E. It falls within the rainforest ecological zone, characterised by a tropical wet and dry climate with an average annual rainfall of 1,200–1,300 mm and temperatures ranging from 24°C to 34°C. Ibadan is a major urban centre with a mix of rural and peri-urban communities engaged in diverse agribusiness activities, including crop production, livestock farming, agro-processing, and agri-marketing. The city provides a strategic context for studying green technology adoption due to its blend of traditional and modern agricultural practices, increasing environmental awareness, and access to agricultural innovation platforms.

The study adopted a descriptive survey research design. This design was deemed appropriate for capturing the current practices, perceptions, and experiences of agribusiness operators regarding the adoption and impact of green technologies. It enabled the collection of standardised data across a broad sample, facilitating quantitative analysis of patterns and relationships.

A multistage sampling technique was employed to select respondents. In the first stage, four (4) Local Government Areas (LGAs) were purposively selected from the eleven LGAs in Ibadan. The selection was based on two criteria: (i) the concentration of active agribusiness enterprises, and (ii) documented evidence of green technology awareness and usage, as identified in extension office records.

In the second stage, within each selected LGA, two communities with notable agribusiness activity were chosen using purposive sampling based on agribusiness density.

In the third stage, lists of registered agribusiness operators were obtained from community agricultural offices and local associations. From these lists, systematic random sampling was applied using a sampling interval determined by dividing the total number of registered operators by the required number of respondents per community. This ensured proportional representation of different agribusiness types. A total of 120 respondents were selected using this procedure.

This structured approach ensured that the sample was representative of active agribusiness operators with potential exposure to green technologies.

Primary data were collected using a structured questionnaire, which included both closed- and open-ended questions. The questionnaire was segmented into sections covering socio-economic characteristics, types and motivations for green technology adoption, perceived benefits and challenges, and enterprise profit indicators. To ensure validity and reliability, the instrument was reviewed by agricultural extension and agribusiness experts, and a pilot test was conducted with 10 respondents in a similar setting. Necessary adjustments were made before the final administration.

Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarise respondents' characteristics, motivations, benefits, and challenges associated with green technology adoption. Inferential statistics were employed to test hypotheses and determine relationships between variables.

Perceived factors influencing green technology adoption were measured using a structured five-point Likert-type rating scale. Respondents were asked to indicate the extent to which each factor influenced their adoption of green technologies. Access to information and the cost of technology were measured using a five-point Likert-type scale ranging from low (1) to high (5), with higher scores indicating a stronger perceived influence on enterprise profit. Higher values for access to information reflect improved information flow that is expected to enhance green technology adoption and profitability, whereas higher values for technology cost indicate increased financial burden, which is expected to negatively affect profit through higher production expenses. Availability of resources and government support were assessed on a five-point scale ranging from inadequate (1) to adequate (5), such that higher scores represent greater availability of resources and stronger institutional support. These factors are a priori expected to positively influence profit by facilitating the adoption and effective utilisation of green technologies. Market access was measured on a five-point Likert-type scale ranging from difficult (1) to easy (5), capturing respondents' ease of accessing markets for products produced using green technologies. Higher scores indicate better market access, which is expected to contribute positively to enterprise profitability through improved sales opportunities. Each factor was treated as an independent explanatory variable in the regression analysis to allow assessment of its individual association with enterprise profit.

A multiple linear regression model was estimated to examine associations between enterprise profit and selected socio-economic and adoption-related variables. The adoption factors were included as separate variables (access to information, cost of technology, availability of resources, market access, and government support) rather than as a single aggregated index. This disaggregation prevents potential cancellation effects and allows clearer interpretation of each factor's contribution.

Specifically, multiple linear regression analysis was used to identify the significant factors influencing enterprise profit among agribusiness green technology adopters in Ibadan, Oyo State, Nigeria. The significance of explanatory variables was assessed at the 5% level using t-tests, while the overall model fit was evaluated using R-squared and F-statistics.

The multiple linear regression model was specified to examine the association between selected socio-economic characteristics, as well as green technology adoption-related factors and enterprise profit, defined as the average quarterly enterprise profit of agribusiness operators. The model is expressed as:

$$EP=\beta0+\beta1X1+\beta2X2+\beta3X3+\beta4X4+\beta5X5+\beta6X6+\beta7X7+\beta8X8+\beta9X9+\varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where:
EP – Enterprise Profit, which is the dependent variable measured in monetary terms, and the explanatory variables are defined and justified as follows:
X1 – Age: Measured in years, age reflects maturity and accumulated life experience. Older agribusiness operators are expected to possess better decision-making capacity and risk management skills, which may positively influence enterprise profit.
X2 – Work Experience: Measured as years of involvement in agribusiness activities. Experience enhances managerial efficiency, resource allocation, and familiarity with production and marketing systems, making it a key determinant of enterprise performance.
X3 – Household Size: Measured as the number of persons in the household. Household size may have a dual effect on profit: larger households can provide family labour, but may also increase consumption pressure, making its net effect theoretically ambiguous.
X4 – Education: Measured by the highest level of formal education attained. Education improves cognitive skills, access to information, and the ability to adopt and effectively use new technologies, thereby potentially enhancing enterprise profitability.
X5 – Access to Information: Measured using a five-point Likert-type scale reflecting respondents' access to extension services, training, and market information. Better access to information facilitates informed decision-making and efficient use of green technologies.
X6 – Cost of Technology: Measured on a five-point Likert-type scale capturing respondents' perceptions of the cost burden associated with green technologies. High technology costs may reduce profit by increasing production expenses and limiting adoption intensity.
X7 – Availability of Resources: Measured on a five-point Likert-type scale reflecting the adequacy of inputs, infrastructure, and complementary resources required for green technology adoption. Adequate resources are expected to enhance productivity and profitability.
X8 – Government Support: Measured using a five-point Likert-type scale capturing perceptions of policy support, subsidies, and institutional assistance. Government support can reduce adoption barriers and improve enterprise outcomes.
X9 – Market Access: Measured on a five-point Likert-type scale reflecting the ease of accessing output markets. Improved market access enhances sales opportunities, price realisation, and ultimately enterprise profit.

In the model, β represents the regression coefficients that measure the magnitude and direction of the effect of each explanatory variable (X_1–X_9) on enterprise profit (EP), with β_0 as the intercept and ε as the error term that captures the effects of unobserved factors not explicitly included in the model but which may influence enterprise profit.

It is a priori expected that enterprise profit is influenced by both socio-economic characteristics and factors related to green technology adoption. Age and work experience are anticipated to positively affect profit through accumulated knowledge and managerial skills, while education enhances decision-making capacity. Household size may either provide additional labour or increase the financial burden. Among green technology-related factors, access to information, resource availability, government support, and market access are expected to positively influence profit by facilitating adoption and business operations, whereas high technology costs may negatively affect profit by raising production expenses. Overall, both sets of factors are hypothesised to significantly determine enterprise profitability.

The chosen set of independent variables reflects a balance between explanatory relevance and model adequacy. Previous empirical studies (Olawale et al., 2021; Mustapha et al., 2023) have used similar socio-economic indicators to explain variability in agribusiness income and technology-related performance. Given the study's focus on selected factors rather than an exhaustive determination of profitability, the selected variables provide an analytically coherent framework for exploring associations within the study context.

All quantitative analyses, including descriptive statistics and regression modelling, were conducted using Statistical Package for the Social Sciences (SPSS) version 26.

Results and Discussion

Table 1 presents the socio-economic profile of agribusiness green technology adopters in Ibadan. The average age of respondents was 49.1 years, with the majority (56.6%) aged between 36 and 50 years, indicating that green technology adopters are primarily middle-aged and likely to be economically active. Most respondents had 6–10 years of agribusiness experience (68.3%), with a mean of 7.6 years, suggesting moderate exposure to agricultural practices and innovation. The mean household size was 6 persons, and over three-quarters (77.5%) had households larger than four, which could potentially affect labour availability and household-level decision-making.

Table 1. Socio-economic characteristics of respondents

Socio-Economic Characteristics of Respondents		Frequency	Percentage
Age of Green Technology Adopter in Agribusiness (Years); Mean = 49.1 Years	<=35	8	6.7
	36 – 50	68	56.6
	>50	44	36.7
Work Experience (Years); Mean = 7.6 Years	<=5	24	20.0
	6 – 10	82	68.3
	>10	14	11.7
Average Quarterly Enterprise Profit (Naira); Mean = ₦ 486,500	<=350,000	39	32.5
	350,001 - 500,000	48	40.0
	>500,000	33	27.5
Household Size; Mean = 6 Persons	<=4	27	22.5
	>4	93	77.5
Sex of Green Technology Adopters in Agribusiness	Male	63	52.5
	Female	57	47.5
Educational Status of Green Technology Adopters in Agribusiness	No Formal Education	3	2.5
	Primary	26	21.7
	Secondary	61	50.8
	Tertiary	30	25.0
Type of Agribusiness Enterprise of Green Technology Adopters in Agribusiness	Crop Production	88	73.3
	Livestock Farming	100	83.3
	Agro-Processing	13	10.8
	Agri-Marketing	82	68.3
	Others	2	1.7

Sources: Authors' computation, 2025.

In terms of income, the average quarterly enterprise profit was ₦486,500, with 40% earning between ₦350,001 and ₦500,000. Males constituted a slight majority (52.5%), while the educational background was relatively high, with 75.8% having at least a secondary education. In terms of agribusiness types, livestock farming (83.3%), crop production (73.3%), and agri-marketing (68.3%) were the most common, while agro-processing (10.8%) and others (1.7%) were less represented. These results indicate a diverse but livestock-leaning agribusiness landscape among green technology adopters.

Types of Green Technologies Adopted and Motivational Factors

As shown in Table 2, organic fertilisers (75.0%) and biogas systems (58.3%) were the most widely adopted green technologies, followed by drip irrigation (45.8%) and renewable energy (43.3%). This preference reflects the practical relevance and increasing accessibility of these technologies for productivity enhancement and environmental conservation. Solar dryers and other technologies had lower adoption rates.

Table 2. Types of adopted green technologies and motivational factors for adoption

Variables		Frequency	Percentage
Adopted green technologies	Solar Dryers	26	21.7
	Organic Fertilisers	90	75.0
	Drip Water-Efficient Irrigation	55	45.8
	Renewable Energy	52	43.3
	Biogas Systems	70	58.3
	Others (eco-friendly packaging)	16	13.3
Motivation to adopt green technologies	Environmental Sustainability	85	70.8
	Cost Efficiency	43	35.8
	Government Policies	30	25.0
	Market Demand	81	67.5
	Others	7	5.8

Source: Authors' computation, 2025.

Motivational factors for adoption were led by environmental sustainability (70.8%) and market demand (67.5%), while cost efficiency (35.8%) and government policies (25.0%) were less influential. These findings align with the hypothesis that ecological consciousness and market-driven forces are primary motivators for green technology adoption in agribusiness.

Perceived Factors Influencing Green Technology Adoption

Table 3 shows that access to information recorded the highest mean score (Mean = 4.21), indicating a high level of information availability and a strong influence on green technology adoption among agribusiness operators. The cost of technology also had a high mean value (Mean = 4.19), suggesting that the high cost of acquiring and maintaining green technologies strongly influences adoption decisions. Availability of resources followed with a mean score of 4.03, reflecting respondents' perception that essential resources for green technology adoption are largely inadequate, thereby constituting a notable constraint.

Table 3. Perceived factors influencing green technology adoption

Perceived Factors	Mean	Interpretation of Mean Value
Access to Information	4.21	High level of access to information, indicating strong influence on green technology adoption
Cost of Technology	4.19	High cost of technology perceived to strongly influence adoption decisions
Availability of Resources	4.03	Resources perceived as largely inadequate, indicating notable constraints to adoption
Government Support	3.52	Government support perceived as moderately inadequate
Market Access	3.43	Market access perceived as moderately difficult

Note: Mean values were computed from a five-point Likert-type scale. For access to information and the cost of technology, higher values indicate a stronger influence. For availability of resources and government support, higher values indicate greater perceived inadequacy. For market access, higher values indicate greater difficulty.

Source: Author's computation, 2025.

In contrast, government support (Mean = 3.52) and market access (Mean = 3.43) recorded relatively lower mean values, indicating that government support is perceived as moderately inadequate and market access as moderately difficult. Overall, these results suggest that while information access plays a facilitating role, financial and resource-related constraints—particularly high technology costs and inadequate resources—pose significant barriers to green technology adoption. These findings are consistent with earlier studies by Arowosegbe et al. (2024) and Ifeanyi-Obi et al. (2022), which emphasise the importance of effective extension services and improved financial access in promoting the diffusion of agricultural technologies.

Benefits and Challenges of Green Technology Adoption

As shown in Table 4, increased productivity (66.7%) and improved market access (57.5%) were the most cited perceived benefits, followed by cost reduction (51.7%) and environmental protection (45.0%). These outcomes suggest a multi-dimensional gain from green technology adoption, supporting findings by Bello et al. (2021), who reported similar productivity and market improvements among adopters in southwestern Nigeria.

Table 4. Perceived benefits experienced after adopting green technologies

Perceived benefits experienced	Frequency	Percentage
Increased Productivity	80	66.7
Improved Market Access	69	57.5
Reduced Costs	62	51.7
Environmental Protection	54	45.0
Others	29	24.2

Note: Multiple responses.

Source: Author's computation, 2025.

Perceived Challenges Experienced After Adopting Green Technologies

However, some perceived challenges remained. As shown in Table 5, technical complexity (74.2%) and high costs (62.5%) were identified as the most prominent obstacles to the adoption of green technologies. Inadequate support (27.5%) and lack of awareness (16.7%) were also reported by respondents. These constraints emphasise the need for continuous capacity-building initiatives, cost-sharing mechanisms, and targeted awareness campaigns to promote wider adoption and effective utilisation of green technologies among agribusiness enterprises.

Table 5. Perceived challenges experienced after adopting green technologies

Perceived challenges experienced	Frequency	Percentage
Technical Complexity	89	74.2
High Cost	75	62.5
Inadequate Support	33	27.5
Lack of Awareness	20	16.7
Others	49	40.8

Note: Multiple responses.

Source: Author's computation, 2025.

Perceived Impact on Enterprise Productivity and Sustainability

Table 6 shows that the majority (83.2%) of respondents perceived and reported improved enterprise productivity and sustainability following the adoption of green technologies. A smaller proportion (15.1%) indicated slight improvement, while only a marginal 1.7% reported no improvement. These findings highlight the transformative potential of green innovations in enhancing agribusiness performance, operational efficiency, and long-term sustainability.

Table 6. Perceived impact of green technology adoption on enterprise productivity and sustainability

Impact Level	Frequency	Percentage
Not Improved	2	1.7
Slightly Improved	18	15.1
Improved	99	83.2

Source: Author's computation, 2025.

To provide clearer insight into the profitability levels used as the dependent variable in the regression model, Figure 1 presents the distribution of average quarterly enterprise profit among respondents.

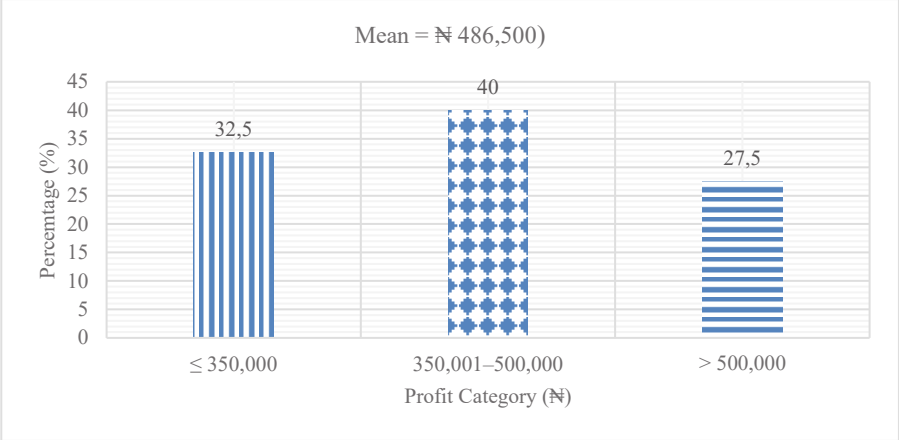

Fig. 1. Distribution of quarterly enterprise profit among respondents

Source: Author's computation, 2025.

Factors Influencing Enterprise Profit among Green Technology Adopters in Agribusiness

The regression results presented in Table 7 show that the model provides a reasonably good fit to the data, with an R^2 value of 0.421, indicating that approximately 42.1% of the variation in average quarterly enterprise profit among green technology adopters is explained by the included socio-economic and adoption-related variables. The F-statistic (F = 8.796) is statistically significant, confirming the overall validity of the model. This suggests that the selected variables jointly provide meaningful explanatory power, although a substantial proportion of profit variation remains attributable to factors outside the scope of the study, such as enterprise scale, capital intensity, and market volatility.

Among the socio-economic variables, age has a positive and statistically significant effect on enterprise profit ($\beta = 0.071$, $p = 0.001$). This finding implies that older agribusiness operators tend to earn higher profits, likely due to accumulated experience, better risk management, and stronger social and market networks. This result is consistent with the findings of Rizzo et al. (2024) and Mustapha et al. (2023), who reported that age is positively associated with managerial competence and enterprise performance in agribusiness contexts.

Similarly, work experience shows a strong positive and highly significant relationship with enterprise profit ($\beta = 0.329$, $p < 0.001$). This indicates that years of engagement in agribusiness substantially enhance profitability, reflecting improved technical knowledge, operational efficiency, and decision-making capacity. This finding aligns with previous studies by Mensah et al. (2021) and Abdulai (2023), which emphasise experience as a critical driver of productivity and profitability in agricultural enterprises.

In contrast, household size has a negative but statistically insignificant effect on enterprise profit ($\beta = -0.047$, $p = 0.711$). This suggests that household size does not play a decisive role in determining profitability among green technology adopters in the study area. The result may reflect a balance between potential family labour contributions and increased consumption pressure, leading to a neutral net effect. Similar inconclusive effects of

household size have been reported in related agribusiness profitability studies (Mpiira et al., 2024).

