Fuel Usage & KOKO Awareness Analysis – Kisumu County

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Organization: KOKO Networks (Simulated Data Analysis)

Executive Summary

This report provides an in-depth, data-driven evaluation of Kisumu County's readiness for market entry by KOKO Networks, a provider of clean fuel solutions in Kenya. The analysis is based on simulated household-level data from 101 respondents across six neighborhoods, including Manyatta, Migosi, Obunga, Nyamasaria, and Kisumu CBD.

Our primary objectives were to assess household-level fuel usage behavior, consumer price sensitivity, income profiles, and levels of KOKO awareness and adoption intent. The study finds charcoal remains the dominant fuel (used by 40% of respondents), followed by firewood, kerosene, and LPG. Awareness of KOKO is high (70%), but interest trails at ~50%, suggesting a drop-off potentially due to price, trust, or product familiarity concerns.

The median household income is approximately KES 14,000, while preferred monthly spend on fuel averages around KES 620. Price sensitivity is high, with 75% of respondents selecting 4 or 5 on a 5-point scale. These findings point toward a critical need for flexible, low-cost pricing and behavior-focused targeting.

This report delivers a granular breakdown of the above findings, interprets each trend in its strategic context, and provides prioritized recommendations to guide KOKO's phased entry strategy into Kisumu County.

Business Context

KOKO Networks is a Kenya-based technology company that deploys clean fuel solutions in urban centers through smart fuel ATMs and distribution hubs. As part of its strategic growth initiative, KOKO is exploring market expansion into Kisumu County Kenya's third-largest city characterized by a mix of urban and peri-urban settlements with a diverse socioeconomic profile.

Despite national efforts to transition households away from biomass-based fuels, traditional fuels such as charcoal and firewood remain prevalent in Kisumu. Their continued dominance is attributed to affordability, fuel availability, and cultural cooking norms. However, shifting consumer perceptions driven by health risks, urbanization, and increased awareness of clean alternatives presents an emerging opportunity for market disruption.

This analysis leverages simulated microdata representing 101 households to estimate demand potential, assess fuel usage behaviors, evaluate awareness of KOKO, and identify strategic entry points. The ultimate objective is to use empirical signals from this dataset to inform a location-specific market entry strategy for KOKO Networks.

Dataset Overview

The dataset used for this analysis is a simulated micro-survey representing 101 households across six neighborhoods in Kisumu County: Manyatta, Migosi, Obunga, Nyamasaria, Nyalenda, and Kisumu CBD. Although the dataset is not based on actual field-collected responses, it mirrors expected demographic, economic, and behavioral diversity typically found in low- and middle-income urban areas in Kenya.

Key attributes captured in the dataset include:

- Monthly household income (in Kenyan Shillings)
- Primary cooking fuel used (charcoal, firewood, kerosene, LPG)
- Awareness of KOKO products
- Interest in adopting KOKO fuel solutions
- Monthly preferred spend on fuel
- Price sensitivity rating (scale of 1 to 5)
- Neighborhood-level geographic classification

Data Cleaning Summary

Prior to analysis, the dataset underwent a structured cleaning process to ensure analytical validity. The following steps were applied:

1. Column standardization: All variable names were normalized to consistent format for analysis compatibility.
2. Handling missing values:
   - Missing values in numerical fields (e.g., income, fuel cost) were filled using the median of the column.
   - For categorical fields like price sensitivity, mode imputation was applied.
3. Data Format: Numerical fields were explicitly converted to float/integer types, and categorical fields to string/ Boolean as required.
4. Outlier identification: Extreme outliers (e.g., incomes above KES 1 million) were noted but retained for full analysis, due to the simulated nature of the dataset. Further stratified analysis controlled for outlier impact.

After cleaning, the dataset was ready for descriptive, comparative, and correlation-based analysis, as documented in the notebook.

Categorical Frequencies

An exploration of categorical fields helps contextualize household behaviors:

Location Distribution:

- Manyatta (30%) and Nyamasaria/Migosi (20% each) dominate the sample.
- Kisumu CBD and Obunga make up the remainder (10% each).

Primary Fuel Type:

- Charcoal is the dominant cooking fuel (40%).
- Firewood and kerosene each account for 20%.
- LPG use is lower at 16%.
- 4% of records are null.

