



## **HENRY GARRETT'S RANKING ANALYSIS OF THE CONSTRAINTS TO YAM MARKETING IN NON-PRODUCING REGION: A CASE STUDY OF BAUCHI STATE, NIGERIA**

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### **ABSTRACT**

The study analysed Henry Garrett's ranking of the constraints to Yam marketing in non-producing region of Bauchi State, Nigeria. Primary data were collected using structured questionnaire from 280 yam marketers, including 120 wholesalers and 160 retailers across five Local Government Areas. The demographic analysis showed that majority (67.5%) of the retailers and wholesalers (53.3%) were under 40 years old. Educational attainment of the retailers and the wholesalers varied, with many having First School Leaving Certificates (38.1% and 41.7%) and fewer having secondary (27.5% and 24.2%) or tertiary education (18.6% and 25.8%). Marketing experience differed, with most (76.9%) retailers having 1-10 years and most (70.8%) wholesalers having 11-20 years of experience. Garrett's ranking analysis revealed that the top constraint for retailers was inadequate marketing capital (78.02), followed by poor market infrastructure (65.64), storage issues (59.88), poor patronage (58.15), and seasonality (54.46). Other notable constraints included insecurity (41.11), high transportation costs (37.21), theft (33.18), and lack of uniformity (25.87). For wholesalers, high transportation costs (78.61) were the primary concern, followed by inadequate marketing capital (66.68), insecurity (61.58), poor market infrastructure (57.53), seasonality (47.69), and storage issues (47.68). The findings indicate that while some constraints are common to both retailers and wholesalers, their priorities differ. To improve yam marketing efficiency in Bauchi State, targeted interventions are needed. The study recommends implementing financial support programs to provide adequate marketing capital and developing better market facilities to address these constraints effectively.

**Keywords:** Garrett, Ranking, Kendall, Coefficient, Yam, Marketing,

### **INTRODUCTION**

Yam (*Dioscorea* spp.) is a significant staple food in tropical and subtropical Africa, playing a crucial role in the diets and economies of many countries in the region. Yams are particularly important in West Africa, where they are a central component of agricultural systems, cultural practices, and food security (Oben *et al.*, 2016). Yam Production is a major economic activity in several African countries. According to the Food and Agriculture Organization (FAO), Africa produces over 90% of the world's yams, with Nigeria being the largest producer (FAO, 2021). The yam industry provides employment for millions of farmers, traders, and processors, contributing significantly to rural livelihoods and economic development (Ariyo *et al.*, 2020; Zaknayiba and Tanko, 2013). Moreover, yams are often used in various forms of trade, both locally and internationally, further underscoring their economic value. Yams also holds a deep cultural significance in many African societies. They are often associated with traditional festivals and rituals, such as the New Yam Festival celebrated in parts of Nigeria and Ghana (Odey, 2020).



Nigeria is ecologically diverse, with various agro-ecological zones: mangrove swamps, tropical rain forests along the coast, open woodland and savannah on the low plateau in the central part of the country, semi-arid plains to the north, and highlands to the east (Bergh *et al.*, 2012). While yams are grown in all parts of the country, the quantity produced in the far North is much lower since the arid climate of the region is not well-suited for yam production. Yam production is concentrated in the forest, derived savannah and southern Guinea savannah agro-ecological zones in the central and southern part of the country (Fu *et al.*, 2011). According to Bergh *et al.*, (2012) major yam producing States include Taraba, Benue, Niger, Nasarawa, Osun, Ekiti, Ondo, Imo, Enugu, Kaduna among others. The report also identified Sokoto, Jigawa, Kano, Bauchi, Gombe, and Borno as non-producing States with no available data on yam production. These regions have production below 10% of the total consumption in the area.

Yam's importance especially in tropical and subtropical Africa is well established. However, ensuring the availability of yams to consumers, particularly in regions where the crop is not produced in commercial quantities, hinges significantly on the efficiency of yam marketing systems which is seriously constrained (Fu *et al.*, 2011). Effective marketing channels are essential for linking producers with consumers, thus ensuring food security and economic stability (Agbaje *et al.*, 2020). Yam marketing encompasses a range of activities, from harvesting and processing to transportation, storage, and final sale to consumers. These activities are often fraught with constraints that hinder the efficiency of the marketing process (Olukosi and Isitor, 1990). Key constraints include inadequate marketing capital, poor market infrastructure, high transportation costs, storage issues, and insecurity (Nwankwo *et al.*, 2022; Kenyon *et al.*, 2021; FAO, 2021; Ayanwale *et al.*, 2019; Okoro *et al.*, 2018).