Educational status exhibits a positive but statistically insignificant relationship with enterprise profit ($\beta = 0.254$, $p = 0.254$). While education is theoretically expected to enhance technology adoption and managerial capacity, its lack of statistical significance in this model suggests that formal education alone may not translate directly into higher profits without complementary factors such as access to capital, extension services, and markets. This finding supports observations by Olawale et al. (2021) and Oyewole and Oyewole (2023), who argue that education improves adoption propensity but does not always guarantee profitability gains.

Regarding adoption-related factors, access to information shows a negative and statistically significant coefficient ($\beta = -0.249$, $p = 0.001$). Given the scale direction used in this study—where higher values reflect stronger influence—this result suggests that inadequate or costly access to information may reduce enterprise profit. It highlights that the mere availability of information is insufficient; the quality, relevance, and timeliness of information are critical for profitable technology use. This finding reinforces the arguments of Arowosegbe et al. (2024) and Ifeanyi-Obi et al. (2022), who stress that ineffective extension systems can limit the economic benefits of agricultural innovations.

Cost of technology has a positive and statistically significant coefficient ($\beta = 0.250$, $p < 0.001$). Given that higher scores represent greater cost influence, this result implies that technology cost plays a decisive role in shaping profitability outcomes. High costs may restrict adoption intensity or divert resources from other productive investments, thereby affecting net returns. This outcome aligns with Fadeyi et al. (2022) and Ukwuaba et al. (2025), who identified cost as a major barrier to profitable adoption of green technologies in Nigeria.

Availability of resources has a negative and statistically significant effect on enterprise profit ($\beta = -0.219$, $p = 0.043$). Since higher values indicate greater perceived inadequacy, this finding suggests that insufficient inputs, infrastructure, and complementary resources constrain the profitability of green technology adoption. This result calls attention to the importance of resource availability for translating technological adoption into economic gains, consistent with findings by Ndekwa et al. (2023) and Jayne et al. (2022).

Conversely, government support exerts a positive and statistically significant influence on enterprise profit ($\beta = 0.216$, $p = 0.037$). This indicates that policies, subsidies, and institutional assistance play an enabling role in enhancing the profitability of agribusinesses adopting green technologies. This finding corroborates earlier evidence from Ahmed and Ahmed (2023) and Ikuemonisan (2024), who emphasise the importance of supportive policy frameworks in promoting sustainable agribusiness performance.

Finally, market access shows a positive and statistically significant relationship with enterprise profit ($\beta = 0.173$, $p = 0.001$). This suggests that easier access to output markets enhances revenue generation and price realisation, thereby improving profitability. Improved market access enables adopters to capture value from green technologies, especially where consumers reward environmentally friendly production. This result is consistent with Ma et al. (2024) and Soomro et al. (2024), who highlight market linkages as a key channel through which technology adoption translates into economic benefits.

Therefore, since some socio-economic characteristics (age and work experience) significantly influence enterprise profit while others (household size and education) do not, the null hypothesis (H_{01}) is partially rejected. This indicates that selected socio-economic

characteristics matter, but their effects are not uniform. Also, given that multiple adoption-related factors significantly affect enterprise profit, the null hypothesis (H_{02}) is rejected.

Overall, the results indicate that profitability among green technology adopters is shaped by a combination of human capital attributes—particularly age and work experience—and adoption-enabling institutional and market conditions, rather than by technology adoption alone. While green technologies offer potential productivity and environmental benefits, their translation into higher enterprise profit depends critically on affordable technology costs, effective access to relevant information, adequate supporting resources, government support, and accessible markets. Experience and maturity enhance managerial efficiency and decision-making, but without complementary infrastructure and institutional backing, the economic gains from green technology adoption remain constrained. These findings highlight the need for integrated policy and development strategies that go beyond the promotion of green technologies to address underlying structural, financial, and market-related constraints, thereby supporting both profitable and sustainable agribusiness practices.

Table 7. Factors influencing enterprise profit among green technology adopters in agribusiness

Variables	β	t	Sig.
(Constant)	-1.425	-0.931	0.354
Age of Green Technology Adopters in Agribusiness (Years)	0.071	3.507	0.001
Work Experience of Green Technology Adopters in Agribusiness (Years)	0.329	5.381	0.000
Household Size of Green Technology Adopters in Agribusiness (Persons)	-0.047	-0.372	0.711
Educational Status of Green Technology Adopters in Agribusiness	0.254	1.148	0.254
Access to Information	-0.249	-1.516	0.001
Cost of Technology	0.250	1.194	0.000
Availability of Resources	-0.219	-1.124	0.043
Government Support	0.216	1.522	0.037
Market Access	0.173	1.340	0.001
R value		0.649	
R Square		0.421	
Adjusted R Square		0.373	
F value		8.796	

Dependent Variable: Average Quarterly Enterprise Profit of Green Technology Adopters in Agribusiness (per ₦100,000).

Source: Author's computation, 2025.

Thus, the findings of this study have important theoretical implications for agri-environmental systems sustainability and development management. The significant influence of age, work experience, and adoption-related factors on enterprise profit reinforces innovation diffusion and human capital theories, which posit that knowledge, experience, and access to information enhance technology uptake and enterprise performance. The high adoption of organic fertilisers and biogas systems calls attention to the integration of ecological modernisation principles into agribusiness operations, where environmental consciousness aligns with economic objectives. Moreover, the link between information

accessibility and adoption effectiveness expands the theoretical understanding of how socio-economic variables interact with environmental innovations to drive sustainable development in rural agri-food systems.

From a practical and policy standpoint, the results suggest that enhancing agri-environmental sustainability requires multifaceted interventions that improve access to affordable green technologies, strengthen extension systems, and incentivise environmentally responsible practices. Policymakers should design targeted subsidies, training programmes, and market incentives to reduce the technical and financial barriers identified, especially for small-scale operators. Practitioners and agribusiness managers must integrate sustainability-driven innovations into business models to achieve profitability and resilience in the face of climate and market shocks. In the broader context of rural development, these findings advocate for institutional collaboration that links technology providers, financial institutions, and extension agencies to promote a circular, inclusive, and sustainable agri-food economy.

While the findings provide useful insights into the profitability of agribusinesses adopting green technologies in Ibadan, they should not be generalised to other regions of Nigeria or beyond. The study focuses on a specific urban–peri-urban context with unique socio-economic and environmental characteristics. Broader generalisations would require multi-regional or nationally representative studies.

Conclusion and Recommendations

The study examined the socio-economic characteristics, types of adopted green technologies, motivational factors, perceived benefits and challenges, and the factors influencing enterprise profit among green technology adopters in agribusiness.

The findings revealed that a majority of adopters were middle-aged, with substantial work experience, and household sizes exceeding four members. Both male and female entrepreneurs participated almost equally, with the majority having at least a secondary education. Crop production and livestock farming were the most common agribusiness enterprises adopting green technologies.

In terms of technology adoption, organic fertilisers, biogas systems, and drip water-efficient irrigation were widely embraced, primarily motivated by environmental sustainability and market demand. Respondents perceived access to information and the cost of technology as the most significant factors influencing adoption, while availability of resources, government support, and market access were identified as moderate constraints. After adoption, enterprise owners reported notable benefits, particularly increased productivity, improved market access, and reduced operational costs. However, technical complexity, high cost, and inadequate support were key challenges faced by adopters. Notably, the majority of respondents indicated that green technology adoption led to measurable improvements in enterprise productivity and sustainability.

Regression analysis further highlighted that socio-economic characteristics and green technology adoption-related factors significantly influenced enterprise profit. Specifically, age, work experience, cost of technology, government support, and market access had significant positive impacts, whereas access to information and resource inadequacy exerted negative influences. Household size and educational status, however, showed no significant effect. Overall, the study calls attention to green technology adoption, which, when supported

by favourable socio-economic conditions, policy frameworks, and resource accessibility, can enhance profitability and sustainability in agribusiness.

However, the study does not capture all possible factors influencing profitability, and many external factors remain unaccounted for. Given the study's limitations, these results should be interpreted with caution and restricted to the specific context of agribusiness enterprises in Ibadan. These results affirm the relevance of green technologies in enhancing agribusiness performance, but also point to systemic gaps in support, capacity building, and affordability that require policy and institutional attention.

This study is limited by its sample size (120 respondents) and by its focus on four purposively selected LGAs in Ibadan. As a result, findings cannot be generalised beyond the study area. In addition, the cross-sectional design does not allow causal inference; the results reflect associations only. Some relevant factors influencing profitability—such as enterprise scale, capital investment, market volatility, and managerial capacity—were not measured, which limits the comprehensiveness of the model. These limitations should be considered when interpreting the findings.

Based on the findings, some policy measures are recommended to promote green technology adoption and enhance agribusiness profitability:

1. Enhance Access to Information and Awareness Campaigns: Extension services, agricultural agencies, and private sector actors should intensify outreach programmes to educate farmers about the benefits, usage, and cost-effectiveness of green technologies. Improved awareness will help reduce misinformation and foster adoption.
2. Financial Incentives and Subsidies: Policymakers should consider providing subsidies, low-interest loans, or grants for green technology adoption. Given that high technology costs remain a critical barrier, such financial interventions can incentivise more agribusiness entrepreneurs to adopt sustainable solutions.
3. Strengthen Government Support and Infrastructure: There is a need for robust government support, including the provision of technical assistance, resource facilitation, and supportive policies that encourage investment in green technologies. This includes improving market access through better infrastructure, storage facilities, and linkages to local and international markets.
4. Capacity Building and Technical Training: Since technical complexity is a major challenge, specialised training programmes should be implemented to equip agribusiness entrepreneurs with the skills needed to operate, maintain, and optimise green technologies.
5. Promotion of Sustainable Practices: Policymakers should integrate green technology adoption into broader agricultural and environmental sustainability strategies. Encouraging eco-friendly practices can simultaneously boost productivity, profitability, and environmental conservation.
6. Monitoring and Evaluation: Continuous monitoring of adopted green technologies and their impacts on productivity and profitability is essential. Data-driven evaluation can guide future interventions and ensure the sustainability of technology adoption programmes.

In brief, this study emphasises that the profitability and sustainability of agribusiness enterprises can be significantly enhanced through strategic adoption of green technologies, provided that the necessary socio-economic, policy, and resource conditions are established and maintained. The adoption of green technologies is not only economically viable but also critical for environmental sustainability and long-term resilience in the agricultural sector.

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Transition Intermediation in the Polish Food System

Abstract. All over the world, we can observe the ongoing transition of agri-food sectors into sustainable food systems. Actors bridging stakeholders and their processes, thereby facilitating transitions, are called intermediaries. The wide variety of their missions, aims, and strategies creates so-called ecologies of intermediation. The main research question was how intermediaries could improve the facilitation of the transition to sustainable food systems in Poland. In order to do so, we analysed five intermediaries, each representing a different level of transition. We focused on organic food production, as organic certificates are commonly regarded as a sign of sustainable production. Understanding the ecologies of intermediation and increased support for activities and the establishment of intermediaries in the Polish food system should become the shared aim in governing the transition to a sustainable food system in Poland. In the public debate, we should highlight the modes, activities, and tasks of systemic, regime, niche, process, and user intermediaries, encouraging new and existing ones to develop, upscale, and intermediate between actors, networks, and institutions.

Keywords: sustainability transition, agri-food sector, Polish economy, food system, intermediaries

JEL Classification: O10, O30, P20, Q01

Introduction

In recent decades, we have been facing both major environmental problems regarding climate change, biodiversity loss, and decreasing natural resources, as well as significant societal problems caused by unsustainable production and consumption in socio-technical systems, like electricity, heat, mobility, and the agri-food sector (Köhler et al., 2019). The solution to these problems lies in a radical shift to a redefined socio-technical system, as neither incremental changes nor technological repairs have solved them (Grin et al., 2010). Such a socio-technical transition includes changes regarding structures, culture, and practices (Lachman, 2013).

In the past, the agri-food sector has faced many transitions, like those connected with mechanisation or robotisation, which contributed to replacing the old system with the new one, not only improving and optimising the existing one. Such new systems are distinguished by changes of both technical and non-technical elements (Köhler et al., 2019). Up to now, the agri-food sector consists of processes related to agricultural raw materials, food production, and utilisation. The most important problems it faces are as follows: intensive use of synthetic chemical fertilisers and pesticides, poor dietary habits causing many health concerns, as well as food insecurity and the degradation of natural resources.

In order to better reply to these challenges, the scope of the agri-food sector was broadened. In the discussion on the boundaries of the food system and pathways for its transition, the Food and Agriculture Organization [FAO], the United Nations [UN], the EC, the OECD, the Science Advice for Policy by European Academics [SAPEA] and many other

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institutions and research bodies participated (FAO, 2018; UN, 2022; Standing Committee on Agricultural Research [SCAR], 2021, 2023; OECD, 2021; SAPEA, 2020).

Currently, scientists taking part in the Horizon Europe project 'Food Systems Science Network' [FoSSNet] (2025) have undertaken the challenge of creating one final definition of a food system, which will ultimately define its boundaries. To the core activities (storing, producing, transporting, consuming, managing waste and surplus food, retailing and food service provisioning, trading, processing and manufacturing) they added three kinds of drivers: environmental conditions (atmosphere, biosphere, geosphere, hydrosphere); social and economic conditions (education, demographics and epidemics, economic development, knowledge systems, geopolitical process and context, ethics and social values, cultural heritage, governance systems and power dynamics); and food system conditions (input prices, science and technology, markets and trade, consumption patterns, policy governance, trust and security, investments, labour skills and availability). Similarly, they added three kinds of outcomes: food system conditions (food price, food quality, animal welfare, antimicrobial resistance); social and economic conditions (food and nutrition security status, equity and fairness status, power relations, livelihoods and economic status, cultural heritage and community building status); and environmental conditions (environmental status), as well as feedback among them.

Because of deep problems and the broadening of the boundaries of food systems, there is also an increase in interest in the food system and its transition, particularly among society, politicians, and non-governmental organisations. The new approach is transdisciplinary and systemic, integrating different kinds of knowledge and many areas of knowledge, such as biology, nutrition, engineering, ethnography, sociology, economics, and law. From the economic point of view, a food system perspective is becoming more and more important, as it constitutes not just a few percent, but a large share in countries' employment and value added. Consequently, the role of agricultural economists increases, and general economists are increasingly interested in joint projects and cooperation.

The inherent element of each transition is intermediation and intermediaries, which facilitate transition by bridging actors and processes (Kanda et al., 2020). Such transition intermediaries were firstly defined by Kivimaa et al. (2019a) as 'actors and platforms that positively influence sustainability transition processes by linking actors and activities, and their related skills and resources, or by connecting transition visions and demands of networks of actors with existing regimes in order to create momentum for socio-technical system change, to create new collaborations within and across niche technologies, ideas and markets, and to disrupt dominant unsustainable socio-technical configurations'.

In this context, the objective of the research was to characterise the role of intermediaries in bridging actors, networks, networks of networks, and institutions. The research questions were as follows:

- What roles do different types of transition intermediaries play, taking into account their current phase?
- On which level of intermediation do Polish transition intermediaries concentrate?
- What are the main gaps in the range of activities undertaken by Polish intermediaries?

Our contribution to the literature is that the problem of insufficient intermediaries' involvement in facilitating the transition in Poland is tackled for the first time. The remainder of the paper is structured as follows. After the literature review, we characterise the methodological approach of the study. Then the results are presented. Section 1 enumerates many examples of intermediaries on different levels of the sustainability transition and

characterises the most well-known intermediaries from systemic, regime, and niche levels, as well as process and user intermediaries. Section 2 describes these intermediaries' functions depending on the current phase of transition. Section 3 analyses how intermediaries bridge actors, networks, networks of networks, and institutions in multi-systems while facilitating transition, and Section 4 indicates gaps in four modes of intermediation, activities, and tasks which should be realised by the Polish food system intermediaries.

Literature review

Gottschamer and Walters (2023) distinguished two analytical frameworks in the transition research: top-down and bottom-up. The first one consists of: a multi-level perspective [MLP] (Geels, 2002), strategic niche management (Kemp et al., 1998), transition management (Loorbach, 2010; Kemp et al., 2007), meta-analyses (Wiseman et al., 2013), transition pathway typologies (Geels and Schot, 2007), and innovation system studies (Hekkert and Negro, 2009), while the second consists of in-depth case studies at different territorial scales (Köhler et al., 2019).

Among them, the most widely used analytical framework is MLP, in which transition is performed through processes on three levels: niche, regime, and landscape. The landscape is an exogenous environment, which cannot be influenced by actors from a regime or niches, but it influences them through trends like climate change, population growth, pollution, urbanisation, or shocks like wars, political and economic crises, and accidents. Their changes last many years and are caused by macroeconomics, politics, and deep cultural patterns (Geels et al., 2017). A regime is a set of rules and routines regarding markets, regulations, technologies, and culture, and transition is a change from one regime to another. Niches are protected spaces, where, through experiments, new alternatives are developed. Innovations emerging as unstable socio-technical configurations find a protective incubation space here. Landscape developments put pressure on a regime, creating windows of opportunity, enabling niche innovation to scale up and become a new regime. The whole process is driven by change agents, who negotiate, search, learn, and cooperate.

Intermediaries play a special, often underestimated and unnoticed role in boosting niche-landscape interactions and niche-regime linkages. Through navigating interactions, conflicts, and the complexity of actors, networks, networks of networks, and institutions, they facilitate transitions (Kanda et al., 2020). There are many discussions on intermediary typologies, taking into account their structure, context, spatial scope, levels, or phases of the transition. The first ones to describe the roles of systemic intermediaries in transitions were van Lente et al. (2003). Kivimaa et al. (2019a) distinguished systemic, regime-based, niche (or grassroots), process, and user intermediaries, which differ regarding level of action, emergence, goal of intermediation, and position versus niche and interest. Goals of systemic intermediation are set at a system level in order to disrupt it. Goals of regime-based intermediation are realised through incremental solutions or political aims. Goals of niche intermediation are pursued from a niche perspective. Process intermediaries implement context-specific priorities, whereas user intermediaries act as a facilitator, representative, or end-user.

