Challenges Associated with Frugal Business Modelling: An Exploratory Factor Analysis

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Abstract:
The research conducted in this study focused on exploring the challenges associated with frugal business modelling in the context of agribusinesses. The study employed a cross-sectional survey design and targeted managers and operational staff working in agribusinesses affiliated with the National Association of Seed Traders of Ghana (NASTAG). The collected data underwent a series of statistical analyses, including exploratory factor analysis, principal component analysis, and varimax rotation. These analyses were performed on the questionnaires, which contained variables assessing the challenges related to frugal business modelling. The findings of the study revealed that several challenges hinder the frugal business modelling in Ghana. These challenges were categorised into six factors: coordination, information and dissemination, regulation and supervision, funding, service delivery, and the institutional framework. These factors emerged after applying exploratory factor analysis, principal component analysis, and varimax rotation techniques. Together, these six factors accounted for 65.6% of the explained variance in the data. The identified challenges have both theoretical and practical implications for enhancing the sustainability of agribusinesses. They provide valuable insights into the specific areas that need attention and improvement to promote the long-term viability of agribusiness operations. However, despite the significance of these findings, the study also recommended the exploration of longitudinal studies. Conducting longitudinal research would enable a deeper understanding of the enduring impact of frugal business modelling on agribusiness sustainability. By examining agribusinesses over an extended period, researchers can gain insights into the dynamics and long-term effects of frugal practices on sustainability outcomes.

Keywords: Frugal business modelling, agribusiness sustainability, frugal innovation, system resource model, contingency model

1. Introduction

Davis and Goldberg (1957) coined the term "agribusiness" to describe the fusion of agriculture and business during the mid-20th century. They defined agribusiness as encompassing all activities related to the creation and dissemination of information, as well as farming practices, storage, processing, and distribution of agricultural products. In concentrated markets, enterprises are incentivised and empowered to exploit individuals with limited alternatives, reinforcing their dominant position and impeding effective competition and market decentralisation (Becvarova, 2005).

The concept of frugality, which entails achieving more with fewer resources, has become intertwined with innovation and integrated into business models in recent times (Radjou & Prabhu, 2015). According to Tiwari *et al.* (2017), frugal innovation continues to progress in emerging markets and has the potential to make a breakthrough in industrialised countries as well.

Most African countries are categorised as developing nations, and Weyori *et al.* (2017) argue that the poor productivity of the agricultural sector in these countries can be attributed to a lack of novel concept development and inadequate adoption of improved agricultural technologies introduced by agribusinesses. Numerous factors have been identified in the literature as influencing farmers' decisions regarding the adoption of agricultural technology. Weyori *et al.* (2017) claimed that several studies have demonstrated the impact of agribusinesses' business model characteristics on the patronage of their services and, consequently, their survival. Access to the technologies provided by agribusinesses is also crucial. The researcher concluded that the supply and demand of enhanced farm technologies from agribusinesses should involve a multifaceted interaction that emphasises indigenous networking, interdependence, and social interactions among all stakeholders. According to French *et al.* (2014), the challenges present in today's world serve as drivers of economic growth and bring together various aspects of agribusiness.

Business modelling by agribusinesses, whether frugal or not, refers to the process through which a new product or service is implemented. Such business modelling should be socially appropriate and provide benefits to all parties involved. This modelling process falls under the umbrella of "innovation systems," which comprise organisations, public and private stakeholders, and their interconnectedness in terms of technical, financial, and commercial competencies

required for sustainability (Fagerberg, Martin & Andersen, 2013). Frugal business modelling, also known as jugaad or inclusive innovation, represents a disruptive approach that emphasises cost-effective solutions to address the needs of resource-constrained consumers. It has gained prominence in emerging economies where traditional business models may not be feasible due to limited resources and infrastructure. Frugal business models enable companies to develop affordable and sustainable products and services, thereby unlocking new markets and driving economic development. However, amidst the opportunities, there are several challenges that need to be understood and addressed to ensure the successful implementation of frugal business models. This research aims to explore the influence of frugal business modelling on the sustainability of agribusiness in Ghana and provide insights for practitioners and policymakers.

2. Review of Related Literature

2.1. Frugal Innovation Theory

Frugal innovation is the ability to achieve more with less, creating social and business value while minimising the use of scarce resources such as time, energy, and capital. In this era of scarcity, companies face increasing pressure from cost-conscious customers, environmentally conscious employees, and other stakeholders who demand sustainable, affordable, and high-quality products. Therefore, frugal innovation has become a game-changer for business strategies. However, frugal innovation goes beyond being merely a strategy; it represents a new mindset where resource limitations are seen as opportunities rather than liabilities (Radjou & Prabhu, 2015).

Frugal innovation can be best understood as the convergence of institutional, technological, and social innovation. Each of these subfields of innovation is relatively new and presents unique challenges for academic research, such as testing and refining theories of innovation, strategies, and entrepreneurship in specific contexts like emerging and developing markets with resource and institutional constraints (Bhatti *et al.*, 2018).

