

Research Article

Analysis of Socioeconomic Determinants of Profitability of Cattle Marketing in North-east Nigeria, Before and During Cash Crunch Period

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Abstract: The recent government cashless policy, which attempted to reduce the circulation of cash in the Nigerian economy in order to address certain macroeconomic problems, brought some difficulties across the informal sector, especially among the cattle marketers who largely relied on cash transactions and lacked adequate knowledge of the cashless economy. This prompted this study on the analysis of socioeconomic determinants of profitability of Cattle marketing in North-east Nigeria before and during the Cash Crunch period. Purposive and simple random sampling techniques were adopted to select 495 respondents to form the sample size. Primary data was employed, which was sourced from a cross-sectional survey of cattle marketers with the aid of a well-structured questionnaire along with interviews. The study employed an inferential method of analysis. The results of the multiple regression analysis using Robust Ordinary Least Square (OLS) showed that access to credit facilities, education and market information all had a positive coefficient of 0.540, 0.027 and 0.431, and Significant at $p < 0.01$, respectively. The R^2 values for these determinants were 61% and 59% before and during the cash crunch period, indicating that between 61% and 59% of the variations in profitability were explained by the aforementioned factors. The Z-test revealed no significant difference in these factors between the two periods, emphasizing their consistent positive impact. The study recommends that financial institutions should design specialized credit facilities that cater to the unique requirements of cattle marketing, and marketers should indulge themselves in groups or associations to facilitate their digital financial learning process to alleviate the challenges associated with remote and cashless transactions in cattle marketing.

Keywords: Cash Crunch, Cattle, Marketing, Profitability, Socioeconomic.

I. INTRODUCTION

Cattle are large ruminant animals raised primarily for their products, including milk, meat, hides, and cheese [1]. In the context of Nigeria's agricultural landscape, cattle hold immense significance, with the country ranking among the top four cattle producers in sub-Saharan Africa [2]. By nature, cattle have special features, especially in size, which place them mostly out of the household enclosure. Their dependency on open pasture and transhumance, especially in the wet season, puts them into a special category among the agricultural resources. Cattle is an integral part of agriculture, and it plays a vital role in Nigeria's national economy through the supply of important products. The many utility of the cattle acts as a basis for their role in livelihood sustenance and value chains backing food security supply. The realization of Nigeria as the leading cattle producer in the Sub-Saharan region underlines the importance of the country in the wider agricultural economy. Cattle marketing is very important in most economies and, especially in developing countries, where it is nearly impossible to replace cattle in most families. Government policy is a key determinant of the profitability of cattle marketing. Such policies cut across e-payment and cashless policy introduction with restrictions on cash transactions, where theoretical studies on the subject indicate the effect of government policies on cattle marketing profitability being varied in different contexts or specific niches in the livestock industry [3]. This will be useful to further understand the practical implications regarding government policies for livestock marketing profitability across regions and sectors [4].

The beef cattle industry has a long history of being established in Northern Nigeria as part of the economy and, to an even greater extent, its cultural and social lives. The regions of Adamawa, Borno, Taraba, and Yobe have traditionally hosted high numbers of cattle. Cattle contribute in very many ways to rural households' livelihoods, providing a valuable source of meat, milk, and income from their sales. However, as demonstrated by the cattle market in North-East Nigeria, so many challenges influence the market, both inherent structural characteristics of the market and, majorly, the external. A major challenge in recent times includes the cash crunch period [6]. However, the emergence of a cash crunch period in Nigeria significantly affected the landscape of cattle marketing, including in this part of Nigeria. Infrastructure development, coupled with supportive government



policies, can improve market access and reduce transportation costs through increased mobility and commercialization of smallholder goods, a factor that positively impacts profitability [7].

Rural road investments, cold storage facilities, and marketplaces improve efficiency in the marketing of livestock [8]. Government-designed insurance programs reduce financial uncertainties in cattle marketing. Livestock producer and trader incomes are thereby safeguarded against adversity [9]. Market information access is provided through government policy, which is important in making decisions with regard to cattle marketing [10]. Such policies that support the purposeful dissemination of price information through either digital platforms or extension services can result in the empowerment of market participants and improved profitability [11].

II. STATEMENT OF THE PROBLEM

It is not surprising that demographics come into play in the cattle sales business. Their age, gender, and educational background may greatly impact people's interest or participation in this kind of enterprise. It has been observed that older individuals, especially those with years of experience in cattle rearing, tend to be deeply interested in cattle marketing [12]. However, a rising wave of younger folks is entering the scene, many of whom come equipped with formal education that can shake up how things work [13]. This changing demographic landscape promises fresh perspectives and new approaches to the cattle business. It could lead to shifts in strategies and techniques within the sector. The exciting part is acknowledging the knowledge and skills these younger individuals bring and the potential for innovation in tune with evolving market trends [14]; [15]. More research examining how these younger, formally educated generations are making their mark in cattle marketing practices can benefit the literature.

Keynesian economics also acknowledges that government policies and economic conditions can influence the effectiveness of the Transaction Motive. Policies aimed at reducing the circulation of currency, such as the naira redesign, can disrupt the normal flow of transactions, as demonstrated by [16]. No doubt, cattle farming plays a crucial role in the economy and culture of Northeastern Nigeria. However, this shortage of cash flow diminished people's purchasing power, disrupted supply chains, and caused cattle prices to fluctuate. These challenges have not only impacted the income of cattle farmers but have also made it more difficult for consumers to access affordable meat (protein sources).

Overall, Livestock production is a vital economic activity, playing a critical role in the lives of millions of households in Northeastern Nigeria by serving as the primary source of income, savings, and non-monetary wealth for many while also fulfilling an essential role as a food source. However, the cattle marketing system in North-east Nigeria faces various challenges, with the recent cash crunch resulting from government policy being the most pronounced in recent times. This requires improved strategies to enhance market performance.

Notably, previous research such as [17], [18] and [19] revealed that cattle marketing business is profitable. Although there was limited research work on cashless policy, it is against this background this research aims to "**Analyze the socioeconomic determinants of profitability of cattle marketing in North-east Nigeria, before and during cash crunch Period**". This study not only analyzed this issue but also offered insights into policy considerations for enhancing market orientation and economic stability in the region. This research addresses a significant gap in existing research and has broad implications for cattle marketing and the livelihoods of people in North-east Nigeria.