Kivimaa et al. (2019b) defined what the roles of each kind of these intermediaries should be depending on the phase of transition, which may include destabilisation (which can precede or follow acceleration), pre-development and exploration, acceleration and

embedding, and stabilisation. In other words, they provided a classification of intermediaries' functions and activities based on the level, type, and phase. According to Loorbach and Rootmans (2006), the second phase may also be named a take-off phase.

Kanda et al. (2020) conceptualised three levels within which intermediation occurs, suggesting heterogeneous roles of individual intermediaries at different system levels. At level 0, non-systemic intermediation between individual entities took place. Level 1 concerns intermediation between entities in a network, level 2 is intermediation between networks of different entities, and level 3 is intermediation between actors, their networks, and institutions. Lastly, this categorisation was modified by Soberón et al. (2022), who added a new level 4, concerning intermediation between intermediaries, actors, networks, and institutions.

Hernberg and Hyysalo (2024) studied the fields of activity of intermediaries, firstly dividing them into four modes (brokering, configuring, structural negotiating, facilitating and capacitating), which have some shared activities (see Table 4), and finally, each activity into several tasks. This framework of intermediation modes is mainly utilised in indicating how intermediaries can intensify their engagement in advancing local bottom-up experimentation. It enables the estimation of gaps in the range of activity undertaken by intermediaries, so that they or decision-makers may compare what has been done and what might be done in order to foster the transition. The authors also highlighted that intermediation requires simultaneous engagement in different modes depending on their competencies and resources.

Although many studies discuss the types, roles, mechanisms, influence, and evolution of intermediaries, and intermediation has received increasing attention in transition studies, there is still much to be done. Firstly, because of increasing uncertainty resulting from the COVID pandemic, the war in Ukraine or AI development, and, secondly, transitions in other areas, like heat or mobility, lead to new interactions and often new conflicts caused by different values and visions or resource competition (Heiber and Truffer, 2022, Rosenbloom et al., 2019). The newest papers in the field highlight that in an increasingly uncertain world, intermediation cannot be delivered by single isolated actors, but we should rather speak about ecologies of intermediation defined as a variety of intermediary actors with different missions, views, strategies, aims, mandates or levels of agency, that connect actors and resources at different scales of socio-technical systems (Barrie and Kanda, 2020, Hyysalo et al., 2022, Soberón et al., 2022). They not only cooperate in bringing together actors in multi-system transitions, but can also hamper them through conflicts, self-interest, or power struggles. Interestingly, Kivimaa et al. (2019b) proved that although systemic and niche intermediaries seem to be the most important intermediary actors in transitions, they need to be complemented by other forms of intermediaries. Because intermediaries in ecologies face conflicts of interest and contestations, their processes and activities need to be shaped through facilitating collaboration and managing competition between them, creating adequate conditions, or helping intermediaries to adapt their roles and types.

Regarding Poland, there is a shortage of articles tackling the subject of transition in the agri-food sector. Kufel (2010) characterised the transition arena model, analysing step by step how to implement transition management in the agri-food sector. In the earlier publication (Kufel, 2009), she presented the transformation policy characteristics and outcomes of its implementation in the Netherlands. The results obtained by Skrzypczyński et al. (2021), analysing different Polish grassroots initiatives active in promoting agroecology and organic farming, showed a diversity of strategies employed by these initiatives, and indicated that replicating them in other contexts should contribute to advancing the transition

in agri-food systems. The latest analysis of transition processes in the Polish agri-food sector stated that it is in the take-off phase, in which rapid and conflicting changes destabilise the system, creating 'windows of opportunity' for new developments (Kufel-Gajda, 2024). There has been no paper directly taking up the topic of intermediaries in the Polish agri-food sector so far. As they are an inherent element of every transition and their role is usually underestimated, our aim was to fill this gap. Analysing their roles and ways to improve their functioning is an important task for institutional economists utilising the transition perspective in their studies.

Data and Methods

In order to analyse the sustainability transition in the Polish food system, we arbitrarily chose one niche and performed the analysis through its lens. It was organic food production, because organic certificates are commonly regarded as signs of sustainable production, and organic farming is one of the most widely known sustainable models of agricultural production (Antczak, 2021). According to Kamel and El Bilali (2022), organic food production is one niche innovation that is eminently a sustainable agri-food system. Dumont et al. (2020) showed that in Belgium, organic agriculture has already become a part of a socio-technical regime. Organic food production is a radical change which contributes to eliminating societal problems. Consequently, it became one of the major tools to make the European agri-food sector more sustainable. The European Commission (EC, 2020), in the Green Deal's Farm to Fork strategy, set the target of cultivating organic farming to at least 25% of the EU agricultural land in 2030.

In the first stage of the analysis, we mapped actors and key players acting as intermediaries on all levels of the sustainability transition. In the second stage, we concentrated on the analysis of selected cases. A literature review and online research were performed in order to answer the research questions. Apart from analysing the thematic reports, mission statements, press releases, and websites of organisations, we based our analysis on the knowledge acquired during many years of experience of one of the authors working in non-governmental organisations in the field. After presenting many examples of intermediaries operating on all levels of the sustainability transition, we chose these most active and well-known on the landscape, regime, and niche levels, respectively, one concentrated on processes and one on users, and performed further analyses on them. Because of difficulties in defining and finding objective comparable data regarding the ecology of intermediation in the organic food system, the selection had to be based on the subjective perception of the authors.

While answering the three research questions, we took advantage of the typology of intermediaries developed by Kivimaa et al. (2019a), their characteristics regarding the phase of the transition process described by Kivimaa et al. (2019b), levels of intermediation distinguished by Kanda et al. (2020) and four modes of intermediation distinguished by Hernberg and Hyysalo (2024).

Results

Intermediaries in the Polish food system sustainability transition by types

Table 1 presents examples of systemic, regime-based, niche, process, and user intermediaries in the sustainability transition towards organic food production. The ecology of intermediation seems to be well developed in Poland.

Table 1. Intermediaries in the Polish sustainability transition towards organic food

Category	Examples
Systemic intermediary	Ministry of Agriculture and Rural Development
Regime-based intermediary	Polish Chamber of Organic Food, Institute of Rural Development and Agriculture, Polish Academy of Sciences, RURAll Rural and Urban Research Foundation, Faculty of Human Nutrition (Warsaw University of Life Sciences, Faculty of Food Technology (Warsaw University of Life Sciences), Technology Transfer Centre (Warsaw University of Life Sciences), Development Incubator (University of Warsaw)
Niche (or grassroots) intermediary	Food Rentgen, Dobrze Cooperative, Polish Chamber of Organic Food, Polish Ecological Club, Living Earth Coalition, Organic Agriculture Forum, Polish Agroforestry Association, Heinrich Böll Foundation, Demeter, AgriNatura Foundation, Institute of Civil Affairs, CoopTechHub, MOST Cooperative Urban Farm, Science for Nature
Process intermediary	Heads of ministries, departments, and public entities; agro-environmental advisors in agricultural advisory centres, consultants in public entities (persons dealing with public procurement)
User intermediary	Consumer groups on Facebook, neighbourhood shopping groups, neighbourhood anti-GMO groups, food sovereignty movements of activists gathered in this movement, clients of the Dobrze Cooperative

Sources: Authors' own elaboration.

Table 2 presents details on chosen representatives of each category of intermediaries, which, in our opinion, play the major roles within their categories. Each intermediary contributes to the transition to organic food production in another way.

Table 2. Overview of studied intermediaries

Name of intermediary	Legal form	Year of foundation	Area of activity
Ministry of Agriculture and Rural Development	Public entity, ministry	1918	Development organisation
Warsaw University of Life Sciences	Public university	1816	Cluster organisation
Living Soil Coalition	NGO	2018	Collaborative network
Public procurement managers	Public entities	1995	Procurement in public entities
The 'Good Food Good Farming' movement	NGO	2012	Collaborative network

Source: Authors' own elaboration.

The Ministry of Agriculture and Rural Development plays a key role in the development of organic agriculture in Poland through agricultural policymaking, financial support systems, legal regulations, and promotional activities. Its administration undertakes a number of activities to promote organic farming in Poland, focusing on education, financial support and the promotion of organic products. The ministry developed a comprehensive 'Framework Action Plan for Organic Food and Farming for 2021-2030' to develop organic production at all stages of the food chain. The plan envisages support for farmers, investments in processing, and activities to promote organic products. The ministry conducts educational campaigns targeting consumers, e.g. the campaign #BuyConsciouslyEcologicalProduct aims to raise awareness of the benefits of choosing organic food. It informs farmers and producers about the possibilities and conditions for producing certified organic food, encouraging the transition from conventional to organic methods, as well as runs educational programmes under the slogan 'Where organic products come from', which are aimed at shaping pro-ecological attitudes from an early age. In addition, organic competitions are organised to promote knowledge about organic farming. The ministry participates in trade fairs and promotional events, and controls the whole certification system (MARD, 2025).

Public research units implementing specific projects related to organic transition are an example of a regime-based transition intermediary. Although these units were not set up for this purpose, food system transformation is in their area of scientific interest. An example of such an actor is the Warsaw University of Life Sciences [SGGW], which plays a key role in the development of organic farming in Poland through its educational, scientific, and advisory activities. SGGW offers faculties and specialisations related to organic farming, e.g. within faculties such as environmental protection or agronomy. The university conducts numerous research projects on methods improving the efficiency of organic farming, e.g. in the fields of biopreparations and natural methods of plant protection, the impact of organic farming on biodiversity, improving soil quality in organic systems, and technologies related to chemical-free cultivation. The research results are used by both farmers and institutions involved in organic farming.

SGGW runs advisory and training programmes for farmers and cooperates with organisations involved in organic production. The university's experts assist in the process of farm certification and the implementation of modern, environmentally friendly technologies. The university actively promotes organic farming through running various research projects and the establishment of cooperation with national and international institutions. These include the research project SCALE-IT: Effective Alternatives to Conventional Inputs in Organic Agriculture, which is carried out with 30 partners, to, among other things, verify the safety of using plant-based feed additives in the prevention and control of livestock diseases (SGGW, 2025). By increasing knowledge and disseminating research results on organic farming, the research institution can play a significant role in transforming the food system in a more sustainable direction.

The Living Soil Coalition is a grassroots organisation representing a number of foundations and associations working for the development of organic agriculture and food system transformation in Poland. It is a typical example of an organisation formed within a niche and can be considered a player developing that niche. It has an expert and advocacy character, and its main focus is on shaping the CAP so that the production, distribution, and consumption of food is more socially just and environmentally responsible. The coalition is made up of both consumers (grouped, for example, in the 'Well' Food Cooperative) and

researchers, as well as farmers and producer organisations, which significantly influence the reach and scale of the organisation (Koalicja Żywa Ziemia, 2025).

The coalition's numerous activities include social campaigns raising awareness of ethical consumption and promoting certified organic food, as well as actions aimed at farmers, whose aim is to raise their knowledge regarding the reduction of the harmful impact of agriculture on the environment, ecological production methods, closed material cycles on the farm, or sustainable water management. Given the broad scope of the coalition's activities and its recognisable position in the food system environment, it should be assumed that its influence on food system transformation is potentially strong. The expert nature of this organisation and above all, the networking of various actors, those from the grassroots and those from high political levels, empowers the coalition to set the tone for the debate on aspects of the agri-food system.

The coalition's publications, such as the 'Pesticide Atlas' and 'Expertise: Water in Agriculture', create a stir in the industry each time, both among farmers themselves and food consumers. One of the cornerstones of this organisation is to ensure exchange and cooperation between farmers and also between farmers and consumers. The creation of new alliances, the exchange of experiences, and the facilitation of these meetings, which are so important from a brokering point of view, have a direct impact on better communication with the community of key stakeholders from the political environment. This positions the coalition as an important actor in the organic farming network.

Procurement specialists are an example of a process intermediary: an actor from outside the niche, acting as a neutral, impartial 'networker' with no agenda of their own in the system transformation process. By introducing ecological criteria in public procurement (Public Procurement Law, 2019) and including requirements for organic certification, such as the EU organic farming label in tenders for the supply of food to schools, hospitals or offices, they can favour the selection of suppliers of food from organic farms. The tools available to procurement professionals are guided by the EC's recommendations in the Green Public Procurement strategy and include, for example: setting procurement conditions so that smaller organic farms can participate (by splitting the contract into smaller parts), preferring organic food over industrially produced and conventionally farmed food, and raising awareness among officials and other network actors about the advantages of organic food. By creating demand for organic food, procurement professionals can significantly raise the profile of organic farmers and producers and thus contribute to the development of the organic market.

One example of a user intermediary - an actor growing directly out of a niche - is the Good Food Good Farming (2025) movement, whose aim is to draw the attention of the EC to the unequal treatment of small and organic farmers under the CAP. Every year, this informal grassroots movement organises a campaign to raise awareness among consumers and decision-makers about the advantages of sustainable agriculture and the harmful environmental impact of industrial agriculture. Over the course of a month, pickets, demonstrations, marches, lectures, and dinners are organised in a number of EU countries. The core of the organisational group is made up of activists and consumers, but farmers and food producers are also involved in the campaign. In this way, the campaigners bring together different stakeholder groups and increase their scope of influence. The potentially low impact on food system change attributed to consumer action is significantly increased through facilitating and capacitating (scaling and networking).

Intermediaries function depending on the phase of transition

The function and activities taken by the different categories of intermediaries also depend on the phase of transition (Kivimaa et al., 2019b). As Polish organic food production is in the take-off phase (Kufel-Gajda, 2024), we can observe that on the niche level, all categories of intermediaries, apart from regime-based, promote experimentation and the coordination of projects. Niche intermediaries form networks, share best practices, and create reliability for organic products. User intermediaries form knowledge sharing networks and articulate demand for niche producers, while producers and resellers configure systems and uses, and qualify claims. On the regime level, systemic intermediaries articulate societal needs for change, increase the visibility of different technological options, and create political and institutional space. Intermediation between the niche and regime levels engages niche, process, regime-based, and systemic intermediaries. While niche intermediaries articulate early expectations, process ones connect regime priorities with local projects. Regime-based and systemic intermediaries look for R&D funds.

Levels of intermediation in the Polish food system

In order to facilitate transition, intermediaries should take on multiple tasks directed to individual entities, networks, and institutions (Kanda et al., 2020). The main tasks for selected intermediaries in relation to such isolated system levels (0-3) are presented in Table 3. It can be noticed that each category of intermediaries in Poland bridges only one certain type of agent, omitting the other types. The role of process intermediaries in Poland is to bridge actors; regime-based intermediaries bridge networks; grassroots and user intermediaries link networks of networks; and systemic intermediaries connect institutions across multiple systems. In order to accelerate transition, intermediaries should become more interested in bridging other agents' configurations. There are definitely too few connections in the system. Only through catalysing multi-actor transition governance processes, intermediaries may contribute to boosting the transition (Klerkx and Leeuwis, 2009; Moss, 2009). Moreover, aiming at increasing the number of actors in the system and interactions between them, intermediaries should be careful that costs need to be offset by the benefits (Kant and Kanda, 2019; Patala et al., 2020).

Table 3. Activity of selected intermediaries in relation to the conceptual system levels of intermediation

Case	Level 0 Non-Systemic Intermediation between individual entities	System Level 1 Intermediation between entities in a network	System Level 2 Intermediation between networks of different entities	System Level 3 Intermediation between actors, networks and institutions
Ministry of Agriculture and Rural Development				X
Warsaw University of Life Sciences		X		
Living Soil Coalition			X	
Public procurement managers	X			
The 'Good Food Good Farming' movement			X	

Source: Authors' own elaboration.

Gaps in a range of activities of Polish intermediaries

Table 4 presents gaps in four modes of intermediation distinguished by Hernberg and Hyysalo (2024). It appeared that the role of process and user intermediaries is very limited in Poland. The analysed regime-based and grassroots intermediaries play a moderate role in intermediation, whereas the highest pressure is put on the systemic intermediaries. Interestingly, the majority of identified intermediaries act locally in the Mazovian Voivodeship. More cooperation with nationwide actors, networks, and institutions while governing the transition is needed. Also, the prevailing opinion that the Ministry of Agriculture and Rural Development should be the leader of changes should be rethought. On the one hand, it might be too overwhelming for one organisation. On the other hand, it pushes away responsibility from other intermediaries. Very rarely is the public sector a main leader of change, and its role should be complemented with strong bottom-up initiatives.

Looking at the modes of intermediation in the Polish food system transition, it becomes evident that intermediaries contribute to transition mainly through facilitating and capacitating, and through brokering, while structural negotiating and configuring require more attention. Intermediaries are focused mainly on developing capacities, facilitating experimentation, and negotiating regulations. In order to accelerate the transition process, intermediaries should pay more attention to the following activities: negotiating operational practices and conventions, technical and spatial configuring, advancing collaboration, marketing and value evidence, and configuring actors and organisational practices.

