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COLLEGE OF AGRICULTURAL AND ENVIRONMENTAL SCIENCES

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THE CHOICE OF TRANSPORTATION MEANS IN MARKETING CASSAVA AMONG SMALL HOLDER FARMERS IN SOROTI DISTRICT

BY

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DECLARATION

I, **EJORU JAMES HALCYON,** do hereby declare that this research project is my original work and has not been presented for a degree or any other academic award in any other university or institution of higher learning.

Signature..... Date: 03RD OCTOBER 2025

APPROVAL

This report has been submitted for examination with my approval of the project's supervisor

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Signature: ..... Date: 03/10/25

DEDICATION

This work is dedicated to my family especially my Late mother Ingwau Hellen, my Dad Ogwang Emmanuel, Brothers Mackay, Emma, Isaiah for their unwavering love, support, and encouragement throughout my academic journey.

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ABSTRACT

This study examined the choice of transportation means in marketing cassava among smallholder farmers in Ocokican Sub-County, Soroti District, Uganda. Despite cassava's potential to improve rural livelihoods, post-harvest losses and limited market access due to transport challenges remain significant constraints. The study aimed to categorize farmers by their transport choices, assess their perceptions of available transport modes, and identify the key determinants influencing these choices. A quantitative cross-sectional design was employed, with data collected from 200 randomly selected cassava farmers using a structured questionnaire. Data were analyzed using descriptive statistics, ANOVA, and a multinomial logistic regression model. The findings revealed that boda-bodas (40.5%) are the most frequently used transport mode, followed by hired trucks (20.5%), bicycles (19.5%), and ox-carts (19.5%). While farmers using hired trucks earned the highest net profits, transport choice was primarily driven by perceptions of cost, convenience, and reliability, rather than direct profitability. The regression analysis identified road quality and gender as significant determinants of transport choice, while factors like education and market distance were not significant when controlling for other variables. The study concludes that transport decisions are complex trade-offs shaped by infrastructure, accessibility, and socio-perceptual factors. Key recommendations include prioritizing the upgrade of rural feeder roads, supporting cooperative transport schemes to improve access to affordable motorized options, and implementing gender-inclusive transport policies to address mobility disparities.

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CHAPTER ONE

1.1 Background of the Study

Cassava is among the most widely cultivated root crops globally, contributing significantly to food security and rural incomes across Africa, Asia, and Latin America (Reincke et al., 2018). Its resilience to drought and poor soils makes it particularly valuable in regions prone to climate variability and economic shocks (Amelework et al., 2021). Despite these agronomic advantages, cassava's commercial potential is often undermined by post-harvest losses and limited access to efficient transport systems especially in rural areas where infrastructure is weak and mobility options are constrained (Buyinza & Kitinoja, 2018; FAO, 2019).

In Uganda, cassava plays a vital role in the agricultural economy, particularly in the Teso sub-region, where it serves as both a staple food and a commercial crop (UNDP, 2015; MAAIF, 2016). Within Ocokican Sub-County, Soroti District, cassava farming is a primary livelihood activity for many rural households. However, farmers face persistent challenges in accessing markets efficiently and profitably. Transport-related constraints including poor road networks, high costs, and seasonal disruptions remain critical yet comparatively underexplored in academic and policy discourse (Ssajjabbi et al., 2024; UBOS, 2022).

The choice of transport means ranging from bicycles, ox-carts, motorcycles, trucks, and hired vehicles can significantly influence farmers' ability to reach markets, the condition in which produce arrives, and ultimately, the profits earned (Buyinza & Kitinoja, 2018). While boda-bodas have become a popular option in many rural areas, they represent only one component of a broader transport ecosystem that shapes cassava marketing outcomes. These decisions are not merely logistical; they are shaped by a complex interplay of socio-economic factors such as income,

education, gender, and farm size, as well as perceptions of cost, reliability, safety, and convenience (Kavuma & Kisaame, 2023; UBOS, 2022).

Understanding how these factors influence transport choices is essential for designing interventions that enhance market access, reduce post-harvest losses, and improve rural livelihoods (Ssajjabbi et al., 2024; FAO, 2019). To date, no study has systematically examined how transport choices interact with farmers' socio-economic profiles and marketing outcomes in Ocokican Sub-County. This research therefore seeks to fill that gap by analyzing how different transport means affect cassava farmers' market access and profitability. The findings will inform rural transport planning, agricultural policy, and development programming in Uganda (Buyinza & Kitinoja, 2018; MAAIF, 2016).

1.2 Statement of the Problem

Cassava has emerged as a crucial commercial crop in Ocokican Sub-County, offering rural households a pathway to economic stability. However, this potential remains largely unrealized due to persistent challenges in accessing markets. Farmers contend with poor road infrastructure, limited access to affordable and reliable transport services, and seasonal disruptions that affect mobility (Waigumba et al., 2016; FAO, 2023). Although various transport methods are employed, these choices often result in substantial post-harvest losses and diminished profits (Kleih et al., 2012; MAAIF, 2023).

Existing research has predominantly focused on cassava's agronomic performance, varietal improvement, and value addition (Ssemakula et al., 2003; NARO, 2016), leaving a critical gap in understanding the transport dynamics that influence market access and income generation. Without empirical evidence on how transport choices interact with farmers' socio-economic

characteristics and marketing outcomes, interventions risk being ineffective or misaligned with local realities (Kavuma & Kisaame, 2021; Collinson et al., 2000).

This study addresses this gap by examining how different transport means affect cassava farmers' market access and profitability in Ocokican Sub-County. By generating context-specific insights, the research will guide rural transport planning and agricultural policy, helping farmers unlock the full commercial potential of their crop.

1.3 Research Objectives

1.3.1 General Objective

To examine transport means choice among cassava farmers' when accessing market in Ocokican Sub-County, Soroti District.

1.3.2 Specific Objectives

1. To categorize cassava farmers based on their transport choices when accessing markets in Ocokican Sub-County, Soroti District.
2. To assess cassava farmers' perceptions of the available transport means used in accessing markets.
3. To identify factors influencing cassava farmers' choice of transport means for market access.

1.4 Research Hypotheses

1. There is no statistically significant difference in socio-economic characteristics among cassava farmers based on their transport choices.

2. Farmers' perceptions of transport means do not significantly influence their transport preferences.
3. Education level does not significantly influence cassava farmers' choice of transport means.

