

BEYOND MARKETS AND BORDERS: ON THE COMMUNITY OF VALUES AMONG PRODUCERS IN THE BIOECONOMY

Małgorzata Pink

University of Agriculture in Krakow, Poland

The first quarter of the 21st century was full of dramatic events – starting with the financial crisis in 2008, through the COVID epidemic, ending with political instability and the outbreak of war in Ukraine. In addition, the effects of global warming have intensified. The accumulation of global events of a revolutionary nature is conducive to the transformation of social values. History proves that new values are the driving force of social and economic change. The 2030 Agenda adopted by the UN indicates the need to transform the approach to production and consumption (Goal 12). This involves the dissemination of low emission approaches to production. One of these is the circular bioeconomy. The aim of this article is to diagnose the attitudes of a niche group of producers: manufacturers of bio-based materials used in construction and interior finishing. They exploit by-products of agriculture and other biomass industries and use biomass processing microorganisms. The study was based on a survey questionnaire in which entrepreneurs declared their personal values and assessed the bio-based materials market and the situation of their own company. Two research hypotheses were formulated: H1: Entrepreneurs operating in the circular bioeconomy market are characterized by a community of the values, creating 'values archipelago'. H2: The values of entrepreneurs in the circular bioeconomy market depend on the market situation in which they find themselves and economic condition of their entity. The responses obtained were analyzed using the level of variance and Spearman's correlation test. As a result of the conducted analysis, hypothesis H1 was verified, while H2 was rejected. This means that in relation to the studied sample, despite the strong diversity of the environment and the situation of enterprises, entrepreneurs are characterized by very similar environmental and social values. The declared values are unrelated to the size of the enterprise, its business profile and economic condition.

Keywords: bioeconomy, bio-based materials, cleaner production, values evolution, values' archipelago

Introduction

The troublesome 21st century has brought an increase in political, economic and environmental unrest. The wars and political tensions taking place in the northern hemisphere and economic crises alongside the ongoing Industrial Revolution 4.0 are part of a long-term business cycle known for centuries. Research has confirmed a connection between the Kondratieff cycle and war (Goldstein, 1985). Economic crises stimulate a reassessment of existing social and economic structures, often leading to significant policy changes and shifts in social norms and values (Palley, Rochon and Vernengo, 2012). This was evident after the Great Depression, which was sparked by the lack of control over the actors of the New York Stock Exchange, and which forced a reassessment of the meaning of freedom and the role of the state in the economy. After World War II, the economy of Western countries was dominated by state interventionism and the development of instruments to support society. Work and consumption became a focus point, and the latter began to be perceived almost as a virtue. The oil crises of 1974 and 1980 undermined social democratic values in favor of liberalization and deregulation, basing the economy on the entrepreneur who takes part in the market game, in which the key value is free competition and taking the largest possible share of the market. However, these values were found to be insufficient, and the resulting pathologies led to the financial crisis of 2008, the sources of which Paul Dembinski saw in the lack of moral values (Dembinski, 2011). The shock of the financial crisis was deepened by the COVID-19 pandemic a little over a decade later. The ongoing war in Ukraine, involving a large part of Western countries, the conflict in the Middle East and the risk of more wars, are also part of the process. However, the economic crisis is impacting the process of fundamental systemic changes, and the turbulence of the first quarter of the 21st century seems to be accelerating the transformation towards sustainable development (Loorbach and Lijnis Huffenreuter, 2013).

SDG and the Importance of Goal 12

The sustainable development paradigm is a response to concerns and fears resulting from extreme weather events, irreversible changes in ecosystems, unmet basic human needs and dysfunctional socio-economic structures and institutions. In 2015, 193 UN member states agreed to work towards sustainable development within the 2030 Agenda for Sustainable Development. Sustainable Development Goals (SDG) 2030, which defined a series of social, environmental, economic and systemic aims. The goal that guides the shape and sources of economic growth in the future is SDG 12 – cleaner production and consumption. Numerous studies indicate that SDG 12 is a foundational element for the other goals. Responsible consumption practices directly contribute to SDG 2 (zero hunger) and SDG 3 (good health and well-being). Efforts to reduce food waste, as included in SDG 12, can significantly improve food security and nutrition, closely aligning with ending hunger and improving food availability as part of SDG 2 (Schröder et al., 2019) (Jacob-John et al., 2021). Waste reduction and resource efficiency, achieved under Goal 12, supports economic growth and poverty reduction, which is linked to achieving Goal 1 (eradicating poverty) and Goal 8 (decent work and economic growth) (Pradhan et al., 2017) (Jones, Comfort and Hillier, 2018). The link between SDG 12 and environmental goals is clear. Responsible production practices can lead to positive outcomes for SDG 13 (climate action) and biodiversity goals, through more sustainable farming and business practices that mitigate climate change while protecting natural habitats (Lozano and Barreiro-Gen, 2023). The circular economy – a key tool for SDG 12 – is a common transformative strategy to achieve SDG 11 (sustainable cities and communities). Clean production and consumption also include clean energy production and access to clean water. In summary, one can refer to the conclusions of Bengtsson et al., who argue that the elements of SDG 12 are part of several SDGs, reflecting its transdisciplinary nature. These linkages

mean that an effective implementation of SDG 12 can enable and support the achievement of the related goals.

A key strategy for achieving SDG 12 is to implement economic policies that promote sustainable production practices and encourage responsible consumption habits. Economic growth must be linked to resource efficiency; hence the importance of innovative economic models, such as the circular economy, which focus on minimizing waste and maximizing resource use (Bengtsson et al., 2018). Biological cycles (along with technical ones) are a pillar of circular economy. A sustainable, circular bioeconomy is essential for achieving SDG 12. Based on the priorities of sustainable development, the EU bioeconomy strategy is aligned with the 53 targets included in the 12 SDGs, with synergies arising primarily from clean energy, recycling, protection of ecosystems and agricultural biodiversity (Ronzon and Sanjuán, 2020). Globally, in the context of the analysis of 41 national strategies, research shows the importance of policy support and regulatory measures in achieving sustainable development. The presented findings indicate that a well-managed bioeconomy can significantly support sustainable practices, thus contributing to the broader efforts to achieve this goal (Dietz et al., 2018). But the change on the demand side is also crucial. The popularity of the sharing economy is growing, which may have been caused by social changes during the COVID-19 pandemic (Kraus et al., 2020). Its global market value in 2022 was approximately USD 150 billion. It is forecasted to reach USD 335 billion in 2025 and USD 794 billion by 2028 (Luchian and Doncev, 2023). Although there is still a long way to go before the consumption paradigm can fully change, the trend towards cleaner consumption is growing. The global market for organic products is growing by an average of 10% per year and is estimated to reach \$220 billion in 2026 (Galutskykh and Didorchuk, 2024). The apparel sector is seeing a growing trend of slow fashion consumption, especially among younger consumers. Attitudes and descriptive norms significantly predict slow fashion purchase intentions, which is consistent with a broader societal shift towards sustainable fashion consumption (Van Gogh et al., 2025). 'Greening' labels and products is becoming a sales strategy and a significant added value for consumers. 'Green' labelling increases the willingness to buy environmentally friendly products, especially among people who hold pro-ecological values (Schwartz, Loewenstein and Agüero-Gaete, 2020) (Majeed et al., 2022). The change in processes and behaviors leading to cleaner production and consumption is the result of many phenomena, from building the appropriate institutional framework, through supporting consumer knowledge and producer innovation, to the values of market entities.