Table 4. Four modes of intermediation, activities, and tasks in Polish intermediaries (1-5*)

Mode	Activity	Task	IN 1	IN 2	IN 3	IN 4	IN 5
Brokering (33%)	Building networks and partnerships (40%)	Matchmaking	X	X			X
		Introducing new actors into a project	X	X			
		Advocating and representing on behalf of certain groups or actors	X				
		Curating and gatekeeping	X	X			
	Advancing collaboration (20%)	Dividing responsibilities	X				
		Setting local rules	X				
		Communicating and translating	X				
		Co-designing	X	X			
	Building alignment (40%)	Aligning interests and resolving conflicts	X		X		
		Building trust	X		X		
	Connecting actors, resources, and knowledge (40%)	Identifying needs and connecting with supporting actors/resources	X	X			
		Editing information to make it more accessible	X	X			
		Articulating demand from users to incumbent government actors	X	X			
	Marketing and value evidence (20%)	Marketing spaces	X				
		Providing evidence of realised value in local conditions	X				
Configuring (20%)	Technical and spatial configuring (13%)	Configuring technical arrangements regarding ways of eating		X			
		Setting up and managing Internet discussion forums and groups			X		
		Configuring and repurposing ways of eating					

	Configuring actors (20%)	Configuring consumers' needs and requirements and estimating the types of consumers and their engagements	X	X			
		Estimating the types of users and user engagement with organic production					
		Configuring the goals, expectations, and priorities of other actors	X				
		Configuring new actor roles and introducing new actor configurations in order to fill gaps in the ecology of intermediation	X				
	Configuring organisational practices (20%)	Reconfiguring operational or business models				X	
		Reconfiguring contract terms and conditions				X	
	Configuring content (40%)	Articulating project briefs or implementation plans	X			X	
Structural negotiating (27%)	Negotiating strategies and visions (40%)	Negotiating and aligning visions	X		X		
		Advocating policy development	X		X		
		Linking bottom-up engagement to larger-scale or longer-term urban development	X		X		
	Negotiating regulations (50%)	Negotiating exemptions from regulations or creative solutions within the existing regulatory framework	X		X	X	
		Identifying incentives for alternatives	X		X		
	Negotiating operational practices and conventions (5%)	Negotiating models (e.g. operational or business models)					
		Negotiating contract terms and conditions					
		Providing evidence that counterbalances model-based assumptions of new technologies					
		Contributing to a shift in the perception of new technologies	X				
Facilitating and capacitating (51%)	Developing capacities (57%)	Creating space for searching and gaining knowledge	X	X			X
		Providing advice and instructions	X	X	X		
		Providing peer support	X	X	X		
		Encouraging consumers to take the initiative and responsibility	X		X		
		Creating a space for dialogue and learning between different actors/groups	X		X		X
		Gathering and disseminating knowledge	X	X	X		
	Creating space for dialogue and participation (40%)	Creating a space for voicing concerns and articulating critique			X		X
		Organising participatory activities			X		X
		Engaging in a dialogue with residents or local actors			X		X
	Facilitating experimentation (50%)	Enabling experimentation	X	X			
		Facilitating learning by doing	X	X	X		
SUM			33	15	17	4	6

Source: Author's computation, 2025.

Conclusions

The ecology of intermediation in the transition to sustainable food systems in Poland is underdeveloped and needs more attention. In particular, the activity of niche and user intermediaries should be supported and broadened in regard to the number and variety of connections and territorial scope. The role of transition intermediaries is to speed up the transition through connecting actor groups, such as technology suppliers and adopters, disconnected consumers, new entrants and incumbents, but also through building and managing networks supporting transition. Intermediaries should be encouraged to advocate new technologies and policy goals, translate information between different actors, as well as aggregate and advocate different interests. In order for the acceleration phase to happen, they should provide knowledge and links between organic food suppliers, adopters and users (innovation diffusion), as well as engage users, attract companies, and change policy (new market creation). They should try to better manage conflicts and tensions between stakeholders and strive to create common expectations and coherence between different activities. Organic food production may be included in the current regime only if intermediaries engage more in configurational and structural negotiation activities. The efforts in this direction should not be abandoned, because organic certification seems to be more promising compared to other sustainable niche innovations, like agroecology, for example, taking into account food safety and international expansion possibilities.

The major conclusion is that in order for the transition in the Polish agri-food sector to be better governed, intermediary activity and establishment should be supported. We recommend tackling actions aiming at intensifying the functioning of both private and public intermediaries. In the public debate, we should highlight the modes, activities, and tasks of systemic, regime, niche, process, and user intermediaries, encouraging new and existing ones to develop.

Answering the three research questions embracing the whole broad picture of intermediation in the Polish food system proved to be quite difficult and needed simplification. Therefore, our research has a few limitations, giving opportunities for further research. First, a comprehensive analysis of interactions and dynamics among a much wider range of entities based on available online sources to accurately map the ecology of intermediation seems to be a promising future research direction. The method of social network analysis may be used for this purpose. Second, instead of making generalisations based on single and separate examples of intermediaries, in the future, we would like to take advantage of ethnographic observation during workshops and meetings. Third, it would be worthwhile to include intermediaries facilitating a broader range of niche innovations, not only organic food production. Fourth, in order to indicate factors hindering and accelerating the intermediation processes in Poland, semi-structured interviews with different stakeholders of the Polish food system would be necessary.

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Drivers of Empowerment and Performance among Youth Agripreneurs in Jigawa State of Nigeria

Abstract. Youth engagement in agribusiness is a strategic priority for addressing unemployment and ensuring food security in Nigeria. However, the persistence of high failure rates among youth-led enterprises suggests that conventional support models, predominantly focused on financial provision, are insufficient. Therefore, this study investigates the multidimensional drivers of empowerment and performance among youth agripreneurs in Jigawa State, Nigeria. The study employed a cross-sectional survey design, collecting data from 286 young agribusiness entrepreneurs selected through a multistage sampling technique. The survey was conducted in the year 2025, and it lasted for a period of three months (May-July). An easy-cost-route approach, a well-structured questionnaire complemented with an interview schedule, key informants, and a focus group discussion were the tools used for information synthesis. Furthermore, a structural equation model (SEM) was used to analyse the relationships within four theoretical frameworks: the Agripreneurship Empowerment Dimension Theory (AEDT), the Youth Agency Dimension Theory (YADT), the Youth Agripreneurship Performance Theory (YAPT), and the Agripreneurship Resource Construct (ARC). The results revealed that psychological empowerment and self-efficacy were the strongest and most significant predictors of empowerment, far surpassing the impact of economic factors, which were statistically insignificant. Political empowerment and autonomy also showed significant positive effects. Regarding performance, customer-oriented factors and social resources, such as networks and mentorship, were the most critical drivers, while financial resources alone showed no significant direct effect. The study concludes that empowerment and performance are intrinsically linked to intrinsic psychological assets and social capital rather than purely financial inputs. Consequently, it recommends a paradigm shift in policy and practice towards integrated interventions that prioritise mindset development, leadership training, political inclusion, and the strengthening of social networks to build resilient and empowered youth agripreneurs capable of transforming Jigawa State's agricultural landscape.

Keywords: agripreneurship, empowerment, performance, youth, SEM, Jigawa State, Nigeria

JEL Classification: M20, O12, O13, Q12

Introduction

Background of the Study

Youth engagement in agriculture is widely recognised as a critical pathway to sustainable economic development, food security, and poverty reduction in sub-Saharan Africa (SSA) (Kote et al., 2024; Geza et al., 2021). Despite the sector's immense potential, many African economies, including Nigeria, face a paradox: a burgeoning youth population simultaneously experiencing high unemployment rates and a pervasive aversion to careers in agriculture (Consentino et al., 2023). This aversion is often fuelled by the perception of

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agriculture as a rudimentary, low-status, and high-risk venture characterised by inadequate financial returns and difficult working conditions (Adeyanju et al., 2021).

In response, governments and development agencies have initiated numerous programmes aimed at incentivising youth participation through financial support, training, and policy interventions. However, the success of these initiatives has been mixed. A growing body of literature suggests that traditional approaches, which often prioritise economic inputs, fail to address the multidimensional nature of youth empowerment and performance (Shaari et al., 2025; Okolo-obasi & Uduji, 2023; Twumasi et al., 2019). Empowerment is not merely a function of capital access; it is a complex construct encompassing psychological, social, and political dimensions that collectively influence an individual's capacity to make strategic life choices and act upon them (Isaacs et al., 2007).

In northern states such as Jigawa, agriculture dominates local economic activity, with more than 80% of households depending on farming as their primary occupation (Sadiq et al., 2024a&b; Sadiq & Sani, 2024). Despite its potential, agriculture faces challenges including limited access to finance, weak infrastructure, and poor market systems, which constrain productivity and discourage youth engagement (Sadiq et al., 2024a&b).

Youth empowerment through agribusiness has recently gained traction as a strategic response to unemployment, food insecurity, and rural poverty. Programmes such as the Fadama Graduate Unemployed Youth Support (FGUYS) and Poultry Empowerment Initiatives in Jigawa have been implemented to integrate young people into profitable agricultural ventures (Adeyanju et al., 2021; Osabohien et al., 2021). Evidence suggests that when youths are supported with skills, networks, and resources, they demonstrate resilience, innovation, and capacity to sustain agribusinesses (Babu et al., 2020). However, their full potential remains underutilised due to systemic and institutional barriers.

In Nigeria, and specifically in Jigawa State, understanding these nuanced drivers is essential. Agripreneurship presents a viable solution to youth unemployment, but its sustainability hinges on a deeper comprehension of what truly empowers young agripreneurs and enables their enterprises to thrive beyond initial support.

Problem Statement

Youth unemployment in Nigeria has reached alarming levels, with rural areas like Jigawa State experiencing high rates of poverty and outmigration despite vast agricultural potential. Many young people perceive agriculture as an unattractive, low-status occupation due to cultural attitudes, poor infrastructure, and limited financial returns (Adeyanju et al., 2021a). Even where empowerment programmes exist, challenges such as inadequate access to credit, weak political inclusion, and the lack of supportive social networks hinder youth participation and performance.

Despite significant investments and policy attention, youth participation in agribusiness in Jigawa State remains suboptimal, with many ventures failing to achieve sustainability and scale. A critical gap exists between the provision of support—primarily financial—and the actual empowerment and performance outcomes for youth. Existing interventions often operate on the assumption that economic resources are the primary catalyst for success, overlooking the foundational roles of psychological capital, social networks, and political agency (Garbero & Jackering, 2021; Ninson & Brobbey, 2023).

Specifically, in Jigawa State, studies highlight that while youth participate in government empowerment programmes, their long-term success in agribusiness is inconsistent, with many dropping out due to weak institutional support and insufficient

entrepreneurial capacity (Adeyanju et al., 2021a). This raises concerns about the sustainability of youth empowerment efforts and the need for multidimensional approaches that address not only financial resources but also psychological, social, and political dimensions of empowerment.

Consequently, there is a pressing need to move beyond monolithic support models and instead investigate the specific dimensions of empowerment—such as psychological resilience, political inclusion, and social capital—that most effectively drive youth success. The problem, therefore, is the lack of an empirically-grounded understanding of the differential impacts of various empowerment dimensions (AEDT, YADT) and resource types (ARC, YAPT) on youth agripreneurship in Jigawa State. Without this knowledge, policies and programmes risk being misaligned with the actual needs and drivers of success for young agripreneurs.

Justification for the Study

This study is justified by its potential to provide an evidence-based framework for designing more effective, multidimensional youth interventions in Jigawa State and similar contexts. By applying established theoretical frameworks like the Agripreneurship Empowerment Dimension Theory (AEDT), the Youth Agency Dimension Theory (YADT), the Youth Agripreneurship Performance Theory (YAPT), and the Agripreneurship Resource Construct (ARC), this research moves beyond anecdotal evidence to quantify the specific pathways to empowerment and performance.

The findings, which reveal the paramount importance of psychological empowerment and self-efficacy over purely financial support, challenge conventional intervention strategies. This research provides crucial insights for policymakers, development partners, and educational institutions. It argues for a reallocation of resources towards building human capital, strengthening social networks, enhancing political voice, and fostering resilient mindsets, thereby creating a more enabling ecosystem for youth agripreneurs.

Ultimately, this study contributes to filling a critical knowledge gap in youth agricultural development literature. It offers a replicable model for understanding agripreneurship dynamics and provides actionable recommendations to transform youth agribusiness from a subsistence activity into a viable, empowering, and high-performance career choice in Jigawa State and across Nigeria.

Research Objectives

The broad objective of this research is to investigate the multidimensional drivers of empowerment and performance among youth agripreneurs in Jigawa State, Nigeria. The specific objectives are: (i) to determine the empowerment status of youths participating in agribusiness; and (ii) to determine the performance status of youths participating in agribusiness in the study area.

Literature Review

Theoretical Framework

This study is guided by four interrelated theories that explain how youth empowerment translates into agripreneurship performance: the Agripreneurship Empowerment Dimension

Theory (AEDT), the Youth Agency Dimension Theory (YADT), the Youth Agripreneurship Performance Theory (YAPT), and the Agripreneurship Resource Construct/Theory (ARC). Together, these frameworks provide a multidimensional lens for understanding empowerment outcomes among youths in agribusiness in Jigawa State (Figure 1).

1. Agripreneurship Empowerment Dimension Theory (AEDT)

AEDT emphasises empowerment as a four-dimensional construct: psychological, political, economic, and social empowerment. Psychological empowerment—rooted in confidence, resilience, and motivation—forms the strongest driver of success. Political empowerment relates to inclusion in policies and decision-making, while economic empowerment highlights financial access and market opportunities. Social empowerment underscores networks and cultural perceptions. Studies show that mindset and psychological resilience are often more decisive than material resources in sustaining agripreneurship (Shaari et al., 2025).

2. Youth Agency Dimension Theory (YADT)

YADT frames empowerment around autonomy, participation, self-efficacy, and voice. Autonomy empowers youth to make independent business choices; participation involves collaboration in cooperatives and training; self-efficacy reflects confidence in one's abilities; and voice represents the ability to influence higher-level decisions. Evidence indicates that self-efficacy is the most significant predictor of empowerment, while voice often remains underdeveloped due to institutional and cultural barriers (Adeyanju et al., 2021b).

3. Youth Agripreneurship Performance Theory (YAPT)

YAPT explains youth performance in agribusiness through four pillars: customer orientation, finance, growth, and operational efficiency. Customer engagement—satisfying consumer needs, maintaining quality, and building loyalty—is the strongest driver of success. Finance and operational efficiency also matter, but are weaker predictors if not coupled with managerial capacity. Research shows that customer focus and adaptive marketing strategies enhance youth agribusiness survival (Adesina &Eforuoku, 2016; Adeyanju et al., 2021b).

4. Agripreneurship Resource Construct/Theory (ARC)

ARC views agripreneurship through resource-based factors: financial, human, physical, and social capital. Human resources—skills, knowledge, and entrepreneurial orientation—are pivotal for resilience and innovation. Physical resources like land and equipment improve efficiency, while social resources such as mentorship and networks strengthen market access and bargaining power. Financial resources alone have a limited impact unless paired with capacity building and social capital (Adeyanju et al., 2021a).

Integration of Theories

AEDT and YADT address empowerment dimensions (mindset, agency, inclusion), while YAPT and ARC explain how these empowerment factors lead to business performance (customer engagement, growth, operational strength). Their integration provides a holistic framework for assessing not just whether youths are empowered, but how empowerment translates into sustainable agribusiness outcomes in Jigawa State. In other words, these four theories provide the foundational lenses through which the empowerment and performance of youth agripreneurs in Jigawa State are analysed in this study.

Conceptual Framework

This framework integrates four theories – the Agripreneurship Empowerment Dimension Theory (AEDT), the Youth Agency Dimension Theory (YADT), the Youth

Agripreneurship Performance Theory (YAPT), and the Agripreneurship Resource Construct (ARC) – to explain youth empowerment and performance in agribusiness. AEDT and YADT highlight the multidimensional nature of empowerment, focusing on psychological, political, social, and agency-related drivers. YAPT and ARC emphasise how customer orientation, operational efficiency, and resource access translate empowerment into tangible agripreneurship outcomes. Together, the framework demonstrates that sustainable youth agripreneurship in Jigawa State requires both internal empowerment (self-efficacy, mindset, autonomy) and external enablers (networks, resources, supportive policies) for lasting performance and development impact.

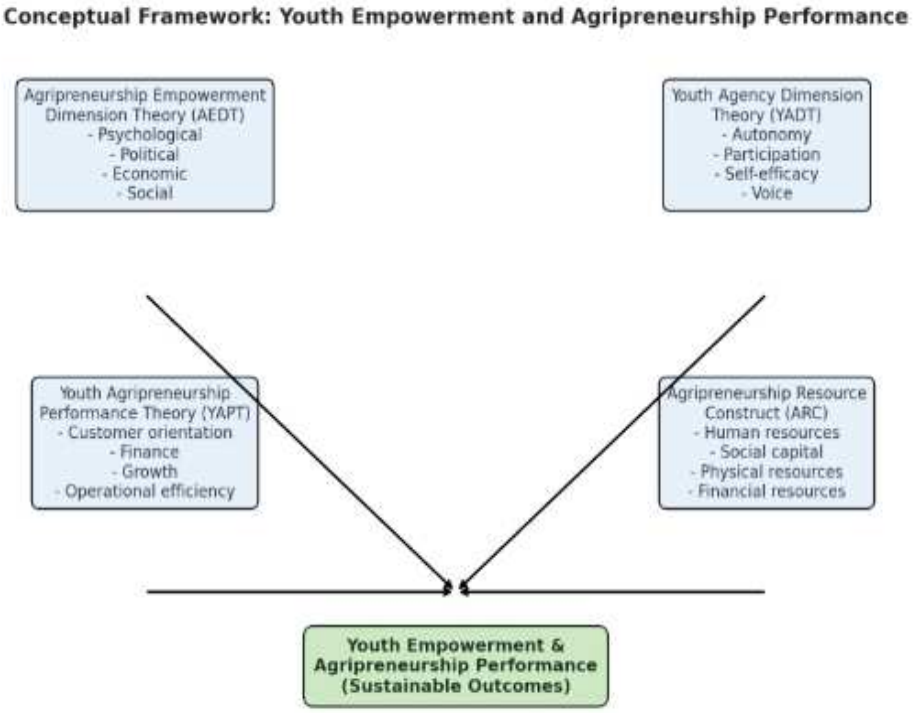

Fig. 1. Conceptual framework

Source: Python software, 2025.

Empirical Review

A growing body of empirical evidence has explored youth empowerment and agripreneurship in Nigeria and across Africa. These studies highlight empowerment as a multidimensional construct shaped by psychological, social, political, and economic factors, while agribusiness performance is driven by customer focus, resources, and institutional support.

Adeyanju et al. (2021a&b) empirically assessed agricultural training programmes in Nigeria and found that youth participation significantly improved entrepreneurial skills, self-

efficacy, and agripreneurship performance. Similarly, Adeyanju (2023) demonstrated that empowerment interventions under ENABLE-TAAT enhanced business confidence, though voice and advocacy capacities remained weak.

Ikebuaku (2021) and Nuhu (2021) employed a capability approach and showed that psychological empowerment and agency (autonomy and self-efficacy) were critical in shaping entrepreneurial intentions among Nigerian youth. Boye et al. (2024) also found that entrepreneurial traits moderated willingness to engage in agribusiness, underscoring the role of mindset in empowerment.

