DETERMINANTS OF LPG USAGE AND POTENTIAL ALTERNATIVE COOKING ENERGY SOURCES IN RURAL SRI LANKA

Tharundi Ileperuma*
University of Kelaniya, Sri Lanka

This study investigated the impact of energy security on rural household cooking practices. A sample of 56 households out of 561 households in Pamunugama area of the Kalutara District of the Western Province was selected using stratified random sampling and data collected through structured questionnaires. Secondary data from Grama Niladhari reports were incorporated to reinforce the empirical analysis. Tables and graphs were used to present the data. Energy is used for various purposes, but here we analyze only the energy security of energy used for domestic cooking in the rural sector. Numerous studies on energy security and domestic energy sources indicate a growing preference among rural populations for the use of imported liquefied petroleum gas (LPG) for household purposes. However, due to the recent economic crisis faced by Sri Lanka, a problematic situation arose regarding the import of energy, and due to this, a problematic situation also arose regarding the energy used for cooking in rural households. That is, the availability of affordable, continuous sources of energy for cooking in rural households poses challenges. The main objective of this research was to analyze how energy security influence rural household cooking practices, with particular emphasis on LPG adoption and the exploration of alternative energy sources. The first specific objective was to identify the key socio-economic, demographic, and accessibility factors that have led rural households to increasingly adopt LPG for cooking and the second spesific objective was to identify alternative cooking energy sources viable in rural areas to reduce household cooking costs while ensuring affordability, availability, and accessibility. This analysis was done through multiple regression models and statistical measures, and the SPSS software was also used for this purpose. Key factors influencing the preference for LPG included household income levels, distance from LPG supply points, family size, and the number of meals prepared daily. Compared to electricity and kerosene, primary sources of energy such as firewood, crop residues, animal waste etc. are successful alternatives that can be used for cooking in rural areas and reduce cost. Overall, the study concluded that energy security in rural household cooking is primarily influenced by the affordability, accessibility, and convenience of energy sources. Promoting the use of locally available primary energy resources can significantly enhance energy security, reduce dependence on imported fuels, and ensure sustainable cooking practices in rural Sri Lankan communities. The research contributes to policy-level discussions on energy resilience and the promotion of sustainable, locally appropriate energy alternatives in rural development strategies.

Keywords: energy security, rural household cooking, liquefied petrolium gas (LPG)

**Corresponding Author: tharukavi1998@gmail.com*

DETERMINANTS OF LPG USAGE AND POTENTIAL ALTERNATIVE COOKING ENERGY SOURCES IN RURAL SRI LANKA

Tharundi Ileperuma
University of Kelaniya, Sri Lanka

1. Introduction

Energy is essential for the functioning of all systems and is categorized into renewable and non-renewable sources. Global discourse increasingly emphasizes energy security, which the International Energy Agency (IEA) defines as the uninterrupted availability of energy at an affordable price. Achieving Sustainable Development Goal 7 requires universal access to sustainable and modern energy by 2030. Energy security supports all economic sectors—agriculture, industry, and services—and intersects with broader issues such as political stability and population growth. Sri Lanka, reliant on fossil fuel imports for 60% of its energy needs and faces a critical energy crisis. In domestic contexts, especially cooking, energy sources such as LPG, firewood, electricity, and kerosene are commonly used. With approximately 3 billion people globally lacking clean cooking solutions, there is a pressing need to focus on affordable and sustainable energy options. In Sri Lanka, despite regional disparities, rural areas are increasingly shifting to LPG. However, dependency on imports and recent shortages necessitate a reassessment of this trend and the exploration of alternative energy sources for cooking.