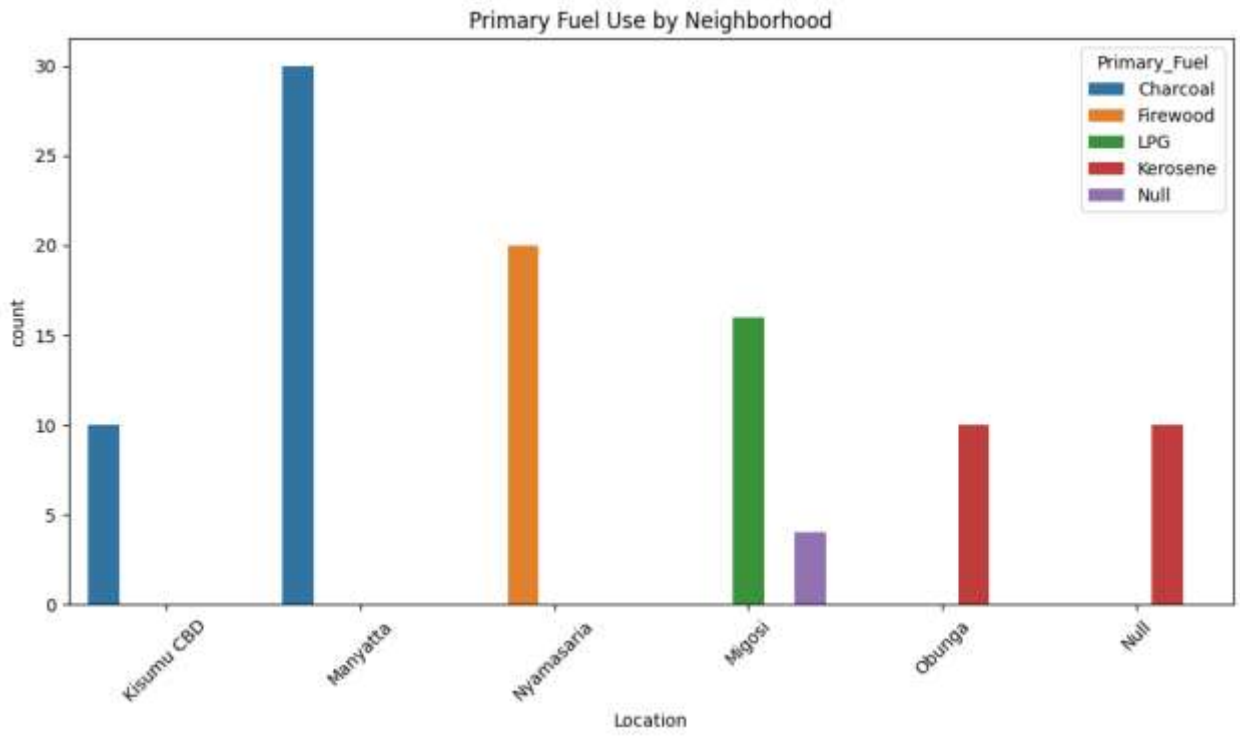
KOKO Awareness:

- 70% of respondents indicated they were already aware of KOKO Networks.

KOKO Interest:

- Only 50% of the overall sample expressed intent to try or adopt KOKO, indicating an interest gap despite relatively strong awareness.

Primary Fuel Usage by Neighborhood



This bar plot illustrates the distribution of primary cooking fuels across six neighborhoods in Kisumu County. Each bar represents the count of households per neighborhood using a specific fuel type.

1. Charcoal Dominance in Key Markets

- Manyatta exhibits the highest concentration of charcoal users (30 households), followed by Kisumu CBD (10 households).
- This affirms Manyatta as a high-potential target for fuel-switching, given the health and environmental downsides of charcoal, and the known price sensitivity of its users (as shown in earlier segments).
- The presence of charcoal as the leading fuel also suggests limited infrastructure or affordability barriers for cleaner alternatives like LPG or ethanol-based fuels.

