JOURNAL OF THE NIGERIAN INSTITUTE OF TOWN PLANNERS
VOL30 NO 3, JUNE 2025
https://nitpjournals.ng/index.php/jnitp/



Technical and Managerial Competencies for Youth Participation in Charcoal Briquette Production for income generation in Benue State, Nigeria.

DOI: https://doi.org/10.5281/zenodo.15512488

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Abstract:
This study explores the technical and managerial competencies required for youth participation in the production of charcoal briquettes for income generation in Benue State, Nigeria. Utilizing a survey research design, the study investigates the essential skills and knowledge that enable youth to effectively engage in this sustainable livelihood activity. A total population of 1559 youth from the three agricultural zones of the state were chosen for the study. Furthermore, one local government each from the three agricultural zones were randomly sampled for the study. Sample size for the study was determine using Taro Yamen's formulae for sample determination. Hence, the sample size of 153 was arrived at. Data was analyzed using descriptive statistics, specifically frequency and percentage distributions, to identify the key competencies needed for successful youth participation in charcoal briquette production. The findings highlighted significant gaps in both technical skills (such as briquette formation, quality control, and technology usage) and managerial capabilities (including business management, marketing, and financial planning). The study concluded that trainings, capital and infrastructural improvement are necessary to foster sustainable and profitable business in charcoal industry. Hence recommendations for training programs and capacity-building initiatives aimed at enhancing the skill set of youth in the region, thus promoting increased youth involvement in environmentally friendly and economically viable charcoal briquette production.

Keywords: Technical Competency, Managerial Competency, Charcoal Briquette, Youth participation, Income generation.

1.0 Introduction

The charcoal briquette industry is increasingly seen as a viable alternative to traditional charcoal and firewood, with its potential to provide a sustainable and eco-friendly source of energy. Charcoal briquettes are produced from organic waste materials such as sawdust, rice husks, or agricultural residues, which are compressed into a compact form for burning (Akinmoladun, 2020). This industry is gaining importance due to its environmental benefits, as it reduces deforestation and promotes waste recycling. In Nigeria, Benue State, with its extensive agricultural base, has abundant raw materials that can be utilized for charcoal briquette production. These materials include palm kernel shells, sawdust, and agricultural residues that are often discarded as waste (Ogunyinka, Adekunle, and Edeh 2021). Despite these advantages, the involvement of

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youth in the charcoal briquette production industry in Benue State remains underdeveloped. One of the critical factors affecting youth participation is the lack of both technical and managerial competencies. While there is recognition of the economic potential of this sector, many young people in Benue State lack the necessary technical competences to maximize this potential.

Technical competencies involve practical knowledge and abilities, such as understanding the processes of converting raw materials into charcoal briquettes, maintaining equipment, and ensuring the product's quality. On the other hand, managerial competencies encompass skills related to running a business, such as financial management, marketing, and human resource management (Nwachukwu, and Okpo 2018).

Ogunyinka et al, (2021) maintained that technical competencies required for youth participation in charcoal briquette production include the ability to handle raw materials, operate machines effectively, and maintain quality control throughout the production process. These competencies are essential for ensuring the efficiency of the production process and producing high-quality briquettes that can meet market standards. Additionally, technical knowledge about the various types of biomass materials suitable for briquette production, the carbonization process, and the mechanisms for compression and drying are crucial for improving productivity and ensuring sustainability in the industry.

Managerial competencies are equally important, as they enable youth to effectively oversee the operations of a charcoal briquette business. This includes skills in budgeting, managing finances, and ensuring that the business remains profitable and sustainable in the long term. Akinmoladun (2020) researched on *biomass briquettes as an alternative source of cooking* stressed that successful charcoal briquette production requires an understanding of market trends, consumer behavior, and strategies for pricing and distribution. Effective managerial skills also involve understanding how to create a business plan, manage staff, and promote the business to attract customers. Without such competencies, it is difficult for young entrepreneurs to scale their businesses or compete effectively in the market.

The role of youth in economic development is critical, particularly in Nigeria, where the youth population represents a significant portion of

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the working-age group. In Benue State, youth unemployment rates are high, and finding sustainable avenues for economic participation is crucial. Youth involvement in charcoal briquette production could provide a source of income, promote self-employment, and contribute to the state's overall economic development (Olanrewaju, Andrew, Li, and Phylaktou 2019). However, without adequate training in both the technical and managerial aspects of the industry, youth may face difficulties in establishing and maintaining successful enterprises.

