PATTERNS OF FLOW OF TOMATO AND YAM AND THEIR CONTRIBUTIONS TO THE ECONOMIC GROWTH BENUE STATE

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Abstract:This study examines the patterns of tomato and yam flow within Benue State and their respective contributions to the state's economic growth. By analyzing data on production, trade, and economic indicators. The study explores the interplay between agricultural production and economic growth. The findings reveal significant correlations between tomato and yam production volumes, as well as their impacts on key economic indicators such as GDP and employment. These insights shed light on the role of tomato and yam agricultural produce in shaping Benue State's economic landscape.

Keywords: Flow patterns, Yam and Tomato, Economic growth

1.0 Introduction

Globally, agriculture has a critical role in the sustainability of economies, particularly in countries engaging in commercial-scale agricultural activities (Otaha, 2012; Sekunmade, 2009; Yakub, 2008). The significance of agriculture in economic systems is important, encompassing food security, economic progress, and job creation (Udemezue and Osegbue, 2018). Primarily, agriculture's essential function lies in providing sustenance to the population, thereby reducing scarcity and hunger (Begg, 2003). Efficient movement of agricultural produce from production sites to distribution hubs, both domestically and internationally, serves as a vital tool for economic growth and food security (Dong et al., 2018; World Bank, 2022).Understanding the intricate flow patterns of agricultural produce is essential for resource allocation and optimization (Jia et al., 2019). Notably, factors like production locations, transportation infrastructure, consumer demand, and trade policies significantly shape the flow of agricultural goods (Puma et al., 2015). This underlines the necessity of careful examination of these factors for a seamless agricultural flow (Tunde and Adeniyi, 2012).The agricultural sector in Benue state experiences high productivity; especially in yam and tomato production. However, the state struggles with low exports (Jato and Terungwa, 2020). The reason for this lies in the lack of transportation, distribution channels, and market linkages which are very pivotal for the smooth flow of agricultural produce from production hubs to consumption areas (Iorkosu and Apavigba, 2018). The outdated transportation system within the state has consistently led to delays in the transportation of agricultural produce, resulting in spoilage over time. According

to Benue state ministry of agriculture and rural development (2020), an estimate of 1.5 million metric tons of agricultural produce, tomato and yam inclusive, remain unharvest yearly due to inadequate transportation network. This has over the years deprived the state and farmers a potential higher income and thereby causing substantial annual waste of agricultural products (Igba, 2021).Also, poor access to markets constitutes one of the major challenges faced by small scale farmers in Benue state which affects directly their productivity, incomes and standard of living. (Otene, et al., 2018).Jato and Terungwa (2020) also argued that, rural markets are very difficult to access because they are not linked with good access roads. Storage facilities are essentials to farmers because they need to store their farm produce to be consumed when needed and also to be sold in the future when prices of food items improve. This poses a serious challenge for expansion of farm size when what is produced cannot be adequately and properly stored for future use. Lack of storage facilities leads to massive post-harvest losses and food wastages which discourages investment into the sector (Mada, et al, 2014; Imonikebe, 2013; Atanda, et al., 2011). In situations of huge post-harvest losses of farm produce, farmers are highly discouraged as they wallow in abject poverty. It is against this background that the study seeks to examine the patterns of flow of tomato and yam and their contribution to the economic growth of Benue state. **2.0 Aim and objectives and the study area**

The aim of this study is to examine the patterns of flow of tomato and yam and their contribution to economic growth of Benue State.

The specific objectives of this research are:

  i. Determine the patterns of flow of tomato and yam produce in Benue state
 ii. Examine the annual volume of tomato and yam produced in Benue State from 2011-2021
iii. Identify the factors affecting the patterns of flow of tomato and yam produce in Benue state
 iv. Examine the contribution of the production of yam and tomato to the economic growth of Benue State