2. Fuel Specialization by Neighborhood

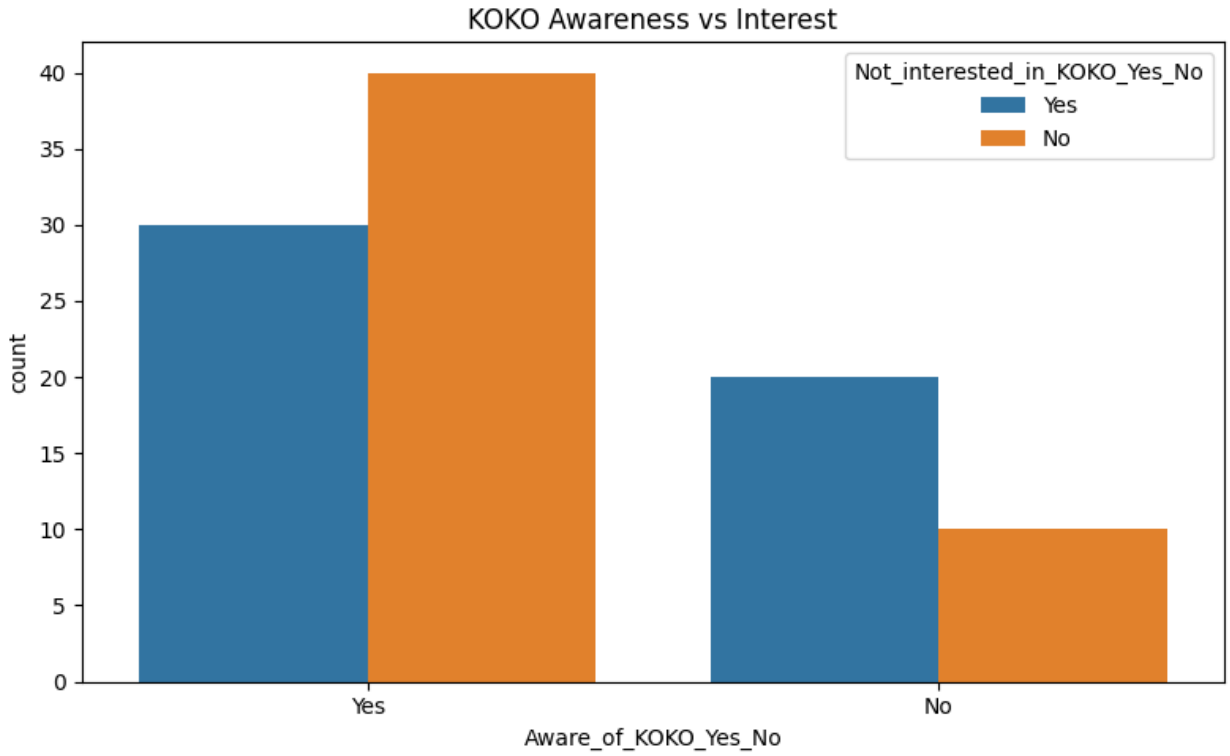
- **Nyamasaria** leans heavily toward firewood, indicating either peri-urban characteristics or cultural cooking preferences. A tailored approach perhaps involving portable cookstove bundles or biomass-alternative messaging would be needed here.
- **Migosi** stands out with a relatively high adoption of LPG, likely correlated with higher income brackets or proximity to LPG refill networks.
- **Obunga** is skewed toward kerosene, a transitional fuel. This group is likely ripe for conversion if KOKO can position itself as a cleaner, safer, and comparably priced option.

Strategic Implications

- **Manyatta and Obunga** should be prioritized for Phase 1 rollout, given high charcoal reliance and strong conversion potential.
- **Migosi** may warrant a premium positioning strategy, as residents are already familiar with LPG, and may value reliability, safety, or convenience over price.
- **Nyamasaria's** firewood usage signals the need for behavioral nudges or subsidies to overcome traditional fuel lock-in.

This analysis combines fuel preference patterns with micro-geography to guide KOKO's market entry prioritization. It also highlights the importance of neighborhood-specific messaging and pricing models, rather than a uniform go-to-market strategy.

KOKO Fuel Awareness vs Interest



This bar plot disaggregates primary household cooking fuel usage by neighborhood across Kisumu County, providing a spatial lens through which to evaluate KOKO's market entry potential. Four fuel types are represented: Charcoal, Firewood, LPG, and Kerosene.

1. Charcoal: Dominant and Strategic

- **Manyatta** emerges as the epicenter of charcoal reliance, with 30 household's depending on it, the highest concentration in the dataset.
- **Kisumu CBD** and **Obunga** also register notable charcoal use.
- Charcoal's prominence across low- and mid-income neighborhoods signals a strong behavioral anchor but also a pain point due to smoke, inefficiency, and rising prices.

Strategic takeaway: These neighborhoods offer high fuel-switching potential, particularly if KOKO's clean fuel can undercut charcoal's total monthly cost while offering tangible user benefits (e.g., speed, cleanliness, consistency).