Identifying and analysing these constraints require robust statistical methods, of which several are available and suitable, including but not limited to; Descriptive Statistics, Garrett's Ranking Technique, Kendall's Coefficient of Concordance, Factor Analysis, Regression Analysis and Structural Equation Modelling (SEM) (Dhanavandan 2016; Montgomery, *et al.*, 2012; Ouma and Jagwe, 2010). Descriptive statistics is the most used statistical method in studying constraints (Oguntade, *et al.* 2010; Ouma an Jagwe, 2010). It provides a summary of the data, offering insights into the distribution, central tendency, and variability of the constraints being studied (Spiegel and Stephens, 2008;). Though it is simple to compute and interpret, and provides clear overview of the constraints, it is limited in-depth analysis of relationships between constraints and cannot infer causality. Okoye *et al.* (2010) identified high transportation costs, lack of storage facilities, and fluctuating market prices as marketing constraints. Similarly, Offor *et al.* (2016) noted perishability, bulkiness, and high transportation costs as major constraints to yam marketing in Umuahia. Both using descriptive statistics. While it is useful for identifying constraints, often fall short in effectively prioritizing them based on their relative importance. There is a need for a more robust analytical approach that not only identifies but also ranks the constraints in order of severity as perceived by stakeholders. This research aims to apply Garrett's Ranking Analysis and Kendall's Coefficient of Concordance to achieve this objective, thereby providing a clearer, actionable insight into the primary challenges in yam marketing.

## **RESEARCH METHODOLOGY**

### **Study Area**

The study was conducted in Bauchi State, Northeast Nigeria, situate between latitude 09°52' and 09°86' north of the equator and longitude 10°45' and 10°45' east of the prime meridian (Waziri, *et al.*, 2018). The State has an estimated population size of 6,537,314 in

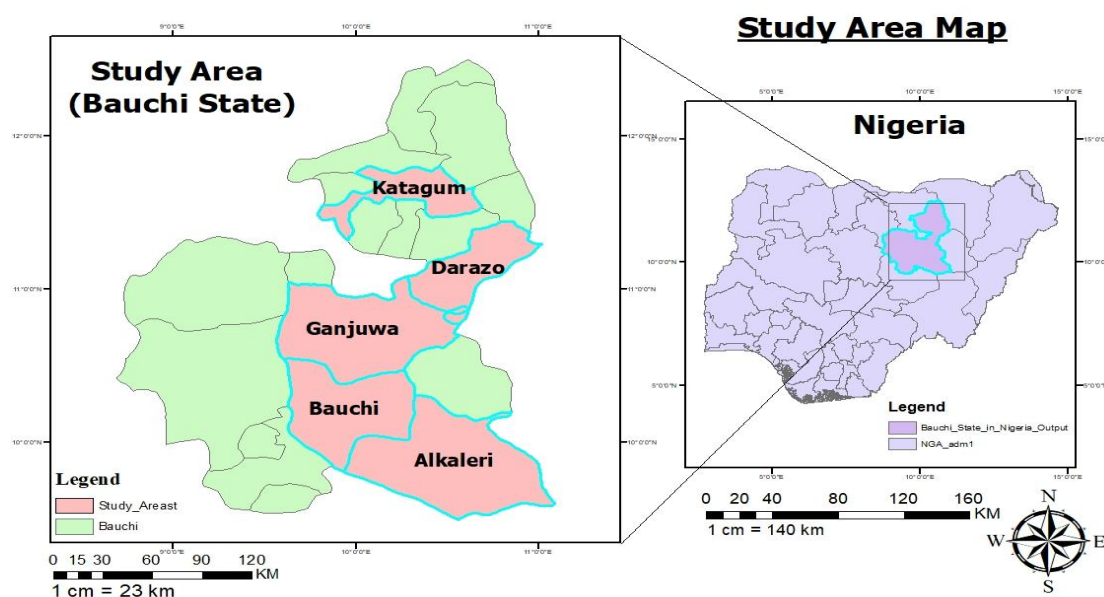
2016 (NBS, 2017), making it a market hub for agricultural produce. Bauchi produces millet, maize, rice, groundnut, and guinea corn in commercial quantities, and sources other agricultural commodities like yam and Irish potato from neighbouring states. Yam marketing is a growing business in Bauchi, with no religious or cultural restrictions on its consumption, providing livelihood to many stakeholders.