2.1 Study Area

Benue State is situated in the North-Central part of Nigeria, between latitudes 6°25′ N and 8°8′ N and longitudes 7°47′ E and 10° E (see figure 1.1). The state shares boundaries with five other states, namely Nasarawa to the North, Taraba to the East, Cross River to the South, Enugu State to the Southwest, and Kogi to the West (Benue State Agricultural and Rural Development Authority (BNARDA), 1995). It also shares a common boundary with the Republic of Cameroon to the Southeast and covers a land area of 30,955 square kilometers
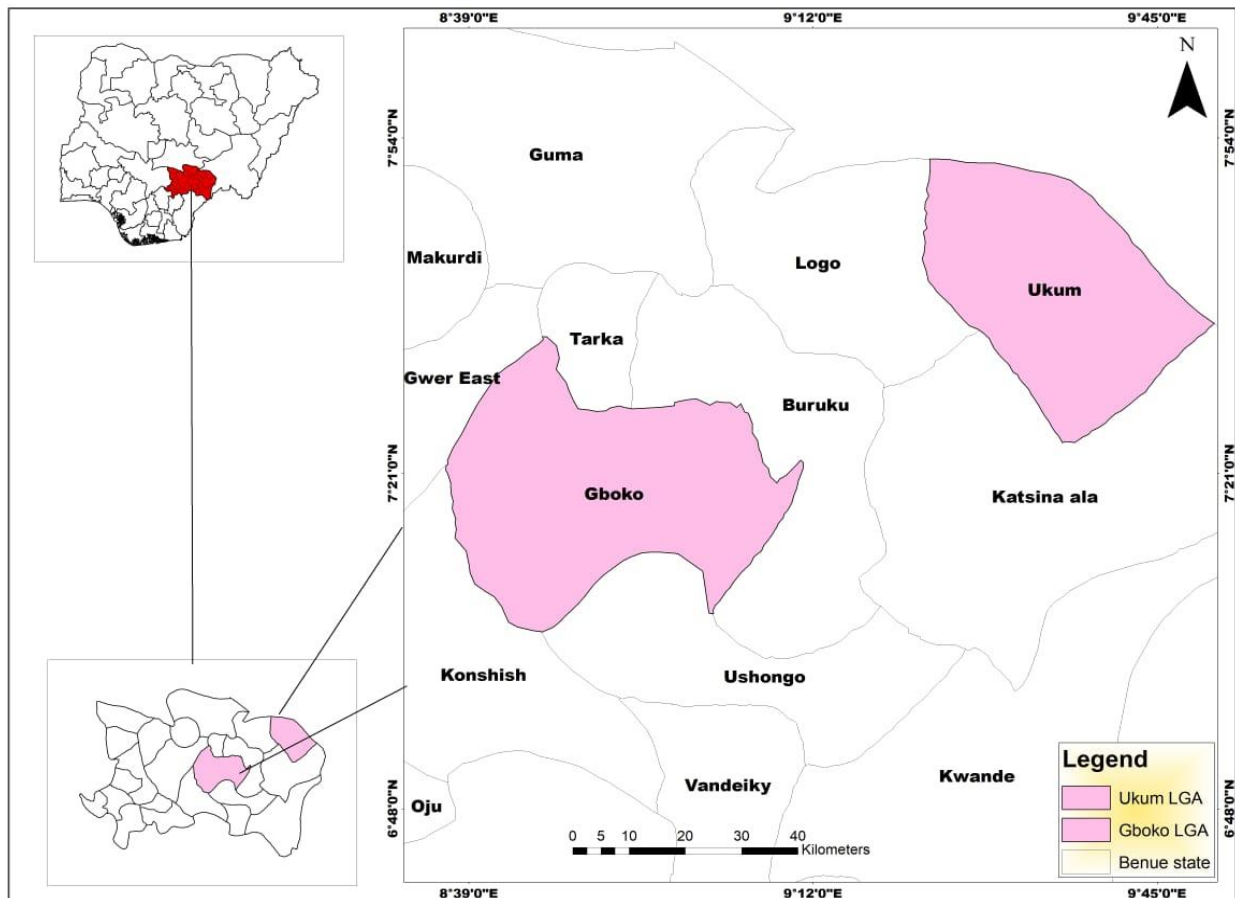
Figure 1.1: Map of Benue state showing the study areas
Source: Author's compilation (2023)

3.0   Research methodology and results discussions

3.1   Methods of Data Collection

3.1.1   Data types and data sources

The needed data for this research included; data on Gross Domestic Product (GDP), data on per capital incomewas obtained from Nigerian Bureau of statistics (NBC, 2011-2022),and data on the volume of yam and tomato exported. These data covered the period of 2011-2022. The annual volume of tomato and yam (2011-2022) was obtained from Benue ministry of Agriculture and Rural development.Primary data of the respondents (tomato and yam farmers, middlemen) was obtained through the use of a structured questionnaire. A hand geographic positioning system (GPS) was used to collect point coordinate to ascertain the farm locations of the farmers.

3.1.2   Researchdesign

This study adopted survey design since primary data were needed from a sample of individuals through the use of questionnaires.The structuredquestionnaires was administered on farmers and middlemen involved in the production of tomato yam agricultural produce.

3.1.3   Sampling Technique and Sample Size

The study used multi-stage sampling technique because the study targeted population is large and spread over a wide geographic area (Benue State). In the first stage, two local governments were sampled from Benue State. Ukum and Gboko local government, the reason for sampling the two local governments was becausea pre-study showed that,Gboko local government engaged predominantly in the production of tomato while Ukum local government engaged predominately in the production of yam. In the second stage, five sub-units were randomly selected, for Gboko Local government the sub-unit included Mbatyu, Igyorov, Mbakpeh, Ukpekepegh and Mbaanku, this settlement are the hub for tomato production in the local government while inUkum Local government, Afia, Amuta, Abuul, Tse-choko, Tse-Anonogor. These settlements are the hub for yam production in the local government. In the final stage, a purposive selection of two hundred and fifty (250) farmers and middlemen from the sub-unit were selected bringing a total sample size of five hundred (500). The reason for selecting asample of 500 is because it is considered large enough to achieve reasonable representativeness in the study areas.