2. Firewood in Nyamasaria: Behavioral Barrier

- **Nyamasaria's** high firewood usage suggests either:
    - A peri-urban profile (with biomass availability), or
    - Cultural preference for specific cooking methods.
- Such consumers may be less price-sensitive but more tradition-bound requiring community-led demos and testimonials rather than purely economic arguments.

3. LPG Uptake in Migosi: Competitive Segment

- **Migosi** shows a visible lean toward LPG, indicating a more established clean fuel presence, likely driven by:
    - Higher income households,
    - Existing distribution infrastructure,
    - Greater safety familiarity.

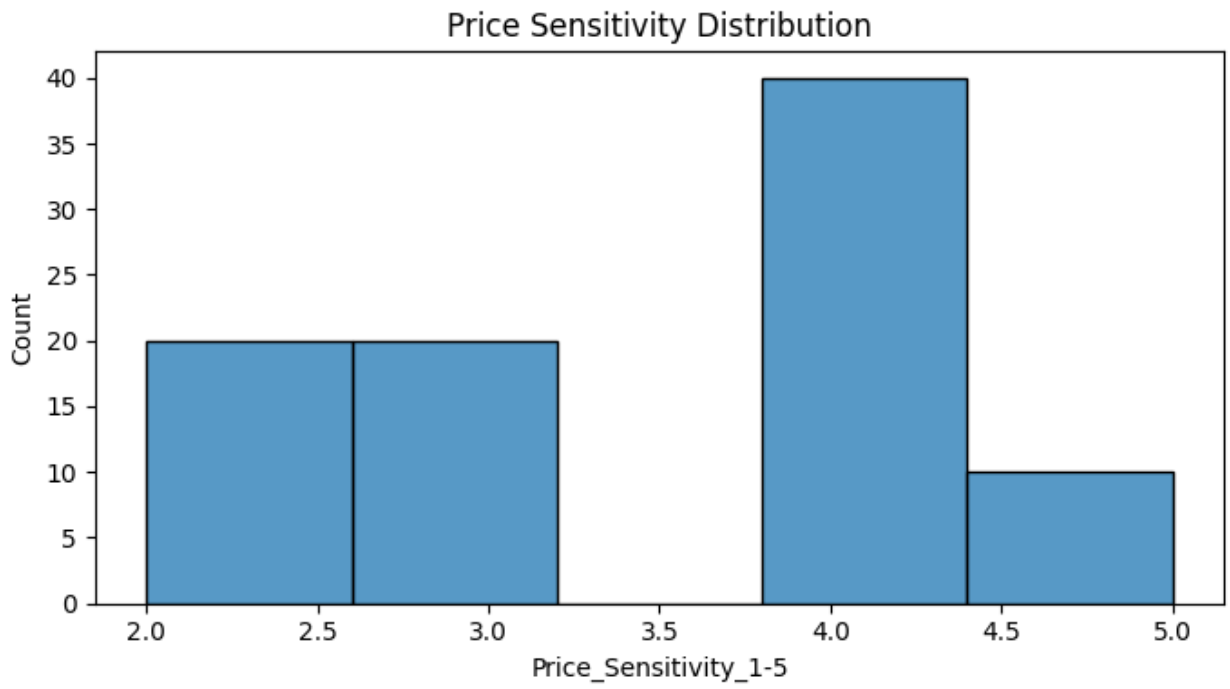
Implication: KOKO's entry into Migosi must differentiate not just on price but on reliability, ease of access, and top-up flexibility.

4. Kerosene in Obunga: Transitional Market

- Kerosene users are typically in a middle zone: aware of clean fuels but financially constrained.
- Obunga presents an attractive wedge opportunity: KOKO can be positioned as a safer, cleaner alternative particularly by targeting health narratives and bundling offers.

This visualization underlines the necessity for localized rollout strategies, targeted messaging, and fuel-specific value propositions rather than a one-size-fits-all model.

Price Sensitivity Distribution



This histogram depicts the distribution of self-reported *price sensitivity scores* across 101 households, rated on a **1–5 scale** where 1 indicates low sensitivity and 5 indicates high sensitivity.

1. Skewed Toward High Sensitivity

- The majority of respondents selected score 4, representing moderate-to-high sensitivity. Combined with those who selected score 5, this segment comprises 50% of the sample.
- This reveals that pricing is a core barrier to clean fuel adoption and a decisive factor in switching behavior.