### Data Collection

The primary data used for the study were collected using well-structured questionnaire, while the secondary data were obtained from published journals, books, internet, periodicals, government official websites and other relevant sources. The information collected from the respondents was grouped into socioeconomic characteristics of respondents and the ranking of marketing constraints faced in the study area.

### Sampling Procedure and Sample Size

Multi-stage sampling technique was used in the selection of respondents for the study. At the first stage, five Local Government Areas namely Alkaleri, Bauchi, Darazo, Ganjuwa and Katagum were purposively selected based on the prominence of yam marketing in the Local Government. At the second stage 25 percent of yam marketers registered with Yam Marketer's Association from the selected Local Government Areas were randomly selected. The sampling frame was stratified into wholesalers and retailers. A total 120 wholesalers and 160 retailers were selected for the study.



**Figure 1: Study Area Map**  
**Methods of Data Analysis**

The data obtained from this study were analysed using both descriptive and inferential analytical techniques. Descriptive statistics was used to describe the socio-economic characteristics of the respondents, while Henry Garrett's Ranking Techniques and Kendall's coefficient of concordance were used in analysing marketing constraints facing wholesalers and retailers, and to measure the rate of agreement among the respondents respectively.

### Henry Garrett's Ranking Technique

The ranking of the constraints done by the respondents were converted into percent position using the Henry Garrett's Ranking formula as used by Sama *et al.* (2019). The percentage position of each rank was then converted into Garrett's value by referring to statistical table given by Garrett and Woodworth (1969). The scores of individual

respondents were added together and divided by the number of respondents. The mean scores for all the factors were ranked in descending order. In this study, respondents were asked to rank ten constraints identified during the reconnaissance survey.

$$\text{Percentage Score} = \frac{100(R_{ij}-0.50)}{N_j} \quad \dots(1)$$

Where:

$R_{ij}$  = rank,  $i^{\text{th}}$  item,  $j^{\text{th}}$  individual

$N_j$  = number of items Ranked by  $j^{\text{th}}$  individual

### **Kendall's Coefficient of Concordance**

Kendall's coefficient of concordance was used to determine the variation in the rankings given by the respondents i.e., to ascertain the degree to which the rankings of the respondents agree (Kendall and Smith, 1939).

$$W = \frac{12R}{m^2(k^3-k)} \quad \dots(2)$$

Where:

$W$  = Kendall's coefficient

$R$  = sum of squared deviation

$m$  = number of respondents

$k$  = number of constraints ranked

The sum of squared deviation for the rankings of the respondents was calculated using the following formula:

$$R = \sum_{i=1}^K (R_i - \bar{R})^2 \quad \dots(3)$$

Where:

$R_i$  = sum of evaluators scores for each item

$i$  = individual item (constraint) being ranked

$\bar{R}$  = the mean of the  $R_i$  values

## **RESULTS AND DISCUSSION**

### **Socioeconomic Characteristics of Yam Marketers**

The age distribution of respondents shows that 67.5% of retailers and 53.3% of wholesalers were under 40 years of age, while 32.5% of retailers and 46.7% of wholesalers were 40 years and above. This indicates a predominantly middle-aged population in the study area. These results are similar to Ikpeazu and Moguluwa (2017), who found that 61.66% of marketers were under 40 years. According to Akelere *et al.* (2019), younger marketers are better positioned to leverage emerging opportunities to improve marketing efficiency and profitability. The gender distribution of respondents reveals a male-dominated market (100%). Oga *et al.* (2020) similarly reported 77.5% male marketers, while Akelere *et al.* (2019), Oladapo *et al.* (2015), and Okoedo-Okojie and Okwukenye (2016) found females to be the major marketers. Kadurumba *et al.* (2016) and Okwukenye and Onemolease (2011) reported a balanced gender distribution. This study suggests social and religious barriers to female participation, with Asumugha *et al.* (2007) noting men dominate in Muslim areas and women in non-Muslim areas. These findings highlight the need for interventions to address gender disparities, especially in regions where norms restrict female participation.

Marital status is an indicator of responsibilities and can significantly influence economic activities like yam marketing. The result shows that 52.5% of retailers and 75.8% of wholesalers were married, while 47.5% of retailers and 24.2% of wholesalers were single.