II. LITERATURE REVIEW

Cattle marketing plays a pivotal role in many economies, particularly in developing countries where livestock production is a significant source of income for millions of households. Various factors, including government policies influence the profitability of cattle marketing. Government policies have a significant impact on the profitability of cattle marketing. These policies encompass various areas, such as the introduction of e-payments and cashless policies and the imposition of restrictions on cash transactions. The theoretical studies that have been conducted on the subject reveal that the effects of government policies on cattle marketing profitability may vary depending on the context and the specific livestock industry [3]. To better understand the practical implications of government policies on livestock marketing profitability in different regions and sectors, it is necessary to conduct further research [4].

Infrastructure development, supported by government policies, can improve market access and reduce transportation costs, positively influencing profitability [20]. Investments in rural roads, cold storage facilities, and marketplaces are essential for enhancing the efficiency of livestock marketing [8]. Government-backed insurance programs can mitigate financial uncertainties in cattle marketing and safeguard the incomes of livestock producers and traders during adverse events [21]. Government policies can facilitate access to market information, which is crucial for decision-making in cattle marketing [10]. Policies supporting the dissemination of price information through digital platforms or extension services can empower market participants and improve profitability [11].

Literature suggests that adopting technology, including mobile phones and digital platforms, is increasingly relevant in cattle marketing. Technology can improve market information flow and facilitate transactions. Cattle marketers who embrace technological innovations may gain a competitive advantage [22]. Digital marketing strategies have been found to augment customer reach, sales effectively, and engagement in various industries [23]. Digital technologies allow small farms to compete with large beef producers, and the introduction of digital platforms in small-scale cattle farms can help revitalize the livestock system [24]. These platforms strengthen the livestock system by connecting system actors, improving coordination, enabling transactions, and enhancing profitability. It is important, however, to consider the potential challenges and complexities posed by digital platforms, including the consolidation of power and hidden complexities that might make the prevailing conditions worse. In general, technological innovation embraced in the marketing of cattle benefits market information flow, transaction facilitation, and gaining a competitive edge, while all due consideration has to be taken regarding drawbacks.

A) Methodology

Adamawa State is located in the Northern part of Nigeria. It lies between latitude 7° and 11° North of the equator and between longitude 11° and 14° east of the Greenwich meridian. It shares boundaries with Taraba State in the Southwest, Gombe State in the Northwest, and Borno State in the North. The state has an international boundary with the Cameroun Republic along its Eastern border. It covers a land area of about 38.74km² with a current projected population of about 3.2 million people according to the 2006 National Census figure using the annual estimated population growth rate of 2.41 percent [25].

However, Taraba State had a population of about 2,300,736 people as of [26]. It has 16 Local Government Areas and one Special Development Area. It is divided into three Senatorial Districts: North, South and Central. It lies between latitudes 6° 30'N and 8° 30'N of the equator and between longitudes 9° 00' and 12° 00' E of the Greenwich Meridian with a land mass of 54,426 km² [27]. Taraba State shares boundaries with Bauchi and Gombe States in the North, Adamawa State in the East and Republic of Cameroun in the South and Nasarawa and Benue States in the Southwest, as indicated in Figure one below (Figure1). It has a tropical wet and dry season, well-drained alluvial soils and is characterized by both savannah and temperate vegetation. Its dry season lasts for a minimum of five months (November to March), while the wet season spans early March to late November in the south and early April to November in the North. The mean annual rainfall ranges from 1000 mm in the northern part to over 1800 mm in the extreme southern part and Mambila area [27].

Borno state is located on latitude 10° 05' to 13° 55'N and longitude 11° 05' to 14° 05'E. It is bounded northeast by Lake Chad and north by the Republic of Chad. West by Yobe state, south by Gombe and Adamawa state and east by the Republic of Cameroon. It has its capital in Maiduguri, and it is made up of 27 local government areas. The climate is characterized by two distinct seasons: dry and wet; the wet season lasts a period of four months (June – September), while the dry season covers the months of October to May. Precipitation is quite low, with a mean annual rainfall of 630mm. Temperature is generally high throughout the year, with an annual average of 26°C. The Harmattan wind; however, it exercised a moderating effect on temperature between November and February. The main annual sunshine hours are high in the State of Borno (10 hours), while the mean annual humidity is low (20-40%).