Research by Haji et al. (2022) and Benton (2025) underscores psychological empowerment—particularly self-confidence and resilience—as the most critical driver of successful entrepreneurial outcomes, often outweighing initial financial inputs.

The significance of political empowerment is evidenced by Adeyanju (2023) and Chiang (2023), who found that access to structured programmes and policy platforms enhances resource access and legitimacy for young agripreneurs. Conversely, studies indicate that economic empowerment alone shows limited impact. Brooks et al. (2013) and Msangi et al. (2024) observed that financial support without complementary capacity building often fails to sustain youth engagement in agriculture.

Awobajo et al. (2025) examined agribusiness clusters in Southwest Nigeria and found that youth policy engagement and cooperative participation enhanced sustainable practices. Kansiime et al. (2025) further highlighted digital platforms like FarmCrowdy as facilitators of youth empowerment, enabling stronger market access and social capital formation.

Empirical studies consistently stress that access to finance alone does not guarantee agribusiness success. Songca et al. (2024) found that financial empowerment was insignificant without complementary training and social capital. Similarly, Abdullahi et al. (2025) reported that agricultural students in Northwestern Nigeria valued skills and institutional support more than access to credit in shaping willingness to pursue agribusiness.

Regarding performance, Adeyanju et al. (2021) identify customer-oriented practices and social resources—such as networks and mentorship—as vital to enterprise success. This aligns with Abrahman et al. (2021), who stress the importance of passion-driven skill development (human resources) and identify physical infrastructure as a key enabler, though often constrained by access limitations.

A recurring theme across studies, including Ninson & Brobbey (2023), is that socio-cultural barriers—such as the perception of agriculture as a low-status career—can inhibit youth participation and limit the effectiveness of social networks. Furthermore, Herani & Pranandari (2024) note that a lack of voice and advocacy skills often prevents youth from translating individual capabilities into systemic influence.

Evidence from Songca et al. (2024) showed that agribusiness empowerment programmes improved income and resilience among youth agripreneurs across Africa, including Nigeria. Stanley and Tochi (2025) demonstrated that ecopreneurship practices enhanced sustainability and long-term profitability among young agripreneurs in Southwest Nigeria. Likewise, Awotodunbo et al. (2025) confirmed that integrated agribusiness hubs created sustainable employment opportunities but stressed the need for combining financial and human resource development.

Beyond Nigeria, Ouko et al. (2022) and Akrong & Kotu (2022) showed that youth agripreneurship in Kenya and Benin improved employment creation and food security, reflecting similar challenges of finance, skills, and institutional barriers. These findings

resonate with Nigerian contexts, reinforcing that empowerment is most effective when combining self-efficacy, skills training, and social networks.

Collectively, this empirical literature confirms that effective youth agripreneurship support requires a holistic approach integrating psychological, political, social, and human resource dimensions, rather than focusing predominantly on economic interventions.

Research Methodology

Jigawa State, located in northwestern Nigeria, was created in 1991 from the northeastern part of Kano State (Sadiq et al., 2024a). It lies between latitudes 11°N and 13°N and longitudes 8°E and 10.15°E, sharing an international boundary with the Republic of Niger and domestic borders with Kano, Katsina, Bauchi, and Yobe States (Sadiq et al., 2024b) (Figure 2). The state covers about 23,154 square kilometres and has a projected population of 6.7 million people as of 2025 based on a 3% annual growth rate. With over 60% of its population under 35 years, Jigawa has a predominantly youthful demographic. The Hausa and Fulani ethnic groups dominate, and Islam is the major religion. Ecologically, the state falls within the Sudano-Sahelian zone, characterised by a long dry season and a short rainy season (Sadiq & Sani, 2024). Rainfall ranges between 600 mm and 1,000 mm annually, while temperatures vary from 21°C to 38°C. The vegetation is largely savannah grassland interspersed with shrubs, making it suitable for farming and livestock. Agriculture is the backbone of the economy, employing more than 80% of the working population (Sadiq et al., 2024a; Adeyanju et al., 2021b). Major crops include millet, sorghum, rice, maize, cowpea, and groundnut, while irrigation supports wheat and vegetable production. However, climatic variability and recurrent droughts pose significant risks to agricultural productivity.

Despite agriculture being a core sector, it faces challenges such as limited access to modern inputs, underdeveloped value chains, and high youth unemployment rates (Sadiq & Sani, 2023). The state government has initiated programmes like the Jigawa State Youth Empowerment Programme to stimulate agribusiness engagement, yet sustainable outcomes remain hindered by structural and resource constraints.

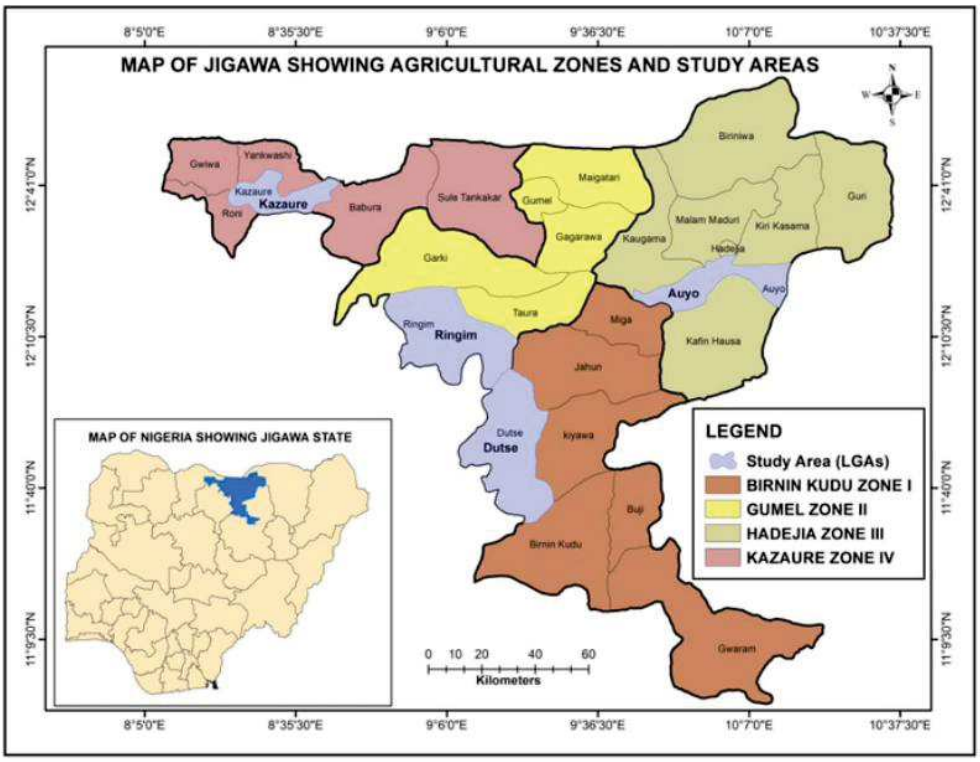

Fig. 2. Map of the study area

Source: Authors' own design, 2025.

The study focused on youths actively involved in small agribusiness within Jigawa State. To achieve a representative sample, a multistage sampling technique was adopted. In line with the stratification of the state by the Jigawa Agricultural and Rural Development Authority (JARDA), the four agricultural zones—Birnin Kudu, Hadejia, Kazaure, and Gumel—were used as the first stage of selection (Figure 2). One Local Government Area (LGA) was then purposively chosen from each zone, based on the high presence of agripreneurship-oriented youths.

From the selected LGAs, three communities were randomly drawn, giving a total of twelve communities: Dutse, Kudai, Chamo, Ringim, Chai-Chai, Sankara, Kazaure, Gada, Tsohon Kafi, Auyo, Gamsarka, and Gamafoi. Furthermore, a reconnaissance survey was conducted to validate community selections, collect preliminary information, and ensure an accurate understanding of the youth population distribution across the study areas.

Cochran's sample size determination formula was applied, resulting in a final sample of 264 youths. The sampling frame was obtained from JARDA's official register of eligible agribusiness participants, from which respondents were randomly selected (Table 1). This process ensured that the study captured a diverse and representative group of youth agripreneurs across the state.

Furthermore, by adopting an easy-cost-route approach, a well-structured questionnaire complemented with an interview schedule, key informants, and a focus group discussion were used to elicit valid information from a cross-sectional survey targeting young agripreneurs in the year 2025 (May-July). A desk review – using journals, books, manuals, etc.—was used to elicit information that supports empirical review. Moreover, using SEM as a precursor, all the specified objectives were unambiguously achieved.

Table 1. Sampling frame of youth agripreneurs in the study area

Zones	LGA	Communities	Sample frame	Sample size
Birnin kudu	Dutse	Kudai	800	18
		Dutse	1300	30
		Chamo	900	20
Gumel	Ringim	Sankara	950	21
		Ringim	1000	22
		Chai chai	800	18
Kazaure	Kazaure	Kazaure	1000	22
		Gada	800	18
		Tsohon kafi	700	16
Hadejia	Auyo	Auyo	1500	34
		Gamsarka	1200	27
		Gamafoi	800	18
Total			11,500	264

Source: JARDA, 2023; Reconnaissance survey, 2023.

Cochran's Sampling Formula:

$$n_0 = \frac{Z^2 * P * (1-P)}{e^2} \quad \text{.. (1)}$$

Where:
n_0 = initial sample size;
Z = Z statistic corresponding to the desired confidence level (90% =1.645);
p = estimated proportion of the population with the attribute of interest (if unknown, 0.5 is used for maximum variability);
$q = 1 - P$ (proportion without the attribute);
e = degree of freedom (5%).

Adjusted for finite population:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}} \quad \text{.. (2)}$$

Where:
n = total sample size;
N = total population size;
n_0 = initial sample size from the first formula.

Empirical Review

Structural equation model (SEM): SEM is a statistical technique used to analyse complex relationships among observed and latent (unobserved) variables. It uses confirmatory factor analysis to model both direct and indirect effects between variables. SEM helps researchers test theoretical models that describe how constructs are related, allowing for hypothesis testing, measurement validation, and causal inferences using model fit indices such as CFI, RMSEA, and χ^2.

1. Agripreneurship Empowerment Dimension Theory (AEDT)

This theory considers four empowerment dimensions: Psychological (Psy), Political (Pol), Economic (Eco), and Social (Soc).

$$Emp = \beta_1 Psy + \beta_2 Pol + \beta_3 Eco + \beta_4 Soc + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:

Emp = overall empowerment of youth

$\beta_1 \ldots\ldots\ldots \beta_4$ = path coefficients (strength of each factor)

ε = error term

2. Youth Agency Dimension Theory (YADT)

This theory uses Autonomy (Aut), Participation (Par), Self-Efficacy (SE), and Voice (Vo).

$$Emp = \beta_5 SE + \beta_6 Aut + \beta_7 Par + \beta_8 Vo + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where:

Emp = empowerment through agency;

$\beta_5 \ldots\ldots\ldots \beta_8$ = regression weights.

3. Youth Agripreneurship Performance Theory (YAPT)

Performance is measured by Customer (Cus), Finance (Fin), Growth (Gro), and Operations (Op).

$$Perf = \beta_9 Cus + \beta_{10} Fin + \beta_{11} Gro + \beta_{12} Op + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where:

Perf = agripreneurship performance;

$\beta_9 \ldots\ldots\ldots \beta_{12}$ = regression coefficients.

4. Agripreneurship Resource Construct (ARC)

Performance depends on Financial (FinR), Human (HumR), Physical (PhyR), and Social (SocR) resources.

$$Perf = \beta_{13} Cus + \beta_{14} Fin + \beta_{15} Gro + \beta_{16} Op + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where:

Perf = youth agribusiness performance;

$\beta_{13} \ldots\ldots\ldots \beta_{16}$ = path coefficients.

Results and Discussion

Empowerment Status of Youths Participating in Agribusiness Enterprises

Youths' empowerment status based on the Agripreneurship Empowerment Dimension Theory (AEDT)

This section explores how empowered young people feel in their agribusiness activities, using the AEDT framework, which looks at four key dimensions: psychological, political, economic, and social empowerment (Table 2 and Figure 2).

The results show that psychological empowerment is by far the strongest driver of overall empowerment ($\beta = 0.500$, $p < 0.001$). In other words, the young people who believe in their own abilities, stay resilient through challenges, and feel motivated are the ones most likely to succeed and sustain their businesses. This echoes what Okolo-obasi & Uduji (2023) found, namely that self-confidence and decision-making skills are the real engines of turning opportunities into results. It also supports Shaari et al. (2025), who argued that while external barriers like a lack of funds and infrastructure can discourage youth, a strong belief in one's capacity to succeed often pushes them forward despite the odds. Simply put, mindset matters the most as it is the foundation on which other forms of empowerment rest.

Political empowerment also shows a significant and positive effect ($\beta = 0.237$, $p = 0.003$). This means that when young people are included in policies, given access to government programmes, or represented in decision-making bodies, their sense of empowerment grows noticeably. This finding is consistent with Garbero and Jackering (2021), who showed that access to structured agricultural programmes through political platforms often improves food security and resource access. In Jigawa State, being politically empowered gives youth more legitimacy and leverage—it helps them push through systemic barriers to finance, training, and markets.

Furthermore, economic empowerment ($\beta = 0.069$, $p = 0.383$) is positive but not statistically significant. While income, market access, and capital are important, the results suggest that money alone is not enough to make youth feel fully empowered. Similar to what Brooks et al. (2013) observed, even when young people get financial injections, many eventually abandon agriculture if they lack capacity-building support. Isaacs et al. (2007) also emphasised that finance must be paired with skills like business planning and entrepreneurship training before it translates into real empowerment. In the AEDT framework, this means that money is a resource, but without skills and structures, it doesn't create lasting change.

Finally, social empowerment comes out slightly negative and not significant ($\beta = -0.062$, $p = 0.387$). This suggests that the social networks that youth currently rely on in Jigawa State are not helping them to move forward. Weak or fragmented networks or cultural norms that discourage innovation and risk-taking may be limiting their positive impact. Shaari et al. (2025) made a similar observation, noting how cultural attitudes often frame agriculture as a low-status career. This can undermine the potential benefits of community affiliation and weaken motivation, as also highlighted by Ninson & Brobbey (2023). Nevertheless, the diagnostic test results confirm the fitness of the confirmatory factor analysis for the specified theories (Table 6).

When compared with other studies across Africa, these findings show an interesting pattern. For example, Magagula (2019) found that youth tend to view agriculture positively when they are exposed to it through education and receive proper financial support, but structural barriers like limited affordable credit and unstable markets often push youth away from farming into other careers. What stands out in Jigawa State, however, is that while these economic and social barriers remain real, strengthening psychological resilience and political engagement seems to have the most immediate and powerful impact on youth empowerment.

In summary, empowerment in Jigawa's youth agribusiness sector is multidimensional but uneven. Psychological empowerment is the strongest pillar, followed by political empowerment, while economic and social empowerment are weaker. For policy and practice, this means three things: investment in mindset and leadership development helps youth build confidence, problem-solving ability, and risk tolerance; strengthening political inclusion so that youth voices shape agricultural policies; and resource allocation. Coupled with financial support, social networks, training and capacity-building translate into meaningful empowerment. By focusing on these areas, interventions can create not just short-term fixes but sustainable pathways for youth to thrive as empowered agripreneurs in Jigawa State.

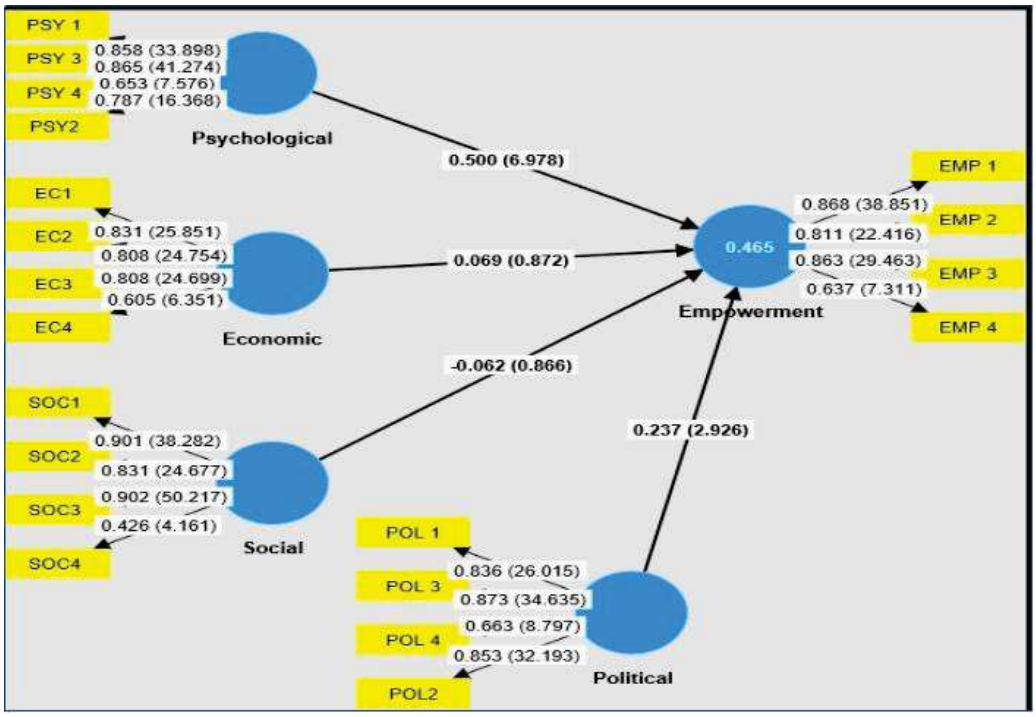

Fig. 2. SEM showing youths' empowerment status based on AEDT

Source: authors' own calculations.