3.1.4   Methods of Data Analysis

This study used one-way analysis of variance (ANOVA) to examine the variation in the volume of yam and tomato produced annually in Benue state from 2011-2022 against its' determinant factor, farm size. The analytical tool procedure was chosen over other approaches because of the categorical independent variables (farm size) and a continuous dependent variable (volume of tomato and yam produce annually). Also, the study employed pearson correlation to examine the relationship between the volume of tomato and yam produce and their contribution to Benue state. This analytical tool was chosen over other approaches because it is the most appropriate tool in identify whether changes in one variable are associated with changes in another variable. In addition, multiple regression analysis was also use to examine factors affecting the flow patterns of tomato and yam. The analytical tool procedure was chosen over other approaches because It is the most suitable that helps a research to understand how the independent variables (transport cost, level of education, farm size, number of middlemen) collectively predict the variation in the dependent variable (Volume of tomato and yam flown outside Benue state). Cartographical analytical approach was employed to examine the flow patterns of tomato and yam. The analytical tool procedure was chosen over other approaches because it is the most suitable analytical tool used in mapping out flow patterns of agricultural produce.In the flow map, the lines connecting different locations represent the movement of tomato or yam from the source region (Benue) to the final destinations. Different colors were used to indicate the volume of of tomato or yam that was exported from Benue sate to other states in Nigeria. The red lines represent the highest volume of tomato or yam that was exported from the source location (Benue state) to the final destination (other states in Nigeria). The blue lines represent a substantial flow of tomato or yam. The green lines indicate a comparatively

lesser flow of yams between the locations. The black lines represent the lowest volume of tomato or yam that was exported.

3.2   Results and discussions

3.2.1   Socio-Demographic Characteristics of farmers

Respondents' gender

Gender is an important factor in agriculture. The distribution of famers by gender was examined in this study. Figure 4.1 shows that, majority 64.4% of the respondents involved in farming are males while 35.6 % are females for yam and tomato farming respectively. This implication is that, men constitute a greater proportion in farming yam and tomato in the area. This also suggest that, since the farming of yam and tomato is a very stressful job,energeticmen are capable to withstand the stress involved in the farming activities, this may encourage the flow of tomato and yam since large quantity may be produced. Also, gender roles often dictate who performs specific tasks within agricultural activities. Men and women may have different roles in yam and tomato cultivation, such as planting, weeding, harvesting, and post-harvest processing. These gender-based divisions of labor can influence the timing and efficiency of various activities, thereby shaping the overall flow pattern.

Respondents' level of education

The education level of farmers was also examined in the study, since education play an important role in agriculture practices. Result in table 4.1 shows that, majority of the respondents 54.3% had acquired an informal education, 11.3% had were holdersof primary education (FSCL), and 20.3%had acquired secondary school education while 36.3% had attained tertiary education level for yam and tomatoes farmers respectively. This implied that, the majority of the farmers in the study area had informal education.This suggests that, the low level of educational accomplishment may affect the flow patterns of tomato and yam, as farmers with low levels of education may lack access to modern agricultural knowledge and techniques. This can lead to outdated farming practices, inefficient resource utilization, and low yield levels. The flow patterns of production and distribution might be affected as a result.

Respondents' monthly income

The implication of low monthly income on the flow patterns of tomato and yam production must be properly addressed, as it affects various aspects of the agricultural value chain. The distribution of farmers' monthly income was examined; the results in Table 4.3 show that respondents earned between ₦5,000 - ₦20,000 (47.9%), ₦20,000 - ₦30,000 (22.0%), and ₦35,000 - ₦50,000 (16.5%) monthly. Others earned between ₦50,000 and ₦65,000 (9.60%), ₦65,000 - ₦80,000 (2.60%), ₦85,000 - ₦95,000 (1.0%), and only 0.2% of the respondents earned ₦100,000 for yam and tomato farmers respectively. The foregoing implication of the above result is that, low income might limit farmers' ability to invest in quality inputs, modern technologies, and tools. This can impact the flow patterns by reducing overall productivity and efficiency. Also, low income can lead to delayed harvesting due to the inability to afford labor

or necessary equipment. This delay can disrupt the flow patterns by affecting market timing and product quality.

Respondents' farm size

The size of the farm plays a significant role in shaping the flow patterns of tomato and yam cultivation and production. Farm size directly influences the scale of operations, resource allocation, decision-making, and engagement with markets. Analysis of result in table 4.4 shows that, majority 30.3% of farmers have between 1 -2 hectares of farmland, 69.7% had between 3 - 4 hectares for yam and tomato respectively. This result suggests that, larger farm sizes typically allow for greater production volumes. This can influence the flow patterns by affecting the quantity of products available for distribution, storage, and sale.