Moreover, the challenges faced by youth in acquiring these competencies are significant. Inadequate access to training programs, lack of mentorship, and limited access to capital are some of the primary barriers (Nwachukwu, et al 2018). Many youth in Benue State also face challenges related to poor infrastructure, such as unreliable power supply, which affects the efficiency of production processes. Furthermore, the absence of robust networks for sharing information and best practices in charcoal briquette production limits opportunities for learning and growth in the industry.

The potential for youth involvement in charcoal briquette production is enormous, given the growing demand for alternative energy sources in Nigeria and the global shift toward sustainable practices. However, addressing the gap in both technical and managerial competencies is key to ensuring that youth can participate effectively and benefit economically from the sector. There is a need for comprehensive training programs that integrate both technical skills, such as machine operation and raw material processing, with essential business management knowledge. Such programs could help bridge the gap between technical and managerial competencies and ensure that youth can contribute meaningfully to the industry (Olanrewaju et al., 2019).

Moreover, the development of youth in the charcoal briquette sector can contribute to the achievement of sustainable development goals (SDGs) in Nigeria. By promoting the use of renewable energy sources like charcoal briquettes, the country can reduce its reliance on traditional fuels, which often contribute to deforestation and environmental degradation. Additionally, increasing youth participation in environmentally friendly industries can

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stimulate job creation, reduce unemployment, and promote economic stability.

Benue State, with its rich agricultural heritage and raw material abundance, is ideally positioned to harness the potential of charcoal briquette production. The state government and other stakeholders must invest in building the technical and managerial capacities of youth to enable them to take full advantage of this opportunity. By developing a skilled youth workforce, Benue State can become a leading hub for charcoal briquette production, benefiting not only the youth but also the environment and the local economy.

While the potential for youth participation in the charcoal briquette industry in Benue State is evident, significant challenges remain in terms of the acquisition of both technical and managerial competencies. Addressing these gaps through targeted training and support initiatives will be crucial for empowering youth and ensuring the sustainability and success of the charcoal briquette production sector in the region. This study aims to explore these competencies and provide recommendations to enhance youth participation in the sector.

2.0. Literature Review

Charcoal briquette production has been explored in various studies, particularly in developing countries where it has been presented as a solution to waste management and energy production. According to Adeyemi and Ajiboye (2018), charcoal briquette production from agricultural waste is a sustainable way to address deforestation while providing an alternative energy source. The key technical competencies required include knowledge of carbonization techniques, pressing methods, and drying processes (Akinmoladun et al., 2020).

On the managerial side, Bello (2021) highlighted that managing a successful charcoal briquette business requires skills in marketing, financial management, supply chain management, and entrepreneurship. The ability to scale operations and manage resources effectively is also essential for long-term sustainability. Moreover, Nwachukwu (2019) found that youth in rural areas often face challenges in accessing the necessary training and capital to enter the charcoal production industry, further complicating the development of their competencies.

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2.1 Theoretical Framework

This study was guided by two main theoretical frameworks:

Human Capital Theory: The theory emphasizes that investing in individuals' education and skills development leads to improved productivity and economic outcomes (Becker, 1993). For youth, acquiring technical and managerial competencies is critical for success in the charcoal briquette industry.

Sustainable Livelihood Framework: This framework, proposed by Ellis (2000), was used to examine how the production of charcoal briquettes can contribute to sustainable livelihoods for youth in Benue State. It explores the link between skills development and income generation.

3.0 Methodology

Survey research design was used to delve into the competencies required for charcoal briquette production. This approach allowed for a comprehensive understanding of the technical and managerial competencies of youth in the sector. The scope will be limited to Benue State due to its agricultural dominance, availability of raw materials, and the state's potential for expanding charcoal briquette production. The research will also include an analysis of the challenges and opportunities faced by the youth in this sector.

The population of the study consisted of 1559 youth aged 18-35 from the six agricultural zones in the 23 LGAs in Benue State, particularly those involved in agriculture. The sample size for the study was 153 youths in the study area. This was drawn from the population of 1559 using Taro Yamen's formular for sample size determination. Sampling for the study was done using simple random sampling techniques to select one LGA each from the six agricultural zones namely, agricultural zone A, B and C for ease of data collection. Data were collected using structured questionnaires, administered to 153 youth involved in agricultural activities to gather quantitative data on technical and managerial competencies in charcoal briquette production.

Statistical analysis was conducted using SPSS version 20. The data were processed using descriptive statistics (frequency distribution, percentages) to identify the key technical, managerial competencies and challenges needed by youth.

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4.0 Result and Discussion

What technical competencies are required for youth involvement in charcoal briquette production in Benue State?