Are Values Important for Shaping Economic Systems?

The concept of value is a modern one. It emerged from economics, initially in relation to 'use value' and 'exchange value' (Smith 2005, p. 29), then the value of the goods they acquire in the process of work (Marx, 2015). Later, in the Austrian School approach, economic value was reduced to the subjective assessment of consumers (Menger, 2011). At the same time, at the turn of the 19th and 20th centuries, this concept permeated into neo-Kantian philosophy and phenomenology, taking on an ethical, aesthetic and cognitive dimension. This article interprets values as the normative ideas or principles that define what is considered good, desirable or worthy of recognition in a given culture, society or individual belief system. Values play an orientational and regulatory function, influencing the decisions, attitudes and actions of individuals and social groups, thus shaping the formal and informal institutions that create the market and economic systems. Economic systems and the values professed by communities are closely related. The important values in the period of the natural economy

and feudalism were social hierarchy, community (primarily religious), work and behavior resulting from one's position in the social hierarchy. The beginning of the industrial revolution was associated with the values of the Enlightenment, the primacy of reason, individualism, the spirit of entrepreneurship, the importance of efficiency and the accumulation of capital. Further industrialization and the transition to a mass consumption society strengthened democratic values related to equality and social justice. In the post-industrial period and the 21st century economy, the importance of creativity and innovation increased, criticism of hyper-consumerism appeared, and the trend of social and environmental responsibility in management strengthened. The evolution of the economic order was associated with technological revolution and the evolution of values. These processes are also taking place today. In 1981, R. Inglehart wrote that post-war prosperity had led to a generational shift from materialistic to post-materialistic values in Western societies (Inglehart, 1981). This thesis is supported by further research. Society is moving towards an era of post-materialism, the values of which may pave the way for a sustainable economy, or even an era of post-growth (Booth, 2021). These values primarily include self-fulfillment, individual autonomy, quality of life, tolerance, social diversity and giving priority to ecology and sustainable development. This change in values was described in a book describing the Western society, entitled *Cultural Creatives* (Ray and Anderson, 2000). The main values that the authors identified as distinctive are altruism and self-actualization, alongside idealism, activism, ecological values, engaged action, seeing the world as interwoven and connected and the growing role of women.

Circular Bioeconomy and its Values

These values are reflected in the concept of sustainable development and the resulting approaches to cleaner production of the circular economy and the circular bioeconomy. The bioeconomy is an economic system based on the sustainable production and use of renewable biological resources for the production of food, biomaterials, bioenergy and bioproducts while minimizing the impact on the environment. The bioeconomy aims to close the cycle of matter and energy, support biotechnological innovation and replace fossil raw materials with bio-based alternatives, which contributes to climate change mitigation, biodiversity protection and sustainable socio-economic development (European Commission. Directorate General for Research and Innovation, 2018). However, the bioeconomy is not inherently sustainable and can lead to sustainability conflicts if not managed properly. Simply replacing fossil resources with bio-based resources may not provide additional social or ecological benefits, and may exacerbate ecological and social tensions (Gawel, Pannicke and Hagemann, 2019) (Székács, 2017). Research on the conditions for implementing a sustainable bioeconomy focuses on several key aspects of this process. The first is governance: appropriate policies, strategies and management of the bioeconomy at the macro level. A sustainable bioeconomy requires innovative governance to reduce competitive drawbacks and secure ecological, social and economic sustainability requirements (Gawel, Pannicke and Hagemann, 2019). Also important are decisions regarding spatial planning for resource production and the conservation and restoration of ecosystems at regional and local levels (Grossauer and Stoeglehner, 2023), and above all, creating support systems and developing a sustainable bioeconomy through strategies at the national level (Dietz et al., 2018). Another aspect is the cooperation and involvement of stakeholders (Palmer, Burton and Haskins, 2020). A sustainable bioeconomy is based on proactive stakeholder engagement in planning and governance. This enables an effective integration of economic, social, environmental and technological processes and their widespread

acceptance, and requires participatory approaches that support decision-makers, entrepreneurs and citizens in the transition period (D'Amico et al., 2022). Finally, an often-cited aspect is the approach to bio-resources, their extraction, production and processing. A sustainable bioeconomy depends on innovative technologies (Schütte, 2018) and the development of industrial symbioses (Bijon et al., 2022), which is related to the previous condition, i.e. cooperation of stakeholders. They help to improve the efficiency of biomass use and increase sustainability. Of course, this is under the assumption that such values are the guiding principles of market actors, especially producers and legislators. The implementation of bioeconomy should take into account strong principles of sustainable development, which include not exceeding ecological thresholds and respecting planetary boundaries (Gawel, Pannicke and Hagemann, 2019) (Liobikiene et al., 2019). The word 'should', however, moves the discussion to the normative level; consequently, this perspective seems to apply to all the above-mentioned aspects. The institutional framework and legislation are the result of values declared or implemented by the representatives of legislative structures – in case of the Western civilization, elected in democratic elections – and other stakeholders, who are the driving force of social change. The popularization of the sustainable bioeconomy model requires a change in values that will be simultaneous with social change. This begins with a local social innovation, which is created when the leader of change creates a circle of actors who communicate and act differently from the routine and pressure of the environment. They strengthen their autonomy in order to be able to voluntarily cooperate with other actors and become 'islands' in their environment, which strive to create an 'archipelago'. Their activity consists in developing specific tools, the use of which will enable the realization of their individual and group aspirations. The production of such tools leads at the same time to the emergence of specific forms of cooperation. 'Island actors' create an 'archipelago', strengthening themselves as a community, which allows them to influence their environment. What unites such a community is not only a short-term benefit or interest. Forming an archipelago and incurring the costs associated with it only makes sense when the purpose is something much more than just a benefit, namely, a long-term goal expressed as an idea. The path to social change leads through autonomy ('island') and cooperation ('archipelago'). The strength of a small gravitational system, such as an archipelago, is based on partnership and solidarity, which requires a community of values. The strength and attractiveness of the archipelago depend on every island, not just the largest and best-equipped ones. Such a system can be said to operate on the following principle: that if you want to be stronger, make sure that the weaker ones cooperating with you become stronger (Hausner, Paprocki and Gronicki, 2018). The archipelago metaphor seems to be particularly useful in relation to the emergence of sustainable bioeconomy structures. It requires a new axiological basis in the economy and business, different from the perspective common in the fossil fuel economy. It also requires cooperation between stakeholders at a previously unprecedented level.