This suggests that a substantial proportion of yam marketers were married, with more married individuals among wholesalers. Yam marketing is likely a primary income source for married individuals, indicating its profitability and stability, especially for those with greater familial responsibilities. Education significantly influences decision-making in marketing (Akelere *et al.*, 2019). The result reveals that many yam marketers in the study area possess formal education: 38.1% of retailers and 41.7% of wholesalers had a First School Leaving Certificate (FSLC), 27.5% of retailers and 24.2% of wholesalers had secondary education, and 15.6% of retailers and 8.3% of wholesalers had tertiary education. Meanwhile, 18.8% of retailers and 25.8% of wholesalers had no formal education. These findings highlight that most yam marketers are educated, which enhances their ability to adopt effective marketing strategies, assess risks, and make informed financial decisions, ultimately driving profitability and business sustainability.

Marketing experience impact resource use efficiency and risk management (Oga *et al.*, 2020). The result of marketing experience revealed 76.9% of retailers and 29.2% of wholesalers had 1-10 years of experience, while 23.1% of retailers and 70.8% of wholesalers had 11-20 years of experience. This suggests that new entrants usually start as retailers with small capital and gradually move to wholesaling, which requires more capital and business contacts. The findings emphasize the need for support and training for new entrants, along with policies to improve access to capital and business networks, to enhance market efficiency and resilience in the yam marketing industry in Bauchi State.

Household size is crucial for yam marketers, influencing family labour availability and dependency on business income. In the study area, 90.6% of yam retailers and 74.2% of wholesalers had household sizes ranging from 1 to 10 members, while 9.4% of retailers and 25.8% of wholesalers had 11 to 20 members. Larger households may provide more family labour, reducing operational costs and enhancing efficiency. However, they can also increase the financial burden due to a higher number of dependents, necessitating a balanced approach to utilizing family labour for business growth while managing financial responsibilities.

The study found that most yam marketers used personal savings for capital, with 30% of retailers and 29.2% of wholesalers relying on family and friends. No financial support from cooperatives, banks, or government programs was reported. The study highlighted capital investment levels, revealed that 80% of retailers and 4.2% of wholesalers had investments below ₦200,000, focusing on short-term transactions, resulting in poor investment in storage infrastructure creating unstable supply and prices fluctuation. Emphasizing the need for policy interventions through improve access to credit, storage facilities, and long-term business planning training.

**Table 1:** Distribution of Respondents based on the Socioeconomic Characteristics (n =280)

Characteristics	Frequency		Percentage	
	Retailers	Wholesalers	Retailers	Wholesalers
<b>Marital status</b>				
Married	84	91	52.5	75.8
Single	76	29	47.5	24.2
<b>Sex</b>				
Male	160	120	100	100
<b>Age</b>				
20 – 29	45	19	28.1	15.8
30 – 39	63	45	39.4	37.5
40 – 49	37	36	23.1	30.0
50 – 69	15	20	9.4	16.7
<b>Household size</b>				
1 – 5	92	38	57.5	31.7
6 – 10	53	51	33.1	42.5
11 – 15	12	18	7.5	15
16 – 20	3	13	1.9	10.8
<b>Education level</b>				
Primary	61	50	38.1	41.7
Secondary	44	29	27.5	24.2
Tertiary	25	10	15.6	8.3
No-formal education	30	31	18.8	25.8
<b>Marketing experience</b>				
1 – 5	28	3	17.5	2.5
6 – 10	95	32	59.4	26.7
11 – 15	26	40	16.2	33.3
16 – 20	11	45	6.9	37.5
<b>Source of Capital</b>				
Personal saving	112	85	70	70.8
Family and Friends	48	35	30	29.2
<b>Capital Investment Level</b>				
< 200,000	128	5	80	4.2
200,000 – 500,000	32	77	20	64.2
> 500,000	-	38	-	31.6

Computed from Field Survey Data, 2019

### Garrett's Ranking of Constraint to Yam Marketing

The result of Garrett's ranking of constraints of yam marketing in the area is presented in table 2 and 3. The result shows that retailers are significantly affected by inadequate marketing capital which is ranked 1<sup>st</sup> with poor market infrastructure, storage problem, poor patronage, seasonality problem ranked 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> respectively. Insecurity situation, high transportation cost, theft and lack of uniformity in measurement were ranked 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> respectively. The wholesalers were mostly affected by high transportation cost, inadequate marketing capital, insecurity problem, poor marketing infrastructure, seasonality problem and storage problem were ranked 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and



6<sup>th</sup> respectively. Poor patronage, inadequate marketing information, lack of uniformity and theft were ranked 7<sup>th</sup>, 8<sup>th</sup> 9<sup>th</sup> and 10<sup>th</sup> respectively. The result of inadequate marketing capital as a major constraint to yam marketing agrees with the finding Bergh *et al.* (2012). Inadequate marketing capital limit retailers from achieving their goals of increasing marketing capacity and integration into wholesaling role. Access to agricultural credit has been positively linked to agricultural productivity in several studies (Dayo *et al.* 2008). Yet this important component has eluded smallholder agricultural practitioners in Nigeria, challenged with the problems of collateral and high interest rates, unfavourable policies and corruption.