3.3   Cartographical analysis of the flow patterns of yam in Benue state

Cartographic analysis was used to determine the flow patterns of yam using agricultural flow map, in the agricultural flow map, the lines connecting different locations represent the movement of yams from the source region (Benue) to the final destinations. The line colors were used to indicate the volume of yams being exported from one location to another (see figure 3.1). The red lines represent the highest volume of yams that was exported from the source location (Benue state) to the final destination location (other states in Nigeria). The blue lines represent a substantial volume of yam. The green lines indicate a comparatively lesser flow of yams between the locations. The black lines represent the lowest volume of yams being exported. The result of analysis in figure 4.12 shows that, Lagos, Katsina, Portharcourt and Kogi states are the highest receiving states of yam produce 7001-18000 metric tons from Benue state annually, while state like Kano, Kwara, Abuja, Bayelsea, Imo received an export of 1400 metric tons of yams annually. Anambra, Enugu, Ebonyi, Delta received 1401-2500 metric tons of yams annually from Benue State. The reaming state Kano, Akwa-Ibom,Cross-River and Kaduna states received about 2501-4600 metric tons of yam. The forging implication is that, Lagos, Katsina, Portharcourt and Kogi, being a highly populous and commercially vibrant state, offers a large consumer market for yam producers in Benue. The high demand in Lagos Lagos, Katsina, Portharcourt and Kogi has profitable opportunities for Benue farmers, encouraging them to expand their yam production to meet the market's needs. Also Increased yam sales to Lagos, Katsina, Portharcourt and Kogi has boost the income of farmers in Benue, thereby contributing to poverty reduction and improved livelihoods in the agricultural communities. This additional income has also stimulated rural economic activities and support local businesses in Benue.
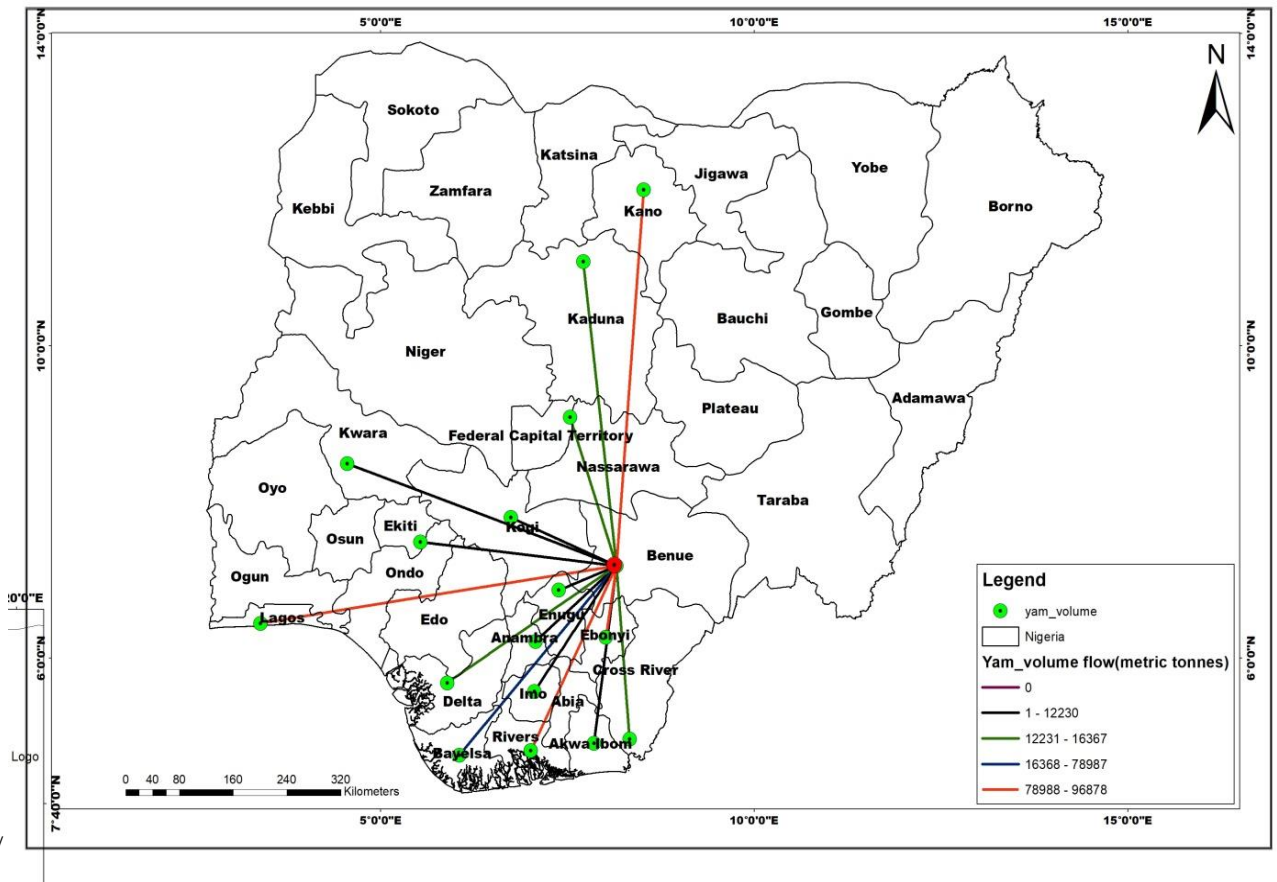
Figure 3.1: The flow map of yam

