

GRAPPLING WITH BIOECONOMY RESEARCH AND DISCOURSE IN NIGERIA – MIXED METHOD TO THE RESCUE

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Very little is known about public understanding, awareness, and perception of bioeconomy in Nigeria where its adoption is scant. Addressing this problem, we adopted a mixed method research design study to investigate the level of understanding, perception, and awareness of bioeconomy and its products among 550 Lagos residents', 500 survey respondents and 50 focus group participants. Results revealed self-assessed moderate understanding and positive perception of bioeconomy, but poor knowledge of bioeconomy products. The recommendation is that bioeconomy development initiatives should target improvement of individuals' knowledge of bioeconomy, and awareness of bioeconomy products, and reinforce environmental benefits, and climate action attributable to bioeconomy to drive its adoption among the populace.

Keywords: bioeconomy, bio-based, climate change, sustainability, Nigeria

Introduction

Over the last two decades, there has been high priority on the expansion of bioeconomy as an engine of sustainable development (Calicioglu and Bogdanski, 2021; Venkatraman et al., 2021), and specifically as an innovation for combating climate change (Yang et al., 2021; Dees et al., 2023). Bioeconomy is not an entirely new concept in Africa. Traditional African economies were bio-based relying on nature for food, medicines, fuel and building material. However, adoption of advanced bioeconomy and sustainably refined bioeconomy products is scant in Africa (Ncube et al., 2022; Fertahi et al., 2023). Only South Africa has a dedicated bioeconomy strategy on the continent, though other countries do have some bioeconomy-related policies and initiatives, but there is no evidence of any significant positive impact by bioeconomy on the African economy and society at large (Abass et al., 2021). Furthermore, bioeconomy potentials of African countries are poor when compared with those of countries with dedicated bioeconomy policies or strategies (Oguntuase and Adu, 2021).

Adoption and diffusion of bioeconomy and its products is critical to overcome challenges associated with petroleum-based economy, such as price escalation, non-renewability and environmental pollution to build a more sustainable, more prosperous, and more inclusive Nigerian society with plenty of opportunities for multiple positive socio-economic impacts such as green growth, job creation, rural regeneration, and ensure sustainable livelihoods. To increase the share of bioeconomy products in the Nigerian consumer market, one needs to answer the following questions towards making them appealing to consumers: What is the level of understanding and perception of bioeconomy? Do they appreciate the values embedded in a bioeconomy? Are they aware of bioeconomy products? Despite the boost in bioeconomy-related literature in recent years, literature search shows these questions have not been answered in Nigeria context, if even Africa, where knowledge base for the bioeconomy is poor and lags behind most countries (Faleke et al., 2021; Mougnot and Doussoulin, 2022). What is clear, then, is that the desirable first step to expand epistemology and discourses to complement the sparse literature on bioeconomy in Africa is to answer the above research questions.

Material and methods

Research design

Due to the novelty of the study's objective and the need to ensure that no important aspect was overlooked, this study adopted a mixed method research design, comprising questionnaire-based survey, and focus group study to analyze a total of 550 Lagos residents' responses.

Study population and sampling procedure

The 50 voluntary participants in the focus group study were selected through a convenience sampling method among the researcher's personal contacts that have shown interest in transition to low-carbon technology in the past. All the participants met the following criteria as specified by Sijtsma et al. (2016) to ensure the study focuses on the consumers and not those ones who have more or specific knowledge or expertise about bioeconomy.

The sample size of the survey study was calculated using the simplified formula by Yamane (1967). The Yamane formula is:

$$n = N/1 + N(e)^2$$

where: n – the sample size; N – the population size; e – the margin of error

Based on Lagos' estimated population of 21 million people, the calculated sample size was approximately 400. However, to overcome risks of nonresponses or poorly answered questionnaires the number obtained was divided by the expected response of 80% which is considered acceptable (see Fincham, 2008) to get 500 as study population. Proportional stratified random sampling was employed to distribute questionnaires with constructs items in Table 1 among the accessible population. The survey was carried out between February 2022 and July 2022. The process of sorting the collected data revealed 35 uncompleted responses amongst the 500 questionnaires administered.

Research instrument

Two close-ended question items comprising of one dichotomous item and one five-point Likert-type scale item were employed in the survey study as shown in Table 1.

Table 1 Survey study constructs items

Item	Statements	Possible answers
Awareness of bioeconomy	Have you heard about bioeconomy before?	1 – yes 2 – no
Knowledge of bioeconomy products	I have sufficient knowledge of bioeconomy products	1 – strongly agree 2 – agree 3 – unsure 4 – disagree 5 – strongly disagree

Source: Compilation of the authors

The operationalization of the two-in-one focus group study was based on the Kotler's stimulus-response theory (Kotler, 1965) as adapted from Stern et al. (2018). The first task of the focus group study was for the participants to associate 33 keywords with bioeconomy. The keywords include one fictitious term, enfusent, as a validity check. The second task tested the participants' awareness of bioeconomy products that can be produced using bio-based materials by asking a simple question: I am aware that the following items can be produced using bio-based materials (Gaffey et al., 2021).