According to Radjou and Prabhu (2014), a better understanding of frugal innovation requires integrating the four core attributes of customers from emerging economies, along with other dimensions such as product simplification, management support, and resilience. The study of Radjou and Prabhu (2014) thereby proposed seven propositions based on frugal innovation dimensions about the association of FIs to the creation of value as per the following:

- Affordability: An essential characteristic of resource-constrained innovation in developing countries is its ability to offer unique and affordable services and products to consumers. Affordability is a significant aspect of frugal innovation that holds high value for customers (Radjou & Prabhu, 2014).
- Simplicity: According to Radjou and Prabhu (2014), simplicity involves adding meaning while eliminating the obvious. Simple yet effective ideas captivate customers' attention. Innovations are said to mask the true cost and divert the search for more sustainable solutions. This entails creating advantages out of constraints.
- Quality: Mahmood *et al.* (2014) argue that services and products must exhibit superior quality while remaining affordable. Frugal innovations aim to develop solutions of higher quality standards for consumers at the bottom of the pyramid (BOP).
- Sustainability: Larson *et al.* (2000) propose that sustainable businesses are both profitable and feasible. They assert that encouraging frugal innovation is necessary for fostering collaboration among people at all levels of management in sustainable businesses, be it in advanced or emerging economies.
- Resilience: Bristow and Healy (2017) suggest that businesses should focus on innovative, flexible approaches rather than investing in expensive research and development projects that require significant changes to traditional business models. With emerging nations leading in progressive development, developed economies have also embraced investments in research and development and have adopted less risky approaches to creativity.
- Management Support: According to Dubey *et al.* (2015), progressive senior management leadership in innovation motivates employees to engage in corporate behaviour and innovation, fostering a participative innovation mindset. Frugal innovation reduces production complexity and costs by eliminating non-essential features from durable goods in general.
- Defeaturing: Chhabra (2012) states that defeaturing is a crucial component of frugal business models. Services and products demand simpler systems rather than complex ones. Organisations should focus on value-driven components and avoid including non-value-added features that increase production costs.

2.2. System Resource Model

The effectiveness of a system is determined by its ability to acquire necessary resources from external settings beyond the organisation (Schermerhorn *et al.*, 2004). When there is a strong connection between an organisation's resources and the goods or services it provides, system resources can lead to success (Cameron, 1981). Managers are encouraged to view their organisation not just as an isolated entity but as a member of a larger group. The prevailing mindset is that any aspect of an organisation's operations has an impact on all other aspects (Mullins, 2008). Furthermore, the use of input and output measures of effectiveness in the system resource approach is desirable due to its quantitative nature. However, these measures alone may not provide a complete picture of performance since new ideas and discoveries may not have an immediate and directly observable impact. Even after a prolonged period of support, academic and research organisations may not produce remarkable outcomes. Founders may continue to offer support if they believe they can make significant contributions in the future, even in the absence of sufficient evidence of effectiveness (Altschuld & Zheng, 1995).

Relationships with the environment to ensure continuous input receipt and favourable output acceptance, flexibility in adjusting to environmental changes, the organisation's efficiency in converting inputs into outputs, the clarity of internal communications, the degree of group conflict, and employee job satisfaction are just a few of the factors that are taken into consideration by the systems perspective (Robbins, 1990).

In contrast to the goal-achievement approach, proponents of the systems approach do not disregard the value of specific goals in organisational efficiency (OE) (Yutchman & Seashore, 1967). Instead, they question the validity of the chosen goals and the metrics used to track progress towards those goals. End goals are not overlooked in the systems resource approach to OE; rather, they are viewed as one aspect of a complex set of criteria that promote the organisation's long-term survival (Yutchman & Seashore, 1967). Essentially, the systems approach focuses on the means to achieve specific goals rather than the goals themselves. According to Yutchman and Seashore (1967), the system resource approach offers five advantages:

- The organisation serves as the frame of reference;
- Relationships between organisations are included in its definition;
- The general framework can be applied to various organisations;
- Measurement techniques for comparative evaluation can be diverse; and
- Guidelines for selecting empirical key performance metrics are provided.

2.3. Contingency Theory

Contingency theory suggests that a leader's strategy that works well in one context might not be effective in another. This theory attempts to explain why a leader who excels in one context could struggle in another or when circumstances alter (Hersey & Blanchard, 1982). As used in this review, the contingency method is described as identifying and creating functional connections between management, environmental, and performance variables. In order to achieve efficient performance, Miller and Starr (1970) developed specific contingency links between different scenarios in addition to quantitative decision-making processes. The contingency technique has also been crucial in the categorisation of organisational system categories. With the growing emphasis on open-systems models, many of these classification systems are predicated either explicitly or indirectly on the characteristics of the environmental super system within the business. The way the company interacts with its surroundings is given special consideration.