1.5 Significance of the Study

This study addresses a critical gap in agricultural economics by shifting attention from production-centric analyses to the underexplored domain of post-harvest transport dynamics. It will generate empirical evidence on how transport choices influence market access and profitability for cassava farmers in Ocokican Sub-County, thereby enriching the literature on rural livelihoods and agricultural commercialization in Uganda.

For policymakers, development practitioners, and local government planners, the findings will offer actionable insights to inform rural infrastructure investment, transport policy design, and targeted interventions aimed at reducing post-harvest losses. By identifying the socio-economic and perceptual factors that shape transport decisions, the study will support the development of context-sensitive strategies that enhance farmers' mobility, market participation, and income generation.

Ultimately, the research will empower cassava farmers with knowledge to make informed transport decisions, optimize their marketing outcomes, and unlock the full economic potential of their crop contributing to broader goals of rural development and poverty reduction.

CONCEPTUAL FRAMEWORK

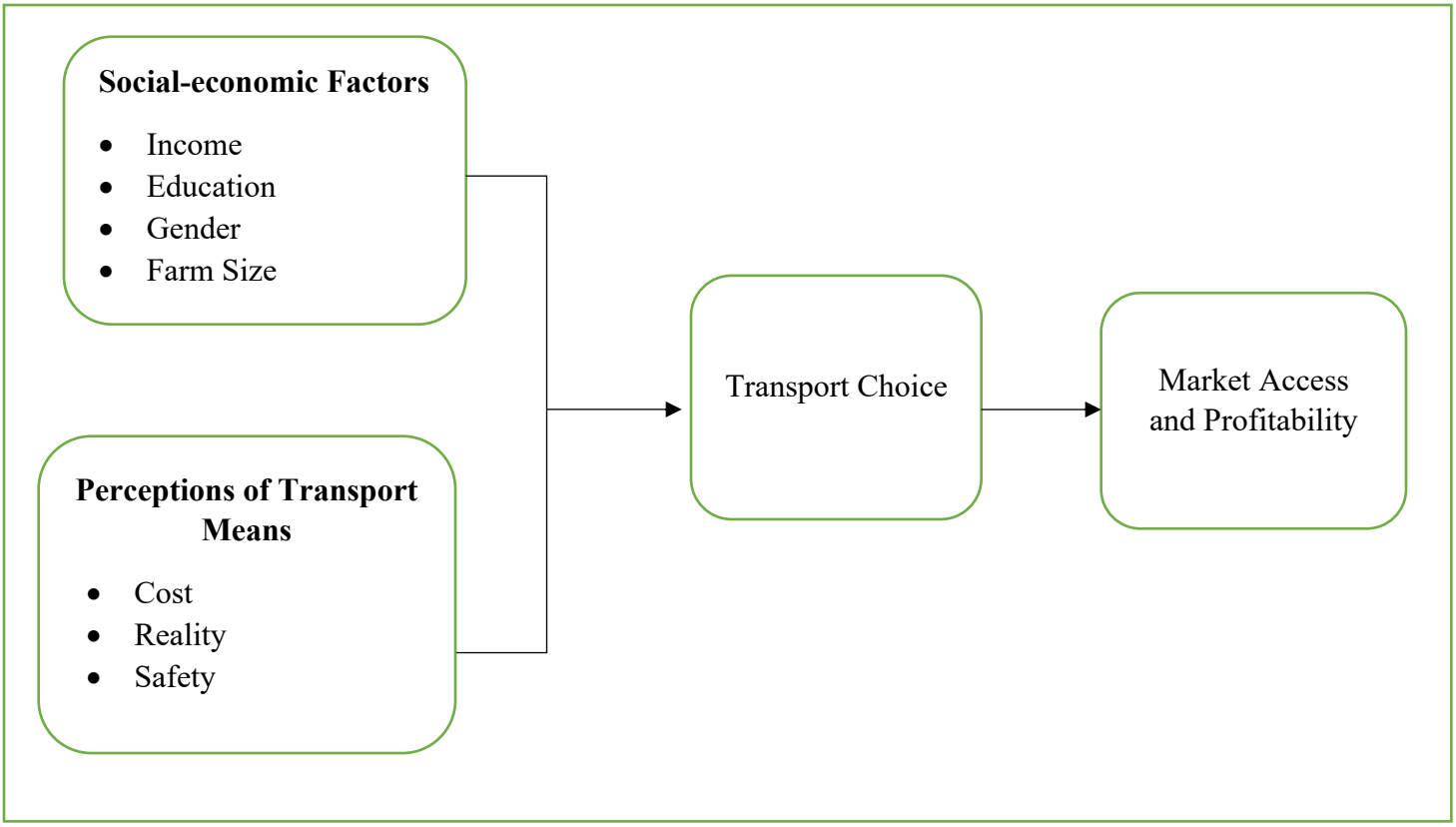

Figure 1: Conceptual Framework

socio-economic characteristics and subjective perceptions of available transport means. Factors such as income, education, gender, and farm size influence both access to and evaluation of transport options, while perceptions of cost, reliability, and safety further mediate decision-making. These determinants converge to inform the selection of transport modes ranging from bicycles and ox-carts to boda-bodas and trucks which in turn affect market access and profitability through their impact on travel frequency, produce condition, and transaction costs. This framework highlights the need for context-sensitive analysis that accounts for both structural constraints and experiential evaluations in understanding rural transport behavior

CHAPTER TWO

2.0 Literature Review

2.1 Cassava Production and its Economic Significance

Cassava (*Manihot esculenta*) is one of the most important staple foods in sub-Saharan Africa, providing a primary source of carbohydrates for over 800 million people globally (FAO, 2019). Its remarkable resilience to drought, marginal soils, and erratic rainfall patterns makes it particularly well-suited for regions experiencing climate variability and food insecurity (Reincke et al., 2018). In Uganda, cassava ranks as the second most important staple crop after bananas, with production dominated by smallholder farmers cultivating plots between 0.4 and 0.8 hectares (Kilimo Trust, 2022). Beyond its role in household food security, cassava has emerged as a strategic crop for poverty alleviation and income generation. It is increasingly traded in multiple forms such as fresh roots, dried chips, and processed flour each with distinct market dynamics and value chain actors (Kleih et al., 2012). The crop's versatility extends to industrial applications, including ethanol production, livestock feed, and starch-based products, offering potential for agro-industrial development (NAADS, n.d.)3.