Entrepreneur's Personal Values

The analysis of entrepreneurs' values is difficult because of their strong grounding in cultural values, which has been thoroughly researched and described at the turn of the 20th and 21st centuries. The classifications and criteria of cultural differences have been explained in the context of different values that guide entrepreneurs in different parts of the world (Hampden-Turner and Trompenaars, 1995) (Hofstede, Hofstede and Minkov, 2010). An important factor influencing the level of sustainable values may be also the gender of the entrepreneur. Women may place greater emphasis on social values than their male colleagues, which influences their approach

to sustainable practices (Hechavarría et al., 2017). However, research in the first quarter of the 21st century has indicated that a certain community of values is developing among entrepreneurs, regardless of their place of origin. When writing about a different axiological attitude, it is necessary to define the attitudes that characterized the period of the economy based on fossil fuels. In the post-war and Cold War periods, research was conducted to define the values that were key for entrepreneurs and characterized them. In the 1960s, McClelland indicated achievement and power as the main values and motivators of entrepreneurs (McClelland, 1976). In the following decades, the values of entrepreneurs included, in addition to achievements, a sense of internal control and economic values (Cromie and Johns, 1983) (Pandey and Tewary, 1979). Hornday and Bunker write about the desire for money, along with intelligence, creativity, high energy level and achievement as the characteristics of a successful entrepreneur (Hornday and Bunker, 1970). Singh adds competitiveness, punctuality, hard work, upward striving and emotional stability (Singh, 1989) as other key values for entrepreneurs. It seems that the last quarter of the century has brought a certain change in the area of their personal values. The growth of the importance of the personal values, shapes the motivations and intentions underlying entrepreneurial actions, ultimately influencing the types of ventures implemented. Entrepreneurship has an evolutionary character, which reflects the change of personal values over a period of time (Santos et al., 2021) and is therefore associated with changes in the environment. The growing problem of global warming is affecting personal values. Modern entrepreneurs are increasingly motivated by social and ecological concerns in addition to financial aspects (Kaesehage et al., 2019). Businesses with values aligned with sustainable development are more likely to integrate environmental issues into their business models, leading to socially responsible practices (Afshar Jahanshahi, Brem and Bhattacharjee, 2017). Today, entrepreneurs are increasingly recognized as agents of change who are able to solve environmental problems through their business practices. Driven by environmental concerns, they not only create innovative business models, but also redefine conventional notions of success by including sustainability in their core missions (Yasir et al., 2023) (Tehseen and Haider, 2021). However, this does not mean that the change is universal and easily implemented. A study by Arshi & Wallis's has shown that entrepreneurial values inspired by the free-market capitalist economy, which promotes hedonic and selfish consumption, are in conflict with the values of the circular economy. To disrupt and overthrow linear business practices in favor of the circular economy strategy, fundamental changes in value and belief systems are necessary (Arshi and Wallis, 2024). At the same time, evidence from many studies emphasizes that market conditions significantly influence entrepreneurial actions and the values adopted by entrepreneurs. Market dynamics, as emphasized by Zhang et al. (Zhang et al., 2022), plays a key role in shaping the way technology entrepreneurs interact with their environment. Research shows that entrepreneurs' attitudes and values are influenced by the institutional environment. Choices related to the creation of entrepreneurial value are influenced by institutional pillars, such as the regulatory framework, the normative pillar and the cultural pillar, but also by income inequality and economic uncertainty (Diaz Tautiva et al., 2023). Earlier studies indicate that the normative and cognitive dimensions of the institutional environment influence the entrepreneurial orientation of an organization, whereas the regulatory dimension influences the type of entrepreneurial activity of an enterprise (Gómez-Haro, Aragón-Correa and Cordón-Pozo, 2011). Beyond the institutional framework, the level of competition in the market can also shape the attitudes and personal values of producers, as it requires a reassessment of personal and professional priorities (Macha-Huamán et al., 2023). Market uncertainty not only shapes

business strategies, but also strengthens certain entrepreneurial values, such as resilience and adaptability (Holm, Oppen and Nee, 2013). The market for innovative, sustainable bio-based products is still in its early stages, with great growth potential (Hasegawa et al., 2022) (Joseph et al., 2023). Entrepreneurs operating on it, face competition from conventional, unsustainable and much cheaper substitutes. However, in different parts of the world, institutional conditions and, of course, the condition of economic entities on the market of innovative bio-based products are different. In this context, hypotheses (research) were formulated regarding a specific group of entrepreneurs who decided to operate on the circular bioeconomy market.

H1: Entrepreneurs operating in the circular bioeconomy market are characterized by a community of the values, creating 'values archipelago'.

H2: The values of entrepreneurs in the circular bioeconomy market depend on the market situation in which they find themselves and economic condition of their entity.

Material and Methods

The study is a pilot for broader research on the conditions for transformation towards a circular economy and bioeconomy. It was conducted in 2024. The study population consisted of managers and owners of business entities that specialize in the production of bio-based materials and goods and operate in the bioeconomy market. Participation in the study was voluntary. The survey was sent by e-mail to 300 potential business entities. A return rate of 13% was obtained, of which 31 sheets were completed correctly and were analyzed. The addresses of business entities were obtained from the open database <http://materialdistrict.com>. The sample selection was purposeful. The sample entities were entrepreneurs producing construction and finishing materials and interior furnishings from biomass, which is a by-product (waste) of other processes, biomass from primary production and biomass produced by microorganisms and fungi. The study focuses on a very specific group of manufacturers in the bioeconomy sector, specialising in the production of bio-based materials (Figure 1).

This is a specific group of bioeconomy stakeholders, which gives biomass a relatively high added value. Twenty-three producers base their production on raw materials, which are the by-products of other biomass processing processes (agricultural and food production waste, dung human hair and feathers) and the activity of living organisms used to process the biomass, i.e. mycelium and fermentation microorganisms. Nine producers use raw materials from primary production (wood, grass, jute, hemp, sugar cane, plant roots, flax and bamboo). The structure of the sample is described in Figure 2 and Table 1.

The entrepreneurs who took part in the study represented 11 countries from 4 continents. The sample was dominated by small enterprises whose turnover in the bioeconomy sector did not exceed EUR 100,000 and small companies employing from 2 to 10 employees.

The survey was conducted using a survey questionnaire made available online. The survey consisted of 25 questions regarding: personal values of the respondents (V1–V11), assessment of the bioeconomy product market (MA12–MA18) and assessment of the functioning of each respondent's enterprise in this market (RC19–RC25). The answers to the questions were marked on a Likert scale (1–10). The research results were subjected to statistical analysis. An analysis of variance was conducted, which is a measure of variability and indicates the degree of dispersion of values in the data set. The aim of the analysis was to determine the convergence of values represented by the surveyed entrepreneurs and the community of experiences in the bioeconomy market. In the next step, a Spearman correlation test was conducted. The Likert scale was treated as an ordinal scale (Jamieson, 2004). The aim of the analysis was to determine the correlation between the values and experiences in the bioeconomy market and the size of enterprises measured by turnover (Kotane, 2015) and the number of employees (Kobayashi et al., 2019). The interdependences between the type of raw material used, country of origin and the declared values and observations of the respondents were examined using the Kruskal-Wallis test.