2.4. Agribusiness and Frugal Business Modelling

The agribusiness system encompasses all activities involved in the procurement, distribution, production, and marketing of agricultural products, with a systematic interconnection to other related activities (Firmansyah et al., 2003). The concept of agribusiness has evolved, giving rise to "Agribusiness Systems Analysis," which has two fundamental elements. Initially, agriculture was considered an isolated sector, but now it is recognised as an interdependent system comprising agents specialised in interconnected industries. Furthermore, as a percentage of the overall value of production, value-added at the farm level tends to decline over time, with important strategic ramifications. The first person to highlight that profit margins rise as a product gets closer to its ultimate market destination was Goldberg. Based on sector research, Goldberg created the Agribusiness Systems Model, which emphasises inter-sectorial linkages. In the absence of other institutions, his research is predicated on the existence of costless market processes and seamless interactions.

As mentioned above, the agribusiness system, like any other system, consists of various subsystems with specific inputs and a transformation process that converts inputs into outputs. The framework can be seen as a collection of subsystems that collaborate and depend on each other and the surrounding environment. Consequently, agribusiness falls within the framework of sociology, where activities are influenced by various disciplines such as plant science, industrial strategies, marketing, and institutions, all working together to facilitate the production of agricultural goods and services (Thony, 2012). In order to make innovations more accessible and affordable when compared to traditional methods, frugality involves minimising the use of resources (raw materials, production resources, energy, fuel, water, waste, and financial resources). As a result, frugality is frequently linked to sustainability (Albert, 2019).

Zeschky et al. (2014) argue that resource-constrained innovations, such as frugal business models, provide cost-effective alternatives to existing Western models, particularly suitable for consumers in developing markets. The term "business model" began appearing in scientific publications and discussions in the 1950s, but its usage lacked specificity. The concept of the business model, particularly in relation to technology, emerged as a new unit of analysis influenced by transaction cost economics, suggesting that business design could be made more cost-effective through the increasing availability and affordability of information technology (Osterwalder et al., 2005). The widespread adoption of the internet for commercial purposes in the mid-1990s further popularised the concept (Zott et al., 2011). Initially, business modelling was primarily associated with system modelling and was seen as an operational endeavour (Wirtz et al., 2016). This description aligns with the four key elements that constitute a business model according to Chesbrough (2007): value proposition, creation and delivery of value, revenue model, and customer interface. The value proposition refers to the value generated for consumers, while the creation and delivery of value involve how companies position themselves to deliver the proposed value. The revenue model encompasses the cost structure and how value is attained, while the customer interface involves establishing relationships and communication channels with customers.

2.5. Challenges Associated with Frugal Business Modelling

Frugal innovation has emerged as a popular approach in recent years for developing sustainable business models that cater to the needs of low-income consumers. However, implementing frugal business models comes with its own set

of challenges. Businesses that adopt such models must navigate various economic, social, and cultural factors that can influence their success. One significant challenge in establishing agribusinesses, as highlighted by Bruinsma (2009), is the lack of adequate funding and high lending rates. Many agribusinesses are founded by individuals with limited financial resources, resulting in financial stress and limited access to corporate or government support (Ousmane, 2008). To ensure the sustainability and growth of the agribusiness sector, it is crucial to improve efficiency and productivity by integrating into global value chains and promoting diversification of rural livelihoods.

A study on agribusiness operations in Australia identified key challenges such as poor organisational structure, low output, insufficient technical knowledge, inadequate training, weak industrial relations, and inadequate management (Bandarla, 1991). Evans and Wurster (2000) emphasised the challenge of developing a comprehensive measurement of a company's capacity and capability, which is essential for identifying core competencies and sustaining a competitive advantage.

The security of intellectual capital and competence was identified as a significant challenge in agribusiness operations by Jules (2006). While agribusinesses may be capable of assessing their current operational capacity, they often struggle to identify the competencies and capacities required for future success.

According to Todd and Rose (2006), agribusinesses encounter challenges getting formal, low-interest credit. Access to credit is crucial for funding routine activities and formulating effective policies. The inability to access credit often hampers the growth and performance of agribusinesses, leading to suboptimal outcomes.

Overall, these challenges underscore the complex nature of agribusiness operations and highlight the importance of addressing financial, organisational, knowledge, and credit-related hurdles to achieve sustainable and successful outcomes.

3. Methodology

This study used a cross-sectional survey approach to gather data from managers and operational staff working in fifty-eight (58) agribusinesses affiliated with the National Association of Seed Traders of Ghana (NASTAG). The purpose of the survey was to examine the relationships among the variables under investigation. The choice of this design was appropriate because the study adopted a quantitative approach, necessitating the measurement of variables. The researchers used the Purposive Sampling Technique to select participants, focusing on managers, administrators, and operational staff from agribusinesses registered with NASTAG. Including top-level managers as subjects allowed the authors to gain insights into how these managers perceive the challenges, success factors, and sustainability of agribusinesses. The total population of NASTAG is 289, and the sample size was determined using the Slovin (1960) formula. According to Slovin's formula, when the error tolerance is not specified, the researcher can determine their error tolerance by subtracting 1 from an estimate of the confidence level. In this case, the researcher aimed for a 95 percent confidence level, resulting in a sample size of 205. The researchers distributed questionnaires through an online Google Form and received 205 responses from the participants. The Statistical Package for Social Scientists (SPSS) was used to examine the acquired data using exploratory factor analysis and descriptive statistics.