Ethical consideration

While ethical approval was not required for this study, critical ethical principles of freely-given consent, anonymity, confidentiality, and withdrawal for survey were observed. The nature and purpose of the survey were explained and the respondents were asked for verbal consent before the questionnaires were administered.

Results and discussion

Demographic data of study respondents and participants

There was fairly even distribution among the survey study respondents and the focus study group participants and respondents. There are 50 participants involved in the focus group study: 23 participants were female, 16 participants have postgraduate degrees, 29 are graduates, and 5 are non-graduate. The respondents included 237 male (50.97%) respondents and 228 female (49.03%) respondents. Nearly a quarter of the respondents (24.73%) were 25 years old and below, followed by those aged between 26 and 41 years (23.65%), between 42 and 57 years (22.37%), then between 58 and

76 years (16.56%) and ≥ 77 years old (12.69%). Furthermore, 38.50% of the respondents were single ($n = 179$), 35.70% were married ($n = 166$), about a tenth are separated ($n = 48$) while the remaining respondents were equally divorced or widowed ($n = 36$). The respondents had different levels of education, beginning with secondary school (21.94%), followed by Nigeria Certificate in Education (NCE) and equivalent National Diploma (ND) (23.01%), bachelor's degree and its equivalents (40.00%), and master's and above (15.05%).

Survey study respondents' awareness of bioeconomy and knowledge of bioeconomy products

Results indicated that, so far, Lagos residents have limited awareness of bioeconomy with nearly half of the respondents having heard about bioeconomy before. A total number of 236 respondents, 51 percent of the respondents, have not heard about bioeconomy as presented in Figure 1. The respondents' knowledge of bioeconomy products is presented in Figure 2. Majority of the respondents in the survey study are either unsure or do not have sufficient knowledge of bioeconomy products.

Focus study participants' understanding and perception of bioeconomy

The results showed that focus group study participants linked all the relevant 32 keywords to bioeconomy but some keywords were mentioned more often than others. Figure 3 presents the frequency of occurrence of the keywords in the results of the word association exercise with. Bio-based was mentioned 50 times, Replacement of Fossil Fuel 37 times, Sustainability 35 times, Climate Mitigation 32 times, and Greenwashing 19 times. The participants were able to detect the fictitious word – enfusent. This showed the participants were attentive and their responses are not a reflection of random responses or social desirability bias.

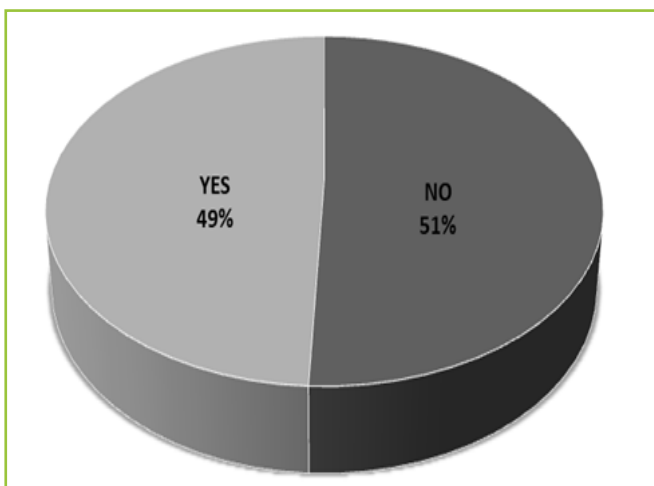


Figure 1 Survey study – Awareness of bioeconomy
Source: Own research, 2022

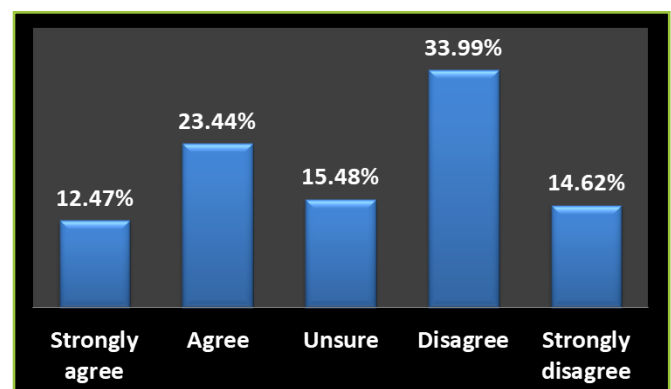


Figure 2 Survey study – Knowledge of bioeconomy products
Source: Own research, 2022