Source: Authors' compilation

Similarly, strong demand for tomatoes can boost trading activities as tomatoes are widely used in various foods and processed products, making them a sought-after commodity in many markets. In figure 3.2, the results shows that, Lagos state received 18,000 thousand tons of tomatoes from Benue state annually, followed by Abuja, 16,000 tons and Port-Harcourt 14,000 tons of tomato annually. This implied that Lagos as urban centers generally have higher income levels compared to Benue state. The increased purchasing power of urban dwellers allows them to afford a diverse range of agricultural products, including perishable and high-value items that are not typically produced within cities. The analysis of the figure 3.2 indicates an agricultural flow map of tomato out of Benue state.

The map depicts the final destinations where tomato is consumed. The map's color-coding represents the volume of tomato and the flow patterns to different state in Nigeria. The red colour coding represent the highest volume of tomato exported shows that, Lagos, Kogi, Port Harcourt and Cross River states are the highest receiving states of perishable (tomato) of about 4601-2500 metric tons from Benue state. States like Enugu,Anambra, Ebonyi, received about 2501-4600 metric tons of tomatoes annually. Bayelsa, Delta, Imo and Abiah, 1401-2500 received 1401-2500 metric tons of tomatoes annually from Benue State. The reaming states which include Kwara, Akwa, Ibom,Edo state   received 1400 metric tons of Tomato. The

resulting map clearly shows the predominant flow of tomato exports from Benue State to the southern part of Nigeria. The thicker or darker flow lines leading to the southern states indicate a significant volume of tomato trade between these regions.The analysis suggests that factors such as consumer demand, market preferences, and economic activities in the southern states contribute to the concentration of tomato exports from Benue to the south. It might indicate a strong market demand for tomatoes in the southern region, leading to the strategic allocation of Benue's tomato produce.
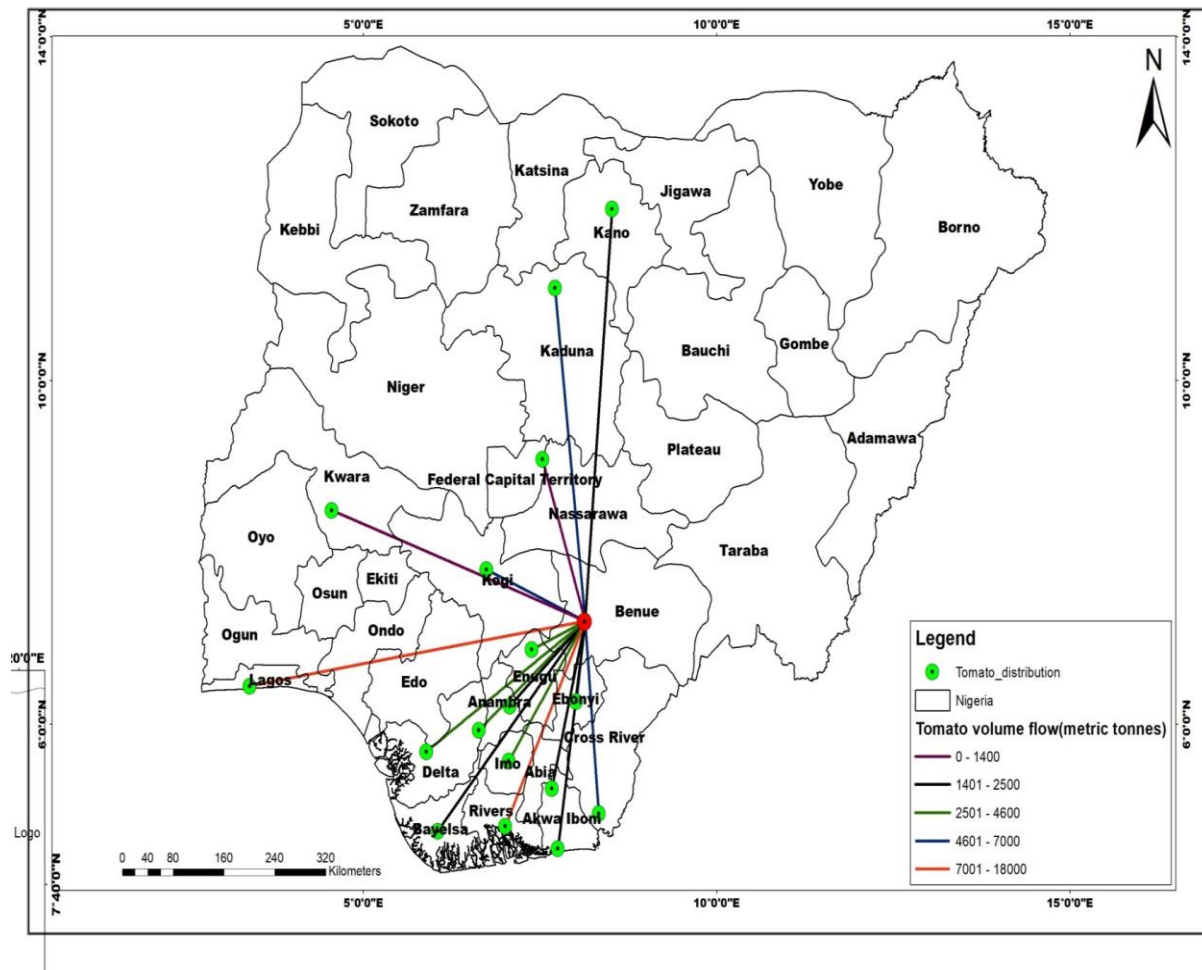