4. Results and Findings

4.1. Descriptive Information

4.1.1. Demographic and Background Information

In this section, we present an analysis of the data regarding the employees' years of experience in the agribusiness industry, their work designations within the company, age brackets, and the number of employees in the agribusiness. The findings are summarised in table 1. According to table 1, the majority of respondents (35.1%) had less than 5 years of experience in the agribusiness industry. The next largest group (34.6%) had between 6 and 10 years of experience. A smaller proportion of respondents had been working for 11 to 15 years (18.5%), and even fewer had more than 15 years of experience (11.7%). In terms of work designation, nearly half of the respondents (47.3%) held management roles, while 35.1% were involved in operational roles. Those in administration and finance roles accounted for 11.2% and 6.3% of the respondents, respectively. Regarding the age bracket of the companies, approximately 10% of the respondents claimed that their companies had been operating for 11 to 15 years, followed by those whose companies had been running for more than 15 years. Around 35.1% and 37.1% of the respondents reported that their companies had been in operation for 6 to 10 years and less than 5 years, respectively. This observation aligns with Wolter's (2009) findings, which suggested that funding from donors for agriculture and agricultural multi-donor programs in Ghana has contributed to an increase in actors within the agricultural value chains. In terms of staff strength, the largest group of respondents (36.1%) indicated that their companies had more than 30 employees. Those claiming a staff strength of less than 10 accounted for 27.3% of the respondents. Additionally, 24.4% of the respondents reported having a staff strength between 11 and 20, while 12.2% claimed a staff strength between 21 and 30.

In summary, the data presented in table 1 provide insights into the years of experience, work designations, age brackets of the companies, and staff strengths in the agribusiness industry based on the responses of the participants.

Variables	Frequency	Percent
Years of experience in the agribusiness industry		
Less than 5 years	72	35.1
6 to 10 years	71	34.6
11 to 15 years	38	18.5
More than 15 years	24	11.7
Work designation within the company		
Management	97	47.3
Administration	23	11.2
Operations	72	35.1
Finance	13	6.3
Age bracket of the company		
Less than 5 years	76	37.1
6 to 10 years	72	35.1
11 to 15 years	21	10.2
More than 15 years	36	17.6
Number of staff		
Less than 10	56	27.3
11 to 20	50	24.4
21 to 30	25	12.2
More than 30	74	36.1
Total	205	100.0

Table 1: Demography of Respondents
Source: Field Data (2023)

4.1.2. Descriptive Statistics for Challenges Associated with Frugal Business Modelling

In analysing the objectives, descriptive statistics are used, specifically employing a mean scale ranging from 1 to 5. Following this, an exploratory factor analysis is conducted. The mean scale is divided into two categories using a cut-off mean, separating the low and high portions. A high score for a challenge related to frugal business modelling indicates that respondents perceive the firms to be strong in that area, while a low score indicates the opposite. The study operationalised the challenges into six variables, namely: funding, institutional framework, service delivery, information and dissemination, coordination challenges, and regulation and supervision. Each challenge factor is further broken down into sub-indicators that contribute to the overall components. The statistics related to these factors are presented in table 2.

Variables of Challenges	Indicator	Mean
Funding	C_Funding	3.28
Institutional Framework	C_Inst_Framewk	2.12
Service Delivery	C_Serv_DelivMgt	3.14
Information & Dissemination	C_Info_Dissem	3.66
Coordination Challenges	C_Coord_Challenges	3.68
Regulation & Supervision	C_Regul_Superv	3.40
	Composite Mean	3.22

Table 2: Level of Variables of Challenges Associated with Frugal Business Modelling
Scale (Mean): 0 – 2.9 = Low; 3 – 5 = High
Source: Field Data (2023)

Table 2 presents descriptive statistics on the challenges associated with frugal business modelling on agribusiness sustainability in Ghana. The composite mean indicates a high score ($\bar{X}$ = 3.22), indicating that respondents generally acknowledge the significance of the parameters used to measure these challenges. Additionally, all variables used in measuring sustainability received high mean scores ($\bar{X} \geq 3$).

The first variable, funding, encompasses factors such as low fundraising proficiency, inadequate staff resources, insufficient institutional support for employee development, limited financial resources, insufficient funding, unfavourable conditions, and lack of personnel. Table 2 shows that funding received a high mean score surpassing the cut-off point ($\bar{X}$ = 3.28), suggesting that the majority of respondents perceive funding as a significant challenge for agribusinesses.