1.1 Research Problem

Energy security is defined by the International Energy Agency as the availability of sustainable and affordable sources of energy. Renewable and non-renewable energy sources are used for various purposes, including agriculture, industrial services, recreation, and domestic activities. Among domestic activities, energy sources have become an integral part of rural household cooking. Around the world, household cooking uses liquefied petroleum gas, firewood, and electricity. Coal, crop residues, dung, natural gas, biogas, and solar energy. In Sri Lanka, these energy sources are also used in various ways for cooking. Especially in rural areas, liquefied petroleum gas, firewood, electricity, and kerosene are used for household cooking. Alternatives such as coal, dung, crop residues, etc. are used. A trend that is visible today is that although there are various options for cooking at home, the rural people have increasingly turned to the use of imported liquefied petroleum gas (LPG). However, recently, the price of LPG has increased rapidly and there has been a shortage of LPG. This has led to the difficulty of continuously obtaining LPG at an affordable price for rural domestic cooking. Therefore, at a time when global attention has been focused on energy security, it is a timely need to pay attention to how energy security affects rural domestic cooking. That is, consideration should be given to using energy sources such as LPG, electricity, petroleum and primary energy sources (including firewood) for rural household

cooking, depending on the availability of affordable and sustainable sources of energy.

1.2 Research Questions

Main Research Question:

How does energy security affect rural household cooking?

Specific research questions:

i. Why have rural households increasingly adopted LPG for cooking?

ii. What viable alternative energy sources exist that can help reduce cooking costs in rural areas?

1.3 Objectives

Main Objective

To analyze how energy security influences rural household cooking practices, with particular emphasis on LPG adoption and the exploration of alternative energy sources.

Specific Objectives:

1. To identyfy the key socio-economic, demographic, and accessibility factors that have led rural households to increasingly adopt LPG for cooking.

2. To identify alternative cooking energy sources are viable in rural areas to reduce household cooking costs while ensuring affordability, availability, and accessibility.

2. Methodology

A sample of 56 households out of 561 households in the Pamunugama area of Kalutara District, Western Province, was selected using stratified random sampling**.** The stratification was conducted geographically across five roads, with proportional allocation to ensure the sample accurately reflected the population distribution. Within each stratum, households were randomly selected using electoral rolls as the sampling frame to guarantee geographic representativeness. Data collection was undertaken via structured questionnaires administered to the selected households. In addition to primary data, secondary data obtained from Grama Niladhari reports were incorporated to enhance the robustness of the analysis. Descriptive statistics were presented through tables and graphs to illustrate energy usage patterns. To investigate determinants of LPG usage for household cooking, a multiple regression model was developed. Furthermore,

statistical measures, including means and frequency distributions, were applied to identify and evaluate alternative energy sources that may contribute to reducing cooking costs in rural households.

3. Results and Discussion.

The data generated in this study provide a representative overview of the current energy security conditions in rural households of the Pamunugama area. These findings highlight important usage patterns of cooking energy and identify aspects requiring further attention. A multiple regression analysis was conducted to examine the key factors influencing the duration of LPG cylinder usage in rural households. In this model, the dependent variable is the number of weeks an LPG cylinder lasts, while the independent variables include household income, number of household members, number of meals cooked per day and distance from the household to the LPG supply market .The model explains 75% of the variation in LPG cylinder usage duration, as indicated by an R-squared value of 0.75. The ANOVA test confirms the overall significance of the model with a p-value of 0.000, which is well below the 0.05 threshold.

Table1: Coefficient Table

Variable	Coefficient (Unstandardized B)	Significance (p-value)
Constant	31.485	.000
Household income	-5.800	.007
Number of family members	-1.443	.000
Number of meals cooked per day	-4.963	.000
Distance to LPG market (km)	-.004	.005

(Source: SPSS software)

The values for household income, number of household members, number of meals cooked per day, and distance to the LPG market are 0.007, 0.000, 0.000, and 0.005 respectively. Since all of these values are below the 0.05 significance level, the results are statistically significant. This indicates that each of these factors has a reliable individual effect in the analysis.

The analysis indicates that, in addition to LPG for household cooking, several other viable energy alternatives have been identified as effective in reducing household energy costs in rural areas.

The median monthly household expenditure on firewood, kerosene, and electricity is 1.11%, 3.15%, and 1.52%, respectively.