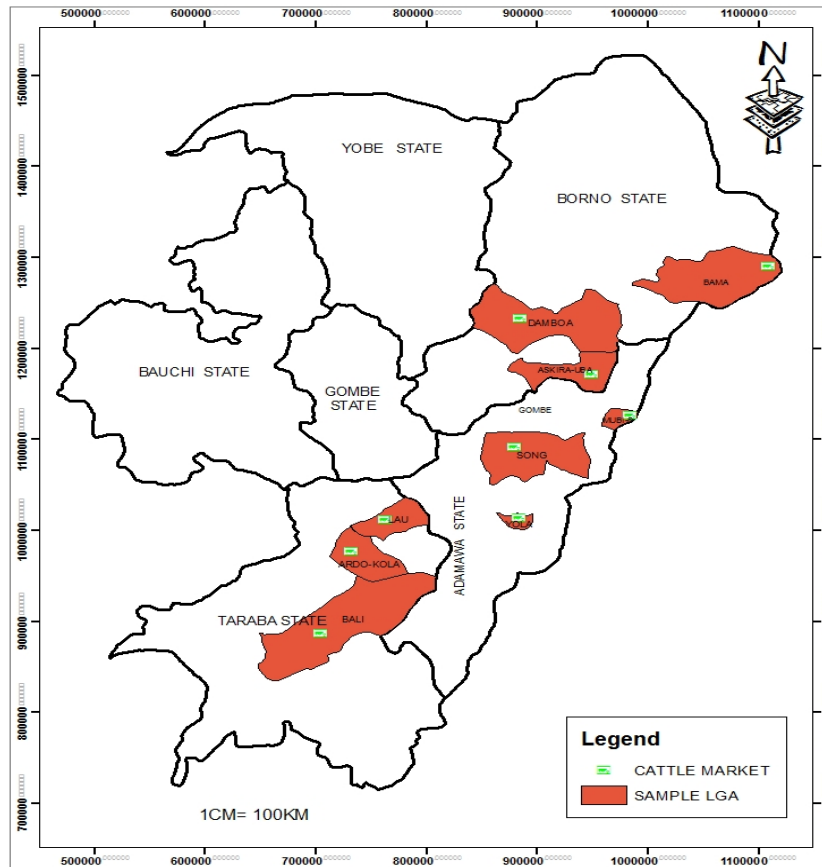


Fig. 1 Map of Nigeria indicating Study Area

B) Sampling Procedure

Table 1: In this study, the researcher implemented a purposive and simple random sampling approach to ensure the accuracy and reliability of the findings when examining the economic dynamics of cattle marketing in Northeastern Nigeria during a period characterized by cash shortages. The sampling process consisted of five distinct stages, each serving a specific purpose and contributing to the overall robustness of the research. Firstly, it involved the purposive selection of three states, namely Adamawa, Borno, and Taraba, within the North-East region. They were chosen based on the realized concentration of cattle marketing activities that were experienced under their jurisdictions. This decision was backed up by the argument that most major cattle markets were found in these regions; otherwise, they deserved a closer look study-wise in the cashless policy era.

The researcher went ahead to narrow the study area by selecting three local governments from each of these states. This was measured by the number of cattle markets, the size of the markets, and the capacity of cattle trade they facilitated.

The research had to follow a purposive selection of three specific cattle markets in each of the selected local governments. In the selection, the researcher relied upon very visible factors, which are the observable capacities of identified cattle inflow and outflow capabilities of the markets under consideration. Using these tangible indicators, the researcher was therefore trying to ensure that only the markets that best reflected the nature of diversities amongst cattle marketing performers in the region were selected.

Thirdly, since the sampling procedure was invested in finding the targeted number of samples, the researcher did this by taking into account the size of each market vis-à-vis the percentage of the total market, whereby their population of cattle marketers was from government tax collectors' records. Despite the fact that such records were wanting in individual names, they availed nuggets of information on the sizes of cattle market populations.

In this selection, the researcher used simple random sampling to find individual cattle marketers who participate in selling cattle. This thus gave every cattle marketer in these markets an equal selection in the sample. The process was characterized by randomness, which minimized biases in the findings.

C) Sampling Frame and Sample Size

From Table 1 in Adamawa State: Yola South, Song and Mubi South local governments were selected, with their respective cattle markets, Ngurore, Song cattle market and Tike International cattle market. The table details the population of cattle marketers in each of these markets: 560 in Ngurore, 470 in Song, and 750 in Mubi South. A 10% sample of the entire population in all the markets considered is being considered by using 178 individuals sampled from Adamawa State. The government areas in Borno State are considered to include Askira Uba, Chibok, and Maiduguri, and the cattle markets in the areas are the Askira Uba, Chibok, and Maiduguri cattle markets. The table indicates the population of cattle marketers in these markets as 558 in the Askira Uba market, 510 in the Chibok market, and 580 in the Maiduguri market. The study drew a 10% sample of each of the markets, with a total sample size of 165 respondents extracted from Borno State.

The last of these is Taraba, with the local governments of Gashaka, Eware, and Sardauna, and their respective cattle markets, Gashaka, Eware, and Nguroje cattle markets. The table outlines the population of cattle marketers in each market, with 541 in Gashaka, 515 in Eware, and 464 in Sardauna. Sample sizes: The samples drawn for the study comprised 10% of all the rice market respondents in Taraba State; 152 people took part in the study. The summary from the table above shows a theoretical and well-structured plan for sampling in this study, culminating in a representation of 30.

The sample is obtained from various local government areas and cattle markets in the selected states, with a total sample size of 495 individuals across the three states. This systematic approach is crucial for conducting a rigorous and informative study on cattle marketing in Northeastern Nigeria.

Table 1: Sampling Frame and Sample Size

State	Local Government	Cattle markets	Population of cattle marketers	Sample (10% of the population)	Total sample
Adamawa	Yola South	Ngurore	560	56	
	Song	Song cattle market	470	47	
	Mubi South	Tike Int'l cattle Market	750	75	
			1,780	178	178
Borno	Askira Uba	Askira Uba cattle market	558	56	
	Chibok	Chibok cattle market	510	51	
	Maiduguri	Maiduguri cattle market	580	58	
			1,648	165	165
Taraba	Gashaka	Karamti cattle market	541	54	
	Eware	Eware cattle market	515	52	
	Sardauna	Nguroje cattle market	464	46	
			1,520	152	152
Total			4,948		495

Source: Designed by the author based on information from each of the markets.

D) Method of Data Collection

The data collection process involved the distribution of structured questionnaires and oral interviews to the selected respondents, namely cattle marketers operating in the chosen markets within the states and local governments under study. The

respondents were approached and briefed on the purpose of the research, the significance of their participation, and the assurance of confidentiality.

E) Analytical Techniques

The present study uses multiple regression analysis in order to investigate the socioeconomic determinants of profitability of cattle marketers before and during the cash crunch period and uses robust ordinary least squares estimates. Robust OLS was chosen for its ability to provide more reliable regression estimates in the presence of potential outliers or heteroscedasticity.

F) Model Specifications

Multiple linear regression model has been specified to determine the factors that influence the profitability of the cattle marketing business. This model is provided in equation 1 in the form of a log-linear relationship, and it is used to determine the factors influencing profitability both before and during the cash crunch period.

$$LOGY_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + \beta_6 X_{i6} + \beta_7 X_{i7} + \beta_8 X_{i8} + \beta_9 X_{i9} + \beta_{10} X_{i10} + u_i - (1)$$

Where;

$LOGY$ = logarithm of total profit (gross margin) realized from cattle marketing business measured in Naira (₦)

X_1 = Access to credit (measured using dummy variable where 1 = access to credit if the respondent had access to credit and 0 otherwise)

X_2 = Employment status (measured using dummy variable where 1 = full-time if the respondent is a full-time cattle marketer and 0 if the respondent is not a full-time cattle marketer)

X_3 = Years of education (Number of years of schooling),

X_4 = Digital financial literacy (measured using a dummy where 1 = digital financial literacy if the respondent is literate about digital payment platforms for transfers and 0 otherwise)

X_5 = Age (age of the respondent in years)

X_6 = Membership of cattle marketers' association (dummy =1 if the respondent belongs to the association and 0 otherwise).