Figure 3.2: The flow map of tomato

Source: Authors' compilation

3.4   Variation in the volume of yam and tomato produced annually in Benue State (from 2011-2022)

To ascertain the variation l of the annual volume yam produced in Benue State from (2011-22) using one-way analysis of variance (ANOVA).The result in table 3.1 shows that, there are no statistically significant differences in the volume of yam products produced on an annual basis within Benue state, since the p-value (0.46) is greater than the typical significance level of 0.05.The forgoing result suggests that, insufficient financial resources can hinder farmers from investing in inputs, technologies, and proper farm management practices which ought to increase production

Table 3.1 Result of one way analyses of variance modeling of annual volume of yam produce and farm size in Benue State (2011-2022).

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	91691263.300	1	91691263.30	0.058	0.46
Within Groups	1565292376.068	10	156529237.60		
Total	1656983639.368	11			

Source: Author's analysis (2023)

Similarly, a one way analysis of variance modeling was attempted to determine the variation in the volume of tomato produced annually in Benue state (from 2011-2022). The results in table 3.2 shows that, there is no statistically significant differences in the volume of tomato products produce annually in Benue state since   the p-value (0.88) is greater than the significance level (0.05). The forgoing result suggests that,external factors such as climate, land availability, government policies, and conditions may be the main causes of lack increase in the quantity of yam produced annually.

Table 3.2: Result of one way analysis of variance modeling of annual volume of tomato produce and farm size in Benue State (from 2011-2022).

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	23.66	1	23.66	0.025	.878
Within Groups	11506.64	12	958.89		
Total	11530.20	13			

Source: Authors survey (2023)

3.5 Factors affecting the flow of tomato and yam from Benue State

Table 3.3.2 reveals the result of a multiple regression analysis on the factors influencing the flow of tomatoes in Benue State. The results shows that, transportation cost has a negative coefficient of -1.19, but it is not statistically significant ($p = 0.47$) in this model. This indicates that transportation costs inversely influence the flow of tomatoes. As transportation costs increase, the flow of tomatoes decreases. Poor road conditions and longer distances to markets result in higher transportation costs, affecting market participation for tomato producers. Higher transportation costs make it more challenging and costly to get the produce to the market, leading to reduced quantities taken to the market by farmers, as indicated by the results. Similarly, middlemen have a negative coefficient of -220.089, and they are not statistically significant ($p = 0.189$). This implies that, as the number of middlemen increases in the tomato supply chain, the flow volume of tomato decreases. The effect of middlemen in the supply chain depends on various factors, in some cases, powerful middlemen can exert significant control over pricing and terms, potentially disadvantaging producers and affecting the flow of agricultural produce, as indicated in the results. The coefficient for farm size is 650.925, and it is marginally not statistically significant ($p = 0.06$). This suggests that larger farms generally have the capacity to produce more tomatoes than smaller ones. Consequently, they can contribute a greater quantity of tomatoes to the market, potentially increasing the flow of tomatoes from the region.

Furthermore, the analysis reveals that education has a positive coefficient of 339.264, and it is statistically significant ($p = 0.09$). This implies that being well-educated may facilitate the gathering of information on marketing activities by the respondents. This result aligns with the view of Obasi (2008), who observed that better education among farmers is advantageous as it enlightens them on how to strategize and adapt to better flow conditions. Based on this regression analysis, education appears to be the most significant factor influencing the flow of tomatoes out of Benue State, as it has a significant positive impact. However, other variables such as transportation cost, the number of middlemen, and farm size do not exhibit statistically significant impacts on the flow of tomato produce in this particular model

Table 3.3.1: Summary of statistical calculation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	0.98[a]	0.97	0.94	171.47

Predictors: Cost of transport, number of middlemen, farmers education and farm size

Source Authors analysis (2023)

Table 3.3.2: Contribution of transport cost and other socio-economic variables to the flow of tomato in Benue state

Dependent variable: Average tomato produce

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Constant	-19.38	902.54		-0.021	0.9
TransportationCost	-1.19	1.51	-0.168	-0.79	0.47
Number of middlemen	339.26	71.62	0.61	4.75	0.01
Farmers education	-220.08	139.06	-0.49	-1.58	0.19
Farm size	650.92	244.39	1.11	2.66	0.06