Retailers reported poor market infrastructures in the study area and acknowledged having little access to the available facilities. They make use of space by roadsides, hawking with wheelbarrow and carrying yam load on their head. Anuebunwa (2002) findings showed that wholesalers controlled 85% of the physical marketing facilities, namely lock-up shops and open market space with retailers controlling 15%. The distance between point of purchase and selling point (Bauchi), the nature of the commodity (bulkiness), the terrible state of roads and the poor conditions of most vehicles used in yam transportation account for the high transportation cost identified as a major constraint by wholesalers. Okwuokenye, and Onemolease (2011) also reported a high transportation cost, where it constitutes 71.96% of the total marketing cost incurred by wholesalers. With marketers' haven to deal with high marketing cost, the result of inadequate capital been a constraint is explained. The difficulty in accessing capital from commercial banks and other financial institutions, has made this challenge a common name in agricultural marketing. Recent insecurity situation in the country has its own effect on yam marketing in the study area vis-à-vis; increase marketing cost, delay in delivery time leading to commodity spoilage, loss of lives and properties and scarcity. States that are yam source to the study area affected by insurgency, harder-farmers conflict and kidnapping includes Plateau State, Taraba State, Kaduna State and Benue State.



Respondents' Ranks		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	Average	Ranks
Constraints	Garrett Value	82	70	63	58	52	48	42	36	29	18	score	
High transportation cost		820	630	126	174	364	768	462	864	899	846	37.21	8
Inadequate marketing capital		9922	1610	567	232	104	48	0	0	0	0	78.02	1
Poor market infrastructure		1394	4830	2394	870	728	144	42	72	29	0	65.64	2
Storage problem		164	1820	3150	2436	1248	720	42	0	0	0	59.88	3
Seasonality problem		0	140	1449	3132	2444	1008	504	36	0	0	54.46	5
Poor patronage		820	2030	1764	1334	1612	1248	294	144	58	0	58.15	4
Inadequate marketing information		0	0	441	580	1300	2496	1218	540	406	144	44.53	6
Insecurity situation		0	140	189	522	364	912	2352	1476	551	72	41.11	7
Theft		0	0	0	58	104	240	1428	1872	1102	504	33.18	9
Lack of uniform measure		0	0	0	0	0	96	378	756	1595	1314	25.87	10

**Table 2:** Garrett value and ranking of marketing constraints faced by retailers  
 Computed from Field Survey Data, 2019





**Table 3:** Garrett value and ranking of marketing constraints faced by wholesalers

	Respondents' Rank	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	Average scores	Ranks
Constraints	Garrett value	82	70	63	58	52	48	42	36	29	18		
High transportation cost		7872	910	441	174	0	0	0	36	0	0	<b>78.61</b>	<b>1</b>
Inadequate marketing capital		1312	3290	2205	812	208	96	42	36	0	0	<b>66.68</b>	<b>2</b>
Poor market infrastructure		82	630	2205	2146	1248	240	252	72	29	0	<b>57.53</b>	<b>4</b>
Storage problem		0	0	252	1276	1612	1344	588	432	145	72	<b>47.68</b>	<b>6</b>
Seasonality problem		0	70	315	464	1404	2160	924	252	116	18	<b>47.69</b>	<b>5</b>
Poor patronage		82	350	315	638	624	816	798	1080	377	126	<b>43.38</b>	<b>7</b>
Inadequate marketing information		0	0	126	290	156	672	1932	1044	232	234	<b>39.05</b>	<b>8</b>
Insecurity situation		492	3080	1512	1044	676	144	168	216	58	0	<b>61.58</b>	<b>3</b>
Theft		0	0	0	58	52	96	42	756	1421	810	<b>26.96</b>	<b>10</b>
Lack of uniform measure		0	70	189	58	260	192	294	396	1102	900	<b>28.84</b>	<b>9</b>

**Computed from Field Survey Data, 2019**

The result of degree of respondent's agreement on the rankings given to the constraints are presented in table 4 and 5. Kendall's Coefficient of Concordance for retail respondents was 0.706, which shows about 70% agreement level; referred to by Brossart, *et al.* (2018) as substantial agreement. Kendall's coefficient values can range from 0 to 1. The higher the value of Kendall's, the stronger the association. Usually, Kendall's coefficients of 0.9 or higher are considered very good. A high or significant Kendall's coefficient means that the appraisers are applying essentially the same standard when assessing the samples.