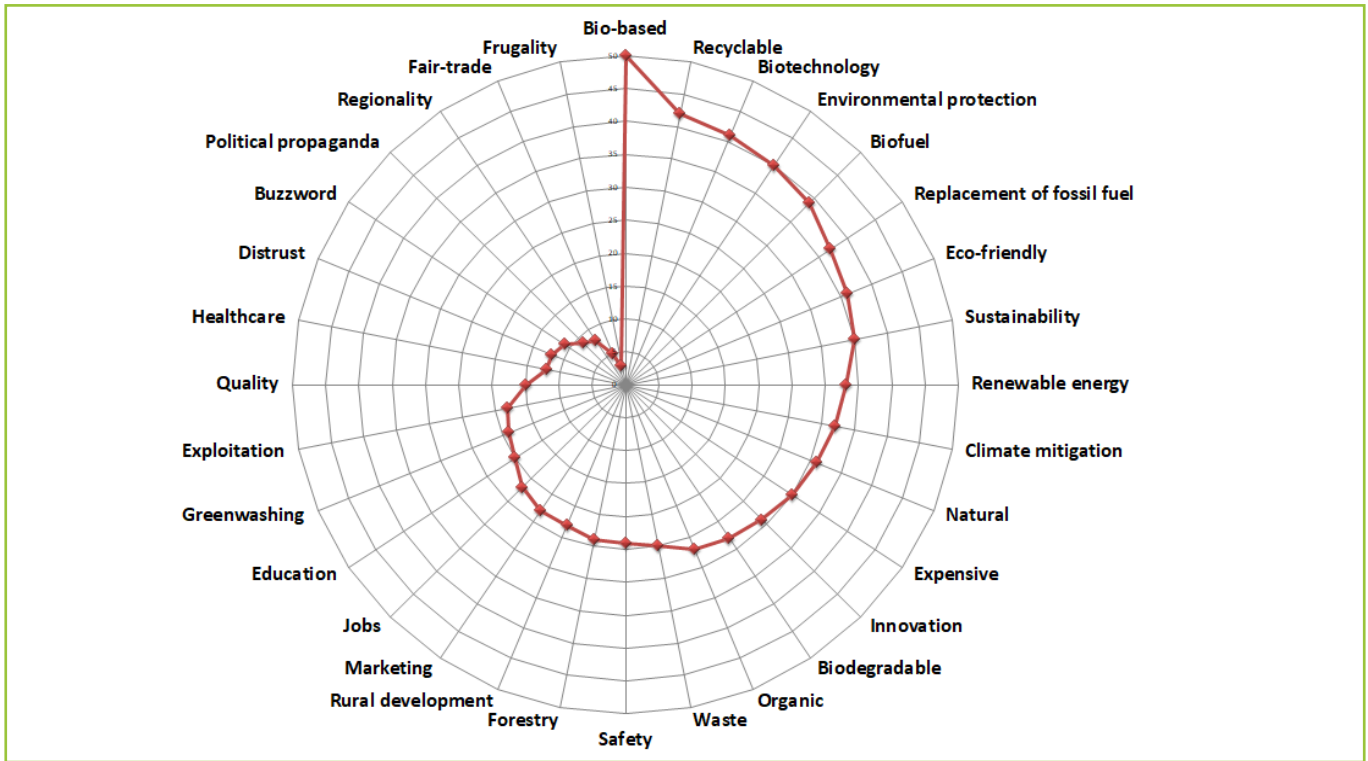


Figure 3 Focus study – Results of word association exercise
Source: Own research, 2022

The results of the word association exercise were further analyzed to assess the participants’ perception of bioeconomy along positive, negative, or neutral connotations. Figure 4 shows thematic coding and the participants’ perception of bioeconomy.

Focus study participants awareness of bioeconomy products

The 50 respondents were asked to identify products which can be produced using bio-based materials. Packaging material was identified by 33 participants, biofuels used for transport was identified by 29 participants, while only 4 participants identified anti-freeze solutions as shown in Table 2.

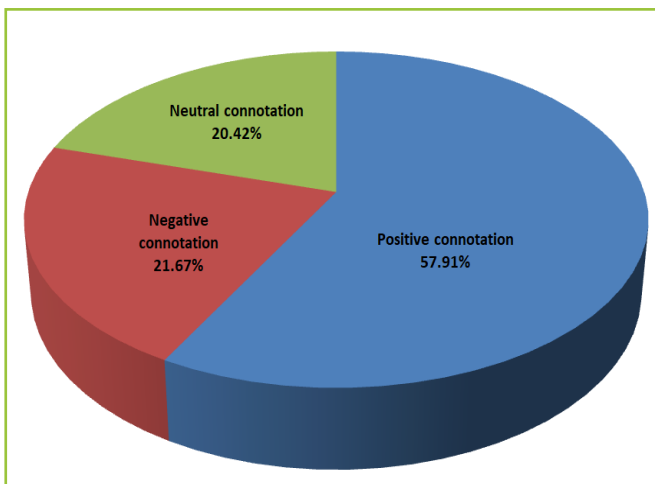


Figure 4 Focus group study – Participants perception of bioeconomy
Source: Own research, 2022

Answering the question whether information about the benefits of bioeconomy products is readily available, 64% of the participants answered that there is not enough available information and 20% are unsure if the information is readily available as shown in Figure 5.