The second variable, institutional framework, includes aspects like institutional mandate, alignment of actions and mission, clarity of organisation's mission and goals, leadership strength, absence of growth and sustainability strategies, overlapping roles, and lack of established organisational structure. In table 2, the mean score for the institutional framework is below the cut-off point ($\bar{X}$ = 2.12), indicating that respondents do not consider it a substantial challenge associated with frugal business modelling. It is the only variable that scored below the cut-off point.

The third variable, service delivery, involves challenges related to market diversity, insufficient variety in delivery approaches, operational impact due to lack of framework, ineffective service risk management policies, and customer

reluctance to disclose personal information. Table 2 shows a high mean score for service delivery, surpassing the cut-off point ($\bar{X}$ = 3.14), indicating that respondents perceive significant challenges in this area for agribusinesses.

The fourth variable, information and dissemination, includes parameters such as customer knowledge of frugal activities, central monitoring difficulties by investors, lack of clear reporting structures, weaknesses in data gathering, absence of common benchmarks and methods for measuring frugal innovation, and inadequate customer information. The mean score for this variable is high ($\bar{X}$ = 3.66), surpassing the pre-determined mean midpoint ($\bar{X}$ = 2.9). This suggests that respondents believe information and dissemination challenges hinder the sustainability of agribusinesses.

The fifth variable, coordination challenges, includes parameters like the absence of a formal coordinating body, fragmentation among service providers, lack of reliable data for decision-making, and costly access to information for coordination. This component received the highest mean score ($\bar{X}$ = 3.68), indicating that respondents strongly believe their firms face coordination challenges that hinder their business. This mean score surpasses both the pre-determined mean midpoint ($\bar{X}$ = 2.9) and all other means under sustainability.

The final variable, regulation and supervision challenges, involves factors such as similar legal regulations, lack of frugal operation guidelines, inadequate governing structure, absence of a formal board appointment structure, board members lacking necessary knowledge, and ineffective board oversight. This variable received a high mean score ($\bar{X}$ = 3.22), indicating that respondents perceive regulation and supervision challenges as significant obstacles to the sustainability of their agribusiness firms. This mean score is the highest among all variables, surpassing both the pre-determined mean midpoint ($\bar{X}$ = 2.9) and all other means under sustainability.

Table 3 presents the results of the normality test based on Skewness and Kurtosis for the challenges associated with frugal business modelling on the sustainability of agribusinesses in Ghana.

Variables of Challenges	Skewness Statistic	Kurtosis Statistic
Funding	-0.337	-0.92
Institutional Framework	-0.935	-0.326
Service Delivery	-0.661	0.332
Information & Dissemination	-0.963	0.462
Coordination Challenges	-0.711	-0.172
Regulation & Supervision	-0.637	1.145

Table 3: Normality Test of Variables of Challenges Associated with FBM
Source: Field Data (2023)

According to Mishra *et al.* (2019), a variable is considered to have a normal distribution when its skewness statistics (50 ≤ n < 300) falls between -2 and +2, and its kurtosis is less than or equal to 3.29. Upon examination of table 3, it can be observed that all the variables fall within this range, indicating that they exhibit a normal distribution.

4.2. Exploratory Factor Analysis for Challenges Associated with Frugal Business Modelling

In order to identify the challenges associated with frugal business modelling on the sustainability of agribusinesses in Ghana, the study data underwent an exploratory factor analysis. Principal component analysis, followed by a varimax rotation, was performed on the questionnaires containing 36 variables that evaluated the challenges related to frugal business modelling. Preliminary findings revealed that all variables exhibited significant cross-loadings, indicating that none of the variables had low extraction communalities (commonalities below 0.5). The analysis yielded a Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy value of 0.762, indicating that the sample size was sufficient for factor analysis. Additionally, a Bartlett's Test of Sphericity was conducted (resulting in approx. Chi-square value = 7838.054, df = 630, p-value = 0.000). These results indicate that the variables were well-correlated, as suggested by Gaur and Gaur (2006) and Pallant (2013). The outcomes of the principal component analysis, which included the 36 variables, are presented in table 4.

Variables	Communality	Factor	Eigen Value	% of Variance	Cumulative %
The organisation's mission and goals are unclear	0.751	1	12.035	33.43	33.43
The institutional mandate and operating values do not agree	0.909	2	5.738	15.94	49.369
The institution's actions and mission do not really align well	0.877	3	2.649	7.358	56.728
Strong leadership is lacking	0.827	4	2.261	6.28	63.008
The organisation does not have a strategy that addresses its growth and sustainability while being frugal	0.885	5	1.957	5.436	68.444
There are currently instances where the roles and obligations of stakeholders overlap	0.656	6	1.691	4.696	73.14
There is no established organisational or institutional structure or reporting connections among all the parties	0.706				