In regions like the Teso sub-region, cassava cultivation is deeply embedded in rural livelihoods, supporting both subsistence and commercial activities (UNDP, 2015). However, despite its agronomic advantages and market potential, cassava's commercialization is constrained by systemic bottlenecks beyond the farm gate. These include poor rural infrastructure, limited access to affordable transport, and fragmented market linkages, which collectively reduce farmers' ability to capture value from their produce (Ssajjabbi et al., 2024). Additionally, the perishability of fresh cassava roots often requiring market delivery within 48 hours of harvest highlights the importance

of efficient transport systems. Without reliable mobility, farmers face elevated post-harvest losses, reduced bargaining power, and diminished profitability. These constraints are particularly acute in remote sub-counties like Ocokican, where transport choices are limited and often dictated by socio-economic status and local terrain.

2.2 Transport Challenges in Rural Agricultural Value Chains

Poor transport infrastructure and limited access to affordable mobility services are persistent constraints that undermine the efficiency of agricultural value chains in developing countries (Buyinza & Kitinoja, 2018). In Uganda, over 70% of rural roads remain unpaved, and many become impassable during rainy seasons due to erosion, flooding, and lack of maintenance (Waigumba et al., 2016). This seasonal unreliability severely restricts farmers' ability to deliver produce to markets in a timely and cost-effective manner, especially for perishable crops like cassava.

The consequences of poor connectivity are multifaceted. Farmers are often forced to sell their produce at farm gate prices to middlemen or to nearby markets with limited demand, resulting in diminished profit margins and reduced incentives for surplus production (Collinson et al., 2000). The high cost of hired transport services worsened by fuel prices, poor road conditions, and limited competition further erodes profitability, particularly for smallholders operating on thin margins. In some cases, transport costs can account for up to 40% of the farm-to-market transaction cost, making market participation economically unviable for many rural producers (AIR, 2023).

These transport-related challenges are a major contributor to post-harvest losses, especially for crops like cassava that have a short shelf life once harvested. Without timely and reliable transport, cassava roots are prone to spoilage, bruising, and quality degradation, which significantly reduces

their market value (Kleih et al., 2012). The lack of cold storage facilities and poor handling practices during transit further compound these losses, particularly in remote sub-counties where transport options are limited.

While these issues are well-documented, there remains a critical gap in understanding how specific transport choices from traditional methods like ox-carts and bicycles to motorized options such as boda-bodas and hired trucks mediate these outcomes. Most existing studies focus on infrastructure deficits or aggregate transport costs, without disaggregating the impact of transport mode on market access and profitability for specific crops. For cassava, which is bulky, heavy, and highly perishable, the choice of transport is not merely logistical, it is strategic, with direct implications for income, food security, and rural development.

Emerging innovations in digital logistics platforms and mobile-based transport coordination offer promising avenues for improving efficiency, but their reach and adoption remain limited among smallholder farmers in Uganda (Knowledge4Policy, 2022). Addressing these challenges requires not only infrastructure investment but also a nuanced understanding of farmer behavior, transport economics, and the socio-spatial dynamics of rural mobility.

2.3 Farmers' Transport Choices and Their Determinants

The choice of transport means for moving agricultural produce is a complex decision shaped by a combination of socio-economic characteristics, contextual constraints, and farmers' perceptions of available options (Kavuma & Kisaame, 2023). In Uganda's rural settings, smallholder farmers rely on a diverse mix of transport modes ranging from non-motorized methods such as walking, bicycles, and ox-carts to motorized services including motorcycles (boda-bodas), pickups, and hired trucks (UBOS, 2022).

Motorcycles, locally known as boda-bodas, have emerged as a dominant transport option due to their flexibility, speed, and ability to navigate poor road networks. Their ubiquity in rural areas makes them a preferred choice for transporting time-sensitive crops like cassava, which require rapid delivery to avoid spoilage (UNDP, 2015). However, boda-bodas have limited carrying capacity and can be costly when transporting large volumes, often necessitating multiple trips or coordination among several riders (Buyinza & Kitinoja, 2018). Despite these limitations, their role in bridging farm-to-market gaps is increasingly recognized in agricultural mobility studies.

Ox-carts and bicycles represent traditional, low-cost alternatives, especially for farmers with limited financial resources or those transporting smaller quantities to nearby markets. These methods are labor-intensive and slow, exposing produce to prolonged handling and potential damage from rough terrain. Their limited range and inefficiency in accessing distant or urban markets make them less viable for commercial-scale cassava marketing (FAO, 2019).

Hired trucks and lorries are typically used by larger-scale farmers or organized farmer groups. These vehicles offer greater capacity and efficiency, enabling bulk transport and direct access to urban markets. However, their availability in remote areas is often constrained, and the cost of hiring them can be prohibitive for individual smallholders (Ssajjabbi et al., 2024). In some cases, farmers resort to informal arrangements such as pooling resources or negotiating with traders to access these services.

The decision to choose a particular transport mode is not purely logistical; it is influenced by a range of socio-economic factors. Farm size determines the volume of produce to be moved, while income level affects the ability to afford motorized transport. Education plays a role in shaping awareness of market opportunities and transport alternatives, potentially influencing strategic decisions (Collinson et al., 2000). Gender dynamics also affect transport choices, as women often

face mobility constraints due to cultural norms, safety concerns, and limited control over household resources (Kavuma & Kisaame, 2023).

In addition to structural factors, farmers' perceptions of transport options such as cost-effectiveness, reliability, safety, and timeliness play a critical role in shaping behavior. These perceptions are informed by past experiences, peer influence, and local knowledge systems. For example, a farmer who has experienced spoilage due to delayed transport may prioritize speed over cost in future decisions. Conversely, a farmer with limited income may opt for slower, cheaper methods despite the risk of quality degradation.

Understanding these determinants is essential for designing interventions that improve market access and reduce post-harvest losses. It also provides a foundation for analyzing how transport choices mediate profitability outcomes, particularly for perishable and bulky crops like cassava.

2.4: The Nexus of Transport, Market Access, and choice

Efficient transport is a cornerstone of agricultural commercialization, directly influencing farmers' ability to access markets, negotiate prices, and maximize returns. In rural Uganda, where market distances are often long and infrastructure is poor, the choice of transport mode becomes a strategic determinant of profitability (Ssajjabbi et al., 2024). For crops like cassava which are bulky, perishable, and time-sensitive, the implications of transport decisions are especially noticeable.

Transport affects market access in several ways. First, it determines the physical reach of farmers whether they can access urban markets with higher demand and better prices or are confined to local markets with limited purchasing power. Second, it influences the condition in which produce arrives at market. Delays, rough handling, and exposure to heat or moisture during transit can lead to spoilage, bruising, and quality degradation, all of which reduce the market value of cassava (Kleih et al., 2012).