Source: Authors analysis (2023)

Similarly, a regression modeling was attempted to determine major factors influencing the flow of yam from Benue State. Transport cost, education level, number of middlemen, and farm size were used as independent variables. Volume of yam exported from Benue to locations outside was used as dependent variable. Result of the regression modeling presented in table 3.4 shows that; correlation coefficient (r) was 0.62. It implies that there is positive relationship between transport cost, number of middlemen, education, farm size and the flow of yam in Benue State. The coefficient of determination (r) was 0.55 which implies that about 55% variations in the flow of yam produce could only be explained by transport cost, number of middlemen, education and farm size, while the remaining 45% were due to other variables outside the regression model which also have impact on the flow of yam produce in Benue state. The table further revealed that, transport cost influence the flow of yam produce in Benue State with (p = 0.35); the number of middlemen influence the flow of yam produce out of Benue sate with (p = 0.18); education affects the flow of yam produce in Benue State with the value (p = 0.48). Farm size also influence flow the of yam produce out of Benue state with the value (p = 0.22). The overall regression models is significant in terms of its overall goodness of fit as F calculated (15.65) is greater than F tabulated (3.86) at n-k degree of freedom. Therefore, transport cost, number of middle, education and farm size factors are responsible for the quantity of crops produced by farmers in the study area and these vary from farm to farm and settlement to settlement. These significantly, impact the volume of agricultural produce in Benue state Nigeria. The findings of the regression analysis provided valuable insights into the key determinants of yam export from Benue. By identifying these factors that significantly influenced yam export policymakers, farmers, and other stakeholders could make informed

decisions and develop strategies to promote and enhance yam export, leading to potential economic growth and development for the state.

Table 3.3.3: Summary of statistical calculation

Model	R	R^2	Adjusted R^2	Std.Error of the Estimate
	0.63[a]	0.55	0.35	0106

Predictor(Constant), Cost of transporting yam outside Benue state, number of middlemen, farmers level of education and farm size.

Source: Authors 'analysis (2023)

Table 3.3.4: Contribution of transport cost and other socio-economic variables to the flow yam in Benue state

Dependent variable: Average yam produce

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.36	.01106		12.909	0.0
Transportation cost	0.23	0.06	0.35	3.96	00
Number of middlemen	.0.16	0.05	0.18	3.18	00
Farmers education level	0.17	0.05	3.35	3.35	0.75
Farm size	0.23	0.58	0.2	3.90	0.01

Source: Authors' analysis (2023)

3.6   Contribution of yam and tomato to the economic growth of Benue State

Yam production is very vital to Benue State's economy, earning it the slogan "Food Basket of the Nation. To ascertain the contribution of yam production to the economic growth of Benue, product-moment correlation analysis was employed, variables such per capita income data (2011-2022), cultivated land, volume of yam produce data (2011-2022), and gross domestic product (GDP) data from 2011 to 2021. The result in Table 4.20 shows that, there is a strong positive correlation between per capita income and cultivated land. The correlation is statistically significant at 0.01 level (2-tailed). This result implied that, as per capita Income increases, there is a proportional increase in the area of land cultivated. Also, the correlation is statistically significant at the 0.01 level (2-tailed), implying that, high per capita income tend to increase the volume of yam produce. From the result, there is a strong positive correlation between per capita income and gross domestic product since the correlation coefficient (r) is 0.86. The correlation is statistically significant at the 0.01 level (2-tailed). This indicates that, as per capita income increases, there is a corresponding increase in the gross domestic product.

Furthermore, the analysis of result showed that, cultivated land (Hectares) had a moderately strong positive correlation between volume of yam produce. The correlation coefficient (r) is 0.76, representing a moderate positive relationship. The correlation is statistically significant at the 0.05 level (2-tailed). This implies that larger areas of cultivated land are associated with higher volumes of yam produce. Also, there is a strong positive correlation between cultivated land and gross domestic product. The correlation coefficient (r) is 0.86 indicating a strong positive association. The correlation is statistically significant at the 0.01 level (2-tailed). This suggests that an increase in cultivated land is associated with an increase in the gross domestic product. There is a moderate positive correlation between volume of yam produce and gross domestic product. The correlation coefficient (r) is 0.62 representing a moderate positive relationship. The correlation is statistically significant at the 0.05 level (2-tailed). This implies that higher volumes of yam produce are associated with higher gross domestic product. There is a perfect positive correlation r = 1.00 between per capita income and cultivated land, signifying that, as per capital income increases, the area of cultivated land proportionally increases. Also, there is a strong positive correlation r = 0.82 between per capita income and volume of yam produce, indicating that areas with high income tend to have higher volumes of yam produce. The result further shows that, there is a strong positive correlation r = 0.87 between per capita income and gross domestic product, indicating that an increase in income corresponds to a rise in GDP. Also, there is a moderately strong positive correlation r = 0.76 between cultivated land and volume of yam produce, suggesting larger cultivated areas are associated with higher yam production. There is a moderate positive correlation r = 0.62 between volume of yam produce and gross domestic product, implying that, higher yam production corresponds to higher GDP. Overall, these findings provide insights into the economic and agricultural production, emphasizing the importance of income, cultivated land, and yam production in contributing to economic growth.