Discussion and conclusions

The findings of the focus group and survey studies are similar despite their participants and respondents having distinct characteristics. Self-assessed understanding of bioeconomy was moderate among the residents; however, its underlying ideas are vastly appreciated, aligning with similar studies (see: Gaffey et al., 2021; Dallendörfer et al., 2022). The residents also have positive perception of bioeconomy, primarily associated with perceived environmental benefits as reported in previous studies (see: Deligiannis et al., 2018; Sabini et al., 2020). They rightly associated bioeconomy with sustainability and

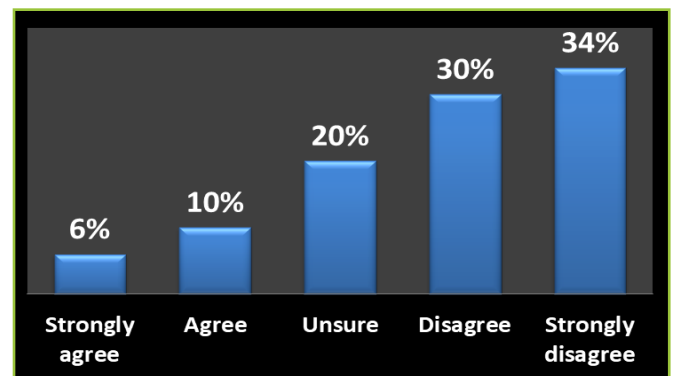


Figure 5 Focus group study – Availability of information on benefits of bioeconomy products
Source: Own research, 2022

Table 2 Focus group study – Identification of bioeconomy products

Sn.	Bioeconomy products	Freq.	Sn.	Bioeconomy products	Freq.
1	packaging material and carrier bags	33	14	children toys	17
2	bioenergy for heating and electricity	30	15	cosmetics and personal care products	16
3	biofuels used for transport	29	16	industrial, aircraft, and automotive parts	16
4	fertilizers	27	17	paints and protective coatings	15
5	furniture and home decoration	24	18	cleaning materials	12
6	office materials	23	19	catering products (disposable tableware, etc.)	10
7	biogas for heating and electricity	23	20	sports equipment	8
8	clothes and textiles	21	21	adhesives	8
9	pulp and paper	20	22	corrosion inhibitors	7
10	chemicals (industrial solvents etc.)	20	23	lubricants	7
11	gardening products	19	24	surfactants	5
12	food and feed additives	18	25	anti-freeze solutions	4
13	construction and building materials	17			

Source: Own research, 2022

appreciated the role of bioeconomy in replacing fossil fuel in the society and climate mitigation action of bioeconomy.

The residents are not familiar with bioeconomy products and have poor knowledge of bioeconomy products, as was found in some earlier studies (see: Sabini et al., 2020; Gaffey et al., 2021). This is not unexpected since bioeconomy products are not readily available in Nigerian market as reflected in significant number of participants submitting that information about bioeconomy products is not readily available in the country.

This study is one of the starting points for expanding epistemology and discourses on transition to bioeconomy in Africa where knowledge base for bioeconomy is limited. Considering the positive relationship between perception and intention to accept bioeconomy in literature (see: Leal Filho et al., 2021; Nguyen et al., 2021), the study results are significant outcomes to be taken this into considerations to achieve a consumer-driven bioeconomy.

Nigeria, like all other African countries, must shape public policy towards transition to innovative, sustainable, and socially acceptable bioeconomy. The starting point is to formulate a coherent bioeconomy policy. The moderate self- assessed understanding of bioeconomy and poor awareness of bioeconomy products demand that discussion around bioeconomy move from general to abstract level to specifics. Moving forward, bioeconomy education – both formal and informal – to enlighten the public about gains of transition to bioeconomy should be treated as a transformative game changer. Following the identified positive perception, it is desirable for public policies and entrepreneurial engagements in bioeconomy in Nigeria and other African countries to focus on the identified environmental and sustainability benefits in order to accelerate adoption and diffusion of bioeconomy among the populace. Furthermore, incorporation of bioeconomy concepts into existing school curriculum at all levels will provide a platform to improve individuals' knowledge of bioeconomy and awareness of bioeconomy products with attendants' environmental, social, and economic benefits across the continent.

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