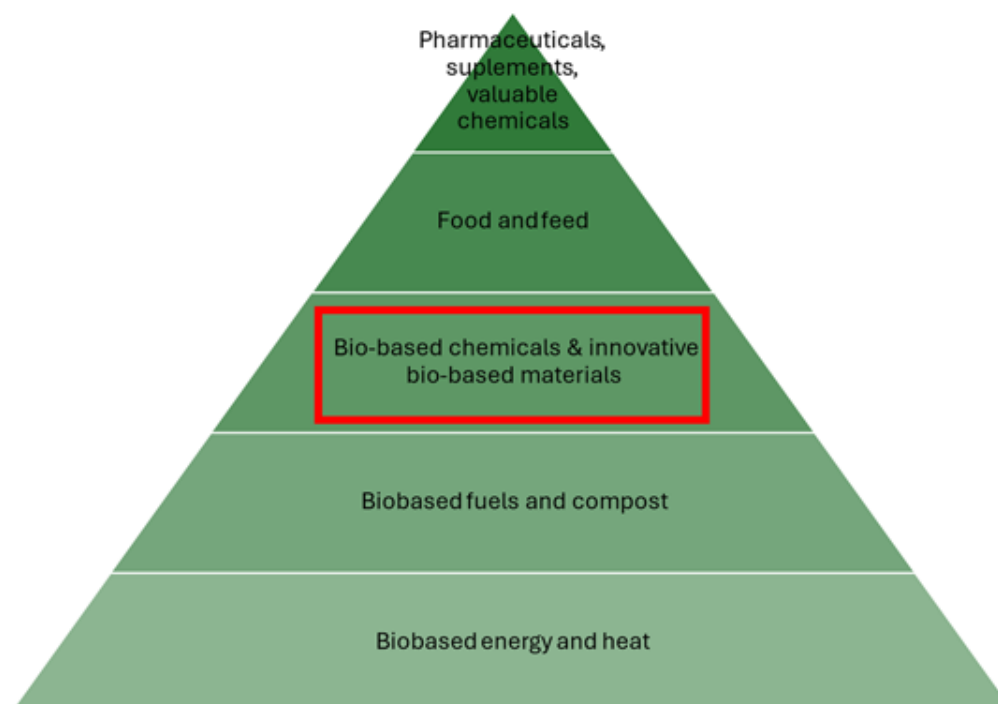


Figure 1 Bioeconomy product value pyramid

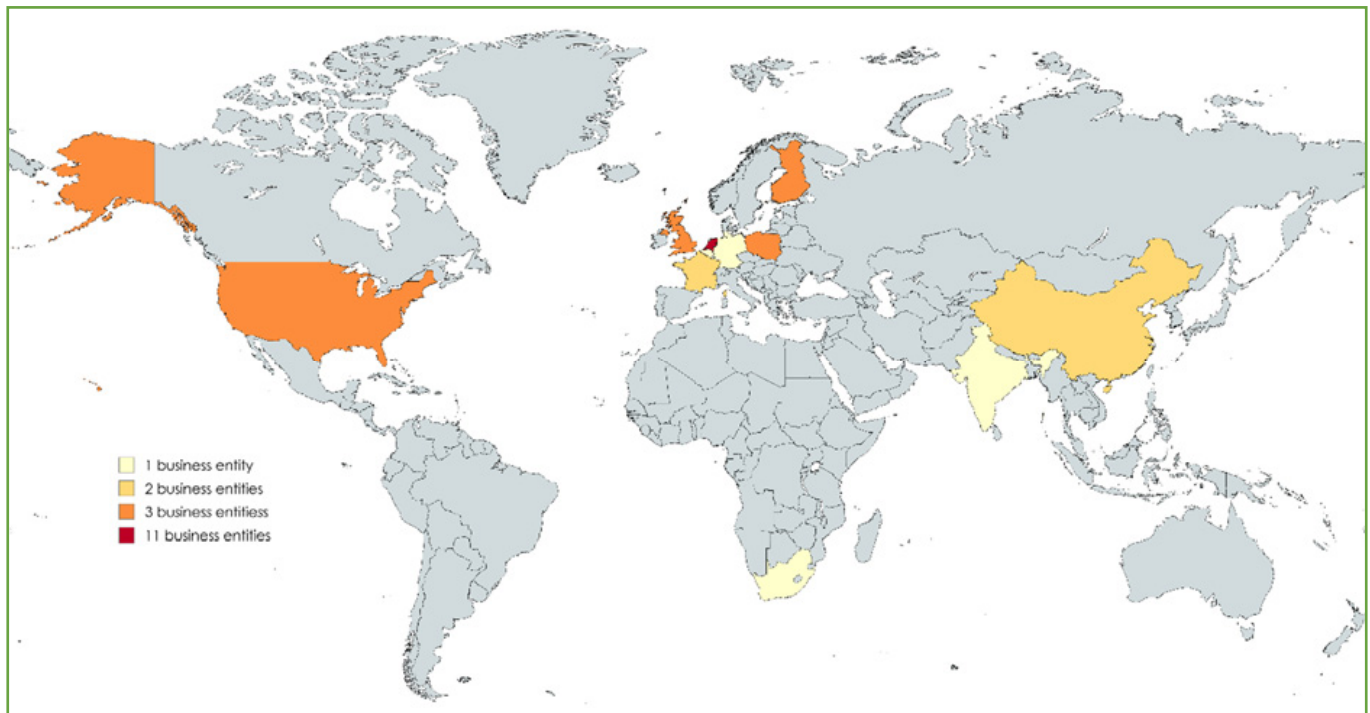


Figure 2 Countries of origin of the research sample

Table 1 Turnover and number of employees in the research sample companies

Estimated annual turnover in the area of biobased materials	10,000–100,000 €	101,000–500,000 €	501,000–1,000,000 €	1,001,000–5,000,000 €	5,000,000–10,000,000 €	>10,000,000 €
	15	2	5	5	0	4
Number of employees	freelance					
	8	12	7	3	1	

Results

In the first part of the survey, respondents declared the values they identified with as business owners. In the next part, they assessed the situation on the bioeconomy products market, and in the last part, they referred to the condition of their companies in the context of bioeconomy.

Values (V1 – V11)

Respondents rated the importance of a set of values on a scale from 1 to 10, where 1 meant 'Not at all important', and 10 meant 'Very important'. Eleven questions (V1–V11) concerned environmental, social and market values

(Figure 3, section V1–V11). An analysis of variance was performed for the obtained results (Table 2).

The variance informs, how much changeability there is in the results in a given data set. A low variance indicates a high degree of agreement in the respondents' answers. The lowest level of variance was recorded for social and environmental values. The answers to the questions about values related to market position and market relations were more diversified, whereas those related to market success were the most diversified. An analysis of the variance of the answers to the questions from the first group (values) indicated that the surveyed entrepreneurs shared a common set of environmental and social values, which seemed to be a priority for the surveyed group (Figure 3).

Table 2 Variances of answers to all questions

	Question	Variance	Category of the question
V1	safety of the materials we offer	0.59	environmental, social and market values
V2	reduction of the negative impact on the environment	0.90	
V3	use of renewable resources	1.24	
V4	avoidance of waste	0.80	
V5	a strong position and lasting presence on the market	4.12	
V6	good co-operation and satisfaction of raw material suppliers	2.58	
V7	profitability of production of the bio-based material	2.72	
V8	a pioneering role in the development and production of materials and composites	3.96	
V9	development of the company	3.11	
V10	being in line with my personal values and the company's mission/vision	1.03	
V11	flexibility in responding to market expectations	2.00	
MA12	I notice the development of the market for bio-based materials	2.40	assessment of the situation on the bio-based goods market
MA13	I notice a positive interest in bio-based materials from customers and contractors	3.24	
MA14	I notice doubts and concerns from customers and contractors regarding the use of bio-based materials	6.36	
MA15	the problem with the production of bio-based materials is the lack of consistent quality and properties of the biological raw material	4.29	
MA16	the problem with the production of bio-based materials is the stability and timeliness of the supply of biological raw materials	6.17	
MA17	the problem with the production of bio-based materials is the regulations and standards that restrict the development of the market for bio-based materials	6.90	
MA18	the level of competition in the market for bio-based materials is	3.43	evaluation of the operation of the entrepreneurs' companies on the bio-based goods market
RC19	the sales volume of my product is satisfactory	6.14	
RC20	I easily gain new customers/clients	5.50	
RC21	the profitability of the production of my material is satisfactory	5.56	
RC22	I intend to continue my activities related to the production of bio-based materials	1.11	
RC23	the energy consumption for the production of my material is	5.66	
RC24	the water consumption in the production of my material is	4.49	
RC25	the labour intensity in the production of my material is	7.25	