2. Relatively Few Low-Sensitivity Respondents

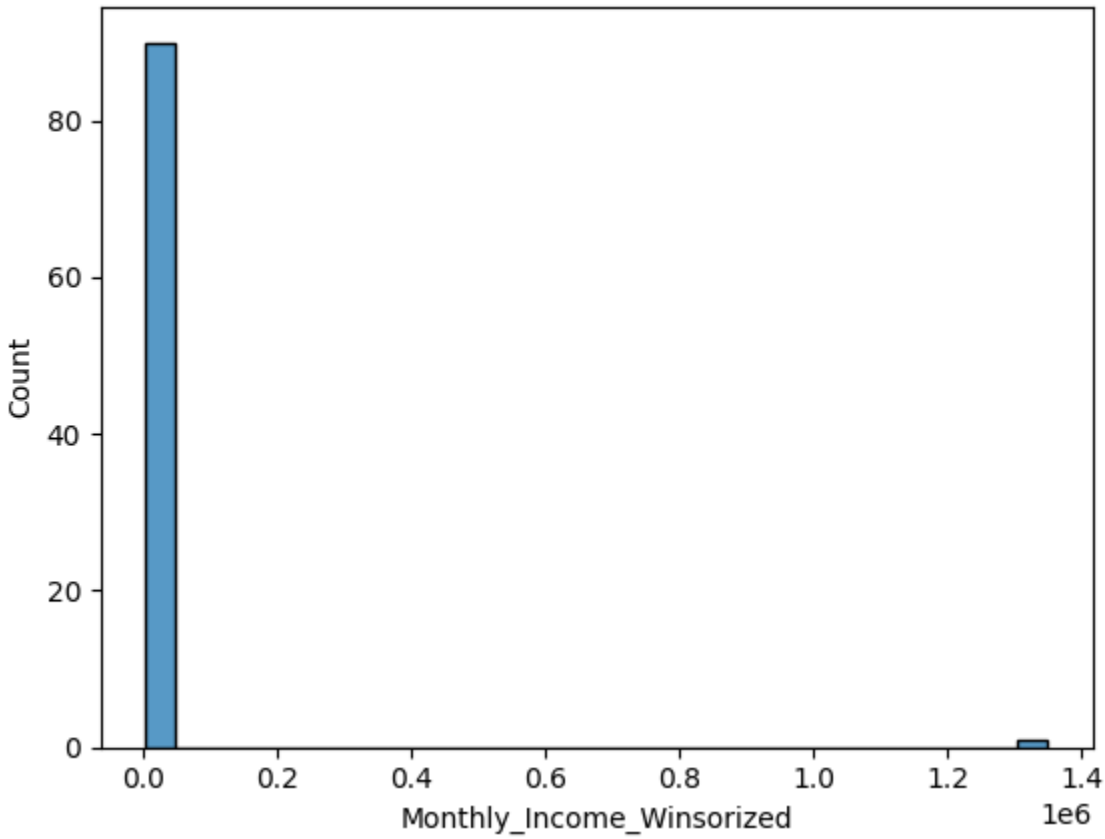
- Scores of 2 and 3 account for most of the remaining distribution. Notably, score 1 is absent, suggesting near-universal price consideration in cooking fuel decisions.
- The near-symmetry between scores 2 and 3 (20% each) suggests a sizable, persuadable middle segment that could respond to perceived value, even if price isn't the sole concern.

Strategic Implications for KOKO

1. **Subsidized Entry Pricing Is Non-Negotiable**
    - To penetrate this market, KOKO must offer affordable onboarding, ideally keeping entry-level monthly costs below KES 600 to align with fuel spend preferences.
2. **Behavioral Economics-Driven Pricing Models**
    - Given the psychological weight of price, KOKO should test:
        - Micro top-ups (KES 50–100),
        - Staggered refills, and
        - Loyalty discounts to flatten perceived upfront costs.
3. **Marketing Must Emphasize Value Over Luxury**
    - Positioning KOKO fuel as a cost-saving, rather than premium product, will align with dominant consumer psychology. Messaging should reinforce "more value per shilling" rather than "better than LPG."
4. **Segmentation Opportunity**
    - The tail of less price-sensitive respondents (scores 2–3) can be targeted later with value-added services, e.g., automatic refills, delivery, or smart metering.