Variables	Communality	Factor	Eigen Value	% of Variance	Cumulative %
The degree of fundraising proficiency is not as high as it should be	0.788				
The staff are not equipped to raise the needed financing for the business	0.799				
Institutional support for employee development and assistance is insufficient	0.674				
The company's financial resources are insufficient	0.824				
There is a lack of sufficient funding	0.809				
Agribusinesses are not favoured by the conditions that come with the available sources of financing	0.674				
Agribusiness associations lacks the personnel necessary to assist member companies in raising capital	0.561				
Sales are challenging due to the market's diverse demands and various groups of customers	0.575				
There is insufficient variety or efficiency in the current service delivery approaches	0.604				
Our operations are impacted by the lack of a framework for operational capacities and capabilities according to frugal business modelling	0.787				
Ineffective service risk management policies	0.63				
Lack of client willingness to divulge personal information	0.628				
Information on agribusinesses, their frugal activities, and customers is lacking in the nation	0.682				
The methods and techniques for data and information gathering at the national level make it difficult to centrally monitor the expansion of agribusinesses for investors' consideration and customers' confidence	0.685				
Neither the government nor the development partners have a clear reporting structure for their frugal efforts	0.725				
Within and across institutions, there exist weaknesses in data/information gathering and distribution	0.827				
One of the most difficult challenges in the subsector is the lack of good and trustworthy information on frugal innovation, both in terms of its depth and breadth.	0.817				
Lack of common benchmarks and methods for measuring frugal innovation	0.73				
Lack of adequate customer information	0.813				
The formal organisation in charge of organising all economic practices related to agribusinesses does not exist	0.669				
Between service providers, practitioners, and end users, there is a lack of coordination, fragmentation, and redundancy	0.718				
There is no reliable body or institution to offer relevant data on frugal innovation for decision-making	0.777				

Variables	Communality	Factor	Eigen Value	% of Variance	Cumulative %
Access to information makes coordination costly	0.687				
Agribusinesses though unique in its operations face similar legal regulations like other industries	0.535				
Clearly defined policies for frugal operations are lacking	0.674				
A strong governance structure is absent	0.604				
There is no set procedure for choosing board members	0.803				
Frequently, the Board members lack the necessary training and expertise to oversee management operations	0.818				
There is no efficient board supervision	0.804				

Table 4: Level of Challenges Associated with FBM – Principal Component Analysis
Source: Field Data (2023)

Table 5 presents the six factors generated by the analysis. Only variables with loadings greater than 0.5 were considered for this investigation, following the recommendation by Hair *et al.* (2016). Variables with a conceptual fitness score of less than 0.5 were either eliminated from the factor or merged with other correlation factors to ensure conceptual fitness and improve reliability.

The six extracted factors accounted for 65.6% of the explained variance. This cumulative percentage variance, as shown in table 5, provides sufficient evidence that the remaining 34.4% of the variance is attributed to additional extraneous variables that were not included in the study.

Variables	Factor 1
The organisation's mission and goals are unclear	0.827
The institutional mandate and operating values do not agree	0.932
The institution's actions and mission do not really align well	0.881
Strong leadership is lacking	0.799
The organisation does not have a strategy that addresses its growth and sustainability while being frugal	0.91
There are currently instances where the roles and obligations of stakeholders overlap	0.661
There is no established organisational or institutional structure or reporting connections among all the parties	0.76
Variables	**Factor 2**
Ineffective service risk management policies	0.534
Lack of client willingness to divulge personal information	0.736
Information on agribusinesses, their frugal activities, and customers is lacking in the nation	0.736
The methods and techniques for data and information gathering at the national level make it difficult to centrally monitor the expansion of agribusinesses for investors' consideration and customers' confidence	0.737
Neither the government nor the development partners have a clear reporting structure for their frugal efforts	0.74
Within and across institutions, there exist weaknesses in data/information gathering and distribution	0.718
One of the most difficult challenges in the subsector is the lack of good and trustworthy information on frugal innovation, both in terms of its depth and breadth.	0.708
Lack of adequate customer information	0.715
Variables	**Factor 3**
The degree of fundraising proficiency is not as high as it should be	0.774
The staff are not equipped to raise the needed financing for the business	0.822
Institutional support for employee development and assistance is insufficient	0.686
The company's financial resources are insufficient	0.827
There is a lack of sufficient funding	0.812
Agribusinesses are not favoured by the conditions that come with the available sources of financing	0.698
Variables	**Factor 4**
Agribusiness associations lack the personnel necessary to assist member companies in raising capital	0.598
The formal organisation in charge of organising all economic practices related to agribusinesses does not exist	0.808
Between service providers, practitioners, and end users, there is a lack of coordination, fragmentation, and redundancy	0.781

There is no reliable body or institution to offer relevant data on frugal innovation for decision-making	0.786
Access to information makes coordination costly	0.676
Variables	**Factor 5**
There is no set procedure for choosing board members	0.765
Frequently, the Board members lack the necessary training and expertise to oversee management operations	0.891
There is no efficient board supervision	0.848
Variables	**Factor 6**
Agribusinesses though unique in its operations face similar legal regulations like other industries	0.662
Clearly defined policies for frugal operations are lacking	0.754
There is no efficient board supervision	0.511