X_7 = Household size (number of household members)

X_8 = Size of business (Number of cattle)

X_9 = Mode of payment (measured using a dummy where 1 = Transfer if the respondent usually makes and receives payments through transfer, and cash if otherwise).

X_{10} = Access to market information (measured using a dummy where 1 = access if the respondent had adequate access to market information and 0 otherwise).

u = is the disturbance term which captures the effect of other factors that could influence profitability but are not included in the model.

i = individual respondent.

β_0 = constant

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9$ and β_{10} = the coefficients to be estimated.

G) A Priori Expectations

This study expects that $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9$ and β_{10} would have positive and significant signs. This means that access to credit, employment status, education, digital financial literacy, age, size of business (number of cattle), membership of association, household size, and mode of payment are theoretically expected to significantly influence the profitability of cattle marketers by increasing their profitability.

III. RESULTS AND DISCUSSION

A) Socioeconomic Determinants of Profitability of Cattle Marketing Before the Cash Crunch Period

Table 2 indicates the findings of the regression analysis of the socioeconomic determinants of profitability in the cattle marketing sector taken prior to the cash crunch period. The analyses, through the results obtained from the regression, indicate that profitability in the cattle marketing sector could be increased through various implications regarding each variable considered.

Access to credit is another key socioeconomic determinant, and the high coefficient given by this result is 0.512 (P-value: 0.000). This gives the variable access to credit a strong positive emphasis on its significance to the variable profitability. In other words, providing such access by other means, possibly through traditional financial institutions or any other means, happens to be a potent strategy that can be used to elevate profitability within the cattle marketing sector. Improved credit will significantly add to overall profitability because being able to access the financial market provides cattle marketers with the independence of increased financial push to grow businesses, take the market movements head-on, and seize newly arising business opportunities. This corroborates with the findings of the study by [17], which stated that since credit accessibility offers competitive motivation, cattle marketers will manage operations, raise investments, and improve profitability. It is also supported by the findings of [28],

which noted evidence that the availability of credit is a strong socioeconomic determinant of profitability. Employment status is a variable that emerges onto the forefront and is closest to significance, with an important coefficient of 0.813 (P-value: 0.000). From this perspective, full-time cattle marketers are a class apart in terms of far more levels of relative superior profitability. This observation has huge implications in the sense that full-time cattle marketers would clearly be more profitable. The profound implication here is that supporting individuals to transition into full-time cattle marketing roles through targeted measures, such as training, improved resource access, or well-structured incentives, may hold the potential to substantially enhance their profitability. In doing so, it would not only benefit the individuals themselves but also contribute to the overall prosperity and resilience of the cattle marketing sector. This highlights the strategic importance of promoting and enabling full-time engagement within the industry.

Education and digital financial literacy emerge as critical factors influencing profitability within the cattle marketing sector. A closer examination reveals a nuanced relationship. While the coefficient for each additional year of education is positive (0.025) and statistically significant (P-value: 0.014), it must be noted that this significance is at a somewhat lower level. This suggests that increasing one's years of education can indeed have a positive impact on profitability, albeit to a moderate degree. This result also supports the findings of [29], who found that educational level had a positive and significant influence on cattle market participation and profit. Specifically, their study revealed that for every one-year increase in the educational year, the probability of participation in the cattle market increases by 13.33%. This can be explained by the fact that as an individual accesses more education, he/she is empowered with the marketing skills and knowledge that will spur the individual to not only participate in the market but also ensure sustainable profit. This suggests that a higher level of education provides a greater opportunity for cattle marketers to participate in the cattle market and make significant profits.

The implication here is that promoting education in relevant areas holds the potential to benefit cattle marketers. Encouraging access to educational opportunities tailored to the needs of the sector can provide individuals with the knowledge and skills necessary to make more informed financial decisions, adopt improved management practices, and navigate the complexities of the cattle marketing industry. While the impact may not be as pronounced as some other factors, it remains a valuable avenue for enhancing profitability. In addition to traditional education, digital financial literacy emerges as a potent socioeconomic determinant. Those with digital financial literacy exhibit higher profitability, as indicated by the strongly positive coefficient of 0.581 (P-value: 0.004). This result highlights the growing importance of digital financial skills in effectively managing various financial aspects of cattle marketing. This result is also in line with previous findings such as [22], [23], [24] that investigated the role of digital platforms and literacy in enhancing businesses in the 21st century and revealed that cattle marketers and generally businesses that acquire some level of digital knowledge, embrace technological innovations, digital marketing strategies and digital payment methods have a higher chance of connecting with customers, increasing sales and ensuring large profitability.

The implication is clear: promoting digital literacy and providing training in financial technology can be a meaningful strategy that can contribute to increased profitability. With digital tools and platforms increasingly taking center stage in the management of finances, an ability of a cattle marketer to surf such technologies accrues a number of advantages, such as ease of transactions, better record keeping, and general accessibility of information on the market. It means, therefore, that many times, investments aimed at enhancing digital financial literacy can have a direct positive consequence on the profitability of businesses in the cattle marketing sector. Thus, education and digital financial literacy have significant but different effects on the profitability of the actors in the marketing of cattle. Education, in terms of more years at school, also shows a positive relation with profitability but at a relatively lower level of significance; hence, there is a need for further education that meets the requirements of the industry. At the same time, the strongly positive and highly significant coefficient makes a standout case for digital financial literacy, reflecting the potential growing role of digital skills in the management of finances. Digital literacy due to training and education in financial technology may thus be an encouraging path toward profit improvement in the sector.

Age holds great importance with regard to the profitability of the cattle marketing business. Confirmatory analysis showed that older cattle marketers were more profitable, supported by a positive and highly significant coefficient (0.031, P-value: 0.000). The reason for the positive description of the association between age and profitability can easily be understood from the accumulated experience and developed networks that a general older age has with respect to their cattle marketing activities.