Table 2. Youths' empowerment status based on AEDT

Construct	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STD)	P values
Economic -> Empowerment	0.069	0.069	0.079	0.872^{NS}	0.383
Political -> Empowerment	0.237	0.241	0.081	2.926***	0.003
Psychological -> Empowerment	0.500	0.498	0.072	6.978***	0.000
Social -> Empowerment	-0.062	-0.062	0.072	0.866^{NS}	0.387

Note: *** ($p \leq 0.001$), ** ($p \leq 0.05$), * ($p \leq 0.01$) & NS mean 1, 5, 10% and non-significant, respectively.

Source: Field survey, 2025.

Youths' empowerment status based on the Youth Agency Dimension Theory (YADT)

The results in Table 3, guided by the Youth Agency Dimension Theory (YADT), show that youth empowerment in small agribusiness enterprises in Jigawa State is shaped by four key dimensions: autonomy, participation, self-efficacy, and voice (see Figure 3). These dimensions do not contribute equally. Some are clear drivers of empowerment, while others remain weak due to social and structural barriers.

Autonomy has a significant positive effect ($\beta = 0.136$, $p = 0.036$). This means that young people who are able to make their own choices, such as deciding what crops to grow, how to run their farms, or how to manage finances, feel more empowered. Autonomy gives them a sense of ownership and control, turning them from passive participants in externally run programmes into active decision-makers. As Falaye (2020) noted, many Nigerian youths value agripreneurship precisely because it offers independence, flexibility, and the potential for financial freedom.

Participation also shows a significant positive impact ($\beta = 0.125$, $p = 0.048$). Engagement in cooperatives, farmer associations, and training groups gives youth access to collective knowledge, stronger networks, and opportunities to influence decisions. Participation is more than just showing up; it's about being actively involved in shaping agricultural activities and outcomes. Adeyanju et al. (2023) stressed that when training programmes are relevant and engaging, participation becomes a powerful empowerment tool. For youth in Jigawa, participation is helping them gain visibility in value chains, strengthen their bargaining power, and build a collaborative influence.

The strongest result comes from self-efficacy ($\beta = 0.624$, $p < 0.001$). This is by far the most powerful predictor of empowerment, showing that belief in one's own ability is the cornerstone of success in agribusiness. Youth with high self-efficacy are more resilient, persistent, and innovative, which allows them to withstand market fluctuations, climate challenges, and financial uncertainty. Okolo-obasi & Uduji (2023) also found that confidence and decision-making ability are critical outcomes of youth involvement in agribusiness. In this study, self-efficacy not only drives empowerment directly but also reinforces other dimensions, giving confidence that youth are more likely to exercise autonomy, engage in groups, and seek platforms to express themselves.

However, voice does not have a significant effect ($\beta = 0.064$, $p = 0.384$). This means that while youth may feel confident and active within their own ventures, their ability to influence larger policies or advocate for their interests at higher levels remains limited.

Cultural norms that undervalue youth voices and weak institutional structures likely explain this muted impact. Ray et al. (2022) also observed that gaps in communication and advocacy skills further reduce youth's ability to push for systemic change. Broader social perceptions that agriculture is a "low-status" career compound this challenge.

Generally, the findings show that in Jigawa State, empowerment is being driven mainly from within: self-efficacy, autonomy, and participation are strong and significant, but voice is still underdeveloped. This creates an imbalance. Youth are building confidence, decision-making skills, and collaborative networks, yet they lack the platforms and structures to translate these strengths into systemic influence. To close this gap, policies and programmes should focus on: strengthening self-efficacy through mentorship, role models, and entrepreneurial training; expanding autonomy by giving youth more decision-making power in resource use and reducing bureaucratic barriers; enhancing participation by encouraging cooperative membership, peer-to-peer learning, and youth-focused professional associations; amplifying voice by institutionalising youth representation in agricultural policy forums; supporting advocacy groups, and building leadership and communication skills.

In short, the study shows that empowerment is real and growing among youth in Jigawa's agribusiness sector, but it is still more personal than political. For empowerment to be sustainable, youth must not only feel confident and capable but also be heard and represented in shaping the agricultural systems that affect their lives.

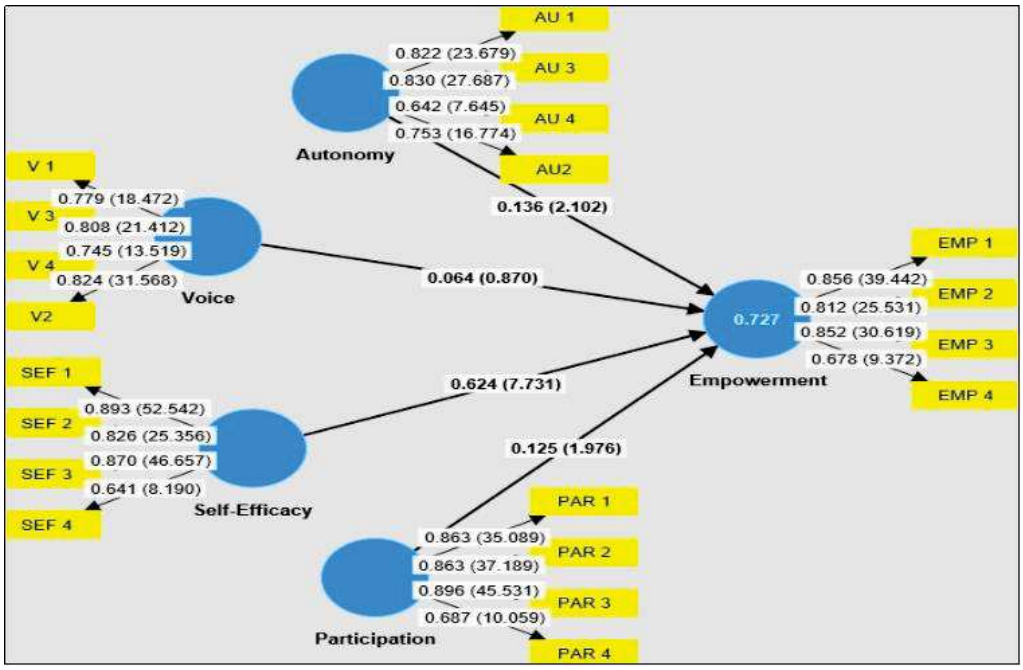

Fig. 3. SEM showing youths' empowerment status based on YADT

Source: authors' own calculations.

Table 3. Youth empowerment status based on YADT

Constructs	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STD)	P values
Autonomy -> Empowerment	0.136	0.144	0.065	2.102**	0.036
Participation -> Empowerment	0.125	0.126	0.063	1.976**	0.048
Self-Efficacy -> Empowerment	0.624	0.616	0.081	7.731***	0.000
Voice -> Empowerment	0.064	0.066	0.074	0.870^{NS}	0.384

Note: *** ($p \leq 0.001$), ** ($p \leq 0.05$), * ($p \leq 0.01$) & NS mean 1, 5, 10% and non-significant, respectively.

Source: Field survey, 2025.

Figure 3 shows that youth empowerment is explained mainly by self-efficacy, which had the strongest positive and significant effect. Autonomy and participation also contributed modest but significant effects, while voice did not significantly influence empowerment. Together, the four constructs explained 72.7% of the variation in empowerment, indicating a strong model fit.

Youths' Agripreneurship Performance in Agribusiness Enterprises

Youths' Agripreneurship performance based on the Youth Agripreneurship Performance Theory (YAPT)

The results in Table 4 (see Figure 4), analysed through the Youth Agripreneurship Performance Theory (YAPT), show that the performance of youth in small agribusiness enterprises in Jigawa State is shaped by several factors, but the strongest driver comes from how well they engage with their customers.

Customer-related factors stood out as the most powerful influence on performance ($\beta = 0.428$, $p < 0.001$). Youth who focus on meeting customer needs, maintaining quality, and building trust are significantly more successful in sustaining their businesses. This finding makes it clear that customer satisfaction and loyalty are the real backbone of youth agribusiness performance in Jigawa State, echoing Adeyanju et al. (2021a), who also found that youth training programmes strengthened market engagement skills.

By comparison, finance showed a positive but statistically insignificant effect ($\beta = 0.143$, $p = 0.133$). While access to money is undeniably important, the results suggest that financial resources are either too limited or not being used effectively enough to make a clear difference. This reflects broader challenges in youth agribusiness across Africa (Adesina & Eforuoku, 2017), where small, high-interest loans and poor repayment structures often blunt the potential of finance to truly boost performance. In practice, this suggests that simply giving youth credit is not enough—financial literacy and efficient capital use are equally essential.

Growth-related factors also showed a significant positive effect ($\beta = 0.159$, $p = 0.093$). This means that while some youths are expanding into new products, markets, or larger scales of operation, these efforts are strong enough to drive measurable performance improvements. This likely reflects the early stage of most agribusiness ventures in Jigawa State, where stabilising market presence comes before large-scale expansion. Adeyanju (2023) highlighted how growth becomes possible when structural supports are present, but in Jigawa State, barriers like poor infrastructure and limited capital still constrain this potential.

A similar picture emerges with operational efficiency (β = 0.143, p = 0.072). Youth who manage their production processes, supply chains, and resources more effectively do perform better. YAPT emphasises that operations are critical for long-term competitiveness, but in Jigawa State, most enterprises lack the technology, training, and standardised processes to make efficiency gains transformative. The diagnostic test results showed the fitness of the CFA for the specified theories, as evidenced by its test results that are within the acceptable threshold values (Table 6).

These findings suggest that youth agripreneurs in Jigawa State are currently strongest in their market relationships, growth, and operational efficiency, while finance remains underdeveloped. This is different from other African contexts (Garbero & Jackering, 2021), where more intensive support programmes have led to measurable increases in income and food security.

In the Jigawa State context, therefore, the immediate priority should be to build on customer engagement by investing in marketing, branding, and customer service skills. At the same time, longer-term strategies should focus on strengthening financial literacy and capital utilisation, creating better pathways for sustainable growth, and improving operational efficiency through targeted technologies and training. From a YAPT perspective, Jigawa State's youth are showing promise in how they connect with the market, but their enterprises still need stronger financial, structural, and operational foundations to achieve sustained growth and competitiveness.

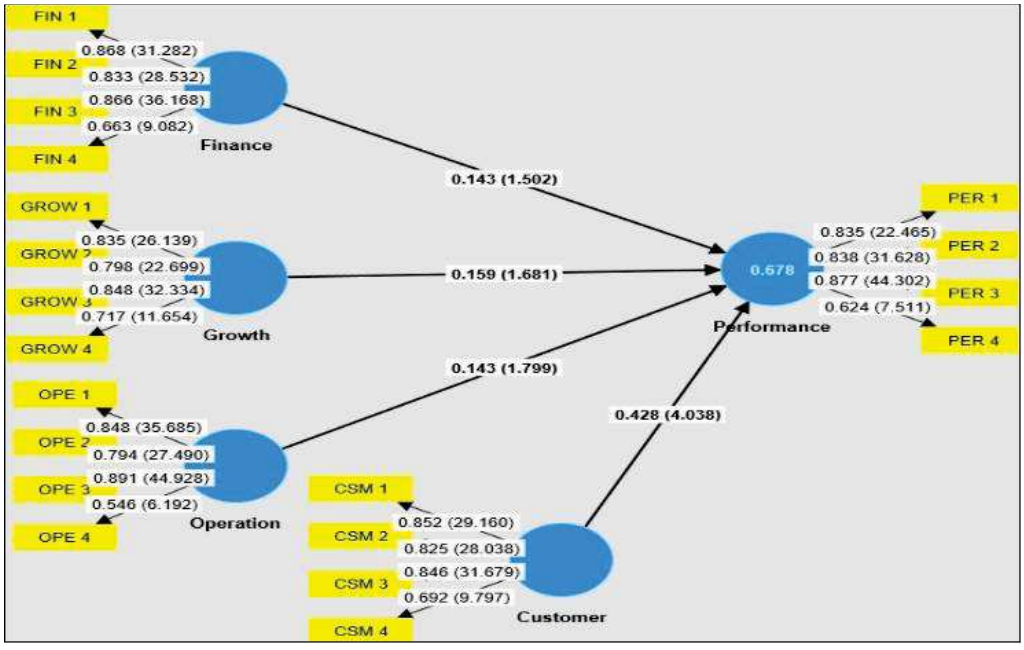

Fig. 4. SEM showing youths' agripreneurship performance based on YAPT

Source: authors' own calculations.

Table 4. Youth empowerment status based on YADT

Constructs	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STD)	P values
Customer -> Performance	0.428	0.414	0.106	4.038***	0.000
Finance -> Performance	0.143	0.150	0.095	1.502NS	0.133
Growth -> Performance	0.159	0.164	0.095	1.681*	0.093
Operation -> Performance	0.143	0.147	0.079	1.799*	0.072

Note: *** ($p \leq 0.001$), ** ($p \leq 0.05$), * ($p \leq 0.01$) & NS mean 1, 5, 10% and non-significant, respectively.

Source: Field survey, 2025.

Youths' Agripreneurship Performance based on the Agripreneurship Resource Construct/Theory (ARC)

The findings presented in Table 5 (see Figure 5) highlight how different resources shape agripreneurial performance among youth in Jigawa State, using the Agripreneurship Resource Construct (ARC). The results show that resources contribute in varying degrees.

Financial resources recorded a negative but non-significant effect on performance ($\beta = -0.08$, $p = 0.264$), indicating that access to finance alone does not guarantee business success. This outcome reflects challenges of misallocation, debt burdens, and low financial literacy. Adeyanju et al. (2021a) similarly observed that without capacity building and mentorship, financial support fails to translate into improved outcomes. Comparable findings in rural Africa (Adesina & Eforuoku, 2017) further confirm that finance works only when coupled with training and supportive structures.

Human resources had a strong and highly significant influence ($\beta = 0.342$, $p = 0.000$), underscoring the importance of technical skills, business acumen, and problem-solving ability in driving performance. This finding resonates with Adeyanju et al. (2021a), who emphasised the role of skill-development programmes in boosting youth-led enterprises; and Okolo-obasi &Uduji (2023), who highlighted passion-driven learning as critical for sustained agribusiness engagement.

Physical resources also contributed positively and significantly ($\beta = 0.228$, $p = 0.011$). Access to productive assets such as land, storage, and equipment enhances efficiency, reduces post-harvest losses, and improves product quality. However, infrastructural constraints in Jigawa limit the full potential of physical capital. This finding aligns with Twumasi et al. (2019), who identified inadequate infrastructure as a core bottleneck for African youth agripreneurs, suggesting the need for targeted support such as leasing schemes, shared cooperatives, and input subsidies.

Social resources emerged as the strongest predictor of performance ($\beta = 0.422$, $p = 0.000$). Networks, mentorship, and trust-based relationships provide access to markets, collective bargaining power, and resilience against shocks. This confirms Adeyanju et al. (2021a), who found that collaborative youth programmes yielded stronger outcomes, particularly where institutional support was weak. In Jigawa State, social capital plays a pivotal role in sustaining agribusiness ventures by compensating for gaps in finance and infrastructure.

In summary, Table 4.3.2 shows that agripreneurial performance in Jigawa State depends more on social ($\beta = 0.422$) and human ($\beta = 0.342$) resources, supported by physical capital

(β = 0.228), while financial capital (β = –0.08) remains insignificant on its own. These findings mirror broader African evidence (Okolo-obasi & Uduji, 2023; Adeyanju et al., 2021a; Adesina & Eforuoku, 2017), reinforcing that youth agripreneurship thrives not simply through financial support but through a balanced mix of skills, networks, and assets. The diagnostic statistical tests justify the appropriateness of the SEM model in explaining the specified theory, as all are within the plausible acceptable values.

Table 5. Youths' agripreneurship performance based on ARC/T

Constructs	Original sample (O)	Sample mean (M)	Standard deviation (STD)	T statistics (O/STD)	P values
Financial -> Performance	-0.081	-0.081	0.072	1.117^{NS}	0.264
Human -> Performance	0.342	0.340	0.070	4.912***	0.000
Physical -> Performance	0.228	0.233	0.089	2.556**	0.011
Social -> Performance	0.422	0.420	0.076	5.550***	0.000

Note: *** ($p \leq 0.001$), ** ($p \leq 0.05$), * ($p \leq 0.01$) & NS mean 1, 5, 10% and non-significant, respectively.

Source: Field survey, 2025.

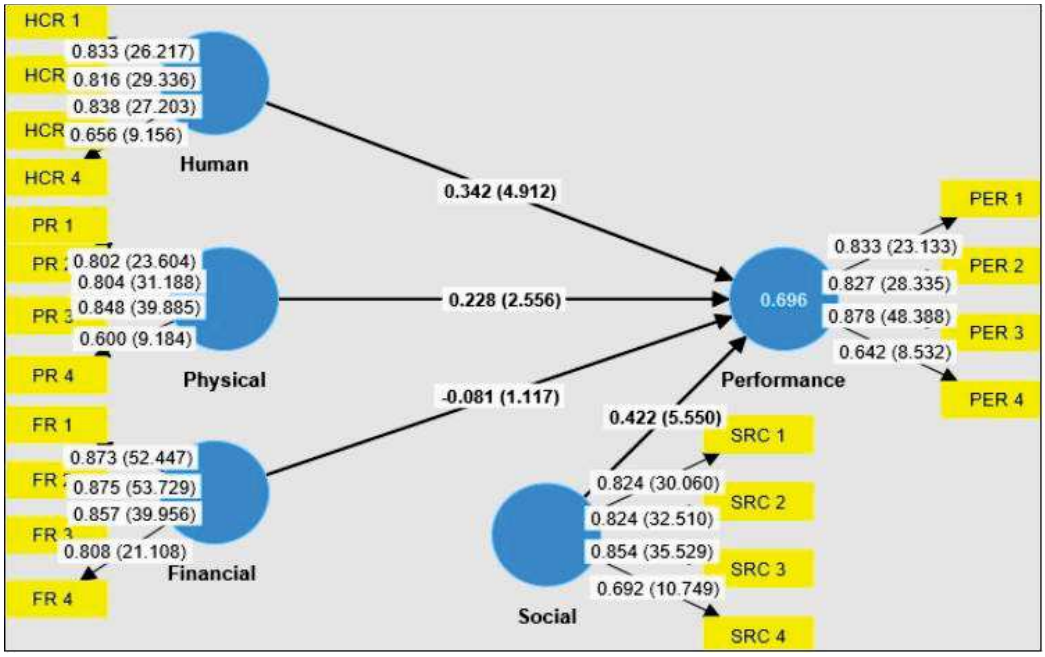

Fig. 5. SEM showing youths' agripreneurship performance based on ARC/T

Source: authors' own calculations.