Table 5: Level of Challenges Associated with FBM – Varimax Rotated Component Matrix
Source: Field Data (2023)

Table 6 displays the internal reliabilities of the obtained factors, measured using Cronbach's coefficient alpha (α). This study employed a cut-off value of 0.6, and an item-to-total correlation above 0.3 was considered acceptable. Considering conceptual fitness, factors 4 and 6 were merged into factor 5. Furthermore, the statement "Agribusiness Associations lacks the personnel necessary to assist member companies in raising capital" from factor 4 was combined with factor 3. Additionally, due to their low reliability, the items related to ineffective service risk management policies in factor 2 were eliminated (refer to Table 6).

Factors and Items	Item-Total Correlation	α-Value	Decision
Factor 1		**0.943**	**Retained**
The organisation's mission and goals are unclear	0.781		
The institutional mandate and operating values do not agree	0.919		
The institution's actions and mission do not really align well	0.845		
Strong leadership is lacking	0.829		
The organisation does not have a strategy that addresses its growth and sustainability while being frugal	0.897		
The roles and responsibilities of stakeholders currently overlap in some cases	0.687		
There is no established organisational or institutional structure or reporting connections among all the parties	0.734		
Factor 2		**0.911**	**Retained**
Information on agribusinesses, their frugal activities, and customers is lacking in the nation	0.7		
The methods and techniques for data and information gathering at the national level make it difficult to centrally monitor the expansion of agribusinesses for investors' consideration and customers' confidence	0.733		
Neither the government nor the development partners have a clear reporting structure for their frugal efforts	0.775		
Within and across institutions, there exist weaknesses in data/information gathering and distribution	0.829		
One of the most difficult challenges in the subsector is the lack of good and trustworthy information on frugal innovation, both in terms of its depth and breadth.	0.76		
Lack of adequate customer information	0.798		
Ineffective service risk management policies	0.475		Eliminated
Lack of client willingness to divulge personal information	0.626		Eliminated
Factor 3		**0.912**	**Retained**
The degree of fundraising proficiency is not as high as it should be	0.79		
The staff are not equipped to raise the needed financing for the business	0.783		
Institutional support for employee development	0.682		

and assistance is insufficient			
The company's financial resources are insufficient	0.852		
There is a lack of sufficient funding	0.777		
Agribusinesses are not favoured by the conditions that come with the available sources of financing	0.636		
Factor 4		**0.858**	**Retained**
There is no formal body that is responsible for coordinating all frugal activities associated with agribusinesses	0.695		
There is no reliable body or institution to offer relevant data on frugal innovation for decision-making	0.787		
There is fragmentation, duplication and inadequate collaboration between and among service providers, practitioners and end users	0.709		
Access to information makes coordination costly	0.704		
Agribusiness Associations lack the personnel necessary to assist member companies in raising capital	0.472		Merged with Factor 3
Factor 5		**0.873**	**Retained**
There is no set procedure for choosing board members	0.806		
Frequently, the Board members lack the necessary training and expertise to oversee management operations	0.747		
There is no efficient board supervision	0.705		
Factor 6		**0.748**	**Merged with Factor 5**
Agribusinesses though unique in its operations face similar legal regulations like other industries	0.471		
There is a lack of well-specified guidelines for frugal operations	0.685		
There is no efficient board supervision	0.601		

Table 6: Level of Challenges Associated with FBM – Internal Consistency and Rotated Decisions of the Structure
Source: Field Data (2023)

The results of computing the weighted means and internal consistency for the remaining five criteria are presented in table 7. Factor 1, focusing on "Institutional Framework"-related concerns, consists of seven items. Factor 2, addressing "Information and Dissemination Challenges," comprises six items. Factor 3, centred around "Funding Challenges," includes seven items. Factor 4, concerning "Coordination Challenges," consists of four items. Finally, Factor 5, related to "Regulation and Supervision Challenges," comprises six items.

Factors and Items	Factor Loadings	Weighted Mean	α-Value
Factor 1 (Institutional Framework)		**2.128**	**0.944**
The organisation's mission and goals are unclear	0.937		
The institutional mandate and operating values do not agree	0.924		
The institution's actions and mission do not really align well	0.931		
Strong leadership is lacking	0.932		
The organisation does not have a strategy that addresses its growth and sustainability while being frugal	0.926		
The roles and responsibilities of stakeholders currently overlap in some cases	0.945		
There is no established organisational or institutional structure or reporting connections among all the parties	0.94		
Factor 2 (Information and Dissemination Challenges)		**3.654**	**0.922**
Information on agribusinesses, their frugal activities, and customers is lacking in the nation	0.924		
The methods and techniques for data and information gathering at the national level make it difficult to centrally monitor the expansion of agribusinesses for investors' consideration and customers' confidence	0.917		
Neither the government nor the development partners have a clear reporting structure for their frugal efforts	0.902		
Within and across institutions, there exist weaknesses in data/information gathering and distribution	0.898		
One of the most difficult challenges in the subsector is the lack of good and trustworthy information on frugal	0.904		