S/N	Questionnaire items	Frequency	%
1	Understanding of different biomass materials (e.g., sawdust, rice husks, agricultural waste) that can be used for briquette production.	98	64.05
2	Ability to operate and maintain briquette production machines (e.g., screw presses, piston presses, or hydraulic machines) is essential.	55	35.95
3	Knowledge of how to control moisture levels in raw materials to ensure proper binding and efficient combustion is needed.	38	24.84
4	Understanding the process of converting raw biomass into charcoal through pyrolysis (heating in the absence of oxygen) required.	81	52.94
5	Familiarity with the selection and use of binders (e.g., starch, clay) to hold the charcoal together during compression.	34	22.22
6	Youth needed skill in setting and adjusting the compression pressure in briquette machines to form stable, high-density briquettes.	46	30.07
7	Ability to monitor the quality of the final product (size, shape, and strength of briquettes) and perform quality tests.	93	60.78
8	Knowledge of safety protocols and environmental considerations (e.g., dust control, emission monitoring) during production is essential.	79	51.63
9	Ability to identify opportunities for improving energy consumption and streamlining the production process to enhance efficiency and reduce costs.	93	60.78
	TOTAL	153	100%

The study revealed that the most common technical competencies required for charcoal briquette production include: 64.05% of respondents emphasized the need to understand which types of agricultural waste (e.g., rice husks, sawdust) work best for charcoal production. 52.92% of the respondents identified knowledge of carbonization techniques as essential. 30.07% mentioned the need for skills in using briquette presses, a crucial step in shaping and compacting the charcoal while 60.78% indicated that understanding the drying and curing process was necessary to ensure the durability and efficiency of the final product. Other responses include; 22.22% knowledge of the selection and use of binders (e.g., starch, clay) to hold the charcoal together during compression. 51.63 needed to understand protocol and environmental consideration during production.

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What managerial skills are necessary for youth to effectively run a charcoal briquette production business?

S/N	Questionnaire Items	Frequency	%
1	The ability to inspire and guide a team, providing direction and motivation to achieve company goals.	59	38.56
2	Efficiently planning, executing, and monitoring projects to ensure the production process runs smoothly and deadlines are met.	95	62.09
3	Understanding budgeting, cost control, and financial planning to ensure profitability and sustainability of the business.	92	60.13
4	Overseeing the production process, managing resources, ensuring quality control, and optimizing production efficiency.	123	80.39
5	Developing effective marketing strategies, identifying target markets, and building strong sales channels to ensure product demand	110	71.89
6	Quickly identifying issues or challenges in production, logistics, or sales, and coming up with effective solutions.	139	90.84
7	Efficiently sourcing raw materials, managing suppliers, and ensuring smooth distribution of products.	57	37.25
8	Recruiting, training, and retaining employees while maintaining a productive and positive work environment.	144	94.11
9	Effectively communicating with stakeholders, employees, customers, and suppliers to ensure clarity and resolve conflicts when they arise.	111	72.54
10	Identifying potential risks (financial, operational, environmental) and developing strategies to mitigate them to safeguard the business	90	58.82
Total		153	100%

The study also identified several managerial competencies that are crucial for running a successful charcoal briquette business: Leadership 38.56%, Project Management 62.09. Human Resource Management 94.11%. Marketing and Sales: 79.89% of the respondents identified the need for skills in promoting and selling the product. Financial Management: 60.13% highlighted the importance of managing business finances, including budgeting, pricing, and profitability analysis. Supply Chain Management: 37.25% emphasized the need for managing the supply of raw materials and distribution of the final product. Entrepreneurship Skills: 72.54% of the respondents highlighted the need for general entrepreneurial competencies such as business planning and customer relationship management.

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What challenges do the youth face in acquiring both technical and managerial competencies in the charcoal briquette production industry?

S/N	Question	Frequency/%	
1	Many young people lack access to formal training programs that cover both technical skills, such as briquette production techniques, and managerial skills like business planning and marketing.	120	78.43
2	Youth experience difficulty in understanding the intricacies of the production process such as selecting raw materials, designing molds, and ensuring product quality, can be difficult without proper technical education.	123	80.39
3	The high startup costs for establishing a charcoal briquette production business can be a significant barrier for youth. Securing loans or investors is often challenging for young entrepreneurs.	139	90.84
4	The absence of experienced mentors who can guide the youth through both the technical aspects of production and the managerial side of running a business leaves them at a disadvantage.	129	84.31
5	Gaining hands-on experience in both technical production and business management can be difficult due to limited opportunities in the local market or the lack of internships in the industry.	126	82.35
6	Youth struggle with acquiring the necessary machines or digital tools for efficient production and management, which limits their ability to scale their businesses or improve product quality.	115	75.16
7	Navigating legal regulations and ensuring compliance with environmental standards can be overwhelming, especially for young people without prior experience in managing a business.	145	94.77
8	Understanding market dynamics, establishing customer bases, and creating effective marketing strategies can be hard without solid business acumen.	123	80.39
9	Many youth hesitate to take risks or make decisions in an industry that is both competitive and requires substantial upfront investment, leading to missed opportunities for growth.	111	72.54
Total		153	