Table 3.4: Contribution of yam and other socio-economic variables to the flow of yam in Benue state

		Per capital Income	Cultivate Land (Ha)	Volume of yam produce	GDP
Per capital income	Pearson Correlation	1	1.00	0.82	0.87
	Sig. (2-tailed)		0.00	0.02	0.01
	N	11	10	11	11
Cultivated land(H.a)	Pearson Correlation	1.00	1	0.76	0.86
	Sig. (2-tailed)	0.00		0.01	0.01

	N	10	10	10	10
Volume of yam produce	Pearson Correlation	0.82	0.76	1	0.62
	Sig. (2-tailed)	0.02	0.01		0.04
	N	11	10	14	11
Gross domestic product	Pearson Correlation	0.87	0.86	0.62	1
	Sig. (2-tailed)	.001	0.01	0.04	
	N	11	10	11	11

Correlation is significant at the 0.01 level (2-tailed).

Correlation is significant at the 0.05 level (2-tailed).

Source: Author's analysis (2023)

Similarly, a correlation analysis was attempted to determine the the contribution of tomato to the economic growth of Benue state using key variables such as per capita income, cultivated land (Ha), volume of tomato production (2011-2022), and Gross Domestic Product (GDP) from 2011 to 2021. Analysis of the result presented in table 23, shows that, there is a positive correlation of $r = 0.59$ between annual volume of tomato produced and cultivated land in hectares, highlighting the strong link between tomato production and cultivated land. Also, there is a positive correlation of $r = 0.89$ between yearly volume of tomato produce and per capita income. Furthermore, there is a positive correlation of $r = 0.703$ between annual volume of tomato produced and gross domestic product, accounting for the overall economic output (GDP) of Benue state. The result also showed that, there is a strong relationship between cultivated land in hectares and per capital income $r = 0.69$, as well as cultivated land in hectares and gross domestic product $r = 0.79$, both statistically significant. Also, there is a positive correlation of $r = 0.867$ relationship between per capita income and gross domestic product. In conclusion, the correlation findings highlight shows a positive link between annual volume of tomato produce, cultivated land, per capita income, and GDP. These connections indicate that, changes in one variable correspond with shifts in others, yielding insightful perspectives into the economic growth of Benue State.

Table 3.4.1: Contribution of tomato and other socio-economic variables to tomato production in Benue state

		Volume of tomato produce	Cultivated land(Ha)	Per capital income	GDP
Volume of tomato produce	Pearson Correlation	1	0.59	0.89	0.70
	Sig. (2-tailed)		0.03	0.00	0.02
	N	14	14	11	11

Cultivated Land(Ha)	Pearson Correlation	0.59	1	0.69	0.79
	Sig. (2-tailed)	0.03		0.03	0.03
	N	14	14	11	11
Per capital income	Pearson Correlation	0.89	0.69	1	0.87
	Sig. (2-tailed)	0.00	0.02		0.01
	N	11	11	11	11
Gross domestic product	Pearson Correlation	0.70	0.79	0.87	1
	Sig. (2-tailed)	0.03	0.03	0.01	
	N	11	11	11	11

Correlation is significant at the 0.01 level (2-tailed).
Source: Authors' analysis (2023)

Conclusion and Recommendation

The study indicates that there is a significant relationship between the flow of tomato and yam and economic growth of Benue state. However, the problems highlighted in the area include poor road conditions that have hindered a lot of development process. There is absence of access road in most parts of the study area, which leads to poor road-network connectivity thereby hindering the flow of these agricultural produce. Another major problem identified is high transport costs. This is due to the poor state of the roads, which has given rise to motorcyclists as a major means of transport in the area. Vehicles do not want to ply the roads because of the bad condition of the roads, since this can easily result in the wear and tear of the vehicles, giving rise to high maintenance cost. Based on the findings of the research, several recommendations emerge as key strategies to enhance the movement of tomato and yam products, so as high economic growth can be achieved in state. There should be an improved access to finance for farmers and agribusinesses are vital. By providing easier access to credit and financial services, agricultural stakeholders can make valuable investments in improving farming practices and adding value to their products. This, in turn, can lead to increased productivity, which is a cornerstone of economic growth in the sector. Furthermore, diversifying markets, both domestically and internationally, holds potential for stimulating economic growth. Exploring new markets for perishable and semi-perishable agricultural products can lead to increased revenue through exports and bolster the resilience of the agricultural sector. New roads should be opened in the communities to alleviate the suffering of the rural farmers. A transportation policy should be put in place at the local government level so as to have a balanced transport network with a

balanced distribution function. Such policy when put in place should sustain the already existing relationship between transportation network and economic growth, and at the same time create a favorable transportation for further growth.