innovation, both in terms of its depth and breadth.			
Lack of adequate customer information	0.9		
Factor 3 (Funding Challenges)		**3.278**	**0.89**
The degree of fundraising proficiency is not as high as it should be	0.865		
The staff are not equipped to raise the needed financing for the business	0.866		
Institutional support for employee development and assistance is insufficient	0.88		
The company's financial resources are insufficient	0.858		
There is a lack of sufficient funding	0.861		
Agribusinesses are not favoured by the conditions that come with the available sources of financing	0.874		
Agribusiness associations lack the personnel necessary to assist member companies in raising capital	0.911		
Factor 4 (Coordination Challenges)		**3.684**	**0.878**
There is no formal body that is responsible for coordinating all frugal activities associated with agribusinesses	0.858		
There is no reliable body or institution to offer relevant data on frugal innovation for decision-making	0.804		
There is fragmentation, duplication and inadequate collaboration between and among service providers, practitioners and end users	0.849		
Access to information makes coordination costly	0.858		
Factor 5 (Regulation and Supervision Challenges)		**3.4**	**0.785**
There is no set procedure for choosing board members	0.743		
Frequently, the Board members lack the necessary training and expertise to oversee management operations	0.75		
There is no efficient board supervision	0.734		
Agribusinesses though unique in its operations face similar legal regulations like other industries	0.816		
There is a lack of well-specified guidelines for frugal operations	0.771		
There is no efficient board supervision	0.744		

Table 7: Level of Challenges Associated with FBM – Factor Loadings, Weighted Means and Cronbach's Alpha

5. Conclusions

The study revealed that the challenges hindering the sustainability of agribusinesses in Ghana in relation to frugal business modelling are coordination, information and dissemination, regulation and supervision, funding, service delivery, and the institutional framework. These findings have significant theoretical and practical implications for understanding and improving agribusiness sustainability.

From a theoretical perspective, the challenge of coordination emphasises the importance of effective collaboration and cooperation among stakeholders in the agribusiness sector. By working together, stakeholders can create synergies, share knowledge, and enhance the efficiency and effectiveness of agribusiness operations. The challenge of information and dissemination highlights the need for access to timely and accurate information to support informed decision-making, adoption of best practices, and awareness of market trends and consumer demands. Addressing this challenge involves improving information systems, promoting transparency, and enhancing communication channels within the agribusiness sector.

Regulation and supervision present a significant challenge that must be addressed for agribusiness sustainability. Effective regulatory frameworks and supervision are crucial to ensure compliance, promote fair competition, and protect the interests of agribusinesses and consumers. Strengthening regulatory mechanisms and supervision contributes to a favourable business environment for agribusinesses to thrive. The challenge of funding underscores the importance of access to finance for agribusiness sustainability. Limited access to capital and financial services can hinder the growth and development of agribusinesses. Addressing this challenge involves exploring innovative financing models, improving credit accessibility, and providing tailored financial support mechanisms for agribusinesses.

Service delivery is another significant challenge impacting agribusiness sustainability. Access to quality support services, such as extension services, market linkages, and infrastructure, is essential for improving productivity, efficiency, and competitiveness in the agribusiness sector. Enhancing service delivery mechanisms helps agribusinesses overcome operational challenges, adopt innovative technologies, and enhance overall performance. Lastly, the challenge of the institutional framework highlights the importance of a conducive policy and governance environment for agribusiness sustainability. Clear policies, supportive institutions, and effective governance structures are critical for fostering innovation, attracting investments, and promoting long-term sustainability in the agribusiness sector. Strengthening the institutional framework enhances the stability and resilience of agribusinesses.

From a practical standpoint, these findings provide valuable insights for policymakers, industry stakeholders, and agribusiness practitioners in Ghana. Understanding the specific challenges enables targeted interventions and the development of strategies to address them. Policymakers can use these findings to inform policy reforms, regulatory improvements, and resource allocation to create an enabling environment for agribusiness growth. Industry stakeholders and agribusiness practitioners can leverage these findings to identify areas for improvement, implement best practices, and collaborate to overcome shared challenges.

By addressing the identified challenges of coordination, information and dissemination, regulation and supervision, funding, service delivery, and the institutional framework, stakeholders in the agribusiness sector can work towards enhancing sustainability, fostering resilience, and unlocking the full potential of agribusinesses in Ghana.

6. Recommendations

It is suggested that further research be carried out to examine the longitudinal studies to understand the long-term impact of frugal business modelling on the sustainability of agribusinesses. This would provide insights into the dynamic nature of frugal practices and their effects on various sustainability dimensions, such as economic viability, environmental stewardship, and social equity.

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