Table 2: Availability and accessibility of energy

Energy type	Percentage of households with a frequency that uses the relevant energy		Percentage of households with a frequency of not using relevant energy	
	Availability	Accessibility	Availability	Accessibility
firewood	100%	84%	70%	50%
keroson	71%	66%	44%	39%
electracity	100%	100%	100%	39%

(Source: Primary data)

Firewood, kerosene, and electricity are used by 100%, 71%, and 100% of the selected households, respectively. Despite this, among households not utilizing these energy sources, availability remains at 70%, 44%, and 100%, respectively. These findings indicate that firewood has the highest overall availability compared to kerosene and electricity.

Firewood, kerosene, and electricity are used by 84%, 66%, and 100% of the selected households, respectively. However, among households not using these energy sources, access remains at 50%, 39%, and 39%, respectively. This indicates that firewood is more widely accessible compared to kerosene and electricity.

Data reveal that firewood is widely available and easily accessible compared to kerosene and electricity in these rural households.

4. Conclusions and Suggestions

4.1 Reasons why people have resorted to using LPG for domestic cooking.

LPG use in rural households is influenced by household income, family size, number of meals cooked per day, and distence between home and LPG market.

4.2 Apart from LPG for household cooking, other successful options for cost reduction in rural areas are:

It can be concluded that firewood is the leading primary energy source compared to kerosene and electricity as successful options that can reduce existing costs in rural areas.

Overall it can be concluded that energy security affects rural household cooking.

4.3 Suggestion.

This study finds that rural households are increasingly using LPG for domestic cooking, mainly due to factors such as household income, number of meals prepared daily, household size, and the distance to the LPG market. These factors reflect the affordability, availability, and accessibility of LPG. However, as Sri Lanka relies on imported LPG, the recent economic crisis disrupted supply, affecting household cooking. Therefore, attention should be given to alternative energy sources that are more locally available. The findings suggest that firewood and other primary energy sources are cost-effective alternatives for rural cooking. To promote their use, it is important to change negative perceptions about traditional firewood and introduce modern, efficient methods of using these local energy sources.

5. Refferences

1. Central Bank of Sri Lanka, Annual Reports (different years)

2. Cookpad, & Gallup. (2021). A Global Analysis of Cooking Around the World. In COOKPAD.

https://static.cookpad.com/worldcookingindex/Cookpad_GlobalAnalysis_reportYear4.pdf

3. Damayanthi, B. W. R. (2018). Socio-Economic determinants of Cooking Fuel Choice among Households in Rural in Sri Lanka. Journal of Environment and Earth Science., 8(2224-3216).

4. Energy Charter Secretariat. (2015). International Energy Security. In Energy Charter. Energy CharterSecretariat.

https://www.energycharter.org/fileadmin/DocumentsMedia/Thematic/International_Energy_Security_2015_en.pdf

5. IEA. (2023). Energy security. IEA https://www.iea.org/topics/energy-security

6. Jayasinghe, M., Selvanathan, E. A., & Selvanathan, S. (2021). Energy poverty in Sri Lanka. Energy Economics, 101, 105450.

7. Miah, Md. Danesh., Foysal, M. A., Koike, M., & Kobayashi, H. (2011). Domestic energy-use pattern by the households: A comparison between rural and semi urban areas of Noakhali in Bangladesh. Energy Policy, 39(6), 3757–3765.

https://doi.org/10.1016/j.enpol.2011.04.004

8. Ministry Of Power, Energy and Business Development. (2019). The Gazette of the Democratic Socialist Republic of Sri Lanka.

https://www.energy.gov.lk/images/resources/downloads/national-energy-policy2019-en.pdf

9. Rajmohan, K., & Weerahewa, J. (2007). Household Energy Consumption Patterns in Sri Lanka. Sri Lankan Journal of Agricultural Economics, 9(0), 55.

10. Stoner, O., Lewis, J., Martínez, I. L., Gumy, S., Economou, T., & Adair-Rohani, H. (2021). Household cooking fuel estimates at global and country level for 1990 to 2030. Nature Communications, 12(1).

https://doi.org/10.1038/s41467-021-26036-x

11. United Nations. (2022). The Sustainable Development Goals Report 2022. In UN Statistic Division. United Nations.

https://unstats.un.org/sdgs/report/2022/The-%20Sustainable-Development-GoalsReport-2022.pdf