Table 6. Diagnostic test results of SEM

Tests	Estimated model				Recommendation
	AEDT	YADT	YAPT	ARC	
SRMR	0.080875932	0.084798528	0.078093904	0.068689293	<0.08
d_ULS	1.373592428	1.510065964	1.280718133	0.990825984	-
d_G	0.509314806	0.513262012	0.625071511	0.443710927	-
Chi-square	852.2674299	861.386558	929.2577582	681.7170816	0.01
NFI	0.945345451	0.93554464	0.962371704	0.995809143	> 0.90

Source: SMART-PLS software, 2025.

Conclusion and Recommendations

Conclusion

The study reveals that youth empowerment in agribusiness is multidimensional but uneven. Psychological empowerment and self-efficacy are the most critical drivers, indicating that internal confidence and resilience are foundational to success. Political empowerment and autonomy also contribute significantly, enabling youth to navigate systemic barriers and make independent decisions.

However, economic empowerment and financial resources show limited direct impact, suggesting that monetary support alone is insufficient without complementary skills and structures. Social empowerment and voice remain underdeveloped, hindered by cultural norms and weak institutional platforms that limit youth influence and collective advocacy.

Regarding performance, customer engagement and social resources (e.g. networks, mentorship) are the strongest predictors of success. Human resources (skills and knowledge) and physical assets also play vital roles, while financial capital alone does not significantly enhance performance without proper management and support systems.

In summary, youth agripreneurs in Jigawa State are most empowered and successful when they possess strong internal drive, supportive networks, and market-oriented skills—not just financial capital.

Recommendations

1. Strengthen Psychological and Self-Efficacy Development
   - Introduce mentorship programmes, role models, and resilience training.
   - Integrate entrepreneurial mindset education into agricultural training curricula.
2. Enhance Political Inclusion and Autonomy
   - Institutionalise youth representation in agricultural policy-making bodies.
   - Reduce bureaucratic barriers and increase youth involvement in resource allocation decisions.
3. Improve Economic and Financial Support Systems
   - Bundle financial aid with capacity-building programmes (e.g. financial literacy, business management).
   - Develop youth-friendly loan products with flexible repayment terms.

4. Boost Social Capital and Voice
    - Facilitate youth cooperatives and networks to strengthen collective bargaining and knowledge sharing.
    - Offer leadership and advocacy training to amplify youth voices in policy and community forums.
5. Support Market-Led and Resource-Based Performance
    - Provide training in customer relationship management, branding, and digital marketing.
    - Improve access to physical resources (e.g. shared equipment, storage facilities) through leasing or cooperative models.
    - Prioritise skill development in technical, managerial, and operational areas.
6. Adopt Integrated and Youth-Sensitive Policies
    - Design holistic interventions that address psychological, social, economic, and political dimensions simultaneously.
    - Ensure programmes are youth-responsive, participatory, and context-specific to Jigawa State.

By implementing these recommendations, stakeholders can foster a more enabling environment for youth to thrive as empowered, resilient, and successful agripreneurs.

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Appendix

Appendix A: Youths' Empowerment Status based on the Agripreneurship Empowerment Dimension Theory (AEDT)

	Construct reliability and validity			
Overview	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Economic	0.769	0.803	0.850	0.590
Empowerment	0.814	0.852	0.876	0.641
Political	0.827	0.860	0.883	0.657
Psychological	0.805	0.834	0.872	0.633
Social	0.797	0.878	0.862	0.625

Source: SMART-PLS software, 2025.

Appendix B: Youths' empowerment status based on the Youth Agency Dimension Theory (YADT)

	Construct reliability and validity			
Overview	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Autonomy	0.764	0.787	0.848	0.586
Empowerment	0.814	0.834	0.878	0.644
Participation	0.850	0.880	0.899	0.691
Self-Efficacy	0.826	0.856	0.885	0.662
Voice	0.799	0.805	0.869	0.623

Source: SMART-PLS software, 2025.

Appendix C: Youths' Agripreneurship Performance based on the Youth Agripreneurship Performance Theory (YAPT)

Construct reliability and validity				
Overview	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Customer	0.820	0.835	0.881	0.651
Finance	0.824	0.844	0.884	0.659
Growth	0.813	0.821	0.877	0.642
Operation	0.783	0.835	0.859	0.610
Performance	0.808	0.840	0.875	0.639

Source: SMART-PLS software, 2025.

Appendix D: Youths' Agripreneurship Performance based on the Agripreneurship Resource Construct/Theory (ARC)

Construct reliability and validity				
Overview	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Financial	0.876	0.879	0.915	0.729
Human	0.795	0.809	0.868	0.623
Performance	0.808	0.830	0.875	0.640
Physical	0.764	0.782	0.851	0.592
Social	0.814	0.832	0.877	0.642

Source: SMART-PLS software, 2025.

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Oddziaływanie rolowanych należności krótkoterminowych na płynność finansową MŚP sektora przetwórstwa rolno-spożywczego

The Influence of Rolled-Over Short-Term Receivables on the Financial Liquidity of SMEs in the Agri-Food Processing Sector

Synopsis. Uzasadnieniem podjęcia tematu jest znacząca rola praktyk odroczonych płatności w kształtowaniu rolowanych należności MŚP sektora przetwórstwa rolno spożywczego w warunkach przewagi dużych odbiorców, wynikającej z asymetrii siły kontraktowej i ograniczeń egzekucyjnych. Celem artykułu było określenie skali i dynamiki rolowanych należności krótkoterminowych w latach 2016–2022 oraz ocena ich wpływu na płynność finansową MŚP. Zastosowano analizę wskaźnikową płynności szybkiej w dwóch wariantach: tradycyjnym, opartym na należnościach krótkoterminowych ogółem oraz skorygowanym, w którym z podstawy obliczeń wyłączono rolowane należności. Analizę uzupełniono o ocenę trendów i dynamiki łańcuchowej. Wyniki wskazują, że rolowane należności stanowią trwały element struktury aktywów obrotowych, a ich udział wykazał przejściowy wzrost w 2020 roku, po czym powrócił do poziomu z lat wcześniejszych. Korekta wskaźników płynności o należności rolowane ujawnia systematyczne przeszacowanie płynności memoriałowej. Korekta ta prowadzi do obniżonej, bardziej wiarygodnej oceny zdolności płatniczej przedsiębiorstw, znacząco różniącej się od wyników tradycyjnych wskaźników. Zaproponowane ujęcie rolowanych należności i wskaźnika ich udziału w należnościach krótkoterminowych wprowadza do analizy płynności element dotąd nieuwzględniany, umożliwiając ocenę wypłacalności z perspektywy bliższej rzeczywistym przepływom pieniężnym.

Słowa kluczowe: rolowane należności krótkoterminowe, ukryte finansowanie dostawcy, płynność finansowa MŚP, kapitał obrotowy, zatory płatnicze, asymetria siły kontraktowej

Abstract. The rationale for addressing this topic stems from the significant role of deferred payment practices in shaping rolled receivables among SMEs in the agri food processing sector, particularly under the dominance of large buyers resulting from contractual power asymmetry and limited enforceability. The study aimed to determine the scale and dynamics of rolled short-term receivables in 2016-2022 and to assess their impact on SMEs' financial liquidity. The analysis applied the quick ratio in two variants: the traditional one, based on total short-term receivables, and a corrected version excluding rolled receivables from the calculation base. The assessment was complemented by trend analysis and chain index dynamics. The results show that rolled receivables constitute a persistent component of SMEs' current assets, with a temporary increase in 2020 followed by a return to earlier levels. Adjusting liquidity ratios for rolled-over receivables reveals a systematic overestimation of accrual liquidity. This adjustment leads to a lower, more reliable assessment of companies' payment capacity, substantially different from traditional measures. The proposed inclusion of rolled receivables and their share in short-term receivables introduces an analytical element previously absent from liquidity assessment, enabling an evaluation of solvency that more closely reflects actual cash flows.

Keywords: rolled short-term receivables, implicit supplier financing, SME financial liquidity, working capital, payment backlogs, contractual power asymmetry

JEL Classification: G32, G33, D22, Q13, L66, M21

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Wstęp

Płynność finansowa jest jednym z kluczowych warunków stabilności i zdolności operacyjnej przedsiębiorstw przetwórstwa rolno spożywczego, szczególnie w segmencie MŚP funkcjonującym w warunkach niskich marż, szybkiej rotacji zapasów i silnej pozycji negocjacyjnej odbiorców. Taka konfiguracja uwarunkowań zwiększa podatność firm na zatory płatnicze oraz ogranicza ich możliwości pozyskiwania finansowania zewnętrznego, co czyni bieżącą płynność jednym z najważniejszych determinantów ich stabilności.

Dotychczasowe badania koncentrowały się głównie na analizie przeterminowanych należności krótkoterminowych jako kategorii statycznej. Przykładem jest ekspertyza Wasilewskiego i Stolarskiego (2023), w której oceniano udział należności stale przeterminowanych w aktywach obrotowych przedsiębiorstw sektora w latach 2016–2023. Wskazano w niej m.in. wzrost zaległości w 2020 roku oraz trwałe pogorszenie dostępności środków pieniężnych, podkreślając ograniczenia tradycyjnych wskaźników płynności opartych na danych memoriałowych. Ekspertyza nie obejmowała jednak analizy mechanizmu cyklicznego odnawiania zaległości, pozostawiając otwarte pytanie o procesy odpowiedzialne za trwałe pogorszenie płynności.

Jednym z takich procesów jest rolowanie należności krótkoterminowych, polegające na odnawianiu przeterminowanych zobowiązań odbiorców poprzez generowanie nowych należności o zbliżonej wartości. Mechanizm ten może prowadzić do systematycznego zawyżania aktywów obrotowych i przeszacowania płynności finansowej, a jednocześnie pozostaje niewidoczny w klasycznych wskaźnikach. Brak operacyjnej definicji rolowanych należności oraz metody ich pomiaru stanowi istotną lukę badawczą.

Wprowadzenie kategorii rolowanych należności pozwala rozszerzyć dotychczasowe analizy, umożliwiając ocenę trwałych zatorów płatniczych oraz ich wpływu na zdolność przedsiębiorstw do regulowania zobowiązań krótkoterminowych. W odróżnieniu od kategorii „należności stale przeterminowanych", rolowanie opisuje proces, a nie stan zaległości, co umożliwia bardziej realistyczną ocenę płynności, zwłaszcza w warunkach, w których metoda memoriałowa prowadzi do jej przeszacowania.

Celem artykułu jest identyfikacja i pomiar skali zjawiska rolowanych należności krótkoterminowych w MŚP sektora przetwórstwa rolno spożywczego w latach 2016–2022 oraz ocena ich wpływu na płynność finansową z wykorzystaniem wskaźników skorygowanych o należności rolowane. Badanie ma charakter replikacyjno rozszerzający względem wcześniejszych analiz, wprowadzając nową definicję operacyjną oraz nowy sposób pomiaru płynności finansowej przedsiębiorstw.

Przegląd literatury

Płynność finansowa przedsiębiorstw, zwłaszcza w sektorze MŚP, pozostaje jednym z kluczowych obszarów badań finansowych. W klasycznym ujęciu oznacza zdolność do regulowania zobowiązań krótkoterminowych przy wykorzystaniu aktywów obrotowych, co odzwierciedlają wskaźniki płynności bieżącej i szybkiej. W zarządzaniu kapitałem obrotowym szczególną rolę odgrywają należności handlowe, które kształtują cykl konwersji gotówki i wpływają na bieżącą wypłacalność przedsiębiorstwa. W praktyce MŚP kredyt kupiecki często przekształca się jednak w formę finansowania odbiorców, zwłaszcza w relacjach o asymetrycznej sile kontraktowej. Badania empiryczne potwierdzają, że wysoki

poziom należności oraz opóźnienia w ich spłacie wydłużają okres zamrożenia kapitału i zwiększają zapotrzebowanie na finansowanie zewnętrzne (Kościelniak, Wróblewska Kazakin, 2011, s. 23–31; Coricelli, Frigerio, 2018, s. 1549). Wydłużenie okresu spływu należności (Days Sales Outstanding - DSO) pogarsza płynność i obniża zdolność MŚP do regulowania zobowiązań, co jest szczególnie dotkliwe w branżach o niskiej rentowności i silnej pozycji negocjacyjnej odbiorców, takich jak przetwórstwo rolno spożywcze. Wskazuje się również, że struktura należności ma istotny wpływ na płynność przedsiębiorstw (Czerwonka, Jaworski, 2023, s. 173).

Odbiorca, który wydłuża terminy płatności, korzysta z kredytu udzielanego przez dostawcę (Wang i in., 2021, s. 796). W literaturze podkreśla się, że duzi odbiorcy traktują kredyt kupiecki jako nieodpłatne źródło finansowania (Zawadzka, 2008, s. 639–643), co w warunkach ograniczonego dostępu MŚP do kredytu bankowego (Wolański, 2015, s. 465-466) prowadzi do narastania zatorów płatniczych (Grzywacz, 2023, s. 44). Mechanizmy te znajdują teoretyczne uzasadnienie m.in. w teorii nowej ekonomii instytucjonalnej (Williamson, 1998), w koncepcji kontraktów niekompletnych (Grossman & Hart, 1986; Hart, 1995) oraz monopsonicznej siły nabywców (Robinson, 1969; Porter, 1980). Dostawcy, obawiając się utraty kluczowych kontrahentów, rzadko korzystają z narzędzi egzekucyjnych (Dankiewicz, 2018, s. 40), a alternatywy, takie jak factoring czy windykacja, są kosztowne lub trudno dostępne (Nowak, 2014, s. 826).

Istotny wkład w analizę płynności finansowej MŚP sektora przetwórstwa rolno-spożywczego wnosi ekspertyza Wasilewskiego i Stolarskiego (2023), w której oceniono wpływ pandemii COVID 19 na płynność przedsiębiorstw w latach 2016–2023, analizując m.in. udział należności stale przeterminowanych oraz zmiany wskaźnika płynności II stopnia. Kategoria ta ma jednak charakter statyczny i nie pozwala na identyfikację mechanizmu powstawania i odnawiania zaległości płatniczych. W literaturze podkreśla się rosnącą potrzebę stosowania wskaźników opartych na przepływach pieniężnych oraz identyfikacji zjawisk, które nie generują realnych wpływów pieniężnych, a jedynie zwiększają wartość należności w ujęciu memoriałowym.

W badaniach międzynarodowych pojawiają się koncepcje zbliżone do rolowania należności, takie jak „evergreening trade credit", „rolling over receivables" czy „implicit supplier financing", jednak dotyczą one głównie dużych przedsiębiorstw przemysłowych. Brakuje analiz odnoszących się do MŚP przetwórstwa rolno spożywczego, które charakteryzują się odmienną strukturą kosztów, sezonowością produkcji oraz silną zależnością od odbiorców o dużej sile rynkowej.

Wprowadzenie kategorii rolowanych należności krótkoterminowych stanowi odpowiedź na lukę badawczą dotyczącą identyfikacji trwałych zatorów płatniczych oraz ich wpływu na płynność finansową przedsiębiorstw. Rolowanie jako proces cyklicznego odnawiania zaległości poprzez generowanie nowych zobowiązań krótkoterminowych o zbliżonej wartości, pozwala na bardziej precyzyjną ocenę ryzyka płynności, niż tradycyjne wskaźniki oparte na należnościach ogółem lub należnościach przeterminowanych. W literaturze brakuje również badań uwzględniających korektę wskaźników płynności o należności rolowane, co stanowi istotny wkład niniejszego artykułu.

Dane i metody badawcze

Badanie oparto na danych zagregowanych dotyczących przedsiębiorstw MŚP sektora przetwórstwa rolno spożywczego, publikowanych przez Główny Urząd Statystyczny (Wyniki finansowe przedsiębiorstw niefinansowych; Wyniki finansowe podmiotów gospodarczych). Zakres analizy obejmuje lata 2016–2022, co pozwala uchwycić zmiany w strukturze należności krótkoterminowych zarówno przed pandemią COVID 19, jak i w okresie jej oddziaływania. Wykorzystane dane obejmują: należności krótkoterminowe ogółem, należności przeterminowane, krótkoterminowe aktywa finansowe, zobowiązania krótkoterminowe oraz przychody ze sprzedaży.

W celu oceny skali zjawiska rolowania należności krótkoterminowych wprowadzono wskaźnik udziału rolowanych należności w należnościach krótkoterminowych:

$$\alpha = \frac{R_{\text{rol}}}{R_{\text{krotko}}}, 0 \leq \alpha \leq 1$$

Wskaźnik α pełni funkcję diagnostyczną, pozwalając określić, jaka część należności nie generuje przepływów pieniężnych i jest przenoszona na kolejne okresy. Stanowi to podstawę do korekty wskaźników płynności oraz oceny ryzyka zatorów płatniczych.

Dane dotyczące struktury należności oraz dynamiki opóźnień płatniczych zestawiono na podstawie raportów BIG InfoMonitor (2023a, 2023b), Euler Hermes (2019), Intrum (2023) oraz Szybkiego Monitoringu NBP (2025). Na ich podstawie określono udział rolowanych należności w należnościach krótkoterminowych MŚP sektora przetwórstwa rolno-spożywczego α (tabela 1). Udział ten wynosił ok. 0,14 w latach 2016–2019, wzrósł do 0,26 w 2020 roku, a następnie obniżył się do 0,16 w 2021 roku i 0,14 w 2022 roku.

Tabela 1. Rolowane należności krótkoterminowe w wartości należności krótkoterminowych MŚP α

Table 1. Rolled short-term receivables to the value of short-term receivables of SMEs α

Wyszczególnienie	Lata						
	2016	2017	2018	2019	2020	2021	2022
Udział rolowanych należności krótkoterminowych	0,14	0,14	0,14	0,14	0,26	0,16	0,14

Źródło: opracowanie własne.