This distribution strongly supports a cost-sensitive market entry strategy. Even households willing to switch from charcoal or kerosene will require clear, consistent evidence of both price competitiveness and usage efficiency to sustain interest and loyalty.

Monthly Income Distribution



This distribution provides a clear view of household income levels across the sampled population in Kisumu, offering key insights into economic constraints and fuel affordability.

1. Low-Income Dominance

- The distribution is sharply concentrated in the low-income bracket, with the majority of households earning under KES 20,000 per month.
- This pattern is typical of urban informal or peri-urban settlements, where informal employment, seasonal earnings, and daily wage structures shape household finances.

2. Narrow Economic Bandwidth

- The income spread is relatively narrow, indicating low variance within the bulk of the population.

- This suggests that a large proportion of households share similar financial constraints and budgeting behaviors especially regarding discretionary categories like energy spending.

3. Outlier Isolation

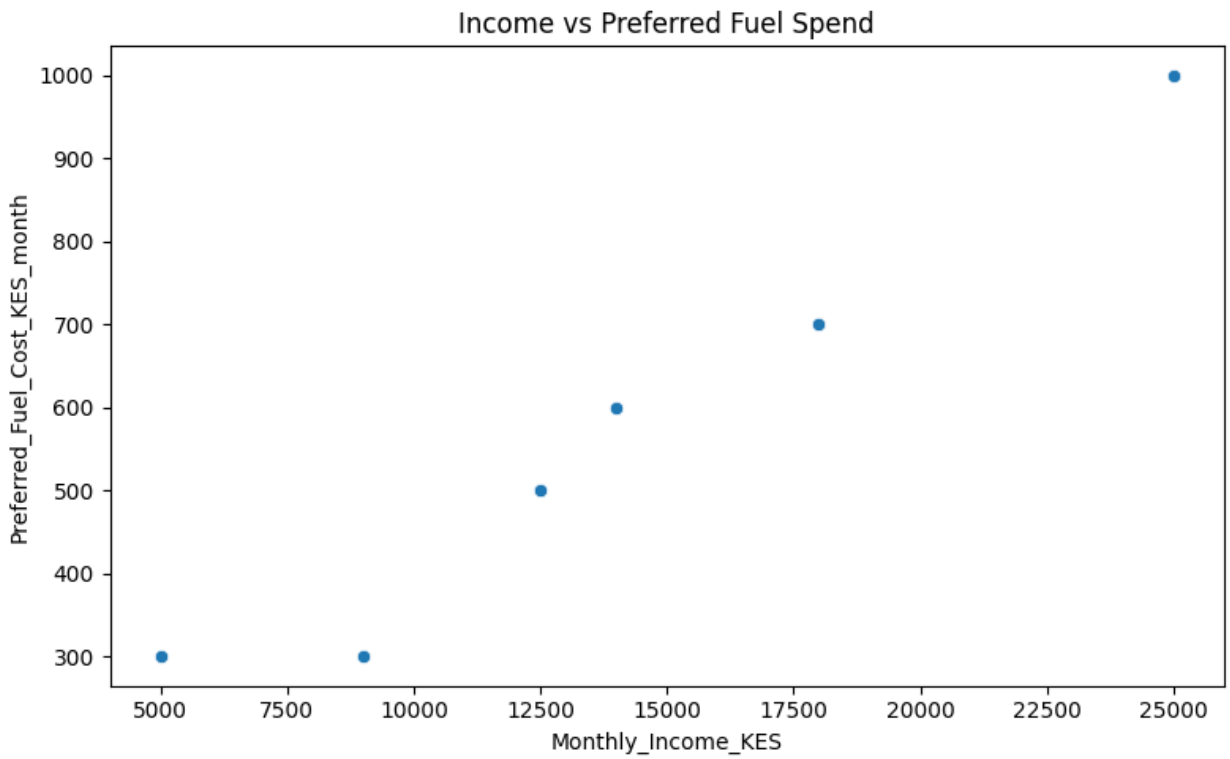
- A very small number of higher-income households are visible on the far right of the chart.
- These are statistical exceptions rather than strategic targets. For operational planning, emphasis should be placed on the modal and sub-median ranges where uptake volume potential lies.