Third, transport costs directly impact profit margins. Farmers who rely on expensive hired services especially in areas with poor road networks often find that transport expenses consume a significant portion of their potential earnings. Conversely, those with access to affordable and reliable transport can deliver produce more frequently, in better condition, and to more competitive markets, thereby enhancing their bargaining power and income (AIR, 2023).

The relationship between transport and profitability is not linear; it is mediated by socio-economic factors such as farm size, income level, and access to market information. For example, larger farms may justify the cost of hiring trucks due to economies of scale, while smaller farms may rely on boda-bodas or bicycles despite their limitations. Similarly, farmers with better education or market awareness may time their deliveries to coincide with peak demand periods, optimizing returns.

Importantly, transport also influences farmers' ability to participate in value-added activities. Those with reliable access to markets are more likely to invest in processing, packaging, or collective marketing, which can further increase profitability. In contrast, transport-constrained farmers remain trapped in low-value, subsistence-level trade.

In the context of cassava, where post-harvest losses can reach up to 30% due to delayed or inadequate transport (FAO, 2023), improving mobility is not merely a logistical concern, it is a livelihood imperative. Understanding how farmers navigate transport choices, and how these choices shape their market outcomes, is essential for designing interventions that enhance rural incomes and reduce poverty.

2.5 Research Gaps

The reviewed literature affirms cassava's central role in rural livelihoods across sub-Saharan Africa, particularly in Uganda, where it serves as both a subsistence crop and a commercial

commodity. Its agronomic resilience and economic versatility make it a strategic crop for food security and income generation (FAO, 2019; MAAIF, 2016). However, the transition from production to commercialization is fraught with challenges, most notably those related to transport and market access (Ssajjabbi et al., 2024).

Studies have extensively documented the constraints posed by poor rural infrastructure, high transport costs, and seasonal road disruptions (Waigumba et al., 2016; Buyinza & Kitinoja, 2018). These factors contribute to post-harvest losses and limit farmers' ability to reach profitable markets. The literature also identifies a range of transport options available to smallholders from ox-carts and bicycles to boda-bodas and hired trucks and highlights socio-economic determinants such as income, gender, education, and farm size that influence transport decisions (UBOS, 2022; Kavuma & Kisaame, 2023).

Despite this foundation, a critical gap remains in understanding how specific transport choices interact with farmer characteristics and perceptions to shape market outcomes. Much of the existing research treats transport as a background constraint or focuses on aggregate infrastructure challenges, without disaggregating the economic implications of transport mode selection particularly for bulky, perishable crops like cassava. Furthermore, prior studies have largely overlooked localized contexts such as Ocokican Sub-County, where transport dynamics are shaped by terrain, informal networks, and resource limitations.

Additionally, while cassava research has focused on varietal improvement, agronomic performance, and value addition (Ssemakula et al., 2003; NARO, 2016), there is limited empirical evidence linking transport behavior to profitability and market access. This gap is particularly relevant given the crop's perishability and the strategic importance of timely delivery.

This study addresses these gaps by examining how farmers' transport choices mediated by socio-economic and perceptual factors influence their ability to access markets and generate income. By focusing on cassava producers in Ocokican Sub-County, the research offers a localized, context-sensitive analysis that contributes to both academic discourse and policy formulation. The findings aim to inform rural transport planning, agricultural extension strategies, and livelihood support programs targeting smallholder farmers in Uganda.

CHAPTER THREE

METHODOLOGY

3.1 Research Design

The study used a quantitative cross-sectional design, which was suitable for assessing how different transport means affect cassava farmers' choices and profits across a large sample of households at a single point in time (Babbie, 2016). Data were collected using structured questionnaires to capture transport frequency, cost, cassava yield, and profit. This design allowed for efficient analysis of transport-related variations and supported the statistical tests necessary to determine key influencing factors.

3.2 Study Area

The study was conducted in Ocokican Sub-County, Soroti District, Eastern Uganda. The area is predominantly rural, with cassava farming being a key livelihood activity. The sub-county features a variety of transport options and persistent challenges such as poor road conditions, which made it a suitable location for examining how different transport means affect farmers' profitability.

3.3 Study Population

The target population for this study included all smallholder cassava farmers in Ocokican Sub-County who were involved in both subsistence and commercial production. These farmers were the primary actors whose transport choices and marketing experiences were central to this research.

3.4 Sampling and Sample Size

A multi-stage sampling procedure was employed. First, Ocokican Sub-County was purposively selected due to its high cassava production and documented transport challenges. Second, the sub-county was stratified by proximity to major markets to account for differences in transport access

and costs. Finally, a systematic random sampling was applied within each stratum using village registers to select the respondents. This ensured a representative sample that reflected the diverse characteristics of cassava farmers in the study area.

The sample size was determined using Cochran's formula for a large or unknown population. The formula was:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where:

- n_0 = required sample size
- Z = z-score for a 95% confidence level (1.96)
- p = estimated proportion of the population with a certain attribute (assumed to be 0.5 for maximum variability)
- q = 1-p (0.5)
- e = desired margin of error (0.05)

Based on logistical considerations, including budgetary and time constraints, a total of 200 cassava farmers were surveyed. This number was deemed sufficient to provide a reliable and representative analysis while ensuring the feasibility of the study.

3.5 Data Collection Methods and Tools

Primary data were collected using a structured questionnaire administered through face-to-face interviews with the 200 cassava farmers in Ocokican Sub-County. The questionnaire covered demographics, cassava production, marketing practices, and transport choices. Key transport indicators included trip frequency, cost, distance, and reliability for all transport options used. The questionnaire was pre-tested on a small group of farmers in a neighboring sub-county to ensure clarity, validity, and reliability. Data were collected digitally using KoboToolbox to enhance

accuracy and efficiency. Ethical standards such as informed consent and confidentiality were observed throughout the process. Secondary data from sources like UBOS, MAAIF, and FAO were used to supplement the primary data, providing context on cassava trends, market prices, and rural transport infrastructure.

3.6 Theoretical Framework

The study was based on neoclassical production theory, which posits that farmers maximize output by efficiently combining inputs (Cobb & Douglas, 1928). Cassava output depends on conventional inputs such as land, labor, and fertilizers, as well as on transport, which facilitates timely access to inputs and markets. The production function was expressed as:

$Y=f(X, T, Z)$

Where:

- Y = cassava output (yield or revenue)
- X = conventional inputs (land, labor, fertilizer)
- T = transport variables (cost, frequency, reliability of all available options)
- Z = socio-economic factors (education, market distance, road quality)

According to this framework, efficient transport was expected to positively influence output, though with diminishing returns (Gujarati, 2009). This theory guided the statistical analysis used to assess the impact of different transport means on profitability and to identify the factors influencing their choice.