Dane empiryczne zestawiono w tabeli 2, obejmującej determinanty płynności finansowej szybkiej: należności krótkoterminowe ogółem, należności rotujące, należności rolowane, krótkoterminowe aktywa finansowe oraz zobowiązania krótkoterminowe.

Tabela 2. Determinanty płynności finansowej szybkiej, w mln zł

Table 2. Determinants of quick financial liquidity, in PLN million

Lata	Należności krótkoterminowe R_{krotko}	Należności krótkoterminowe rotujące R_{rot}	Należności krótkoterminowe rolowane R_{rol}	Krótkoterminowe aktywa finansowe A_{fin}	Zobowiązania krótkoterminowe $Z_{krótko}$
2016	27986	23984	4002	11504	37905
2017	29795	25534	4261	12704	40751
2018	30499	26138	4361	11946	41345
2019	31437	26941	4496	11696	42223
2020	29557	21894	7663	12796	42435
2021	34074	28496	5579	14189	51199
2022	44164	37848	6315	13614	65017

Źródło: opracowanie własne na podstawie danych GUS (publikacje: Wyniki finansowe przedsiębiorstw niefinansowych oraz Wyniki finansowe podmiotów gospodarczych).

Konstrukcja kategorii rolowanych należności

W celu identyfikacji zjawiska rolowania należności dokonano dekompozycji należności krótkoterminowych na dwie kategorie:

- rolowane należności krótkoterminowe (R_rol) – należności nieuregulowane w terminie, przenoszone na kolejne okresy poprzez generowanie nowych zobowiązań o zbliżonej wartości.
- rotujące należności krótkoterminowe (R_rot) – należności regulowane w cyklu operacyjnym, generujące realne wpływy pieniężne,

Rotujące należności krótkoterminowe zdefiniowano jako:

$$R_{rot} = R_{krótko} - R_{rol}$$

gdzie: $\boldsymbol{R_{krót}}$ – należności krótkoterminowe ogółem, $\boldsymbol{R_{rot}}$ – należności rotujące.

Wprowadzenie kategorii rolowanych należności ma charakter operacyjny i diagnostyczny — pozwala na identyfikację trwałych zatorów płatniczych, które nie są widoczne w tradycyjnych analizach opartych na należnościach ogółem lub należnościach przeterminowanych.

Konstrukcja wskaźników płynności szybkiej

W celu oceny wpływu rolowanych należności na płynność finansową przedsiębiorstw zastosowano dwa warianty wskaźnika płynności szybkiej:

I. Wskaźnik płynności szybkiej tradycyjny (Quick Ratio)

$$\boldsymbol{QR = \frac{A_{fin} + R_{krótko}}{Z_{krótko}}}$$

gdzie: $\boldsymbol{A_{fin}}$– krótkoterminowe aktywa finansowe, $\boldsymbol{R_{krótko}}$ – należności krótkoterminowe ogółem, $\boldsymbol{Z_{krótko}}$ – zobowiązania krótkoterminowe.

II. Wskaźnik płynności szybkiej skorygowany o należności rolowane (Quick ratio adjusted)

$$QR_{sk} = \frac{A_{fin} + R_{rot}}{Z_{krótko}}$$

gdzie: R_{rot} – należności rotujące, tj. należności generujące realne wpływy pieniężne.

Korekta polega na wyłączeniu z aktywów obrotowych tej części należności krótkoterminowych, która nie generuje przepływów pieniężnych i jest przenoszona na kolejne okresy. Analizę przeprowadzono w ujęciu operacyjnym, zakładając kontynuację działalności oraz zamianę aktywów obrotowych na gotówkę w ramach cyklu operacyjnego (Wędzki, 2019, s. 160).

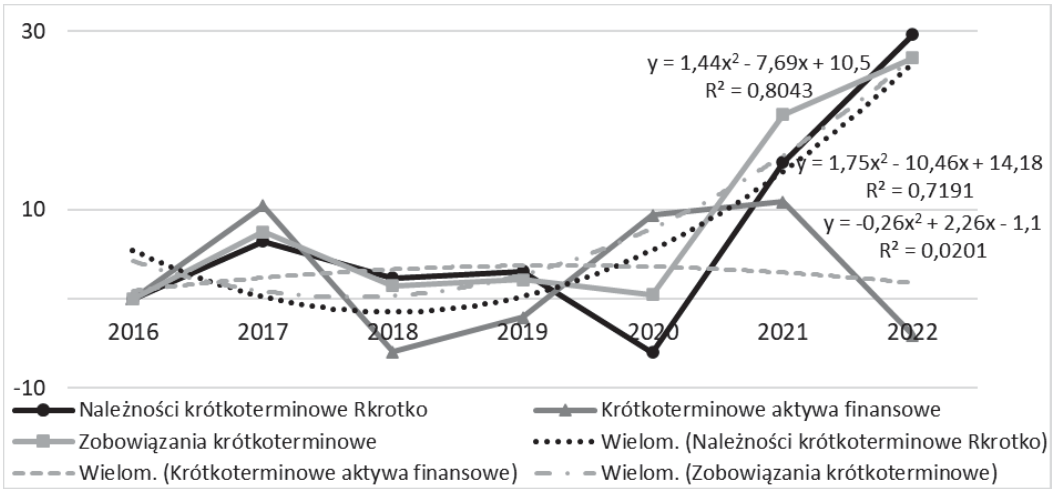
Dynamikę rolowania należności krótkoterminowych oraz jego wpływ na płynność oceniono z wykorzystaniem analizy trendu (funkcja liniowa i wielomianowa), analizy dynamiki bazowej i łańcuchowej (rok do roku), porównania wskaźników tradycyjnych i skorygowanych, analizy udziału należności rolowanych w należnościach krótkoterminowych. Podejście to umożliwia ocenę zarówno poziomu i trwałości rolowania, jak i jego wpływu na zdolność przedsiębiorstw do regulowania zobowiązań.

Badanie ma charakter replikacyjno-rozszerzający względem wcześniejszych analiz dotyczących należności przeterminowanych. Wprowadza jednak nową definicję operacyjną oraz nowy sposób pomiaru płynności finansowej, identyfikując rolowanie jako proces cyklicznego odnawiania zaległości. Pozwala to na bardziej precyzyjną ocenę ryzyka płynności niż podejścia makroekonomiczne koncentrujące się wyłącznie na poziomie zaległości.

Wyniki badań

Dekompozycja należności krótkoterminowych na należności rotujące i rolowane ujawniła, że udział rolowanych należności w należnościach krótkoterminowych wzrósł z ok. 0,14 w 2019 roku do 0,26 w 2020 roku, następnie zmniejszył się do 0,16 w 2021 roku i 0,14 w 2022 roku (tabela 1). Oznacza to, że istotna część należności nie generowała realnych wpływów pieniężnych, lecz była przenoszona na kolejne okresy poprzez mechanizm rolowania. Zjawisko to wpływało na ograniczanie dostępność gotówki w MŚP sektora przetwórstwa rolno-spożywczego, utrudniając terminową spłatę zobowiązań krótkoterminowych, co mogło przyczynić się do szybszego wzrostu tych zobowiązań w latach 2021–2022.

W celu oceny dynamiki zmian determinant płynności szybkiej obliczono wskaźniki dynamiki bazowej i łańcuchowej należności krótkoterminowych, aktywów finansowych i zobowiązań krótkoterminowych. W latach 2016–2022 należności krótkoterminowe w ujęciu bazowym wzrosły o ok. 58%, natomiast zobowiązania krótkoterminowe aż o 71% Aktywa finansowe zwiększyły się natomiast o 18% Wzrost wartości należności ogółem był szczególnie widoczny w latach 2020–2022, co koresponduje z obserwowanym w ekspertyzie Wasilewskiego i Stolarskiego (2023) wzrostem zaległości płatniczych w okresie pandemii COVID 19. Wskaźniki łańcuchowej dynamiki zmian (rys. 1) wskazują na wyraźne przyspieszenie wzrostu zobowiązań krótkoterminowych w latach 2021–2022.



Rys. 1. Wskaźniki łańcuchowej dynamiki zmian należności krótkoterminowych, aktywów finansowych i zobowiązań krótkoterminowych (%

Fig. 1. Chain dynamics indicators of changes in short-term receivables, financial assets and short-term liabilities (%

Źródło: opracowanie własne na podstawie danych GUS.

Pochodne funkcji wielomianowej trendów potwierdzają, że od 2020 roku tempo narastania zobowiązań krótkoterminowych ($y' = 3{,}50x - 10{,}46$) przewyższa tempo wzrostu należności krótkoterminowych ($y' = 2{,}88x - 7{,}69$), co oznacza rosnące obciążenie płynności.

W tabeli 3 przedstawiono wyniki obliczeń wskaźnika płynności szybkiej (PFS) w obu wariantach z uwzględnieniem pełnych należności krótkoterminowych Rkrótko oraz rotowanych należności krótkoterminowych Rrot. W praktyce wskaźnik płynności szybkiej powinien być równy lub większy od 1 (Wędzki 2020, s. 103). Wyniki wskazują na systematyczny spadek płynności w całym okresie badania, przy czym wariant oparty na należnościach krótkoterminowych ogółem charakteryzuje się łagodniejszym spadkiem niż wariant skorygowany.

Tabela 3. Wskaźnik płynność szybkiej MŚP sektora rolno-spożywczego

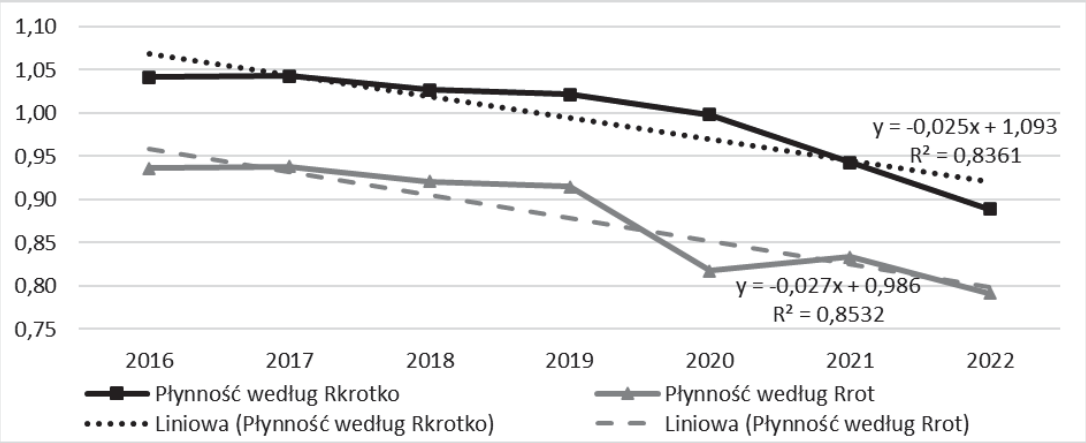
Table 3. Quick liquidity ratio of SMEs in the agri-food sector

Wyszczególnienie	Rok						
	2016	2017	2018	2019	2020	2021	2022
Płynność według R_{krotko}	1,04	1,04	1,03	1,02	1,00	0,94	0,89
Płynność według R_{rot}	0,94	0,94	0,92	0,92	0,82	0,83	0,79

Źródło: opracowanie własne na podstawie danych GUS.

Wartość PFS według $R_{krótko}$ zmniejszyła się z 1,04 w 2016 roku do 0,89 w 2022 roku, natomiast wskaźnik oparty na należnościach rotujących (R_{rot}) zmniejszył się z 0,94 do 0,79. Oznacza to, że MŚP sektora przetwórstwa rolno spożywczego stopniowo traciły zdolność do szybkiego regulowania zobowiązań krótkoterminowych, a tradycyjny wskaźniki płynności szybkiej przeszacowywał ich faktyczną zdolność płatniczą.

Na rys. 2 przedstawiono zmiany płynności szybkiej w latach 2016–2022 wraz z liniami trendu.



Rys. 2. Wskaźnik płynności szybkiej MŚP sektora przetwórstwa rolno-spożywczego

Fig. 2. Quick liquidity ratio of SMEs in the agri-food processing sector

Źródło: opracowanie własne.

W 2020 roku widoczne jest odchylenie od trendu, wynikające ze wzrostu udziału rolowanych należności do 0,26 w pierwszym roku pandemii. Wariant PFS oparty na R_{rot} wykazuje w tym okresie silniejsze obniżenie płynności, co potwierdza, że rolowane należności istotnie zniekształcają ocenę zdolności płatniczej. Wyniki wskazują, że narastające trudności MŚP w regulowaniu zobowiązań wynikają zarówno ze wzrostu zobowiązań, jak i ze struktury należności, w której rolowane należności stanowią istotny udział.

Wyłączenie rolowanych należności z kalkulacji wskaźnika płynności ujawnia niższą zdolność regulowania zobowiązań krótkoterminowych, co potwierdza konieczność ostrożniejszej interpretacji tradycyjnych wskaźników. Wyniki dowodzą, że rolowane należności prowadzą do zawyżenia płynności memoriałowej i mogą maskować ryzyko utraty zdolności płatniczej. Ostatecznie ustalono, że przedsiębiorstwa funkcjonują w warunkach ukrytego kredytowania odbiorców, co ogranicza ich zdolność do finansowania działalności operacyjnej.

Podsumowanie

Przeprowadzone badanie potwierdza, że rolowane należności krótkoterminowe stanowią trwały i istotny element struktury należności przedsiębiorstw MŚP sektora przetwórstwa rolno spożywczego. Zjawisko to nie ma charakteru incydentalnego – odzwierciedla utrwalony mechanizm cyklicznego odnawiania zaległości, niewidoczny w tradycyjnych kategoriach należności przeterminowanych. Oznacza to, że przedsiębiorstwa pełnią funkcję nieformalnych kredytodawców swoich odbiorców, co prowadzi do narastania ukrytych zatorów płatniczych i ogranicza dostępność środków pieniężnych.

Porównanie wskaźników płynności tradycyjnych i skorygowanych o należności rolowane wykazało, że podejście memoriałowe systematycznie przeszacowuje zdolność przedsiębiorstw do regulowania zobowiązań krótkoterminowych. Wartości wskaźnika płynności szybkiej po korekcie były istotnie niższe, co potwierdza konieczność uwzględniania jakości należności w ocenie płynności finansowej. Wyniki te dostarczają nowych dowodów empirycznych dla sektora MŚP przetwórstwa rolno spożywczego i wzmacniają argumenty literatury wskazującej na ograniczenia tradycyjnych miar płynności.

Analiza trendów potwierdziła strukturalny charakter rolowania należności, utrzymujący się również po okresie zaburzeń pandemicznych. Zjawisko to zwiększa podatność przedsiębiorstw na ryzyko płynności, szczególnie w branżach o niskiej rentowności i wysokiej sezonowości, gdzie dostęp do kapitału obrotowego warunkuje ciągłość produkcji.

Wkład metodologiczny badania polega na wprowadzeniu nowej kategorii operacyjnej – rolowanych należności krótkoterminowych – oraz na konstrukcji wskaźników płynności skorygowanych o tę kategorię. Pozwala to uchwycić proces cyklicznego odnawiania zaległości, który nie jest widoczny w analizach opartych na należnościach ogółem lub przeterminowanych. Wprowadzenie tej zmiennej umożliwia bardziej realistyczną ocenę ryzyka płynności oraz identyfikację trwałych zatorów płatniczych. Badanie ma charakter replikacyjno rozszerzający: opiera się na istniejących danych zagregowanych, lecz wzbogaca je o nową definicję operacyjną i nowy sposób pomiaru płynności finansowej, co stanowi istotne uzupełnienie dotychczasowych metod analizy.

Wyniki mają również znaczące implikacje praktyczne. Wskazują na potrzebę monitorowania dynamiki rolowania należności jako kluczowego elementu zarządzania płynnością oraz uwzględniania ryzyka trwałego odraczania płatności w polityce kredytu kupieckiego. Z perspektywy instytucji finansowych i regulatorów podkreślają konieczność traktowania zatorów płatniczych jako istotnego czynnika ryzyka w ocenie kondycji finansowej przedsiębiorstw. Badanie wskazuje także na potrzebę dalszych analiz, zwłaszcza w ujęciu mikroekonomicznym, obejmującym dane jednostkowe przedsiębiorstw. Pozwoliłoby to na identyfikację czynników determinujących skłonność odbiorców do odraczania płatności oraz ocenę skuteczności narzędzi zarządzania należnościami w ograniczaniu zatorów płatniczych.

Wnioski

1. Rolowane należności są ważnym mechanizmem cyklicznego odnawiania zaległości, który prowadzi do trwałego odraczania płatności i ukrytego finansowania odbiorców. Rolowane należności istotnie wpływają na ocenę płynności finansowej MŚP

przetwórstwa rolno-spożywczego w Polsce; brak ich korekty prowadzi do zawyżania tradycyjnych wskaźników. Zjawisko rolowania ma charakter strukturalny i trwale ogranicza dostępność środków pieniężnych.

2. Rolowanie należności w przedsiębiorstwach w Polsce wynika m.in. z asymetrii siły kontraktowej i ograniczeń egzekucyjnych, zwiększając podatność MŚP przetwórstwa rolno-spożywczego na ryzyko płynności. Stąd monitorowanie struktury należności powinno stanowić kluczowy element zarządzania ryzykiem finansowym.
3. Istotnym wkładem metodycznym badań jest wprowadzenie kategorii rolowanych należności krótkoterminowych oraz wskaźnika płynności skorygowanej o tę kategorię. Zastosowany wskaźnik udziału rolowanych należności $\alpha = Rrol/Rkrotko$ pozwala na identyfikację trwałych zatorów płatniczych i realistyczną ocenę płynności.
4. Dalsze badania mikroekonomiczne są konieczne dla pełnego zrozumienia mechanizmów odraczania płatności i powinny się koncentrować na identyfikacji czynników determinujących skłonność odbiorców do odraczania płatności oraz ocenę skuteczności i rozwój narzędzi zarządzania należnościami w ograniczaniu zatorów płatniczych.

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