**Table 4:** Kendall's coefficient of concordance of constraints of retailers (N= 160)

S/N	Constraints	$R_i$	$(R_i - \bar{R})^2$
1	High Transportation cost	1,195	99,288
2	Inadequate marketing capital	226	427,585
3	Inadequate marketing infrastructure	449	185,675
4	Inadequate storage facilities	589	84,623
5	Seasonality problems	742	19,016
6	Poor patronage	654	51,031
7	Inadequate marketing information	1,027	21,638
8	Insecurity	1,129	62,051
9	Theft	1,320	193,688
10	Lack of uniform measure	1,468	345,862
	<b>Total</b>		<b>1,490,457</b>
	<b>W</b>		<b>0.706</b>
	<b>Chi-Square</b>		<b>1016.645</b>
	<b>Asymp. Sig.</b>		<b>0.000</b>

Computed from Field Survey Data, 2019

W = Kendall's Coefficient of Concordance

**Table 5:** Kendall's Coefficient of Concordance to Constraints of Wholesalers (N=120)

S/N	Constraints	$R_i$	$(R_i - \bar{R})^2$
1	High transportation cost	163	247,009
2	Insecurity	415	60,025
3	Inadequate marketing capital	318	116,964
4	Poor market infrastructures	489	29,241
5	Inadequate storage facilities	702	1,764
6	Inadequate marketing information	881	48,841
7	Seasonality	710	2,500
8	Poor patronage	792	17,424
9	Lack of uniform measure	1043	146,689
10	theft	1087	182,329
	<b>Total</b>		<b>852,786</b>
	<b>W</b>		<b>0.718</b>
	<b>Chi-Square</b>		<b>775.260</b>
	<b>Asymp. Sig.</b>		<b>0.000</b>

Computed from Field Survey Data, 2019

W = Kendall's Coefficient of Concordance



## CONCLUSION AND RECOMMENDATIONS

Yam marketing in Bauchi State is significantly hindered by various constraints that impact both retailers and wholesalers. Through the application of Garrett's ranking analysis and Kendall's coefficient, this study has identified and prioritized these constraints. For retailers, inadequate marketing capital and poor market infrastructure emerged as the most pressing issues. Wholesalers, on the other hand, are primarily challenged by high transportation costs and inadequate marketing capital. Addressing these constraints is crucial for realizing the full potential of yam marketing in the study area. The persistent issues of poor road networks and the deplorable condition of roads connecting production regions to markets have been recurrent themes in agricultural marketing research for decades. This study reinforces the urgent need to address these enduring challenges to improve the efficiency and profitability of yam marketing in Bauchi State.

1. **Infrastructure Development:** It is imperative for the government to invest in the improvement and maintenance of road networks connecting yam-producing regions to major markets. This will reduce transportation costs and enhance market access for wholesalers.
2. **Financial Support:** Both governmental and non-governmental organizations should provide accessible financial services to retailers and wholesalers to mitigate the challenge of inadequate marketing capital. This can be achieved through microfinance programs, grants, and low-interest loans.
3. **Market Facilities:** Upgrading market infrastructure, including storage facilities and market stalls, will help alleviate the challenges faced by retailers. Modern, well-equipped markets will support better handling and preservation of yam, reducing post-harvest losses.
4. **Policy Implementation:** The government should implement policies that support agricultural marketing, focusing on reducing the cost of transportation and improving market access. This could include subsidies for transportation costs and incentives for private investment in market infrastructure.
5. **Public-Private Partnerships:** Encouraging collaborations between the government, private sector, and non-governmental organizations can foster innovative solutions to these constraints. Public-private partnerships can drive investment in infrastructure, financial services, and market development.
6. **Research and Development:** Continuous research should be conducted to identify emerging constraints and opportunities in yam marketing. This will ensure that interventions are data-driven and effectively address the needs of the stakeholders involved.

Addressing these constraints requires coordinated efforts from all stakeholders. By prioritizing these recommendations, the agricultural sector in Nigeria can better meet global expectations and enhance the livelihoods of those involved in yam marketing.

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