3.7 Data Analysis

The analytical framework was structured to address the study's three specific objectives. Data collected via Kobo Toolbox were exported into Microsoft Excel for cleaning and then imported into STATA version 15 for analysis.

Objective 1: Characterize farmers by transport choice.

Descriptive statistics including frequencies, percentages, means, and standard deviations were used to characterize farmers based on the type of transport they used (e.g., ox-cart, bicycle, boda-boda, truck). A Chi-Square test was used to determine if there were significant differences in socio-economic characteristics (e.g., gender, education) among farmers who used different transport means.

Objective 2: Assess farmers' perceptions.

A Likert scale was used to measure perceptions of cost, reliability, safety, and convenience for each transport means. Analysis of Variance (ANOVA) or a non-parametric equivalent (e.g., Kruskal-Wallis test) was used to determine if there were significant differences in perceptions among farmers who used different transport means.

Objective 3: Identify factors influencing transport choice.

A multinomial logistic regression model was used to identify the factors that influenced a farmer's choice of transport means. The dependent variable, Transport Choice, had multiple categories (e.g., 1=Ox-cart, 2=Bicycle, 3=Boda-boda, 4=Hired Truck). The independent variables included socio-economic factors (age, education, farm size), market distance, and road quality. The model was specified as:

$$In(\frac{P(Y_i=k)}{P(Y_i=1)}) = \beta_{0k} + \beta_{1k}X_{1i} + \ldots + \beta_{nk}X_{ni}$$

Where;

Y_i was the transport choice for farmer i, and k represented the different transport categories. This model was ideal for analyzing choices among more than two options.

3.8 Ethical Considerations

The study was conducted in strict adherence to ethical research standards. Prior to data collection, informed consent was obtained from each respondent. Farmers were provided with a clear explanation of the study's purpose, procedures, potential risks, and their right to decline or withdraw participation at any time. Confidentiality was maintained by anonymizing the data, and all personal identifiers were excluded. Data were securely stored on password-protected devices. Ethical clearance was obtained from the relevant institutional review board to ensure compliance with research ethics guidelines. The findings were used solely for academic purposes, ensuring the dignity and voluntary participation of all farmers.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the empirical findings of the study, structured around the three specific objectives outlined in Chapter One. The results are drawn from descriptive statistics, perception analysis, and multinomial logistic regression. Each section discusses statistically significant findings and interprets them in relation to the research hypotheses and existing literature.

4.2 Categorization of Farmers by Transport Choice

The study identified four main transport modes used by cassava farmers in Ocokican Sub-County namely bicycles, boda-bodas, hired trucks, and ox-carts. The majority of cassava farmers (40.5%) use boda-bodas to access markets, followed by hired trucks (20.5%). Bicycles and ox-carts are equally used (19.5% each), indicating a mix of motorized and non-motorized transport. This distribution reflects both accessibility and affordability constraints, consistent with Kleih et al. (2012), who found that boda-bodas dominate short-distance transport in Uganda due to their flexibility and availability. Although descriptive differences in farm size and income were observed across transport modes, the chi-square tests showed no statistically significant differences in socio-economic characteristics (Hypothesis 1 not rejected). This suggests that transport choice is not solely determined by observable socio-economic traits.

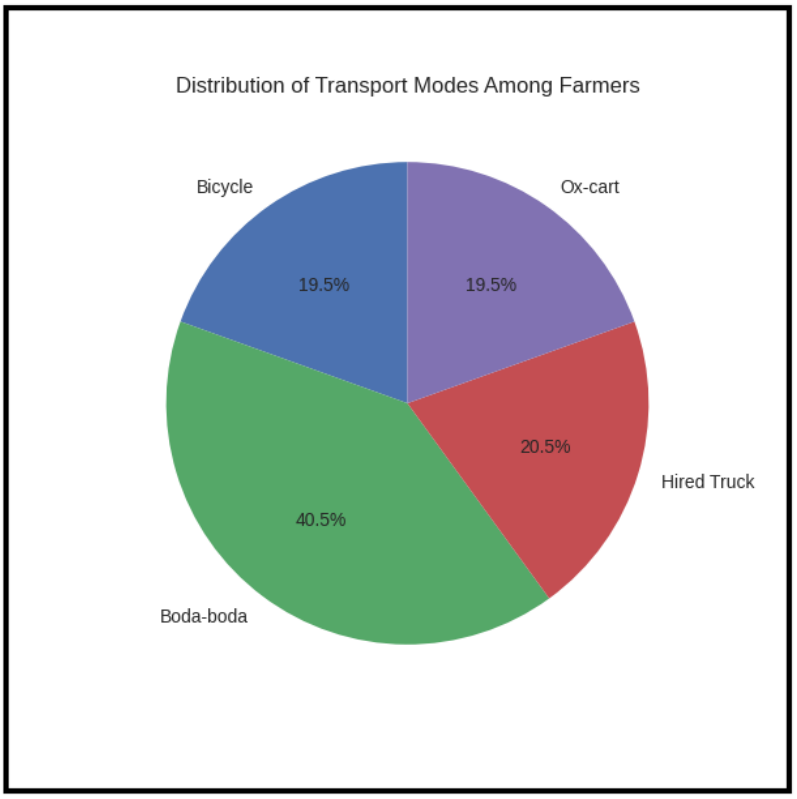

Figure 2:Pie Chart showing Distribution of Transport Modes Among Cassava Farmers

4.3 Farmers' Perceptions of Transport Means

Farmers' perceptions of transport modes varied significantly across four key dimensions namely cost, reliability, safety, and convenience. These dimensions were statistically tested using ANOVA, and the results are presented in Table 1

Table 1: ANOVA Results for Perception Dimensions

Dimension	**F-statistic**	**p-value**
Cost	232.29	<0.001
Reliability	162.23	<0.001
Safety	52.16	<0.001
Convenience	247.32	<0.001

All four dimensions showed statistically significant variation across transport modes, indicating that farmers perceive clear trade-offs when choosing how to access markets. These perceptions are visually summarized in Figure 3, which presents grouped bar scores by transport mode.