The study identified several challenges that youth face in acquiring these competencies: Limited Access to Capital: 90.84% mentioned that insufficient access to startup capital prevents them from establishing a charcoal production business. Inadequate Infrastructure: 75.16% identified inadequate infrastructure (e.g., electricity, access to efficient production tools) as a major challenge. Limited Market Access: 80.39% of respondents cited difficulties in accessing markets for their charcoal briquettes. Insufficient Mentorship: 84.31% reported absence of experienced mentors who can guide the youth through both the technical aspects of production and the managerial side of running a business which leaves them at a

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disadvantage. Regulatory and Environmental Barriers: 94.77% indicated that, navigating legal regulations and ensuring compliance with environmental standards can be overwhelming, especially for young people without prior experience in managing a business.

What are the strategies for improving youth participation in the charcoal briquette production sector?

S/N	Questions	Frequency	%
1	Establish hands-on training programs focused on the charcoal briquette production process. These could include technical skills like molding, drying, and quality control, as well as business skills for entrepreneurship.	120	78.43
2	Create micro-financing options or seed funding for youth who want to start or scale up charcoal briquette production businesses, making it easier for them to invest in equipment and raw materials.	90	58.82
3	Governments can create favorable policies and provide tax incentives or subsidies for young entrepreneurs in the charcoal briquette sector. This can also include access to land for production.	59	38.56
4	Launch national or local awareness campaigns that highlight the benefits of charcoal briquettes, such as their eco-friendly nature and efficiency. This can attract more youth to join the industry.	127	83.01
5	Collaborate with private sector players to establish partnerships that provide the necessary infrastructure, technical know-how, and market access for youth-led businesses in the sector.	97	63.39
6	Connect youth with experienced professionals in the charcoal briquette industry for mentorship, advice, and business networking. This can help them avoid common pitfalls and grow faster.	129	84.31
7	Encourage youth to view charcoal briquette production as a sustainable alternative to traditional charcoal, aligning with global trends toward cleaner energy sources and environmental conservation.	149	97.38
8	Foster the creation of youth-led cooperatives or groups to pool resources and share equipment. This will make the production process more affordable and efficient for smaller producers.	132	86.27
9	Provide youth entrepreneurs with market access, such as linking them to both local and international buyers. Educate them on marketing strategies and how to build strong customer bases.	107	69.93
10	Support research and development into more efficient and environmentally friendly charcoal briquette production methods. Encourage youth to adopt these innovations and use modern technology to increase production and reduce costs.	140	91.50
Total		153	100%

Improving youth participation in the charcoal briquette production sector can foster economic empowerment and environmental sustainability. The study revealed as follows; 78.43% needed education and training programs. By establishing hands-on training programs

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focused on the charcoal briquette production process. These could include technical skills like molding, drying, and quality control, as well as business skills for entrepreneurship. 58.82% needed access to funding. Creating micro-financing options or seed funding for youth who want to start or scale up charcoal briquette production businesses, making it easier for them to invest in equipment and raw materials. 38.56% needed government incentives and policies. Governments can create favorable policies and provide tax incentives or subsidies for young entrepreneurs in the charcoal briquette sector. This can also include access to land for production. Awareness Campaigns: 83.01% indicated that launching national or local awareness campaigns that highlight the benefits of charcoal briquettes, such as their eco-friendly nature and efficiency. This can attract more youth to join the industry. Public-Private Partnerships: 63.39% Collaborate with private sector players to establish partnerships that provide the necessary infrastructure, technical know-how, and market access for youth-led businesses in the sector. Mentorship and Networking Opportunities: 84.31% connect youth with experienced professionals in the charcoal briquette industry for mentorship, advice, and business networking. This can help them avoid common pitfalls and grow faster.