**Figure 3** Variances of the declared values

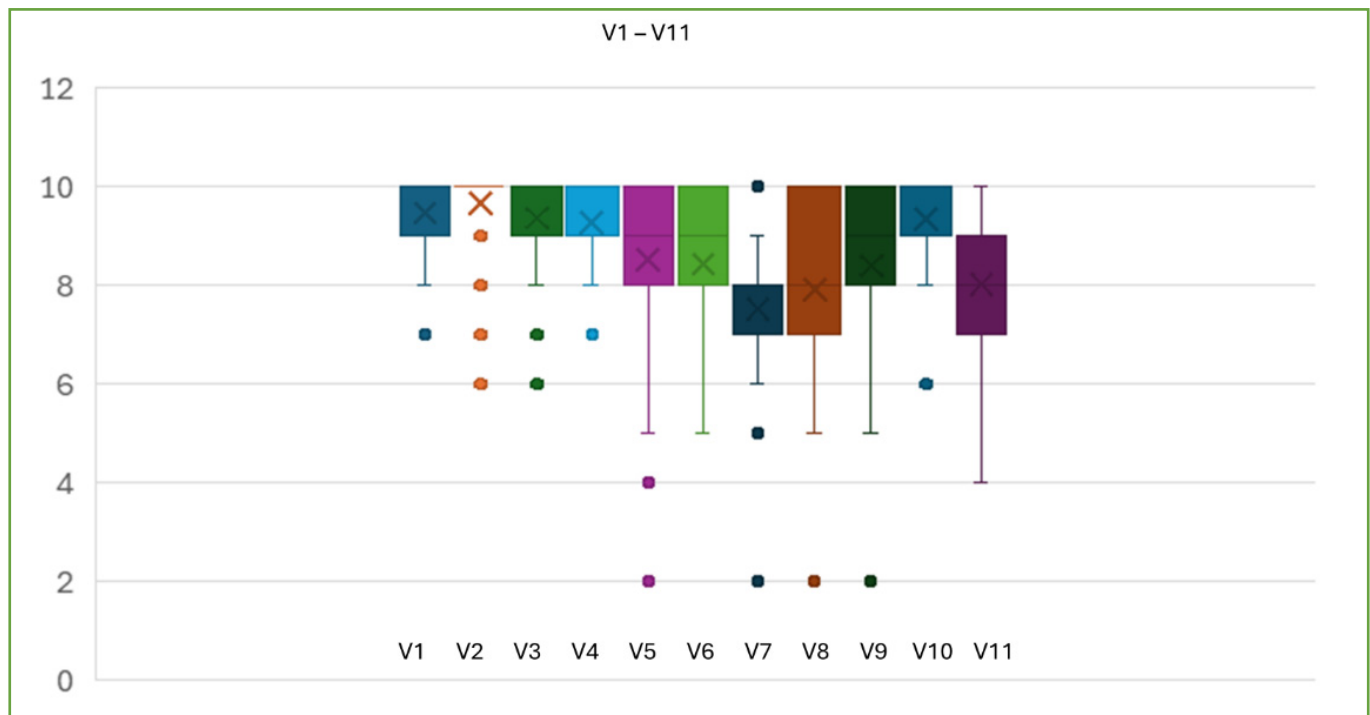


Figure 4 Box plot: Values

The importance of product safety, limiting environmental pressure, reducing waste and compliance with personal values characterized all surveyed entities. A detailed analysis of the declared values is presented in the box plot (Figure 4).

Most variables had high medians (above 8). The median in most boxplots ranged between 8 and 9, which indicated generally positive assessments for all variables and a low level of variability for most variables. This low variability proved the agreement between the respondents. The boxes were relatively narrow, which means that most answers were concentrated around the median. There were individual outliers and a right-skewed distribution, but most assessments were high, and the mean was lowered by individual cases.

In the next step, the Spearman correlation test was conducted to determine possible correlations resulting from the economic potential of the surveyed enterprises (Table 3). The Likert scale used was assumed to be ordinal. The scale assigns numerical values to qualitative answers, ranging from 'strongly disagree' to 'strongly agree', which allows for the ranking of attitudes, but does not guarantee that the intervals between the possible answers are equal or mathematically significant (Leonor, Easud and Fernando, 2022; Gardner and Martin, 2007).

Declared values (V1–V11) in two cases turned out to be interdependent with the number of employees of the surveyed companies. The Spearman test result showed the existence of a moderate, negative correlation between avoiding waste generation and being in line with personal values and the number of employees. These relationships seem to be understandable – with a larger number of employees, it is necessary to look for compromises. At the same time, the Kruskal-Wallis test, which was used to examine the differentiation of responses depending on the biomaterial used and the country, did not show any differentiation of the entrepreneurs' values (V1–V11) in these respects.

Market and the Company

The community of values in the study group did not result from similar experiences or a similar environment of market entities. In relation to the variance of answers to the questions related to the assessment of the bio-based products market (MA) and one's market situation (RC), the level of variance was higher than in the case of social and environmental values. This is understandable, as the entrepreneurs operated in different institutional environments and used different processes. An exceptionally low level of variance (1.11) was noted in relation to the declaration of the intent to remain on the bio-based products market. Figure 5 presents the comparative levels of variance for the assessment of the bio-based products market and the situation of one's enterprise.

There was a fairly high level of agreement among respondents regarding staying on the bio-based products market, which can be interpreted in the context of the potential of bio-based materials that they perceived. Entrepreneurs fairly commonly noticed a positive increase in interest in bio-based materials and a growing competition on this market. However, they did not share problems related to production (labor-, water- and energy-intensity) and perception of the problems related to the biomaterials market.

The perception of the market and one's company was found to be interdependent in several areas with the size of the surveyed business entities. The company's turnover showed a significant correlation with satisfaction with the sales volume observed in one's company and the profitability of the business, which is logical and requires no comment. A negative, statistically significant correlation was also shown between turnover and the intention to stay in the bioeconomy sector. To examine the differences in the responses according to the main type of raw material used for production, the Kruskal-Wallis test was used, the purpose of which is to compare the medians of more than two groups. With respect to the analysis of the answers to each question, a null hypothesis was put forward that