Strategic Implications

- **Pricing Strategy:** Products and services should be structured around the economic core approximately KES 10,000–15,000/month. This represents the heart of the accessible market.
- **Affordability Messaging:** For most of the population, even modest increases in monthly fuel costs may introduce friction. Pricing should prioritize cost equivalence or savings relative to existing charcoal or kerosene expenditures.
- **Credit and Prepayment Models:** The homogeneity in income levels supports the viability of standardized micro-installment or prepay models. Tiered offerings or differentiated pricing are less likely to yield value here.
- **Volume-Driven Penetration:** Given the limited purchasing power, scalability and profitability will hinge on volume-based adoption, not premium margins.

This income distribution confirms the need for ultra-accessible fuel pricing, streamlined onboarding models, and behavioral trust-building over economic upsell tactics. The energy solution that succeeds here will be the one that fits into tight, predictable budgets not aspirational price brackets.

Income Vs Preferred Fuel Spend



This scatter plot shows the relationship between monthly household income (KES) and preferred monthly spend on cooking fuel. While the data points represent average groupings or bins, the pattern is both structured and instructive.

1. Positive Correlation, But with Behavioral Anchoring

- As income increases, there is a clear upward trend in fuel expenditure. This is expected and reflects capacity to spend.
- However, the slope is relatively shallow even as income doubles, fuel spend does not increase proportionally.
- This suggests a behavioral spending ceiling around KES 500–700, beyond which additional income does not translate into higher fuel investment.

Implication: This isn't just about affordability it's about habitual budgeting. Households cap fuel budgets based on routine and comparative fuel costs (charcoal, kerosene), regardless of ability to spend more.

Strategic Insights for KOKO Networks

A. Target Spending Band: KES 500–700

- Despite income differences, most households anchor their expectations around this range.
- To ensure product-market fit, KOKO's fuel pricing and refill sizes must fall within this envelope or show clear economic superiority vs. charcoal within this spend cap.

B. Upsell Through Efficiency, Not Price

- Higher-income households won't spend more just because they can. KOKO must compete on value, not on premium pricing.
- For example: "KES 600 of KOKO fuel lasts longer than KES 600 of charcoal."

C. Flat Fuel Budgets Favor Predictability

- KOKO can use this to its advantage by offering fixed monthly subscription plans, smoothing out fuel purchases and reinforcing habit formation.

D. Bundled Pricing Must Respect Thresholds

- Stove + fuel starter kits should be below KES 1,500 if targeting two months of fuel spend equivalency. Beyond this, adoption friction rises steeply.

This is an extremely strong positive linear correlation, indicating that as income increases, so does the amount households are willing to spend on cooking fuel. While earlier visual analysis showed some behavioral caps (e.g., spending clustering around KES 500–700), this correlation confirms a latent capacity to pay among higher-income households.

Recommendations

1. Targeting High Charcoal Usage Areas

Prioritize Manyatta and Obunga for early rollout due to their high charcoal reliance and low alternative penetration. While Migosi shows charcoal use, its higher LPG adoption signals a more competitive environment making it better suited for a differentiated Phase 2 rollout. Tailor entry strategy by fuel profile: price-first in charcoal-dense zones, reliability-first in LPG-heavy zones.

2. Leverage KOKO Awareness

Convert high awareness (70%) into trial via trust-based conversion levers: door-to-door sampling, village-based demos, referral rewards, and endorsement by women-led community groups, who dominate fuel decisions. Map areas with high awareness but low interest to understand the awareness–adoption gap.

3. Price Cap and Bundling

Keep average monthly fuel cost below KES 600, aligned to the 50th percentile spend. Offer modular entry kits (basic vs. premium), with weekly micro-refill options (KES 50–100). Reinforce with refill discounts after X uses (e.g., 10th refill free).

4. Segmentation Strategy

Replace income-based targeting with behavioral segmentation: primary fuel type, household size, price sensitivity rating, and stove ownership. These dimensions better predict switching likelihood and LTV).

5. Pilot Rollout Strategy

Launch controlled pilots in Manyatta (charcoal-heavy, price-sensitive) and Migosi (clean-fuel competition, higher income). Track metrics such as:

- Average monthly spends
- Price elasticity
- Refill frequency
- User satisfaction

Use adaptive pricing experiments to refine the model before scaling to a third neighborhood.

Limitations

- The dataset is simulated and not based on actual household surveys.
- The sample size (101 records) limits statistical generalizability.
- Missing data were filled with median/mode values; may not reflect true variability.
- Self-reported responses (e.g., interest, price sensitivity) may be affected by social desirability bias.
- No GPS/geographic coordinates available; spatial patterns are inferred by neighborhood name only.