The important implication is that the younger professionals belonging to the cattle marketing business may hence significantly draw mentorship programs and knowledge transfer programs, even with the relative lack of depth in experience as shown by older professionals. This way, younger marketers are able to gain knowledge and network connections, as with their much-experienced colleagues, in mentorship relations with older professionals. Such knowledge transfer, with respect to vital insights and strategies, aids in contributing to a highly profitable stake. Moreover, one needs to consider the fact that the strong positive relationship between age and profitability highlights the role of experience when dealing with the vagaries of the cattle marketing business. Older marketers would have passed through various market conditions and challenges. Therefore, they

would be in a better position to know effective strategies for risk and manager. This pooled knowledge will significantly benefit and increase the profitability for the younger lot of cattle marketers by helping overall growth in the sector.

Membership in cattle associations emerges as a strong socioeconomic determinant with deep implications for profitability within the cattle marketing sector. This fact is underlined further by the observed highly significant coefficient of 0.469 (P-value, 0.000), which indicates that those who are members of cattle associations tend to realize considerably higher profitability. This positive relationship is a function of the collective action and support mechanisms provided by such associations, which by nature would enhance business performance. The implications of this finding are numerous. Those cattle marketers currently not a members of these associations may find it highly beneficial to join them. The positive impact ranges from sharing knowledge and resources, both human and capital, to joint marketing initiatives. Marketers realize all the benefits of joining a single network because of the critical information, sharing of resources, and collective marketing, all of which lead to higher profitability. Actually, the improvement of formation and its enhancement to an association are among the ways in which the profitability of industries could be raised. Promotion of formation and consolidation of cattle associations can lead to more profitability for the whole sector. Such efforts deserve supportive policies and resources that would further enable these associations to contribute meaningfully toward improving the economic welfare of cattle marketers.

This result, therefore, summarizes that membership in an association tends to increase the profitability in cattle marketing considerably. In other words, collective action and shared knowledge, as well as collective initiatives, positively affect the outcomes of a business. As such, the strategic promotion of these associations can lead to increased profitability, offering a valuable avenue for enhancing the economic vitality of the cattle marketing industry.

Household size, although displaying a relationship with profitability that is less significant (Coefficient: 0.018, P-value: 0.089), still warrants consideration within the context of the cattle marketing sector. The coefficient, while not highly significant, suggests that larger household sizes may contribute slightly to profitability. This observation implies that, to some extent, the number of individuals in a household may offer certain financial advantages. However, other factors in this context are likely to exert a more substantial impact. This finding is in line with [30], who found that family size has a positive and significant influence on the profitability of cattle farmers and marketers in the Khatlon region of Tajikistan.

The implication of this finding highlights the complexity of the relationship between household size and profitability. While the relationship was positive, it was weaker and statistically less significant than with some of the other socioeconomic determinants measured, indicating that household size is one of the key variables that determines profitability in the cattle marketing sector to a lesser degree. Regarding this, cattle marketers should realize that, though a large household size may bear on improved profitability to some degree, other socioeconomic determinants are more influential on the issue, such as business size and access to credit. It is these factors, after all, that have shown in the analysis that close relationships are already existing.

In general, household size is related to profitability, but in the cattle marketing sector, it is very weak. Though there may be some economic benefits associated with increasing the household size, these are usually modest when set against other important independent socioeconomic determinants. Cattle marketers should consider this in their overall business strategies, recognizing that other factors are more likely to drive substantial improvements in profitability.

The size of the cattle business, as indicated by the number of cattle, emerges as a pivotal socioeconomic determinant of profitability within the cattle marketing sector. The presence of a highly significant coefficient of 0.002 (P-value: 0.000) indicates that the scale of the business significantly influences profitability. Specifically, the results reveal that larger businesses, characterized by a greater number of cattle, tend to generate more profits. This is contrary to the findings of [30], who found that cattle herd size had a negative and significant influence on the profitability of cattle farmers and marketers in the Khatlon region of Tajikistan. The implications brought about by this result are very strong. It justifies the principle of business growth and scaling in the cattle marketing industry. Cattle marketers who pursue the principle of higher profits should engage in strategies on how to scale up, and they could do so by acquiring more cattle. An increased business scale leads to higher participation in the market, more production, and the possibility of reaping economies of scale, which contribute to heightened profitability.

Again, the relation between business size and profitability places an impetus on the strategic growth and expansion of cattle businesses. This growth should be controlled by management, financial stability, and proper watching of the dynamics in the market. In this way, marketers, by strategically escalating the level of the cattle business, can improve their financial performance and secure a stronger foothold in the industry. Overall, this clearly stipulates the importance of the size of the business concerning the profitability of the business in the section of cattle marketing. More cattle simply means that the levels of profit will be high; thus, increasing the number of cattle is a direct way to increase profitability. To the cattle marketer, this should be put into consideration during strategic formulation for long-term success within the cattle marketing business. Payment methods are considered a significant socioeconomic determinant in the profitability of cattle marketing. Results present an interesting relationship. The presence of a positive and highly significant coefficient value of 0.358 with a P-value of 0.002 infers

that the payment method is highly influential on profitability. Specifically, digital payment transfer methods favour profitability. This finding is in support of the views and empirical findings of those who revealed that digital technology enhances the sustainability and profitability of cattle businesses, including cattle marketing. Ramifications of this finding are breathtaking and, therefore, underscore the growing importance of digital payment methods in facilitating efficient financial transactions within the industry of cattle marketing. Cattle marketers who will adopt and promote digital payment mechanisms can, therefore, potentially experience better profitability. Powered by the benefits accruing to digital transfers since they are more transparent, efficient, and very easy for purposes of managing their finances. Digital transactions lessen the use of cash that is easily lost either by carelessness or theft, and because of leaving a digital trail, it becomes easy to keep records and become accountable.