Table 3 Correlation between turnover, number of employees and given answers

	Question	Turnover	No. of employees
V1	Safety of the materials we offer	not statistically significant, $r(29) = 0.09, p = 0.627$	not statistically significant, $r(29) = 0.06, p = 0.754$
V2	Reduction of the negative impact on the environment	not statistically significant, $r(29) = 0.14, p = 0.459$	not statistically significant, $r(29) = 0.04, p = 0.814$
V3	Use of renewable resources	not statistically significant, $r(29) = 0.09, p = 0.645$	not statistically significant, $r(29) = -0.24, p = 0.185$
V4	Avoidance of waste	not statistically significant, $r(29) = -0.21, p = 0.247$	a moderate, negative correlation between the avoidance of waste and number of employees; the correlation between the avoidance of waste and number of employees was statistically significant, $r(29) = -0.36, p = 0.046$
V5	A strong position and lasting presence on the market	not statistically significant, $r(29) = -0.25, p = 0.18$	not statistically significant, $r(29) = -0.14, p = 0.462$
V6	Good co-operation and satisfaction of raw material suppliers	not statistically significant, $r(29) = -0.22, p = 0.232$	not statistically significant, $r(29) = -0.15, p = 0.421$
V7	Profitability of production of the bio-based material	not statistically significant, $r(29) = -0.07, p = 0.689$	not statistically significant, $r(29) = 0.24, p = 0.189$
V8	A pioneering role in the development and production of materials and composites	not statistically significant, $r(29) = -0.17, p = 0.357$	not statistically significant, $r(29) = -0.06, p = 0.769$
V9	Development of the company	not statistically significant, $r(29) = -0.11, p = 0.542$	not statistically significant, $r(29) = 0.17, p = 0.363$
V10	Being in line with my personal values and the company's mission/vision	not statistically significant, $r(29) = -0.1, p = 0.583$	a moderate, negative correlation between being in line with my personal values and the company's mission/vision and number of employee; the correlation between being in line with my personal values and the company's mission/vision and number of employees was statistically significant, $r(29) = -0.38, p = 0.034$
V11	Flexibility in responding to market expectations	not statistically significant, $r(29) = 0.16, p = 0.386$	not statistically significant, $r(29) = 0.16, p = 0.394$
MA12	I notice the development of the market for bio-based materials	not statistically significant, $r(29) = 0.3, p = 0.096$	not statistically significant, $r(29) = 0.17, p = 0.375$
MA13	I notice a positive interest in bio-based materials from customers and contractors	not statistically significant, $r(29) = 0.2, p = 0.288$	not statistically significant, $r(29) = 0.28, p = 0.133$
MA14	I notice doubts and concerns from customers and contractors regarding the use of bio-based materials	not statistically significant, $r(29) = -0.15, p = 0.435$	not statistically significant, $r(29) = 0.04, p = 0.827$
MA15	The problem with the production of bio-based materials is the lack of consistent quality and properties of the biological raw material	not statistically significant, $r(29) = -0.11, p = 0.572$	not statistically significant, $r(29) = -0.04, p = 0.815$
MA16	The problem with the production of bio-based materials is the stability and timeliness of the supply of biological raw materials	not statistically significant, $r(29) = -0.1, p = 0.611$	not statistically significant, $r(29) = -0.04, p = 0.835$
MA17	The problem with the production of bio-based materials is the regulations and standards that restrict the development of the market for bio-based materials	not statistically significant, $r(29) = -0.2, p = 0.277$	not statistically significant, $r(29) = 0.12, p = 0.521$
MA18	The level of competition in the market for bio-based materials is	not statistically significant, $r(29) = 0.16, p = 0.387$	not statistically significant, $r(29) = 0.01, p = 0.948$
RC19	The sales volume of my product is satisfactory	a high, positive correlation between the sales volume of my product is satisfactory and Turnover; the correlation between the sales volume of my product is satisfactory and Turnover was statistically significant, $r(29) = 0.51, p = 0.004$	not statistically significant, $r(29) = 0.29, p = 0.11$
RC20	I easily gain new customers/clients	not statistically significant, $r(29) = 0.33, p = 0.069$	not statistically significant, $r(29) = 0.35, p = 0.051$
RC21	The profitability of the production of my material is satisfactory	a moderate, positive correlation between the profitability of the production of my material is satisfactory and Turnover; the correlation between the profitability of the production of my material is satisfactory and Turnover was statistically significant, $r(29) = 0.37, p = 0.038$	not statistically significant, $r(29) = 0.14, p = 0.441$
RC22	I intend to continue my activities related to the production of bio-based materials	a moderate, positive correlation between I intend to continue my activities related to the production of bio-based materials and Turnover; the correlation between I intend to continue my activities related to the production of bio-based materials and Turnover was statistically significant, $r(29) = 0.4, p = 0.027$	not statistically significant, $r(29) = 0.08, p = 0.675$
RC23	The energy consumption for the production of my material is	not statistically significant, $r(29) = -0.11, p = 0.566$	not statistically significant, $r(29) = 0.23, p = 0.203$
RC24	The water consumption in the production of my material is	not statistically significant, $r(29) = -0.08, p = 0.662$	not statistically significant, $r(29) = 0.25, p = 0.169$
RC25	The labour intensity in the production of my material is	not statistically significant, $r(29) = -0.07, p = 0.706$	not statistically significant, $r(29) = -0.12, p = 0.538$