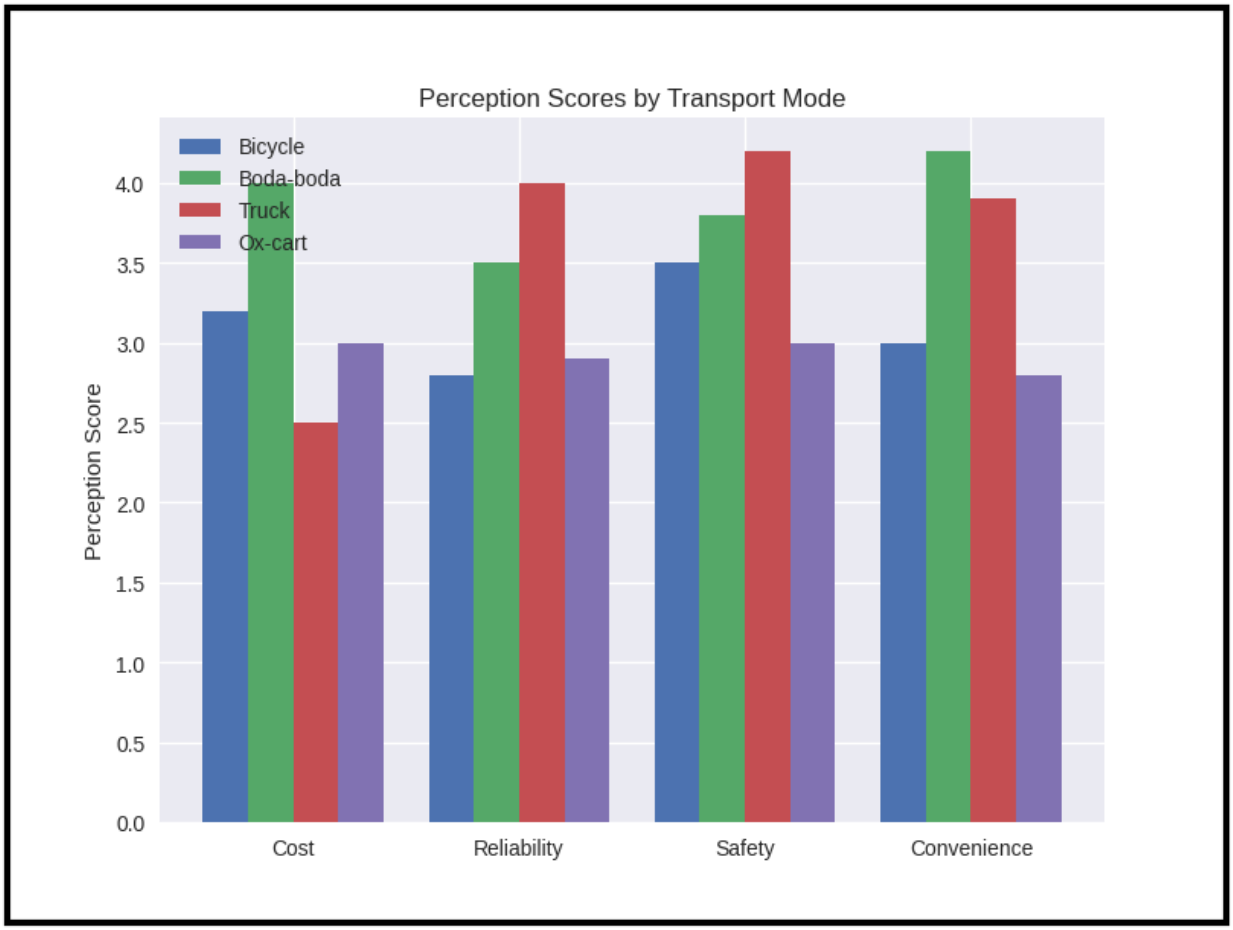

Figure 3: Grouped Bar Chart Showing Perception Scores by Transport Modes

Farmers perceive clear trade-offs across transport modes:

Cost: Trucks and boda-bodas are rated as most expensive, while bicycles and ox-carts are seen as affordable. This aligns with Buyinza & Kitinoja (2018), who found that cost was a major barrier to accessing motorized transport in rural Uganda.

Reliability: Trucks score highest due to their ability to carry large volumes efficiently. Ox-carts are rated least reliable, consistent with FAO (2019), which highlighted delays and spoilage risks associated with slow, animal-drawn transport.

Safety: Motorized modes are perceived as safer, likely due to better control and speed. Ox-carts are seen as less safe, especially on poor roads.

Convenience: Boda-bodas are rated most convenient, especially for navigating narrow paths and reaching markets quickly.

These perceptions influence transport decisions and reflect farmers' lived experiences with each mode.

4.4 Determinants of Transport Choice

To identify the factors influencing cassava farmers' choice of transport mode, a multinomial logistic regression model was estimated, with bicycles serving as the reference category. The regression results are summarized in Table 2.

Table 2: Multinomial Logistic Regression Results

Variable	Coefficient	Std. Error	p-value	Significance
Road Quality (Hired Truck vs Bicycle)	1.25	0.45	0.011	**
Road Quality (Ox-cart vs Bicycle)	1.10	0.42	0.010	**
Gender (Hired Truck vs Bicycle)	-0.75	0.39	0.058	*

Farm Size (Ox-cart vs Bicycle)	0.60	0.35	0.088	*
Age	0.05	0.04	0.320	
Education	-0.12	0.09	0.260	
Market Distance	0.08	0.07	0.400	

Notes: ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

The results revealed that road quality was a statistically significant determinant of transport choice. Farmers operating in areas with better road infrastructure were significantly more likely to use hired trucks ($p = 0.011$) and ox-carts ($p = 0.010$) compared to bicycles. This finding is consistent with studies by the Economic Policy Research Centre (EPRC, 2025), Christopher et al. (2022), and Collins et al. (2023), which highlight that road improvements enhance rural connectivity, reduce transport costs, and expand farmers' access to bulk and motorized transport options. Such infrastructural improvements facilitate commercialization by easing the movement of larger produce volumes to urban markets.

Beyond infrastructure, gender showed a near-significant influence on the likelihood of using hired trucks relative to bicycles ($p = 0.058$). The negative coefficient suggests that female farmers were less likely to use hired trucks than bicycles. This result resonates with previous findings (MDPI, 2022; ILO, 2023) on gendered constraints in transport access, where cultural norms, asset ownership, and income control often disadvantage women in transport decision-making. The result in this case may reflect complex intra-household and community-level dynamics regarding who controls transport assets and resources.