In this era, with the continuous digitalization of financial transactions and management tendencies, the future, therefore, is clear. Cattle marketers should, therefore, take into consideration a strategic approach to promote the adoption of digital payment methods. From the mode of payment practised, financial ecosystems will become efficient and transparent to benefit all stakeholders beyond their improved financial performance. That is to say, profitability in the sector of cattle marketing is fostered by the mode of payment adopted, precisely the use of digital transfer methods. Consequently, in allowing for these types of transparency and efficiency, the adoption of digital payment mechanisms can also be furthered via an increase in profitability. It is in this regard that the main recommendation for improving financial performance and helping to advance the industry towards a situation of being integrated into a more modern and efficient financial backdrop are efforts directed towards the promotion and use of digital payments. Specifically, it has been determined that access to market information is one of the key and highly relevant socioeconomic factors that determine profitability in the cattle marketing sector. Its positive coefficient, 0.583 (P-value: 0.000), positively indicates the fact that having access to market information significantly and positively influences profitability. This relationship underlines the very crucial role of well-informed decision-making within the sector. This result also confirmed the positive relationship of access to market information in improving profitability obtained, even though their result appeared to be statistically insignificant in the region of Tajikistan. The implications of this finding are immense. This underpins the crucial nature of market information for cattle marketers. Those with the advantage of timely, appropriate market data and information are thus better placed to make more informed pricing, timing, and market-trend decisions. This eventually converts into improved profitability, as one can capitalize on opportunities that develop and navigate the hurdles presented to the market.

In such a case, the strategic function of ensuring that there are avenues through which market information is shared seems apparent. In this respect, facilitating access to market data—perhaps through such means as digital platforms or information-sharing networks—is an effective strategy to enhance profitability within the cattle marketing sector. Such efforts are also of benefit to individual cattle marketers, as they contribute to a more dynamic yet informed industry landscape.

This reveals how important access to market information is in terms of influencing the level of profitability within the cattle marketing sector. Indeed, it has been found that access to market information largely raises profitability levels because it is a case where informed decisions are made. The implication is that the promotion of the development and dissemination of market information mechanisms, therefore, becomes one strategic avenue for the enhancement of profitability and enabling of a more informed and well-off cattle marketing industry.

Table 2: Socioeconomic Determinants of Profitability of Cattle Marketing Before Cash Crunch Period

Dependent variable: Profitability before cash crunch period (log of profit before cash crunch period)	Coefficient	Standard Error	t-value	P-value
Access to credit (1 if had access to credit, 0 otherwise)	0.512***	0.111	4.590	0.000
Employment status (1 if full-time cattle marketer, 0 otherwise)	0.813***	0.153	5.320	0.000
Years of education	0.025**	0.010	2.460	0.014
Digital financial literacy (1 if having digital financial literacy, 0 otherwise)	0.581***	0.203	2.870	0.004
Age (in years)	0.031***	0.005	5.650	0.000
Membership of cattle association (1 if member, 0 otherwise)	0.469***	0.096	4.900	0.000
Household size	0.018*	0.011	1.700	0.089
Number of cattle (size of business)	0.002***	0.000	11.610	0.000
Mode of payment (1 if transfer, 0 if cash)	0.358***	0.117	3.050	0.002
Access to market information (1 if had access, 0 otherwise)	0.583***	0.109	5.360	0.000
Constant	9.372***	0.264	35.460	0.000
Mean dependent var	12.532	SD dependent var		1.421
R-squared	0.607	Number of obs		470
F-test	68.046	Prob > F		0.000
		Bayesian crit. (BIC)		1281.55

*** p<.01, ** p<.05, * p<.1 indicate significance at 1%, 5% and 10% levels, respectively.

B) Overall Performance of the Regression Model

The additional statistical information provided in the regression is crucial for understanding the overall model's relevance and how it includes the socioeconomic indicators of profitability in the beef cattle marketing sector. R-squared equals 0.607. It is the coefficient of determination and explains the percentage of variation observed in profit that is actually accounted for by the introduced independent variables within the model. In this context, it implies that approximately 60.7% of the variations in profitability lie within the factors considered here. This is a pretty high R squared value, meaning that the model is good enough to explain a substantial variation in the profitability among cattle marketers. This R-squared of 60.7% falls well within the range of a significantly high-performing model, as suggested by [30]. The F-test gives the overall significance of the model, and the statistic is 68.046.

The Prob > F value is .000, so it is very low. Hence, this model is very significant, and the independent variables, on the whole, account for huge numbers in explaining variability in profitability. In simpler words, the model does fit the data well, and the selected independent variables have a great impact on explaining profitability in this industry of cattle marketing. In summary, these findings underscore the multifaceted nature of profitability within the cattle marketing sector before the cash crunch period. Lending, full-time job holding, education, digital financial literacy, age, membership in cattle associations, business size, digital payment methods, and access to market information all have a knock-on effect on profitability. It is also the understanding of these determinants that allows the development of particular policies and strategies that help increase the level of profitability within the cattle marketing industry, thus benefitting businesses, policymakers, and researchers in the endeavor.

C) Socioeconomic Determinants of Profitability of Cattle Marketing During Cash Crunch Period

Moreover, Table 3 presents the regression analysis of the socioeconomic determinants in which they have a hand in the profitability within the cattle marketing sector during the challenging cash crunch period.

The coefficient for access to credit was very significant, with a value of 0.540 (P-value: 0.000). The coefficient suggests that for those with access to credit resources, the profit-relative ratio was high during the cash crunch. It rather over-emphasizes the need for flexibility in financial management by people during hard economic times, whereby access to credit can be a very vital strategy that a marketer of cattle would sail through successfully. The high coefficient of 1.398 in full-time employment as a cattle marketer during the cash-crunch period. This demonstrates that individuals fully committed to the cattle marketing profession achieved notably higher profitability. The implication is clear: dedicating one's efforts entirely to cattle marketing, especially during challenging economic conditions, is instrumental in enhancing profitability.

Although the coefficient for years of education is smaller (0.027) but statistically significant (P-value: 0.019), it remains noteworthy. This suggests that higher education levels have a positive impact on profitability during the cash crunch period. Cattle marketers with more education may possess better decision-making and financial management skills that are particularly valuable in adverse economic circumstances. This is also consistent with the findings of [30], who showed that education level had a positive and significant impact on the profitability of cattle farmers and marketers, emphasizing the consistent role of education in good and bad times (cash crunch period) for cattle marketers.

The coefficient for digital financial literacy is also positive (0.402) and significant at a lower level (P-value: 0.056), providing a notable implication. It indicates that individuals with digital financial literacy skills tend to be more profitable during the cash crunch period. This underscores the growing importance of digital competence in managing financial affairs, which can be particularly advantageous when physical transactions face challenges.