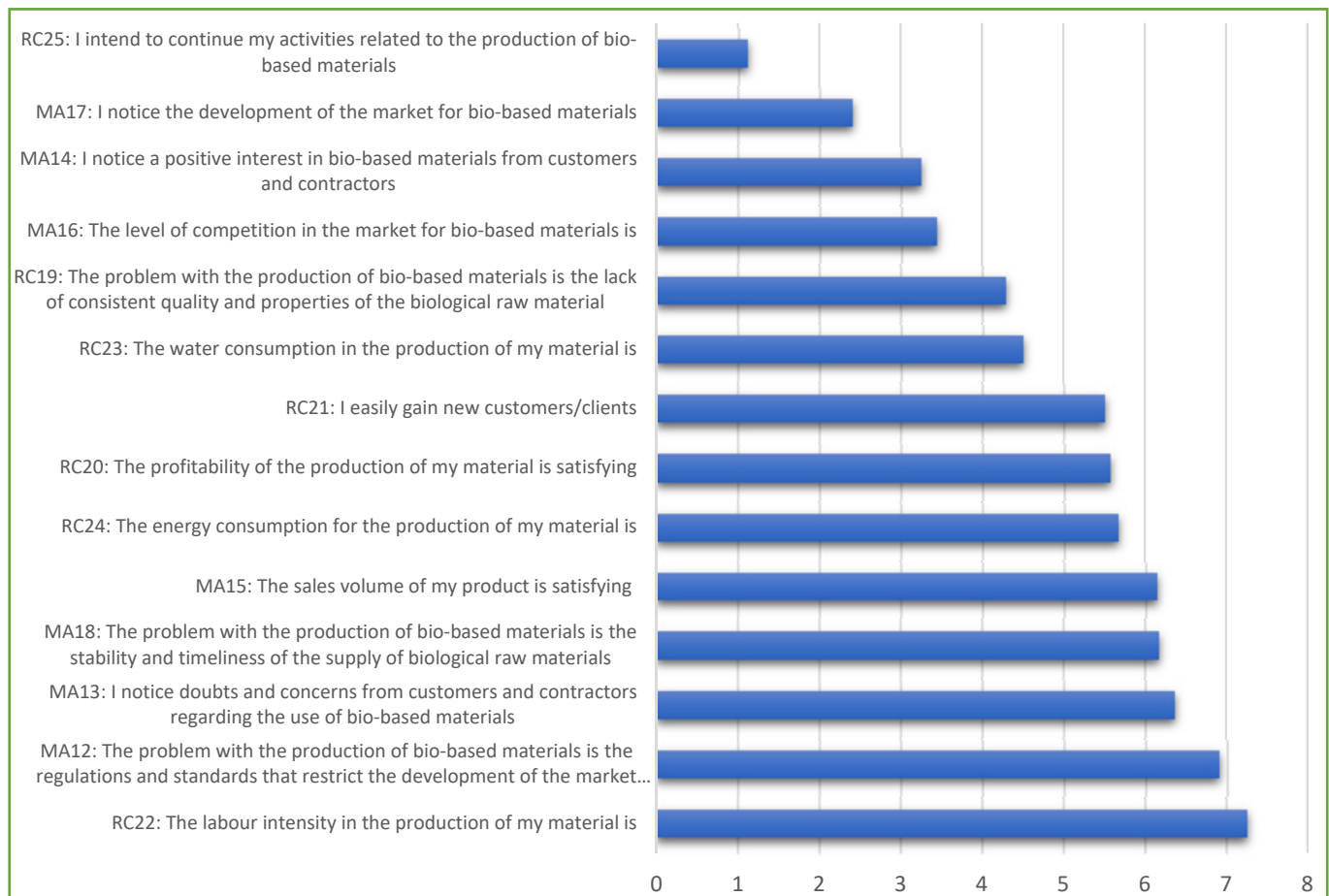


Figure 5 Variance of the assessment of the bio-based market

there was no difference between the categories of answers to the questions in the area of independent variables in the context of dependent variables. No statistically significant differences were found in the answers provided to any of the questions. In the studied group, neither the type of biological raw material nor the values declared by the entrepreneurs differentiated the perception of the market or the entrepreneur's own situation. In relation to the differentiation of answers depending on the respondent's country, a Kruskal-Wallis test showed that there was a significant difference between the categories of the independent variable with respect to the dependent variable. The profitability of the production of my material is satisfactory, $p = 0.048$. Consequently, based on the available data, the null hypothesis was rejected. A Dunn-Bonferroni test was used to compare the groups in pairs to determine which was significantly different. Despite the significant difference in the Kruskal-Wallis test, no pairwise group comparison was significant in the Dunn-Bonferroni test; all adjusted p values were greater than 0.05. Therefore, there were certain differences in satisfaction with the profitability of the production of the material, which were interdependent with the country of operation, but their localisation is difficult.

The box plot (Figure 6) illustrates the specificity of the answers to the questions about the perception of the bioeconomy market by the surveyed entrepreneurs. The MA12 I notice the development of the market for bio-based materials variable (orange boxplot) had a median of close to 8 and a low variability, although a few outliers were visible, but most answers were in the range of 8–9. The development of the bio-based products market was, therefore, clearly noticed by the producers. The median and the MA13 I notice a positive interest in bio-based materials

from customers and contractors (grey boxplot) showed an even distribution in the range of 6–9, with no strong outliers. Producers observed rather positive consumer behaviors and attitudes towards bio-based products on the market. The answers to MA14 I notice doubts and concerns from customers and contractors regarding the use of bio-based materials (yellow boxplot) were more diverse. The median response was around 7, but the variability was high, indicating more diverse opinions among the respondents. MA15 The problem with the production of bio-based materials is the lack of consistent quality and properties of the biological raw material (blue boxplot) had a median of close to 5, but the whiskers extended from 2 to 8, the widest interquartile range, indicating a high variability in the responses. Although most producers did not report that variable biomass quality was a problem, some of them indicated this phenomenon as a weakness in bio-based production. However, the country of origin, the type of raw material used or the size of the company did not significantly correlate with this opinion. The respondents were slightly more likely to agree with the statement MA16 The problem with the production of bio-based materials is the stability and timeliness of the supply of biological raw materials (green boxplot), the median of which was 7, and the long upward whisker indicated several strong agreements with this opinion. MA17 The problem with the production of bio-based materials is the regulations and standards that restrict the development of the market for bio-based materials (dark blue boxplot) has a median between 6 and 7 and showed a moderate variability of responses and no outliers, but the graph indicates that producers did not assess the regulations and standards of the bioeconomy at a very high level, even though the study was conducted in a strongly international