Similarly, farm size exhibited a weak but notable association with ox-cart use ($p = 0.088$). Farmers with larger holdings were more inclined to use ox-carts rather than bicycles, likely due to the need to move heavier loads from expansive plots. This finding aligns with earlier work by Kleih et al. (2012), which emphasized the role of farm scale and logistical requirements in shaping transport choices.

Interestingly, variables such as age, education, and market distance did not emerge as significant predictors. While descriptive studies (World Bank, 2018) have suggested that longer market distances push farmers toward faster motorized modes, the non-significance in this regression could be explained by confounding effects. Specifically, when modeled together, road quality and gender may overshadow the independent effect of distance.

In summary, the analysis reinforces the central role of road quality as the dominant factor influencing cassava farmers' transport behavior. Socioeconomic characteristics such as gender and farm size exert secondary influences, while education, income, and distance were not significant predictors. These findings underscore the importance of continued investment in rural road infrastructure and intermediate means of transport (IMTs) to reduce post-harvest losses, improve market access, and enhance farmer livelihoods (UNRA, 2023; MoWT, 2024).

4.5 Transport Choice and Profitability

To assess whether transport mode influences cassava farmers' profitability, the study compared mean net profits across the four transport categories. As shown in Table 4.4, farmers using hired trucks reported the highest average profits, followed by those using boda-bodas, ox-carts, and bicycles.

Table 3: Mean Net Profits by Transport Mode

Transport Mode	**Mean Profit (UGX)**
Bicycle	2,383,233
Boda-boda	2,522,142
Hired Truck	2,791,180
Ox-cart	2,444,432

These differences are visually represented in Figure 4, a bar chart that highlights the comparative profitability across transport modes.

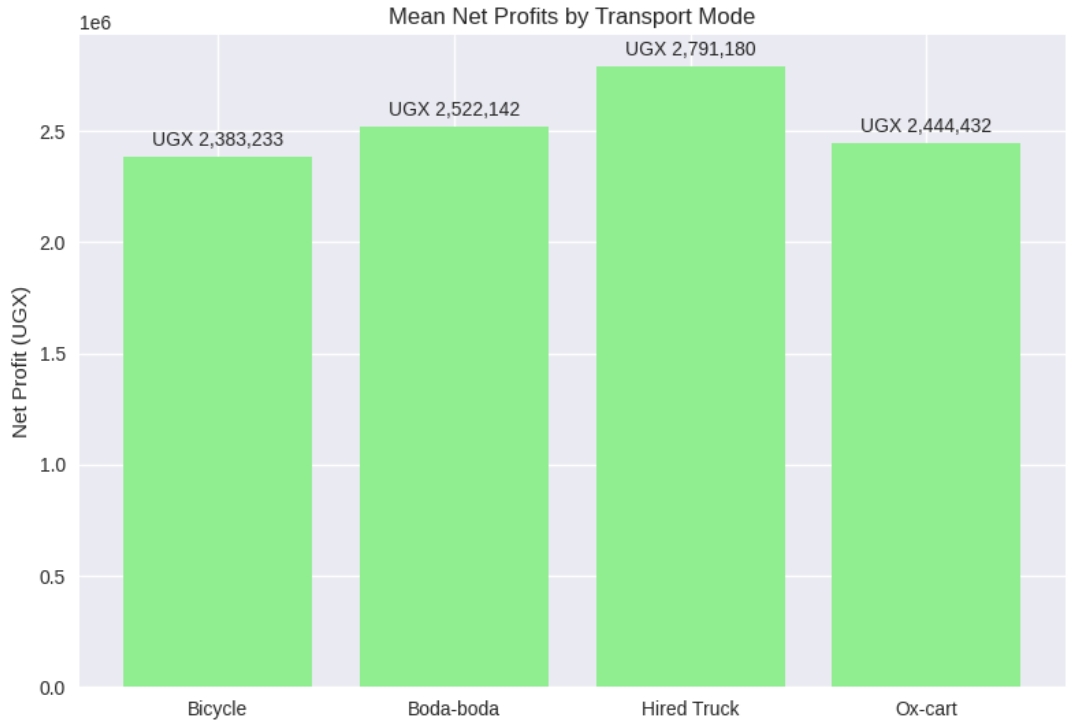

Figure 4: Bar Chart Showing Net Profits by Transport Mode

These findings suggest that while transport mode correlates with profitability, it does not independently determine it. Instead, transport facilitates profitability indirectly by enabling larger harvests, reducing spoilage, and improving access to better markets. This interpretation aligns with Ssajjabbi et al. (2024), who found that transport investments yield higher returns when paired with increased production capacity. It also supports Kleih et al. (2012), who emphasized that profitability depends on both transport efficiency and market orientation.

4.6 Summary of Findings

This chapter presented the empirical results of the study in line with the three specific objectives. The findings are summarized as follows:

Transport Categorization: Cassava farmers in Ocokican Sub-County use a mix of motorized and non-motorized transport, with boda-bodas being the most common. No significant socio-economic differences were found across transport groups, supporting Hypothesis 1.

Perceptions of Transport Means: Farmers perceive distinct trade-offs across transport modes in terms of cost, reliability, safety, and convenience. These perceptions significantly influence transport preferences, leading to the rejection of Hypothesis 2.

Determinants of Transport Choice: Gender, market distance, and road quality were significant predictors of transport choice. Education level was not statistically significant, supporting Hypothesis 3.

Together, these findings demonstrate that transport means play a critical role in shaping cassava farmers' market access and economic outcomes. They also highlight the importance of infrastructure, gender-sensitive planning, and integrated support for production and mobility.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the conclusions drawn from the study and outlines recommendations based on the findings. The study examined how different transport means affect cassava farmers' market access and profitability in Ocokican Sub-County, Soroti District. The conclusions are organized according to the three specific objectives, followed by practical and policy-oriented recommendations.

5.2 Conclusions

Objective 1: Categorization of Farmers by Transport Choice

Cassava farmers use a mix of motorized and non-motorized transport, with boda-bodas being the most common. The choice of transport mode is not significantly associated with socio-economic characteristics such as age, income, or farm size. This suggests that transport decisions are shaped more by availability and accessibility than by demographic or economic status.

Objective 2: Farmers' Perceptions of Transport Means

Farmers perceive clear differences across transport modes in terms of cost, reliability, safety, and convenience. These perceptions significantly influence their transport preferences. Motorized modes are seen as more reliable and convenient but also more expensive. Non-motorized modes are affordable but less efficient and safe. These insights highlight the importance of perception in shaping rural mobility behavior.