Age is a highly significant socioeconomic determinant, with a coefficient of 0.043 (P-value: 0.000). This suggests that older cattle marketers experienced higher profitability during the cash crunch period, possibly due to their accrued experience and established networks. Younger cattle marketers can benefit from mentorship programs and knowledge transfer to enhance their profitability, especially during challenging economic periods.

The coefficient of 0.281 (P-value: 0.021) for membership in cattle associations highlights the importance of collective action. Being a member of such associations positively influences profitability during the cash crunch period, as it can provide support, knowledge sharing, and joint marketing initiatives. The coefficient of 0.005 (P-value: 0.665) for household size suggests that it has no significant impact on profitability during the cash crunch period. Other factors are likely to exert more substantial influences, and therefore, the effect of household size is relatively insignificant. Business size, represented by the number of cattle (Coefficient: 0.002, P-value: 0.000), significantly affects profitability during the cash crunch period. Larger cattle businesses generate more profits, reinforcing the value of scaling up operations, even in challenging economic conditions.

The mode of payment also has an impact, with a coefficient of 0.281 (P-value: 0.036). Digital transfer methods are favourable in influencing profitability during the cash crunch period, highlighting the importance of embracing digital payment mechanisms, which offer transparency and efficiency.

The coefficient of 0.431 (P-value: 0.001) for access to market information emphasizes its critical role. Having access to market data considerably improves their profitability during the cash crunch period. In fact, providing means of dispersing market information can be an efficient strategy to increase profitability in the sector of cattle marketing when economic conditions are not favorable.

Model Performance: The model R-square of 0.588 establishes that it explains a large portion of the variation in profitability during the cash crunch period. The high significance of the F-test (Prob > F: 0.000) underlines the strength of the model in general and the collective effect of independent variables.

This study concludes by giving a critical and contextual understanding of the socioeconomic determinants of profitability in the cattle marketing sector during the cash crunch period. These remain influential in access to credit, full-time employment, education, digital financial literacy, age, membership in cattle associations, business size, digital means of payments, and access to market information. These will no doubt help cattle marketers, policymakers, and researchers know what to do to ensure increased profitability during these very rough times.

Table 1: Socioeconomic Determinants of Profitability of Cattle Marketing During Cash Crunch Period

Dependent variable: Profitability during cash crunch period (log of profit during cash crunch)	Coefficient	Standard error	t-value	p-value
Access to credit (1 if had access to credit, 0 otherwise)	0.540***	0.132	4.100	0.000
Employment status (1 if full-time cattle marketer, 0 otherwise)	1.398***	0.156	8.960	0.000
Years of education	0.027***	0.012	2.360	0.019
Digital financial literacy (1 if having digital financial literacy, 0 otherwise)	0.402*	0.210	1.910	0.056
Age (in years)	0.043***	0.006	6.900	0.000
Membership of cattle association (1 if member, 0 otherwise)	0.281**	0.121	2.310	0.021
Household size	0.005	0.012	0.430	0.665
Number of cattle (size of business)	0.002***	0.000	13.57	0.000
Mode of payment (1 if transfer, 0 if cash)	0.281**	0.134	2.100	0.036

Access to market information (1 if had access, 0 otherwise)	0.431***	0.135	3.200	0.001
Constant	8.195***	0.277	29.61	0.000
Mean dependent var	11.462	SD dependent var		1.567
R-squared	0.588	Number of obs		470
F-test	74.295	Prob > F		0.000
Akaike crit. (AIC)	1359.795	Bayesian crit. (BIC)		1405.476

.*** p<.01, ** p<.05, * p<.1 indicate significance at 1%, 5% and 10% levels, respectively.

D) Comparing Socioeconomic Determinants of Profitability of Cattle Marketing Before and During Cash Crunch Period

The analysis of socioeconomic determinants of profitability in the cattle marketing sector before and during the cash crunch period gives a wide perspective on how economic crises affect the factors that determine financial performance. In both periods, access to credit comes out as a very significant socioeconomic determinant, implying that access to credit resources plays a pivotal role in increasing profitability irrespective of economic conditions. It will allow cattle marketers the financial freedom to invest in their businesses for better performance through market fluctuations.

This makes being a full-time cattle marketer strongly important in profitability both during the normal period and during the cash crunch period. In this regard, its importance increases with the cash crunch period, supporting its strong role in conditions when the economic situation is hard. Thus, one can underscore the importance of fully engaging in cattle marketing during such times.

Other important socioeconomic determinants are education and digital financial literacy; however, their strength is slightly different. The effect of education weakens during the time of cash crunch, which presupposes that other factors might be of higher importance in the conditions of economic crisis. Digital financial literacy, though still significant, does not bear as much influence, which can be explained by reliance on traditional financial management skills during an economic crisis. Age is still very significant in both periods, but its positive significance is more emphasized in the cash crunch period. The author brings out the fact that an older cattle marketer, with his experience and networks, is better armed to face economic challenges. Mentorship, hence, comes among the key recommendations for young cattle marketers during such periods. This result indicates a better theoretical orientation of the impact of age on profitability than the findings of those who found in their work that age among cattle marketers negatively influenced profitability, insinuating that membership in cattle associations remains imperative. Its importance has increased somewhat during the cash crunch period.

This confirms the relevance of the partnership in both collaboration and support in difficult times of the economy, and it is made available by knowledge transfer and co-marketing. The size of the household does not show any significant result in any of the periods, so the impact on profit is very small. Other proxies of parameter determinations demonstrate higher impact and, for this reason, render household size insignificant in both situations. Although this result agreed with theoretical expectations, it disagreed with the findings of [31], who found that there is empirical evidence of the negative but insignificant influences of membership of cattle marketers associations and household size on profitability.

Business size, indicated by the number of cattle, significantly affects profitability in both periods, with slightly increased significance during the cash crunch period. This highlights the growing importance of scaling up cattle businesses, especially during economic challenges, as larger operations generate more profits.

The mode of payment remains significant, with digital transfer methods being favoured in both periods. The adoption of digital payment mechanisms becomes even more critical during the cash crunch period, offering transparency and efficiency and reducing reliance on cash transactions. This further reinforces the assertion and findings of [26] that embracing technological innovations increases the competitiveness of cattle marketers and enhances their profitability, especially during economic challenges.