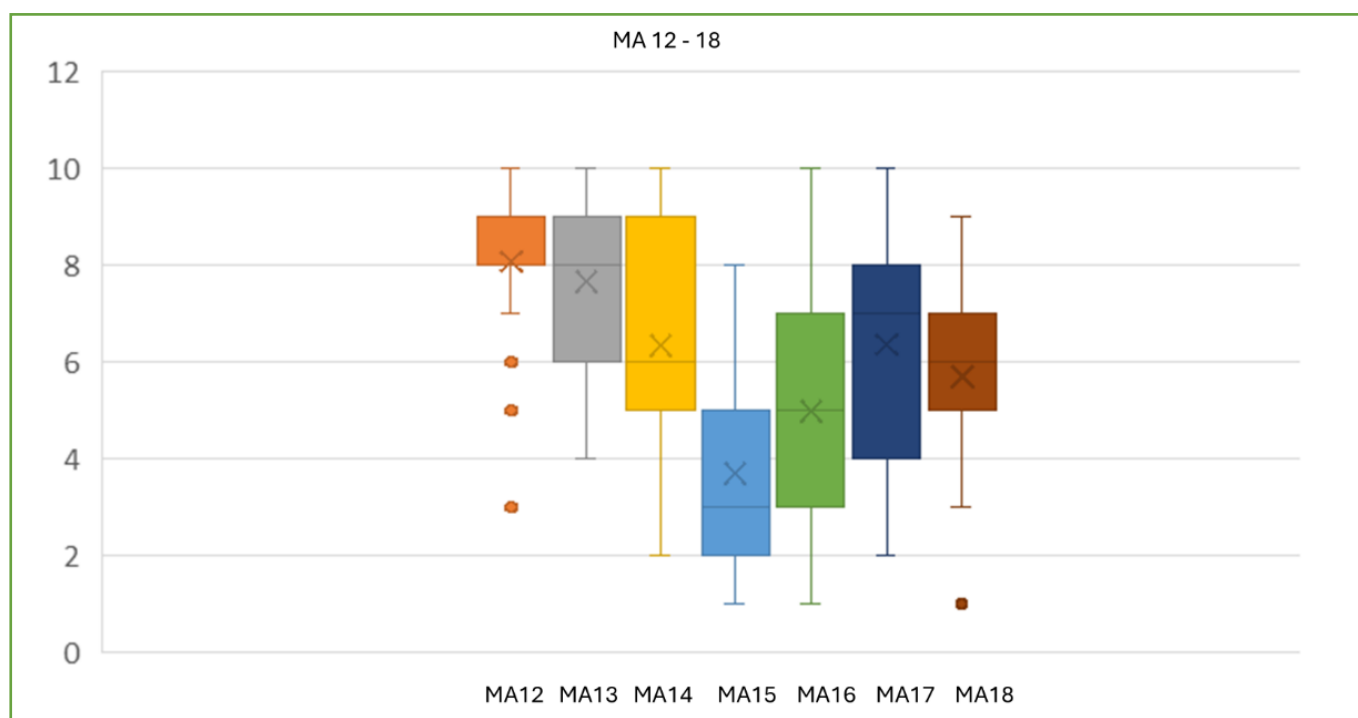


Figure 6 Box plot: Market assessmentt

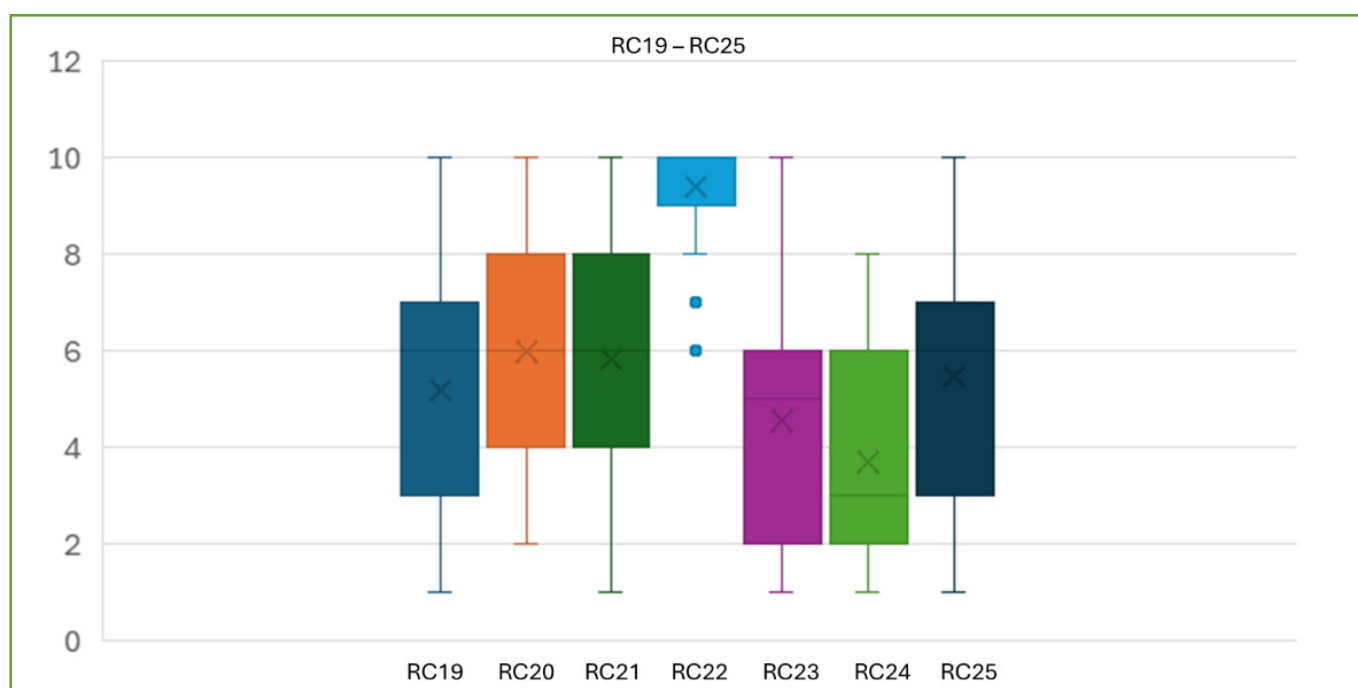


Figure 7 Box plot: own company assessment

environment. In the case of MA18 The level of competition in the market for bio-based materials is... (brown boxplot), the median was 7, but there was an outlier, where according to the respondent, there was practically no competition on the market for bio-based products. However, he remained an isolated case. In the opinion of the majority, competition was moderate. No respondent rated it at the highest level of 10.

Declarations regarding the activities of companies owned (managed) by the respondents showed the greatest degree of differentiation. Respondents are very unanimous only about continuing production based on biomass (RC22). Sales volumes (RC19) and energy and water intensity (RC23, RC24) are the most diverse – this indicates a lack of a uniform approach to technological solutions in the sector. Profitability (RC21) and ease of acquiring customers (RC20) are assessed moderately positively, but not without problems. Labor intensity (RC25) remains at an average level – companies may have challenges in terms of optimizing employment or automation.

Discussion and Conclusion

The research sample, diversified in terms of geography, raw materials and economy, turned out to be very uniform in the context of professed personal values. In the entire sample, all respondents indicated the highest importance of socio-environmental values. Product safety, avoiding waste, reducing the impact on the environment and operating in accordance with one's values accounted for practically all the surveyed entities, in addition to the declaration of continuing to use biomass in further production. As the analysis showed, these values were not dependent on either the perception of the situation in the circular bioeconomy product market or the situation of one's company. Both the perception of market dynamics, competition and relations with other stakeholders, as well as the assessment of the market position of one's own company were strongly diversified. The environment in which the participants operated and the company's condition were not related to the core values of the entrepreneurs. Therefore, the hypothesis (H1): Entrepreneurs operating in the circular bioeconomy market are characterized by a community of the values, creating 'values archipelago', can be considered as verified. One can refer here to the notion of the 'archipelago of values' (Hausner, Paprocki and Gronicki, 2018) among the entrepreneurs operating in this very specific market niche of bio-based materials, products and solutions derived from them. These archipelagos of values among small and medium-sized enterprises can create a real alternative to international corporations, through transaction platforms, industry organizations and certification institutions (Biga et al., 2017). One such archipelago, consisting of hundreds of producers, is for example the materialdistrict.com. The development of the archipelago and the inclusion of new 'islands' sharing the same values is perhaps a harbinger of the emergence of a new type of market structure and entry into a new stage of the evolution of the economic system. It should also be added here that the identified community of values concerns primarily non-economic issues: social and environmental.

In the context of the obtained answers and results, it should be stated that the second hypothesis H2: The values of entrepreneurs in the circular bioeconomy market depend on the market situation in which they find themselves and economic condition of their entity is false. The pro-environmental values of bio-based product producers are not the result of their specific market position nor the result of the impact of the closest economic environment in which they operate. In the opinion of the surveyed entities, the bio-based products market is developing dynamically, although it is not easy for all respondents. Respondents experience various problems both

from the institutional environment and in their own businesses, the energy, water and labor consumption of which are very diverse. Despite this, almost the entire surveyed group is strongly motivated to keep using biomass as a raw material for production. However, this variable is interdependent with turnover, with low turnover being interdependent with low motivation to stay on the biomass market. Unsurprisingly, turnover is also interdependent with satisfaction with the level of sales and the assessment of the cost-effectiveness of sales in the surveyed entities. Respondents remain on the bioeconomy market primarily due to their beliefs and values. The key to its development is a dissemination of these values and promoting bioeconomy products among consumers and all stakeholders, of the bioeconomy, because it is the socio-environmental values that are the main motivator in the surveyed group, rather than market opportunism. The economic aspect and the ability to survive on the market without having to compromise on values is the second condition for the transformation towards a bioeconomy.

Limitations

The conducted study serves as a pilot for further research on the evolution of value in an economy based on a closed cycle. It does not have a representative value for the population of bio-based product producers, because its biggest limitation is the small research sample. This may result from the limited identification of respondents with the category of 'bioeconomy', the lack of relational embeddedness of the study, as well as structural barriers characteristic of SMEs in the bio-based sector. Despite the limited size of the sample, its composition was characterized by a high level of geographical and typological diversity (in terms of type of activity, scale of production, raw materials used), which allows for capturing the multiplicity of perspectives in a niche, poorly researched segment of the bioeconomy. The results should be interpreted as a qualitative insight into the complexity of the market and organizational conditions from the perspective of pioneers and entities operating on the fringes of the mainstream economy.

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Contact address

Małgorzata Pink
University of Agriculture in Krakow, Poland//
Uniwersytet Rolniczy im. Hugona Kołłątaja w Krakowie
Department of Economics and Food Economy//
Katedra Ekonomii i Gospodarki Żywnościowej
✉ malgorzata.pink@urk.edu.pl
<https://orcid.org/0000-0002-3390-4140>