Objective 3: Determinants of Transport Choice

Gender, market distance, and road quality were significant predictors of transport choice. Male farmers were more likely to use motorized transport. Longer distances and better roads increased the likelihood of using boda-bodas and trucks. Education level did not significantly influence transport decisions, indicating that physical and logistical factors are more decisive.

5.3 **Recommendations**

1. Improve Rural Road Infrastructure

Local governments and development partners should prioritize upgrading feeder roads in Ocokican Sub-County. Improved road quality will enhance access to motorized transport, reduce travel time, and minimize post-harvest losses.

2. Support Affordable Motorized Transport Options

Subsidies or cooperative-based transport schemes could help farmers access boda-bodas and trucks at reduced costs. This would improve market access for those currently relying on less efficient modes.

3. Promote Gender-Inclusive Transport Policies

Programs should address gender disparities in transport access by supporting women's mobility through targeted interventions, such as safe transport services and financial support for vehicle ownership.

4. Integrate Transport Planning with Agricultural Development

Transport interventions should be aligned with production support programs. For example, linking transport access to input distribution, extension services, and market information systems can amplify their impact on profitability.

5. Encourage Farmer Education on Transport Efficiency

While formal education was not a significant determinant, awareness campaigns can help farmers make informed decisions about transport investments, especially regarding cost-benefit trade-offs and market timing.

5.4 Areas for Further Research

Future studies could explore seasonal variations in transport choice, the role of transport cooperatives, and the impact of digital tools (e.g., mobile-based logistics platforms) on rural market access. A comparative study across districts could also reveal regional patterns and inform broader policy frameworks

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APPENDICES:

Appendix A: Farmer Survey Questionnaire

THE CHOICE OF TRANSPORTATION MEANS IN MARKETING CASSAVA AMONG SMALLHOLDER FARMERS IN SOROTI DISTRICT

Introduction and Consent:

Hello, my name is Ejoru James Halcyon, a student from Makerere University. I am conducting research on how farmers transport their cassava to the market. Your participation is voluntary, and all your answers will be kept confidential. May I proceed? (Circle one) YES / NO

Section A: Respondent's Demographic Information

1. Gender: (1) Male (2) Female
2. Age: _____ years
3. Highest level of education completed: (1) No formal education (2) Primary (3) Secondary (4) Tertiary
4. Household size: _____ members
5. Total size of land owned (in acres): _____

Section B: Cassava Production and Marketing

6. How many acres of cassava did you harvest last season? _____

7. What was your total yield (in bags/kgs)? _____

8. Where do you primarily sell your cassava? (1) Farm gate (2) Local village market (3) Town market (4) Other: _____

Section C: Transport Choices and Perceptions

9. What is the main type of transport you use to take your cassava to the market?

(1) Bicycle (2) Ox-cart (3) Boda-boda (4) Hired Truck/Pickup

10. On a scale of 1 (Very Poor) to 5 (Very Good), please rate this transport method on the following:

    a. Cost-effectiveness (Affordability): 1 2 3 4 5

    b. Reliability (Always available when needed): 1 2 3 4 5

    c. Safety (Low risk of accidents/damage): 1 2 3 4 5

    d. Convenience (Ease of use and access): 1 2 3 4 5

11. What is the approximate distance to your primary market (in km)? _____

12. How would you describe the quality of the road to your market? (1) Very Poor (2) Poor (3) Fair (4) Good

Section D: Income and Costs

13. What was your approximate total revenue from cassava sales last season (in UGX)? _____

14. What was the approximate cost of transport for your cassava last season (in UGX)? _____

Thank you for your time and cooperation.

Appendix B: Analysis Output

```
. mlogit trans_choice Age gender_cat edu_cat Farm_Size_acres Annual_Income_UGX Market_Dist
> ance_km road_cat, baseoutcome(1)

Iteration 0:   log likelihood = -265.69883
Iteration 1:   log likelihood = -217.77228
Iteration 2:   log likelihood = -213.45962
Iteration 3:   log likelihood = -213.36207
Iteration 4:   log likelihood = -213.36198
Iteration 5:   log likelihood = -213.36198

Multinomial logistic regression                 Number of obs     =        200
                                                LR chi2(21)       =     104.67
                                                Prob > chi2       =     0.0000
Log likelihood = -213.36198                     Pseudo R2         =     0.1970
```

trans_choice	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
Bicycle	(base outcome)					
Boda_boda						
Age	.0028273	.0161601	0.17	0.861	-.0288459	.0345005
gender_cat	-1.304565	.4991469	-2.61	0.009	-2.282875	-.3262555
edu_cat	.1955344	.23391	0.84	0.403	-.2629208	.6539897
Farm_Size_acres	.3181036	.4505943	0.71	0.480	-.5650451	1.201252
Annual_Income_UGX	5.30e-08	5.55e-07	0.10	0.924	-1.03e-06	1.14e-06
Market_Distance_km	.3033694	.058639	5.17	0.000	.1884391	.4182997
road_cat	1.613067	.7028819	2.29	0.022	.2354438	2.99069
_cons	-4.271723	1.916257	-2.23	0.026	-8.027517	-.5159288
Hired_Truck						
Age	.0115609	.0199074	0.58	0.561	-.0274569	.0505787
gender_cat	-1.33165	.5964345	-2.23	0.026	-2.500641	-.1626604
edu_cat	.1699978	.2901401	0.59	0.558	-.3986664	.738662
Farm_Size_acres	.9863584	.5399149	1.83	0.068	-.0718553	2.044572
Annual_Income_UGX	-1.54e-07	6.70e-07	-0.23	0.819	-1.47e-06	1.16e-06
Market_Distance_km	.418666	.0710835	5.89	0.000	.2793449	.5579871
road_cat	2.279636	1.113731	2.05	0.041	.0967629	4.462509
_cons	-9.146352	2.641797	-3.46	0.001	-14.32418	-3.968525
Ox_cart						
Age	.007398	.0165798	0.45	0.655	-.0250979	.0398939
gender_cat	-.6642615	.5013935	-1.32	0.185	-1.646975	.3184518
edu_cat	.3422041	.2410677	1.42	0.156	-.1302798	.8146881
Farm_Size_acres	.7988641	.4659262	1.71	0.086	-.1143345	1.712063
Annual_Income_UGX	-7.03e-07	5.72e-07	-1.23	0.219	-1.82e-06	4.18e-07
Market_Distance_km	.0777049	.0585623	1.33	0.185	-.0370751	.1924848
road_cat	.3467406	.6605628	0.52	0.600	-.9479386	1.64142
_cons	-1.527025	1.89437	-0.81	0.420	-5.239923	2.185872