Access to market information is a critical socioeconomic determinant of profitability in both periods, with slightly increased significance during the cash crunch period. This underscores the consistent importance of being well-informed to make strategic decisions, particularly in economically challenging times. The R-square values are highly significant, and the F-tests also come out to be highly significant, which justifies that the model performance is strong in the sub-periods. Therefore, it confirms that the models are fit to elaborate on the variability in profitability. In sum, a comparison of socioeconomic determinants of profitability before and during the cash crunch period indicates that while many of the factors remain the same, the significance levels and impacts of some of the socioeconomic determinants vary across the economic challenge periods. These will be very useful for cattle marketers, policymakers, and other researchers in the community to strategize for better profitability under different economic conditions. The proper performance of the models across any of those periods shows the relevance of these determinants in understanding profitability in the cattle marketing sector.

E) Z-Test of Differences in Coefficients of Socioeconomic Determinants of Profitability before and during Cash Crunch Period

Table 4 presents the results of the z-test of equality of coefficients of socioeconomic determinants of profitability for cattle marketers before and during the cash crunch period. A z-statistic is tested to determine if there could be any statistical differences in the effect of these determinants at the two points in time.

Access to Credit: The z-statistic on access to credit interaction is -0.115; hence, the coefficient impact on profitability between the two periods is not significantly different. This would, therefore, suggest that the impact of access to credit remains even with the economic challenges presented during the cash crunch period.

Employment Status: The employment status has an overall calculated z-statistic of -1.893, which is always greater than the critical z of 1.64, showing that at the 10% level of significance, the null hypothesis is extremely rejected. The coefficient in the case of cash crunch for employment status (1.398) is significantly high, with the dummy coefficients being largely higher than before the cash crunch, indicating more pronounced effects of prohibition on full-time employment in profitability during this crisis period.

Years of Education: For the years of education, the computed z-statistic is -0.091; hence, over the periods, there is no significant difference in the effect that education has on profitability. The effect of education is, therefore, not radically different between the two periods.

Digital Financial Literacy: The z-statistic for digital financial literacy is 0.433, signifying no significant difference in its impact on profitability between the two periods. Despite a slight decrease in the coefficient, digital financial literacy continues to be a consistent socioeconomic determinant of profitability.

Age: The z-statistic for age is -1.091, suggesting no statistically significant difference in the coefficient's impact on profitability between the two periods. Older age continues to influence profitability consistently across both periods.

Membership of Cattle Association: The z-statistic for membership in cattle associations is 0.866, indicating no significant difference in its impact on profitability between the two periods. The influence of association membership remains relatively stable.

Household Size: The z-statistic for household size is 0.565, suggesting no significant difference in its impact on profitability between the two periods. Household size does not exhibit significant variations in its influence.

Number of Cattle: There is no significant difference in the coefficient for the number of cattle between the two periods, as indicated by a z-statistic of 0.000.

Mode of Payment: The z-statistic for the mode of payment is 0.307, suggesting no significant difference in its impact on profitability between the two periods. The mode of payment maintains its consistency as a determinant.

Access to Market Information: The z-statistic for access to market information is 0.623, indicating no significant difference in its impact on profitability between the two periods. Access to market information continues to be a consistent socioeconomic determinant.

In summary, the z-test results reveal that the impact of most Socioeconomic determinants on profitability remains relatively stable between the two eras. Only the influence of full-time employment status significantly increases during the cash crunch period, highlighting its heightened importance in challenging economic conditions. This information is valuable for understanding how specific socioeconomic determinants respond to economic challenges and can inform decision-making for cattle marketers and policymakers in different economic contexts.

Table 4: Z-Test of the Coefficient of Socioeconomic Difference in the Determinants of Profitability of Cattle Marketing Before and During Cash Crunch Period

	Coef before	SE before	Coef during	SE during	Coef Diff	z-stat
Access to credit	0.512	0.111	0.54	0.132	-0.028	-0.115
Employment status	0.813*	0.153	1.398	0.156	-0.585	-1.893
Years of education	0.025	0.01	0.027	0.012	-0.002	-0.091
Digital financial literacy	0.581	0.203	0.402	0.21	0.179	0.433
Age (in years)	0.031	0.005	0.043	0.006	-0.012	-1.091
Membership of the Cattle Association	0.469	0.096	0.281	0.121	0.188	0.866
Household size	0.018	0.011	0.005	0.012	0.013	0.565
Number of cattle	0.002	0.000	0.002	0.000	0.000	0.000
Mode of payment	0.358	0.117	0.281	0.134	0.077	0.307
Access to market information	0.583	0.109	0.431	0.135	0.152	0.623

Note: * indicates a significant difference at a 10% level of significance since the computed z statistic of 1.893 is greater than the critical z value of 1.64.

IV. CONCLUSION

This study analyzed the socioeconomic determinants of profitability of Cattle marketing in Northeastern Nigeria before and during the Cash Crunch period. Purposive and simple random sampling techniques were adopted to select 495 respondents to form the sample size. Primary data was employed, which was sourced from a cross-sectional survey of cattle marketers with the aid of a well-structured questionnaire along with interviews. The study employed an inferential method of analysis. The results of the multiple regression analysis using Robust Ordinary Least Square (OLS) showed that access to credit facilities, education and market information all had positive coefficients of 0.540, 0.027 and 0.431, and Significant at $p < 0.01$, respectively. The R² values for these determinants were 61% and 59% before and during the cash crunch period, indicating that between 61% and 59% of the variations in profitability were explained by the aforementioned factors. The Z-test revealed no significant difference in these factors between the two periods, emphasizing their consistent positive impact.

The financial institutions should design specialized credit facilities that cater to the unique requirements of cattle marketing, offering reasonable interest rates and accessible terms. Furthermore, partnerships with microfinance institutions can provide microloans that specifically address the financial needs of cattle marketers.

Cattle marketers should indulge themselves in groups or associations to facilitate their digital financial learning process. Enhanced network connectivity and mobile banking services can alleviate the challenges associated with remote and cashless transactions in cattle marketing.

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