Promotion of Green Energy: 97.38% encourage youth to view charcoal briquette production as a sustainable alternative to traditional charcoal, aligning with global trends toward cleaner energy sources and environmental conservation. Create Youth-Led Cooperatives: 86.27% Foster the creation of youth-led cooperatives or groups to pool resources and share equipment. This will make the production process more affordable and efficient for smaller producers.

Market Development and Access: 69.93% provide youth entrepreneurs with market access, such as linking them to both local and international buyers. Educate them on marketing strategies and how to build strong customer bases. Technical Innovations: 91.50% support research and development into more efficient and environmentally friendly charcoal briquette production methods. Encourage youth to adopt these innovations and use modern technology to increase production and reduce costs.

By employing these strategies, youth can be better equipped to enter and succeed in the charcoal briquette production sector, contributing to both their economic development and environmental sustainability.

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4.1 Discussion of findings

The results of this study demonstrated that technical competencies are essential for youth involved in charcoal briquette production in Benue State. The youth needed to acquire specific technical skills in carbonization, briquetting, and drying processes to produce high-quality charcoal. Moreover, strong managerial competencies are necessary for them to scale operations and ensure business sustainability.

The challenges identified, including limited access to training, capital, and infrastructure, highlighted the need for targeted interventions to empower youth in this sector. Addressing these barriers will not only enhance the technical and managerial skills of youth but will also improve their ability to engage in the charcoal briquette industry profitably and sustainably.

This study emphasizes the dual importance of technical and managerial competencies for youth involvement in charcoal briquette production. This aligns with literature suggesting that entrepreneurial success requires a combination of hard skills (technical knowledge) and soft skills (management skills).

A study by Nassaji and Tavakol (2019) in the International Journal of Engineering & Technology supports the present study and highlights the role of technical training in improving productivity and product quality in sustainable industries. For example, technical knowledge in processes like carbonization, briquetting, and drying is essential to producing high-quality products, which can meet market demand. This reinforces the argument that youth in Benue State needed targeted technical training to thrive in the charcoal briquette sector.

Studies by Schaper and Volery (2014) in Entrepreneurship and Small Business show that managerial skills such as financial management, strategic planning, and operational efficiency are crucial for small-scale entrepreneurs. Without strong managerial skills, it becomes difficult for businesses to scale or remain sustainable. This complements the conclusion of this study, that youth in Benue need managerial competencies to ensure sustainability and growth in their ventures.

The present study highlights barriers such as limited access to training, capital, and infrastructure. These barriers have been well-documented in the literature, particularly in developing regions, where entrepreneurs face challenges that hinder business growth.

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In a similar note, Osei-Assibey, Frempong and Adjei, (2019) in The Journal of African Business, discussed how limited access to training has stunt the development of technical and managerial capabilities, leading to lower productivity. In the context of charcoal briquette production, without specialized training, youth may struggle with inefficient production techniques, leading to poor-quality products and low market competitiveness. This claim was also supported by Akinboade and Kinfack (2012) in African Finance Journal argue that capital access is a common barrier to entrepreneurship in African countries. Limited access to funding sources often forces youth entrepreneurs to rely on informal funding methods, which are insufficient to scale operations. This lack of capital makes it difficult for entrepreneurs to invest in advanced equipment and infrastructure, both of which are critical for the success of charcoal briquette production.

UNICEF (2020) in its report on youth empowerment in Africa argues that providing access to entrepreneurial education and financial support can foster sustainable businesses. Tailored capacity-building programs for youth in sectors like charcoal briquette production could address the skills gap and help them overcome resource limitations.

5.0 Conclusion

In sum, this study's findings about the need for technical and managerial competencies are well-supported by existing literature on entrepreneurship and youth empowerment. The barriers of training, capital, and infrastructure are recognized challenges faced by youth entrepreneurs globally, and targeted interventions ranging from training programs to access to finance and infrastructure improvements are necessary to foster sustainable and profitable businesses in the charcoal briquette sector.

This holistic approach, combining competency development with addressing systemic barriers, could significantly enhance the potential for youth in Benue State to engage successfully in the charcoal industry.

5.1 Recommendations

Training and Capacity Building: Government and non-governmental organizations should establish training programs focused on both technical and managerial competencies for youth interested in charcoal briquette production.

Access to Finance: Microfinance institutions and government programs should provide affordable loans and grants to youth in Benue State to support the establishment of charcoal briquette businesses.

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Infrastructure Development: Government and private sector partnerships should focus on improving infrastructure, including electricity, transportation, and access to production tools.

Market Linkages: Programs to link youth producers with markets for their products, both locally and nationally, should be developed to ensure sustainable demand for charcoal briquettes.

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